British Trust for Ornithology

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Birds and Sustainable Agriculture at Colworth Park

A progress report for winter 1999/2000 and summer 2000

Confidential

Ian Henderson, Stephen Holloway & Nigel Clark

A Report by the British Trust for Ornithology

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1. INTRODUCTION

The Colworth Estate is partly located within one of the two main areas of woodland in Bedfordshire, although arable land occupies the greater part (75%) of the estate. Woodland (semi-natural ash, maple and oak, with hazel-dominate understorey) occupies around 20% of the whole estate, recreational areas around 5%, while scrub and hedgerows cover less than 1% of the area.

The farmed area is mainly intensively managed as productive arable land, subject to cultivation, weed and pest control. Within the estate, however, lies an area of around 60 ha (around 1/5th of the estate) allocated to research and sustainable agriculture. In 1999/2000, this Sustainable Agriculture Project (SAP) area mainly comprised arable land, with additional grass margins, hedgerows and woodland edge (Fig. 1). The crop area of the SAP site is operated on a seven-year rotation, and for 1999/2000, was largely sown to winter wheat, plus one field each of winter-sown oilseed rape and spring-sown vining peas.

As part of the current research programme for the SAP, extensive, year-round bird population surveys were carried out on the site to identify associations and influences of the agricultural regime on bird numbers and distribution. The information is used to develop recommendations that will, in future years of the rotation, maintain, if not increase both conservation and scientific interest of the site. The report, below, also presents the results of a winter farm audit of the whole Colworth Estate.

SECTION A

2. BIRD STATUS AND DISTRIBUTION WITHIN THE SAP AREA

2.1 Field Methods

A survey of the birds of the Sustainable Agriculture Project (SAP) area was carried out in each month from September to March 1999/2000, and was followed by a breeding birds census from April to August 2000. In both periods, the procedure involved a "field by field" method of walking around each field boundary then across each field once, recording all birds seen or heard, using standard recording codes and procedure (Marchant *et al*. 1992). This method meant that all bird records could be allocated to specific habitat features. A total of 10 visits to the SAP area in summer was required in order that the position of breeding territories could be identified and their distribution examined in relation to crop types and boundary habitats. Thus, territories are estimated from the locations of singing birds or clusters of individual bird records accumulated over the 10 visits to the site. For some species it can be misleading to identify discrete breeding territories where the species is rarely observed (e.g. birds of prey, Grey Partridge). For other species it may be inappropriate to identify discrete territories where, for example, the species nests within colonies (e.g. Rooks, Jackdaws and Starlings).

On each visit field and boundary habitat details were recorded in the following way:

Fields: All conventional fields and field margins, strips or set-aside areas were independently labelled (Fig. 2), with field content and vegetation height being recorded in each case.

Boundaries: Each field boundary was labelled, and in some cases sub-divided into sections and labelled, where the boundary character changed along its length (Fig. 2). Thus, bird records could be attributed to specific boundary features. Each boundary section was classified as either: 1. Open, 2. Hedge without mature trees (where a tree is > 5m tall), 3. Hedge with mature trees or 4. Tree line (no hedge). Hedgerow height and width was estimated to the nearest half metre. The number of mature trees per boundary section was used to calculate linear density, and the species of tree was recorded. Where a boundary strip of vegetation existed along the hedge bottom, the average width of the strip was estimated to the nearest half metre (boundary strip width). The presence of ditches and/or dead wood was also noted.

Field areas were supplied and boundary lengths were calculated from site maps.

2.2 Results

2.2.1 Winter 1999/2000

The distribution of bird records for early winter (October) and for the mid winter period (November to January) is summarised in Fig. 3. In October, the stubble field G (see Fig. 2) supported large numbers of finches, plus Meadow Pipits and Pied Wagtails, but the finches used only one area of the field where perhaps grain had been spilt. Yellowhammers were mainly concentrated along the railway line boundary, with most internal fields and grassland margins being largely devoid of birds. Rooks and Jackdaws were present only on the grazed field of pasture beyond the north east boundary of the SAP (Fig. 3). From November 1999, very few birds were recorded on the cultivated fields that had replaced the stubbles present in

October. One large flock of Woodpigeons was feeding on the freshly cultivated field G in November, and a few Rooks and Starlings were recorded foraging on the remaining stubbles of field A. From November to January, ground-feeding birds were mainly recorded from field I (fallow, then sown for oilseed rape). Rooks and Jackdaws again foraged mainly on the grazed area of pasture lying outside the SAP area (Fig. 3). Although densities of birds on fields were generally low during the winter, a discernible shift in distribution between October and November probably reflected the process of cultivation and crop development across the site, which included clear preferences for oilseed rape. Future relocations of oilseed rape within the crop rotation will establish whether this preference was due to the crop *per se*, or other factors such as field location, topography or the previous crop type.

2.2.2 Summer 2000

An estimate of the number of breeding territories is presented for 32 species in Table 1, with a list of additional species recorded during the breeding season presented in Appendix 1. The distribution of breeding territories is presented in Figs. 4 and 5 for boundaries and fields respectively.

In general, the site was good for Yellowhammers (12 pairs), Whitethroats (10 pairs) and Skylarks (12+ pairs), although each species demonstrated a preference for particular areas of the site. Grey Partridge (BAP), Turtle Dove(BAP), Song Thrush(BAP), (possibly Blackbird), Tree Sparrow(BAP), Linnet(BAP), Greenfinch and Goldfinch were under-represented on the site, as were some migrant warblers. Five of these species are subject to national Biodiversity Action Plans(BAP) to aid their recovery on farmland.

Birds on boundaries

Of 34 boundary sections identified, those associated with territories of each of 32 bird species are presented in Table 1. The relationship between bird density and boundary type is summarised in Fig. 6. Tall, broad hedges with mature trees (13, 17, 27, 28 & 29) dominate the preferred boundaries selected in Table 1. Among hedgerows without trees, boundary 16 was prominent. This boundary, of thick blackthorn-dominated construction, also lay adjacent to the scrub-rich railway embankment. As a rule, the distribution of breeding territories of most species was strongly associated with habitats that border or lie just beyond the SAP area (Fig. 4). As regards internal boundaries, two core areas attracted breeding birds: 1. the convergence of boundaries 1, 2, 25, 27 and 29 (see Fig. 2) and 2. the convergence of boundaries 28 and 33 by the irrigation pond. The densities of birds nesting along the boundary (30), which forms the southern border of the oilseed rape field (I), were very low, probably reflecting the under-developed composition of the hedgerow there (Fig. 4). However, while none of the open boundaries supported breeding birds directly, they may have contributed to the use of adjacent fields by species such as Skylarks that habitually avoid tall, wooded boundaries (Fig. 5). Three boundaries, 5, 13 and 27 were especially prominent in winter, but mainly due to a single large flock of Redwings and Fieldfares that happened to land there on our visit in January. These three boundaries have tall trees, and such boundaries tend to attract higher numbers of birds, particularly where a hedgerow runs below the trees (Fig. 6).

Breeding pairs of Palaearctic migrants such as Willow Warbler, Garden Warbler, Blackcap and Chiffchaff, as well as resident Greenfinches and Goldfinches were relatively scarce within the SAP area despite being common and widespread as breeding species across the UK. Blackcap was the commonest of these species at Colworth and mainly confined to the

woodland areas of understorey bordering the SAP area. Willow Warblers were associated with the scrub areas along the railway embankment, while Garden Warbler was not recorded on the Colworth SAP areas as a breeding species (Fig. 4). Goldfinches and Greenfinches tend to breed in mature trees with an enclosed canopy (e.g., conifers, birch or beech) and feed in sparse grassland and weed-rich habitats. Both the breeding and foraging requirements of these two species are probably under represented within the SAP area, with the grassland/scrub mosaic of the railway embankment providing most of the suitable foraging habitat. Two interesting species, Cuckoo (a nest-parasite of Willow Warblers or Dunnocks) and Green Woodpecker (which feeds on ants) were also recorded mainly near to the scrub/grassland habitat of the railway embankment.

Some species of high conservation concern in the UK were rare or under-represented on the SAP area at Colworth. These included Grey Partridge, Turtle Dove, Song Thrush and Tree Sparrow. Each of these species is subject to a national Biodiversity Action Plan to aid their recovery across the UK.

Birds on fields

For Whitethroat and Reed Bunting (as well as Skylark) (Fig. 5), the field of oilseed rape appears to have strongly influenced the establishment of breeding territories along nearby boundaries as well as with the crop itself (Fig. 5). If this association is strong, then these species may be expected to track the rotation of rape in future growing seasons.

Skylark territories were established on most fields, including young crops of wheat, with cereal fields C, E, F & G each supporting between one to two pairs of Skylarks (but none on cereal field A. Skylark breeding densities were highest however, on the pea field (D) and rape field (I). Three pairs of Skylarks, were associated with rape, in addition to foraging Starlings, Whitethroats (possibly breeding there), Linnets, Greenfinches, Goldfinches, Reed Buntings (possibly breeding there) and Woodpigeons. The pea field attracted high densities of foraging birds, particularly around the time of flowering, with the variety of species even including insectivores Willow Warblers that are normally associated with scrubland (Fig. 5). Again species strongly associated with peas may shift their foraging distribution in future years in response to the rotation of the pea field. This will determine whether their distribution is more strongly associated with the pea crop itself or the boundary features nearby. No other species was recorded breeding in cereal fields with Woodpigeons making up the occasional forging recorded.

Summary

1. Main concentrations of territories were associated with border habitats, with key features including mature trees, scrub and thick hedges.

2. Strong contrast between cereals and non-cereals. Oilseed rape and peas were associated with the highest densities of Skylarks (both crops), Whitethroats and Reed Buntings (oilseed rape). Peas attracted high densities of foraging birds, particularly near flowering (Fig. 5).

3. Some migrant warblers were under-represented on the SAP area (probable lack of young trees and boundary structure).

4. Greenfinches and Goldfinches were under-represented on the SAP area (possible lack of weedy foraging patches or breeding habitat).

5. Some important BAP registered species were either not recorded or were rarely recorded on the SAP area.

3. PLANNING, HABITAT MODIFICATIONS AND BIODIVERSITY

3.1 Literature Review

Crop diversification (including spring crops and non cropped areas such as set-aside) are currently viewed as a key requirement for higher densities of foraging and breeding birds on farmland (Wilson *et al.* 1997). However, mixed winter crops (such as wheat, barley and rape) may be of lower value than spring crops, set-aside or fallow land since Chamberlain *et al.* (1999) maintain that crop type rather than diversity *per se* was the closest predictor of Skylark distribution. Spring crops (including peas) provide birds with accessible vegetation in which to forage and nest (Wilson *et al.* 1997). Spring crops also follow over-winter stubbles that provide foraging habitats for seed-eating birds (Donald & Evans 1994, Wilson *et al.* 1997, Buckingham *et al*. 2000). Barley stubbles are particularly valuable in this respect (Buckingham *et al*. 2000, Atkinson pers comm.).

Where an indigenous flora (weeds) develops within crops or stubbles, the crop's value to birds is enhanced (Donald & Evans 1994, Buckingham *et al.* 2000). Structural and botanical variation encourages birds to exploit attendant invertebrates and seeds, and provide gaps in the vegetation to aid access for foraging (Schön 1999, Wakeham-Dawson & Aebischer 1999, Henderson *et al*. 2000 a & b, Henderson *et al.* in press). Field composition also affects invertebrate-feeding bird species, such as Song Thrush, since Buckingham *et al*. (2000) found that Song Thrushes preferred weedy stubbles to crops or grassland in summer. Tucker (1992) also found that insectivorous birds avoided cereals and rape in favour of permanent grassland that was lightly grazed. Species such as Jackdaws and Rooks favour grazed pastures where leather-jackets and dung flies are common, but these species will also feed on stubbles and bare ground, particularly where treated with farmyard manure (pers. obs). Grasses and indigenous weeds are also a source of invertebrate food for finches, buntings and Grey Partridge (Rands 1985, 1986, Potts 1991). Annual weeds, such as fumitory and field pansies which often thrived on worked ground, are important food plants for Turtle Doves which avoid dense, grassland areas (Browne pers obs.).

Chemical inputs onto farmland are widely considered to have been at least partly responsible for reducing the suitability of crops and grassland for birds. Evidence of their impact is strongly circumstantial but lacks direct quantitative support. Thus, low pesticide and herbicide inputs can result in increased grassland invertebrate populations (particularly of sawfly larvae) on which the partridge chicks depend. Carbamate compounds, organophosphates, contact/fumigant nematicides and fungicides are all highly toxic to earthworms and lead to depleted populations on farmland (Edwards & Bohlen 1977, Jenkins 1984). The larvae of Lepidoptera, on which many birds feed their offspring in summer, can occur at higher densities in unsprayed field margins than in sprayed margins (Rands & Sotherton 1986, Dover *et al*. 1990). Pyrethroids can also result in a sustained depletion of sawfly larvae on farmland habitats (Jenkins 1984).

Repeated applications of inorganic fertilisers tend to favour plants, such as cereals, that respond to high nitrogen or phosphorus loads at the expense of species that prefer a less nutrient-rich environment. This results in lower plant species diversity in crops (fewer weeds) or on grassland (more uniform sward) and reduces the attendant invertebrate populations accordingly (Vickery *et al*. in press). There are, however, some valuable plants species for birds, such as Fat Hen (*Chenopodium* spp.) and nettle species (*Urtica* spp.) that thrive in high nutrient conditions.

A summary of some key plants and animals that are exploited by birds on farmland is presented in Tables 2 and 3. These tables are not exhaustive, but identify foods that repeatedly emerge in the literature as dietary components of birds. Their importance should be considered within the context of the sustainability programme.

3.2 Proposed Modifications for 2000/2001

Initiatives for improving bird biodiversity at Colworth were raised in June 2000 with a view to the 2000/2001 field season. Whole-field recommendations were suggested to encourage winter foraging flocks of seed-eating birds (finches, buntings and partridges) as well as ground-nesting species, such as Lapwings and Skylarks in summer. Suggested changes to field margins were aimed at providing winter food and cover for most seed-eating and insectivorous species. A regime of low fertiliser and pesticide levels on selected field areas was proposed as an extremely desirable and valuable area of research that is currently under-researched elsewhere. Thought was given to whole-field changes and input modifications in that they should be relatively straight forward to incorporate within the logistics and labour commitments of the farm. Ideas for within-field manipulations of crops are suggested but are clearly more logistically demanding.

Six "key" species were chosen as representatives of the species present at Colworth, as representatives of the bird species present or potentially present on the site, although clearly no six species can fully represent the complete range of species the occur at Colworth or on English farmland. This list may be modified in future. Five of the six chosen species are subject to national Biodiversity Action Plans (BAPs), the six species being: Grey Partridge(BAP), Lapwing(BAP), Skylark(BAP), Song Thrush(BAP), Linnet(BAP) and Yellowhammer. Lapwing do not breed at Colworth, but present a major challenge for farmland by requiring changes to whole fields that probably mean the inclusion of spring crops/grassland mosaics. Such mosaic should also benefit Grey Partridges that are now rare on farmland due to a loss of grassland habitats and invertebrate food in summer. Unlike Lapwings, Grey Partridge may respond to field margin improvements. Seed-eating species such as Linnets and Yellowhammers require weedy stubble or margins containing small seeds (eg. linseed, rape, mustard and kale for Linnets, and cereals, millet or grasses for Yellowhammers). Broad-leaved crops, such as peas, beans or sugar beet are likely to attract foraging Song Thrushes and Blackbirds.

A. **Whole-field recommendations**: spring cereals are predicted to increase Skylark density and provide foraging opportunities for other ground foraging species. Winter stubbles and **rotational set-aside** would also provide food for finches, buntings, Skylarks and Grey Partridge. In summer, breeding Lapwings may be attracted to larger fields.

B. **Six to 10 m margins:** comprising "wildbird" options or mixed kale and quinoa were suggested to provide food and cover well into February, for seed-eating and insectivores birds. **Harrowing** wide grass margins in autumn, to thin out the vegetation and create bare soil, was suggested to improve their suitability for foraging birds.

C. **Gaps or strips within cereal crops**: were suggested as a way of introducing structural variation to crops, where bird movements could be compared directly with the "mother crop". An interesting option would include within-cereal strips of set-aside or oilseed rape as 20 m swathes.

D. **Reduced pesticide and herbicide applications**: were considered extremely desirable since the activities of birds and their distribution could be balanced against the net agronomic costs or benefits of input loads. A regime where half of the crops are subject to reduced inputs (conducted over two or three years) is considered scientifically valuable. The subject is of major significance for farming and environmental management in an area that lacks quantifiable information.

3.3 Agreed Modifications and Crop Plan for 2000/2001

Crops and field content planned for the winter and summer of 2000/2001 includes provisions for spring crops, whole-field set-aside and wild flower or natural grassland margins but not game-cover margins. A design of high and low pesticide and fertiliser inputs on adjacent crop areas involves the whole SAP site (with the non-SAP farmland providing control treatments). This programme is expected to provide comprehensive and informative research opportunities aimed at baseline monitoring of the spatial distribution of birds and their territories. No provision was made for within-field treatments of crop structure.

3.4 Research Strategy for Birds in 2000/2001

A year-round (month by month) base-line Common Birds Census will continue as in the previous "year", to provide spatial and temporal information on the selection of habitats by foraging and breeding birds in winter and summer respectively, and their response to habitat treatments. Treatments include at least 24 ha of the following: the normal pesticide regime, the low pesticide regime, the normal fertiliser regime and the low fertiliser regime. Other comparisons included spring crops, peas, set-aside and conventional winter crops.

Initiatives for parallel intensive studies are being considered. These would provide details on the responses of birds to habitat treatments and assess species foraging site selection, provisioning rates to nestlings, diet selection for nestlings (through faecal analysis) and possibly measure productivity if sufficient nests can be found. Ideally species for intensive studies would be: 1. conspicuous and observable (to provided reliable behavioural data), 2. relatively common (to provide adequate sample sizes for analysis), 3. be subject to an informative background literature (to provide context with other studies), and, 4. be likely to respond to the habitat treatments incorporated within the SAP area (so ground-foraging species rather than hedgerow-foraging species). Yellowhammer, Skylark and possibly Blackbird may be potential candidates.

Intensive observations could include:

1. Day-long observations of foraging birds, to identify whether habitat selection is random or systematic towards particular field type or treatments (winter and summer work).
2. Day-long observations of feeding rates to chicks on all available pairs as well as random pairs off the SAP area (summer work).
3. Monitor chick growth rates on and off the SAP site (summer work).
4. Analysis of chick faecal samples to assess diet (winter laboratory work).
5. Invertebrate sampling of crops to link with the faecal analysis (summer work).

Details to be discussed.

SECTION B

4. COLWORTH PARK, FARM AUDIT

The BTO carried out a field by field survey of the winter bird numbers and distribution on the Colworth Estate. The winter's fieldwork was the result of two survey visits carried out in December 1999 and January 2000 respectively. Two further visits are planned for winter 2000/2001.

From the first winter, 48 bird species were recorded on the site, including six species that are of high conservation interest being the subject of national Biodiversity Action Plans (BAPs). These species included Grey Partridge, Skylark, Song Thrush, Bullfinch, Linnet and Reed Bunting, although only Bullfinch was recorded at reasonable density (0.15 birds ha^{-1}) on the site.

In summary, the woodland areas held the greatest variety and density of birds, supporting typical species (tits, thrushes, Treecreeper, Nuthatch and Wren), but the contribution of scrub and hedgerow habitats is also emphasised.

4.1 Woodland

Although there are some wildlife management initiatives implemented on the Colworth Estate (Shepherd 1994), game interests are mainly implicit within the historical and current management strategies. The woodland area is subject to a management system that favours natural regeneration, and thus maintains a varied structure and character within the wood. The woodland areas were highest in species richness (36 species) and abundance (Table 5, Fig. 7), although many of the birds recorded there (including Chaffinch, Yellowhammers, Dunnock) were associated with feeders set up to encourage game birds (i.e., Pheasants, Grey Partridge and Red-legged Partridge). Typical woodland birds were well represented and varied, including Greater Spotted Woodpecker, Robin, Blackbird, and tit species (especially Blue, Great, Marsh and Long-tailed Tits), Nuthatch, Treecreeper, Wren, Dunnock and Goldcrest). The mature content of the woodland areas was reflected in the relatively common occurrence of Nuthatches (up to eight calling birds) and Treecreepers. The Bullfinch, which has declined nationally by around 40% since the 1970s, was also well represented (13 individuals recorded), although the densities were not exceptional, being equivalent to only one third of those recorded in exceptional prime breeding habitats (i.e., 0.25 *pairs* ha^{-1}, Newton 1979). The presence of Bullfinches, however, reflects the variable structure of the woodland, including a well developed understorey. Brambles, dock seeds and ash buds are principal winter foods of Bullfinches (Lack 1986) so woodland edge thickets and scrub would benefit this species.

Woodcock, which are often associated with the type of coppice woodland found at Colworth, were also noteworthy within the wooded fringes of the site (eight recorded), and very large numbers of Woodpigeons (over 2000) were recorded around the farm, the majority of which were roosting within the wooded areas.

The most effective policy for maintaining the bird interest of the woodland areas of the estate would be to encourage the development of both the understorey (by thinning trees), scrub and thicket boundaries. Such habitats create structural variation, cover and foraging opportunities for birds within the woodland and in summer could attract Nightingales, which rather surprisingly, do not breed at Colworth. Browsing by deer may deter some scrub development

but careful tree thinning (to allow light through the canopy) and sympathetic management of field boundaries along woodland edges would benefit the winter bird populations on the estate.

4.2 Scrub and Hedgerows

Scrub, in the form of hawthorn, rose species and hazel, and thickets (such as blackthorn) are particularly valuable as cover and a source of food for many bird species in both winter and summer. The scrub and hedgerow areas that currently exist, occupy only a very small proportion of the area of the estate (less than 1%) and in general the habitat was relatively impoverished. The majority of hedgerows were less than 2 m wide and less than 1.5 m tall, and often highly fragmented with gaps, with a thin, underdeveloped base and little or no grass fringe along the hedge bottom. Despite this, scrub and hedgerows supported the highest densities of at least four bird species at Colworth (Table 5, Fig. 2), they being Wren, Dunnock, Blackbird and Chaffinch.

Tall, well developed hedges, or thickets in the corners of fields, and particularly along south-facing borders of woodlands, would greatly increase the value of the site for two of the BAP species recorded in winter, Bullfinch and Song Thrush. Other species, including those currently in decline on farmland (e.g. Turtle Dove in summer, Blackbird and Yellowhammer), would benefit from a well developed woodland edge/hedgerow/scrub mosaic.

4.3 Arable Fields

Beyond the SAP area, the arable fields represented 66% of the surveyed area but supported very few birds, with the exception of a large flock of Woodpigeons (over 500 in one particular count) and a significant flock of Lapwing (47) on winter cereals. Rooks (up to 10) were occasionally recorded foraging on fields, but expected species such as Meadow Pipits and Skylarks were extremely scarce during the survey (e.g. averaging at best, only one Skylark per 40 hectares for that species). No flocks of finches, buntings or sparrows were recorded on the arable land.

4.4 Golf Course

Only Blackbirds, Rooks and Starlings (typical species of mown grassland or “lawns”) were recorded on the golf course, and then only at low density (Fig. 2). There is increasing interest in managing the fringes and fairways of golf courses to be more acceptable to wildlife, but clearly this has to be managed within the framework of the obvious recreational constraints applied to such sites.

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Species	Territories	Characteristics of preferred habitats	Key boundaries	Key fields
Woodpigeon	Many pairs?	Woodland/larger hedges	Throughout	Peas & rape
Stock Dove	1 (2?)	Woodland (& buildings)	(7)	
Turtle Dove	1	Scrub	(16)	
Cuckoo	1	Scrub	(16)	
Little Owl	1	Hedges with mature trees	13	
GS Woodpecker	2	Woodland	(20, 7), 13	
Green Woodpecker	1	Woodland edge / grass	(20, 16)	
Skylark	12+	All fields: higher densities on rape and peas		Rape, peas
Pied Wagtail	1	Buildings and bare ground		
Dunnock	9 or 10	Thicker hedges	(16), 1, 25, 27, 29	
Wren	14	Woodland, thicket and scrub	(20, 7, 9, 16), 13	
Robin	13	Woodland, hedges & scrub	(20, 7), 25, 29	
Blackbird	9	Thicker hedges, woodland & scrub	29, 28, 6, (16)	
Song Thrush	2	Woodland edge, scrub	(7, 20, 16)	
Lesser Whitethroat	3	Thicket	(16, 12) 6	
Whitethroat	10	Thicket, scrub and rape	27,28,30, 33 (16)	Rape
Blackcap	6	Mature hedges, woodland		
Willow warbler	4	Scrub	(16, 15, 12)	Peas
Chiffchaff	1	Trees with understorey	28	
Nuthatch	2 (3?)	Mature woodland	(20, 7, 9)	
Treecreeper	2	Woodland	(20, 7)	
Blue Tit	10	Woodland/mature hedges	(20, 7, 9), 13, 28	
Great Tit	8	Woodland/mature hedges	(20, 7, 9), 13, 28	
Marsh Tit	3	Woodland/mature hedges	(20, 7)	
Long-tailed Tit	2	Thick hedgerows & scrub	28 (16)	
Carrion Crow	2	Woodland edge	(20, 9, 7)	
Magpie		Scrub and grassland	12, 13	
Bullfinch	1 (2?)	Mature hedges and scrub	29	
Linnet	3	Thick hedges	30, 25 (16)	Rape
Chaffinch	15+	Mature boundaries and woodland	(20, 9, 7, 16) 2, 27, 13	
Reed Bunting	2	Tall herbage		Rape
Yellowhammer	12	Thicker hedgerows	1, 2, 27, 25 (16)	Peas

Table 1 Numbers of breeding territories of 32 species of birds recorded during a census of the Colworth SAP area, with closest associated habitats, boundaries and fields. Boundary numbers are given in Fig 2; those in parenthesis border the SAP area. A list of additional species recorded on the site is given in Appendix 1.

Species	Local status	Basic habitat preferences	Identified plant and animal food	
			Winter	Summer
Grey Partridge	Uncommon	Tall sparse grassland	Grass, cereals and clovers (leaves); Knotgrass++.	Sawfly, grass-moth larvae; Beetles (leaf–beetles and weevils adults); Seeds – Chickweeds/campions, grasses (e.g Poa annua).
Lapwing	Non breeding and scarce in winter	Short vegetation or bare ground.	Earthworms	Earthworms ++; Ground beetles; moth larvae; grasshoppers; ants.
Skylark	Low breeding density in cereals, scarce in winter.	Short vegetation or bare ground	Cereal grain & leaves, knotgrass.	Leaf–beetles, weevils & ground beetles (adults)). Veg: Chickweeds, Poa grasses, Fat Hen (autm).
Song Thrush	Present but not common on the farmed habitats.	Shady cover, damp margins, non-cereal crops.	Earthworms & Cepea & Helix snails. Autumn: Fruit	Cepea snails & beetles; Moth & butterfly larvae; earthworms.
Linnet	Scarce	Weedy stubbles, crops or margins. Oilseed rape.	Cruciferae (Charlock, Sh-purse), knotgrass.	Cruciferae; Knotgrass, Fat Hen, Goosefoots, Dandelion, Thistles, Hawksbeards.
Yellow-hammer	Often recorded but not common	Cereals, grasses and larger weed seeds (apparently not crucifers, eg. rape).	Cereal grain, grass seeds (eg. Fescues, Lolium & Poa spp.) (Compositae for beetles). Autumn= beetles, grass seeds & fruit seeds.	Moth & butterfly larvae; spiders; weevils & ground beetles (adults) to chicks (++); Grasshoppers.

Table 2 The status of six representative bird species on the Colworth SAP area and a summary of key dietary components drawn from the literature (NB. ++ means especially well represented in at least one study). In brief, favoured broad-leaved plants include Fat Hen and goosefoots (*Chenopodium* spp.), hawksbits, hawhweeds and thistles (Compositae), knotgrass (Poygonum) chickweeds & campions (Charophyllacae), clovers & vetches (Fabacae) and docks & sorrels (*Rumex* spp). Among grasses, annuals such as Annual Meadow Grass (*Poa annua*) and various fescues (*festuca* spp.) may be important as food for birds and as a refuge for invertebrates.

Season	Key Plants and Field /Habitats	Birds Species That May Benefit
Summer	Compositae (Thistles, Yarrow, Hawkbits etc)	G. Partridge, Skylark, S. Thrush, Linnet, Yellowhammer
	Graminae (Tussocks: eg. Cocksfoot) (Annuals: Poa spp., Fescues)	
	Cruciferae (e.g. Charlock, Shepherd's Purse)	G. Partridge, S. Thrush, Linnet, Yellowhammer, G. Partridge, Lapwing, Skylarks, Linnet, Yellowhammer
	Polygonum (knotgrass), Rumex (docks & sorrels)	G. Partridge, Skylark, Linnet, Yellowhammer
	Chenopodium (Fat Hen, Goosefoot Orache)	G. Partridge, Skylark, Linnet, Yellowhammer
	Stellaria (Chickweeds)	G. Partridge, Skylark, Linnet
	Fabacae (Clovers, Trifoliates, eg. Vicia)	G. Partridge, Skylark, Linnet
	Bare ground	G. Partridge
	Straw/litter	G. Partridge, Lapwing, Skylark, Linnet, Yellowhammer
Winter	Graminae (Tussocks: eg. Cocksfoot) (Annuals: eg. Fescues)	G. Partridge, Skylark, Song Thrush, Linnet, Yellowhammer
	Straw/litter	G. Partridge, Lapwing, Skylarks, Linnet, Yellowhammer
	Bare ground	G. Partridge, Lapwing, Skylarks, Linnet, Yellowhammer
	Polygonum	G. Partridge, Skylark, Song Thrush, Linnet, Yellowhammer
	Chenopodium	G. Partridge, Lapwing, Skylark, Linnet, Yellowhammer
	Cruciferae (especially charlock)	G. Partridge, Skylark, Linnet.

Additional important plant groups include: Labiates (Hemp nettles), Bedstraws, Scabious spp, Strawberry, true nettles; Grasses: Hordeum spp. (barleys), Avena spp (oats).

Table 3 Summarising seasonally important plant species (and ground conditions) for six representative bird species recorded at Colworth (listed by season).

Food Type	Source
Weed seeds:	Brassicas (charlock); hawksbits, hawsbeards, dandelion, thistles; chickweeds & campions; fat hen, orache; clovers & vetches; knotgrass; docks & sorrels; bindweeds. Esp. knotgrass, fat hen, orache, thistles, chickweed. Grasses: Wild barley, oats, fescues and meadow grasses.
Insects: Leaf-beetles, weevils, ground beetles; sawflies, grasshoppers, ants & moths.	Yarrow, yellow compositae, thistles, vetches, hemp-nettles. Grasses: (annual grasses (fescues, Poa spp.), cocksfoot).
Other invertebrates: Earthworms, snails & cranefly larvae & spiders/harvestmen.	Damp soil, unploughed, straw litter, organic material. Low herbage (especially spiders).

Table 4 A summary of the habitats (plant species and soil condition) associated with key food items of six representative farmland birds on Colworth SAP area (see Table 2).

Colworth Park, Winter 99/2000																			
Species	Visit	Golf	Arable	Grass	Yards	Scrub/hedge	Wood	Area Go	Area A	Area G	Area Y	Area S	Area W	Dens Go	Dens A	Dens G	Dens Y	Dens S	Dens W
Sparrowhawk	1	0	0	0	0	0	0	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0	0	0
Kestrel	1	0	0	0	1	0	0	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0.15625	0	0
R-l Partridge	1	0	0	0	0	0	1	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0	0	0.012225
Pheasant	1	0	0	0	1	2	41	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0.15625	0.740741	0.501222
Moorhen	1	0	0	0	0	0	0	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0	0	0
Lapwing	1	0	47	0	0	0	0	16.3	240.6	16.7	6.4	2.7	81.8	0	0.195345	0	0	0	0
Woodcock	1	0	0	0	0	0	7	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0	0	0.085575
LB-b Gull	1	2	0	0	0	0	0	16.3	240.6	16.7	6.4	2.7	81.8	0.122699	0	0	0	0	0
B-h Gull	1	0	0	0	0	0	0	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0	0	0
Stock Dove	1	0	2	0	0	0	0	16.3	240.6	16.7	6.4	2.7	81.8	0	0.008313	0	0	0	0
Woodpigeon	1	0	526	0	0	0	1017	16.3	240.6	16.7	6.4	2.7	81.8	0	2.186201	0	0	0	12.43276
Collared Dove	1	2	0	0	0	0	0	16.3	240.6	16.7	6.4	2.7	81.8	0.122699	0	0	0	0	0
G. Woodp'ker	1	0	0	1	0	1	1	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0.05988	0	0.37037	0.012225
GS Woodp'	1	0	0	0	0	0	1	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0	0	0.012225
Skylark	1	0	0	0	0	0	0	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0	0	0
Pied Wagtail	1	1	0	0	2	0	0	16.3	240.6	16.7	6.4	2.7	81.8	0.06135	0	0	0.3125	0	0
Starling	1	0	0	18	0	0	2	16.3	240.6	16.7	6.4	2.7	81.8	0	0	1.077844	0	0	0.02445
Jay	1	0	0	0	0	0	0	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0	0	0
Magpie	1	0	0	0	0	0	2	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0	0	0.02445
Jackdaw	1	0	0	0	0	0	0	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0	0	0
Rook	1	1	10	6	0	0	0	16.3	240.6	16.7	6.4	2.7	81.8	0.06135	0.041563	0.359281	0	0	0
Crow	1	0	6	0	0	0	4	16.3	240.6	16.7	6.4	2.7	81.8	0	0.024938	0	0	0	0.0489
Wren	1	0	0	0	0	2	14	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0	0.740741	0.171149
Dunnock	1	0	0	0	0	0	9	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0	0	0.110024
Goldcrest	1	0	0	0	0	0	12	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0	0	0.146699
Robin	1	0	0	0	2	1	19	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0.3125	0.37037	0.232274
Blackbird	1	2	10	2	4	8	26	16.3	240.6	16.7	6.4	2.7	81.8	0.122699	0.041563	0.11976	0.625	2.962963	0.317848
Redwing	1	0	0	16	0	5	0	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0.958084	0	1.851852	0
Song Thrush	1	0	1	0	0	0	5	16.3	240.6	16.7	6.4	2.7	81.8	0	0.004156	0	0	0	0.061125
Mistle Thrush	1	0	0	0	1	0	3	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0.15625	0	0.036675

Table 5 Numbers and densities of bird species recorded on six habitats on each of two winter survey visits to the Colworth Park Estate. The numbers of species associated with five key habitats are given in the final row.

	Colworth Park, Winter 99/2000																		
Fieldfare	1	0	0	0	4	0	10	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0.625	0	0.122249
Marsh Tit	1	0	0	0	0	0	10	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0	0	0.122249
Willow Tit	1	0	0	0	0	0	1	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0	0	0.012225
Blue Tit	1	1	0	0	4	4	29	16.3	240.6	16.7	6.4	2.7	81.8	0.06135	0	0	0.625	1.481481	0.354523
Coal Tit	1	0	0	0	0	0	2	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0	0	0.02445
Great Tit	1	0	0	0	1	0	15	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0.15625	0	0.183374
L-t Tit	1	0	0	0	0	0	14	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0	0	0.171149
Nuthatch	1	0	0	0	0	0	2	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0	0	0.02445
Treecreeper	1	0	0	0	0	1	2	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0	0.37037	0.02445
H Sparrow	1	0	0	0	3	0	0	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0.46875	0	0
Chaffinch	1	0	0	0	1	9	24	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0.15625	3.333333	0.293399
Bullfinch	1	0	0	0	0	0	13	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0	0	0.158924
Greenfinch	1	0	0	0	0	0	0	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0	0	0
Siskin	1	0	0	0	0	0	0	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0	0	0
Goldfinch	1	11	0	0	0	0	4	16.3	240.6	16.7	6.4	2.7	81.8	0.674847	0	0	0	0	0.0489
Linnet	1	0	0	0	0	0	0	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0	0	0
Y'hammer	1	0	0	0	0	0	19	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0	0	0.232274
Reed Bunting	1	0	0	0	0	0	1	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0	0	0.012225
Sparrohawk	2	0	0	0	0	0	2	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0	0	0.02445
Kestrel	2	0	0	0	0	0	0	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0	0	0
R-l Partridge	2	0	0	0	0	0	2	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0	0	0.02445
Pheasant	2	0	0	0	0	1	12	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0	0.37037	0.146699
Moorhen	2	0	0	0	0	1	0	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0	0.37037	0
Lapwing	2	0	0	0	0	0	0	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0	0	0
Woodcock	2	0	0	0	0	0	1	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0	0	0.012225
LB-b Gull	2	0	0	0	0	0	0	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0	0	0
B-h Gull	2	6	0	0	0	0	0	16.3	240.6	16.7	6.4	2.7	81.8	0.368098	0	0	0	0	0
Stock Dove	2	0	0	0	0	0	4	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0	0	0.0489
Woodpigeon	2	0	0	0	0	0	2000	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0	0	24.44988
Collared Dove	2	0	0	0	0	0	0	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0	0	0
G. Woodp'ker	2	0	0	0	0	0	0	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0	0	0
GS Woodp'	2	0	0	0	0	0	3	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0	0	0.036675
Skylark	2	0	6	0	0	0	0	16.3	240.6	16.7	6.4	2.7	81.8	0	0.024938	0	0	0	0
Pied Wagtail	2	2	0	0	2	1	0	16.3	240.6	16.7	6.4	2.7	81.8	0.122699	0	0	0.3125	0.37037	0
Starling	2	3	48	28	0	0	0	16.3	240.6	16.7	6.4	2.7	81.8	0.184049	0.199501	1.676647	0	0	0
Jay	2	0	0	0	0	0	3	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0	0	0.036675
Magpie	2	0	0	0	0	1	1	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0	0.37037	0.012225
Jackdaw	2	0	0	0	0	11	1	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0	4.074074	0.012225

		Colworth Park, Winter 99/2000																	
Rook	2	4	0	0	0	0	0	16.3	240.6	16.7	6.4	2.7	81.8	0.245399	0	0	0	0	0
Wren	2	0	0	0	0	2	9	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0	0.740741	0.110024
Dunnock	2	0	0	0	0	4	8	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0	1.481481	0.0978
Goldcrest	2	0	0	0	0	0	10	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0	0	0.122249
Robin	2	0	0	0	0	1	23	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0	0.37037	0.281174
Blackbird	2	6	0	9	2	9	15	16.3	240.6	16.7	6.4	2.7	81.8	0.368098	0	0.538922	0.3125	3.333333	0.183374
Redwing	2	0	0	12	0	0	3	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0.718563	0	0	0.036675
Song Thrush	2	0	0	0	0	2	1	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0	0.740741	0.012225
Mistle Thrush	2	0	0	0	0	0	2	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0	0	0.02445
Fieldfare	2	0	1	56	0	0	0	16.3	240.6	16.7	6.4	2.7	81.8	0	0.004156	3.353293	0	0	0
Marsh Tit	2	0	0	0	0	0	16	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0	0	0.195599
Willow Tit	2	0	0	0	0	0	0	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0	0	0
Blue Tit	2	0	0	0	0	3	17	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0	1.111111	0.207824
Coal Tit	2	0	0	0	0	0	1	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0	0	0.012225
Great Tit	2	0	0	0	0	1	17	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0	0.37037	0.207824
L-t Tit	2	0	0	0	0	11	20	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0	4.074074	0.244499
Nuthatch	2	0	0	0	0	0	8	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0	0	0.0978
Treecreeper	2	0	0	0	0	2	3	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0	0.740741	0.036675
H Sparrow	2	0	0	0	6	0	0	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0.9375	0	0
Chaffinch	2	0	0	0	0	16	24	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0	5.925926	0.293399
Bullfinch	2	0	0	0	0	0	11	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0	0	0.134474
Greenfinch	2	0	0	0	0	0	6	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0	0	0.07335
Siskin	2	0	0	0	0	0	2	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0	0	0.02445
Goldfinch	2	0	0	0	0	0	0	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0	0	0
Linnet	2	0	0	0	0	4	0	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0	1.481481	0
Y'hammer	2	0	0	0	0	0	20	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0	0	0.244499
Reed Bunting	2	0	0	0	0	0	2	16.3	240.6	16.7	6.4	2.7	81.8	0	0	0	0	0	0.02445
Species no.		9	9	5		19	36												

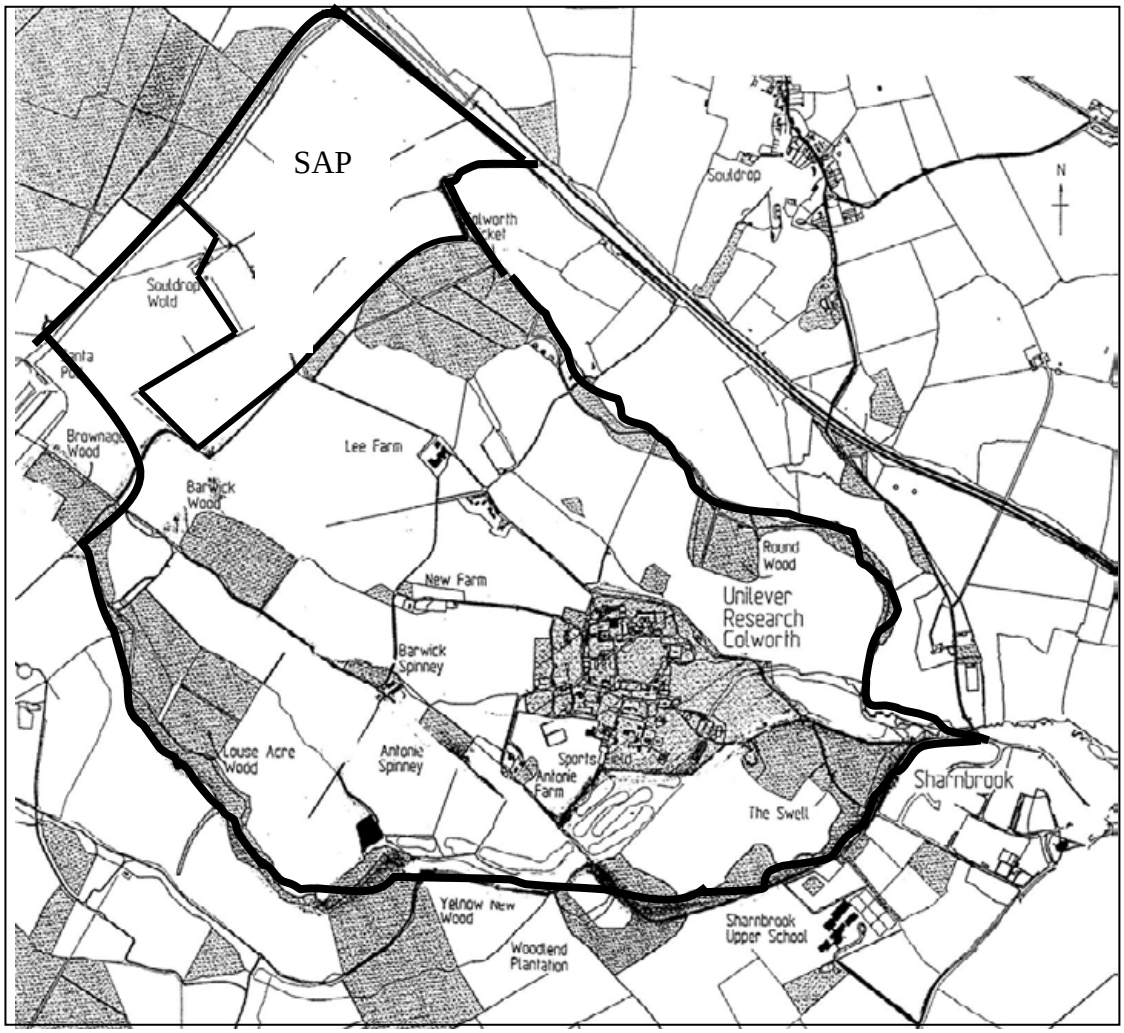

Figure 1 Colworth Park grounds (bold outer line) showing the position of the Sustainable Agriculture Project area (SAP) and woodland blocks (shaded).

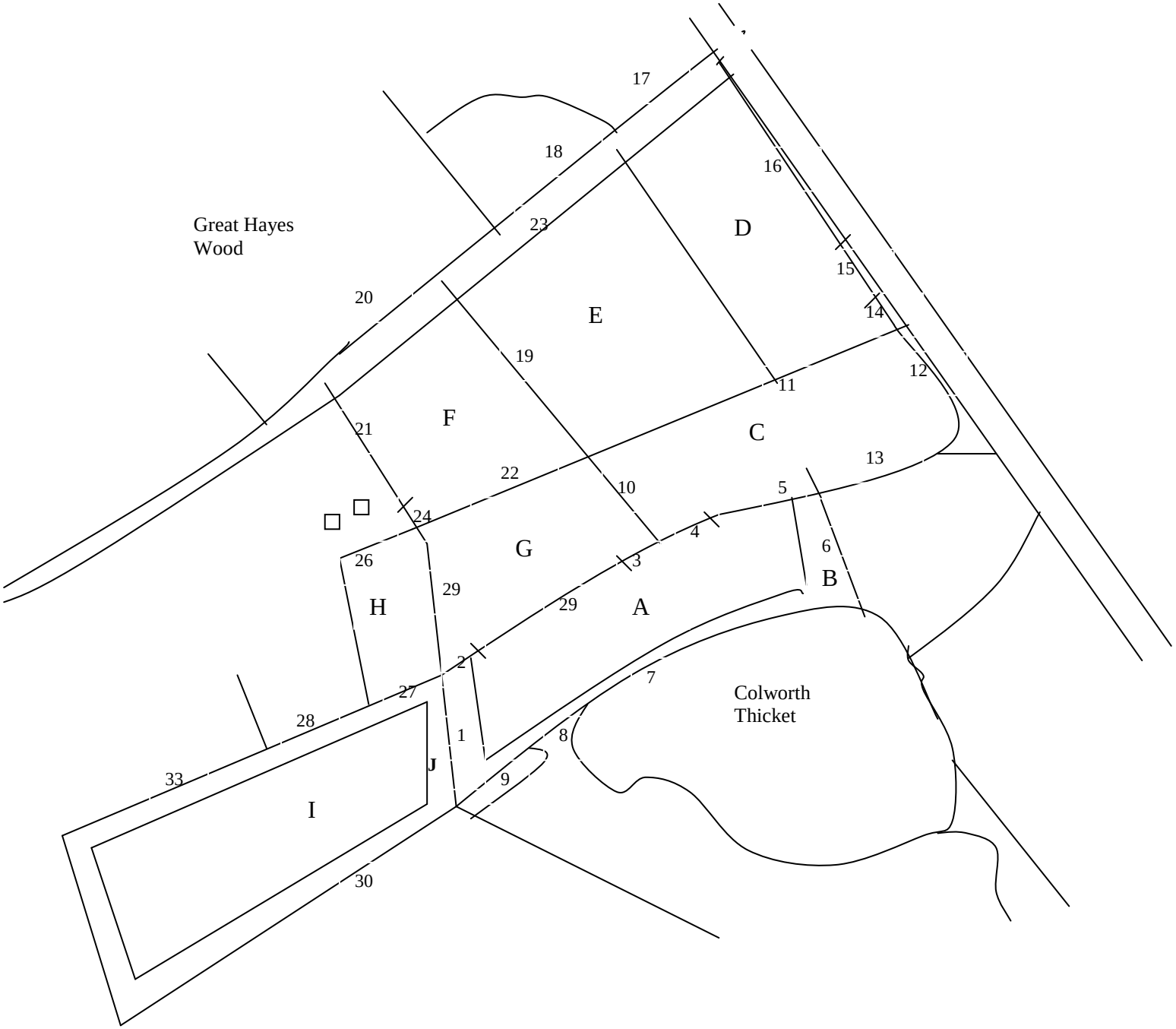

Figure 2 Diagrammatic representation of the SAP area showing field labels (letters in bold) and boundary labels (numbers)

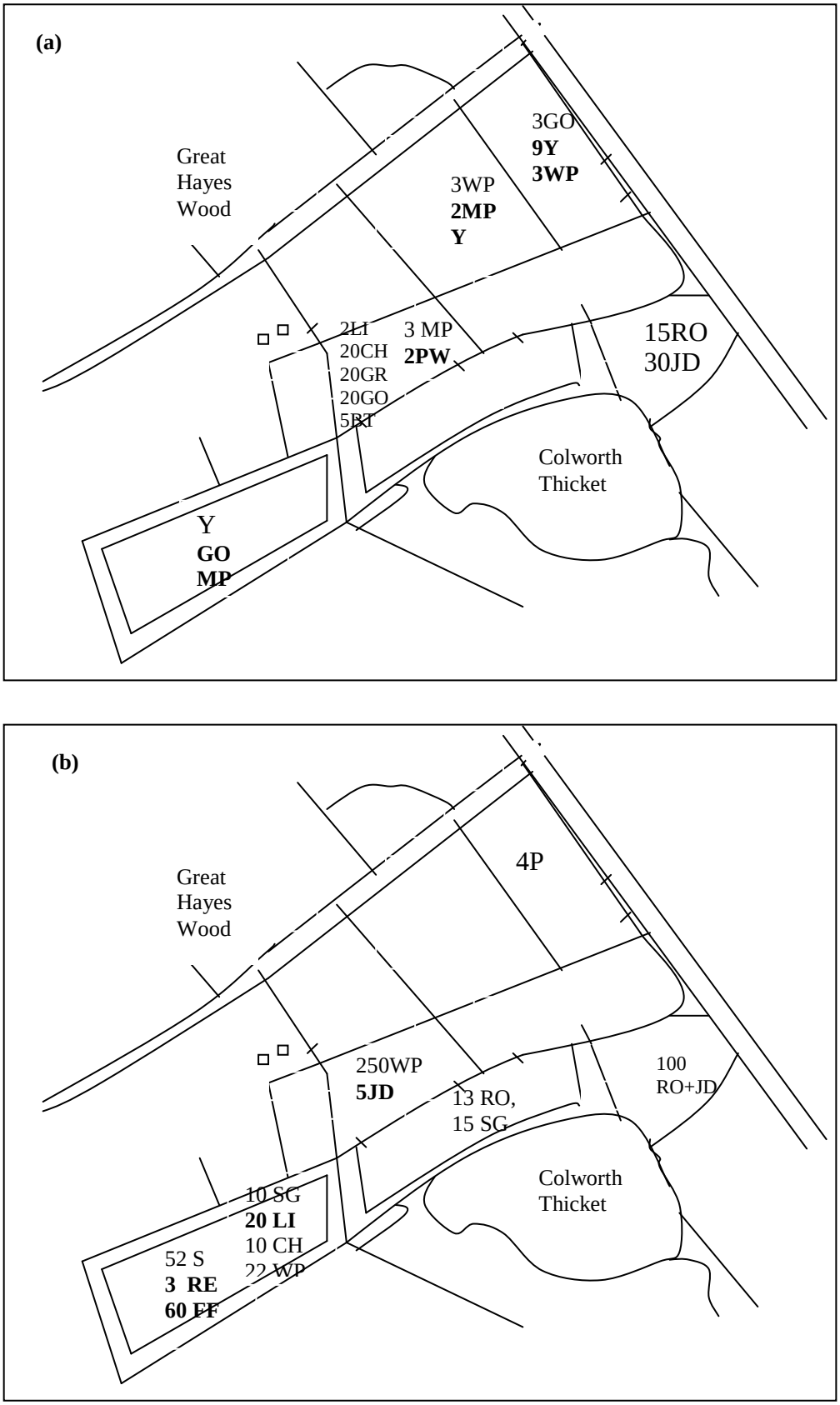

Figure 3 A schematic representation of the distribution of birds on fields in (a) October 1999, mainly on stubbles, and (b) from November to January 1999/2000, mainly on ploughed land.

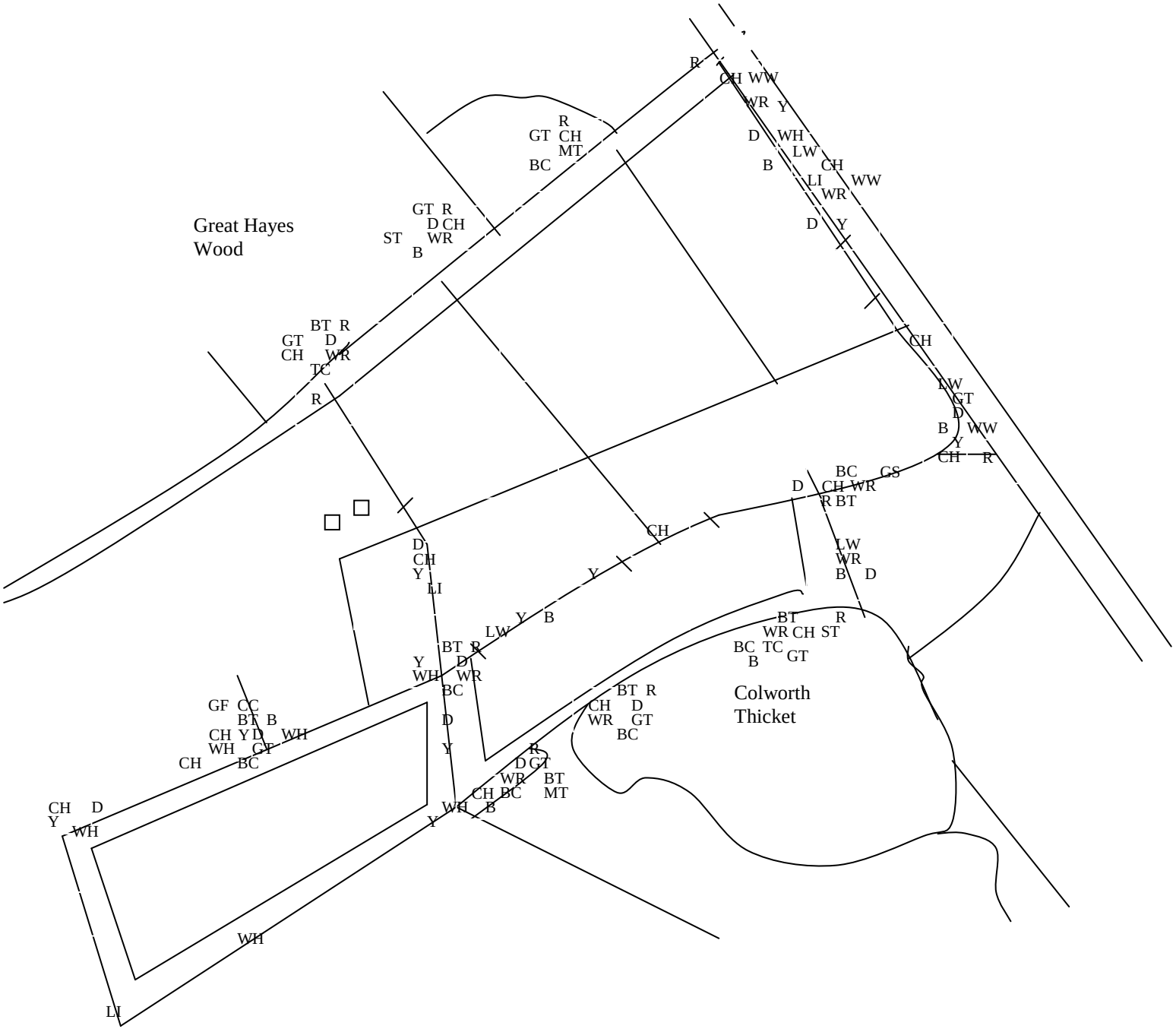

Figure 4 A schematic representation of Colworth SAP area showing the approximate location of breeding territories of boundary-based species (abbreviations are defined in Appendix 2).

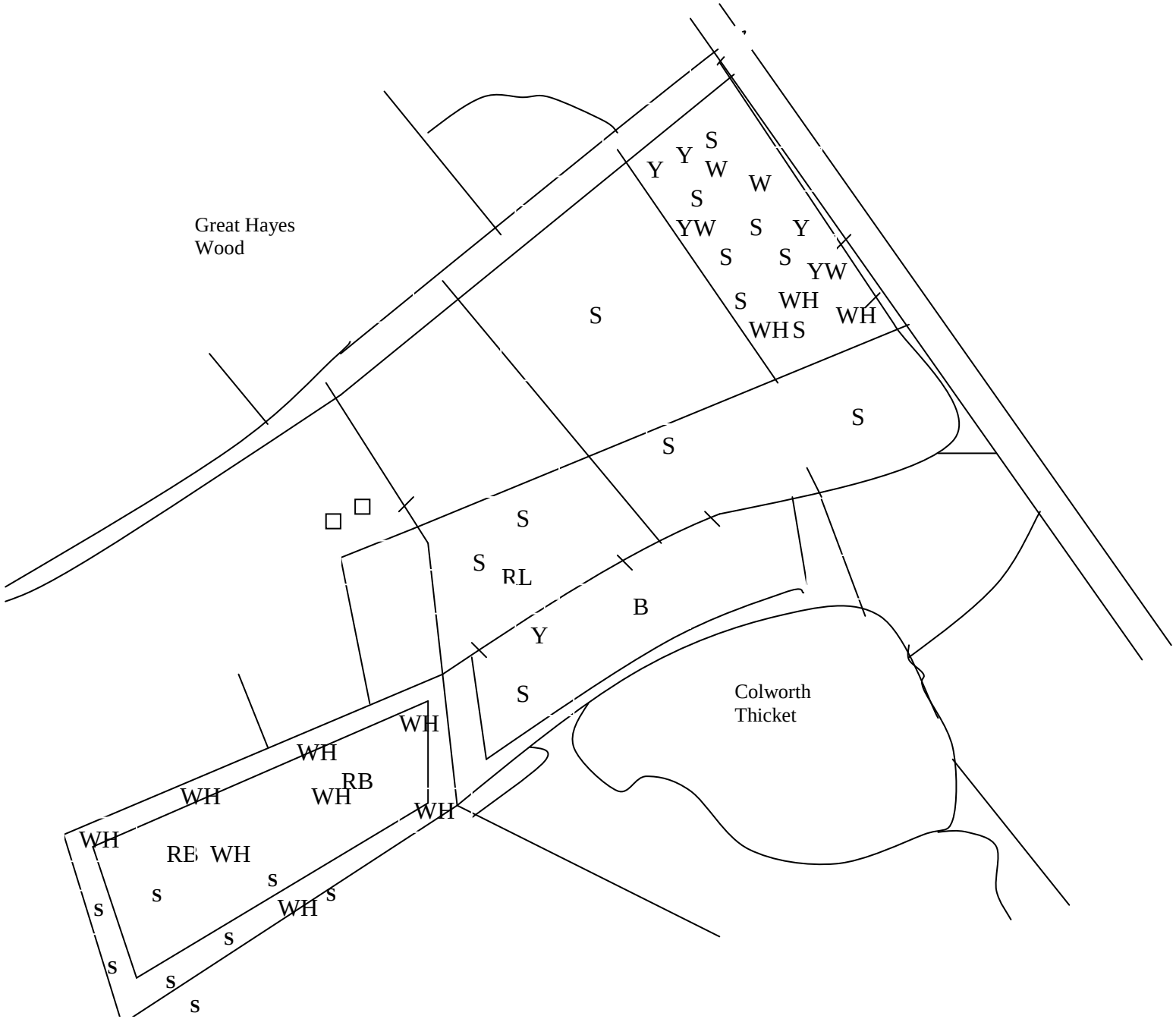

Figure 5 A schematic representation of the approximate location of birds recorded on fields on the SAP area in June, when the peas were in flower.

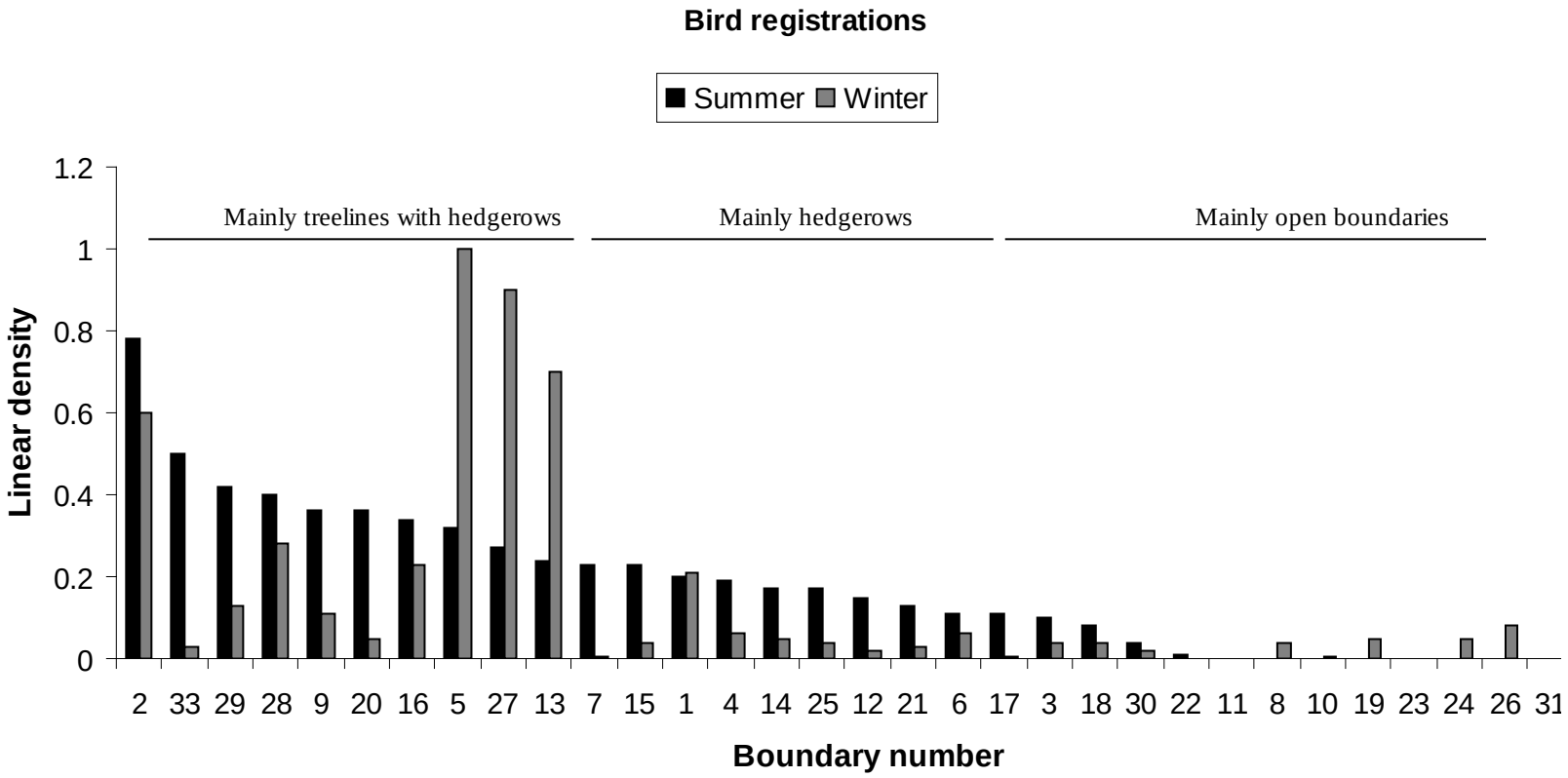

Figure 6 Field boundaries (see Fig. 2) ranked by the density of bird records (all species combined) in summer and winter.

Figure 7 Maximum recorded densities of a selected range of bird species (preferences ranging from grassland to woodland) in winter. Habitat types are:go=golf course, ar=arable land, gr=grassland, sh=scrub/hedgerow, wo=woodland.

APPENDIX 1

Additional species recorded on Colworth SAP area for which breeding territories could not be estimated (with the habitats that breeding and foraging birds are likely to require).

Species	Territories or status	Preferred habitats
Kestrel	1 pair?	May breed in nearby woodland, hunts over farmland
Sparrowhawk	Recorded occasionally	May breed in nearby woodland, hunts along hedgerows and in woodland
Red-legged Partridge	Probably several pairs, but released stock also present (uncommon)	Farmland
Grey Partridge	1 pair?; up to 4 birds recorded	Weed-rich grassland
R-n Pheasant	Probably many pairs but released stock also present	Farmland/woodland edge
Collared Dove	0 (rare on the SAP area)	Farm buildings
Meadow Pipit	Passage migrant	Grassland
Yellow Wagtail	Passage migrant	Open wet grassland
Swallow	1 pair?	Farm buildings, grazed pastures
Redstart	Passage migrant	Hedges and woodland edge
Wheatear	Passage migrant	Open low herbage, bare ground
Spotted Flycatcher	Passage migrant	Woodland edge
Goldcrest	? (rare on the SAP area)	Mature hedges, woodland
Jackdaw	Breeds in the woodland	Woodland, grassland and stubbles
Rook	Breeds near to Colworth	Grassland and stubbles
Starling	Breeds in the woodland	Woodland; grassland and bare ground
House Sparrow	Rare on the SAP area	Farm buildings, hedgerows

APPENDIX 2

Species 2-letter codes as used in the report above.

Species 2-Letter Codes

BO	Barn Owl	MP	Meadow Pipit
B	Blackbird	M	Mistle Thrush
BH	Black-headed Gull	MH	Moorhen
BC	Blackcap	N	Nightingale
BT	Blue Tit	NH	Nuthatch
BF	Bullfinch	OC	Oystercatcher
BZ	Buzzard	PE	Peregrine
C	Carrion Crow	PH	Pheasant
CH	Chaffinch	PW	Pied Wagtail
CC	Chiffchaff	Q	Quail
CT	Coal Tit	RL	Red-legged Partridge
CD	Collared Dove	LR	Redpoll
CO	Coot	RK	Redshank
CB	Corn Bunting	RT	Redstart
CK	Cuckoo	RB	Reed Bunting
CM	Common Gull	RW	Reed Warbler
CU	Curlew	RP	Ringed Plover
D	Dunnock	R	Robin
FP	Feral Pigeon	RO	Rook
GW	Garden Warbler	SM	Sand Martin
GC	Goldcrest	SW	Sedge Warbler
GO	Goldfinch	SU	Shelduck
GH	Grasshopper Warbler	SK	Siskin
GB	Gt Black-backed Gull	S	Skylark
GS	Great Spotted Woodpecker	SN	Snipe
GT	Great Tit	ST	Song Thrush
G	Green Woodpecker	SH	Sparrowhawk
GR	Greenfinch	SF	Spotted Flycatcher
H	Grey Heron	SG	Starling
P	Grey Partridge	SD	Stock Dove
GL	Grey Wagtail	SC	Stonechat
HF	Hawfinch	TN	Stone Curlew
HG	Herring Gull	SL	Swallow
HY	Hobby	SI	Swift
HM	House Martin	TO	Tawny Owl
HS	House Sparrow	TP	Tree Pipit
JD	Jackdaw	TS	Tree Sparrow
J	Jay	TC	Treecreeper
K	Kestrel	TU	Tufted Duck
L	Lapwing	TD	Turtle Dove
LB	Lesser Black-backed Gull	W	Wheatear
LS	Lesser Spotted Woodpecker	WC	Whinchat
LW	Lesser Whitethroat	WH	Whitethroat
LI	Linnet	WT	Willow Tit
LG	Little Grebe	WW	Willow Warbler
LO	Little Owl	WK	Woodcock
LE	Long-eared Owl	WP	Woodpigeon
LT	Long-tailed Tit	WO	Wood Warbler
MG	Magpie	WR	Wren
MA	Mallard	YW	Yellow Wagtail
MR	Marsh Harrier	Y	Yellowhammer
MT	Marsh Tit		