



BTO Research Report No. 253

**BIRDS EYE WALL'S:
Partnership for Sustainability**

**Progress Report on the
Use of Pea Fields by Birds**

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1. EXECUTIVE SUMMARY

1. As part of Birds Eye Wall's Partnership for Sustainability programme in 1999 & 2000, the BTO carried out a breeding season survey of birds on 20 and 19 farm sites (for 1999 and 2000 respectively) in the east of England, and an intensive study of Skylarks on five East Anglian farms. The purpose was to investigate the potential of pea crops to be managed productively and in a manner that may prove beneficial to wildlife (here birds).
2. For the extensive survey, volunteer ornithologists surveyed pairs of fields (one pea field and one cereal field per pair), with each field-pair located on a different farm. Observers made up to six visits to their farm plot between March and August, and on each visit they walked around the perimeter of each field recording all birds seen or heard on both the field and boundary. On fields they recorded birds within distance band categories of 0-5, 5-10, 10-20 and over 20 m from the field boundary.
3. During the intensive studies, two observers made records of Skylark activities to ascertain whether this species was using pea fields to nest in or to forage in, and understand how these activities might corresponded to the seasonal shift in crop growth from March to August.
4. The extensive survey revealed that higher densities of species and a greater abundance of most types of species were recorded on pea fields compared to cereal fields. In March however, bare soil was avoided by most species, but much greater use was made of the sparse or developing pea crops from April to June (the key phase). As a consequence, farming activities before April were unlikely to have much affected the birds using the pea fields. However, crops rolled several weeks after drilling would clearly pose some threat to ground nesting clutches of Skylarks and possibly Lapwings.
5. Thrushes, finches and buntings occurred at higher densities nearer field boundaries, and would probably benefit from field margin conservation strips. From intensive studies, Skylarks would only use marginal strips where these occurred on open boundaries between two fields (e.g. beetle banks).
6. Skylarks breeding on peas appeared to continue into June and possibly July, thereby potentially raising more offspring than on cereals. However, when not tied to a breeding site, birds used pea fields much less frequently and often foraged beyond the pea-field boundary. Overall, the mosaic created by pea crops, cereals and other crop types on rotational farms may help to maintain both foraging and breeding habitat for longer over the summer season.

2. INTRODUCTION

In recent years there has been growing concern about widespread loss of biodiversity in arable landscapes, in particular in the UK, mainland Western Europe and the USA (Flade & Steiof 1990; Barr *et al.* 1993; Saris *et al.* 1994; Millenbah *et al.* 1996). In the UK a number of long-term monitoring programmes have shown substantial declines in the status of many groups of plants and animals (Firbank *et al.* 1991). For example, the results of Countryside Survey 1990 (Barr *et al.* 1993) showed a marked reduction in hedgerow length and plant biodiversity in arable landscapes since 1978. Analysis of the British Trust for Ornithology's Common Birds Census, supported by two periodic atlas studies of bird distribution, also revealed that many of Britain's farmland bird populations have suffered serious long-term declines (Gibbons *et al.* 1993; Marchant & Gregory 1994; Fuller *et al.* 1995; Siriwardena *et al.* 1998), with declines less evident in other habitats such as woodland (Fuller *et al.* 1995). The species in decline represent a broad range of ecological needs and include birds like Grey Partridge *Perdix perdix* and Song Thrush *Turdus philomelos*, and seed-eating passerines such as Skylark *Alauda arvensis*, Tree Sparrow *Passer montanus*, Linnet *Carduelis cannabina* and Yellowhammer *Emberiza citrinella*. Similar declines in farmland birds are reported from elsewhere in Europe, for example, in Germany (Flade & Steiof 1990) and The Netherlands (Saris *et al.* 1994).

There is now growing evidence linking these bird declines with major changes in agriculture since the 1970s (e.g. Fuller *et al.* 1995; Siriwardena *et al.* 1998). These changes include increased use of pesticides, with possible indirect effects on the food resources of birds (Rands 1985, 1986; Potts 1986, 1991; Campbell *et al.* 1997), and a switch from spring to autumn sown cereals. The latter has resulted in a loss of winter stubble fields that provide important foraging habitats (Evans & Smith 1994; Aebischer 1997; Evans 1997a; Buckingham *et al.* 1999).

One of the problems facing attempts to reverse declines in bird population trends on farmland has been the difficulty of integrating intensive agricultural regimes with conservation measures. Field margins (marginal strips, beetle banks and conservation strips) may go some way to achieving this but occupy a relatively small proportion of the landscape. Meanwhile, initiatives which search for ways to integrate whole-field agriculture with conservation requirements are rare and currently dependent on the uptake of relatively expensive agri-environment schemes such as the Arable Stewardship Scheme, or the manipulation of set-aside.

A programme, by Birds Eye Wall's (the Partnership for Sustainability), to investigate the potential of pea crops to be managed in a manner that can also provide benefits to wildlife is a welcome approach. As part of this programme, the following report assesses the relative abundance and species richness of birds on pea fields compared to winter cereals, and in relation to the timing of crop management activities and crop development. As part of this protocol, the BTO carried out: 1) a breeding season survey of birds on 20 farm sites, 2) an intensive study of Skylarks on five East Anglian sites, and 3) has conducted a review of the use of arable fields as key winter habitats by birds (Henderson 1999). Below we report on points 1 and 2.

3. METHODS

3.1 Study Sites and Field Methods for the Extensive Survey

For the Pea Field Survey, the BTO found volunteer ornithologists to survey 20 and 19 (for 1999 and 2000 respectively) pairs of fields (one pea field and one cereal field per pair) with each pair of fields located on a different farm. The farms were located in East Yorkshire and Lincolnshire (12) and East Anglia (9) with field sizes averaging for pea and cereals, 15.8 ha and 17.4 ha respectively.

Observers made up to six visits to their farm plot between March and August. On each visit, they walked around the perimeter of each field recording all birds seen or heard on both the field and the field boundary. On fields, they recorded birds within distance bands, estimated by eye, in categories of 0-5, 5-10, 10-20 and over 20 m from the hedge or field boundary. Birds were recorded as either singing (i.e. indicative of a breeding territorial) or in some other activity (e.g. foraging, flying, preening etc.). Birds were recorded as using the first field or boundary in which they were seen to occur, with subsequent movements between fields ignored. Observers were asked to take care in distinguishing between independent records and probable duplicates caused by the movements of individual birds. No visits were made in heavy rain or in wind greater than force four. The timing of farm visits was intended to coincide with significant phases of pea-crop development or farm activities. Thus bird usage of peas and cereals targeted the following "growth" periods:

1. Bare earth soon after drilling (March/April (May).
2. Soon after the crop was rolled - if it was not rolled immediately after drilling - and with the pea crop approximately 5-10 cm tall (April/May).
3. Pea flowering period (June/July).
4. Pre-harvest usage (July).
5. Post-harvest usage (July/August).

Several studies have emphasised the importance of the physical characteristics of hedgerows in determining bird abundance, in particular hedge height and tree frequency (Green *et al.* 1994; Parish *et al.* 1994, 1995). Field boundary variables (hedge height, tree frequency, boundary strip width (the strip of grassy vegetation between the crop and the hedge)) and the presence of a wood nearby were recorded by botanical surveyors during their fieldwork, with the intention that they become incorporated into the analysis at a later stage.

3.2 Extensive Survey: Analysis

Relative bird densities were compared between the pea and cereal crops and across months of the survey in order to assess bird usage relative to different pea-growth phases (using a Genmod procedure: standard General Linear Modelling with Poisson error). Below a combined analysis of all sites draws together the main findings of the fieldwork. This is followed by a summary of the number of species and their abundance on both the pea field and cereal field for each farm.

4. RESULTS

4.1 Species Richness and Abundance

The total number of species recorded on both fields and boundaries for the survey as a whole was similar between pea and cereal fields (52 species and 46 species respectively). However, the average number of species per field was 13.5 species for peas/beans but only 6.4 species for cereals. The relative densities of birds were higher on pea fields than on cereal fields (Fig. 1) although spring crops such as spring cereals, borage and linseed also supported high densities of birds. For fields, which changed from peas to cereals or visa versa in consecutive years, the densities of most species were higher on the pea field than on the same field under winter cereals (Fig. 2). Yellowhammers, Reed Buntings and Corn Buntings as a combined group tended to decline in number on peas during crop development (Fig. 3) but many other species including finches (Linnet Goldfinch and Greenfinch), Blackbird and Song Thrush increased in number on the pea field during the flowering and pod period (Fig. 3). The tendency for relatively high densities of insectivorous species (e.g. wagtails, Dunnock, Robin and Wren) to increase further during the flowering and pod phases of growth indicates that abundant insect numbers were the probable source of attraction for many of the bird species that utilised pea fields at this time (Fig. 3). Pigeons, including Woodpigeon, Turtle Dove, Collared Dove and Stock Dove, were also recorded on pea fields at the highest densities of any group of species, particularly in spring on bare ground.

The number of species being recorded on pea fields was greater than on cereal fields throughout the growth period, and particularly during the flowering phase of development when the difference between peas and cereals was greatest (Fig. 4). High numbers of species continued to be recorded on peas right through to the post harvest period (Fig. 4).

4.2 Spatial Use of Fields and Field Margins

Within pea fields, highest densities of birds were recorded within 5 m of the boundary with densities becoming progressively lower with greater distance into the field (Fig. 5). Partly this reflects detectability, which is likely to have been higher nearer the field boundary. The inner field sections, because of their area of cover, nevertheless supported a far greater abundance of certain species, particularly breeding and foraging Skylarks (March to August; 50% of all 236 records on peas), and foraging Lapwing (92% of 60 records) in the early months, March to May while the crop was still short.

4.3 Characteristics of Preferred Field Boundaries

Boundary characteristics that were associated with birds varied from group to group (Table 2). Carrion Crows showed a preference for tall hedgerows and mature trees in hedgerows, which they may use as look-out posts and as nest sites. As expected, Partridges and Pheasants preferred boundaries with fringing strips of grass or rank vegetation. This feature, however, was also a component of boundaries preferred by insectivorous birds, such as wagtails, Dunnock, Robin and Wren, all of which may forage in weedy marginal vegetation. Thrushes such as Blackbird and Song Thrush, were most strongly associated with tall hedgerows, with no detectable preference for whether or not such hedgerows supported mature trees.

4.4 Overview by Species Group

Below we provide a brief overview of the use of pea and cereal crops by several birds, combined for convenience, into species groups (i.e. groups of related species with similar requirements). In general, bare soil in March was avoided, but much greater use was made of the sparse or developing pea crops from April to July. Farming activities before April are unlikely to have affected birds using the pea fields. However, if rolling was delayed for some period after drilling, and after the establishment of Skylark territories, then clearly some threat would be posed to the nests and clutches of this species. The same may be true of Lapwings, although they were very rarely recorded as a breeding species during the present survey and no assessment of their seasonal requirements can be made here.

(a) **Gamebirds (Pheasant, Red-legged Partridge with a few Grey Partridge):** Preferred pea fields to cereal fields, in April and May before flowering when the ground is relatively accessible.

(b) **Skylark:** In general, higher densities were recorded on pea fields than on cereals but mainly from June through the late season in July before harvest. Dense cereal crops from May onwards are known to discourage Skylarks from nesting in crops. The provision of relatively late-drilled pea crops will provide Skylarks with alternative areas for raising later second broods.

(c) **Insectivores (including Dunnock, Pied and Yellow Wagtails, Robin and Starlings):** These species preferred pea fields to cereal fields particularly in June and July before harvest. Most likely, the pea crops support more insects at this time of year compared to cereal crops. Possibly, the relatively tangled canopy of pea crops might have also encouraged birds to feed further away from boundaries than they might otherwise have done. A boundary strip, between the hedge and crop was important to these species.

(d) **Song Thrush and Blackbird:** These species are insectivorous and were recorded at higher density in pea crops than in cereal crops. Pea-fields were especially exploited in June, July and August before and after harvest (mainly before) when young fledglings and their parents would have been searching for insects, slugs and spiders within the crop or on the ground. Superior access to the ground may have been an important factor in attracting these species to peas rather than cereals (with relatively dense growth within cereal rows). A tall, mature hedgerow was an important boundary feature for these species.

(e) **Buntings (Yellowhammer and Reed Bunting plus a few Corn Buntings):** These species were recorded on peas at higher density than on cereals throughout the summer but particularly in May and June when the pea crop was short. Buntings are relatively late breeding species and although they are seed-eaters, they seek insects to feed to their offspring. Buntings were therefore most likely to be using the pea crop as a source of insect food rather than as nesting cover. A boundary strip, between the hedge and crop was important to these species.

(f) **Linnets, Goldfinches and Greenfinches** (known as Cardueline finches): These species were most prominent on the pea crops (at higher density than on cereal crops) when the pea crop was in flower, pod or just harvested. These species will feed on the ground on tiny weed seeds such as those provided by groundsel or chickweed or they may feed on the weed plants themselves. Access to the ground or low growing weeds is usually required, so dense crops tend to be avoided unless weedy margins are provided. Thus, a boundary strip, between the hedge and crop was important to these species.

5. INTENSIVE FIELDWORK

5.1 Activities and Field Usage by Skylarks

An intensive study of the use of pea and cereal fields by Skylarks was conducted on five farms in East Anglia. Skylarks are of particular interest on farmland because of their close association with fields, rather than boundaries, as places in which to nest and forage. Thus, their numbers are more likely to reflect changes in field quality which alter a field's suitability to birds (Wilson *et al.* 1997). Skylarks have declined by more than 50%, as a breeding bird, on farmland since the mid 1970s. The process of arable intensification is implicated in this decline such that the losses are linked to the increased use of pesticides and fertilisers (Potts 1991), the loss of winter stubbles (Donald & Evans 1994; Evans 1997a) and the loss of late developing spring crops and crop diversity (O'Connor & Shrubbs 1986; Chaney *et al.* 1997; Evans 1997b; Wilson *et al.* 1997; Chamberlain *et al.* 1999).

The purpose of the intensive work was therefore to identify the reasons why Skylarks were using pea fields, whether for breeding purposes or as a foraging resource, and how their activity might be affected by field management (rolling or spraying) or crop growth.

5.2 Field Methods

Observations of Skylarks were made by recording activities over periods of between one and three hours per day, on at least five occasions between April and late July inclusive. The purpose of these observations was to quantify the level of movement by Skylarks within and between the survey fields and nearby fields. Birds were thus recorded as being: (a) on the ground (usually out of site), (b) singing or (c) travelling either within or between fields. The hourly frequency of these activities provided an assessment of why pea fields were being utilised by Skylarks, when they were being utilised and which parts of the field were being utilised.

5.3 Intensive Studies: Results

On average Skylark song flight densities (used as an index of breeding density) was higher on peas than on winter cereals, although there was much variation between sites and months of observation. There was evidence from behavioural activities that peas were being utilised for breeding and foraging, later in the summer than winter cereals (Fig. 6) and that this difference, and the longer season, was responsible for the higher average densities of Skylarks on peas, as a whole. Consistent with an increase in breeding activities, was an increase in other flight activities (in July and August) indicative of Skylarks provisioning broods and offspring with food (Fig. 6).

There was, however, evidence too of an interaction between the timing of observations and the crop condition. In other words, where the pea crop was established by April or May, Skylarks occupied the crop and attempted to breed (Fig. 7a). Where the pea crop was not established by May then Skylarks avoided nesting there (but continued to breed on the cereal field), until sufficient vegetation had grown to encourage breeding attempts. Skylarks require sparse or uneven vegetation for breeding purposes (Fig. 7), but not completely bare ground. This means that late-sown pea crops offer only a short breeding season to Skylarks and that only earlier sown pea crops provide a preferred habitat during May (or earlier), when compared to winter cereals.

However, a notable feature was the clear value of pea crops to foraging Skylarks during the flowering and pod phases of growth. Relatively high densities of birds occupied pea crops during these phases regardless of the initial timing of drilling (Fig. 7). Figure 6 indicates that many of these birds were foraging rather than singing in the pea crop, since song activity tended to decline by the time the flower emerged.

The loss of opportunity for completing two sequential broods is widely suspected as being a major contributing factor to declining Skylark populations on arable farmland in the last 25 years. The mosaic created by pea crops, cereals and other crop types on rotational farms may help to maintain both foraging and breeding habitats throughout the summer season.

In 1999, foraging birds frequently entered neighbouring turnip or set-aside fields and were also recorded using marginal strips between two adjacent fields. Skylarks actively avoid structured boundaries such as hedgerows or woodlands but where no hedge is present between two fields, a grassy marginal strip would serve both as potential nesting and foraging habitat for Skylarks, away from the threat of farm management activities on fields.

In all, the Skylark activity data for 1999 and 2000 indicate:

1. Higher densities of Skylarks on peas than on winter cereals, consistent with the main extensive survey.
2. That higher densities of both singing and foraging bird were recorded on peas than on cereals, indicating that peas provide breeding conditions and food for Skylarks that may not be available in winter cereals.
3. The advantage of an extended breeding season for Skylarks (into late June, July and maybe even August) was mainly realised in pea crops that had been sown early in March or April as opposed late sown crops drilled in May.
4. That like many other species the flowering and pod phases of growth were particularly conspicuous in attracting foraging birds to peas.
5. There was much variation between sites. In some sites (L1), a late-sown pea crop supported very few birds of any kind.

6. THE CONTRIBUTION OF PEA FIELDS TO FARMLAND BIODIVERSITY

The extensive survey revealed that a greater number of species and a greater abundance of most types of species were recorded on pea fields compared to cereal fields. These birds include those representing insectivorous and seed-eating species. Their use of pea fields was particularly apparent during the pea flowering and pod stage of growth. However, these densities are lower than those recorded in previous studies for farmland habitats, such as rotational set-aside (Henderson *et al.* in press).

Across the season, bare soil (in March) was avoided by most species, but greater use was made of the sparse or developing pea crops from April to July (the key phase) and to a lesser extent August (after the harvest). Farm activities before April were unlikely to have much affected the birds' use of pea fields, but crops rolled several weeks after drilling, would clearly pose some threat to ground nesting clutches of Skylarks and possibly Lapwings during late April and May. Some evidence suggests that pea crops drilled late, in May rather than April, may curtail the early part of the breeding season of Skylarks, which avoid totally bare ground in which to nest.

Thrushes, finches and buntings occurred at higher densities nearer field boundaries, and would probably benefit from field margin conservation strips. This is a fairly well established feature for boundary-based birds on farmland, and one that is also recognised in other studies of farmland birds (Henderson *et al.* in press). From intensive studies of Skylarks, this species would only use marginal strips where these occurred on open boundaries between two fields. Skylarks breeding on peas appeared to continue into June and possibly July, thereby potentially raising more offspring than on cereals. Skylarks used pea fields for foraging as well as breeding, especially near flowering time. Overall, heterogeneity created by pea crops, cereals and other crop types on rotational farms is likely to help to maintain both foraging and breeding habitats for a longer period over the summer than would be available from winter-sown cereals alone.

In Table 3, the densities of a range of species are shown. These species are broadly representative of those found on English arable land. Bird densities are compared between pea and cereal crops, as well as with densities extracted from the literature from observation made on farmland in previous studies.

Among these species, Lapwings were not recorded as a breeding species on peas, even though spring crops are considered valuable in providing Lapwing with suitable breeding habitat. Like Lapwing, the Grey Partridge is a species of national conservation concern, now generally scarce in the countryside where once it was very common. It too was recorded on peas slightly more often than in cereals, but much higher densities have been recorded on suitable farmland comprising set-aside, spring crops or traditional grass leys. Among songbirds, the pea field vegetation probably allowed foraging access into the crop and onto the ground, but high numbers of birds such as Blackbirds and Song Thrushes were especially associated with the flowering phase of pea growth, presumably because of insects attracted to the pea flowers. Again, however, Blackbirds were recorded at low densities compared to those recorded on farmland near a suitable woodland fringe. Farmland scrub or sympathetic hedgerow management and grass margins would attract Blackbirds as well as Whitethroats, Linnets and Yellowhammers to farmland. Unsprayed crops, grass margins, headlands and beetle banks are also predicted to increase the food resource of these species.

Although most species were found to occur on peas in greater numbers than on cereals, the densities of these species were not high. An increase in biodiversity may be achieved through manipulation of field boundaries, following the progression from hedgerow to headland to field-marginal strips, without herbicide or pesticide inputs to the crop edge itself.

Spring crops, including peas offer birds sparse, low growing vegetation through spring and early summer, in which they can both nest and forage. Low rates of mechanical interference would encourage the use of pea fields by Skylarks and Lapwings both of which might be encouraged to utilise pea fields in greater numbers than were observed during 1999.

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Codes	Species	1999	2000	Codes	Species	1999	2000
B	Blackbird	P	P	RB	Reed Bunting		P
C	Crow	P	P	R	Robin	P	P
CH	Chaffinch	P	P	RO	Rook	P	P
CD	Collared Dove	P	C	SM	Sand Martin		P
CB	Corn Bunting	P	C	SW	Sedge Warbler		C
D	Dunnock	P	P	SU	Shelduck	P	
GO	Goldfinch	P	P	SK	Siskin	P	C
GR	Greenfinch	P	P	S	Skylark	P	P
P	Grey Partridge	P	P	ST	Song Thrush		P
HS	House Sparrow	C	P	SH	Sparrowhawk	P	P
JD	Jackdaw	P	P	SG	Starling	P	C
K	Kestrel	P	C	SD	Stock Dove	P	P
L	Lapwing	P	P	SL	Swallow	P	C
LI	Linnet	C	P	SI	Swift	P	P
MG	Magpie	P	C	TS	Tree Sparrow	P	C
MP	Meadow Pipit	P	P	TD	Turtle Dove	P	C
M	Mistle Thrush	P	P	WH	Whitethroat	P	P
MH	Moorhen	P	P	WP	Woodpigeon	P	P
PH	Pheasant	P	P	WR	Wren	P	P
PW	Pied Wagtail	P	P	YW	Yellow Wagtail	P	C
Q	Quail		P	Y	Yellowhammer	P	P
RL	Red-legged Partridge	P	P				

Table 1. A list of foraging bird species recorded in fields, on farm plots during the pea field survey together with 2-letter codes as used in the current report. Highest densities on peas ('P') as opposed to cereals ('C') are indicated and (visa-versa) for each species for 1999 and 2000 respectively. Roosting flocks of gulls, feral pigeons and waders such as Golden Plover and Curlew are not included here.

Species	Boundary features		
	Hedge height	Mature trees	Boundary strip of vegetation
Gamebirds			+
Pigeons			
Insectivores			++
Thrushes	+++		
Crows	++	+++	
Finches & Buntings			+

Table 2. Preferences for three key boundary feature by seven bird groups. Significant preferences are indicated by: +++ ($p < 0.005$), ++ ($p < 0.05$), + ($p < 0.05$). Gamebirds include Grey Partridge, R-l Partridge & Pheasant; Pigeons include Woodpigeon, Stock Dove, Turtle Dove and Collard Dove; Insectivores include wagtails, Dunnock, Robin and Wren; Thrushes include Blackbird, Song Thrush and Mistle Thrush; Crows included Carrion Crow, Jackdaws, Rook, Magpie and Jay.

Total densities (per hectare) of birds recorded on and around both pea and winter cereal fields					
Species	Winter cereals	Peas	Potential densities that may be achievable on farmland	UK: maxima for territory densities in ideal habitats	Pea score
Lapwing	0.00	0.01	0.13 (e.g. spring tillage [†])	0.27 (stubble [†])	2
Grey Partridge	0.01	0.06	0.20 (e.g. set-aside/spring tillage)	0.60 (Norfolk mixed farmland and traditional leys [♥])	3
Skylark	0.15	0.18	0.5-1.0 (e.g. spring tillage)	1.50 (traditional leys, set-aside [♦])	4
Blackbird	0.06	0.12	0.48 (e.g. farm woodland fringe [♦])	7.00 (suburbia [♦])	5
Whitethroat	0.06	0.06	1.0 (e.g. scrub [♦])	1.60 (scrub [♦])	3
Linnet [♦]	0.06	0.13	0.27(e.g. arable/grassland) [*]		5
Yellowhammer	0.07	0.09	0.23 (e.g. farmland CBC 1980 [♦])	0.47 (scrub [♦])	5

Sources, see references: ^{*}BWP, [♥]Gibbons *et al.* 1993, ^{*}Gregory & Baillie 1998, [♦]Hickling 1983, [♦]Wilson *et al.* 1997, [†]Wilson *et al.* 1999. [♦]Pers obs.

Table 3. A comparison of mean densities of a representative selection of species recorded on peas and winter cereals during the 1999 survey with densities recorded in other studies (for example on spring tillage) and/or habitats (examples of maximum densities from the literature). In the final column, the “pea score” is a crude indication of the current success of pea fields to support breeding densities of each selected species (based on the first year’s results). In most cases densities on or around pea fields were much less than half of those that have been observed (and are therefore theoretically achievable) in other farmland crops or habitats (column 4). Pea fields therefore tend to score less than 5, whilst the index ranges from 0 (poor) to 10 (excellent).

APPENDIX 1

Future Research

BEW Sustainable Agriculture 2001

Preferred options for improving bird biodiversity in and around pea crops.

1. Marginal Strips

A diverse sward: preferred strips should include a mixture of flowers and grasses, tall and possibly thickish near the hedge or boundary, but sparser nearer the crop. Grass-only margins generally considered of less value, since flowers produce seeds and insects as food for birds. 6-12 m margins are considered optimal but very little information to back this up. The plant species in the tables that follow (A1 and A2) are identified in the literature as being important for birds but the list is not exhaustive. A warm aspect and shelter by good hedges are preferred but may not be essential; margins next to stubbles are also ideal. Margins on the shady side of tall hedges may, however, have less impact on crop yield if encouraged in areas where the shade often effects crop growth. Unsprayed strips are crucial, especially re broad spectrum herbicides or insecticides.

2. Field Manipulation Options

- A. Unsown and unsprayed patches or strips within the crop, around one drill width and 10m long amounting in total to between 1% and 5% of the crop area.
- B. Reduced herbicide inputs on both the stubbles (until cultivation) and on the peas crop, on half of the crop, and also reduce pesticide inputs (e.g. near flowering).
- C. Simple, unsprayed 10 margins of the crop itself, to allow weeds to grow with the crop outer sector.
- D. Stubble retention: retain unsprayed stubbles for as long as possible before drilling (e.g. for late sown pea crops).

A and B especially valuable.

Tables below summarising important plant types and animal types for birds and the conditions required.

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 <i>Poa annua</i>).
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, <i>Poa</i> 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.
Yellowhammer	Often recorded but not common	Cereals, grasses and larger weed seeds (apparently not crucifers, eg. rape).	Cereal grain, grass seeds (eg. Fescues, Lolium & <i>Poa</i> spp.) (Compositae for beetles). Autumn= beetles, grass seeds & fruit seeds.	Moth & butterfly larvae; spiders; weevils & ground beetles (adults) to chicks (++); Grasshoppers.

Table A1 A summary of key dietary components drawn from the literature, of six indicator bird species (NB. ++ means especially well represented in at least one study). In brief, favoured broad-leaved plants include Fat Hen and goosefoots (*Chenopodium* spp.), hawksbits, hawthweeds and thistles (Compositae), knotgrass (Poygonum) chickweeds & champions (Charophyllaceae), clovers & vetches (Fabaceae) 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.

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

Table A2 A summary of the habitats (plant species and soil condition) associated with key food items of six representative farmland birds found on farmland (see Table 1).

APPENDIX 2

Field counts and bird records for individual farms

Bird Survey Results: summer 2000

L1: Mr John Mitchell

County: Norfolk

Crops surveyed: Vining peas and spring barley

Thirteen species of bird were recorded on and around the pea and cereal fields, with their proximity to wetland areas indicated by Sedge Warblers and Moorhens. Other birds included finches, Yellowhammer and common species of field boundaries such as Wren, Dunnock and Great Tit. On the fields, six species were recorded using the pea field, compared to just two on the cereal field. Bird numbers were generally low on both fields. On the peas, species included Blackbird and Song Thrush both of which are declining on farmland at a national level and are of national conservation concern. Two pairs of Skylarks were present on the cereal field. In the survey, as a whole, Skylarks were recorded at higher density on pea fields than on winter cereal fields, particularly during June and July when winter cereals became too tall and dense to allow access to the soil. Peas may allow Skylarks to extend their breeding season into July, and raise a greater number of broods.

Maximum numbers of birds recorded during a single 1-hour visit on fields

Species	Field type	
	Pea/beans	Cereal
Red-legged Partridge	2 (0.09)	1 (<0.01)
Woodpigeon	5 (0.20)	
Skylark		2 (0.08)
Blackbird	2 (0.04)	
Song Thrush	1 (0.03)	
Sedge Warbler	1 (<0.01)	
Chaffinch	1 (0.03)	

Bird Survey Results: summer 1999 & 2000

L2: Mr S Marsh
County: Norfolk
Crops surveyed: Vining peas and winter wheat

Thirty-six species of bird were recorded on and around the pea and cereal fields including Great Spotted Woodpecker, warblers, and a variety of common species on the field boundaries. On the fields, 26 species were recorded using pea fields, compared to 12 on the cereal field. On the peas, species included Turtle Dove, Yellow Wagtail and Skylark, each one declining on farmland nationally and of national conservation concern. Skylarks were more abundant on the pea field than on the cereal field in line with the general survey picture where Skylarks were recorded at higher densities on peas rather than cereals, particularly during June and July when the cereal crops became too dense. This process extends the breeding season of Skylarks allowing a greater number of broods to be raised.

Maximum numbers of birds recorded during a single 1-hour visit to fields (with average summer densities in parenthesis)

Species	Pea/beans	Cereal
Golden Plover	25 (1.15)	
Kestrel	1 (0.07)	
Pheasant	1 (0.08)	3 (0.10)
Red-legged Partridge	3 (0.16)	
Woodpigeon	17 (0.39)	27 (0.42)
Stock Dove	4 (0.23)	
Turtle Dove		1 (0.06)
Collared Dove	1 (0.08)	
Skylark	31 (0.91)	17 (0.59)
Meadow Pipit		4 (0.29)
Pied Wagtail	11 (0.44)	
Yellow Wagtail	2 (0.08)	5 (0.26)
Mistle Thrush	3 (0.11)	
Blackbird	6 (0.19)	6 (0.07)
Starling	70 (5.20)	
Crow	4 (0.32)	
Rooks	37 (3.36)	
Magpie	2 (0.09)	
H. Sparrow	24 (0.44)	25 (0.44)
Goldfinch	6 (0.04)	
Linnet	3 (0.07)	3 (0.05)
Goldfinch	6 (0.44)	
Greenfinch	2 (0.03)	1 (0.01)
Chaffinch	2 (0.03)	2 (0.02)
Yellowhammer	1 (<0.01)	1 (0.01)
Reed Bunting	2 (0.14)	

Bird Survey Results: summer 1999 & 2000

L3: Mr Robert Middleditch
County: Suffolk
Crops surveyed: Vining peas and winter wheat

An excellent variety of species (34) was recorded on and around the pea and cereal fields including Sparrowhawks, Whitethroats, Jay, finches plus a variety of common species using the field boundaries. No species were particularly abundant but 14 species were recorded on peas compared to eight on cereals. Five species were recorded on the rape field, and two of these species were especially abundant, Greenfinch and Goldfinch. On the peas, species included Yellowhammer, Linnet and Skylark, all of which are declining on farmland nationally and therefore are of national conservation concern. In the survey, as a whole, Skylarks were recorded at higher density on peas than on cereals, particularly towards June and July when the cereal crop became too tall and dense. This process extends the breeding season of Skylarks enabling a greater number of broods to be raised.

Maximum numbers of birds recorded during a single 1-hour visit to fields (with average summer densities in parenthesis)

Species	Field type		
	Pea/beans	Cereal	OSRape
Sparrowhawk	1 (0.01)		
Kestrel		1 (0.01)	
Red-legged Partridge	6 (0.24)	2 (0.13)	
Pheasant	2 (0.08)		
Moorhen	4 (0.20)	1 (<0.01)	
Woodpigeon	6 (0.25)	6 (0.1)	
Skylark	8 (0.20)		3 (0.13)
Pied Wagtail	2 (0.12)		4 (0.13)
Blackbird	1 (<0.01)		
Crow	1 (0.07)	1 (0.06)	
Magpie	1 (0.12)	1 (0.01)	
Rook	4 (0.10)	4 (0.14)	
H. Sparrow		1 (0.04)	
Linnet	10 (0.16)		
Goldfinch	6 (0.14)		30 (0.48)
Greenfinch			30 (0.48)
Chaffinch	2 (0.06)		3 (0.08)
Yellowhammer	1 (<0.01)		

Bird Survey Results: summer 1999 & 2000

L4: Mr David Rush
County: Suffolk
Crops surveyed: Vining peas and winter wheat

An excellent variety of species (34) was recorded on and around the pea and cereal fields including Sparrowhawks, Turtle Dove, finches plus a variety of common species using the field boundaries. No species were particularly abundant, although Skylark densities were good. Fifteen species were recorded on peas compared to nine on cereals. On the peas, species included Yellowhammer, Linnet and Skylark, all of which are declining on farmland nationally and therefore are of national conservation concern. In the survey, as a whole, Skylarks were recorded at higher density on peas than on cereals, particularly towards June and July when the cereal crop became too tall and dense. This process extends the breeding season of Skylarks enabling a greater number of broods to be raised.

Maximum numbers of birds recorded during a single 1-hour visit to fields (with average summer densities in parenthesis)

Species	Field type	
	Pea/beans	Cereal
Pheasant	11 (0.14)	3 (0.06)
Red-legged Partridge	3 (0.07)	1 (<0.01)
Woodpigeon	14 (0.01)	3 (0.07)
Skylark	13 (0.31)	8 (0.13)
Meadow Pipit	2 (0.05)	
Pied Wagtail	2 (0.12)	
Blackbird	4 (0.25)	4 (0.01)
Rook	4 (0.25)	
Crow	2 (0.11)	
Jackdaw	1 (0.06)	
Starling	15 (0.93)	
H. Sparrow		2 (0.12)
Linnet	5 (<0.01)	3 (<0.01)
Goldfinch	1 (0.06)	
Chaffinch	1 (0.03)	2 (<0.01)
Yellowhammer	2 (0.03)	1 (0.01)

Bird Survey Results: summer 1999 & 2000

L5: Mr Michael Porter
County: Suffolk
Crops surveyed: Vining peas, winter wheat and linseed

An excellent variety of species (48) was recorded on and around the pea and cereal fields including a passing Osprey as well as Turtle Doves (a species of national conservation concern), a notable flock of Lapwings, plus Whitethroats, Jays, finches and a variety of common species using the field boundaries. No species were particularly abundant but 17 species were recorded on peas compared to eight on cereals and just three on linseed (including occasional high numbers of Skylarks). On the peas, species included Yellowhammer, Linnet and Skylark, all of which are declining on farmland nationally and therefore are of national conservation concern. In the survey, as a whole, Skylarks were recorded at higher density on peas than on cereals, particularly towards June and July when the cereal crop became too tall and dense. This process extends the breeding season of Skylarks enabling a greater number of broods to be raised.

Maximum numbers of birds recorded during a single 1-hour visit to fields (with average summer densities in parenthesis)

Species	Field type		
	Pea/beans	Cereal	Linseed
Kestrel	1 (0.07)		
Lapwing	36 (3.27)		
Moorhen	3 (0.23)		
Red-legged Partridge	3 (0.18)	2 (0.08)	
Pheasant	5 (0.20)	2 (0.04)	3 (<0.01)
Woodpigeon	12 (0.39)		
Stock Dove	2 (0.18)		
Skylark	4 (0.23)	1 (<0.01)	10 (0.01)
Pied wagtail	4 (0.22)		
Dunnock	4 (0.09)	4 (0.11)	
Blackbird	2 (0.09)	1 (0.03)	
Crow	1 (0.01)		
Jackdaw	3 (0.19)	2 (<0.01)	
Starling	9 (<0.01)		
Linnet	1 (<0.01)		
Chaffinch	4 (0.04)	1 (<0.01)	
Yellowhammer	1 (0.07)	1 (<0.01)	

Bird Survey Results: summer 1999

L6: Mr R & B Allen
County: Norfolk
Crops surveyed: Vining peas and winter wheat

Twenty-three species were recorded on and around the pea and cereal fields, including a Little Owl, Moorhen, Great Spotted Woodpecker, Cuckoo, Whitethroat, Lesser Whitethroat, Blackcap, Linnet, Goldfinches, plus a good variety of common species. Six species were recorded on peas compared to three on the cereals. On the peas, species included Yellowhammer and Skylark, both of which are declining on farmland nationally (but neither was common) and of national conservation concern. However, Skylarks occurred on the cereal field at lower densities than on peas, and in the survey, as a whole, Skylarks were recorded at higher density on peas than on cereals, particularly towards June and July when cereals became too tall and dense. On peas, this process extends the breeding season of Skylarks and enables a greater number of broods to be raised.

Maximum numbers of birds recorded during a single 1-hour visit to fields (with average summer densities in parenthesis)

Species	Field type	
	Pea/beans	Cereal
Red-legged Partridge	1 (0.08)	2 (0.14)
Woodpigeon	74 (1.78)	
Skylark	3 (0.20)	4 (0.11)
Pied Wagtail	3 (0.12)	
Chaffinch	2 (0.02)	
Yellowhammer	1 (0.01)	1 (<0.01)

Bird Survey Results: summer 1999 & 2000

L7: Mr M Cook
County: Suffolk
Crops surveyed: Vining peas and winter wheat

Twenty-one species were recorded on and around the pea and cereal fields, including Meadow Pipits, Whitethroat, Blackcap, Linnet and Yellowhammers, plus a healthy variety of common hedgerow/boundary species. Of these, only nine species were recorded on peas compared to three on cereals. On peas, species included Yellowhammer and Skylark, both of which are declining on farmland nationally and are therefore of national conservation concern. Sand Martins, from a nearby colony, were also feeding over the pea field in June. Skylarks were more abundant on the pea field than the cereal field in line with the survey as a whole where Skylarks were recorded at higher density on peas than on cereals, particularly during June and July when the cereals became too dense. This process of shifting from cereals to peas may extend the breeding season of Skylarks, enabling a greater number of broods to be raised overall.

Maximum numbers of birds recorded during a single 1-hour visit to fields (with average summer densities in parenthesis)

Species	Field type	
	Pea/beans	Cereal
Red-legged Partridge	4 (0.11)	2 (0.20)
Pheasant	4 (0.20)	2 (0.13)
Woodpigeon	4 (0.39)	
Sand Martin	14 (1.56)	
Skylark	4 (0.27)	4 (0.18)
Pied Wagtail	3 (0.30)	
Blackbird	1 (0.08)	
Chaffinch	2 (0.10)	
Yellowhammer	2 (0.07)	

Bird Survey Results: summer 1999 & 2000

L8: Mr James Leggate
County: Suffolk
Crops surveyed: Vining peas, winter barley and spring barley

A good variety of species (33) was recorded on and around the pea and cereal fields including Sparrowhawks, Whitethroats, Jay, finches plus a variety of common species using the field boundaries. No species were particularly abundant but 12 species were recorded on peas compared to five on winter cereals and five on spring cereals. On the peas, species included Yellowhammer and Skylark, all of which are declining on farmland nationally and therefore are of national conservation concern. Skylarks were at similar densities on all fields, though slightly higher on the spring barley. In the survey, as a whole, Skylarks (and other species) were recorded at higher density on peas and spring cereals than on winter cereals, particularly towards June and July when the winter cereals (but not spring cereals) became too tall and dense. On both peas and spring cereals, access to relatively short crops extends the breeding season of Skylarks to enable a greater number of broods to be raised.

Maximum numbers of birds recorded during a single 1-hour visit to fields (with average summer densities in parenthesis)

Species	Field type		
	Pea/beans	Cereal	Spring Cereal
Red-legged Partridge	2 (0.06)		
Pheasant	4 (0.30)	1 (<0.01)	1 (0.14)
Woodpigeon	29 (0.52)		2 (0.01)
Stock Dove	2 (0.08)		
Skylark	5 (0.12)	5 (0.12)	2 (0.14)
Blackbird		1 (0.02)	1 (0.11)
Whitethroat	2 (0.09)		
Crow	2 (0.17)		
Jackdaw		5 (0.20)	
Magpie	2 (0.19)		
Starlings	60 (8.57)		
Linnet			1 (0.14)
Greenfinch	15 (0.86)		
Chaffinch	2 (<0.01)		1 (0.03)
Yellowhammer	3 (<0.01)	1 (<0.01)	

Bird Survey Results: summer 1999 & 2000

L9: Mr Richard Styles
County: Suffolk
Crops surveyed: Vining peas and winter wheat

An excellent variety of species (34) was recorded on and around the pea and cereal fields including Sparrowhawks, Whitethroats, Linnets, Jays, Mistle Thrush, Tits, Goldfinches and Greenfinches, plus a good variety of other common hedgerow species. No species were particularly abundant but 14 species (including flocks of Lapwings, Woodpigeons and Rooks) were recorded on peas compared to six on cereals. On peas, species also included Yellowhammer and Skylark, both of which are declining on farmland nationally and are of national conservation concern. In the survey, as a whole, Skylarks were recorded at higher density on peas than on cereals, particularly towards June and July when cereals crop became too tall and dense. This process extends the breeding season of Skylarks into late summer, enabling a greater number of broods to be raised.

Maximum numbers of birds recorded during a single 1-hour visit to fields (with average summer densities in parenthesis)

Species	Field type	
	Pea/beans	Cereal
Red-legged Partridge	9 (0.15)	2 (<0.01)
Pheasant	3 (0.05)	4 (0.06)
Moorhen	1 (0.05)	1 (0.02)
Lapwing	60 (2.70)	
Woodpigeon	26 (0.34)	
Skylark	4 (0.10)	4 (0.02)
Pied Wagtail	10 (0.45)	
Whitethroat		1 (0.02)
Magpie	1 (<0.01)	
Crow	2 (0.03)	
Rook	37 (0.42)	
Starling	5 (0.20)	
Greenfinch	1(<0.01)	
Yellowhammer	1 (0.01)	1(<0.01)

Bird Survey Results: summer 1999 & 2000

H1: Mr G Pickering
County: North Lincolnshire
Crops surveyed: Vining peas and winter wheat

Twenty-three species were recorded on and around the pea and cereal fields, including Meadow Pipits, Whitethroat, Blackcap, Linnet and Yellowhammers, plus a healthy variety of common hedgerow/boundary species. Of these, 12 species were recorded on peas compared to two on cereals. On peas, species included Yellow Wagtails, Yellowhammers and Skylarks, all of which are declining on farmland nationally and are therefore of national conservation concern. Skylarks were more abundant on the pea field than the cereal field in line with the survey as a whole where Skylarks were recorded at higher density on peas than on cereals, particularly during June and July when the cereals became too dense. This process of shifting from cereals to peas may extend the breeding season of Skylarks, enabling a greater number of broods to be raised overall.

Maximum numbers of birds recorded during a single 1-hour visit to fields (with average summer densities in parenthesis)

Species	Field type	
	Peas	Cereal
Pheasant	2 (0.16)	
Woodpigeon	2 (0.17)	3 (0.06)
Stock Dove	5 (0.5)	
Skylark	5 (0.3)	3 (0.12)
Meadow Pipit	2 (0.2)	
Yellow Wagtail	2 (0.12)	
Blackbird	2 (0.07)	
Crow	2 (0.17)	
Rook	6 (0.6)	
Magpie	1 (0.03)	
Starling	3 (0.2)	
Yellowhammer	1 (0.02)	

Bird Survey Results: summer 1999 & 2000

H2: Mr Robert Borrill
County: North Lincolnshire
Crops surveyed: Vining peas and winter wheat

Nineteen species were recorded on and around the pea and cereal fields, including Whitethroat, Blackcap, Rooks and Yellowhammers, plus a healthy variety of common hedgerow/boundary species. Of these, thirteen species were recorded on peas compared to three on cereals. On peas and cereals, Skylarks were present in good numbers. For this species of national conservation concern, birds were more abundant on the peas than on cereals, in line with the survey as a whole where Skylarks were recorded at higher density on peas than on cereals, particularly during June and July when the cereals became too dense. This process of shifting from cereals to peas may extend the breeding season of Skylarks, enabling a greater number of broods to be raised overall.

Maximum numbers of birds recorded during a single 1-hour visit to fields (with average summer densities in parenthesis)

Species	Field type	
	Pea/beans	Cereal
Pheasant	1 (0.11)	
Grey Partridge	2 (0.15)	1 (0.11)
R-1 Partridge	2 (0.22)	1(0.22)
Lapwing	4 (0.45)	
Woodpigeon	20 (1.13)	
Skylark	8 (0.83)	6 (0.35)
Pied Wagtail	4 (0.45)	
Dunnock	3 (0.08)	
Blackbird	1 (0.03)	
Rook	45 (4.49)	
Starling	100 (11.10)	
Reed Bunting	6 (0.67)	
Yellowhammer	2 (0.18)	

Bird Survey Results: summer 1999 & 2000

H3: Mr Bill Davey
County: North Lincolnshire
Crops surveyed: Vining peas and winter wheat

Twenty-four species were recorded on and around the pea and cereal fields, including Tree Sparrows (a species declining across Britain) and a healthy variety of common hedgerow/boundary species. Of these species, thirteen were recorded on peas compared to eight on cereals. On peas, species included Yellow Wagtails, Yellowhammers, Corn Buntings and Skylarks, all of which are declining on farmland nationally and are therefore of national conservation concern. Skylarks were much more abundant on the peas than on cereals, in line with the survey as a whole where Skylarks were recorded at higher density on peas than on cereals, particularly during June and July when the cereals became too dense. This process of shifting from cereals to peas may extend the breeding season of Skylarks, enabling a greater number of broods to be raised overall.

Maximum numbers of birds recorded during a single 1-hour visit to fields (with average summer densities in parenthesis)

Species	Field type	
	Pea/beans	Cereal
Pheasant	1 (0.03)	
Red-legged Partridge	3 (0.08)	1 (<0.01)
Grey Partridge	2 (0.10)	
Lapwing	4 (0.24)	
Woodpigeon	59 (1.21)	2 (<0.01)
Skylark	8 (0.26)	6 (0.08)
Yellow Wagtail	1 (0.1)	1 (0.02)
Blackbird	2 (0.16)	1 (0.02)
Crow	3 (0.09)	
Starling	6 (0.48)	
Tree Sparrow		2 (0.10)
Linnet	4 (0.10)	5 (0.03)
Corn Bunting	2 (0.04)	1 (0.02)
Yellowhammer	2 (0.01)	

Bird Survey Results: summer 1999 & 2000

H4: Mr Richard Byass
County: East Yorkshire
Crops surveyed: Vining peas and spring barley

Seventeen species of bird were recorded on and around the pea and cereal fields, including Sparrowhawk, Lapwing and some common hedgerow species. Eleven species were recorded on peas compared to just five on cereals. On peas, species included Yellow Wagtails and Skylarks, both of which are declining on farmland nationally and are therefore of national conservation concern. Skylarks were slightly more abundant on the peas than on cereals, in line with the survey as a whole where Skylarks were recorded at higher density on peas than on cereals, particularly during June and July when the cereals became too dense. This process of shifting from cereals to peas may extend the breeding season of Skylarks, enabling a greater number of broods to be raised overall.

Maximum numbers of birds recorded during a single 1-hour visit to fields (with average summer densities in parenthesis)

Species	Field type	
	Pea/beans	Cereal
Pheasant	1 (<0.01)	1 (0.01)
Red-legged Partridge	1 (0.82)	1 (<0.01)
Kestrel	1 (0.03)	
Lapwing	25 (0.33)	
Woodpigeon	52 (0.064)	
Skylark	8 (0.11)	6 (0.11)
Pied Wagtail	4 (0.05)	
Yellow Wagtail	1 (0.01)	2 (0.03)
Crow	1 (0.09)	
Rook	59 (0.82)	
Goldfinch	1 (0.05)	1 (0.03)

Bird Survey Results: summer 1999 & 2000

H5: Mrs Emma Mountifield
County: East Yorkshire
Crops surveyed: Vining peas and winter wheat

Twenty-three species were recorded on and around the pea and cereal fields, including Linnets, Whitethroats and a healthy variety of common hedgerow/boundary species. Of these species, twelve were recorded on peas compared to four on cereals. On peas, species included Yellowhammers and Skylarks as well as Linnets, all of which are declining on farmland nationally and are therefore of national conservation concern. Skylarks were uncommon and at low density on the farm being slightly commoner on cereals rather than peas, against the trend for the survey as a whole. Skylarks were generally recorded at higher density on peas than on cereals, particularly during June and July when the cereals became too dense. This process of shifting from cereals to peas may extend the breeding season of Skylarks, enabling a greater number of broods to be raised overall.

Maximum numbers of birds recorded during a single 1-hour visit to fields (with average summer densities in parenthesis)

Species	Field type	
	Pea/beans	Cereal
Pheasant		3 (0.05)
Red-legged Partridge	2 (0.07)	2 (0.09)
Lapwing	6 (0.12)	
Woodpigeon	62 (1.06)	
Skylark	4 (0.05)	3 (0.08)
Dunnock	2 (0.04)	2 (0.02)
Pied Wagtail	1 (0.07)	
Crow	4 (0.05)	
Rook	25 (0.97)	
Starling	8 (0.27)	
Linnet	2 (<0.01)	
Yellowhammer	2 (<0.01)	

Bird Survey Results: summer 1999 & 2000

H6: Mr William Osgerby
County: East Yorkshire
Crops surveyed: Broad beans and winter wheat

Nineteen species of bird were recorded on and around the pea and cereal fields, including Grey Partridge and good counts of Yellow Wagtails, each species being vulnerable on farmland and of high conservation interest. Thirteen species were recorded using peas compared to six on cereals over the summer period as a whole. These species included those above plus three additional species of high conservation concern, Reed Bunting, Corn Bunting and Skylark, all of which are declining on farmland nationally. Skylarks were much more abundant on the peas than on cereals, in line with the survey as a whole where Skylarks were recorded at higher density on peas than on cereals, particularly during June and July when the cereals became too dense. This process of shifting from cereals to peas may extend the breeding season of Skylarks, enabling a greater number of broods to be raised overall.

Maximum numbers of birds recorded during a single 1-hour visit to fields (with average summer densities in parenthesis)

Species	Field type	
	Pea/beans	Cereal
Pheasant		1 (<0.01)
Grey Partridge	2 (<0.01)	
Golden Plover	5 (0.01)	
Lapwing	22 (0.65)	
Woodpigeon	2 (<0.01)	
Skylark	9 (0.09)	2 (0.05)
Meadow Pipit	4 (0.04)	2 (<0.00)
Yellow Wagtail	18 (0.02)	1 (0.01)
Crow	4 (0.06)	
Rook	12 (0.27)	
Starling	27 (0.80)	1 (<0.01)
Reed Bunting	2 (<0.01)	
Corn Bunting	2 (0.01)	1 (0.01)

Bird Survey Results: summer 1999 & 2000

H7: Mr Caley Sackur
County: East Yorkshire
Crops surveyed: Vining peas and winter wheat

A good variety of species (36) was recorded on and around the pea and cereal fields including Sparrowhawks, Great Spotted Woodpecker and a variety of common species using the field boundaries. Quail and Grey Partridge were present, the Quail being particularly interesting since the species is a scarce breeding bird in Britain. Other notable species included Linnets, Corn Buntings, Yellowhammers and Skylarks, each one a species of national conservation concern. No species were particularly abundant, although Skylark densities were good, being slightly higher on peas than on cereals. In the survey, as a whole, Skylarks were recorded at higher density on peas than on cereals, particularly towards June and July when the cereal crop became too tall and dense. This process extends the breeding season of Skylarks enabling a greater number of broods to be raised.

Maximum numbers of birds recorded during a single 1-hour visit to fields (with average summer densities in parenthesis)

Species	Field type	
	Pea/beans	Cereal
Red-legged Partridge	2 (0.08)	2
Pheasant	1 (0.02)	
Grey Partridge	1 (0.02)	
Quail	1 (0.02)	
Lapwing	2 (0.06)	
Woodpigeon	3 (0.06)	
Stock Dove	3 (0.10)	
Skylark	9 (0.23)	10 (0.17)
Duncock	2 (0.03)	
Pied Wagtail	2 (0.05)	2 (0.08)
Starling	6 (0.13)	
Crow	2 (0.06)	2 (0.02)
Rook	45 (0.87)	
Linnet	1 (0.02)	
Corn Bunting	1 (<0.01)	
Yellowhammer	1 (<0.01)	

Bird Survey Results: summer 1999 & 2000

H8: Mr Nick Baker
County: East Yorkshire
Crops surveyed: Vining peas and winter wheat

Twenty-nine species of bird were recorded on both the fields and boundaries of the pea and cereal fields including Sparrowhawk, Whitethroat, Spotted Flycatcher and Tree Sparrow (as species of national conservation interest) plus a good variety of common species utilising the field boundaries only. On the fields, 16 species were recorded using the peas compared to just seven on cereals over the summer period as a whole. On the peas, species included several, such as Corn Bunting, Yellow Wagtail and Skylark, which like Tree Sparrows, are declining on farmland nationally and therefore of national conservation concern. A record of Quail calling from the pea field in 1999 added special interest to this area, this species being extremely scarce and elusive in Britain. Skylarks were more abundant on the pea field than the cereal, particularly towards June and July when the cereal crop becomes too tall and dense. This is in line with the general survey picture and extends the breeding season of Skylarks, enabling a greater number of broods to be raised.

Maximum numbers of birds recorded during a single 1-hour visit to fields (with average summer densities in parenthesis)

Species	Field type	
	Pea/beans	Cereal
Red-legged Partridge	6 (0.38)	4 (0.21)
Pheasant	1 (0.01)	1 (0.01)
Quail	1 (0.01)	
Woodpigeon	3 (<0.01)	
Skylark	9 (0.38)	5 (0.27)
Meadow Pipit	3 (0.14)	5 (0.19)
Pied Wagtail	2 (0.01)	3 (0.01)
Yellow Wagtail	1 (0.01)	
Blackbird	1 (0.07)	
Starling	6 (0.58)	7 (0.60)
Crow	4 (0.38)	3 (0.24)
Rook	2 (0.19)	
Tree Sparrow	6 (<0.01)	
Linnet	1 (<0.01)	
Chaffinch	14 (0.22)	
Corn Bunting	2 (<0.01)	

Bird Survey Results: summer 1999

H9: Mr Paul Hayward
County: East Yorkshire
Crops surveyed: Vining peas and winter wheat

Twenty-three species of bird were recorded on both the fields and boundaries of the pea and cereal fields, including Sparrowhawk, Whitethroat, Blackcap, Swallows and Martins plus a good variety of common hedgerow species utilising the field boundaries only. Thirteen species were recorded using the pea field, compared to seven recorded on the cereal field over the summer period as a whole. Records included several species, such as Lapwing, Grey Partridge, Yellowhammer, Linnet and Skylark, which are declining on farmland nationally and therefore of national conservation concern. Unlike the general picture for the survey, which demonstrates a preference for pea fields over cereals by Skylarks in June and July in particular, Skylarks were recorded at slightly higher density on cereals than on peas although the densities on both were low. The general trend for the survey as a whole indicates that pea fields provided breeding and foraging habitat for Skylarks late in the breeding season (June and July) when the cereal crop becomes too tall and dense. This process extends the breeding season of Skylarks, enabling a greater number of broods to be raised.

Maximum numbers of birds recorded during a single 1-hour visit to fields (with average summer densities in parenthesis)

Species	Field type	
	Pea/beans	Cereal
Pheasant	2 (0.10)	1 (0.08)
Red-legged Partridge	6 (0.19)	4 (0.01)
Grey Partridge	2 (0.19)	2 (0.17)
Lapwing	1 (0.09)	
Woodpigeon	4 (0.29)	
Skylark	1 (0.09)	2 (0.17)
Dunnock	2 (0.03)	1 (0.04)
Blackbird	2 (0.03)	1 (0.07)
Rook	1 (<0.01)	
Crow	4 (<0.01)	
Linnet	2 (0.07)	2 (0.09)
Chaffinch	4 (0.01)	
Yellowhammer	1 (<0.01)	

Bird Survey Results: summer 1999 & 2000

H10: Mr Mark Flint
County: East Yorkshire.
Crops surveyed: Vining peas and winter wheat

Twenty-five species of bird were recorded on both the fields and boundaries of the pea and cereal fields including a variety of common species utilising the field boundaries only. On the fields, 18 species were recorded using the pea field, compared to nine recorded on the cereal field. On the peas, species included Lapwing, Grey Partridge, Yellow Wagtail, Linnet, Yellowhammer and Skylark, which are declining on farmland nationally and therefore of national conservation concern. Skylarks were more abundant on peas than on cereals, in line with the general survey, in which Skylarks occurred at higher densities on peas than on winter cereal particularly during June and July when the cereal crops became too dense. This process extends the breeding season of Skylarks and enables a greater number of broods to be raised.

Maximum numbers of birds recorded during a single 1-hour visit to fields (with average summer densities in parenthesis)

Species	Field type	
	Pea/beans	Cereal
Lapwing	13 (0.02)	
Golden Plover	2 (0.06)	
Red-legged Partridge	2 (0.07)	1 (0.03)
Grey Partridge	3 (0.06)	3 (0.07)
Pheasant	1 (0.01)	
Woodpigeon	10 (0.14)	
Skylark	17 (0.18)	9 (0.11)
Meadow Pipit	3 (<0.01)	
Pied Wagtail	2 (0.07)	
Yellow Wagtail	3 (0.04)	1 (0.04)
Duncock	3 (0.03)	2 (0.01)
Blackbird	1 (0.02)	1 (0.01)
Starling	4 (0.01)	
Crow	7 (0.16)	
Rook	4 (0.07)	2 (0.05)
Linnet	13 (0.02)	3 (0.01)
Chaffinch	5 (<0.01)	
Yellowhammer	6 (0.01)	4 (<0.01)

Bird Survey Results: summer 1999 & 2000

H11: Mr David Martinson
County: East Yorkshire
Crops surveyed: Vining peas, winter wheat and borage

A good variety of bird species (30) were recorded on and around the pea and cereal fields, with species including a Marsh Harrier hunting over the area in 1999. There was also a healthy variety of common species using the field boundaries. On the fields, 15 species were recorded using peas compared to six on cereals and four on borage. On the peas, species included Turtle Dove, Yellow Wagtail, Linnet and Skylark, each of which are declining on farmland nationally and therefore of national conservation concern. Skylarks were marginally more abundant on the peas than on cereals, and this was in line with the general findings of the survey. In the overall survey Skylarks (and other species) occurred at higher densities on peas than on winter cereals especially during June and July when the cereal crop became too tall and dense. This process extends the breeding season of Skylarks, enabling a greater number of broods to be raised.

Maximum numbers of birds recorded during a single 1-hour visit to fields (with average summer densities in parenthesis)

Species	Field type		
	Pea/beans	Cereal	Borage
Red-legged Partridge	2 (0.01)	1 (0.01)	
Pheasant	1 (<0.01)	1 (<0.01)	
Woodpigeon	11 (0.36)		4 (0.04)
Turtle Dove	1 (<0.01)		
Stock Dove	2 (0.03)		
Skylark	3 (0.19)	2 (0.11)	
Pied Wagtail	1 (<0.01)		
Yellow Wagtail	3 (<0.01)		
Blackbird			1 (<0.01)
Robin	1 (<0.01)		
Goldfinch	1 (<0.01)	1 (<0.01)	
Whitethroat			2 (<0.01)
Starling	13 (0.22)	4 (<0.01)	
Crow	4 (0.06)		
Rook	1 (<0.01)		
Linnet	7 (0.07)	1 (<0.01)	
Chaffinch	2 (0.08)	3 (0.01)	4 (<0.01)

Bird Survey Results: summer 1999 & 2000

H12: Mr Peter Martinson
County: East Yorkshire
Crops surveyed: Vining peas and winter wheat

Twenty-five species of bird were recorded on and around the pea and cereal fields, including a variety of common species utilising the field boundaries only. On the fields, 14 species were recorded on peas, compared to just eight on winter cereals. On the peas, species included Grey Partridge and Skylark and Tree Sparrows, all of which are declining on farmland nationally and therefore of national conservation concern. Skylarks were relatively scarce on both the pea and cereal fields. The general findings of the survey indicate that pea fields support high densities of Skylarks (and other species), especially during June and July when the cereal crop becomes too tall and dense. This process extends the breeding season of Skylarks, enabling a greater number of broods to be raised.

Maximum numbers of birds recorded during a single 1-hour visit to fields (with average summer densities in parenthesis)

Species	Field type	
	Pea/beans	Cereal
Shelduck	5 (0.38)	1 (<0.01)
Pheasant	1 (<0.01)	
Red-legged Partridge	2 (0.15)	1 (0.07)
Grey Partridge	3 (0.23)	
Woodpigeon	25 (0.06)	1 (<0.01)
Skylark	1 (0.04)	1 (0.04)
Sedge Warbler		2 (0.17)
Pied Wagtail	2 (0.08)	
Duncock	1 (<0.01)	
Robin	1 (0.04)	
Blackbird	1 (0.04)	
Crow	3 (0.05)	21 (0.41)
Starling	100	
Tree Sparrow	2 (<0.01)	
Greenfinch		1 (0.02)
Chaffinch	2 (0.02)	3 (0.03)

