RSPB

Bird Monitoring Methods

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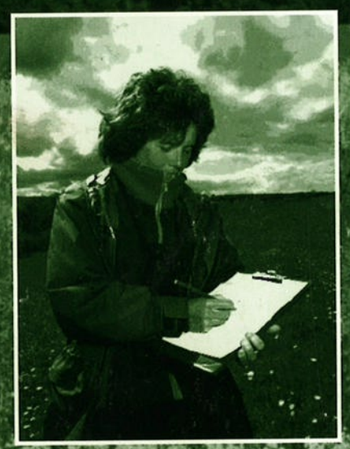





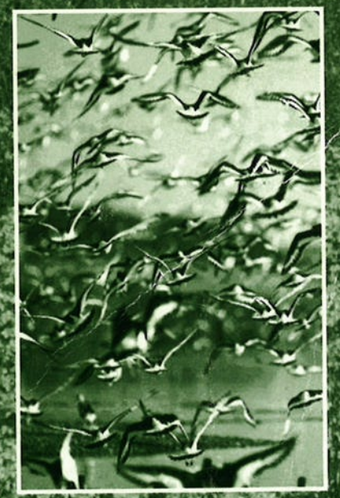

British Trust for Ornithology

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JOINT NATURE CONSERVATION COMMITTEE

Institute of Terrestrial Ecology

the Seabird Group

Breeding Bird Survey (BBS)

The UK Breeding Bird Survey is a partnership between the BTO, JNCC and RSPB and was introduced in the breeding season of 1994 as an annual survey of widespread and abundant terrestrial birds in the UK. The BBS runs in parallel with the Common Birds Census (CBC; see above), but will eventually take over as the UK's main scheme for national bird monitoring, having been set up to improve geographical and habitat representation and to increase species coverage. The BBS is a sample survey in which observers walk two 1-km transects within randomly allocated 1-km squares. The methods provide much more reliable information on UK-wide population trends than does the CBC, although the BBS does not provide as detailed full census information at the plot level as does the CBC.

In terms of national population monitoring, the BBS will provide:
- trends for many species for the UK as a whole
- trends for individual countries within the UK
- trends for European Union regions within the UK
- trends by habitat type.

In addition, the conservation of particular species and habitats will be greatly improved by a more complete understanding of the relationships between birds and broad habitat types, both of which are recorded by the BBS (Gregory et al 1996, 1997).

The BBS is not only a scheme, it is also a method. There are many circumstances in which using the line-transect method of the BBS may be the best way to monitor widespread and common breeding species in a particular area, even though these areas may not be within the formal sampling design of the BBS. In general, this would only work well for reasonably large sites, for example Environmentally Sensitive Areas (ESAs) or National Parks. In practice, such monitoring would probably be done by randomly selecting a sample of 1-km squares within the overall area, using the BBS method within each of these squares and repeating between years. Users of this approach should be warned that the analysis of the data collected using the BBS method can become quite complex and it is recommended that specialist advice is sought. This is particularly the case if the method is to be used to estimate absolute breeding densities and population sizes of individual species, rather than merely performing a between-year monitoring function. To estimate densities and population sizes it is necessary to use the distance sampling methods of Buckland et al (1993) and, ideally, the DISTANCE software specially written for such analyses.

The following is taken from 1998 Breeding Bird Survey Instructions.

Information required

- number of individual birds (excluding juveniles) of all species that were recorded in each 200-m section of a 2-km-long transect, in each of several distance bands, on each of two visits.

Number and timing of visits

Three: first visit March–April (set up route and record habitat); one between early April and mid-May (early transect count); one mid-May to late June (late transect count). The two count visits must be *at least four weeks apart*. NB Fieldwork should begin and end later in more northerly parts of the UK.

Time of day

Morning, beginning ideally 0600–0700 BST, and no later than 0900 BST.

Weather constraints

Do not attempt to census in heavy rain, poor visibility or strong winds.

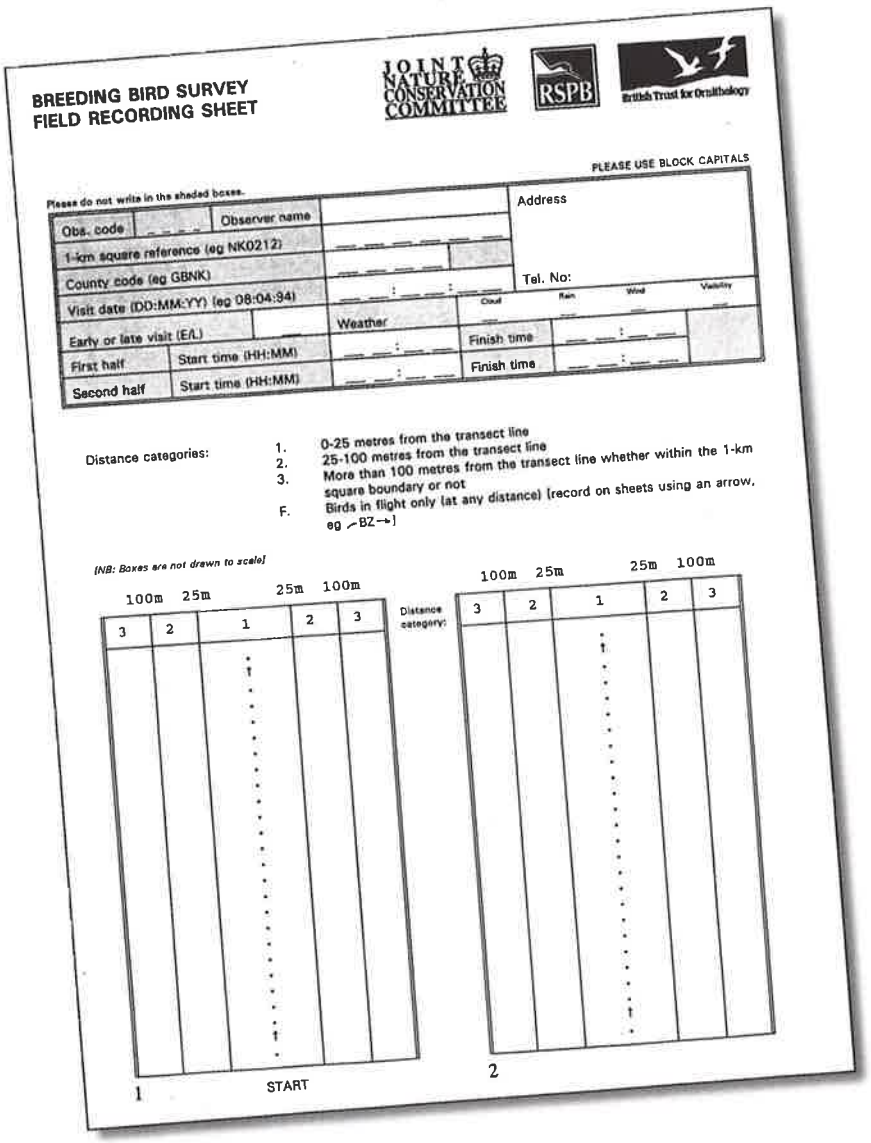
Sites/areas to visit

All accessible habitat types (except large expanses of water). UK-wide scheme: 1-km squares allocated to you by your BTO Regional Representative. BBS as a method outside the UK-wide scheme: randomly selected 1-km squares within the study area.

Equipment

- recording forms (see Figures 1 and 2)
- 1:50,000 and 1:25,000 OS maps of the area.

NB When contributing to the national BBS always obtain instructions and recording forms from: Census Unit, British Trust for Ornithology, The Nunnery, Thetford, Norfolk IP24 2PU.



BREEDING BIRD SURVEY
FIELD RECORDING SHEET

JOINT NATURE CONSERVATION COMMITTEE | RSPB | British Trust for Ornithology

PLEASE USE BLOCK CAPITALS

Please do not write in the shaded boxes.

Obs. code	Observer name		Address
1-km square reference (eg NK0212)			
County code (eg GBNK)			Tel. No:
Visit date (DD:MM:YY) (eg 08:04:94)		Cloud / Rain / Wind / Visibility	
Early or late visit (E/L)	Weather		
First half	Start time (HH:MM)	Finish time	
Second half	Start time (HH:MM)	Finish time	

Distance categories:

1. 0-25 metres from the transect line
2. 25-100 metres from the transect line
3. More than 100 metres from the transect line whether within the 1-km square boundary or not

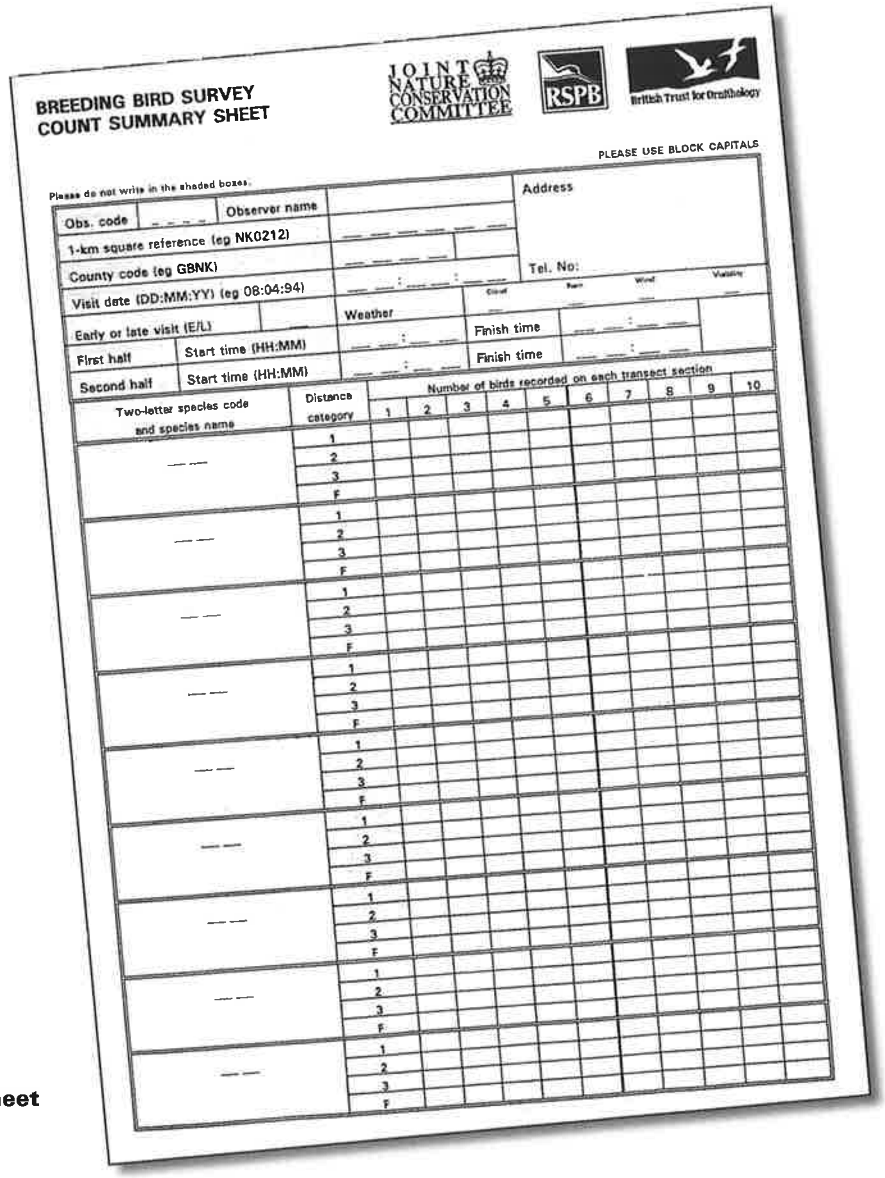
F. Birds in flight only (at any distance) (record on sheets using an arrow, eg ↗BZ→)

(NB: Boxes are not drawn to scale)

100m 25m 25m 100m
3 2 1 2 3
1 START

Distance category:
100m 25m 25m 100m
3 2 1 2 3
2

Figure 1
Example of a field recording sheet as used in the UK Breeding Bird Survey.



BREEDING BIRD SURVEY
COUNT SUMMARY SHEET

JOINT NATURE CONSERVATION COMMITTEE

RSPB

British Trust for Ornithology

PLEASE USE BLOCK CAPITALS

Please do not write in the shaded boxes.

Obs. code | Observer name | Address

1-km square reference (eg NK0212)

County code (eg GBNK)

Visit date (DD:MM:YY) (eg 08:04:94) | Tel. No:

Cloud | Rain | Wind | Visibility

Early or late visit (E/L) | Weather

First half | Start time (HH:MM) | Finish time

Second half | Start time (HH:MM) | Finish time

Two-letter species code and species name	Distance category	Number of birds recorded on each transect section 1	2	3	4	5	6	7	8	9	10
— —	1										
	2										
	3										
	F										
— —	1										
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	F										

Figure 2
Example of a count summary sheet as used in the UK Breeding Bird Survey.

Safety reminders

No specific advice. See general guidelines in the *Introduction.*

Disturbance

This method involves little disturbance to breeding birds.

Methods

If you are contributing to the national scheme, your 1-km square(s) will be allocated for you. If you are using BBS as a survey method outside the national scheme, randomly select several tens of squares within your study area.

Once you know which 1-km square(s) to survey, map your transect route through each square on a habitat recording form. The transect route should consist of two parallel lines, north–south (preferably) or east–west, each 1 km long. It is important to use the same route each year. Transect lines should be 500 m apart and 250 m from the edge of

the square. Each transect line should be divided into five equal 200-m-long sections, making a total of ten 200-m transect sections, numbered 1 to 10 (see Figure 3). It is important to note the starting points of each transect section either by using permanent landmarks or temporary markers. In practice, transect lines are likely to deviate from the 'ideal' because of problems with access, or barriers such as roads, etc. However, at no point should the two transect lines be less than 200 m apart. Minor intrusions into adjacent squares may be unavoidable. It is imperative that the same route be followed year after year.

From your chosen starting point, walk the first half of your transect route at a slow pace, pausing briefly at intervals to listen for song and to scan for birds flying overhead. Using the standard recording form (Figure 1), record all birds seen and heard in the appropriate transect sections and distance categories (see below). At the end of section 5, stop recording, go to the start of section 6 and begin recording sections 6–10. Try to avoid double-counting the same individual. Use standard BTO codes (Appendix 1) and distinguish adults from juveniles.

Record birds in one of the following four distance categories when first noted:

1. Within 25 m either side of the transect line.
2. Between 25 and 100 m either side of the transect line.
3. More than 100 m either side of the transect line (including birds outside the 1-km square boundary).

F. Birds in flight only (at any distance).

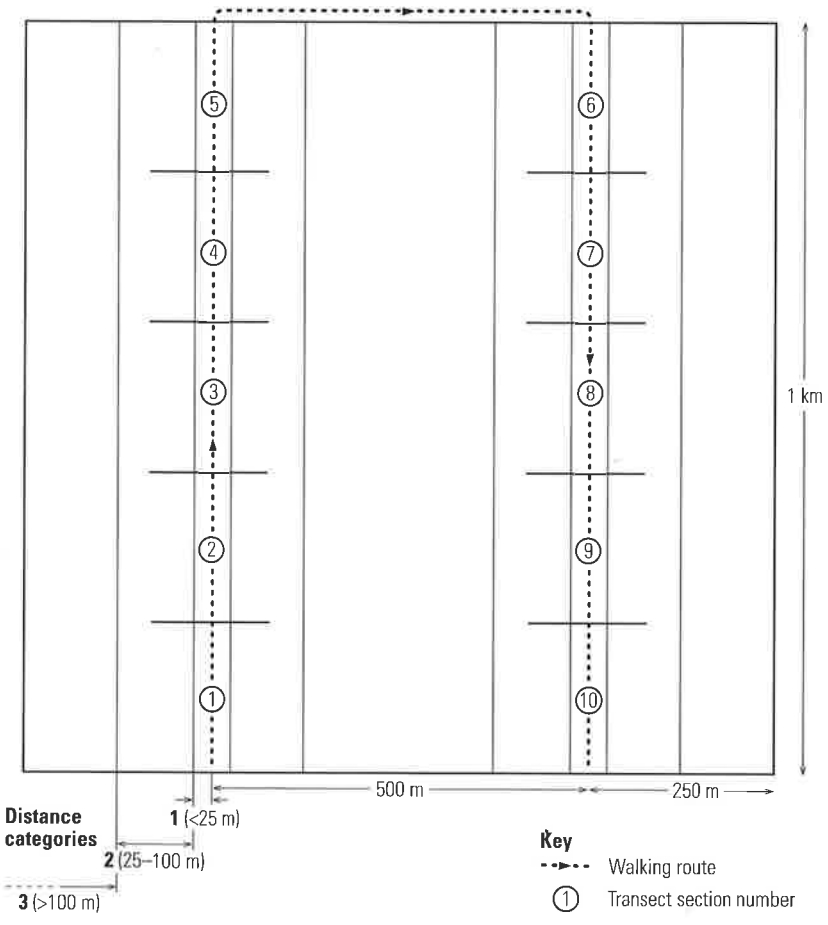

Figure 3
Transect line route, distances and numbered transect sections for a 1-km square in the UK Breeding Bird Survey.

Distances are measured perpendicular to the transect line. A bird seen 200 m ahead of the observer but within 25 m of the transect line should be recorded in category 1. To familiarise yourself with judging 25 m and 100 m distances, pace these out before starting the survey. For category F (birds in flight), draw an arrow through the species' two-letter code to indicate that it is in flight. If a bird is seen to take off or land it should be recorded in the appropriate distance category (1–3) at that position. NB skylarks in display flight should be recorded in the relevant distance category.

Complete the summary sheets (Figure 2) as soon as possible after each field visit. Transfer the number of individuals (excluding juveniles) that were recorded in each section of the transect, 1–10, on each visit, in each distance band. Habitat (and possibly other species) recording are essential parts of the national scheme; details of these will be included with the official forms and instructions received from the BTO.

If the survey is being undertaken as part of the UK-wide scheme, return all recording forms to the BTO via your Regional Representative, who will analyse and report the results. If you are using the BBS as a method rather than as part of the UK-wide scheme, you will probably have to undertake all analyses yourself. It is recommended that you seek specialist help for these analyses: try the BTO Census Unit in the first instance.

References

Buckland, S T, Anderson, D R, Burnham, K P and Laake, J L (1993) *Distance Sampling: Estimating Abundance of Biological Populations*. Chapman and Hall, London.

Gregory, R D, Bashford, R I, Balmer, D E, Marchant, J H, Wilson, A M and Baillie, S R (1996) *The Breeding Bird Survey 1994–1995*. BTO, Thetford.

Gregory, R D, Bashford, R I, Balmer, D E, Marchant, J H, Wilson, A M and Baillie, S R(1997) *The Breeding Bird Survey 1995–1996*. BTO, Thetford.

Waders

These are standard methods of surveying a variety of breeding waders in the UK. While not necessarily the best methods for each individual species, they combine ease of use and compatibility with detailed nest-finding studies, and provide data comparable with other surveys in the UK.

Although a number of methods for surveying breeding waders have been developed, two are currently the most widely used: those of O'Brien and Smith (1992) and Brown and Shepherd (1993). Both methods were designed to survey a number of species simultaneously; thus they are generic, rather than species-specific, schemes. The method of O'Brien and Smith was originally developed for surveying breeding waders on lowland farmland/enclosed areas, and as a consequence is based on field-by-field observations. The O'Brien and Smith method is, however, still recommended for grasslands in Scotland and northern England which are sometimes considered as upland (Grant et al in prep). Provided that these areas are enclosed and below the moorland wall (eg as for previous surveys of Baldersdale, Allendale, etc, in the northern Pennines: M C Grant pers comm), then O'Brien and Smith should be used. By contrast, the method of Brown and Shepherd, which involves timed observations in 500 × 500 m grid cells, was originally developed for breeding waders in upland areas, particularly if open and unenclosed. In principle the Brown and Shepherd method could be extended into enclosed lowland areas, but, given that the majority of lowland wader surveys have followed O'Brien and Smith, and that the lowlands are mostly divided into fields, we recommend that O'Brien and Smith's method is adhered to in the lowlands for ease of data collection and comparability. Details of these two methods are outlined below.

A third method, that of Reed and Fuller (1983) has been developed for censusing waders breeding at high densities, for example on the machair of the Uists in the Outer Hebrides. Once again, though the methods of O'Brien and Smith and Brown and Shepherd could be used under these circumstances, we recommend that those of Reed and Fuller are used in order to maintain comparability with earlier surveys.

The Brown and Shepherd (1993) method for censusing upland breeding wader populations

This method is used to census upland breeding waders, principally golden plover, dunlin, oystercatcher, lapwing, curlew and redshank.

Information required

- estimated number of breeding pairs of each species
- final visit maps showing registrations and the boundaries of the areas covered.

Number and timing of visits

A minimum of two, early April to late June. First visit, early April to mid-May; second visit, mid-May to late June.

Time of day

0830–1800 BST.

Weather constraints

Avoid high winds (greater than Beaufort force 5) and other poor weather conditions.

Sites/areas to visit

This method is recommended for use in open upland moor, although it can also be used in enclosed field systems. Vegetation may range from montane to semi-improved grassland, encompassing boulder-strewn blanket bog, bare stony ground, heath, etc.

Equipment

- 1:25,000 OS maps
- 1:25,000 field maps of the area
- compass.

Safety reminders

Ensure someone knows where you are and when you are due back. Always carry a compass. If possible, surveyors should not work alone. In more remote upland areas, spare warm clothing, a first-aid kit, a plastic survival bag, whistle and food should be carried.

Disturbance

Some disturbance may be unavoidable but can be kept to a minimum; there is no need to search for nests or to get too close to adults.

Methods

Surveys of upland waders should be carried out by observers with experience of their behaviour, calls and songs. This survey method is timed, therefore it is important for the observer to have had a trial run before attempting the real thing. The method is based on constant search effort, so keeping to within the specified times for given areas is important. These times are: 20–25 minutes in each 500 × 500 m quadrat of open land and 0.8–1.0 minute per ha for enclosed fields. Practice at covering quadrats in these times is essential to ensure even coverage.

Clearly mark the boundary of the survey area and the quadrat areas to be covered on a map. Large sites will require a team of people working on adjacent quadrats; this is safer, more enjoyable and reduces the chances of double-counting individual birds moving between quadrats.

Follow a predetermined route through each square so that (most important of all) all parts of each quadrat are approached to within at least 100 m. Although some areas may look more or less attractive to breeding waders (eg lake shores and pools are good for feeding birds), it is important that all areas are covered equally. If possible, walk in the opposite direction through the quadrats on the second visit.

At regular intervals (at least every 100 m) scan round in every direction as far as the terrain or weather allows and also listen for calls and songs. If necessary, scan for a short time from a rock or hillock to get a better view. For some species, eg golden plover, males and females can be distinguished with practice, which helps the interpretation of results. As each individual or pair is encountered, decide whether these are new birds, using individual characteristics such as the amount of black in the plumage of golden plover. However, it may still be necessary to retrace your steps to check on the continued presence of any birds previously located.

Record the location and activities of all wader species seen on 1:25,000 field maps using the standard BTO symbols (see Appendix 1). Make additional notes and cross-reference them with mapped symbols to avoid confusion. These should include information such as the time of the observation (this is particularly important if you are surveying an area adjacent to another person's quadrat), and the behaviour and flight line of the birds.

At the end of each visit, all the observers involved with the survey should get together and put all their registrations on a final visit map. At this stage, duplicate registrations of the same bird made in adjacent survey areas by different people can be removed.

Birds can be said to be breeding if:
- they are observed displaying or singing
- nests, eggs or young are located
- adults repeatedly alarm-call
- distraction displays are seen
- territorial disputes are seen.

Other records are considered to be of non-breeding birds, failed breeders or birds loafing, feeding or on passage to other areas.

Sometimes two birds may be seen close to one another but it may not be clear if they are two members of the same pair, or birds from different pairs. Where this is the case, birds separated by less than 500 m (or 200 m for dunlin) on a given visit are arbitrarily considered to be from the same pair; those separated by more than 500 m are treated as being from two different pairs.

At the end of the season, observers will end up with two final maps of the site, one from each visit. On these maps those registrations which represent pairs and those which do not should be clearly indicated. Estimates of the numbers of pairs at each site or survey area are derived from both the final visit maps. Pairs are considered to be separate from one another only if they are at least 1,000 m apart (500 m for dunlin) on the different visit maps.

The O'Brien and Smith (1992) method for censusing lowland breeding wader populations

This is a generic method covering several species of lowland wader, but there are differences between species in what to record (pairs, displaying males, etc) and in the interpretation of what is recorded. The timing of visits differs, depending on the geographical location of the area to be covered.

Information required

- *Oystercatcher* peak number of pairs.
- *Lapwing* peak number of birds.
- *Snipe* peak number of drumming plus chipping birds.
- *Curlew* mean number of birds.
- *Redshank* mean number of birds.

Number and timing of visits

Three visits, at least one week apart; 15 April to 19 June overall, but with some geographical variation. Note that the third visit is technically redundant for redshank, and can be for lapwing, but these species should nevertheless be recorded on each visit.

England and Wales	First visit 15 April – 30 April Second visit 1–21 May Third visit 22 May – 18 June
N England and Scotland (lowland)	First visit 18 April – 8 May Second visit 9–29 May Third visit 30 May – 19 June

Time of day

Oystercatcher, lapwing, snipe	During the three hours after dawn or the three hours before dusk. It is very important that counts of snipe are not continued more than three hours after dawn.
Redshank	Between dawn and 1200 BST.
Curlew	At least one of the three counts within three hours of either dawn or dusk. The remaining counts can be performed between 0900 and 1700 BST.

Weather constraints

Avoid cold, wet and windy conditions (do not survey when the wind exceeds Beaufort force 3).

Sites/areas to visit

Oystercatcher

Coastal breeding sites include saltmarsh, coastal grazing marshes, shingle beaches, dunes and rocky shores. Inland they breed in a variety of habitats, especially on arable along river valleys and around lakes.

Lapwing

Damp lowland grassland subject to freshwater flooding or waterlogging such as floodplain grasslands, coastal grazing marshes, washlands and isolated pockets of poorly drained grassland. Lapwing also breed on moorland and the surrounding in-bye land. Large numbers also occur on tilled land.

Snipe

Coastal grazing marshes, damp lowland grassland subject to freshwater flooding or waterlogging such as floodplain grasslands, washlands and isolated pockets of poorly drained grassland. Snipe also breed on moorland bogs and marshy rough pasture, and on in-bye/marginal grassland.

Curlew

Found generally on damp upland and northern moorlands and areas of rough grazing, although curlews also breed on some lowland and agricultural sites, particularly in northern Britain.

Redshank

Saltmarsh, coastal grazing marshes, damp lowland grassland subject to freshwater flooding or waterlogging such as floodplain grasslands, washlands and isolated pockets of poorly drained grassland.

Equipment

- 1:10,000 map of the area to be visited.

Safety reminders

No specific advice. See the *Introduction* for general guidelines.

Disturbance

Keep to a minimum. There is no need to search for nests or to get too close to adults.

Methods

All fields on the site should be numbered, as information is collected on a field-by-field basis. Note, however, that the results are analysed and reported on a *site* basis, defined as the amount of ground that can be covered in one visit. If the whole survey area is split into sites, make the boundaries very clear for comparable analysis in future years. Ensure that a site map (1:10,000) showing field numbers is held with the results so that sites/fields can be located easily in the future. Saltmarsh can be divided into 'fields' by using the channels or creeks as boundaries.

Each field should be walked so that the observer gets to within 100 m of every point. Record on the site map the location, movement and behaviour of all waders using standard BTO codes (Appendix 1). This is important as it will help to avoid double-counting the same individual.

Allocate each bird to a single field – the first field in which it was recorded. If the bird was first observed in display-flight it should be allocated to the field in the centre of its flight. Conspicuous waders such as lapwing are best assigned to a specific field by scanning with binoculars and looking 200–400 m ahead, in order to record them before they are disturbed.

Oystercatcher

Record the total number of *pairs* where a pair is taken as:

- number of paired individuals/2
- a displaying individual
- a single bird (not birds in flocks)
- a nest
- a brood.

Record the number of pairs seen in each field. Birds in flocks should *not* be included in this figure and should be recorded separately. The estimate used for year-to-year comparisons is the peak number of pairs per site seen on any one visit.

Lapwing

Record the total number of *birds* seen in each field. Report the maximum number of individuals recorded on the site *between mid-April and late May* divided by two as the total number of pairs.

Snipe

Record the total number of *birds* heard drumming or chipping in each field and report the maximum number for the site over the three visits as the number of pairs. However, if no snipe were recorded during May the figure should *not* be reported.

Curlew

Record the total number of *individuals* (excluding birds in flocks) in each field on each visit. Transform the mean number of individuals (excluding birds apparently in flocks) counted over the three visits at each site using the formula (0.71 × mean count) + 0.10 to give the estimated number of pairs per site. NB if no curlew were recorded at all, the figure should be reported as 0 pairs and not 0.10 (Grant et al in prep).

The previously recommended count unit was the number of apparent pairs (definition of a pair as for oystercatcher, above). This should also be recorded to enable comparisons to be made with past survey data.

Redshank

Record the total number of *birds* seen in each field on each visit. Report the mean number of birds found on the site over both visits (or all visits). This is taken as the number of breeding pairs. Give details if more than two visits are made.

The Reed and Fuller (1983) method for surveying machair breeding wader (high-density) populations

This method is used for censusing waders breeding *at relatively high densities on machair* in the Hebrides. It can be used for dunlin, oystercatcher, ringed plover, lapwing, snipe and redshank.

Information required

- maximum number of breeding pairs of each species from one visit
- maps showing registrations and the boundaries of the areas covered.

Number and timing of visits

At least one visit (maximum four) in the first three weeks of June.

Time of day

0830–1800 BST.

Weather constraints

Avoid persistent rain (any more than a drizzle) or high wind (greater than Beaufort force 5).

Sites/areas to visit

Machair is mainly found on the west coast of the Outer Hebrides. It is a flat sandy plain which can include strip rotation farming, hay and silage fields, machair marshes and small machair lochs. Other areas of damp grassland and marsh on adjacent 'blackland' should be included.

Equipment

- 1:10,000 OS maps of the area
- A4 photocopied field maps.

Safety reminders

Ensure someone knows where you are and when you are due back.

Disturbance

May be unavoidable but should be kept to a minimum. Do not search for nests or get too close to adults.

Methods

Mark the boundary of the survey area clearly on a map and split it into manageable areas. Two people should be able to cover about 4 km^2 in one visit. Working as a pair, walk parallel transect lines 150 m apart (lower bird densities) or 100 m apart (high bird densities, usually wetter habitat). Record locations and behaviour of all waders seen on 1:10,000 field maps, using BTO symbols (see Appendix 1). On subsequent visits, walk the same transect lines, but from the opposite direction to the previous visit (see Figure 4). If more than one visit is made, any possible differences between observers should be minimised by walking different lines on two visits. However, in broken or difficult terrain it is often easier to walk the same line as on the previous visit. If necessary, put out marker posts, sticks, etc, to keep transect lines accurate in high-density areas where there are few geographical features.

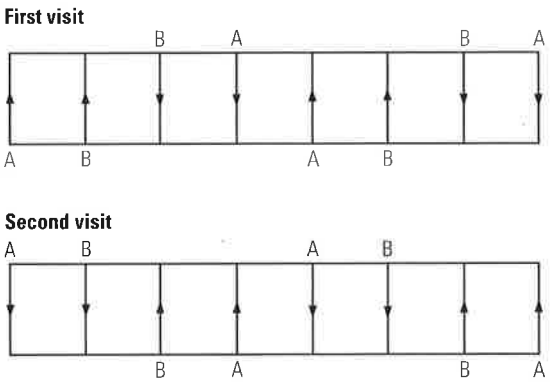

Figure 4
Diagram to illustrate the directions walked by two observers, A and B, on consecutive visits to a hypothetical study site. Any possible differences between observers could be minimised by walking different lines on two visits. However, in broken or difficult terrain it is often easier to walk the same line as on the previous visit (Reed and Fuller 1983).

On the field maps, record the start and finish time, and the weather conditions for each transect. At the end of each pair of transect lines, cross-check with your partner's records to reduce the likelihood of double-recording. A single summary map of the visit should be made as soon as possible; it should include the weather details, the times and the direction of the lines walked.

If several individuals are seen in an area, it may be difficult to determine the number of breeding pairs. Males and females can be distinguished with practice, which helps with interpretation.

The following represent breeding pairs.

Ringed plover and dunlin

(a) One bird recorded alone 50 m or more from other birds = one pair.
(b) Two individual birds within 50 m of each other = one pair.
(c) Two birds together, or two birds recorded as a pair = one pair.
(d) 3–4 birds together = two pairs.
(e) 1–4 birds flying into, out of, or through the area, or into the site = 1–2 pairs.
(f) Five or more birds remaining in the area, either on the ground or circling around (vocal birds only) = three+ pairs.

The following are *excluded* from estimates of breeding dunlin and ringed plover populations.

(g) Five or more birds in a flock on the ground without vocal registrations (assumed non-breeding).
(h) Five or more birds in a flock flying into, out of, or through the area or site.
(i) Any bird(s) which fly out of or through the site in one direction for more than 150 m without landing.
(j) Nests are not included in the estimate of breeding numbers. Some nests discovered lack adults in the immediate area, and inclusion of the nest may lead to inflated population estimates if birds already recorded elsewhere on the site are a nesting pair.

Oystercatcher

(a)–(d) As for dunlin and ringed plover, with the exception that the distance for single birds or two individual birds (rules a and b) is 125 m.
(e) 1–2 birds flying into, out of, or through the area, or into the site = one pair.
(f) Three or more birds remaining in the area either on the ground or circling around (vocal birds only) = 2+ pairs.

The following are *excluded* from estimates of breeding oystercatcher. (g)–(j) are excluded, with the exception that three or more birds (vocal or non-vocal) flying into, out of or through the site are excluded, compared with five or more birds for dunlin and ringed plover.

Redshank and lapwing

Lapwing pairs tend to form mobbing groups, and records are best made by scanning ahead so that pairs are recognised before groups form. Estimates for lapwing and redshank populations are made the same way as dunlin and ringed plover, except that the distance for single birds (rules a and b) is 75 m, rather than 50 m.

Snipe

Snipe counts derived from this count method are undoubtedly an underestimate.

For all species, if more than one visit is made to a site, then the maximum number of breeding pairs for that site should be taken from any one visit.

References

Brown, A F and Shepherd, K B (1993) A method for censusing upland breeding waders. *Bird Study* 40: 189–195.

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Generic wintering bird monitoring methods

Non-breeding waterfowl: general

The distribution of most species of waterfowl (principally swans, geese, ducks and waders) during the non-breeding period is restricted largely or wholly to wetland habitats. Many wetland sites represent relatively discrete areas and, with most species readily visible within these areas, regular monitoring of total numbers is/can be relatively easy. Simple 'look-see' methods, whereby all birds present within a pre-defined area are counted, are thus usually employed for the majority of surveys.

The objectives of surveys of non-breeding waterfowl are normally threefold:

- to determine population size
- to determine trends in numbers and distribution
- to identify important sites.

The Wetland Bird Survey (WeBS) Core Counts represent a generic approach that, given sufficient coverage of sites, provides adequate data to fulfil these objectives satisfactorily for a large proportion of the species concerned. Details of methods and requirements of WeBS Core Counts are given below.

The different habits of some species, and their use of habitats not regularly covered by WeBS Core Counts, necessitate additional surveys to properly fulfil the objectives. These are complementary to WeBS Core Counts, and many of the principles of WeBS apply equally to these additional methods. Details of these methods are provided in subsequent sections. For clarity, these sections identify only the differences from the general WeBS approach, and thus should be used in conjunction with the section on WeBS Core Counts.

If you see any waterfowl with colour-rings, please note details of the species, date, time, location (with OS grid reference), ring colour(s) and inscription (if any), which leg the ring was on, the presence of any other rings, the number of birds in the flock and, if possible, whether the bird was paired or had young. This information should be sent to the following coordinators:

Cormorant	Robin Sellers, Rose Cottage, Ragnall Lane, Walkley Wood, Nailsworth, Gloucestershire GL6 0RU.
Wildfowl	Richard Hearn, The Wildfowl & Wetlands Trust, Slimbridge, Gloucestershire GL2 7BT.
Waders	Stephen Browne (Wader Study Group Colour-ring Register), c/o British Trust for Ornithology, The Nunnery, Thetford, Norfolk IP24 2PU.
Large gulls	Peter Rock, 32 Kersteman Road, Redlands, Bristol BS6 7BX.

In return, details of the bird's history, including previous sightings, will be sent to you.

Wetland Bird Survey (WeBS) Core Counts

National, co-ordinated counts of non-breeding waterfowl on wetlands have been undertaken in the UK since 1947 (Cranswick et al 1996). The initial scheme was restricted to wildfowl, with waders and other waterfowl (grebes, cormorant, gulls) counted later as part of a complementary scheme. These schemes were merged in 1993 as the Wetland Bird Survey (WeBS), ensuring consistent methods for monitoring all waterfowl species in all habitats at wetland sites throughout the UK.

WeBS is a partner scheme of BTO, WWT, RSPB and JNCC and relies on the efforts of a network of over 3,000 largely volunteer counters. National Organisers co-ordinate the survey through information provided in regular newsletters and are assisted by a network of volunteer Local Organisers who co-ordinate counts on a county or site basis.

Most UK estuaries and the most important inland still waters (eg reservoirs, gravel pits) are covered regularly for WeBS Core Counts, and most are counted once per month during the winter. Other habitats, eg rivers and the open coast, and small sites or those furthest from centres of population are relatively poorly covered.

Counts are compatible with the International Waterfowl Census (IWC), and January data are submitted to Wetlands International for inclusion in the IWC database.

Always contact the WeBS Secretariat before beginning counts at a site. They will be able to check whether the site is already covered and, if so, supply you with the necessary details, including a recording form, a map of the count area and details of the Local Organiser. This will ensure that your counts are co-ordinated with those on adjacent count areas.

Note that the specialised methods given below for particular species or groups of species should only be used for those surveys. When undertaking a WeBS Core Count, only WeBS Core Count methods should be used. Thus, for example, counts of swans and geese submitted on WeBS Core Count forms should be daytime counts of birds on wetlands made at the same time as counts of other species, not counts of birds in fields or of roosting birds. The systematic errors that arise from WeBS are known and can be accounted for, providing that the data submitted are consistent with WeBS, eg it is expected that only a very small number of pink-footed geese would be recorded during a daytime count at a major roost site.

Information required

- total number of individuals of each species present
- additional data elements listed on the WeBS recording form
- map of the count area if not previously covered.

Number and timing of visits

One count per month on predetermined dates (see below), September–March. The January count is particularly important for inclusion in the

IWC. Dates are provided for counts during summer months also, but these are of lower priority. Any number of additional counts can be undertaken to assess site importance.

Time of day/state of tide

During the day; at estuarine sites or at those close to the coast, within two hours (three at most) either side of high tide. At inland sites, counts should be completed within four hours, preferably in the morning.

Weather constraints

Sites should be visited on the allocated date if safe to do so. If poor weather or other factors prevent a proper count, make a repeat count as close to the recommended date as possible, although consideration should be given to co-ordination with adjacent sites. If monthly counts are made throughout the winter period, the absence of one count is unlikely to have a significant effect on the objectives of the survey.

Sites/areas to visit

All wetland sites. Most of the important sites for waterfowl, eg estuaries and large still waters, are already covered.

Equipment

- telescope (preferably 30 × magnification; a wide-angle lens may be an advantage)
- 1:25,000 map showing boundary of the area to be covered
- field notebook and two(!) pencils
- WeBS Core Count recording form
- tally counter (optional)
- dictaphone (optional).

Safety reminders

Ensure that someone reliable knows of your whereabouts and when you will return. Ensure that she/he knows what to do if you are late. Check that you are not liable to be cut off by the tide. Beware of slipping into saltmarsh creeks, which can be hidden by vegetation, and very soft sediments from which it may be difficult to extricate oneself.

Disturbance

Avoid undue disturbance to birds near shorelines, as it may confuse the count if they change location. This is especially true at tidal sites, where there may be few or no alternative safe roost locations, and during cold conditions, when birds may waste energy moving location or be denied access to feeding areas.

Methods

To ensure that the data collected can be used to estimate national populations and trends, synchronisation of counts between different sites is important. Given the large proportion of volunteer counters, 'priority dates' are recommended for the once-monthly WeBS Core Counts. This enables counts across the whole country to be synchronised, thus reducing the likelihood of birds being double-counted or missed. Such synchronisation is imperative where a number of counters are required to cover large sites, due to the likelihood of local movements affecting count totals. Local Organisers ensure co-ordination in these cases.

WeBS priority dates are set to coincide with spring high tides occurring during daylight hours on most estuaries. If it is not possible to count on

these dates, eg because of differences in the tidal regime in some parts of the UK, the site should be counted in a systematic manner that reduces the possibility of double- or under-counting. Similarly, if synchronisation is not possible between adjacent sites, coverage should be organised in such a way as to reduce the possibility of bird movements going undetected. Exceptionally, at some sites counts may best be made at different times of the tidal cycle.

All sites counted in recent years are currently being mapped at 1:25,000. Counters should contact the WeBS National Organiser or relevant Local Organiser for a map and use the same count boundary if the site has been covered previously, ensuring comparable data are collected over time.

Large sites are divided into sectors, each of which can practicably be counted by a single person in a reasonable time (up to four hours). If the site has not been counted previously, or if sector boundaries are being determined for the first time, choose boundaries that are easily recognisable. Divisions should be based on permanent features that can be readily identified in the field. Only decide on the count boundary to use when you are sufficiently familiar with the site.

Changes to existing boundaries should only be necessary in exceptional circumstances, usually when the area of wetland habitat changes, eg when a new gravel pit is dug or an old one infilled. Counters should consult the WeBS Secretariat before any other proposed changes are made in order that the implications for the WeBS database and for other counters can be considered.

Always obtain permission for access to privately owned land. Often, an initial approach and explanation of the work being undertaken is sufficient, but a letter from the WeBS Secretariat can be provided if necessary. Ensure that you follow subsequent instructions from the site owner, eg many water companies require counters to comply with safety regulations when counting reservoirs.

Choose good vantage points from which to count. Use landscape or other features to ensure you do not re-count the same area when moving to a new position. Make a note of any birds that move during the count, in particular the position to which they have moved, so that they are not missed or double-counted.

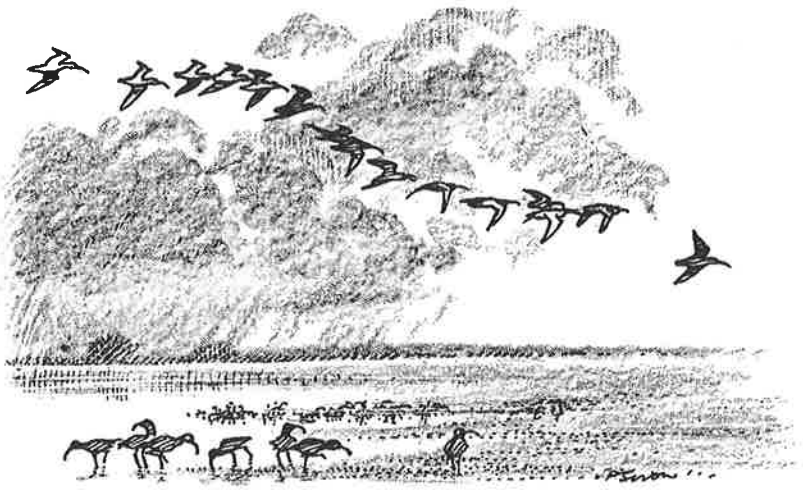
All waterfowl species, as defined by Wetlands International (see Rose and Scott 1997), should be counted. In the UK, this includes divers, grebes, cormorants, herons, swans, geese, ducks, rails, waders, gulls and terns (including vagrants, introductions and escapes, eg flamingos). In addition, WeBS records numbers of kingfishers.

Ensure that all areas are searched, and pay particular attention to water edges and the edges of reedbeds, although birds hidden in channels and secretive or cryptic species, eg snipe, are likely to be systematically undercounted. Only counts of birds *seen* should be recorded on the form; estimates of birds thought to be hidden should not be recorded. If large numbers of birds are known to be out of sight, eg a flock of waders seen to fly into a creek that could not be viewed, the count of the species should be noted as an undercount (see below). Counts of naturally secretive or cryptic species should *not* be recorded as undercounts; this is taken into account as part of the methodology. Counts of gulls and terns for WeBS Core Counts are optional.

Any points peculiar to the coverage of the site (eg a particular route used to avoid disturbance) should be documented to enable future counts to be made in exactly the same way. The route should be designed to ensure that the whole count area is viewed (the reliable range of most binoculars is around 500 m, especially if species are in mixed flocks; with a telescope, if topography and weather conditions allow, experienced observers can identify birds up to 3-4 km away). Although winter roosts are often at traditional sites, they may move between years, so always search the survey area thoroughly.

It is important to record the accuracy of the count, especially if it was conducted in poor weather or visibility, or disturbance has caused birds to fly around. The overall accuracy of the count should be recorded as 'OK' or 'Low'; 'Low' indicates that the count was a gross underestimate and that caution should be used when using count data. If a count of an individual species is low, flag this count accordingly. Even experienced observers may only be within 10% of the true total when estimating large flocks (experiments have shown that smaller numbers are overestimated and very large flocks are underestimated); however, these counts should still be treated as 'OK' in terms of accuracy.

If, in exceptional circumstances, you are unable to make a count of a particular species, ensure that you note its presence on the form, otherwise it will be assumed that no birds were present. Also, if you visit a site and no birds are present, eg the site is covered in ice or there is much disturbance, always complete and return the form indicating a nil count, otherwise it will be assumed that either the site was not counted or that the birds had moved and were recorded by another counter at the site to which they moved.



Count birds present in relatively small numbers or dispersed widely individually. Estimate the number of birds in large flocks by initially counting five or ten individuals, dividing them mentally into groups of the same size and counting the number of groups. Estimate very large flocks by counting in groups of 50 or 100, or exceptionally even 1,000. In these cases, make allowances for varying densities of birds in the flock, making the block size larger or smaller as appropriate. Tally counters are particularly useful for this approach.

If large numbers of birds are moving, or are thought likely to leave (eg because of disturbance), the following should allow at least an approximate count:

1. Make a quick total count (don't separate species).
2. Make a quick assessment of proportions of species.
3. Start with the most common species; if all birds leave, you can probably make a reasonable guess at the others (eg recording that pochard are twice as common as tufted duck is better than nothing).
4. Re-scan slowly for less common species; slow scans also help to locate diving species in mixed flocks which may have been missed on the first scan.
5. Scan slowly through the whole flock (a dictaphone can be useful).

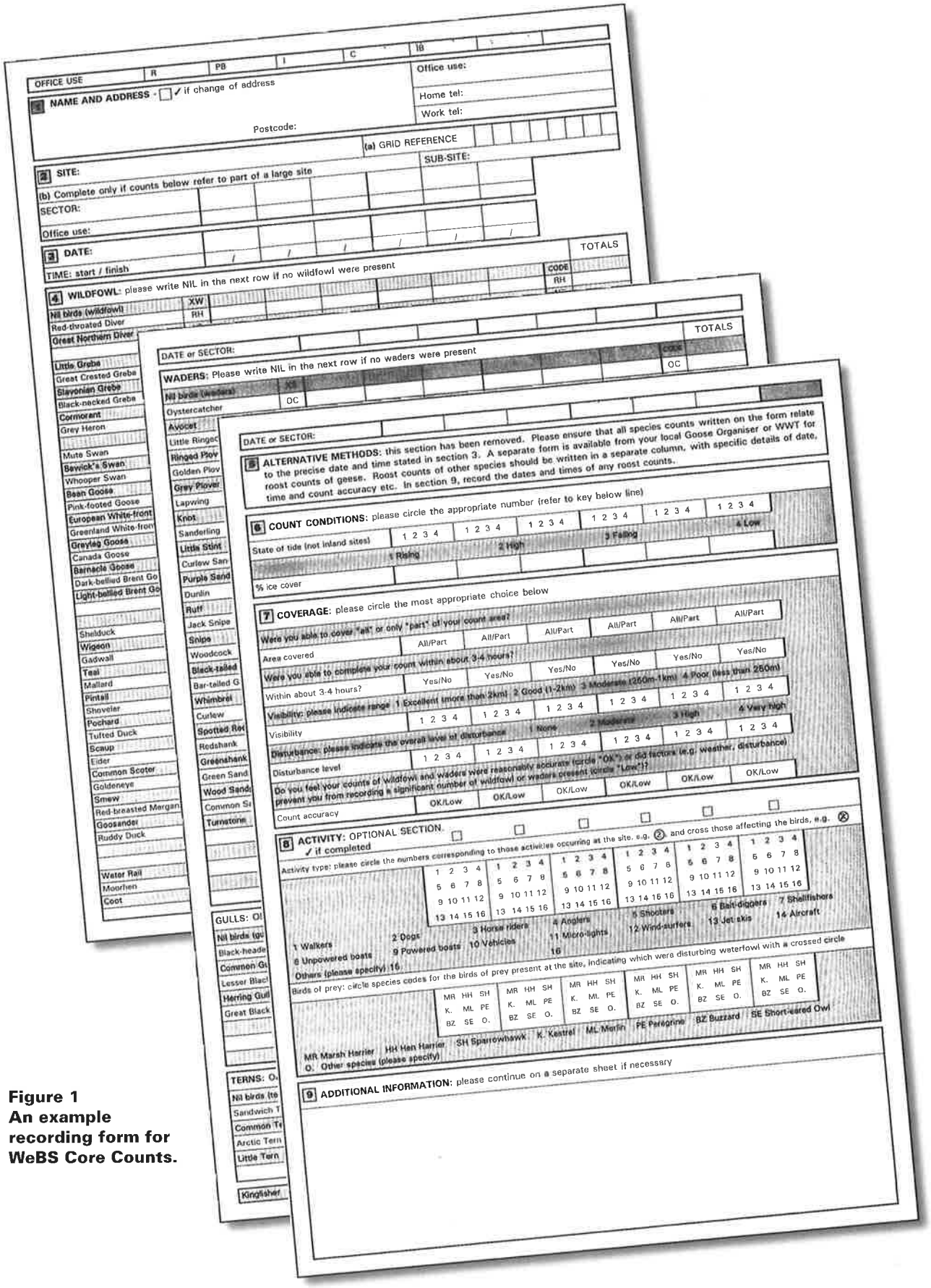


Figure 1
An example recording form for WeBS Core Counts.

If it is not possible to positively identify the species, record birds as 'unidentified' or within a given category, eg unidentified *Aythya* spp, unidentified scoter spp, unidentified grey goose spp. If you cannot be accurate, be honest!

Only record birds using the site, eg do not record geese simply overflying the area. Do not separate males and females; simply provide one count per species. If making counts during the breeding season, only young that are at least three-quarters grown should be included in count totals; small ducklings should be excluded.

Use a notebook in the field; fill out the WeBS recording form (Figure 1) as soon after the count as possible.

Completed WeBS recording forms should be returned to the WeBS Secretariat via the relevant WeBS Local Organiser directly after the March count.

Additional information

During particularly cold periods, numbers of birds may be swollen by influxes from the continent or other areas. An additional count under these conditions may be useful to identify potential cold-weather refuges. Extra care should be taken to avoid disturbance to birds at this time as they are likely to be stressed.

Some sites may be particularly important as roost sites for birds which feed in different habitats during the day (eg geese return to wetland roosts after feeding on agricultural land during the day, goosanders feeding on rivers often use still waters as roosts); count methods for species which regularly exhibit such behaviour are provided in the following sections. Nevertheless, some sites are also used as roost sites by species such as mallard and teal. Additional counts late in the evening may thus be important in assessing site importance. Such counts should be made using the same methodology as above. It is particularly important to record the start and end times of these counts.

Analytical methods have been developed specifically for the WeBS dataset to allow estimation of low or missing counts for inclusion in calculating national population estimates and trends (Underhill and Prys-Jones 1994). Please contact the WeBS Secretariat for details.

For further details, contact: Mark Pollitt, WeBS National Organiser (Core Counts), WeBS Secretariat, The Wildfowl & Wetlands Trust, Slimbridge, Gloucestershire GL2 7BT; tel 01453 890333 ext 255/280.

Contributed by Peter Cranswick

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