

# WADER HUB

## Breeding Wader Census Guidance



Golden Plover, by Liz Cutting / BTO

### FIRST PRINCIPLES

See **Local decision-making guidance** before deciding on any of these census methods. Then see the **Breeding Wader Survey Guidance** for general advice on conducting breeding wader surveys. **Note:** you should seek landowner permission before undertaking any wader surveys.

Once you have decided to undertake breeding wader censuses as part of your project's monitoring, it is crucial you clearly define your total **survey area** (regardless of which census method you choose). Then split your total survey area into **monitoring sites**, which are manageable to cover in one **survey visit**. Once you have clearly defined monitoring sites, you can plan your survey visits in earnest (allocating surveyors, printing your survey maps). Though not strictly necessary for census surveys, it is helpful to plan a path through your monitoring sites in advance.

For projects with a strict Curlew focus, select the **CRP (2022) Curlew Census**, but if you wish to monitor multiple wader species, select one of the two other census methods. If your survey area is primarily lowland, enclosed (fences/walls/hedgerows) farmland, select the O'Brien & Smith (1992) method for censusing lowland breeding waders. If your survey area is primarily unenclosed (few fences/walls/hedgerows) moorland (including 'in-bye' enclosed farmland on moorland edges), select the Brown & Shepherd (1993) method for censusing upland breeding waders.

**Note:** observations of nests and broods on breeding census surveys are helpful but not the focus – census surveys produce estimates of breeding pairs based on a standard methodological approach that everyone follows (i.e. they do not necessarily provide the true number of pairs breeding in an area). Likewise, whilst they are based on wader ecology, most 'rules' for estimating pairs are more designed to standardise pair estimates most accurately and you should not treat them as a definitive value for the true number of pairs attempting to breed in an area. If you wish to pin down where exactly pairs are breeding and locate nests (rather than the broader estimates that surveys provide), please see the **Wader Nest Monitoring Guidance**.

For all methods, after you have mapped your survey observations, ensure you have summarised the following key counts/estimates for each species after each survey visit to each monitoring site:

- Total adult count.
- Total count of territorial (usually displaying) adults.
- Total count of adults repeatedly alarm-calling or with chicks.
- Total count of any chicks observed.
- Estimated territorial pairs (using your census method for estimating pairs).

(cont)

## O'BRIEN & SMITH (1992) METHOD FOR CENSUSING LOWLAND BREEDING WADERS

**Target species:** Curlew, Lapwing, Oystercatcher, Redshank, and Snipe (you may record other species when encountered but there is no explicit guidance on estimating pairs for other species).

**Essential equipment:** binoculars, 1:10,000 map(s) of survey area(s).

**When to visit:** three visits to each field in your survey area(s) across the wader breeding season (Table 1), each visit completed three hours after dawn or three hours before dusk.

**Table 1: Visit date ranges for O'Brien & Smith (1992) method for censusing lowland breeding waders.**

Visit number	England and Wales	Northern England and Scotland
1	15 Apr–30 Apr	18 Apr–8 May
2	1 May–21 May	9 May–29 May
3	22 May–18 June	30 May–19 June

**Field methods:** you should label each field with unique identifiers (e.g. numbers). Methodically walk within 100 m of everywhere in each field surveyed. Record the species, count, location, behaviour, and presence of nests/chicks for all waders encountered. There is no timed element to searches – you should leave fields when you are confident that you have searched enough to have identified pairs if they are present. It is important to note:

- Birds displaying or 'singing'.
- Territorial disputes.
- Any nests or chicks observed.
- Birds intensely and persistently alarm-calling.
- Birds reluctant to leave the area.
- Distraction displays.
- Birds flying towards/circling the observer.
- When you flush birds at short distances (~30 m or less).

It is important to keep scanning ahead with binoculars and the naked eye as far ahead as possible. You may observe the more conspicuous waders long distances away, and counts of birds before you disturb them can be equally useful as those made in the immediate area. However, do your best to use both to avoid double-counting birds noted from scanning ahead when you are closer to the area.

Allocate each bird encountered to the field you first encountered it in and make a final decision on the number of birds (or pairs for Oystercatcher) in each field, and in total for the monitoring site covered during that survey visit. It can be helpful to watch territorial or flushed birds for as long as possible to help judge whether a subsequent sighting in the same area could be the same or a different individual. For certain species (e.g. Lapwing), it can be helpful to note, grade, and sketch the pattern of plumage on the belly/breast as this can help distinguish individuals.

**Estimating pairs:** summarise and estimate pairs based on the guidance in **Table 2**.

**Table 2: What to summarise, and what to report (estimated pairs) for each species for O'Brien & Smith (1992) surveys.**

Species	What to summarise (observations)	What to report (estimated pairs)
Curlew	Total number of individuals in each field on each visit (excluding birds in flocks)	(0.71 x mean number of individuals recorded across each survey visit) + 0.10*  <i>*If mean = 0, then report estimated pairs as 0 (not 0.10)</i>
Lapwing	Total number of birds seen in each field	Maximum number of individuals recorded on any one survey visit conducted between mid-April and late-May, divided by two.
Oystercatcher	Pairs: <ul style="list-style-type: none"> <li>• Number of paired individuals/2</li> <li>• Displaying individuals</li> <li>• Single birds</li> <li>• Nests</li> <li>• Broods</li> </ul>	Maximum number of pairs recorded on any one survey visit (excluding birds in flocks)
Redshank	Total number of birds seen in each field on each visit	Mean number of birds seen across all visits (give details if you conducted more than two visits)
Snipe	Total number of birds heard drumming or chipping in each field	Maximum number of birds heard drumming or chipping in each field (unless no Snipe recorded in May - in which case estimated pairs = 0)

O'Brien & Smith (1992) recommend reporting pair estimates per monitoring site (summarising totals across all fields searched); However, in practice pair estimates are often reported by field. If doing so, use field-level pair estimates with caution (i.e. just because you saw a bird in a field, it does not mean it is nesting in that field).

**Estimating breeding success:** for each monitoring site, you can calculate a crude **index of productivity** by dividing the number of pairs seen with chicks or showing behaviour consistent with chick-rearing during the final survey visit (latest visit in May for Lapwing) by your total estimate of pairs for the season (estimated above). Behaviours consistent with chick-rearing are:

- Intense and persistent alarm-calling.
- Reluctance to leave the area.
- Flying towards/circling the observer.
- Short flushing distances or distraction display.

**Productivity Index** (for each species) = pairs showing chick-rearing behaviours in **final** survey visit / total estimate of pairs

This produces a number between 0 and 1, which represents the proportion of pairs that were apparently still chick-rearing in the survey visit closest to the key chick-rearing period. A productivity index of 1 would mean all pairs were showing behaviour consistent with chick-rearing during this visit, and a productivity index of 0 would mean no pairs were showing behaviour consistent with chick-rearing during this visit.

Again, you should report these indices at the site-level, but you can report them at the field-level; use even more caution when doing so (once chicks have hatched, broods are mobile and will often relocate to other fields).

**Note:** you can only generate these indices for species that vociferously and repeatedly alarm-call during the chick-rearing period (e.g. not Snipe). If you have any questions regarding estimates of breeding success, please contact [waders@bto.org](mailto:waders@bto.org) for support.

### O'Brien & Smith (1992) species-specific adaptations:

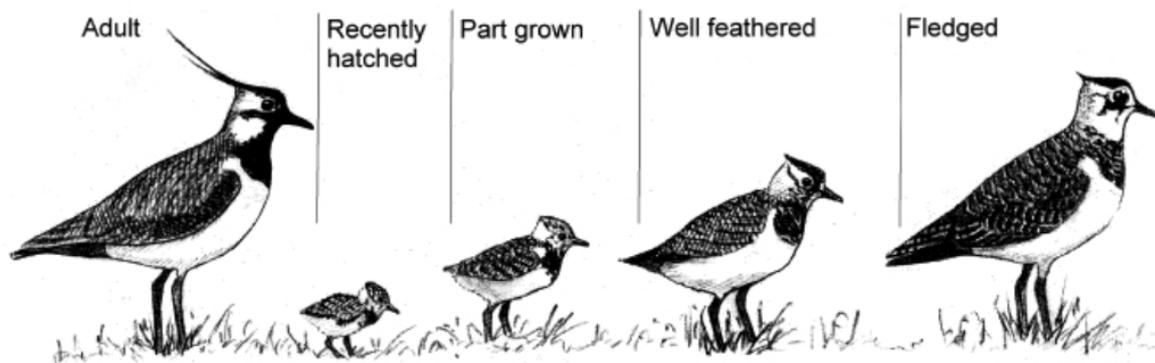
Authors have developed two commonly used species-specific modifications to improve estimates of breeding success.

**Bolton *et al.* (2011):** you can use this adaptation to generate more accurate measurements of Lapwing breeding success. Conduct two extra O'Brien & Smith (1992) survey visits (five in total), between late March and early July, ensuring you spread all survey visits three weeks apart. Follow O'Brien & Smith (1992) methods on all survey visits, scanning fields intensively for Lapwing chicks (watch for the noticeable white strip behind the neck of Lapwing chicks when moving), and adults showing behaviours consistent with chick-rearing. As for any visit, note the following for each monitoring site:

- Total number of Lapwings.
- Total adult Lapwings with chicks or showing behaviours consistent with chick-rearing.
- Total number of Lapwing chicks (and age in four categories: recently hatched, part-grown, well-feathered, and fledged - see Figure 1).

Estimate number of fledged young (and breeding success) by counting and summing the total number of well-feathered and fledged young on all visits.

**Figure 1:** Illustration provided to fieldworkers to standardise assessment of chick growth stages (from Bolton, M., Bamford, R., Blackburn, C., Cromarty, J., Eglinton, S., Ratcliffe, N., Sharpe, F., Stanbury, A. & Smart, J. 2011. Assessment of simple survey methods to determine breeding population size and productivity of a plover, the Northern Lapwing *Vanellus vanellus*. *Wader Study Group Bulletin* 118 141-152.)



**Grant *et al.* 2000:** you can use this adaptation to generate more accurate measurements of Curlew breeding success. Conduct two extra survey visits June–July (five in total), the first between 17 June and 1 July, the second between 2 July and 15 July. Follow O'Brien & Smith (1992) methods (though it only requires coverage within 300 m of everywhere in your monitoring), scanning fields for Curlews with chicks (rare to observe) and adults showing behaviours consistent with chick-rearing (more commonly observed). The key metric is an index of the proportion of pairs with chicks late in the season. However, if Curlew is the focus of your project, consider using the CRP (2022) method for censusing breeding Curlews (see below), which captures breeding success from survey visits in an equivalent way.

(Grant, M.C., Lodge, C., Moore, N., Easton J., Orsman, C. & Smith, M. 2000. Estimating the abundance and hatching success of breeding Curlew *Numenius arquata* using survey data. *Bird Study* 47: 41–51. DOI: 10.1080/00063650009461159)

## BROWN & SHEPHERD (1993) METHOD FOR CENSUSING UPLAND BREEDING WADERS

**Target species:** Curlew, Dunlin, Golden Plover, Lapwing, Oystercatcher, and Redshank (you may record other species if encountered).

**Essential equipment:** binoculars, 1:10,000 map(s) of survey area(s).

**When to visit:** a minimum of two visits, one early April to mid-May, a second mid-May to late June. Calladine *et al.* (2009) recommend four visits across this period, each at least two weeks apart, to improve accuracy of pair estimates for some species. You must complete each visit must between 08:30–18:00 British Summer Time (BST). Searches should be constant effort per area, 60–80 minutes per km<sup>2</sup> (~35-45 seconds per hectare).

**Field methods:** follow a predetermined route through each part of your survey area(s), ensuring you approach everywhere to within 100 m. Using your maps and BTO symbology, record the location, behaviour, and movements of all waders encountered; it is important to note when birds are observed simultaneously using a dashed line (e.g. CU ♂----- CU ♀ two Curlew pairs observed in different locations but simultaneously, i.e. definitely not the same pair!). It is especially important to note the following on your survey maps:

- Birds displaying or 'singing'.
- Territorial disputes.
- Any nests, eggs, or young observed.
- Birds intensely and persistently alarm-calling.
- Birds reluctant to leave the area.
- Distraction displays.
- Birds flying towards/circling the observer.
- When birds are flushed at short distances (~30 m or less).

If possible, walk in the opposite direction through your survey area in your second visit (and switch each time if more than two visits completed). At all times, listen out for wader calls, stopping at least every 100 m to scan round in every direction as far as is visible; it helps to stop and watch for a few minutes from good vantage points.

### Estimating pairs:

Consider birds 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.

Consider other records to be non-breeding birds, feeding away from nest sites or on passage elsewhere.

Use survey maps from all visits to estimate a final total of pairs. Consider breeding observations of the same species recorded close to each other on the same survey visit (within 500 m of each other, or 200 m for Dunlin) to be from the same pair (unless the surveyor has indicated they were observed simultaneously using a dashed line), but any further than 500 m (or 200 m for Dunlin) away from each other to be from a different pair.

For pairs observed on different survey visits, consider breeding observations of the same species recorded within 1 km (or 500 m for Dunlin) to be from the same pair, but any further than 1 km (or 500 m for Dunlin) away from each other to be from a different pair.

This can be quite confusing. In practice it is easiest to use the map from the visit that recorded the greatest number of pairs for the species you are estimating pairs for (using the >500 m (200 m for Dunlin) rule above), then double-check the survey maps from other visits to see if there are any additional pairs greater than 1 km away (500 m for Dunlin) from those already identified (and add them to your season pair estimates, if so).

### Estimating breeding success:

For each monitoring site, you can calculate a crude **index of productivity** by dividing the number of pairs seen with chicks or showing behaviour consistent with chick-rearing during the final survey visit (latest visit in May for Lapwing) by your total estimate of pairs for the season (estimated above). Behaviours consistent with chick-rearing are:

- Intense and persistent alarm-calling.
- Reluctance to leave the area.
- Flying towards/circling the observer.
- Short flushing distances.
- Distraction display (e.g. broken wing display).

Productivity Index (for each species) = pairs displaying chick-rearing behaviours in final survey visit / total estimate of pairs

This produces a number between 0 and 1, which represents the proportion of pairs that were apparently still chick-rearing in the survey visit closest to the key chick-rearing period. A productivity index of 1 would mean all pairs were showing behaviour consistent with chick-rearing during this visit, and a productivity index of 0 would mean no pairs were showing behaviour consistent with chick-rearing during this visit. Again, you should report these indices at the site-level.

**Note:** you can only generate these indices for species that vociferously and repeatedly alarm-call during the chick-rearing period (e.g. not Snipe). If you have any questions regarding estimates of breeding success, please contact [waders@bto.org](mailto:waders@bto.org) for support.

### Brown & Shepherd (1993) species-specific adaptations:

Authors have developed a commonly used Curlew-specific modification to improve estimates of breeding success.

**Grant et al. 2000:** you can use this adaptation to generate more accurate measurements of Curlew breeding success. Conduct two extra survey visits June–July (**five** in total), the first between 17 June and 1 July, the second between 2 July and 15 July. Follow O'Brien & Smith (1992) methods (though it requires coverage within 300 m of everywhere in your monitoring site), scanning fields for Curlews with chicks (rare to observe) and adults showing behaviours consistent with chick-rearing (more commonly observed). The key metric is an index of the proportion of pairs with chicks late in the season. However, if Curlew is the focus of your project, consider using the CRP (2022) method for censusing breeding Curlews (see below), which captures breeding success from survey visits in an equivalent way.

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## CRP (2022) METHOD FOR CENSUSING BREEDING CURLEW

This method is broken into three **Tiers** (Table 3), March to mid-April, late April, and late May to mid-July. This means that you can check the total survey area for **occupancy** and **territorial pairs** in Tier 1 and 2, respectively, then visit fewer monitoring sites to estimate **breeding success** in Tier 3 (saving fieldworkers' time in this period). For the full guidance document, please see the Curlew Recovery Partnership Resources at [www.curlewrecovery.org/resources](http://www.curlewrecovery.org/resources).

**Target species:** Curlew (other species can be recorded and pairs estimated if encountered, though survey coverage and dates may not suit other species).

**Essential equipment:** binoculars, 1:10,000 map(s) of survey area(s).

**When to visit:** avoid the two hours after dawn and before dusk in during the date ranges recommended for each Tier (Table 3), though this is not a strict requirement.

**Table 3:** When to visit using CRP (2022) method for censusing breeding Curlew.

Tier	Date range	No. of visits	Output	Notes
1	March to mid-April	Unspecified	Site occupancy	Designed to be built upon with Tier 2 visits, but can alone form useful basis for mapping populations
2	Late April	Minimum of 2	Territorial pairs	Visits must be 7 days apart
3	Late May to mid-July	1–9	Estimated breeding success	Visit every 7–10 days from late May (until no Curlew observed on at least 2 consecutive visits – i.e. breeding attempt outcome has likely happened)

**Field methods:** for enclosed sites, use vantage point(s) to search monitoring sites for Curlews. For unenclosed sites, walk transects to within 100 m of monitoring sites. It is important to accurately map your Curlew observations, or note the field or km<sup>2</sup> they you first observed them in. Note count, behaviour, presence of nests and young, and movements using BTO standard survey symbology (see **Breeding Wader Survey Guide**). It is important to note:

- Birds displaying or 'singing'.
- Territorial disputes.
- Any nests, eggs, or young observed.
- Birds intensely and persistently alarm-calling.
- Birds reluctant to leave the area.
- Distraction displays.
- Birds flying towards/circling the observer.
- When birds are flushed at short distances (~30 m or less).

During **Tier 3** visits, you only need to visit monitoring sites where you identified territorial Curlew pairs during **Tier 2** visits. You may need to walk over fields to detect chick-rearing Curlews that you would otherwise miss from vantage points (when chick-

rearing, adults and broods often stay hidden/quiet unless threats arise). Please walk over sites with caution. Once you detect a bird (e.g. it is alarm-calling), immediately avoid/leave the area where the bird is (or you flushed it from), re-routing your path to minimise disturbance.

**Estimating pairs:** the CRP Curlew Survey Method is based around identifying Apparently Occupied Territories (AOTs) or Territorial Pairs based on Tier 2 survey visits alone.

**Estimating breeding success:** you can derive a crude index of productivity from the proportion of pairs still showing behaviour consistent with chick-rearing in late June Tier 3 visits, divided by the number of pairs estimated from late April Tier 2 visits.

Index of productivity = number of pairs still showing behaviour consistent with chick-rearing in late June Tier 3 visits / number of pairs estimated to be rearing chicks from late April Tier 2 visits.

Observations of chicks are too infrequent to provide comparable metrics; however, maximum count of fledged or well-feathered chicks observed during Tier 3 visits (but not observations outside survey visit times) can provide useful information.

## 5. Data Entry

We have provided survey cover sheets to use on census surveys in combination with your field maps to capture core information from each census method the Wader Hub supports; you can use these with your survey maps to record your visit info and wader observations in the field.

Usually, summary data is the key information you need to submit from your census surveys; these are the totals/estimates provided on your survey cover sheet. You can submit your summary data from any survey method supported to the Wader Hub.

### 5.1. Data Entry Options

- *Data Entry Spreadsheets:* visit [www.bto.org/wader-hub](http://www.bto.org/wader-hub) to download the relevant spreadsheet for your chosen survey method. Please complete your spreadsheet and email it to [waders@bto.org](mailto:waders@bto.org).
- *Paper Return:* email [waders@bto.org](mailto:waders@bto.org), attaching your survey cover sheets and survey maps, to submit survey data by paper.

We are still in the early stages of establishing the Wader Hub; at this stage by submitting data, you would be helping to develop a universal data entry system to start protecting wader populations monitored by local individuals and groups (by representing these data at a national level) and beginning to investigate demographic patterns and trends across the UK, to inform conservation decision-making. With further development, we hope to provide greater levels of support to local individuals and groups to interpret and report upon the results of their survey data.

*Version 1 (16 August 2023) – Natural England and the Esmée Fairbairn Foundation funded the BTO staff time for the development of this document. If you notice any errors, or any omissions you would like to see included, please use the anonymous online feedback form (<https://forms.gle/86vimoBBEmnyiFgJA>) or email [waders@bto.org](mailto:waders@bto.org) to suggest changes for future versions.*

