DEVELOPMENT OF DEMOGRAPHIC MONITORING UNDER THE JNCC/BTO PARTNERSHIP

Background

A key aim for the BTO/JNCC Partnership is to understand how populations change in order to inform effective conservation policies (RIN:APR10:2). The demographic monitoring schemes (Ringing and Nest Record Schemes, CES and RAS) have a critical part to play in this by providing information on survival, productivity and dispersal which can be used to interpret abundance data collected by schemes such as BBS. Results from this work are produced and reported through JNCC Work Stream 4 on species and environmental change, which includes production of the Wider Countryside Report (http://www.bto.org/birdtrends) and also through a range of other research projects. In order to maintain effective and efficient monitoring, we need to improve the targeting of these demographic schemes to better support conservation policies, and to inform the needs of JNCC and the Country Agencies who make a large contribution to the funding of all of these schemes. Our main aim is to increase the number of species for which good quality demographic analyses can be undertaken, and hence for which causes of population change can be inferred, and to provide measures of cross species patterns that are indicative of broad environmental change. To achieve this aim we will need a significant culture shift within the Ringing Scheme towards more focussed ringing which will provide higher quality demographic information.

Over the last year RIN has supported the need to increase our ability to monitor the demography of a range of species (RIN:APR10:MIN, RIN:OCT10:MIN) and to develop a new demographic targeting strategy in line with the JNCC/BTO Partnership Agreement. This paper presents specific proposals for how this may be achieved, both in terms of ringing activities that are likely to be particularly helpful in addressing this goal and ways in which we might alter the subsidy system to provide some incentive for focussing ringing effort in the most useful ways.

What do we need to achieve?

Ideally, we would like to be able to construct full population models based on a good knowledge of each demographic parameter for a range of species that are representative of different habitats and regions. We have successfully undertaken such analyses for some species (e.g. Blackbird, Starling, Song Thrush, Lapwing) and these have been very helpful for understanding population change and formulating policy action. In order to ensure we have enough data to do this for a reasonable range of species, we will have to target effort at selected species. A major part of the targeting process will necessarily focus on the CES and RAS schemes which have successfully provided structured ringing data for a number of years. Structured effort will also benefit many other research uses to which the data may be put, since being able to control for variability between sites or years is often of key importance. For example, the condition of individual birds will vary between years due to weather so sampling heavily from one year may skew the results. The site based approach of CES and RAS also lends itself to collecting additional data to answer specific questions about the role of environmental factors; quantification of these has long been a key gap in our understanding of population change.

For convenience it is useful to consider five broad groups of species. The largest (and the primary focus of this paper, since it is these that most ringers will encounter) are terrestrial birds, mostly passerines. Additionally, we need to consider: top predators (which are sensitive to changes in wider food chains); seabirds, including gulls; wintering waders; and, finally, wildfowl. The challenges associated with monitoring each group are rather different. For seabirds, we are undertaking a similar exercise over the summer with JNCC, reviewing the feasibility and implementation of a demographic monitoring programme; we aim to incorporate the results of this into our demographic targeting strategy by the autumn. There is much work undertaken on top predators, both through ringing and nest recording and we need to consider how this may best contribute demographic information. Britain holds internationally important numbers of wintering waders and wildfowl. We have already reviewed survival monitoring of waders (BTO Research Report 469) and most wader ringing groups are already operating relatively structured ringing programmes for these species, although more effective co-ordination and analysis of results is needed. The numbers of wintering wildfowl that are

ringed have declined in recent years and we will need to consider how best to address this in consultation with WWT, who have previously led much of the ringing of this group. We note that in Scotland there is interest in the development of Adaptive Harvest Management of waterfowl, particularly geese, following on from a recent review conducted by BTO Scotland. If such a system was to be developed it would require a significant ringing component.

There are three approaches that can help us achieve our aims: (i) providing training that fosters an ethos where ringers appreciate the value of systematic ringing and this becomes the 'ringing activity of choice' as it gives a deeper insight into local populations; (ii) providing guidance on the species that are of most value, advice and support on how best to approach them and timely feeding back of results so they are motivated to undertake the sometimes challenging work required and (iii) using the price of rings to encourage (and reward) the most valuable ringing. We have made some progress with addressing (i) in recent years, although there is still much that we can do; some particular priorities are highlighted below. Once we have a clear set of priorities in place we will need to review how to deliver training and recruitment that better support them. The second and third strands form the main focus of the rest of this paper.

What challenges are there?

While there continues to be a role for general ringing and nest-recording, there is an increasing recognition that quantifying variation in demographic patterns is vastly easier with data collected in a structured fashion. Thus we need to continue the change from a Ringing Scheme where most of the activity involved general ringing to one where a higher proportion of activity is delivered through structured projects. This is likely to mean that we will mark fewer birds and that we will collect more recaptures and resightings per individual marked. There are a number of key sources of demographic data: the Nest Record Scheme, age ratios of captured birds, recaptures of ringed birds and (dead) recoveries of ringed birds. A common issue across all schemes is that of sampling biases. Although ideal, a nationally randomised sample of demographic monitoring sites (in the style of the BBS) is clearly not feasible; we do, though, have to give regard to issues of geographical representativeness, since landscapes, and hence presumably population processes, vary markedly over the country. Capturing this variation can be enormously helpful in interpreting variation in population trend, but, clearly, the number of recorders is a limiting factor.

Nest Record Scheme: Responsibility for this scheme has recently been transferred to RIN and priorities for developing its potential have been identified (RIN:APR10:1). These include:

- increasing the level of recording for common open-nesting species
- encouraging recorders to focus their efforts on particular species or sites to reduce the degree of sampling heterogeneity within the scheme
- promoting submission of multi-visit nest records by ringers of pulli.

We are actively implementing these measures and they appear to be proving successful with record numbers of nest records submitted in 2010; the forthcoming nest-finding guide should also help in this regard.

Ring-recovery: the finding and reporting of dead ringed birds has traditionally provided the main way of estimating survival rates and such data have been very valuable in diagnosing causes of population declines, for example of farmland birds. As birds can potentially be found anywhere, recoveries provide a good estimate of survival rates, particularly for immature birds which may disperse far from the site at which they were ringed. However, the frequency with which recoveries are reported to BTO HQ has declined enormously in the last few decades, compromising our ability to estimate annual survival probabilities in even common species. Introducing web-addresses on rings, and promotion of the www.ring.ac address should help stem, or even reverse this trend but there remains a real need to increase ring reporting rates further. However, the number of species for which ring-recoveries will generate useful survival estimates is likely to be limited: mostly to larger species and some passerines that are recovered in good numbers, e.g. blackbird, starling.

Mark-recaptures: Re-captures of ringed birds also provide an important way of estimating survival rates. These have the benefit that they can usually be generated in greater numbers than recoveries and the effort employed can be more easily quantified (or standardised) leading to a more robust dataset from which to estimate survival rates. Mark-recapture data can also be used to estimate recruitment (the number of new birds entering the breeding population). Although we have traditionally thought in terms of re-captures, all that is really needed is that identifiable individuals are re-encountered systematically; increasingly this may be through field readings of colour-marks or through the use of various tags. Standardising effort is extremely important, both because the analytical techniques used can be very sensitive to variation between individuals in their likelihood of recapture (probably more so than for ring-recovery data); this is why projects such as CES and RAS are so valuable. Because individual birds need to be recaptured to determine if they have survived, mark-recapture methods are generally less appropriate for estimating the overall survival of immature birds, since these have a propensity to disperse away from the ringing site (and this need not be very far), meaning they are no longer available for re-capture and so are assumed to be dead. However, measures of relative survival may still be useful in some cases. Colour-marking is increasingly used for certain species, mainly waders, wildfowl and large gulls. These have the potential to generate large numbers of re-sightings, however, the large degree of heterogeneity in re-sighting effort means that while they give useful descriptive information on movements, the majority are unlikely to be very useful for estimating survival rates, unless they are part of a well co-ordinated scheme.

How do we best direct effort?

Based on discussion at the last RIN (RIN:OCT10:1) we have included a suggested list of species around which we should particularly encourage ringers to focus efforts (Annex 1). These species represent those for which we should be able to construct useful demographic models with either current information, or with some extra effort. While we will initially focus on national monitoring, it would greatly enhance our ability to understand population change if we are able to analyse regions or habitats separately, so the plan proposed here should be regarded as a minimum on which to build over the longer-term. Clearly, a major part of the targeting process will focus on the CES and RAS programmes which have successfully provided structured ringing data for a number of years. Although it is unlikely in the short-term that we will have sufficient data to construct full population models for species not on the list, the Ringing and Nest Recording Schemes may provide some useful demographic information, perhaps averaged over a span of years to help inform more basic population models. Where comprehensive population models are not available more basic models can still be helpful for exploring the likely consequences of proposed conservation strategies.

Suggested priorities for each scheme are:

Constant Effort Sites:

- This scheme is operating well and provides extremely valuable data on a range of common, mostly scrub and woodland, species. We need to continue to promoting CES to at least maintain the number of sites operated in the face of site turnover and increase coverage, particularly in areas where there are few sites currently
- Increasing the range of species for which it provides good demographic estimates may be difficult as to do so may mean a need to increase the number of participating sites substantially. However, it may be possible to take a more targeted approach to new sites, focussing on habitats with species for which not quite enough birds are caught currently (e.g. Goldcrest, Coal Tit, Yellowhammer, Kingfisher and Great Spotted Woodpecker).
- It may also be worthwhile to strategically approach the larger land-owning organisations (e.g. Wildlife Trusts, water companies, MoD, National Trust) to facilitate operation of CES on those sites which they manage that contain suitable habitat in a coordinated fashion.
- We could consider the inclusion of garden/suburban CE sites. This is unlikely to increase the range of species covered significantly, but gardens do represent an important habitat for many

species. We need to establish the value which conservation bodies such as JNCC and the Country Agencies place on data from these relatively artificial habitats.

- We have for some time encouraged group working at CES sites, and the handing on of sites to new ringers where this is needed to maintain continuity. This trend should be continued.

Re-trapping Adults for Survival:

- This is where additional promotional and educational effort offers the greatest potential for increasing the range of species for which we have good demographic data. The focus of RAS, though, needs to shift from purely monitoring survival to a more integrated study of populations, for example by incorporating nest recording and/or simple counts (both of which are currently encouraged but not mandatory). We should change the name of the scheme to reflect this (as previously discussed, RIN:APR10:MIN).
- We should aim for a network of 10-12 sites for the range of species identified, though useful results can be achieved with 4-5, particularly if site turnover is low. This is ambitious, but has already been achieved for Sand Martin and Pied Flycatcher; key target species would be House Sparrow, House Martin, Swallow, Dipper, Marsh Tit, Tree Sparrow and perhaps Barn Owl.
- It is worth noting that for RAS studies, ringing may take place in the winter, providing that birds are re-sighted/re-encountered during the summer; indeed some studies, particularly of sparrows already do so. For some sedentary species (e.g. Marsh Tit, Willow Tit, House Sparrow, Tree Sparrow) it may be useful to consider RAS's which operate in winter and estimate between-winter (rather than between-summer) survival rates.
- We also need to encourage a group-based mentality to RAS (as we already do with CES) and foster the idea that projects may outlive their original creator, for example if they move away from an area.

General Ringing:

- General ringing still has the potential to provide valuable recovery information and, especially for the larger common species (e.g. Mute Swan, Canada/Greylag Goose, Woodpigeon, Barn Owl) we are likely to receive sufficient dead recoveries to produce temporal trends in survival rates. For most passerines, which are recovered in far fewer numbers, we are unlikely to generate enough recoveries to estimate survival in this way. However, recent work using Age Specific Totals shows this may be possible for at least some species, including Blackbird, Starling, Swallow and Greenfinch.
- Many ringers already undertake their ringing in a semi-standardised fashion and/or record effort (e.g. in terms of net-foot hours). We are investigating whether such sites can be identified and whether they provide sufficiently good-quality data to estimate survival rates or other demographic parameters, though staff resources are currently limited. This may be only the way to generate estimates for widely dispersed species that may never be caught in sufficient numbers on CE sites. There may be merit in collecting some simple effort based information for such sites, although surrogates such as time between first and last captures might also be considered. However, collection of such semi-standardized data should not be seen as an alternative to effective development of CES and RAS.
- In some species, birds caught in the spring can be aged as 5 or 6, which may provide a useful index of recruitment of young birds into the breeding population. This key demographic parameter integrates productivity and first-year survival, the latter of which can be extremely difficult to estimate independently.

Nest Recording

- We should continue efforts to promote recording of open-nested species, particularly those listed in Annex 1 and as part of RAS studies. This need not be by the RAS ringer - targeted recruitment of new nest recorders to areas at which RAS studies are also running is already being undertaken and we will continue this as a priority in future.
- We will also continue to promote the value of systematic nest recording.

If all of these approaches are successful we should aim to provide useful demographic interpretation of population change for about half of the species for which numbers are monitored by BBS. These will cover a wide range of species, including a good number of species of current conservation concern (16 on the Amber list and 8 on the Red list) and birds indicative of particular habitats. The following table summarises the number of species for which we aim to estimate each of the key demographic parameters; productivity and adult survival are much easier to collect data on than juvenile survival or recruitment:

	Nest Success	**Productivity**	**Immature Survival**	**Recruitment**	**Adult Survival**	**Total**
Conservation status						
Green	28	22	7	10	27	29
Amber	16	6	1	3	17	16
Red	7	5	3	1	7	8
Habitat						
Farm	9	6	1	2	8	9
Wood	21	18	3	8	20	21
Wetland	7	5	3	2	9	9
Upland	3	0	0	2	4	4
Predator	6	3	3	3	6	6
Migrant	17	10	1	2	18	18
TOTAL	51	33	11	14	51	53

How do we achieve this?

Although these ideas have been much discussed over the last few years we still have a big job to do in selling them to ringers! Many ringers may not appreciate being asked to change their patterns of ringing activities, though at least some, particularly newly qualified C ringers, are keen for direction to make their ringing as valuable as possible. Many will have other commitments during the breeding season (including other BTO surveys) and at least some think the amount of commitment, both within a season and the need to maintain the effort over a number of years, daunting.

We need to think holistically about how we train ringers in such a way that they appreciate the value of structured ringing. In particular promoting the value of RAS will be of key importance. While the fieldwork may be challenging and the commitment daunting, those that do undertake their ringing in this way generally gain immense satisfaction from getting to know 'their' birds in detail. Furthermore, effective team working can provide high quality results based on modest inputs from each of the contributing individuals. We are already tackling this through a number of initiatives, such as:

- developing information 'packs' aimed at T's and newly qualified C's
- planning regional workshops providing practical advice and networking opportunities for "demographic" ringers
- significantly revising and updating the CES/RAS pages on the website, which would include producing specific guidance on how best to catch/re-sight each species.

Currently, ringing that provides data of strategic importance, is encouraged by the provision of RING subsidies which reduce the cost of ringing of target species. Currently these are provided to ringers in two forms: a ring *subsidy* whereby the rings are sold at a cheaper price because most (or all) of the species taking that ring size are of particular interest (e.g. B rings cost £22.75 per 100, whereas B+ rings cost only £8.00 per 100, reducing the up-front cost to the rimger) and a ring *refund* where an amount is returned to the ringer if they ring species of interest (essentially those on the Red and Amber lists, seabirds and top predators), ring birds as part of CES or RAS, or submit data

electronically. These pots of money are not separate so we could, for example, invest less in subsidies and more in refunds to communicate a clearer message. However, the total funding available will not increase. Therefore our overall package for ring prices and subsidies will have to balance the books, so if we increase support for one area we will need to reduce support elsewhere.

We propose that the refunds are altered to reflect the priorities outlined above. Subsidising ring prices makes a big difference to the number of seabirds, waders and wildfowl ringed annually, as these rings are costly. We should consider changes to both ring subsidies and ring refunds; alterations to the former (which affect the up-front cost of buying rings) may be more controversial than the latter. Any revised scheme needs to be simple to administer. We suggest the following options:

- A refund equivalent to the current cost of rings used as part of CES.
- A refund equivalent to the current cost of the rings for new birds per year (i.e. including re-traps) for RAS projects (currently a refund is given on *new* rings only).
- Refunds on pulli ringed for which a multi-visit nest record is submitted, possibly including at least one visit at the egg stage?
- Consider grants for undertaking CES and/or RAS especially to C ringers, though ideally we would need some surety that they were going to continue in the longer-term. These might be targeted to purchase of equipment – not only of nets etc. but technology like PIT readers to facilitate 'retraps'.
- Consider refunds for those species listed in Annex 1 as likely to generate sufficient ring recoveries ringed during the breeding season (i.e. Barn Owl, Canada/Greylag Goose, Grey Heron, Mute Swan, Woodpigeon); these are also the species for which costs are likely to be greatest.
- Continue subsides for seabirds, waders and wildfowl, which are also the most expensive species to ring. Review subsidies for raptor ringing.
- Discontinue subsidies for the ringing of Red and Amber list species.
- Remove the computerisation refund as almost everyone does so, and data need to be submitted electronically and on time to attract a refund anyway.

Detailed financial planning will depend on how we handle the non-passerine groups that take relatively expensive rings. So we cannot put forward detailed plans until work on these groups is further advanced.

Annex 1. Proposed List of Priority Species for Demographic Monitoring.

Table 1 lists the 52 species we propose form a core list for which we should encourage co-ordinated effort to facilitate national monitoring of demographic parameters. For all of these species we have population trend data from BTO/JNCC/RSPB BBS. For 22 species (marked by an asterisk, *) we already have a reasonable data for most of the key demographic parameters, for 10 species (marked by a question mark, ?) collecting data across all or most of the parameters is likely to be challenging, so these should perhaps form a lower priority. This leaves 20 species which should be seen as key priorities for expanding ringing effort from a demographic point of view.

For each species we identify the schemes contributing data to each of the key demographic parameters. These parameters are:

Nest Success: success (in terms of number of chicks fledged) per breeding attempt, mostly from the Nest Record Scheme

Productivity: Number of young produced per season, i.e. incorporating multiple attempts and a possibly component of post-fledging survival.

Immature Survival: For passerines, typically the survival probability from ringing as fully-fledged juveniles to entry into the breeding population the following summer (note that this excludes 'post-fledging survival, ie the probability that a bird will survive from fledging to be a free-flying juvenile available for capture, which may be low since mortality at this stage is significant). This will typically be lower than adult survival, and may well show different temporal variation. Some species (esp.

larger and non-passerine species) do not breed in their first year, so may need to consider survival over multiple years.

Recruitment: The probability that a fledged juvenile enters the breeding population,, it thus combines the Productivity and Immature Survival estimates.

Adult Survival: Survival of birds of breeding age from year to year, usually measured from one breeding season to the next.

Note that Recruitment, Productivity and Nest Success all measure the reproductive output of the population, but at different stages. They are thus likely to be related, but one or other parameter may be easier to measure in any particular species. In some senses recruitment is the key demographic measure of reproductive output, but being able to estimate the others provides greater insights into demographic mechanisms affecting population change.

For each parameter we have listed the scheme that will contribute data to estimate the parameter and, for most schemes, an indicative number of records received currently. Schemes entered in capitals currently supply a 'reasonable' amount of data, those entered in lower case currently supply less and are thus priorities for directing effort. These are:

NRS: Nest Record Scheme – The number indicates the number of nest records contributing towards the estimate of fledglings per attempt (fpba) each year (averaged over the last five years) presented in the Wider Countryside Report (WCR). This is usually the lowest of the individual parameters contributing to it (typically failures at the egg-stage). Note for waders, geese and swans are nidifugous thus present particular challenges. Note also that for some species (eg Sand Martin) most records come from one or a few sites.

CES: Constant Effort Sites – Numbers indicate the mean number of sites contributing to productivity each year and the total number of sites contributing to survival rates, both presented in the WCR. Note estimating survival rates requires a good number of adult birds caught on each site, so the number of sites contributing is generally (much) smaller than for productivity or abundance.

RAS: Re-trapping Adults for Survival – Number of sites that have contributed sufficient data to estimate survival rates. These currently do not appear in the WCR, but will do so soon. See the main text for discussion of future development of RAS, which is really just structured ringing focussing on a particular species, preferably with elements of nest and population recording. It is likely to be most suitable for those species occurring in particular habitats at reasonably high density, or which are attracted to nest-boxes.

RING: General ringing – for larger species recoveries can be used to estimate immature and adult survival. No indication of sample size is given since effectiveness is quite hard to capture in a simple single measure. For species ringed mostly as pulli (e.g. Barn Owl, Grey Heron) estimating adult survival is likely to be harder. For some species it may be possible to use the ratio of 5's to 6's caught in the spring to provide a measure of recruitment into the breeding population, but this hasn't yet been tested.

Table 2 lists these species according to various criteria. BoCC indicates species on the latest Red (R) or Amber (A) lists. BBS gives the population trend from the BBS over the period 1995-2008 (which is that given in the latest annual report). Farm Woodland and Wetland indicate species contributing to each of these UK Biodiversity Indicators, Upland indicates those species contributing to the SNH Biodiversity indicator for that habitat. The final two columns indicate species that are either top predators or which migrate to Britain to breed (from southern Europe or Africa).

Table 1. Coverage by Scheme and Priorities for Development

	Nest Success	Productivity	Immature Survival	Recruitment	Ad Survival	Priority
Barn Owl	NRS (84)	ras	RING		ring	RING
*Blackbird	NRS (245)	CES (101)	RING	ring/ces	RING/CES (141)	
*Blackcap	nrs (36)	CES (97)			CES (104)	NRS
*Blue Tit	NRS (834)	NRS/CES (102)		ring/ces	CES (98)	
Bullfinch	nrs (11)	CES (84)		ring/ces	CES (77)	NRS
?Canada Goose	nrs (not input)	nrs	ring		ring	RING
*Chaffinch	NRS (54)	NRS/CES (84)		ring/ces	CES (59)	
*Chiffchaff	nrs (45)	CES (89)			CES (48)	NRS
?Collared Dove	nrs (37)			Ring	ras (0)	RAS
Com. Sandpiper				Ras	ras (2)	RAS
Dipper	NRS (68)			Ras	ras (2)	RAS
*Dunnock	NRS (65)	CES (101)			CES (112)	
*Garden Warbler	nrs (11)	CES (78)			CES (48)	NRS
*Great Tit	NRS (712)	NRS/CES (101)		ring/ces	CES (67)	
Greenfinch	nrs (41)	CES (46)		ring/ces	ring	NRS/CES
*Grey Heron	nrs (<10)		RING		RING	NRS/RING
?Grey Wagtail	nrs (27)				ras (0)	NRS/RAS
?Greylag Goose	nrs (not input)	nrs	ring		ring	NRS/RING
House Martin	nrs (<10)				ras (4)	RAS
House Sparrow	NRS (99)				ras (5)	RAS
Jackdaw	NRS (65)	NRS			ras (0)	RAS
*Kestrel	NRS (51)			ras	ras (0)	NRS/RAS
?Lapwing			RING		RING	RING
Les. Whitethroat	nrs (<10)	CES (54)			CES (14)	NRS
Linnet	NRS (53)	ces (20)				
Little Owl	nrs (28)			ras	ras (0)	NRS/RAS
Long-tailed Tit	nrs (41)	CES (86)				CES
Marsh Tit	nrs (16)	ras			ras (1)	RAS
?Meadow Pipit	nrs (10)				ras (0)	NRS/RAS

	Nest Success	Productivity	Immature Survival	Recruitment	Ad Survival	Priority
*Mute Swan	nrs (24)	nrs	RING		RING	NRS
?Nightingale	nrs (<10)				ces (4)	
*Pied Flycatcher	NRS (357)			ras	RAS (12)	RAS (occupancy)
Redstart	nrs (32)				ras (0)	RAS/NRS
*Reed Bunting	nrs (14)	CES (61)			CES (43)	NRS
*Reed Warbler	NRS (110)	CES (61)			CES(84)	
*Robin	NRS (102)	CES (101)			CES (67)	
Sand Martin	NRS (70)	ras			RAS (17)	
*Sedge Warbler	nrs (<10)	CES (71)			CES (96)	NRS
*Song Thrush	NRS (115)	CES (90)	ring	ring/ces	RING/CES (36)	
?Sparrowhawk	nrs (15)	nrs	ring		ring	
*Starling	nrs (48)	ras	RING		RING/ras (1)	
Stock Dove	NRS (141)				ras (0)	RAS
Stonechat	nrs (41)	ras			ras (1)	RAS
?Spot. Flycatcher	nrs (39)				ras (0)	
*Swallow	NRS (749)				ras (7)	RAS
Tawny Owl	NRS (83)	NRS		ras	ras (0)	RAS
Tree Sparrow	NRS (639)	ras			ras (0)	RAS
Wheatear	nrs (<10)				ras (2)	NRS/RAS
?Whinchat	nrs (<10)				ras (1)	NRS/RAS
*Whitethroat	nrs (19)	CES (75)			CES (49)	NRS
*Willow Warbler	nrs (17)	CES (98)			CES (133)	NRS
Wood Pigeon	NRS (64)		ring		ring	NRS/RING
*Wren	NRS (59)	CES (102)			CES (108)	

Table 2 Population and ecological classification of proposed priority species.

	BoCC	BBS	Farm	Wood	Wetland	Upland	Top Predator	Migrant
Barn Owl	A	+464					Y	
Blackbird		+26		Y				
Blackcap		+61		Y				M
Blue Tit		+1		Y				
Bullfinch		-8		Y				
Canada Goose		+106						
Chaffinch		+9		Y				
Chiffchaff		+43		Y				M
Collared Dove		+26						
Com. Sandpiper	A	-15			Y	Y		M
Dipper		-27			Y	Y		
Dunnock	A	+21		Y				
Garden Warbler		-13		Y				M
Great Tit		+43		Y				
Greenfinch		+12	Y					
Grey Heron		+8			Y		Y	
Grey Wagtail	A	+27						
Greylag Goose		+144						
House Martin	A	+1						M
House Sparrow	R	-9						
Jackdaw		+36						
Kestrel	A	-20	Y				Y	
Lapwing	R	-13			Y			
Les. Whitethroat		+2		Y				M
Linnet	R	-23	Y					
Little Owl		-24					Y	
Long-tailed Tit		+13		Y				
Marsh Tit	R	-18		Y				

	BoCC	BBS	Farm	Wood	Wetland	Upland	Top Predator	Migrant
Meadow Pipit	A	-20				Y		
Mute Swan		+22			Y			
Nightingale	A	-53		Y				M
Pied Flycatcher	A	-50		Y				M
Redstart	A	-2		Y				M
Reed Bunting	A	+33	Y		Y			
Reed Warbler		+28			Y			M
Robin		+23		Y				
Sand Martin	A	+22			Y			M
Sedge Warbler		+9			Y			M
Song Thrush	R	+27		Y				
Sparrowhawk		-7					Y	
Spot. Flycatcher	R	-39		Y				M
Starling	R	-38	Y					
Stock Dove		0	Y					
Stonechat		+168						
Swallow	A	+34						M
Tawny Owl		-7		Y			Y	
Tree Sparrow	R	+55	Y					
Wheatear	A	-5				Y		M
Whinchat	A	-57						M
Whitethroat	A	+20	Y					M
Willow Warbler	A	-8		Y				M
Wood Pigeon		+35	Y					
Wren		+23		Y				
No. of Species	A=16 R=6		9	21	9	4	6	18