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The GWCT Grey Partridge Recovery Programme: *a Species Action Plan in Action*

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In 1994, the UK government launched its Biodiversity Action Plan (BAP). Its list of BAP species included the grey partridge *Perdix perdix*, whose UK numbers had declined by 91% since 1962. The government set numerical targets in its grey partridge Species Action Plan, then nominated the Game & Wildlife Conservation Trust (GWCT) as lead partner to take the Plan forward. To this end, the GWCT has sought to raise awareness of the issues among the farming and shooting communities with promotional material. It has encouraged land and shoot managers to join its Partridge Count Scheme and established local Partridge Groups as a focus for information dissemination, guiding management with local targets set using landscape characteristics to estimate the potential distribution of grey partridges at the 1-km² level. Leading by example, the GWCT has demonstrated on the ground how appropriate management leads to successful grey partridge recovery, and it has initiated research into optimal methods of re-establishing grey partridges in areas of extinction. I consider the current population status of the grey partridge in the UK, review the targets of the Species Action Plan in the light of that status, and discuss the chances of success.

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Key words: action plan, grey partridge, *Perdix perdix*, population recovery, UK

Introduction

In June 1992, the UK Prime Minister and heads of state from over 150 countries signed the Convention on Biological Diversity at the Earth Summit in Rio de Janeiro, Brazil. Two years later, the UK government published its first Biodiversity Action Plan (BAP), which sought to develop a framework to conserve biodiversity in the UK (Anonymous 1994). The Steering Group set up to implement it identified priority species and habitats in need of conservation and published action plans for them (Anonymous 1995).

Prominent among the species was the grey partridge *Perdix perdix*, whose numbers in Britain had declined by 88% between 1962 and 1988 (Marchant et al. 1990), and whose range had contracted by 19% between 1970 and 1990 (Gibbons et al. 1993). The grey partridge Species Action Plan (Anonymous 1995) defined three targets for population restoration: halt the decline by 2005, ensure that the population is above 150,000 pairs by 2010, maintain and

where possible enhance the current range of this species. The yardsticks against which to judge performance against these particular targets were the bird surveys organised by the British Trust for Ornithology (BTO): the Breeding Bird Survey (formerly the Common Birds Census) for a national index of abundance since 1962 (see Figure 1), involving over 2000 random 1-km² squares visited annually (Newson et al. 2005), and the Breeding Bird Atlas surveys for the assessment of range, involving complete coverage of all 100-km² squares in the UK every 20 years since 1968 (Sharrock 1976, Gibbons et al. 1993).

In 1996, the UK government nominated the Game & Wildlife Conservation Trust (GWCT) as lead partner responsible for implementing the action plan for grey partridge. No government funding accompanied the nomination, but thanks to the generosity of private individuals and companies, the GWCT raised enough money to launch a major programme for partridge recovery. Because almost all UK land is privately owned, and land ownership

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GWCT Grey Partridge Recovery Programme

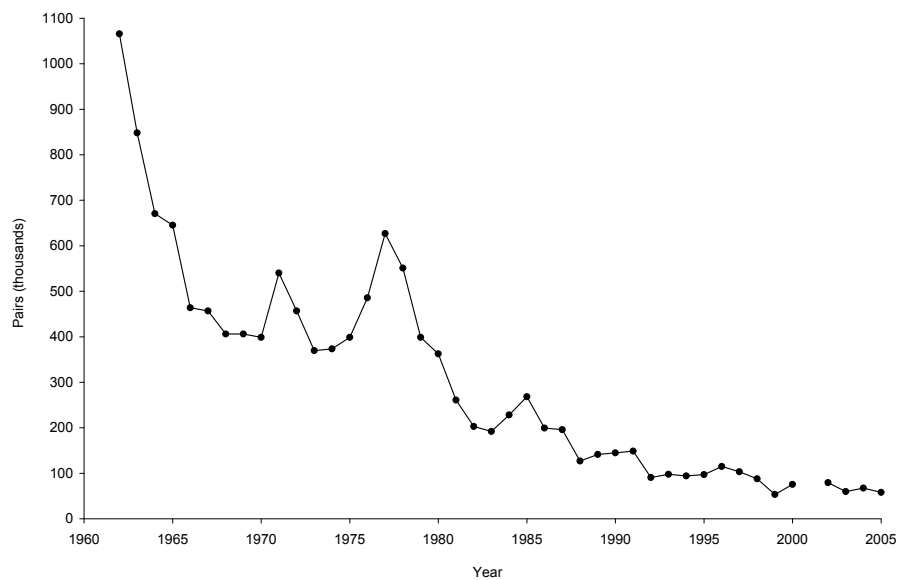


Figure 1: Grey partridge abundance in the UK, 1962-2005, based on annual indices from British Trust for Ornithology surveys (Marchant et al. 1980 and Newson et al. 2005, updated), calibrated by reference to the 1988-91 Atlas of Breeding Birds (Gibbons et al. 1993).

confers ownership of any game present, the cornerstone of the programme was to motivate farmers, land owners and shoot managers to conserve grey partridges on their land.

The programme was primarily education-oriented rather than research-based because, already in the 1970s, GWCT research had identified agricultural intensification and increased predation losses as the principal drivers of partridge decline (Potts 1980, 1986). In brief, nesting cover disappeared following hedgerow removal to improve farming efficiency, brood production fell because of increased pressure from avian and mammalian predators, and chick survival dropped when pesticide use depleted numbers of chick-food insects in cereals. During the 1980s and 1990s, the GWCT developed crop and margin management techniques to mitigate these effects without compromising farming profitability (Aebischer 1997). These include selectively sprayed cereal margins ("conservation headlands") to restore beneficial cereal insects, and raised mid-field strips of tussocky grass ("beetle banks") to provide nesting

cover and biological pest control. Turning to advantage the European Union's farm subsidy requirement of setting aside a percentage (8% in 2006) of arable land from crop production, they also include growing unharvestable crop mixtures (e.g. mustard and triticale, or kale and quinoa) on set-aside land to provide nesting, brood-rearing and overwinter cover, ideally in combination.

GWCT Grey Partridge Recovery Programme

The GWCT recovery programme seeks to influence management at the farm level in several different ways, as reviewed below.

Educational Material

The GWCT has put together a range of leaflets to raise awareness of the grey partridge conservation needs, all of which are available via the internet (<http://www.gwct.org.uk/partridge>).

The main summary leaflet "Conserving the Grey Partridge" is eight pages long. It was endorsed

by the Farmland Birds Species Action Plan Steering Group, comprising representatives of government, statutory conservation bodies and NGOs, and is aimed at the general public as well as practitioners and policy-makers. It describes the BAP context, the status of the grey partridge and general management measures to improve land for grey partridges (during the nesting period, when suitable nesting cover is required, the chick-rearing period, when insect availability is of paramount importance early in life, and the overwinter period, when food and shelter are often lacking in the modern agricultural landscape). The leaflet also provides guidelines on when to shoot or not to shoot grey partridges, emphasizing the need to take precautionary measures during driven shooting based on released red-legged partridges (Aebischer and Ewald 2004).

A series of six fact sheets address management issues in greater detail for farmers who would like to help the grey partridge on their land. The sheets cover specific habitat requirements ("Restoring grey partridges to your farm", "Providing nesting cover for wild grey partridges", "Providing brood-rearing cover for wild grey partridges", "Providing winter cover and food for wild grey partridges"), the methods of controlling predators ("Using predation control to increase wild grey partridge numbers") and how to make use of government agri-environment subsidies to best effect ("Environmental Stewardship: making the most for grey partridges").

Two further leaflets advertise the GWCT's Partridge Count Scheme and its demonstration project at Royston (see below).

Partridge Count Scheme

The GWCT's Partridge Count Scheme (PCS) began in 1933. Originally, it was a means of monitoring annual densities and breeding success through a network of around 90 gamekeeper participants who counted the birds on their land in spring and autumn. The GWCT relaunched the scheme in 1998 under the banner "Every one counts". It sought to increase the national coverage and, in addition to the monitoring role, to use the contact with game-

keepers, farmers and landowners to encourage more and better management. Core to the approach was persuading such people that, even if they had few grey partridges on their land, it was worth making the effort to conserve them because every increase contributed to the restoration of the species. To help contributors count and monitor their own partridges, the GWCT produced a guide to aging and sexing grey partridges in the spring and autumn. In addition, each contributor receives a spring and autumn newsletter, a minimum numbers of pairs to aim for (based on landscape characteristics - see below) and feedback on how to achieve this. The paper by Ewald et al. (2009) goes into the PCS in greater depth.

Local Partridge Groups

Bringing together people who are interested in grey partridges promotes enthusiasm and opportunities for information dissemination. In counties (or clusters of counties) with over 30 PCS contributors, the GWCT organises local Partridge Groups with at least two meetings a year open to all contributors within the area. The meetings allow presentation and discussion of the latest research, management ideas and government agri-environment regulations relevant to grey partridges, and also comprise field visits showing good management practice. In 2006 there are nine Partridge Groups, in the Borders, Cotswolds, East Lothian, Kent/Sussex, Lincolnshire, Norfolk, Northumberland, Shropshire/Cheshire/Staffordshire and Wessex, with more planned.

Restoration Project

The GWCT's demonstration farm at Loddington has shown spectacularly for pheasants and hares how much may be achieved for relatively modest effort, and welcomes over 2000 visitors a year (Stoate and Leake 2002). The same type of demonstration was sorely needed for grey partridges. In 2001, the GWCT therefore set up a new demonstration site where visitors may see for themselves the management techniques that are needed for grey partridges, observe the increase in numbers of grey partridges

that results from the management, and learn about the pitfalls and costs. This restoration project is so important that it deserves a section all of its own (see below).

Research into Re-establishment

The approaches described above attempt to address the first of the grey partridge Species Action Plan targets, lay the foundations for the second, but fail to tackle the third. The problem is that the grey partridge has now disappeared from large parts of its former range, and is at very low density in others. By 2003, anecdotal evidence was mounting that, despite appropriate management, grey partridge restoration was unsuccessful in some areas because of a lack of wild birds to take advantage of it. Re-establishment through releasing was the obvious solution, especially as the grey partridge is relatively easy to rear in captivity. However, past work has shown that the standard practice of releasing young game-farm birds in late summer fails repeatedly because of poor post-release survival. In 2005, the GWCT therefore launched a new research project "Determining optimal release methods as a tool for restoring the abundance and range of grey partridges in the UK". Browne et al. (2009) review releasing techniques and describe the experimental design of the research trial.

Estimating Partridge Distribution

Underpinning the whole of the GWCT's grey partridge recovery programme is the ability to identify what parts of the UK are suitable for grey partridges, and to assess their potential in terms of the likely density of breeding pairs - it would be self-defeating to encourage species recovery in intrinsically unsuitable locations, or to raise unrealistic expectations.

We built on Tapper (1999), who constructed national habitat maps for game and predator species using the Countryside Information System (Department of the Environment, Transport and the Regions and Centre for Ecology and Hydrology), a mapped repository of landscape, land use and climatic data defined for every 1-km² grid square (100 ha) across

Great Britain. Most data came from the Countryside Survey 1990 and the Land Cover Map of Great Britain (Barr et al. 1993), which provided a national snap-shot of the British countryside from 1988 to 1990 involving detailed field observations and satellite imagery. Ten years later, the Countryside Survey 2000 and Land Cover Map 2000 provided a second snapshot of land cover from 1998 to 1999 (Firbank et al. 2003). Within the Countryside Information System, the Ordnance Survey's 1:250,000 "Strategi" digital map data contributed information on roads and urbanisation. We imported the land cover data into the geographical information system Mapinfo Professional 8.0 (Mapinfo Corp., Troy, New York).

Following Tapper (1999), we first excluded squares influenced by urban areas, specifically ones that met any of the following criteria: >1 ha of town, >25 ha of village, >2 ha of motorway or >6 ha of A-roads. Out of the remainder, squares containing potentially suitable grey partridge habitat were those with >10 ha of arable/horticultural land and <10 ha of deciduous/coniferous woodland. These were further classified into optimal (≥ 50 ha of arable/horticultural land) and suboptimal (the balance). These definitions gave a reasonable approximation to the open arable habitat where the bird was common in the past, as well as taking in the fringe upland habitat on the edge of cultivated ground that also supports this species. The resulting distribution of squares (Figure 2) closely resembled the observed distribution of the grey partridge in the 1968-1972 Atlas (Sharrock 1976), before the partridge decline began in earnest.

To translate the habitat map into potential numbers of birds, we multiplied the area of each habitat type by the potential density expected there: under modern agriculture, around four, two and zero pairs per km² on optimal, suboptimal and unsuitable ground respectively (Potts 1986, Aebischer 1991). The resulting estimates yield UK totals of 219,360 pairs based on the 1990 survey, and 206,160 pairs from the 2000 one (Table 1). The difference between surveys is due to a 30% loss of suboptimal

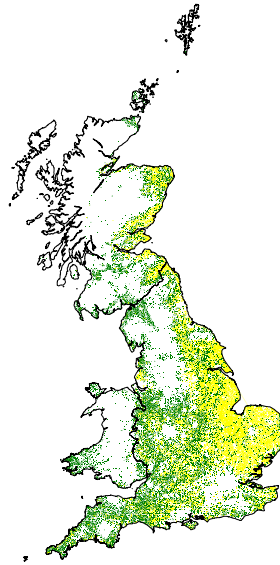


Figure 2: Map of Great Britain showing the national distribution of 1-km² squares classified as optimal (yellow), suboptimal (green) and unsuitable (white) for grey partridges based on landscape characteristics in 2000 (see text for details).

ground, offset to some extent by a 7% gain in optimal ground. The changes resulted mainly from the reclassification of suboptimal ground: a fifth of suboptimal squares became optimal following increases in arable, while over a third became unsuitable, principally through the expansion of woodland.

Despite the changes on the ground during the 1990s, the potential number of partridge pairs remains well over the 2010 target figure from the grey partridge Species Action Plan. This is reassuring, because it means that recovery is not an impossible task.

Based on simulation modelling (Potts 1986, Aebischer 1991), the effects of management are roughly to double the density in the case of either predation control or habitat management implemented separately, or to multiply it sixfold (synergistic effect) when both are implemented together. Projecting backward to the 1950s, before the intensification of agriculture and the widespread cessation of game-keeping, most of Britain would qualify as managed in this way. Assuming a land classification roughly the same as in Table 1, the partridge potential was for 1.2-1.3 million pairs. This fits remark-

ably well with Figure 1, where an estimated 1.1 million pairs existed in 1962, when the decline had just started.

Grey Partridge Demonstration Project

The Grey Partridge Demonstration Project began in 2002, with as specific aims (1) to develop an area of arable farmland as a demonstration site to restore the abundance of wild grey partridges to a level predicted by GWCT models, and (2) to demonstrate how to manage farmland to increase densities of wild grey partridges in accordance with, and for the furtherance of, the targets laid down in the grey partridge Species Action Plan.

The demonstration area covers 996 ha comprising six farm holdings on light chalky land near Royston, Hertfordshire, in eastern England (Figure 3). A surrounding area of 1311 ha (seven holdings) constitutes a reference area for comparison. Using the mapping approach described above, the amount of optimal and suboptimal land was 723 and 99 ha respectively on the demonstration area, and 1161 and 30 ha on the reference area. In the absence of man-

Table 1: Areas of optimal, suboptimal and unsuitable habitat for grey partridges in England, Scotland and Wales, derived from Land Cover Maps (LCM) for 1990 and 2000, and estimated potential number of pairs (see text for method of estimation).

Country	Area (km ²)			Grey partridge potential (pairs)
	Total	Optimal	Suboptimal	
LCM 1990				
England	130,383	31,884	28,766	185,068
Scotland	78,479	3,802	7,556	30,320
Wales	20,757	30	1,926	3,972
Total	229,619	35,716	38,248	219,360
LCM 2000				
England	130,383	33,666	20,047	174,758
Scotland	78,479	4,497	4,678	27,344
Wales	20,757	77	1,875	4,058
Total	229,619	38,240	26,600	206,160

agement, this gives a potential number of pairs on the demonstration area of 31 (3.1 per km²), and on the reference area of 47 (3.6 per km²). The target with full predator and habitat management is 186 pairs (18.6 per km²) on the demonstration area.

Since January 2002, the GWCT has taken the following measures to increase wild grey partridge densities, based on its understanding of grey partridge ecology:

- (a) Predation control. The GWCT employs a gamekeeper whose main duty is the legal control of predators that kill adult partridges or destroy their nests.
- (b) Habitat management. The GWCT has encouraged farmers to undertake management that increases the amount of nesting, brood-rearing and overwinter cover, making best use of set-aside and, where possible, linking in with existing agri-environment options subsidised by government.
- (c) Supplementary feeding. A secondary duty of

the gamekeeper is to provide wheat grain in hoppers placed along field margins and cover strips from September to March, to counteract any winter food shortage.

- (d) Other game species. Wild pheasants *Phasianus colchicus*, red-legged partridges *Alectoris rufa* and brown hares *Lepus europaeus* also respond positively to the management regime, and the gamebirds may compete with grey partridges. The GWCT organises some four shoot days a year to reduce their numbers and to offer recompense to participating farmers. It strongly discourages any releasing of reared gamebirds.

The gamekeeper counts grey partridges on both the demonstration and reference areas twice a year, in the spring (pairs, from 2002 onwards) and in the autumn (adults and young, from 2001 onwards). The 2001 autumn counts and 2002 spring pair counts reflect the densities of grey partridges before management began. The 2001 autumn counts on the demonstration and reference areas gave similar low densities, around 8 birds per km², and the spring

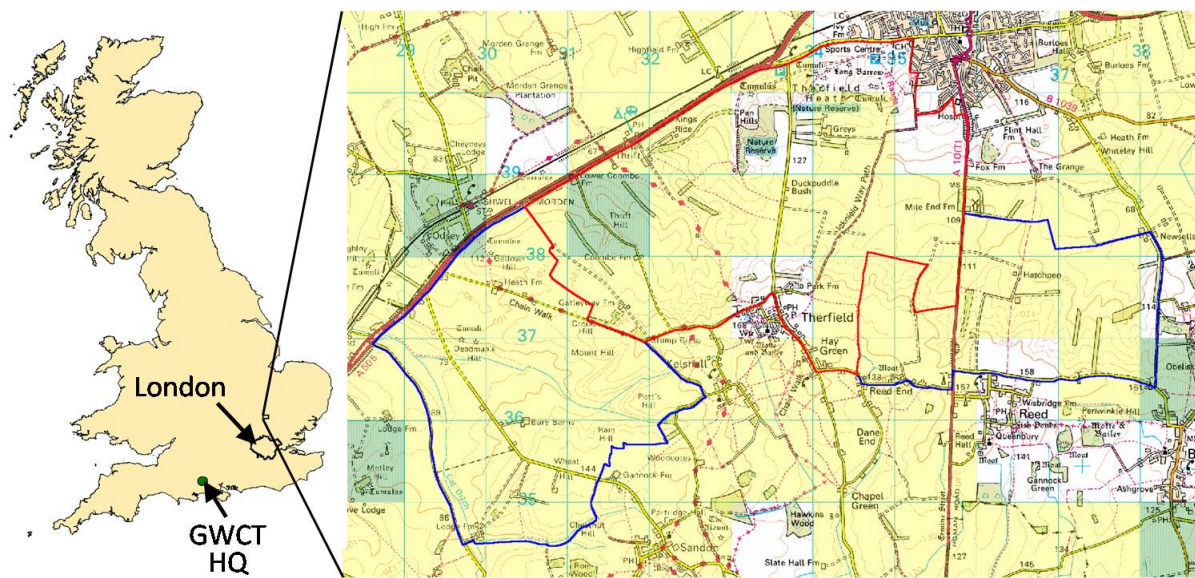


Figure 3: Location of the Grey Partridge Demonstration Project, in eastern England, and Ordnance Survey map outlining the demonstration (blue) and reference (red) areas. Superimposed on the map is a 1x1-km grid, with squares classified as optimal (yellow), suboptimal (green) or unsuitable (white) for grey partridges according to landscape characteristics in 2000 (cf. Figure 2).

densities were below the potential number for unmanaged ground (Figure 4). By spring 2003 the density on the demonstration area had exceeded the unmanaged potential, and by spring 2006 it had increased by 4.5 times, to 13 pairs per km². The most recent (2005) autumn count, four years after the onset of management, gave numbers 8 times higher than at the start. On the adjacent reference area, although spring density had doubled by 2006, it remained below its unmanaged potential. The 2005 autumn numbers were less than a third of those on the demonstration area.

Progress Towards the Targets

Based on calibrating the annual BTO index of abundance with the estimated 140,000-150,000 pairs during the 1988-1991 Atlas survey (Gibbons et al. 1993), the present UK population level is around 65,000 pairs (Figure 1). The last four years of data show an ongoing decline, although an increase from 1999 to 2002 means that abundance since 1999 ap-

pears stable overall. This contrasts with an average annual rate of decline between 1980 and 2000 of -7%. Optimistically, therefore, the first target in the Species Action Plan may be met. Achieving the second target of 150,000 pairs by 2010, however, looks unrealistic. It requires an increase in the national population of 230% over five years, equivalent to a sustained 18% per annum. Although this has been achieved and more at the local level, as at Royston, the dedication and resources needed to achieve such a result are not typical. If the raising of awareness and the changes in government agricultural policy bear fruit, what is more likely is that the decline will be reversed, with a rate of increase perhaps close to the 8% per annum observed in new Partridge Count Scheme participants (Ewald et al. 2009). Taking 7% per annum to be cautious, compound growth over five years gives an increase of 140%, so the predicted total would be 91,000 pairs in 2010, 127,000 pairs in 2015 and 178,000 pairs in 2020.

It seems clear that Britain will not meet the 2010

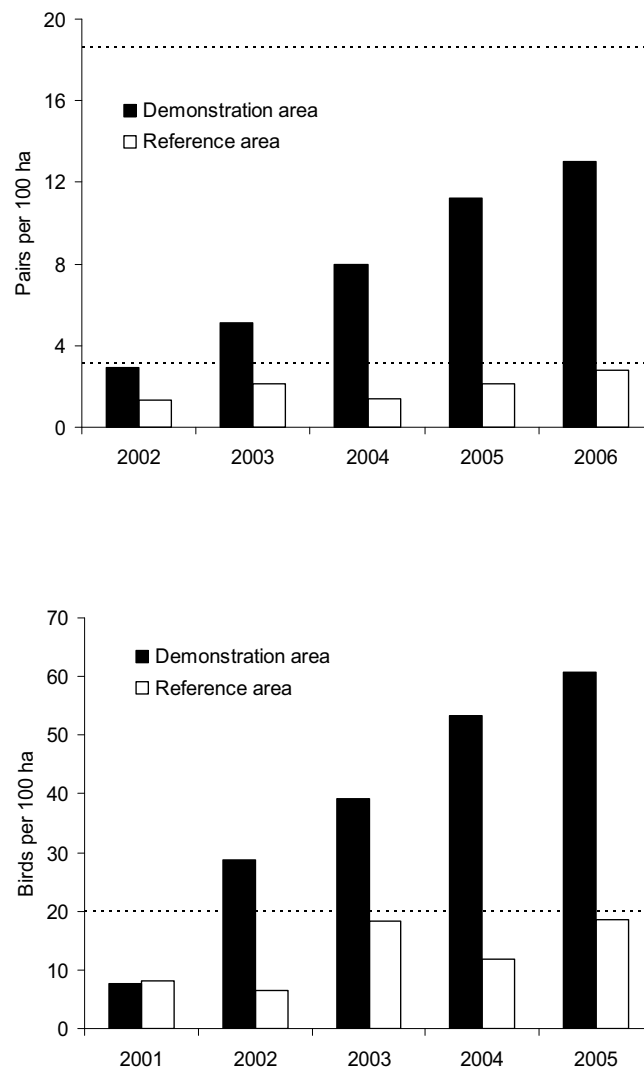


Figure 4: Annual spring (top) and autumn (bottom) grey partridge densities on the demonstration and reference areas of the Grey Partridge Restoration Project at Royston. Management began on the demonstration area in January 2002, so the autumn 2001 and spring 2002 counts are representative of an unmanaged situation. The dashed horizontal lines indicate the potential densities based on landscape characteristics for unmanaged and fully managed scenarios.

target set in 1995. Many other species are in the same situation (UK Biodiversity Reporting and Information Group, unpublished). With the aid of its lead partners, the UK government is in the process of revising the original targets in the light of recent knowledge, and extending them beyond 2010. At the same time, biodiversity conservation in the UK is

now the responsibility of devolved country administrations, each of which needs its own targets. For the grey partridge, based on the calculations above and taking into account that recovery is likely to slow as numbers increase, the GWCT has proposed that revised UK targets should be 90,000 pairs in 2010, 120,000 pairs in 2015 and 160,000 pairs in 2020 (Ta-

Table 2: Revised targets for the UK grey partridge species action plan proposed to the UK government by the GWCT in 1995 for England, Scotland and Wales, together with practical yardstick values based on the BTO's annual Breeding Bird Survey (BBS) against which to measure success.

Country	Revised targets			
	2005	2010	2015	2020
Abundance (pairs)				
England	55,000	76,000	101,000	135,000
Scotland	9,000	12,500	17,000	22,500
Wales	1,000	1,500	2,000	2,500
Total	65,000	90,000	120,000	160,000
BTO abundance index	0.72	1.00	1.33	1.67
Range (100-km squares)				
England	1,100	1,100	1,150	1,200
Scotland	300	300	325	350
Wales	50	50	55	60
Total	1,450	1,450	1,530	1,610
BBS squares occupied (%)	8	10	12	15

ble 2). It has translated these into country targets by subdividing the totals according to the availability of suitable ground in Table 1.

The government also sought measurable targets for range change. Hitherto, the BTO assessed range change through Atlas surveys every 20 years. More frequent assessments are possible by considering the annual percentage of occupied Breeding Bird Survey squares as a surrogate measure. To determine the current range, we extrapolated from the change in number of occupied 100-km² squares observed between the 1968-72 and 1988-91 Atlas periods (England: -14%, Scotland: -24%, Wales: -48%), when abundance fell by 72%, to what the change would be between 1988-1991 and now, when abundance fell by a further 50% (extrapolated change = Atlas change x 50/72). The result, when applied to the range observed in the 1988-91 Atlas, gave a total of 1450 100-km² squares occupied by grey partridges in Britain (Table 2). This corresponds to 8% occupancy of BBS squares (average 1999-2003). Since 1994, when the BBS started, the maximum occu-

pancy rate was 14% in 1996 for an estimated population size of 115,000 pairs (from Figure 1). We proposed targets for range expansion that reflected the population targets, taking into account a likely lag between the consolidation of numbers in core areas and recolonisation (it seems probable that numbers would need to build up first and fill gaps within the existing range before noticeable range expansion occurs), and assuming that rates of increase in BBS occupancy would be matched by ones in Atlas squares (Table 2).

Conservation Implications

The decline in numbers of grey partridges in the UK has been so severe that there is no longer any question that the bird must be a top priority for conservation (Gregory et al. 2002). Farmers, land owners and shoot managers are the people on the ground best placed to help restore the fortunes of the grey partridge, and indeed, to benefit if they can increase numbers to a level where sustainable shooting can take place. Education is therefore crucial to raise

awareness and encourage such people into sympathetic land management. Until recently, such encouragement was outweighed by harsh economic reality, as the production-driven incentives of the European Union's farm subsidies drove farmers towards ever greater intensification, especially as farm incomes deteriorated after 1995 (e.g., Potts 1997).

Two major recent events, however, have led to a widespread upheaval of UK farming. The Policy Commission on the Future of Farming and Food published a report advising the UK government on how to create a sustainable, competitive and diverse farming sector (Curry 2002), with recommendations for incorporating environmental stewardship into farm policy. A major reform of the European Union's Common Agricultural Policy (Council Regulation (EC) No. 1782/2003) paved the way for breaking the link between subsidies and production. The UK government seized the opportunity to combine both, decoupling production from subsidies with the Single Farm Payment scheme, and tying subsidies instead to good agricultural practice and wildlife-sympathetic land management. It also introduced a new Environmental Stewardship scheme (Anonymous 2005b) that replaces and augments previous agri-environmental schemes, and contains many options derived from GWCT research. In England and Wales, these options come in the form of the Entry Level Scheme (Anonymous 2005a), open to all farmers who apply, and the Higher Level Scheme (Anonymous 2005c), which supports more intensive habitat management with a competitive, targeted approach. The Land Management Contracts offer similar opportunities in Scotland (Anonymous 2005d). We have high hopes that these reforms may remove some of the financial barriers that have stood in the way of large-scale adoption of the management required to reverse the grey partridge decline. To showcase how the range of options may best be deployed to aid grey partridge recovery, the GWCT advised farmers from the demonstration area of its Grey Partridge Demonstration Project on choosing and placing Entry Level Scheme options. This Project now offers an essential educational re-

source that should serve as a source of inspiration for land managers across the country.

In conclusion, the different strands of the GWCT recovery programme form a package that, coupled with the government's agricultural reforms, offers genuine hope for the recovery of the grey partridge in the UK. The tools and targets for monitoring that recovery are also in place, and I look forward to reporting on progress in a few years' time.

Acknowledgments

We thank all the individual farmers, gamekeepers, landowners and scientists, as well as the organisations and companies, who have dedicated time, effort and money to the cause of the grey partridge.

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