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Farmland birds and resource protection in the UK: Cross-cutting solutions for multi-functional farming?

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ARTICLE INFO

Article history:
Received 18 April 2005
Received in revised form
23 September 2005
Accepted 18 November 2005
Available online 6 January 2006

Keywords:
Agri-environment schemes
Small constructed wetlands
Diffuse pollution
Biodiversity
Multifunctional

ABSTRACT

Farmland bird declines in Europe are well documented. In the UK, agri-environment schemes are key mechanisms for reversing the declines of birds and other farmland biodiversity, but recent reviews suggest that wet habitats might be a gap in provision by these schemes. Important resources provided by wet habitats include: (i) damp soil, for probing species; (ii) permanent water to provide water-dependent invertebrates, as a source of food; (iii) bare or sparsely vegetated ground in the draw-down zone, to improve access to food; (iv) rank emergent vegetation for nesting. However, wet habitats have been lost from farmland as a result of loss of ponds and filling of ditches, as well as the effective removal of water from fields by surface run-off, itself affected by soil compaction, and extensive under-field drainage. The efficient removal of water from fields can cause problems downstream, both through flooding, and diffuse pollution. Regular farmland pollutants include pesticides, nitrogen, phosphorus and sediment, leading to environmental problems such as eutrophication and reduced quality of drinking water. Major new political instruments, such as the Water Framework Directive, will aim to reduce the impact of this diffuse pollution from agriculture. A variety of solutions to diffuse pollution, such as conservation tillage, buffer strips at field edges, and small constructed wetlands, could simultaneously provide some of the resources required by farmland birds. We suggest that future agri-environment schemes, to be truly multifunctional, could focus on bringing these diverse objectives together.

1. Introduction – farmland bird declines

Declines in farmland birds in the UK and elsewhere in Europe are well documented, with the effects of various components of agricultural intensification primarily to blame (Donald et al., 2001; Krebs et al., 1999; Newton, 2004; Shrubb, 2003; Vickery et al., 2004a,b). In the UK, this has led to a series of Government targets to reverse these declines. These include Biodiversity Action Plans (BAPs: Anon, 1995, 1998) for individual species and the adoption of a composite index of wild bird population trends, including a farmland bird index (FBI), as a key indicator of sustainability of UK lifestyles. The UK Department for Environment, Food and Rural Affairs (Defra) has agreed a Public Service Agreement (PSA) with the Treasury to reverse the long-term decline in farmland bird populations, as measured by the FBI, by 2020.

Changes in European agricultural policy are leading to increased switching of funding from production subsidies to rural development, including support of agri-environment schemes. Though they have received some justified criticism for poor monitoring (Kleijn and Sutherland, 2003), agri-environment schemes are likely to be a key mechanism for UK

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0006-3207/$ - see front matter
doi:10.1016/j.biocon.2005.11.020

farmland bird conservation (Evans et al., 2002; Grice et al., 2004; Kleijn and Sutherland, 2003; Smallshire et al., 2004; Vickery et al., 2004a). In the UK, the successes with agri-environment schemes to date have been for range-restricted species, such as stone curlew *Burhinus oedicnemus* and cirl bunting *Emberiza cirlus*. In these cases, the measures deployed through the Environmentally Sensitive Areas and Countryside Stewardship Schemes, respectively, were based on sound scientific evidence of the requirements of the species and were geographically highly targeted at the species concerned (Aebischer et al., 2000). The next step was to design schemes that could be deployed over wide enough areas to benefit declining, but still widespread, species. Pilot schemes have demonstrated successful enhancement of a range of both invertebrate and plant taxa on which birds depend for food (Critchley et al., 2004; Pywell et al., 2004a,b), though there has been more limited success for birds, possibly as a result of time-lags in the birds' response to resource provision (Bradbury and Allen, 2003; Bradbury et al., 2004; Stevens and Bradbury, in press).

Agri-environment schemes have evolved rapidly in the UK, through a framework of option development and trials (Evans et al., 2002; Vickery et al., 2004a). Generic measures are now being funded, aimed at improving the general quantity and quality of bird habitat on modern farms, including hedgerow re-planting, grassy field margins, fallows, stubbles, low-input crops and wild bird seed mixture crops. Vickery et al. (2004a) concluded that the suite of options now included in the UK agri-environment schemes should provide the majority of the nesting and feeding resources required by farmland birds, though lack of funding might compromise the quality and quantity of delivery of options and hence current potential to deliver bird population increases. However, one key omission in the suite of options was the provision of wet habitats.

As agriculture moves more towards the principle of payment for production of public goods, it is likely that farmers will be required to do much more to internalise both the external benefits and costs of agriculture (Armstrong Brown et al., 2004; Stoate et al., 2001; Stoate, 2003). Costs include damage to soil and water resources. Here, we examine links between wet farmland habitats and declining farmland birds, review the ways in which farmland has been dried out, and the consequences of this process for protection of soil and water resources. Then, we examine some solutions for resource protection and their potential integrated benefits for providing food resources and nest sites for farmland birds.

2. Review methodology

Literature searches were carried out using ISI Web of Science® (1981–present), checking the literature cited in the resulting collection of papers and reports to cover older publications. First, we searched for the literature on UK *farmland birds*. Hypotheses cited by authors to explain variations in behaviour or demography, with respect to wet habitat resource provision, are collated and presented. We then searched the literature on *resource protection* and *diffuse pollution* from the UK and elsewhere, to identify consequences of drying out of farmland for resource protection and potential resource protection solutions with benefits for farmland birds. Decisions on inclusion of resource protection solutions were necessarily subjective, based on our consideration of whether they could provide the resources required by the farmland birds.

3. Links between wet habitats and farmland birds

Large wetland habitats are extremely important to UK biodiversity conservation, with many supporting nationally and internationally important numbers of waterfowl, waders and other taxa, and are recognised as such by conservation status such as Ramsar sites and Special Protection Areas. However, we confine our attention here to the evidence that suggests that resources associated with smaller wet features on farmland are also important for a range of declining bird species of conservation concern (see also Table 1).

3.1. *Water-dependent invertebrates*

Many farmland birds take a wide range of invertebrate taxa as prey (Wilson et al., 1999). Invertebrates are especially important in chick diets, even of granivorous species. Many of these invertebrate taxa, including Odonata and Chironomid midges (Diptera: Chironomidae), are obligately aquatic as larvae. The simultaneous emergence of large numbers of adults of these groups could provide, from an optimal foraging perspective, an ideal food supply for foraging farmland birds. The concentrated feeding of species such as swifts *Apus apus* and hirundines over water-bodies suggests that, at times, these provide productive feeding sites. Davies (1977) found that adult midges were the favoured food of both yellow *Motacilla flava* and pied wagtails *M. alba*, making up 50% of yellow wagtail diet. Similarly, Nelson et al. (2003) found that both midges and damselflies were important components of nestling yellow wagtail diet, while Mason and Lyczynski (1980) showed that 52% of yellow wagtail nests were close to water. Anderson et al. (2002) found that wetland-dependent invertebrates, such as adult midges, were a major component of the diet of tree sparrow chicks *Passer montanus* and consequently provisioning adults selected wet habitats above all other habitat categories. Field and Anderson (2004) further showed that new nest box colonies were more likely to be adopted by tree sparrows when adjacent to aquatic habitats than when in dry intensive farmland. They concluded that selection of wetland habitats reflects the loss of invertebrates on intensive farmland as much as the relatively high quality of feeding resource now provided by wet habitats within such a farmland landscape. This might also explain an association between corn bunting *Miliaria calandra* territories in Essex and water-filled ditches (Mason and Macdonald, 2000).

3.2. *Rank wetland vegetation*

Rank wetland vegetation provides concealment for nest sites and a home for invertebrates such as epigeal arthropods and molluscs. Most breeding reed buntings *Emberiza schoeniclus* in the Trent valley, England, sited their territories close to open water and rank vegetation, with many nesting in this substrate (Brickle and Peach, 2004; Gruar et al., in press). Nearly 80% of all foraging by provisioning adults was also in the rank