Bird Response to Conservation Reserve Program Land and Landscape Attributes in Maryland and Delaware

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Introduction

The U.S. Department of Agriculture's (USDA) Conservation Reserve Program (CRP) offers economic incentives to encourage farm owners to convert highly erodible and other environmentally sensitive agricultural land to perennial, vegetative cover. The goals of the CRP are to improve water quality, reduce soil erosion, and establish wildlife habitat. CRP land often represents the only uncultivated herbaceous areas on farmland in Maryland and Delaware and therefore may be important for wildlife species that use early-successional habitats. Early-successional birds (i.e. grassland or scrub-shrub birds) use herbaceous CRP plantings in Maryland and Delaware for breeding and wintering (Blank et al. 2011).

The landscape around herbaceous plantings influences bird community composition. For example, grassland bird density may be negatively related to landscape cover type diversity (Ribic and Sample 2001). However, there are many uncertainties about the influence of landscape factors on early-successional bird communities (Ribic et al. 2009).

Filter strips (USDA Conservation Practice 21) are strips of herbaceous vegetation that are planted along agricultural field margins and are the most common CRP practice in Maryland and Delaware (Fig. 1). Filter strips are usually planted either to native warm-season grasses or cool-season grasses, with the addition of native wildflowers or introduced legumes (usually clovers).

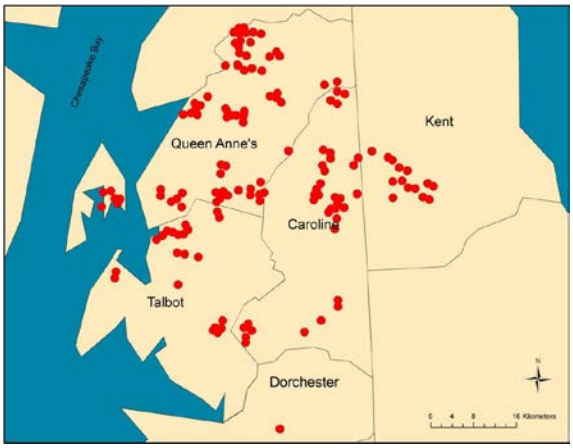
Figure 1 A warm-season grass filter strip between a soybean field and a forested wetland

From 2005-2007 researchers at the University of Maryland assessed the response of breeding early-successional birds to the amount of CRP land and landscape attributes around filter strips in Maryland. They also studied the response of northern bobwhite (*Colinus virginianus*: hereafter bobwhite) to the amount and distribution of CRP land in Maryland and Delaware, and assessed which landscape attributes influenced bobwhite abundance.

Particular attention was focused on bobwhite because it is an important game bird and a species of conservation concern due to its declining population (Brennan 1991, Burger 2001, Sauer et al. 2008). Bobwhite declines are linked to factors including weather, harvest, disease, and land

cover changes (Guthery 2000, Burger 2001). However, the primary cause of bobwhite population declines is the loss or deterioration of bobwhite habitat (Brennan 1991, Burger 2001). The CRP could provide nesting, brood-rearing, and roosting habitat for bobwhite (Burger et al. 1990, Puckett et al. 2000), leading to an increase in bobwhite abundance.

Study Area



The research was conducted in 4 counties (Caroline, Dorchester, Queen Anne's, and Talbot) on the Eastern Shore of Maryland (the area of the state east of the Chesapeake Bay) and in Kent County, Delaware. The region is dominated by rowcrop agriculture interspersed by upland forest blocks and forested wetlands. At least 82% of the CRP land in these counties was planted to herbaceous conservation practices. Early-successional bird surveys were conducted in 34 filter strips, and bobwhite surveys were conducted at 139 roadside locations (Fig. 2) adjacent to fields with and without CRP land.

Figure 2 Northern bobwhite survey locations in Maryland and Delaware

Bird Surveys

Early-successional breeding bird surveys in filter strips were conducted in 2005 and 2006 by using a strip transect method with multiple observers (Blank et al. 2011). Bobwhite were surveyed from 2005–2007 by using a point transect method (Blank 2010) modified from the bobwhite monitoring protocol designed by the Southeast Quail Study Group (Burger et al. 2004). For each survey and in each year, one round of surveys was conducted from May–June, and a second round from June–July.

Spatial Analysis

The 2001 National Landcover Data Set (NLCD) (Homer et al. 2004) was used to classify the land cover types around each study site. In ArcGIS 9.2 (ESRI, Redlands, CA), the raster image was converted to a polygon shapefile and the land cover classes were reclassified into: open water and emergent wetlands; developed and barren land; forest; or agricultural land (including cropland and pastureland). The reclassified land cover shapefile was merged with a shapefile containing the spatial extent and geographic location of CRP land in Maryland and Delaware obtained from the NRCS. Landscape metrics were calculated within 1 km of each filter strip and within 500 m of each bobwhite survey location. The landscape metrics included: the percent cover of CRP land, forest, and agriculture; the length of total edge; the diversity of land cover types; patch density; and an index measuring the aggregation or disaggregation of CRP land.

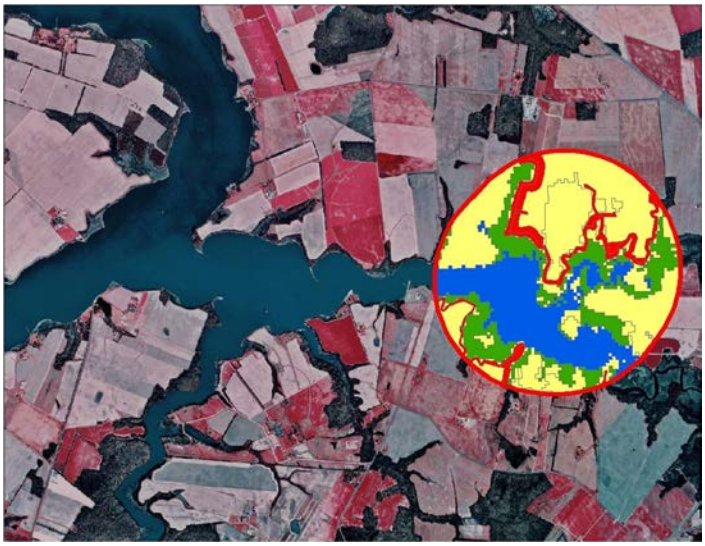


Figure 3 Land cover type classification within a 1-km radius landscape around a CRP filter strip. The red areas in the study landscape represent CRP habitat.

Statistical Analysis

The researchers used partial redundancy analysis, a constrained form of principal component analysis, to assess the effects of landscape variables on the early-successional bird community. Stepwise multiple regressions were used to assess individual species' responses to landscape attributes around filter strips. An information-theoretic model selection approach was used to compare competing models of bobwhite abundance as a function of multiple covariates.

Results

Sixteen early-successional bird species were recorded in filter strips during the breeding seasons of 2005 and 2006. Indigo buntings (*Passerina cyanea*) had the greatest densities, followed by American goldfinches (*Carduelis tristis*), red-winged blackbirds (*Agelaius phoeniceus*), and common yellowthroats (*Geothlypis trichas*).

The early-successional bird community in filter strips was positively related to the amount of agriculture in the surrounding landscape ($F = 3.32$, $P = 0.004$). Common yellowthroats and indigo buntings had higher densities in landscapes with more agriculture, and landscapes with more agriculture had lower landscape cover type diversity. Bobwhites were also more common in landscapes with more agriculture. The amount of CRP land in the landscapes had little effect on the overall bird community, but field sparrows (*Spizella pusilla*) were positively associated with the amount of CRP land.

There was strong support that the amount of CRP land in the landscapes was positively related to bobwhite abundance. At least 78% of the CRP land around the bobwhite survey points was planted to herbaceous vegetation. There was no evidence for a significant relationship between bobwhite abundance and the aggregation of CRP land in landscape. The density of calling bobwhites across all sites was 0.02 bobwhite/ha, and estimated abundance of calling bobwhite across all 139 landscapes was 214 bobwhite.

Discussion

This study agrees with others that have found that some early-successional birds are more common in herbaceous habitats in agriculture-dominated landscapes compared to forest-dominated landscapes (Riddle 2007, Riffell et al. 2008). Landscapes with more agriculture and less forest cover are associated with higher bobwhite densities during the breeding season (Veech 2006, Riddle et al. 2008). This suggests that targeting herbaceous CRP enrollments for agriculture-dominated landscapes will provide better habitat for bobwhite and other early-successional bird species.

Herbaceous CRP land in Maryland and Delaware has provided additional habitat for bobwhite, leading to an increase in bobwhite abundance. The results corroborate Riffell et al. (2008) who reported that bobwhite abundance across their breeding range was positively related to grass-based CRP practices. Higher bobwhite abundance in CRP habitats could be due to relatively high food availability (e.g., higher invertebrate densities) and therefore higher quality brood cover (Burger et al. 1990).

Occasional disturbance of herbaceous habitat is required to reduce litter and vegetation density and to maintain areas of annual weeds and bare ground that are essential for bobwhite (Burger et al. 1990, Brennan 1991, Greenfield et al. 2003). However, opening vegetation on CRP land must be balanced with the CRP goals of improving water quality and reducing soil erosion.

Management Implications

The CRP has created additional habitat for early-successional birds, including northern bobwhite, in Maryland and Delaware. Early-successional bird habitat may be improved if herbaceous CRP plantings were targeted for agricultural landscapes with low landscape cover type diversity. Landscapes with greater proportions of herbaceous CRP land will likely support more bobwhite.

Summary Findings

- Early-successional birds in filter strips were positively associated with agricultural landscapes and with low landscape cover type diversity.
- Targeting CRP enrollments for agriculture-dominated landscapes could provide better habitat for bobwhite.
- Landscapes with greater proportions of herbaceous CRP land supported more bobwhite.
- Increasing the amount of CRP land within approximately 1 km, regardless of its distribution, may provide additional bobwhite habitat and increase bobwhite abundance.

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