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Effects of width, edge and habitat on the abundance and nesting success of scrub–shrub birds in powerline corridors

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ABSTRACT

Concern about declines in scrub–shrub bird populations has resulted in efforts to create and maintain habitat for these species. Vegetation within powerline corridors is managed to prevent contact of vegetation with transmission lines, and comprises approximately 2% of all of habitat for scrub–shrub birds in southern New England. Although previous studies have documented the use of powerline corridors by scrub–shrub birds, important questions remain about the factors affecting the quality of corridors as habitat for these species. We surveyed birds and monitored nests on 15 corridors in western Massachusetts during 2002 and 2003 to determine whether scrub–shrub birds occupy and successfully reproduce in powerline corridors, and to identify the principal factors affecting scrub–shrub abundance and nesting success. We found that corridors were occupied by scrub–shrub birds of high regional conservation priority, however, four of seven focal scrub–shrub bird species were scarce or absent in narrow corridors, and the abundance of these species was highest in corridors of intermediate width. Overall, nest survival was low (0.14) at these sites relative to other types of early successional habitats in the region, however, if we consider only our sites that were wider than the median width ($\geqslant$49 m), nest survival in corridors was (0.33), similar to survival rates reported in other studies of scrub–shrub birds. We conclude that powerline corridors provide habitat for early successional birds of conservation concern, with wider corridors ($\geqslant$50 m) contributing more to regional conservation of these species.

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1. Introduction

The majority of bird species that breed in scrub–shrub habitats in eastern North America have experienced net population declines in recent decades (Askins, 1993). Declines in scrub–shrub birds are associated with decreased availability of suitable breeding habitat (Askins, 1993; Hagan, 1993). Scrub–shrub habitats are dominated by low, woody vegetation with little or no tree canopy, such as old fields or regenerating clearcuts. Historically, these habitats were created and maintained by fire, blowdowns, American beaver (*Castor canadensis*) activity, clearing by Native Americans and, more recently, by logging and agriculture (DeGraaf and Miller, 1996; Askins, 2000; Chandler et al., 2009). The extent of natural and anthropogenic disturbance has declined as the result of modification or disruption of disturbance processes and changes in land use, and scrub–shrub habitats now comprise a small and decreasing portion of the land area in the northeastern US (DeGraaf and Miller, 1996; Trani et al., 2001). Because of this, scrub–shrub birds and other disturbance dependent species are becoming more dependent on human activities to maintain the habitat required for their persistence. Deliberate creation of scrub–shrub habitats is a potentially important component of these efforts (King et al., 2009), however, due to the expense of large-scale habitat restoration projects, it is important for managers to take advantage of human activities that inadvertently create or maintain scrub–shrub habitat whenever possible (Thompson and DeGraaf, 2001).

Because powerline corridors are maintained in an early stage of succession, they comprise a potentially important source of habitat for scrub–shrub birds. Powerline corridors vary in many respects that could influence habitat suitability, however, and one potentially critical characteristic is corridor width. Some scrub–shrub birds appear to be "area-sensitive", and will not occupy otherwise suitable habitat if the patch does not meet their minimum size requirements (Askins et al., 2007; Chandler et al., 2009). Anderson et al. (1977) and Confer and Pascoe (2003) reported that some scrub–shrub birds were more abundant in wider corridors, suggesting that corridor width might affect scrub–shrub birds in a manner analogous to the effect of patch area (Askins, 1994). In addition to its effects on abundance, corridor width might affect

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nest success. Nest success increases with patch size in other habitats, for example, in mature forest (Hoover et al., 1995). Similarly, brood parasitism by brown-headed cowbirds (*Molothrus ater*) is known to be higher in smaller habitat patches (Brittingham and Temple, 1983). If nest success is affected by patch area in scrub–shrub habitats, corridors that are too narrow may not provide sufficient habitat to permit successful reproduction.

Edge avoidance and edge-related nest predation are phenomena associated with area effects that can harm birds (Parker et al., 2005; Weldon and Haddad, 2005). There is evidence that scrub–shrub birds are less abundant near edges (Schlossberg and King, 2008) and predation on scrub–shrub nests is higher near edges (Weldon and Haddad, 2005). Because the proportion of habitat within proximity of an edge decreases with corridor width, edge avoidance and edge-related nest predation could reduce abundance and nesting success of scrub–shrub birds in narrow corridors. This in turn could further compromise the quality of narrow corridors as habitat for scrub–shrub birds. Finally, birds may be influenced by habitat composition of the landscape beyond the bounds of the breeding site either because of potential target or rescue effects (Lomolino, 1990; Gotelli, 1991) or because it is a source for predators or brood parasites (Kurki and Linden, 1995; Rodewald and Yahner, 2001).

We studied scrub–shrub birds in corridors differing in width and other characteristics to help understand the ecology and management of these declining species. Specifically, we were interested in how much scrub–shrub birds use corridors, and whether scrub–shrub bird abundance and nesting success is related to corridor width, edge and habitat at either the site or landscape scale.

2. Methods

We studied birds in powerline corridors over a ≈4000 km^2 study area in western Massachusetts during 2002 and 2003 (Fig. 1). The study area is 86% forested, and in the New England/Acadian Forests ecoregion (Ricketts et al., 1999). All corridor sites within the study area that consisted of shrubby successional upland (as opposed to wetland forest or agricultural field), that traversed mature forest, and were accessible by road were identified. Subsequently, these sites were numbered and 15 chosen randomly for inclusion in the study. In most cases we were able to maintain a minimum distance of 10 km between adjacent sites to maximize statistical independence. These sites averaged 49.3 m (5.69 SE) in width, and represented the full range of available powerline corridor widths in the study area from the narrowest (14.8 m) to the widest (78.4 m). Vegetation within corridors was

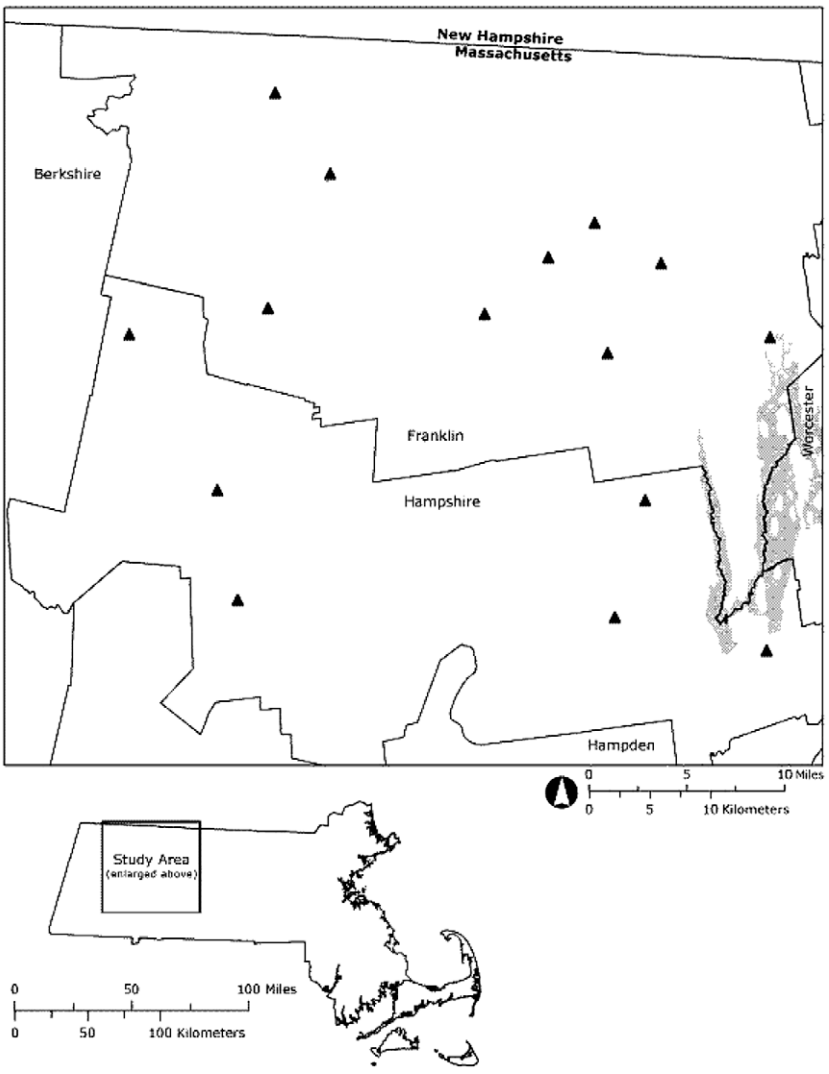

Fig. 1. Map illustrating location of 15 study areas on powerline corridors (▲), Franklin and Hampshire counties, Massachusetts, 2002 and 2003. The dark area on the eastern side of the map is the Quabbin Reservoir.