

The Distribution and Abundance of Obligate Grassland Birds Breeding in New England and New York

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Abstract

It is clear that grassland bird populations have declined significantly during the last 30 years. Declines are widespread in North America, making grassland birds a continental conservation priority. In New England and New York steep population declines for many species warranted listing in many states. Habitat loss through farm abandonment and the subsequent succession of grassland habitat to forest is the principle cause of the observed population declines. Because of the concern for grassland bird conservation and the lack of an understanding of the regional distribution and relative abundance of grassland birds in New England and New York, we coordinated a survey of breeding grassland birds throughout this region from 1997-2000. We estimated the occurrence and relative abundance of seven obligate grassland bird species at 1,140 sites. Sites included hayfields, fallow fields, pastures, airports, and military bases. Of the seven species surveyed, Savannah Sparrows (*Passerculus sandwichensis*) and Bobolinks (*Dolichonyx oryzivorus*) were most common, occurring on 72 percent and 69 percent of all sites, respectively. Eastern Meadowlarks (*Sturnella magna*) were detected on 37 percent of all sites. Upland Sandpipers (*Bartramia longicauda*), Vesper Sparrows (*Poocetes gramineus*), Grasshopper Sparrows (*Ammodramus savannarum*), and Henslow's Sparrows (*Ammodramus henslowii*) were generally uncommon and occurred on <20 percent of the surveyed sites. We used bird distributions and geopolitical affinities to define eight sub-regions throughout the Northeast to better direct conservation actions. Each sub-region was important for different species: Grasshopper Sparrows were most widely distributed in

the Finger Lakes sub-region. Upland Sandpipers and Vesper Sparrows were most abundant in the South-Central Maine sub-region, Bobolinks were most common in the Connecticut River/New Hampshire sub-region, Eastern Meadowlarks were most widespread in the Mohawk Valley of New York, but we estimated the highest relative abundance in the St. Lawrence Plains. With these data, we gained a clear understanding of which areas in each state were most important for each species. This information can assist in setting conservation priorities in New England and New York and provide baseline information for the development of a comprehensive regional grassland bird management plan.

Key words: Bobolink, Eastern Meadowlark, Grasshopper Sparrow, grassland birds, Henslow's Sparrow, New England, New York, Northeast, power analysis, Savannah Sparrow, Upland Sandpiper, Vesper Sparrow.

Introduction

The decline in grassland bird populations throughout North America, and in New England and New York (hereafter Northeast; Askins 1993, Peterjohn and Sauer 1999) has stimulated research and conservation action directed towards grassland bird conservation (Andrle and Carroll 1988, Bollinger et al. 1990, Vickery et al. 1994, Normont 2002). In New England and New York, nine species of grassland birds are listed as endangered, threatened, or of special concern, due primarily to habitat loss (Vickery 1992). For example, native grassland habitats in the Northeast, such as coastal heathlands and sandplain grasslands, have been reduced by >90 percent of their pre-colonial extent (Noss et al. 1995). Farm abandonment, and the subsequent succession of open habitat to forest, has reduced agricultural grassland area by 60 percent (Vickery et al. 1994), leaving the remaining habitat fragmented and patchily distributed. Because many grassland bird species in this region are area-sensitive, some species are limited to the few remaining large tracts of habitat making

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management of specific sites critical to regional population persistence (Vickery et al. 1994).

Management of grassland habitats in the Northeast is an integral component of a regional grassland bird conservation plan (Norment 2002). Due to the succession of grassland habitats to shrublands and young forests, land managers must interrupt this process with mowing, prescribed burning, or herbicide spraying to maintain grassland bird breeding habitat. The intensive management necessary to maintain grassland habitats and the difficulty in estimating the historical extent of grasslands in the Northeast have prompted debate over the prioritization of these species in regional conservation plans (Norment 2002). Regardless of the historical reference concerning the extent of grasslands in this region, the development of a regional grassland bird conservation plan will depend on the acquisition, interpretation, and dissemination of information regarding the distribution and abundance of these species throughout the region.

To this end, we coordinated and conducted a regional survey of obligate grassland birds (*sensu* Vickery et al. 1999) throughout the seven states of the Northeast from 1997-2000. The primary objectives of this study were: 1) to determine the distribution and relative abundance of grassland birds breeding in the Northeast; 2) to increase our understanding of regionally important concentrations of grassland birds to focus conservation efforts; and 3) to develop a framework for a monitoring program. Because the Breeding Bird Survey (BBS), a roadside counting survey, does not adequately detect many grassland bird species in the Northeast with adequate frequency to estimate population trends (Sauer et al. 1997), habitat specific regional surveys are necessary to provide accurate population estimates. Developing and maintaining robust monitoring programs is a challenge that must be overcome as timely and accurate detection of declining populations is of paramount importance to species and habitat conservation. We think the results of this survey provide a framework for developing a regional grassland bird monitoring program.

Methods

We defined eight sub-regions to implement the survey and facilitate conservation planning throughout the region (*fig. 1*). Within each sub-region we selected grassland sites using Natural Resource Conservation Service aerial photographs to identify grassland and agricultural areas. We used DeLorme™ atlases to cross reference grassland areas identified on aerial photographs with road maps. We considered sites suitable if they were open (clear of trees and shrubs), greater than

≈ five ha, and dominated by grasses and forbs. We established 100-m radius points at each site, the number of which was determined by the size of the site. We determined site ownership (private or public) to demonstrate the importance of incorporating private landowners in bird conservation initiatives. All point centers were >300 m apart to ensure independence of samples and were at least 100 m from non-suitable habitat (forested edge or other).



Figure 1— Locations of 1,140 sites surveyed for grassland birds in the northeastern United States, 1997-2000 and identification of eight sub-regions.

We counted birds that were seen or heard for five minutes at each point from 0600-1100 between 1 May and 30 July and indicated whether an individual was within or outside the 100-m radius point. Each survey point was visited at least twice during a breeding season and the maximum number of individuals detected was used as an estimate of species abundance for that point. We included the following species defined as obligate grassland birds (Vickery et al. 1999) in the analysis: Upland Sandpiper (*Bartramia longicauda*), Vesper Sparrow (*Pooecetes gramineus*), Savannah Sparrow (*Passerculus sandwichensis*), Grasshopper Sparrow (*Ammodramus savannarum*), Henslow's Sparrow (*Ammodramus henslowii*), Bobolink (*Dolichonyx oryzivorus*), and Eastern Meadowlark (*Sturnella magna*). We present results as the average number of birds per point where point is considered to be within the 100-m radius for all species except Upland Sandpiper (Ralph et al. 1995). Upland Sandpipers have large territories, are very mobile, and more frequently detected >100 m.

Therefore, we used an unlimited radius to determine the average number of Upland Sandpipers per point.

To design a robust sampling procedure for a future, trend-based monitoring program for the Northeast, we used program MONITOR (Gibbs et al. 1998) to conduct a power analysis based on existing temporal variation observed in our counts. The analysis was based on an average coefficient of temporal variation (CV = 0.90). Our monitoring objectives were to detect a 10 percent decline in grassland bird population sizes (at $\alpha = 0.10$, two-tailed) with surveys involving two repeat visits within a year to sampling points over a 10-year period. We used a general estimate of the sample variability for the more common grassland bird species (Savannah Sparrow, Bobolink, Eastern Meadowlark) to conduct this power analysis which may not be an accurate estimate of the power to detect population trends for the more rare grassland birds (Henslow's, Grasshopper and Vesper sparrows). For these rare Northeast grassland birds, species specific monitoring programs may be necessary to adequately track population changes over time. Our primary goal of this power analysis was to estimate the effort necessary to monitor grassland birds and to provide a framework for how a monitoring program may be implemented.

Results

We surveyed 1,140 sites for grassland birds in the Northeast (fig. 1). Savannah Sparrows and Bobolinks were the most common and widespread species and occurred at 71 percent and 69 percent of all sites, respectively (fig. 2A,B). Eastern Meadowlarks occurred at 37 percent of the sites while Grasshopper Sparrows, Vesper Sparrows, Upland Sandpipers, and Henslow's Sparrows occurred on <20 percent of sites (fig. 2C-G).

Upland Sandpiper and Henslow's Sparrows were only detected on 7 percent and 3 percent of all sites respectively.

The relative abundance and distribution of each species differed among the sub-regions of the Northeast (fig. 2A-G). Bobolinks had the greatest relative abundance and were most widespread in the Connecticut River Valley/New Hampshire sub-region (table 1). Eastern Meadowlarks had the greatest relative abundance in the Southern New England subregion and were most common in the St. Lawrence Plains (table 1). Grasshopper Sparrows had the greatest relative abundance in the Southern New England sub-region and were most common in the Finger Lakes sub-region (table 1). Henslow's Sparrows had the greatest relative abundance and were most common in the St. Lawrence Plains (table 1). Savannah Sparrows had the greatest relative abundance in the St. Lawrence Plains and were most common in Aroostook County Maine (table 1). Upland Sandpipers had the greatest relative abundance in the Southern New England sub-region and were most common in the South/Central Maine sub-region (table 1). Vesper Sparrows had the greatest relative abundance in the Mohawk Valley subregion and were most common in the South/Central Maine sub-region (table 1).

To aid in prioritizing specific sites for conservation, we identified where multiple species of high conservation importance co-occurred. Upland Sandpipers and Vesper sparrows had similar ranges (fig. 2E and F) and co-occurred on 52 percent of the sites where at least one of the species was detected. Eighty-five percent of the sites where Upland Sandpipers and Vesper Sparrows co-occurred were in the commercial blueberry barrens of eastern Maine (fig. 3A). We detected Upland Sandpiper, Vesper and Grasshopper sparrows together on nine sites in the Northeast (fig. 3B).

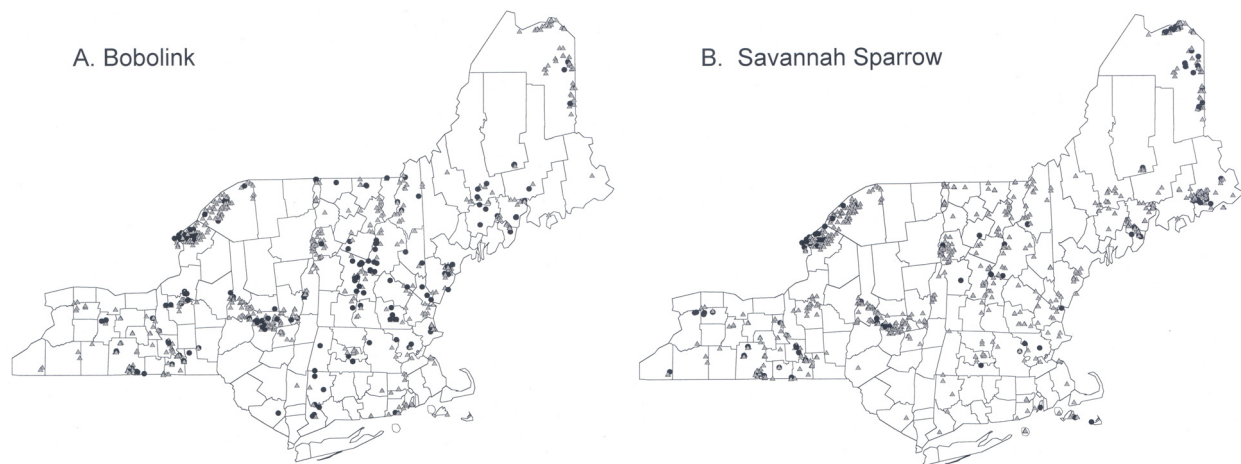


Figure 2— Species maps indicating occurrence and relative abundance among 1,140 sites sampled in the northeastern U.S. (gray triangles = 1-10 individuals detected, black circles = >10 individuals detected) of A) Bobolink, B) Savannah Sparrow.

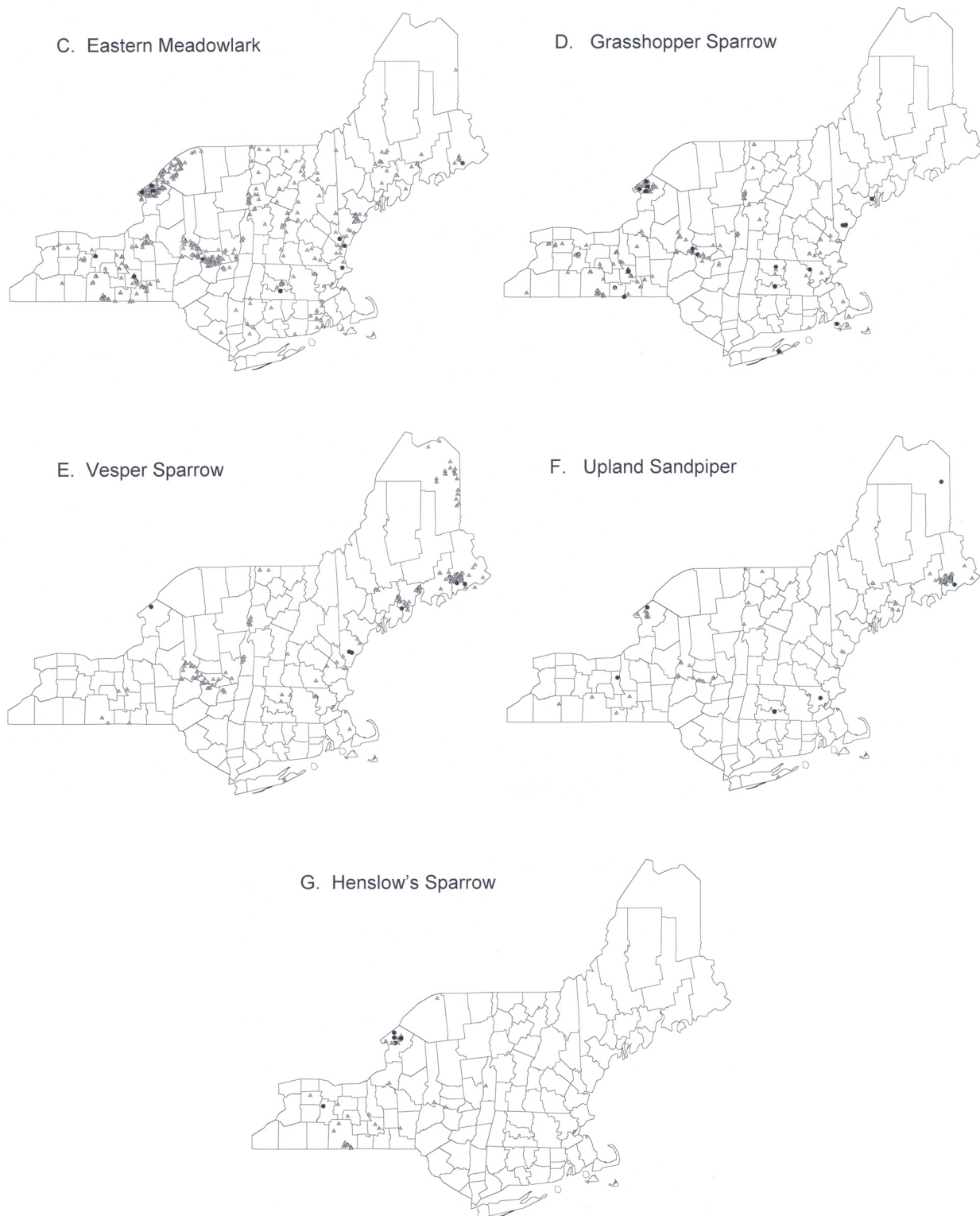


Figure 2— (continued) Species maps indicating occurrence and relative abundance. C) Eastern Meadowlark, D) Grasshopper Sparrow, E) Vesper Sparrow, F) Upland Sandpiper, and G) Henslow's Sparrow.

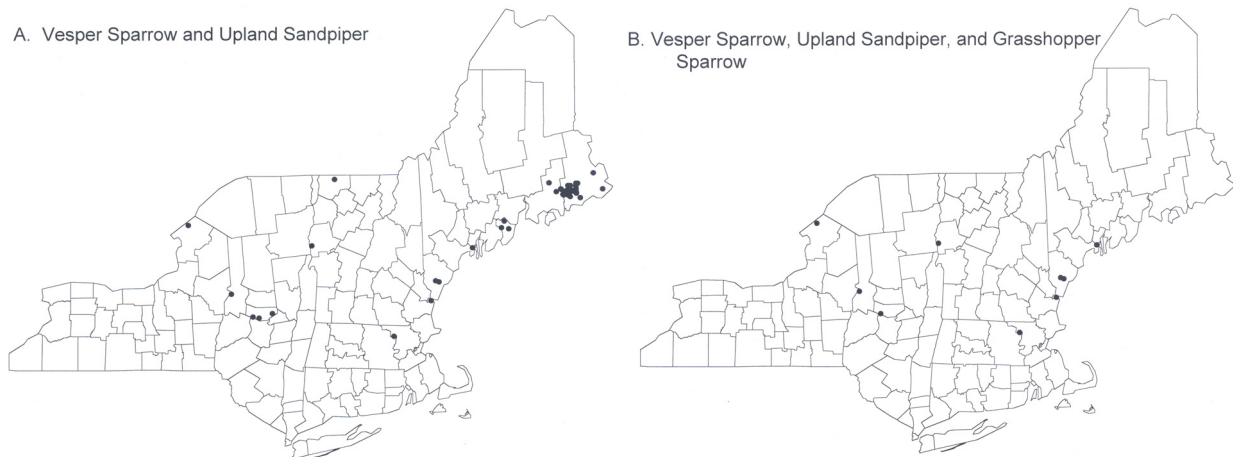


Figure 3— Sites among 1,140 sites sampled in the northeastern U.S. where A) Vesper Sparrow and Upland Sandpiper and B) Vesper Sparrow, Upland Sandpiper, and Grasshopper Sparrow co-occurred.

Based on our power analysis, we determined that we could detect a 10 percent annual decline in grassland bird populations with power >0.90 over a 10-year period if 25 sites were surveyed in each sub-region (200 sites total). Each site would need to be surveyed four times during this 10-year period with two visits/point/survey year. We recommend that the first two surveys be conducted in the first 5-year period and third and fourth surveys be conducted in the second 5-year period.

Discussion

This survey estimated the distribution and relative abundance of grassland birds in New England and New York and indicated which sub-regions were important for each species. These data can be used to prioritize future regional and state grassland bird conservation efforts, provide context for states within a larger geographic framework, and are an important step in the development of a regional grassland bird conservation plan (Wells and Rosenberg 1999). For example, Upland Sandpipers and Vesper Sparrows had similar distributions and were most common in the South-Central Maine sub-region. These data demonstrate the importance of this area to the regional conservation of these two declining species. We think future research should be focused on this area to determine the effects of blueberry management on the reproductive success and habitat selection of these two species.

Upland Sandpiper has been identified as an area sensitive species with a 50 percent probability of occurrence on sites >200 ha (Vickery et al. 1994). Due to the life history requirement of large, contiguous open habitat, this species distribution has become highly fragmented throughout the Northeast. The largest populations in

New England occur at Westover Air Force Base in Massachusetts, and on the blueberry barrens in eastern Maine. Although Upland Sandpiper population trends in the Northeast have not changed significantly between 1966-1995 (Sauer et al. 1997), this may be because the BBS was not sensitive to changes for this rare, locally distributed species; Carter (1992) found that in the Northern Piedmont and Ridge and Valley strata of the Eastern Piedmont Plateau Region, Upland Sandpiper populations have declined by 3 percent and 18 percent respectively.

Vesper Sparrows in the Northeast are found in pastures, barrens, and cultivated land, and have been estimated to be declining by 6 percent annually (Rising 1996, Sauer et al. 1997). In Massachusetts, statewide grassland bird surveys in 1993 and 1998 revealed a decline of approximately 50 percent (A. L. Jones, unpubl. data¹). Henslow's Sparrow has undergone a range contraction in the past 50 yrs and is declining at an estimated rate of 13 percent annually (Sauer et al. 1997). This species is characteristically found in wet meadows, grassy swamps, often interspersed with shrubs (Rising 1996). Because of evident population declines at the range limit of the Eastern subspecies of Henslow's Sparrow (*A. h. susurrans*), this species was considered highest grassland bird conservation priority in the region (Wells and Rosenberg 1999). This survey indicates that the Finger Lakes and St. Lawrence Plains sub-regions were most important to the conservation of Henslow's Sparrows in the Northeast and sites where this species was detected should be given high conservation priority.

¹Unpublished data on file at Massachusetts Audubon Society, 208 South Great Road, Lincoln, MA 01773

Table 1— *The average number of individual grassland birds detected per point (+sd) and the frequency of occurrence (proportion of sites where species was detected) within each of eight sub-regions in the Northeast, 1997-2000.*

Number of sites sampled		Species						
Sub-region		Bobolink	Eastern Meadowlark	Grasshopper Sparrow	Henslow's Sparrow	Savannah Sparrow	Upland Sandpiper	Vesper Sparrow
1. Finger Lakes	224	5.7 (7.4) 0.77	1.5 (2.5) 0.51	1.6 (4.0) 0.38	0.4 (2.4) 0.10	4.9 (7.4) 0.79	0.3 (1.3) 0.07	0.1 (0.7) 0.05
2. St. Lawrence Plains	121	7.9 (26.9) 0.83	2.6 (3.3) 0.64	1.4 (3.4) 0.21	0.9 (3.2) 0.12	7.3 (20.7) 0.87	0.2 (1.1) 0.06	0.1 (1.5) 0.01
3. Mohawk Valley	124	4.6 (5.4) 0.08	1.4 (1.7) 0.62	0.6 (1.8) 0.19	0.1 (0.4) 0.02	2.8 (3.3) 0.71	0.1 (0.3) 0.03	0.5 (1.0) 0.26
4. Champlain Valley	56	4.8 (5.5) 0.77	0.8 (1.4) 0.34	0.7 (2.0) 0.20	0.0	5.4 (5.9) 0.86	0.2 (0.7) 0.07	0.4 (1.0) 0.14
5. Aroostook County	107	2.2 (3.2) 0.63	0.1 (0.1) 0.01	0.0	0.0	6.2 (7.4) 0.90	0.2 (1.9) 0.03	0.4 (1.2) 0.17
6. South/Central Maine	222	3.3 (5.2) 0.48	0.5 (1.1) 0.23	0.3 (2.6) 0.02	0.0	3.9 (5.4) 0.67	0.1 (0.8) 0.22	0.2 (1.3) 0.41
7. Connecticut River/ New Hampshire	130	10.5 (12.9) 0.92	0.9 (2.3) 0.28	0.1 (0.6) 0.05	0.0	3.9 (5.4) 0.75	0.1 (0.8) 0.01	0.2 (1.3) 0.04
8. Southern New England	156	8.4 (22.1) 0.51	2.9 (21.5) 0.30	4.3 (34.3) 0.18	0.0	3.2 (8.7) 0.36	3.0 (34.3) 0.05	0.4 (1.1) 0.14

The importance of the Northeast to grassland bird conservation has been questioned because this open habitat is thought to be an artifact of European land use. Thus, observed declines in grassland bird populations can be explained by the region's natural succession to a forest dominated landscape (Wells and Rosenberg 1999, Norment 2002). However, Winne (1997) analyzed pollen taken from pond sediments in Washington County, Maine and found that some blueberry barrens in this region had been open grassland pine/shrub barrens for at least the past 1,700 yrs. Other available evidence (Askins 1993, 2000) and the presence of a unique taxonomic subspecies of the Greater Prairie Chicken (Heath Hen *Tympanuchus cupido cupido*) in coastal New England provide strong evidence that native grasslands occurred sporadically in New England and likely throughout the Northeast (Jones and Vickery 1997a, Vickery and Dunwiddie 1997).

Because there are a number of unique subspecies of grassland birds in the Northeast, this region is important for the conservation of their genetic diversity across North America (Wells and Rosenberg 1999). Their analysis found that the Northeast supports 100 percent of the eastern subspecies of Henslow's Sparrow (*A. s. susurrans*), 55 percent of eastern subspecies of Savannah Sparrow (*P. s. savanna*), 13 percent of the nominate form of Eastern Meadowlarks (*S. m. magna*), and 12 percent of eastern subspecies of Grasshopper Sparrow (*A. s. pratensis*).

Conservation of grassland birds in the Northeast is a challenge ecologically, financially, and politically (Norment 2002). Land ownership and land use practices clearly have profound impacts on the quality of habitats within landscapes and the conservation of biotic diversity will not be achieved solely on public or protected lands. Results from this project indicated that approximately 82 percent of the sites we surveyed were in private ownership making it imperative that grassland bird conservation planners integrate their knowledge of the needs of breeding grassland birds into initiatives to conserve and/or manage private farmland for grassland birds (see Jones and Vickery 1997b).

Several federal programs exist to aid private landowners with management of wildlife, such as the Natural Resource Conservation Service's Wildlife Habitat Incentives Program, the Department of Agriculture's Conservation Reserve Program (CRP), and the U.S. Fish and Wildlife Service's Partners for Fish and Wildlife Program. These programs provide cost sharing to landowners for develop, manage, or enhance habitat for upland wildlife, wetland wildlife, and endangered species. For example, grassland bird species richness was used effectively in Maine to help prioritize applicants to the CRP program.

Accurately detecting population changes is paramount to the conservation of wildlife populations, the success of which is hinged on developing meaningful monitoring programs (Gibbs et al. 1998). These data provide a sampling frame from which a regional monitoring program can be developed and implemented. Sites within sub-regions could be randomly selected for re-sampling to provide statistically reliable estimates of population trend. A robust regional monitoring program could be developed using these data as the initial count and a framework for site selection within each sub-region. Minimal field effort would be required to conduct two visits per 100-m radius point at 25 sites within each sub-region. Documenting a population trend can only be meaningful, however, if opportunities for changes in management or land-use exist (Elzinga et al. 2001). Because grassland habitats require relatively high levels of management to maintain grass-dominated systems they are especially amenable to monitoring programs that are integrated into adaptive management plans. Any Northeast grassland bird monitoring program should also include information about how specific management actions effect species abundance, and optimally, reproductive success.

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