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Spring Warbler Migration at Swan Point Cemetery, Providence, Rhode Island: A 15-Year Analysis

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Abstract

Swan Point Cemetery in Providence, Rhode Island is a well-known location for spring-migrant birding. The second author (RMB) kept records of wood-warblers that he identified on morning walks during the spring migration season from late April to late May, from 1986 to 2000. He walked the same route at the same time each morning. This report presents an analysis of his records. RMB tallied 4,290 individual warblers of 27 species during the 15-year period. The most abundant species was the Yellow-rumped Warbler ($\bar{x}$ = 4.9 per count-day), and the species detected most frequently was the Black-and-white Warbler (61% of counts). The average number of individual warblers tallied per day exceeded 20 during four of the 15 years (1990, 1995, 1996, 2000), with the maximum ($\bar{x}$ = 33) recorded during 2000, the last year of observations. The mean number of wood-warbler species identified per day was greatest in 1990 ($\bar{x}$ = 9.9) and 1996 ($\bar{x}$ = 8.1). Although there was substantial year-to-year variation in the number of warblers tallied, we did not detect significant trends of increasing or diminishing numbers of warblers for all species combined, or for any of the eight most common species.

Introduction

The Partners in Flight (PIF) Landbird Conservation Plan (Rich et al. 2004, p. 1) underscores the dramatic declines of North American landbirds: ". . .over the past several decades, populations of some once-common species have declined precipitously, and more species than ever are experiencing range-reductions or becoming threatened and endangered." The authors further relate (p. 27) that "Population monitoring is critical for all stages of conservation planning, including assessment of population status, identification of causal factors in population change, setting of population targets, and evaluating success of conservation action," and that more than half of the most vulnerable populations warrant improved monitoring. The revision of the PIF conservation plan (Rosenberg et al. 2016) identifies a host of long-distance landbird migrants, including nine species of wood-warblers, among "Watch List" species of highest population vulnerability and in greatest need of monitoring efforts and other conservation action.

Toward addressing this information gap, we here report on a 15-year monitoring effort of spring-migrant wood-warblers (Parulidae) conducted by RMB in Providence, Rhode Island between 1986 and 2000. The study site, Swan Point Cemetery, is an urban forest fragment situated in the northeastern corner of Providence (Fig. 1). The site has long been heralded as one of the premier locations in the state for observing songbirds resting and feeding during spring-migration stopover periods, and especially as a haven for migratory wood-warblers (e.g., Wood 1981, Frye 1992, Bushnell 2001, Hall and Weber 2017). In addition to the species we cover here, Bushnell (2001) also listed rare wood-warbler species seen over the years at Swan Point but not recorded by RMB during census periods: Prothonotary Warbler (*Protonotaria citrea*), Yellow-throated Warbler (*Setophaga dominica*), and Black-throated Gray Warbler (*Setophaga nigrescens*).

The data reported here enable not only the exploration of population trends over the 15 years, but also form a benchmark of spring-migrant abundance with which future monitoring efforts can be compared. In this paper we present census results and explore questions relevant to an urban migration stopover site: What is the composition of the spring-migrant warbler community? Have numbers of migrant warblers decreased over time, and if so, in what species and by what magnitudes? Has climate change resulted in changes in the migratory timing of warblers moving through Rhode Island?

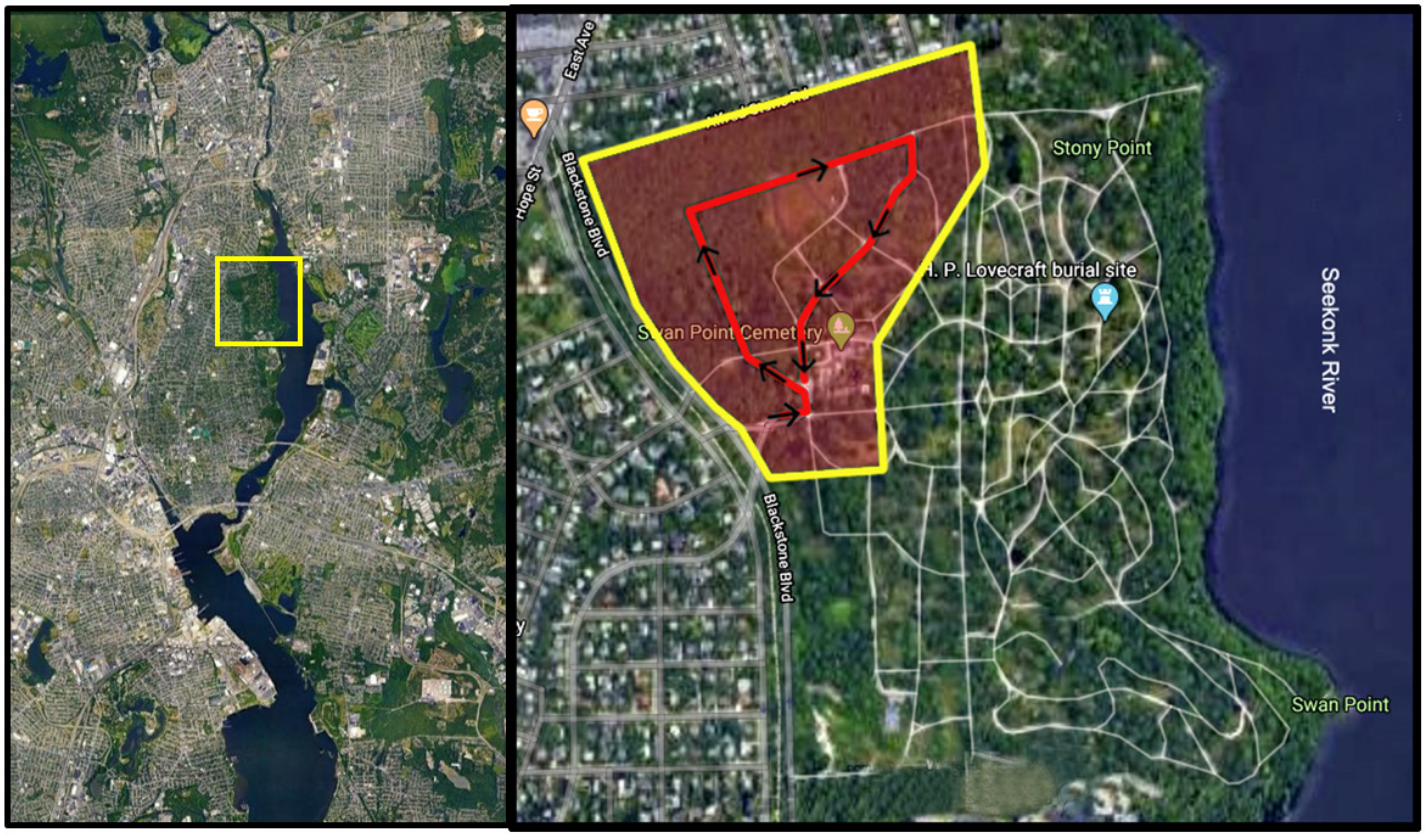

Figure 1. Study area. Left: location of Swan Point Cemetery within Providence, showing the "green island" surrounded by an urban landscape. The yellow box outlines the area expanded in the right map. Right: The segment—within bold yellow delineation—of Swan Point Cemetery covered during each warbler count conducted between 1986 and 2000. The red loop is the route walked by RMB during each count. Aerial photography from Google Maps.

Study Area

Swan Point Cemetery is a 78.5-ha (194-acre) tract of oak-forest/treed-lawn habitats in the northeastern corner of Providence, Rhode Island (Fig. 1). The cemetery had its beginnings in 1846 when an initial 24.3-hectare (60-acre) parcel was purchased; 17.4 additional hectares (43 acres) were added by 1865, and 36.8 more hectares (91 acres) were added near the end of the 19th century (Wood 1981). Significant portions of the original forested tracts were preserved in their natural state, while botanically knowledgeable grounds superintendents planted shrubs and trees throughout the interior, manicured segments of the cemetery (Wood 1981). Rhododendrons and azaleas were imported from England and planted throughout the cemetery, and flowering trees including andromeda, clematis, and dogwood were added to enhance beauty and floral variety (Wood 1981). During the 20th century, holly trees and evergreens were planted near the cemetery entrance (Wood 1981); and horticultural maintenance continues into the current century as cemetery grounds and the surrounding forest tracts continue to provide habitat for migratory landbirds.

Bushnell (2001, p. 89) noted that Swan Point's location is conducive to migration fallouts. It lies "at the northern tip of Narragansett Bay. . .bounded on the east by the Seekonk River, which constitutes a [northward-extending] finger of the Bay". He notes that Swan Point is the most substantial wooded area situated directly on the water from Warwick in the south to Pawtucket in the north, and that (p. 91) "As nocturnal migrants fly up Narragansett Bay, Swan Point is the first significant patch of green available at first light."

The area covered by RMB during his morning census walks is in the northwestern corner of the cemetery (Fig. 1, right frame). Although mature deciduous forest dominated most of the census area, two tracts of more open environs covering approximately 0.4 ha (1 acre) provided early-successional and edge habitats that were used by certain migrating songbirds such as Blue-winged Warblers (see Appendix A for the names of all the wood-warblers covered by this paper) and Indigo Buntings (*Passerina cyanea*). During the 15-year study period, however, those habitats succeeded to woody cover that closed in the open tracts and diminished habitat diversity.

Methods

Warbler counts (RMB)

From 1986 through 2000 I (RMB) tallied warblers at Swan Point from late April through May. I conducted censuses in the period 06:15–07:00. During censuses I helped less-experienced birders (typically 4 or 5, some-times none or as many as 8) to find and to identify migrants, and tallied and recorded the numbers of each warbler species I identified by sight or sound. I followed the route shown in Fig. 1 (right frame) on each census day during the 15-year period. I chose this route because it incorporated prime forested habitat for migrants, and because I was able to complete it within a 45-minute window. I avoided moderate to heavy rain when conducting counts but ventured out in light rains.

Statistical analyses

To quantitatively explore population trends over the 15-year study-period, we regressed annual mean counts on year for all warbler species combined, and individually for the eight most abundant species. We hypothesized that a warming climate could result in shifts toward earlier migration times for spring migrants. To visually explore this notion for wood-warblers at Swan Point, we calculated the migration mid-point for the eight most abundant warbler species, per year, as the date on which one-half of the total annual count for that species was reached. We then graphed the mid-point dates across years for those eight species, and for all species combined.

Results

Warbler community composition

RMB conducted warbler counts on 259 days during the 15-year study period, and during those counts identified and tallied 4,290 warblers of 27 species ($\bar{x}$ = 16.6 birds per count, range = 0–108 birds per count; Tables 1 and 2). The most abundant species were, respectively, Yellow-rumped Warbler ($\bar{x}$ = 4.9 per count-day), Black-and-white Warbler ($\bar{x}$ = 1.8), Northern Parula ($\bar{x}$ = 1.5), and American Redstart ($\bar{x}$ = 1.2); and the species detected most frequently were Black-and-white Warbler (61% of counts), Yellow-rumped Warbler (55%), Northern Parula (53%), and Ovenbird (51%) (Table 2).

Table 1. Numbers of counts (N) and warblers detected, by census year.

Year	N	Total Birds	Warblers per Day		Species per Day	
			Mean (SD)	Range	Mean (SD)	Range
1986	24	422	17.6 (15.2)	2–53	6.3 (4.2)	1–15
1987	17	227	13.4 (12.8)	0–52	5.2 (3.9)	0–16
1988	16	154	9.6 (6.2)	0–23	4.6 (2.4)	0–8
1989	15	190	12.7 (11.9)	1–39	5.5 (3.6)	1–14
1990	17	480	28.2 (19.4)	3–68	9.9 (4.7)	2–15
1991	17	214	12.6 (10.7)	1–33	5.6 (3.1)	1–11
1992	18	196	10.9 (11.5)	0–44	4.4 (3.4)	0–11
1993	18	176	9.8 (9.5)	2–34	4.7 (3.2)	1–11
1994	18	343	19.1 (13.8)	3–46	7.3 (4.3)	1–14
1995	14	289	20.6 (15.1)	3–54	7.8 (4.8)	2–15
1996	17	490	28.8 (20.3)	0–64	8.1 (4.7)	0–15
1997	18	310	17.2 (11.7)	0–38	6.9 (4.4)	0–15
1998	16	56	3.5 (2.7)	0–10	2.4 (1.5)	0–6
1999	16	155	9.7 (12.7)	0–38	4.4 (5.0)	0–14
2000	18	588	32.7 (33.0)	2–108	6.0 (3.5)	1–12
Totals	**259**	**4,290**	**16.6**	**0–108**	**5.9 (3.8)**	**0–16**

The average number of warblers tallied per day exceeded 20 during four of the 15 years (1990, 1995, 1996, 2000), with the greatest number of warblers ($\bar{x}$ = 33) recorded during 2000, the last year of observations (Table 1, Fig. 2). During four years (1988, 1993, 1998, 1999), the mean number of warblers counted per day was fewer than 10, with 1998 exhibiting the fewest migrant warblers of the 15 years ($\bar{x}$ = 3.5 birds per day). The mean number of wood-warbler species identified per day was greatest in 1990 and 1996 ($\bar{x}$ = 9.9, 8.1, respectively), and lowest in 1998 ($\bar{x}$ = 2.4) (Table 1, Fig. 3). The mean number of warblers recorded per day, and the mean number of species identified per day, were highly correlated over the 15 years: $n = 15$, $r = 0.81$, $P < 0.001$ (Fig. 2).

Our population-trends regression analyses detected no significant relationships of abundance and year for either the all-species-combined metric ($R^2 = 0.01$, $P = 0.75$), or for any of the eight dominant species individually. The relationship for Blackpoll Warbler only approached significance ($R^2 = 0.44$, $P = 0.08$); however, that result is possibly confounded by diminishing hearing acuity of RMB over the 15-year period, as the Blackpoll Warbler has a particularly high-frequency song. Thus, no obvious trends of increasing or decreasing warbler numbers emerged over the 15-year study

Table 2. By-species statistics over 259 daily counts conducted during 15 census years, 1986–2000 (sort order by decreasing abundance).

Species	Total Tallied	Annual Mean Count (SD)[1]	Max Daily Count	Number of Days Seen	Percent of Days Seen	Earliest Arrival[2]	Latest Visit[2]	Migration Midpoint[3]
Yellow-rumped Warbler	1,297	4.88 (5.00)	106	142	55	22 Apr	25 May	9 May
Black-and-white Warbler	460	1.76 (0.81)	64	157	61	22 Apr	3 Jun	12 May
Northern Parula	380	1.46 (0.82)	52	136	53	25 Apr	26 May	14 May
American Redstart	312	1.21 (0.89)	58	111	43	6 May	3 Jun	18 May
Ovenbird	272	1.06 (0.45)	28	132	51	29 Apr	3 Jun	14 May
Magnolia Warbler	249	0.96 (0.57)	38	109	42	6 May	3 Jun	18 May
Blackpoll Warbler	235	0.90 (0.54)	35	87	34	7 May	3 Jun	22 May
Black-throated Green Warbler	199	0.75 (0.42)	31	104	40	28 Apr	28 May	14 May
Canada Warbler	134	0.52 (0.66)	46	58	22	9 May	29 May	—
Common Yellowthroat	115	0.45 (0.30)	19	79	31	6 May	30 May	—
Chestnut-sided Warbler	90	0.36 (0.34)	20	53	21	5 May	24 May	—
Tennessee Warbler	86	0.32 (0.49)	32	38	15	6 May	25 May	—
Black-throated Blue Warbler	76	0.30 (0.28)	18	54	21	4 May	22 May	—
Nashville Warbler	69	0.27 (0.18)	10	42	16	30 Apr	20 May	—
Yellow Warbler	66	0.26 (0.21)	13	50	19	2 May	28 May	—
Blackburnian Warbler	67	0.26 (0.20)	14	47	18	1 May	25 May	—
Bay-breasted Warbler	65	0.25 (0.25)	17	41	16	9 May	27 May	—
Blue-winged Warbler	38	0.15 (0.15)	8	29	11	1 May	23 May	—
Wilson's Warbler	20	0.07 (0.10)	6	17	7	11 May	27 May	—
Prairie Warbler	15	0.06 (0.07)	5	15	6	5 May	20 May	—
Palm Warbler	14	0.05 (0.07)	4	11	4	22 Apr	10 May	—
Pine Warbler	9	0.04 (0.10)	6	9	4	29 Apr	14 May	—
Kentucky Warbler	6	0.02 (0.04)	2	6	2	11 May	19 May	—
Cape May Warbler	5	0.02 (0.04)	2	4	2	9 May	15 May	—
Cerulean Warbler	4	0.01 (0.03)	2	4	2	11 May	21 May	—
Mourning Warbler	4	0.01 (0.02)	1	4	2	24 May	2 Jun	—
Worm-eating Warbler	3	0.01 (0.02)	1	3	1	8 May	23 May	—
Overall	**4,290**					**22 Apr**	**3 Jun**	**13 May**

[1]Average of 15 annual means of daily warbler counts. [2]Dates over 15 years, including dates outside the date-range formally analyzed in this study. [3]Average over 15 years, only for the 8 most abundant species and all species combined.

period. A regression of the number of species documented annually versus year demonstrated a weak though not statistically significant inverse relationship ($R^2 = 0.19$, $P = 0.10$), suggesting a diminishing number of species identified per day over the course of the 15-year study period.

Phenology

Migrating warblers arrived as early as 22 April (Table 2) and generally increased in numbers until a peak abundance period was reached between 10 and 19 May (Fig. 3). The abundance spike exhibited on Fig. 3 for 30 April was due principally to an atypically large movement of Yellow-rumped Warblers witnessed in year 2000; 106 yellow-rumps were tallied on one day, which influenced the mean warbler count for that date. There were counts conducted on more days during mid-May, when warbler numbers were generally greatest, than during the periods before or after (Fig. 3).

The graph of the numerical mid-points of migration for all species combined over the 15 years of our study (Fig. 4) reveals no obvious trend for earlier or later movements through Rhode Island. Our analyses of similarly constructed graphs for each of the eight most abundant warbler species

(Table 2) also exhibited little or no change in the migration mid-points over 15 years.

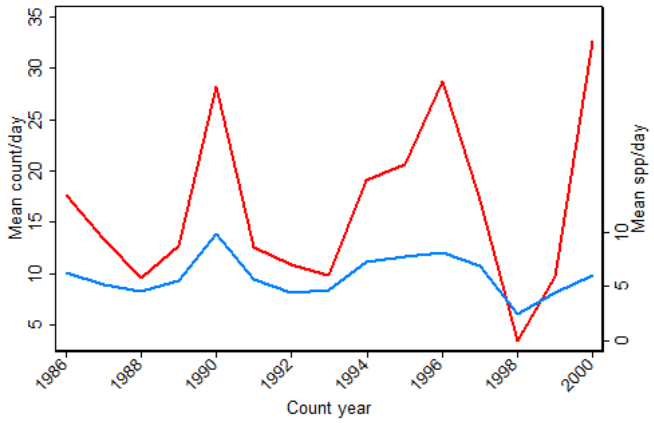

Figure 2. Mean number of warblers tallied per count-day per year (in red, left axis), and mean number of species identified per count-day per year (in blue, right axis).

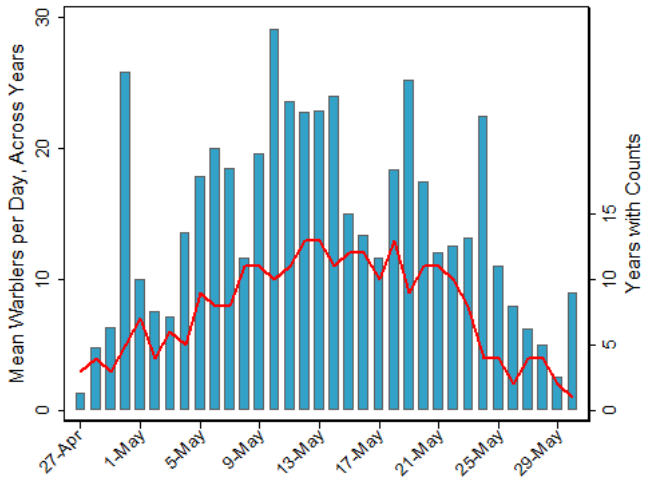

Figure 3. Comparison of daily summary data across all 15 years (1986–2000). Blue bars present the mean daily magnitude of spring warbler migration at Swan Point. The red line shows the number of years (out of the 15 possible) when counts were conducted on that date.

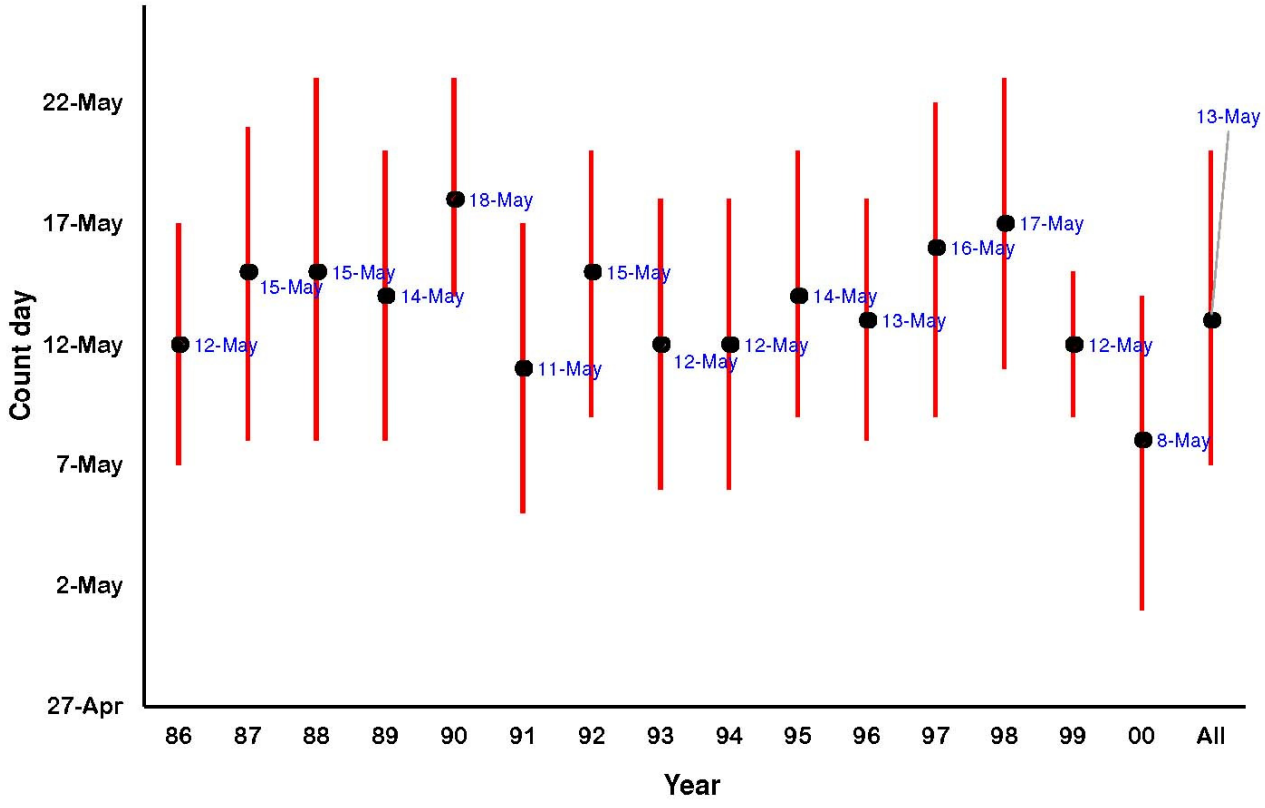

Figure 4. The mid-point days of migration (black circles, ± SD (red bars), by year 1986–2000, for all warbler species combined.

Discussion and Conclusions

The data from this study present a perspective on the spring warbler migration at one location in Rhode Island in the late 20th century up through 2000. Although other analyses (e.g., Rich et al. 2004, Rosenberg et al. 2016) highlight substantial decreases in the number of migrating songbirds over the past several decades beginning in the late 1960s, our analysis of 15 years of spring migration warbler counts—while demonstrating substantial year-to-year variation—did not exhibit such a diminishing trend. This was true also for the mean number of species per day identified each year, although that value did exhibit a non-significant downward trend.

In spite of anticipated global-warming effects on plant and migrant phenology, our data did not demonstrate a change in warbler arrival times over our 15-year study period, both when we combined data for all warbler species, and for each of the eight most abundant species. Our data did, however, demonstrate the expected spring migration crescendo-decrescendo volume of arrival-departure at Swan Point, both across and within species.

This study has several limitations. The 15-year count effort was conducted by a single observer whose auditory capabilities may have diminished subtly during that period. During the fifteen years approximately one acre of old-field habitat succeeded to more woody growth, which could have impacted the numbers and assemblage of warblers using the count area.

Acknowledgments

We appreciate the leadership of Swan Point Cemetery for their long-standing cooperation with the birding community, and for their careful attention to the wildlife value of their property. We thank Hugh Willoughby for his thorough editorial review of this manuscript. We thank Rachel Farrell for encouraging the production of this report, for offering insights on her own bird-count efforts at Swan Point, and for sharing data generated from those efforts. Ms. Farrell conducted counts during 1998–2020, recording all migrant land-birds encountered during near-daily walks of 3–4 hours in duration, which covered the full extent of the cemetery grounds. We are working with Rachel on a follow-up report to this presentation that will incorporate her later years of census, and enable comparisons to the earlier period reported here.

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Adult male Magnolia Warbler (photo by Peter Capobianco).

Appendix A. Scientific names of wood-warbler species identified during count periods.

Common name	Scientific name
Ovenbird	*Seiurus aurocapilla*
Worm-eating Warbler	*Helmitheros vermivorum*
Blue-winged Warbler	*Vermivora cyanoptera*
Black-and-white Warbler	*Mniotilta varia*
Tennessee Warbler	*Leiothlypis peregrina*
Nashville Warbler	*Leiothlypis ruficapilla*
Mourning Warbler	*Geothlypis Philadelphia*
Kentucky Warbler	*Geothlypis formosa*
Common Yellowthroat	*Geothlypis trichas*
American Redstart	*Setophaga ruticilla*
Cape May Warbler	*Setophaga tigrina*
Cerulean Warbler	*Setophaga cerulea*
Northern Parula	*Setophaga americana*

Common name	Scientific name
Magnolia Warbler	*Setophaga magnolia*
Bay-breasted Warbler	*Setophaga castanea*
Blackburnian Warbler	*Setophaga fusca*
Yellow Warbler	*Setophaga petechia*
Chestnut-sided Warbler	*Setophaga pensylvanica*
Blackpoll Warbler	*Setophaga striata*
Black-throated Blue Warbler	*Setophaga caerulescens*
Palm Warbler	*Setophaga palmarum*
Pine Warbler	*Setophaga pinus*
Yellow-rumped Warbler	*Setophaga coronata*
Prairie Warbler	*Setophaga discolor*
Black-throated Green Warbler	*Setophaga virens*
Canada Warbler	*Cardellina canadensis*
Wilson's Warbler	*Cardellina pusilla*

Rhode Island Naturalist Special Issues are not published on a regular schedule. They are designed to make available articles that would be too long to include in a regular issue of the *Naturalist.* A summary version of this article was included in the Fall 2021 issue (volume 16, number 2, pages 17–19).

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