Use of recorded vocalizations in winter surveys of Bachman’s Sparrows

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ABSTRACT. We used a recorded song of the Bachman's Sparrow (Aimophila aestivalis) to determine whether recorded vocalizations improved detection of this secretive species in winter. Surveys were conducted in the Red Hills region of northern Florida and southwestern Georgia under a range of climatic conditions. Bachman’s Sparrows responded readily to taped vocalizations and were detected only on surveys where recorded vocalizations were used. A total of 251 individuals (mean = 1.01 per stop) was observed, or approximately 10–15 observations/h. Detections decreased at lower ambient temperatures and also varied among sites, but adequate numbers were observed even when maximum daytime temperatures remained < 3 °C. We believe variation in the number of sparrows observed among sites may relate to variation in ground cover. Bachman’s Sparrows were most common in areas with extensive native ground cover, but further studies are needed. We recommend use of recorded vocalizations in winter surveys of Bachman’s Sparrows and suggest recorded vocalizations may help in winter surveys of other secretive sparrows.

Key words: Aimophila aestivalis, Bachman’s Sparrow, recorded vocalizations, survey technique, winter populations

The Bachman’s Sparrow (Aimophila aestivalis) is a common but declining species associated with open pine woodlands and early successional habitats of the eastern U.S. (Dunning and Watts 1990). It is listed as a species of management concern by the Partners in Flight program (Hunter et al. 1999) and the U.S. Forest Service (Dunning et al. 2000) because of decreases observed in portions of the breeding range (Dunning and Watts 1990). In addition, most individuals (ca. 90%) observed along Breeding Bird Survey (BBS) routes (Sauer et al. 2002) come from only three states (Alabama, Florida, and Georgia), and low densities have been reported for many areas (Dunning and Watts 1990).

Winter surveys of Bachman’s Sparrow populations have been recommended (Hammerson 1994; Hunter et al. 1999) because population distributions and habitat needs are not well understood outside the breeding season (Dunning and Watts 1990; Hammerson 1994). During the breeding season, Bachman’s Sparrows are associated with a vegetation structure that can be short-lived and variable (Engstrom et al. 1984; Kremen and Christie 2000), and similar specificity may occur in winter (Dunning 1993). Sites where prescribed fires have been excluded for more than two years may have lower breeding-season abundances than sites where early successional conditions have been maintained using prescribed fires (Engstrom et al. 1984). In addition, locations of migrant and resident populations have been difficult to ascertain using the data collected during winter months (Dunning 1993).

Broad-scale winter surveys are hampered by the bird’s secretive nature (Dean and Vickery 2003). Bachman’s Sparrows generally stay close
to the ground in winter and remain silent (Dean and Vickery 2003), and as a result, an average of approximately 50 individuals, or just 0.04 individuals per party-hour, has been observed on Christmas Bird Counts (CBCs) conducted since 1995 (National Audubon Society 2002). Dean and Vickery (2003) studied Bachman’s Sparrows in winter using radio telemetry, but telemetry studies have limitations. The small transmitters suitable for this species are short-lived (ca. 21 days; Dean and Vickery 2003), and telemetry studies conducted over large areas are labor-intensive.

Broadcast vocalizations (Gibbs and Melvin 1993; Takats et al. 2001) have been used in breeding-season surveys of Bachman’s Sparrows to improve detection (Seaman and Krementz 2001), but recorded vocalizations (Johnson et al. 1981; Parker 1991) also are known to improve detection in winter months for many other species. For example, recent studies of several warblers (Graves 1996) have made extensive use of playback recordings to locate birds and map winter territories. In addition, Turcotte and Desrochers (2002) reported that mobbing calls of Black-capped Chickadees (Poecile atricapillus) improved winter abundance estimates for many other species of birds.

We assessed the use of broadcast vocalizations in winter surveys of Bachman’s Sparrows. Our study was conducted in the Red Hills region of southwestern Georgia and northwestern Florida. Surveys were conducted on three properties with different pine-dominated habitats and under a range of weather conditions. Our objectives were to determine the potential effectiveness of broadcast vocalizations in winter surveys of Bachman’s Sparrows and to assess the influence of weather conditions on detection rates. We also considered whether sparrow numbers might be influenced by habitat differences among study sites, especially differences in ground cover conditions.

**STUDY AREA AND METHODS**

Our study was conducted on Pebble Hill Plantation, Grady Co., Georgia, Tall Timbers Research Station, Leon Co., Florida, and the Wade Tract, Thomas Co., Georgia, within the Red Hills physiographic region (84.15 W, 30.70 N). The sites are within a large matrix of private hunting estates managed using frequent prescribed burning and selective timber harvest (Engstrom and Baker 1995). The Wade Tract is a rare old-growth longleaf pine (Pinus palustris) woodland with an open structure and dense ground cover dominated by wiregrass (Aristida stricta) and other pyrogenic species (Means 1996). Tall Timbers Research Station is covered with second-growth pine forests that arose on former agriculture lands and are now dominated by loblolly (P. taeda) and shortleaf (P. echinata) pines. These second-growth forests also have an open structure maintained by frequent fire, but wiregrass and other ground-cover species have been eliminated by agricultural operations (Ambrose 2001). Pebble Hill Plantation contains a mixture of longleaf/wiregrass and second-growth pine forests.

We devised a survey procedure that combined aspects of the North American Breeding Bird Survey (BBS; Sauer et al. 2002) with recommendations regarding the use of playback tapes (Ribic et al. 1999) with wind conditions as used in the BBS (Sauer et al. 2002). A 4.8-km (3-mile) survey route was established along unpaved roads on each property. Routes traversed upland pine habitats, and sampling points were established every 330 m (0.2 mile or 16 sample points per route). Surveys were performed with ($N = 12$) and without ($N = 3$) recorded vocalizations from early December to mid January in 2003 and 2004. Replications involving the recorded vocalization were designed to assess variation associated with daytime temperatures and wind conditions. Data from a weather station at Tall Timbers Research Station were used to determine minimum daily temperatures, while wind conditions were quantified using the Beaufort scale as used in the BBS (Sauer et al. 2002).

A vehicle’s CD-player was used to broadcast a recorded song of a Bachman’s Sparrow while the observer stood outside. The vehicle doors housing the audio speakers were opened fully, and volume was held constant ($\frac{1}{2}$ the maximum indicated on the CD player). The vocalization was created from a digital file (Hardy 2003) and edited so that each track contained 45 s of the primary song (Dunning 1993) followed by 15 s of silence. Four tracks were played at each stopping point (total time, 4 min). The average survey was completed within two hours, and all surveys were completed by 10:30 EST.

We used a step-wise linear regression routine
Table 1. Step-wise regression \((F \text{ for inclusion } \geq 4.00)\) analyzing variation in the total number of Bachman’s Sparrows observed in relation to climate and ground cover features.

<table>
<thead>
<tr>
<th>Effect</th>
<th>Coefficient</th>
<th>Standard error</th>
<th>(F_{1,5})</th>
<th>(P)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Included</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimum temperature(^a)</td>
<td>0.692</td>
<td>0.113</td>
<td>37.82</td>
<td>0.001</td>
</tr>
<tr>
<td>Native cover(^b)</td>
<td>0.097</td>
<td>0.035</td>
<td>7.91</td>
<td>0.031</td>
</tr>
<tr>
<td><strong>Excluded</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average wind(^c)</td>
<td>−0.313</td>
<td>0.54</td>
<td>0.54</td>
<td>0.494</td>
</tr>
</tbody>
</table>

\(^a\) Taken from a weather station at Tall Timbers Research Station.

\(^b\) Native ground cover within 100 m of survey routes, from Ambrose (2001).

\(^c\) On Beaufort scale as adapted by Sauer et al. (2002).

RESULTS AND DISCUSSION

Bachman’s Sparrows generally responded quickly (< 20 s) to playback tapes using the clear, high-pitched “pseet” note (Dunning 1993). This distinctive call note could be heard up to 60 m from sampling stations, and calls frequently increased in intensity as the sampling period progressed. Some of the more intensive responses included the “chitter” call described by Wolf (1977). The “chitter” call has been reported as both a pair reunion and an aggressive call (Haggerty 1986). In the context observed here, it was most likely aggressive in nature because individuals were responding to a full song. This observation supports the proposition of Dean and Vickery (2003) concerning establishment of winter territories. Several birds uttering “chitter” calls also sang partial songs in response to playback recordings on warmer days.

We observed a total of 251 Bachman’s Sparrows along the 12 survey routes performed using recorded vocalizations (7–10 observations per hour); no sparrows were observed on surveys performed without recorded vocalizations. The average number of sparrows detected at each station using recorded vocalizations was 1.01 (±0.53; kurtosis and skewness were both insignificant) and was significantly greater than 0 (i.e., the average without vocalizations; \(t_{11} = 6.67; P < 0.000\)). As many as four individuals were heard responding to vocalizations at some stations, and a few individuals rose to exposed perches, which may have implications for studies involving color-banded individuals.

Temperature had the greatest influence on detections (Table 1). Nearly four times as many sparrows were observed on days when minimum temperatures exceeded 8.3°C (6.3 ± 1.5 vs. 23.0 ± 6.4; \(t_{17} = -4.32; P = 0.03\)). Sparrow numbers also varied significantly in relation to the amount of native ground cover at each site (Table 1). The Wade Tract had the largest average number of birds per survey (23.0 ± 13.3) as well as the largest area of native ground cover. Pebble Hill (14.0 ± 7.9) and Tall Timbers Research Station (15.2 ± 8.3) averaged fewer birds per survey and had less native ground cover.

Hammerson (1994) noted that attempts to find winter Bachman’s Sparrows by flushing silent individuals were labor-intensive and inefficient. Recorded vocalizations improve prospects for winter studies but have not been widely used. Our total (251) greatly exceeded the average annual total (48.7 birds) observed on all Christmas Bird Counts conducted since 1995 (National Audubon Society 2002). We also observed nearly 20 times more birds per stop than observed along BBS routes (Sauer et al. 2002) conducted in Florida (1.01 versus 0.05). This latter comparison is complicated by...
fundamental differences between our surveys and the BBS, but it provides a measure of the potential efficiency of winter surveys using recorded vocalizations. Detection rates on our surveys exceeded the average rate for the BBS even on one cold morning when maximum daytime temperatures remained < 3°C.

The approach used here is also advantageous because it provides an inexpensive means of sampling winter Bachman’s Sparrow populations. In addition to large-scale surveys, playback procedures could be used in line-transect or point-count sampling procedures (e.g., Seaman and Krementz 2001) typically used to assess habitat relationships. For comparison, the Texas Parks and Wildlife Department, the U.S. Forest Service, and the Gulf Coast Bird Observatory (Shackelford et al. 2001) have developed a special winter transect survey for Bachman’s Sparrow (and other grassland species) that requires three participants and advanced skills to identify flushed birds. Estimates of Bachman’s Sparrow populations along these surveys would likely be improved using taped vocalizations, and set-up costs and survey efforts might be lower.

Another beneficial aspect of the procedure was that it familiarized us with the call notes of Bachman’s Sparrows. The notes are easily distinguished from those of other species commonly found in the pine-dominated areas we sampled. At a distance, certain call notes given by Chipping Sparrows (*Spizella passerina*) sound similar, but they were less emphatic and lacked the clear tonal qualities of Bachman’s Sparrow notes. The experience gained from listening to many responses would aid in other survey efforts. For example, experienced observers (Engstrom and James 1981) conducted winter bird censuses on a portion of the Wade Tract coinciding with our surveys. Bachman’s Sparrows were not recorded on this census, but we suspect the species was simply overlooked because we have heard unsolicited call notes infrequently while working in the area that was censused, particularly at dawn and dusk.

Variation in sparrow numbers among study sites coupled with casual observations suggested some interesting community-level dynamics also may be occurring. Sites with fewer Bachman’s Sparrows (e.g., Tall Timbers and Pebble Hill) appeared to support several species of wintering sparrows that were absent or uncommon on the Wade Tract. In addition to Chipping Sparrows, White-throated Sparrows (*Zonotrichia albicollis*), Swamp Sparrows (*Melospiza georgiana*), and Song Sparrows (*M. melodia*) were more common in the woody brush that dominates portions of Pebble Hill and Tall Timbers. Early successional habitats in the Red Hills region exhibit subtle variation influenced by ground-cover conditions and the frequency and timing of prescribed burns, and this variation may alter the structure of wintering sparrow communities (cf. Dunning and Brown 1982; Watts 1990).

Dunning (1993) recommended annual monitoring in areas where Bachman’s Sparrows were known or believed to be declining. We recommend that winter surveys using recorded vocalizations be considered as well to help document winter population status. Additional work will be needed to determine whether responses vary by sex and age, but taped vocalizations offer promise for monitoring winter populations, and, at the very least, should help to determine presence/absence in winter months.

Finally, we speculate that other secretive sparrows may respond in a similar fashion to taped vocalizations. While winter populations of many sparrows are monitored adequately using area searches (Root 1988), transects (Watts 1990) and other techniques that rely on unsolicited detections, several species (e.g., Henslow’s Sparrows [*Ammodramus henslowii*] and Lincoln’s Sparrows [*Melospiza lincolnii*]) defy easy counting (Hamel 1992; Rising 1996; Hammerson 1994) unless time-consuming and technically challenging surveys are initiated. Some species (e.g., White-throated Sparrows and Song Sparrows) appeared to respond to the Bachman’s Sparrow vocalizations used here (cf. Turcotte and Desrochers 2002). We encourage those studying winter sparrow populations to experiment with taped vocalizations. At the same time, we strongly discourage use of recorded vocalizations on the CBC because this would complicate and bias trend analyses considerably.

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LITERATURE CITED


