Surveys of Endangered Songbirds Hampered by Reduction of Singing Upon Nesting

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Abstract: Recent evidence has shown that male songbirds reduce the amount they sing once they become reproductive. They are instead attending to nest building, incubating, and feeding fledglings. Surveys that rely on singing males usually underestimate bird numbers and are generally inaccurate reflections of habitat preference. This has ramifications for surveys of endangered songbirds because these surveys usually rely on observations made by sound as well as by sight. To get a more accurate portrayal of songbird reproductive output under different land uses within priority shrub-steppe habitats of the south Okanagan, British Columbia, direct measures of reproductive success were recorded at eight 40 ha plots (and two smaller plots) during summer 2003. Point count surveys were also performed to assess their ability to estimate productivity at a site. One hundred and fifty-two nests of a variety of provincially red-listed grassland/shrub-steppe and other species were found. This included the discovery of a sage thrasher ([*Oreoscoptes montanus*] federally Endangered in Canada) nest without prior detection of the adults. It is likely that the male was not singing since the site was visited every two days by experienced birders who were looking for nests. Data on song rate in relation to reproductive status is difficult to collect, but we were able to collect some preliminary data for the vesper sparrow (*Pooecetes gramineus*), a declining grassland songbird species, that showed that song rate declined upon nesting. Difficulties in nest finding, especially with silent males, may result in many nests being undiscovered. Using a combination of nest searches with behavioral observations to define territories is the best approach for maximizing knowledge of the productivity of endangered songbirds at a site.

Key Words: vesper sparrow, *Pooecetes gramineus*, Brewer's sparrow, *Spizella breweri*, sage thrasher, *Oreoscoptes montanus*, song rate, demographic surveys, point count surveys, nest searches, songbird productivity, British Columbia

Introduction

We have learned a lot about estimating population numbers of species at risk through monitoring songbird populations. Birds are relatively easy to observe, so one might think they would also be easy to enumerate. Not so. The only way to really know how many individuals there is in a population of birds is to color band every individual.

Indices of abundance do not accurately estimate known productivity of songbird populations (Underwood and Roth 2002). Even measuring productivity by finding nests did not accurately reflect the known abundance of the wood thrush population in Underwood and Roth's (2002) study. This is also true for sagebrush songbirds, which are easier to observe than woodland species.

A few years ago we had an opportunity to determine efficacy of sampling through point count surveys. We had four color-banded populations of Brewer's sparrows (*Spizella breweri*) in the south Okanagan, British Columbia (B.C.) (Mahony 2003), and assessed relative abundance via point counts over a wide area (Paczek 2002). In the four banded populations, of which population abundance was known, there were 2.6 times more males in the population than were estimated by the point counts (Mahony et al., in review).

Why do surveys that rely for the most part on singing males underestimate population numbers? It is becoming clear that males tend to stop singing once they are paired. This is especially so for the Brewer's sparrow, a species with male parental care (Mahony et al. 2001). Male Brewer's sparrows spend a lot of time participating in incubation and brood rearing, so they have less time available for singing. Once paired, they will only sing the long version of their song if provoked by territorial conflicts (Walker 2000). Song rate declines drastically from 3.5 songs/min before pairing to 0.3 songs/min after pairing (Walker 2000).

These kinds of data are difficult to collect because males that do not sing are not easy to locate. Because of this, there has been a move in assessments of habitat quality for songbirds to do not only point counts but to include measures of nest productivity. In 2003, in collaboration with colleagues from the United States, we initiated demographic surveys in shrub-steppe habitats throughout the intermountain west, and incorporated point counts and estimates of site productivity. This paper reports on the British Columbia portion of the data, and focuses on observations regarding song rate in the vesper sparrow (*Pooecetes gramineus*).

Methods and Results

We established 8 plots of 40 ha each and 2 plots of approximately 30 ha each in the south Okanagan and Similkameen Valleys (Fig. 1). We chose sites that represented a range of land uses, understorey types, and habitats types of a variety of red-listed and declining grassland bird species. The sites ranged in elevation from 340 to 1140 m, and were generally south to southwest facing.

Each plot had 6 point count stations 300 m apart, at which we performed 2 point count surveys throughout the field season. In addition, we searched for nests throughout the 40 ha plots and followed the nests through to fledging or failure. We also characterized vegetation throughout the plots to assess habitat associations of birds and nests, but those results will not be described here.

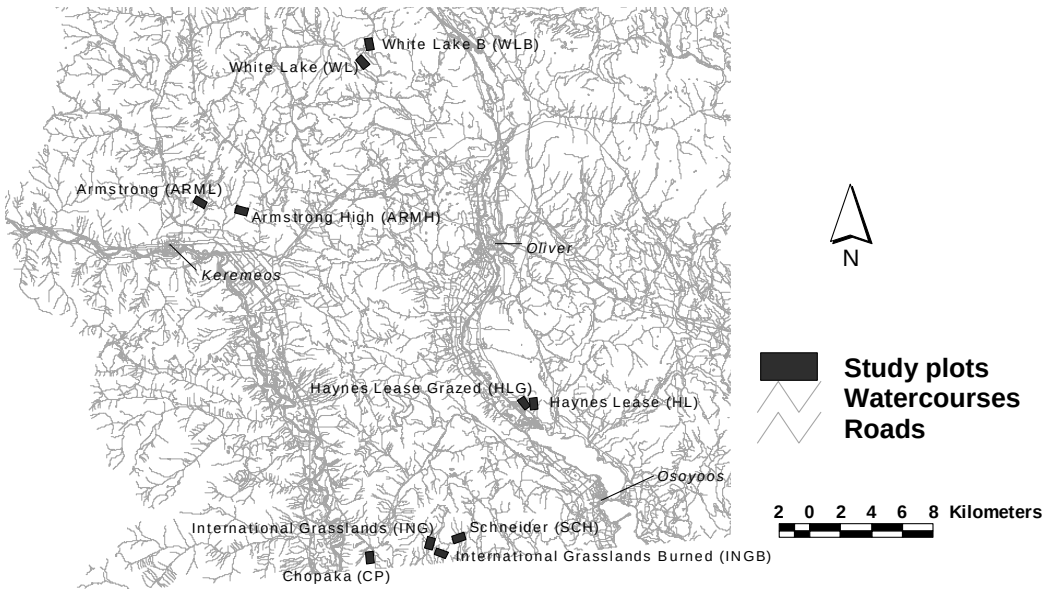

Figure 1. Map of study sites in the south Okanagan and Similkameen Valleys.

Point Counts vs. Productivity

We detected 93 species with the point count surveys; 78 of these species were detected at least twice. The vesper sparrow and western meadowlark (*Sturnella neglecta*) were the most abundant species recorded, with over 200 detections each. We detected many more species with point counts than with nest searches. Although 152 nests were found, they belonged to only 12 species of songbirds.

There were differences between sites in discrepancies between estimated songbird density and nest productivity (Figs. 2 and 3). Given the assumption that the level of effort was the same across sites, site ARML contained many singing unpaired male Brewer's sparrows, whereas site SCH had mostly paired and reproductive male Brewer's sparrows that were not singing (Fig. 2). The other sites were fairly similar in the proportion of nests to singing males. The same pattern held for the most abundant species, the vesper sparrow, with some sites having more singing males than nests, while others had more nests than singing males (Fig. 3).

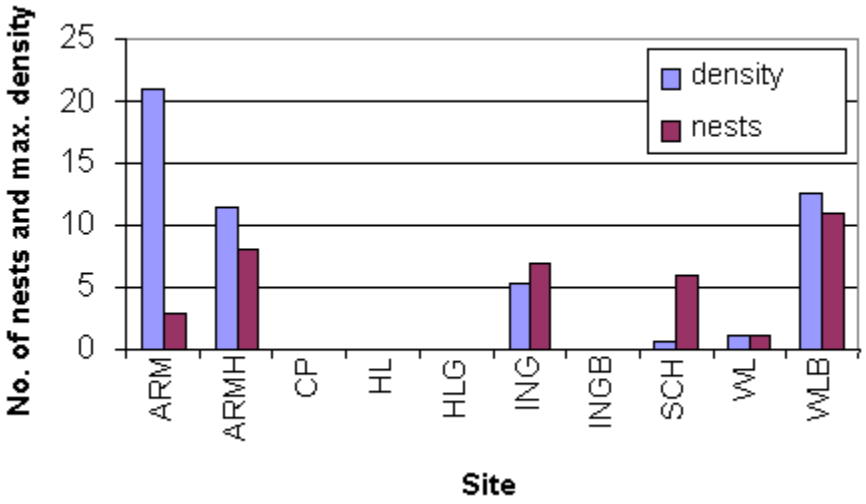

Figure 2. Estimated density (no. of birds/ha) of Brewer's sparrows from six point counts per site and estimated number of Brewer's sparrow nests from each site.

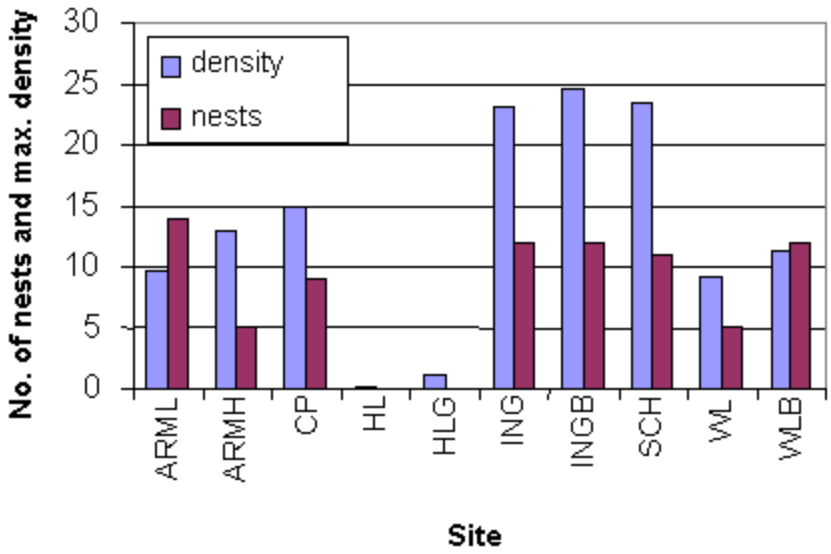

Figure 3. Estimated density (no. of birds/ha) of vesper sparrows from six point counts per site and estimated number of vesper sparrow nests from each site.

Vesper Sparrow Song Rate

Walker (2000) showed that song rate in Brewer's sparrows changed with reproductive status, but no data had been previously collected to test the same for vesper sparrows. To determine whether discrepancy in density estimates from point counts vs. nest productivity were attributable to differences in song rate between paired and unpaired vesper sparrows, we color-banded vesper sparrows and studied their song rate and reproductive status. We predicted that song rate would decline with reproductive status because, similar to Brewer's sparrows, vesper sparrow males share in incubation and brood rearing (Rising and Beadle 1996).

We observed territorial vesper sparrow males and timed how many songs they sang in a five-minute period. We did this throughout the season. Meanwhile, we searched territories for nests and the arrival of females. We then analyzed song rate as a function of pairing and reproductive status.

We determined song rate for 51 vesper sparrow males. The proportion of all males that sang declined over the course of the breeding season (Fig. 4). Early in the season, all males sang at high rates. Later, increasingly more males became silent. We hypothesized that the increasing proportion of silent males reflected an increase in the number of paired males.

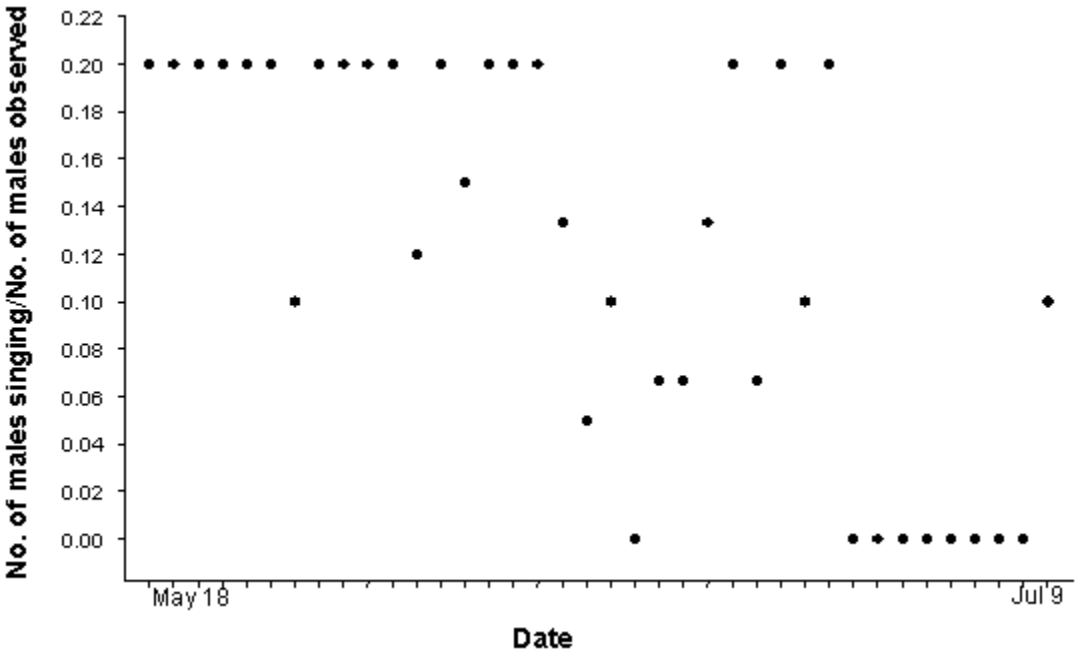

Figure 4. Proportion of male vesper sparrows that were observed to be singing as a function of date.

Pairing and nesting status was observed for 11 of the 51 males. Our suspicions were confirmed: just like Brewer's sparrows, unpaired male vesper sparrows sang at a much higher

rate than paired males (Fig. 5). We followed 3 of the 11 males from bachelorhood to being mated, and they also showed this same pattern (Fig. 6).

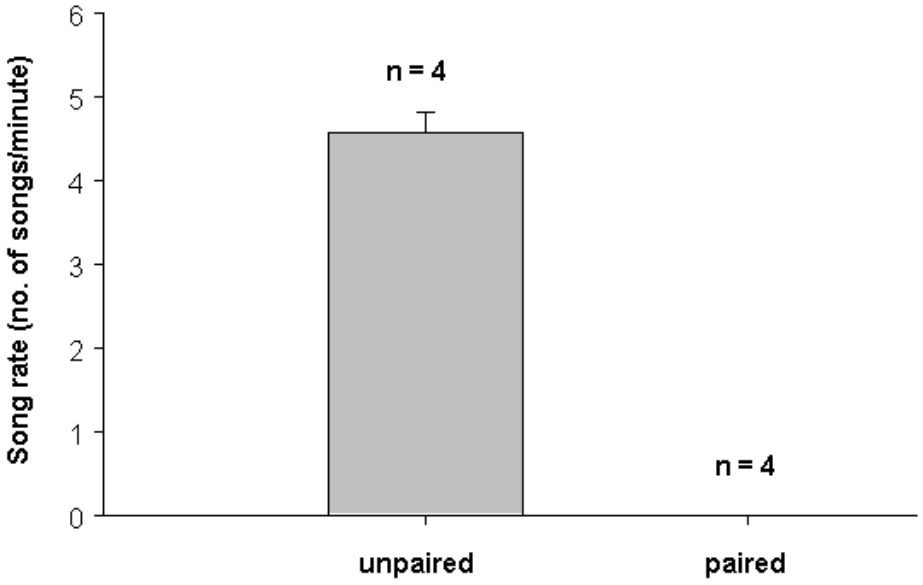

Figure 5. Song rate of vesper sparrows that were paired or unpaired.

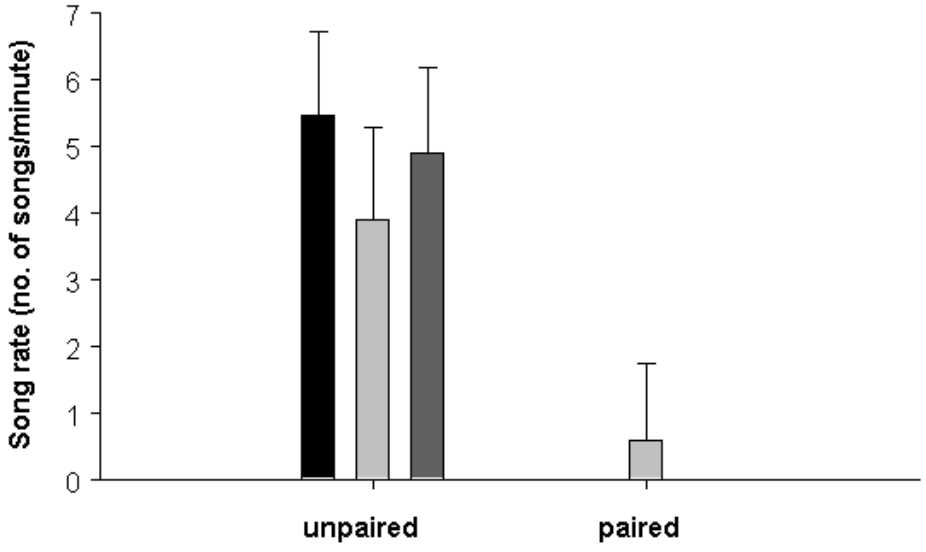

Figure 6. Song rate of vesper sparrows before and after pairing.

This pattern was generally associated with wariness on the part of the reproductive male. We could almost predict that a male was paired by how it behaved in the field—it became much more secretive and would try to direct us away from the nest. We were able to find nests by going in the opposite direction of males who had stopped singing.

Implications for Species at Risk and Critical Habitat Designation

Cessation of singing upon pairing also affects our ability to detect rarer species such as the sage thrasher (*Oreoscoptes montanus*). In 2003, we discovered a sage thrasher nest in one of the plots we had visited every 2–3 days. The crew were astonished that they had not noticed the adults before. There were already four eggs in the nest when it was found. One hypothesis is that the sage thrasher adults came to the site already paired; consequently, the male did not sing frequently. It has been shown that sage thrashers also reduce singing upon nest building and through fledging (Gooding 1970, cited in Reynolds et al. 1999: 30–70 songs/hour prior to nest building, 0–3.5 songs/hour post nest building). It has been almost 10 years since a sage thrasher nest was found in B.C., although singing males are usually seen every year. It is likely that nests will not be found in areas near these singing males.

During the 2004 field season, we intend to search for sage thrasher nests without relying on singing males to determine suitable habitat. We will search the habitat type in which last year's nest was found, and use a Landsat classification scheme for sagebrush habitats (Paczek 2002) to find similar habitat in the south Okanagan. Paczek's (2002) classification scheme indicates that there is approximately 8000 ha of suitable habitat, about 4000 of which is on Crown land or in protected areas. It will be very interesting to see if we find more sage thrasher nests of silent males.

The relationship between song rate and reproductive status makes the designation of critical habitat more difficult for species with rarely observed nests. If critical habitat was designated based on surveys of singing males, habitats with high numbers of unpaired males would be selected; consequently, the selected habitat would have low reproductive value, and the highly productive habitats would go undetected. Therefore, to improve confidence regarding designation of critical habitat, it is crucial that any bird surveys be combined with surveys of nests and productivity, even though this is expensive and time consuming.

Acknowledgments

We are indebted to the rest of the field crew: Nathan Hentze, Dana Seaman, Matthew Justice, Liam Doyle, Natasha Schorb, Jamie Fenneman, and James Bradley. Funding for the bigger project was provided by Environment Canada operating funds, the Habitat Conservation Trust Fund, the Summer Career Placement Program of Human Resources Development Canada, Science Horizons Youth Internship Program of Environment Canada, the Natural Sciences and

Engineering Research Council of Canada's summer student scholarship, and the British Columbia Ministry of Water, Land and Air Protection. We also thank Andy Bezener for helping with the point count surveys and for providing some photos, Jamie Smith for supporting Christina Struik's NSERC application, and Richard Feldman for assistance in preparing this document.

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