The 2014 Targeted Playback Survey for Bachman's Sparrows and Northern Bobwhites on Carolina Sandhills National Wildlife Refuge



Bachman's Sparrow

Prepared by

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INTRODUCTION

Some of the birds associated with longleaf pine (*Pinus palustris*) ecosystems in the southeastern U.S. have undergone widespread population declines in recent decades (Hunter *et al.*, 2001). Species experiencing especially precipitous declines include Northern Bobwhite (*Colinus virginianus*), a popular game species, and two songbirds: Bachman's Sparrow (*Peucaea aestivalis*) and Brown-headed Nuthatch (*Sitta pusilla*). Nearly every southeastern state now lists these three pine-grassland specialists as species of conservation concern, and efforts to stabilize populations on public lands are widespread (Cox and Widener, 2008). In South Carolina, where Carolina Sandhills National Wildlife Refuge (CSNWR) is located, all three species are identified as the Highest Priority for Conservation in the South Carolina Comprehensive Wildlife Conservation Strategy (South Carolina Department of Natural Resources 2005).

The second round of monitoring using the targeted playback method was conducted for Northern Bobwhite and Bachman's Sparrow on CSNWR in 2014. The Comprehensive Conservation Plan (CCP) for CSNWR cites an objective of "developing and implementing habitat management response surveys to identify species response to treatments in longleaf pine habitat" (USFWS 2010). The strategy identified to meet this objective is to "monitor response to habitat treatments of pine-associated breeding birds (e.g. Bachman's Sparrow and Northern Bobwhite)." Both Bachman's Sparrow and Northern Bobwhite are identified as "Resources of Concern" in the refuge's Habitat Management Plan (HMP) (USFWS 2014).

METHODS

Monitoring procedures follow those developed by J. Cox (Tall Timbers Research Station, Tallahassee, FL) for use by the Florida Fish and Wildlife Conservation Commission. Refuge boundaries, timber stands, and roads were merged in ArcView GIS (version 3.2, ESRI Inc., Redlands, CA) and used to establish 65 survey points where Bachman's Sparrow and Northern Bobwhite would be monitored (see Figure 1). Refer to Cox *et al.,* 2012 for further information on survey design.

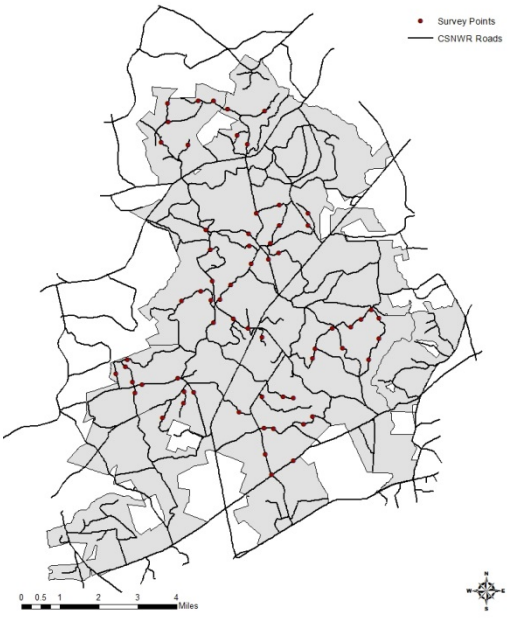


Figure 1. Location of the 65 random survey points on the refuge

Each survey point was visited four times for each species during April-June 2014. Sampling was conducted under fair skies and when wind was ≤3 on the Beaufort scale. A total of 520 visits were made to the 65 points established for Northern Bobwhite and Bachman's Sparrow. A 3-minute recording containing conspecific vocalizations was broadcast during each visit, and the presence/absence of the species was recorded. The recorded vocalizations broadcast at each point included simple songs, aggressive calls, contact notes, and covey calls that alternated with 15 seconds of silence at the end of each minute interval. The vocalizations were broadcast using an MP3 player and battery-powered external speakers with volume held constant (ca. 85 decibels). Surveys were conducted between 0800 and 1630, and times varied so that sites were visited at early and later periods of the day.

Vegetation data was not collected in 2014; it will be collected again in 2016. However, the number of prescribed fires applied since 2000 was calculated for each sample point. When the sample point fell between two or more burn units, the average number of prescribed fires

conducted among all units was calculated as well as the highest number for individual units. Accordingly, a sample point situated between two burn units that received 4 and 6 prescribed fires during the 10-year time interval, respectively, would have an average of 5 and a maximum of 6.

Statistical Analysis

Program PRESENCE (MacKenzie *et al.*, 2002) was used to assess variation in the probability of species occupancy (ψ) and detection probabilities (*p*). The probability of occupancy is a measure of the likelihood of a species occurring at a sample point after adjusting for the probability of detecting the species. If a species is extremely abundant and recorded during all visits made to a sample point, the probability of occupancy would be 1.0 (as would the probability of detection). If a species is extremely rare and not observed during any visits to sampling points, occupancy would be 0.0 (and detection 0.0). If the species is observed at a portion of the visits made to some points, occupancy and detection fall between 0.0 and 1.0 (with error rates calculated for both occupancy and detection).

RESULTS

Bachman's Sparrow

In 2014, Bachman's Sparrows were recorded at 38 of the 65 sample points. The naïve estimate for sparrow occurrence rates was 0.58. The occupancy estimate was 0.67 (±0.08) and the detection probability was 0.40 (±.05). In 2014, each survey point was visited 4 times instead of 3 to increase the likelihood of detection. The best model calculated by PRESENCE allowed the detection probability to vary with the date of the survey (declining detection rates as time increased; Figure 2). Overall, the detection averaged but declined negligibly over the course of the year (-0.04 per day). The relationship between Bachman's Sparrow occupancy and fire treatments again was strong. Areas burned >4 times over the past 10 years were nearly twice as likely to be occupied as sites burned <2 times (Figure 3).

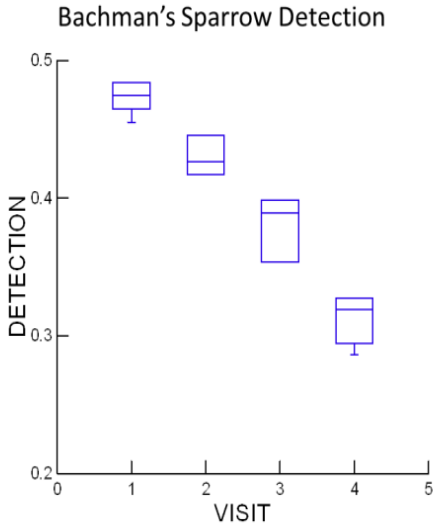


Figure 2. Detection of Bachman's Sparrows over time.

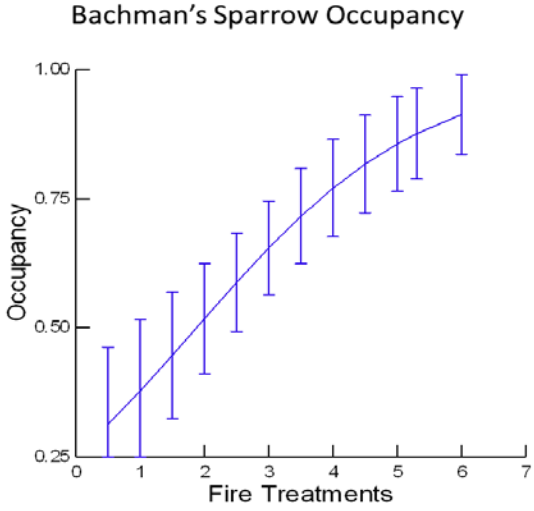


Figure 3. Bachman's Sparrow Occupancy in relation to number of fire treatments since 2000

Northern Bobwhite

In 2014, the Northern Bobwhite was recorded at 33 of the 65 sample points. The naïve estimate for bobwhite occurrence rates was 0.51. The occupancy estimate was 0.63 (± 0.09) and the detection probability was 0.33 (± 0.05). Similar to results for Bachman's Sparrow, variation within subunits of the refuge is evident. The best model of occupancy for quail was one where occupancy was influenced by burn treatments and detection probability was constant. The relationship between Northern Bobwhite and fire treatments was not as steep as the relationship observed for Bachman's Sparrow, but the upward trend is clear and could be greater than estimated (Figure 4).

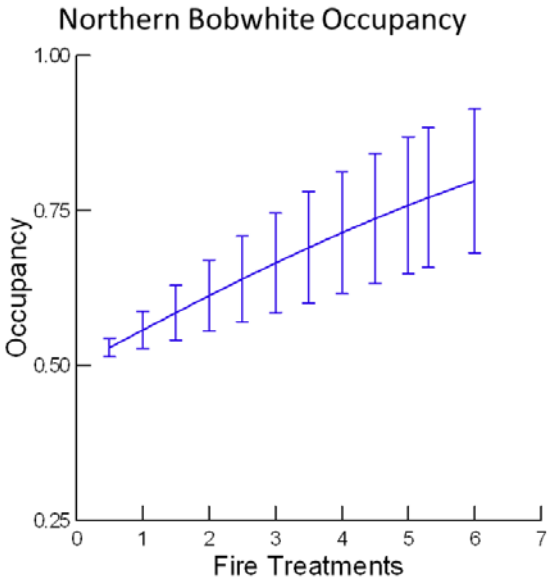


Figure 4. Northern Bobwhite Occupancy in relation to number of fire treatments since 2000

DISCUSSION

In 2012 and 2014, Bachman's Sparrow and Northern Bobwhite occurrence varied widely within subunits of the refuge. Detection increased from 2012 to 2014 for both species (Figures 5 and 6).

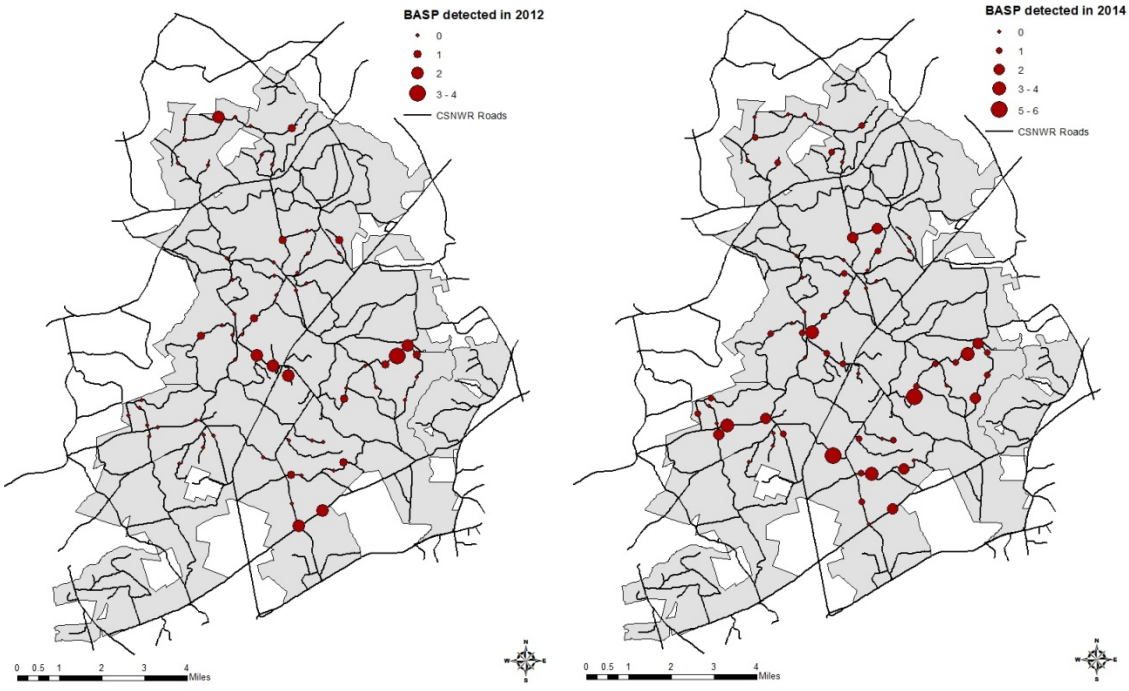


Figure 5. Bachman's Sparrow occupancy (No. of sparrows detected at each survey point) in 2012 and 2014

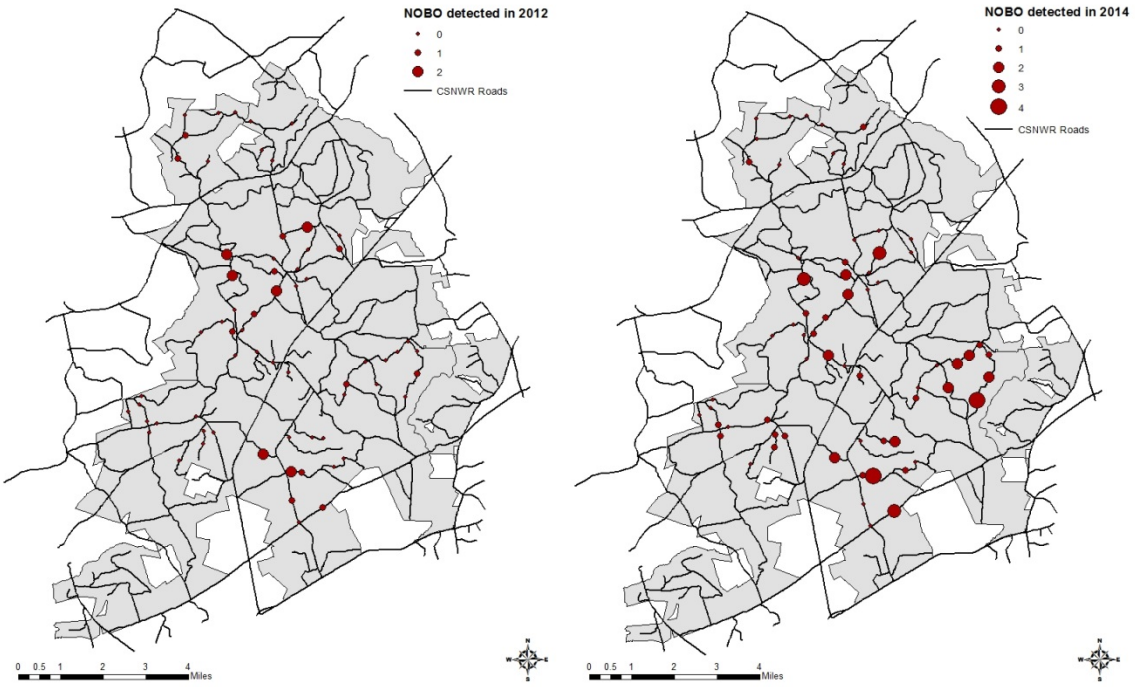


Figure 6. Northern Bobwhite occupancy (No. of bobwhites detected at each survey point) in 2012 and 2014

Based upon the results of the 2012 survey, it was recommended that the number of visits to each point be increased to 4 instead of 3 to see if additional visits improved survey precision. Overall, detection decreased very little over time which indicates occupancy, especially for Bachman's Sparrow, did indeed increase in 2014 as compared to 2012. The top model for detection probabilities allowed the detection probability to vary with the date of survey (declining detection rates as time increased); however, that model was only slightly better than the model where detection was held constant (Figure 2). It appears the extra visit had a negligible impact on detection rates.

Northern Bobwhite detection rates may have also been influenced by the quality of the playback audio file. In 2012, the volume of the Northern Bobwhite playback was noticeably quieter than the Bachman's Sparrow playback. We acquired a new playback audio file for the Northern Bobwhite in 2014 that had the same decibel level as the Bachman's Sparrows. The difference in the decibel level of the Northern Bobwhite playback audio file may have influenced the increase in occupancy witnessed in 2014. However, Northern Bobwhites were detected at the same number of points (18) as Bachman's Sparrows in 2012.

In 2012 and 2014, fire frequency was the most important factor in Northern Bobwhite and Bachman's Sparrow occupancy. CSNWR's fire frequency shapefile, which has the number of times each burn unit has been burned since 2000 indicated by a color code, was overlaid with a shapefile representing species occupancy expressed by point size (Figure 7). While other factors may have influenced species occupancy, this simple analysis identifies areas where the refuge could focus prescribed fire treatments in order to improve habitat quality for Northern Bobwhite and Bachman's Sparrow.

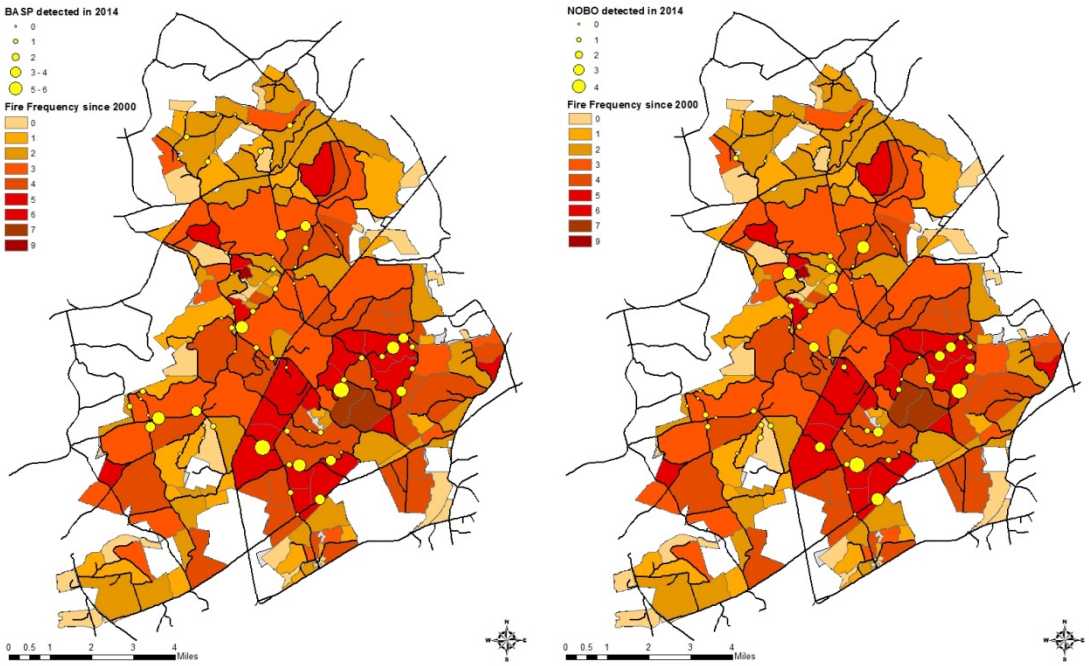


Figure 7. Fire frequency by burn unit and Bachman's Sparrow and Northern Bobwhite occupancy in 2014.

In summary, species monitoring will continue for Bachman's Sparrow and Northern Bobwhite on CSNWR. Both species are declining and appear to occur at low densities. Data collected through targeted species and vegetation monitoring provides data for habitat-related analysis that is not possible with the BBS survey on CSNWR. Additionally, no Brown-headed Nuthatches were seen or heard on the BBS survey in 2014, even though they appeared abundant according to the 2012 playback survey results. The 2014 BBS results may have been due to a harsh winter, therefore possibly reducing Brown-headed Nuthatch numbers. The Nuthatch will be added to the 2016 survey.

Future plans are to conduct the survey for the third time in 2016 for Brown-headed Nuthatch to Bachman's Sparrow and Northern Bobwhite. Vegetation data will be collected as well, except for pine basal area not including pine stands that have been thinned since 2012.

LITERATURE CITED

Cox, J., and B. Widener. 2008. Lightning-season burning: friend or foe of breeding birds. Tall Timbers Research Station Miscellaneous Publication 17.

Cox, J., N. Jordan, & W. Wallett. 2012. Pine Grassland Bird Occupancy and its Relationship to Fire Management and Vegetation Structure on the Carolina Sandhills National Wildlife Refuge. U. S. Fish and Wildlife Service. McBee, SC

Hunter, W.C., D. A. Buehler, R. A. Canterbury, J. L. Confer, and P. B. Hamel. 2001. Conservation of disturbance-dependent birds in eastern North America. Wildlife Society Bulletin 29, 440-455.

MacKenzie, D.I., J. D. Nichols, G. B. Lachman, S. Droege, J. Andrew Royle, and C. A. Langtimm. 2002. Estimating site occupancy rates when detection probabilities are less than one. Ecology 83, 2248-2255.

South Carolina Department of Natural Resources. 2005. Comprehensive Wildlife Conservation Strategy (CWCS). Columbia, SC. http://www.dnr.sc.gov/cwcs/.

USFWS. 2010. Carolina Sandhills National Wildlife Refuge Comprehensive Conservation Plan. Atlanta, GA.

USFWS. 2014. Carolina Sandhills National Wildlife Refuge Habitat Management Plan. Atlanta, GA.