

WINTER POPULATION TRENDS AND DISTRIBUTION OF THE BALD EAGLE (*HALIAEETUS LEUCOCEPHALUS*) ON THE TENNESSEE RIVER, ALABAMA, 1976-1999

Thomas M. Haggerty, Paul D. Kittle, and M. Keith Hudson

INTRODUCTION

The Bald Eagle (*Haliaeetus leucocephalus*) inhabits aquatic ecosystems such as estuaries, large lakes, reservoirs, major rivers, and some seacoast habitats. It feeds primarily on fish, waterfowl, and carrion. Habitat loss, illegal shooting, and food contamination with DDT and other chemicals, however, caused precipitous declines in Bald Eagle populations throughout much of the conterminous United States during the 19th and much of the 20th century (Johnsgaard 1990, Federal Register 1999). By the 1970's, the Bald Eagle was considered a rare to uncommon winter visitor in the Tennessee Valley, an area where it once bred and was considered common (Imhof 1976). With the ban of DDT, federal protection, and recovery programs, Bald Eagle populations have increased and the U. S. Fish and Wildlife Service has recently proposed that it be taken off the List of Endangered and Threatened Wildlife (Federal Register 1999).

Wintering habitats are of the utmost importance for the continued survival of the Bald Eagle. Therefore, studies are needed to identify important wintering sites and document population trends (Federal Register 1999). The objectives of this article are to provide estimates of winter population trends for the Bald Eagle in various regions of the Tennessee River Valley in Alabama between 1976-1999 and to examine the distribution of Bald Eagles wintering along the Tennessee River.

STUDY AREA AND METHODS

Two methods were used to estimate wintering Bald Eagle populations in the Tennessee River Valley, aerial surveys and Christmas Bird Counts (CBC's). Two aerial survey routes were conducted from a single engine airplane during the first two weeks of January between 1979-1999. The Pickwick Reservoir route was approximately 104 miles long. It started at Wilson Dam (Tennessee River mile [TRM] 259), Colbert/Lauderdale counties, Alabama, and extended along

one riverbank until Pickwick Dam (TRM 207), Hardin County, Tennessee, was reached. The route then continued back to Wilson Dam along the opposite riverbank. The Wheeler-Guntersville route was 132 miles long and extended along one riverbank from Hobbs Island (TRM 337), Madison County, Alabama to TRM 403 near Stevenson, Jackson County, Alabama, along one riverbank and returned to Hobbs Island along the opposite riverbank. Eagles along each riverbank were counted. The plane flew at an altitude of approximately 100 ft (30.5 m) at a speed of 90-110 knots (104-127 mph) during daylight hours. Only rain, snow, or extremely windy conditions prevented surveys.

Data from three National Audubon Society Christmas Bird Counts were used in our study. These counts involve teams of observers who count birds within a 15-mile diameter circle on a single day during the last three weeks of December or first week of January. The Guntersville CBC is centered near Guntersville, Marshall County, Alabama, and includes Tennessee River miles 348-368. Miles 349-368 are on Guntersville Reservoir, including Town Creek, Big Spring Creek, Browns Creek, and Honeycomb Creek embayments, while mile 348-349 is in the uppermost portion of Wheeler Reservoir, downstream from Guntersville Dam. The Wheeler CBC is centered near Mooresville, Limestone County, Alabama, and includes Tennessee River miles 303-318 of Wheeler Reservoir, including Limestone Creek and Flint Creek embayments, in Limestone, Madison, and Morgan counties. The Waterloo CBC is centered near Lane Springs, Colbert County, Alabama, and covers Tennessee River miles 222-241 of Pickwick Reservoir, including Bear Creek and Second Creek embayments, in Colbert and Lauderdale counties. Data from 1976 through 1998 were available for the Guntersville and Wheeler counts, while the Waterloo count has been conducted only from 1985 through 1998. The Waterloo and Wheeler counts were conducted on the same day during the second or third week in December, while the Guntersville count was conducted, on average, one week later.

Pearson correlation analysis was used to examine the relationship between eagle counts and year. A t-test and analysis of variance were used to compare count data between the two aerial survey routes and among the three CBC's, respectively. The Duncan multiple range test was used to compare means. Probability values less than 0.05 were considered significant.

RESULTS

Aerial Surveys.- The average number of Bald Eagles counted by aerial survey per year was 53.8. Variation, however, was found among years (e.g., minimum

= 17 in 1979, maximum = 155 in 1994, standard deviation [SD] = 31, $n = 21$). Overall, aerial surveys indicate that eagle numbers during the survey period significantly increased ($r = 0.62$, $P < 0.01$, $n = 21$; Fig. 1A). However, when the routes were examined separately, only the Pickwick route showed a significant increase in eagles (Pickwick route: $r = 0.63$, $P < 0.01$, $n = 21$; Wheeler-Guntersville route: $r = 0.32$, $P > 0.15$; $n = 21$, Fig. 1A). Further, the overall significant increase was also primarily due to an increase that occurred during the first half of the survey period (i.e., 1979-1989; $r = 0.80$, $P < 0.01$, $n = 11$, Fig. 1A). No significant increase was found during the second half of the survey period (i.e., 1990-1999; $r = 0.25$, $P > 0.5$, $n = 10$, Fig. 1A).

A comparison between the two aerial survey routes showed that more eagles wintered along the Pickwick route than along the Wheeler-Guntersville route ($t = 3.7$, $P < 0.01$, Fig. 1A). On average, 35.4 ± 27 (SD) eagles were counted along the Pickwick route and 18.4 ± 8.0 were counted on the Wheeler-Guntersville route.

Christmas Bird Counts. - The CBC data showed a significant decrease in wintering eagle numbers in the count circles between 1985-1998 ($r = -0.58$, $P < 0.05$, $n = 14$; Fig. 1B). However, when the results of the three counts were examined separately, only the Waterloo CBC showed a significant decrease ($r = -0.70$, $P < 0.01$, $n = 14$; Fig. 1B). Comparison of the Bald Eagle counts among the CBC's of the three reservoirs were significantly different ($F = 44.7$, $P < 0.0001$, Fig. 1B). The Waterloo CBC had the highest average count (6.8/10 party-hrs) and the Wheeler CBC the lowest (0.4/10 party-hrs).

DISCUSSION

Our results show that the Tennessee River in Alabama is an important wintering site for the Bald Eagle. The aerial surveys indicate that the number of eagles wintering along the Tennessee River has increased in the last 21 years. Interestingly, the CBC results do not show a similar trend. A number of factors may explain this inconsistency. First, the aerial survey data were collected for six years prior to the start of Waterloo CBC, the only count that showed a significant change. If only the aerial survey data between 1985-1998 (i.e., the years that the Waterloo CBC was conducted) are analyzed, no significant correlation is found ($r = 0.32$, $P > 0.2$, $n = 15$). This indicates that it was primarily an increase during the early 1980's that was responsible for the significant correlation that was shown for the entire survey period. Secondly,

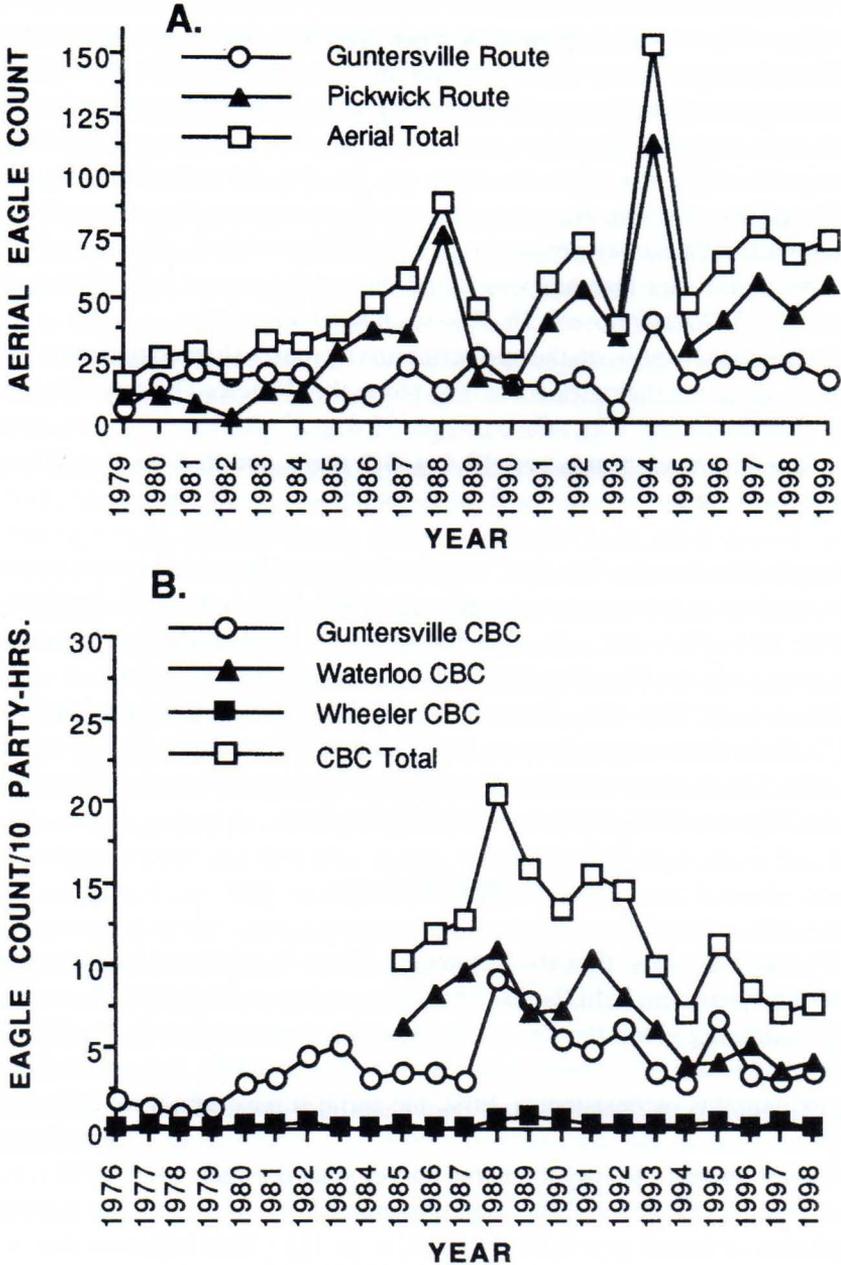


Figure 1. Bald Eagle counts from yearly aerial surveys (A) and Christmas Bird Counts (B) along the Tennessee River, Alabama.

temperature may also have affected the count results. Aerial survey counts were usually conducted after the CBC's. Typically, weeks in late December and early January have colder temperatures than the first weeks of December. Colder temperatures may have reduced open water for feeding at sites farther north and could have forced eagles southward into the Tennessee Valley after the CBC's had been conducted. We suspect that temperature variation also accounts for some of the variation in eagle numbers that was seen among years. Interestingly, the number of eagles wintering in the Tennessee Valley appears to have peaked in the early 1990's. It is unclear if this is due to weather conditions that may have allowed eagles to winter farther north or because the maximum number of eagles that the river can support during the winter has been reached. It may also indicate that the breeding populations with individuals that winter in the Tennessee River have leveled off.

Our results indicate that Bald Eagles are not equally dispersed along the Tennessee River, Alabama. The highest aerial survey counts and CBC's were made on Pickwick Reservoir and its tributaries, with lower counts on Guntersville Reservoir and Wheeler Reservoir. It is unclear what factors account for the winter dispersal pattern that we observed, but variation in food resources (Johnsgaard 1990), roost and perch sites (Johnsgaard 1990), levels of human disturbance (McGarigal *et al.* 1991), and river flow rates (Brown *et al.* 1998) may have been responsible. If the Tennessee Valley is to remain an important wintering site for the Bald Eagle, monitoring studies should continue and additional research is needed to identify the factors responsible for the variation in Bald Eagle distribution along the Tennessee River in Alabama.

ACKNOWLEDGMENTS

Dwight Cooley and Linda Reynolds provided data for the Wheeler and Guntersville CBC's, respectively. Thanks to Damien Simbeck for providing information concerning the Tennessee River reservoirs .

LITERATURE CITED

Brown, B. T., L. E. Stevens, and T. A. Yates. 1998. Influences of fluctuating river flows on Bald Eagle foraging behavior. *Condor* 100:745-748.

Federal Register. 1999. Vol. 64:36463-36464.

Imhof, T. A. 1976. Alabama birds, 2nd ed., University of Alabama Press, Tuscaloosa, Alabama.

Johnsgaard, P. A. 1990. Hawks, eagles and falcons of North America. Smithsonian Institution Press, Washington, D.C.

McGarigal, K., R. G. Anthony, F. B. Isaacs. 1991. Interactions of humans and Bald Eagles on the Columbia River Estuary. Wildlife Monographs No. 115.

Thomas M. Haggerty and **Paul D. Kittle**, Department of Biology, University of North Alabama, Florence, AL, 35632. **M. Keith Hudson**, Nongame Wildlife Program, Department of Conservation and Natural Resources, Montgomery, AL 36130.