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erulean Warbler, photo by J. Culbertson VIREO

STATUS OF THE CERULEAN WARBLER (*DENDROICA CERULEA*) IN NORTHERN ALABAMA, 1999 - 2004

John P. Carpenter, Eric C. Soehren, Adrian A. Lesak, Yong Wang,  
and Callie J. Schweitzer

## INTRODUCTION

The Cerulean Warbler (*Dendroica cerulea*) is a Neotropic-Nearctic migratory passerine that breeds in eastern North America and winters in northwestern South America (Dunn and Garrett 1997, Hamel 2000a, 2000b). The northern two-thirds of Alabama historically represented the southernmost extension of the Cerulean Warbler's breeding range, where they were recorded in 1887 (Holt 1921) and later described as moderately common in the 1920s (Howell 1928). In the mid-1970s, Imhof (1976) stated that they were most numerous toward the western half of the state and a locally common summer resident south to the "Fall Line", the boundary separating the Appalachian foothills and Coastal Plain. Today, Cerulean Warblers are rarely encountered in Alabama during the breeding season and, as a result, their current status and distribution are poorly understood. Furthermore, the Cerulean Warbler is reportedly experiencing the most precipitous population decline of any warbler species in the United States (Hamel 2000b). In 2002, it was designated as a Priority 1 species (Highest Conservation Concern) in Alabama based on its population trends, low relative abundance, patchy distribution, dependence on mature, contiguous forests and continual threats of habitat disturbance and destruction (Soehren 2004a).

The Cerulean Warbler belongs to the subfamily Parulinae, which consists of 16 genera with 53 species breeding in North America (Sibley 2000). Males are sky blue and streaked above, with two wing bars, and a dark band across a white breast; females and juveniles are blue-green above and yellowish below with two wing bars and a broad supercilium (Hamel 2000a, 2000b). The species is a short-tailed insectivore measuring 11.5 cm long and weighing approximately 8-10 g, and is classified as an upper canopy specialist of mature deciduous forests (Dunn and Garrett 1997, Hamel 2000a, 2000b). Cerulean Warblers are a trans-Gulf migrant whose combined average spring and fall migrations total 1,200 miles (1,930 km) across the Gulf of Mexico each year (Hamel 2000b, Soehren 2003).

Cerulean Warbler breeding habitat is characterized by mature floodplain

forests and mesic upland forests with large-diameter hardwoods, complex canopy structures, and sparse understory. The size of forest tracts used varies from >8,000 ha in the Mississippi Alluvial Valley to 10 ha in Ontario, with elevations ranging from <30 m to >1000 m (Hamel 2000a, 2000b). Nests are typically constructed on a horizontal limb at an average height of 11.5 m above the ground in the mid to upper tiers of the canopy and concealed from above by the vegetation of an adjacent branch (Hamel 2000a, 2000b). Clutch size ranges from three to five eggs that are creamy white and blotched around the large end with bay, chestnut, or auburn (Bent 1953, Griscom 1979, Hamel 2000b). Typically only one brood is raised per season, but pairs frequently re-nest after a failed attempt (Oliarnyk and Robertson 1996, Hamel 2000a, 2000b).

At present, the Cerulean Warbler's breeding range encompasses 32 U.S. states and two Canadian provinces with highest concentrations in the Ohio Hills and northern Cumberland Plateau (Hamel 2000a, 2000b, Rosenberg et al. 2000, Nicholson 2003). This species was recognized as one of the most abundant warblers in the Ohio and Mississippi Alluvial Valleys at the turn of the 20th century, but is currently classified as "vulnerable" in both Canadian provinces, "endangered" in one U.S. state, "threatened" in two, and a "species of concern" in 13 others (Hamel 2000a, 2000b, Rosenberg et al. 2000).

Conservationists have witnessed a sharp decline in the number of Neotropical migrants over recent decades, and many of these species have become the focus of research and conservation initiatives (Terborgh 1989, Finch 1991, Robbins et al. 1992). Declines have been attributed to loss and fragmentation of breeding, migratory, and wintering habitats, nest parasitism by the Brown-headed Cowbird (*Molothrus ater*), and loss of important tree species through the introduction of exotic diseases (Terborgh 1989, Finch 1991, Robbins et al. 1992, Villard and Maurer 1996, Hamel 2000b). Examination of Breeding Bird Survey (BBS) data from 1966 to 2001 revealed an annual 4% decline in the Cerulean Warbler population (Sauer et al. 2002), and geostatistical analysis of its entire North American range from 1967 to 1989 indicated the greatest decline was occurring in areas with the highest breeding potential (Villard and Maurer 1996, Hamel 2000b).

Recent discoveries of three Cerulean Warbler populations in Alabama, one in Bankhead National Forest (BNF) and two in Jackson County (Figures 1 and 2, respectively), suggest that suitable habitat may still be available in northern Alabama to support small breeding populations. Nonetheless, current literature on this species in Alabama is limited (Rosenberg et al. 2000, Soehren 2003,

2004a, 2004b, 2004c). and as a result, intensive research on *D. cerulea* has begun in this portion of its range. This report summarizes the research efforts involving these populations from 1999 to 2004 by the Alabama Department of Conservation and Natural Resources (ADCNR), USDA Forest Service (USFS), and Alabama A&M University (AAMU).

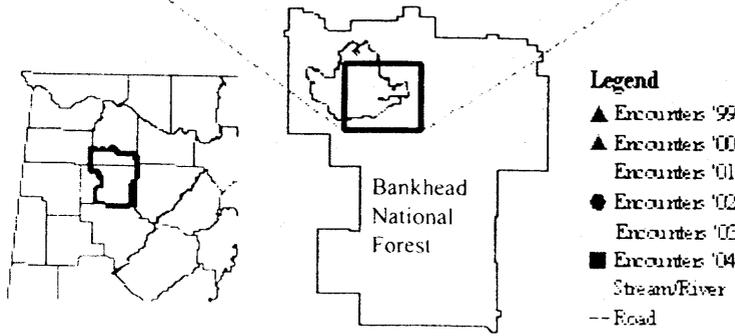
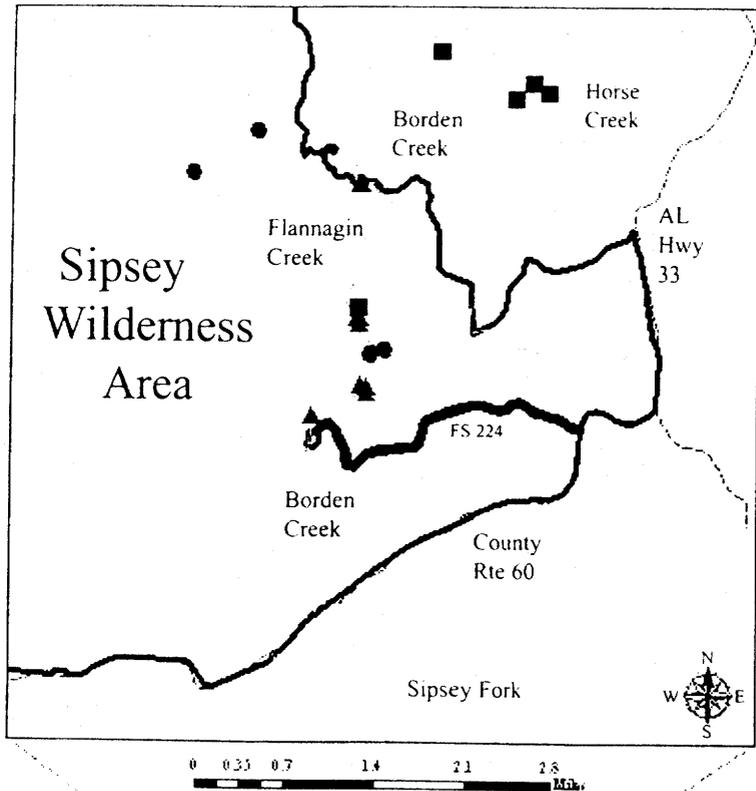
## STUDY AREAS AND METHODS

A challenge cost-share agreement between the USFS and ADCNR's State Lands Division's Natural Heritage Section was established in 1999 to assist in conducting breeding bird point count surveys in BNF (Fig. 1) with an emphasis on locating Cerulean Warblers. Point counts at 16 existing stations in mature (80+ year), seral, mesic hardwood and hardwood-pine habitats were performed in late May 1999 to 2004 (Soehren 2004c). In 2004, potential breeding habitat along the floodplains of and surrounding the Sipsey Wilderness Area in northern BNF was identified and surveyed using U.S. Geological Survey (USGS) quadrangular topographic and USFS Geographic Information System (GIS) maps. All searches and point counts were conducted by foot, with the exception of a vehicle target survey of bridge crossings in 2004. Periodically, the recorded playback of a Cerulean Warbler song was used to elicit responses from males (Soehren 2004c).

In 2002, researchers from AAMU and USFS located a breeding population along Larkin Fork (Fig. 2) near the Tennessee state line while performing an unrelated avian study in Jackson County, AL. Surveys were restricted to observations from AL State Highway 65, which runs parallel with Larkin Fork, because of the proximity of the warbler territories to private property. Subsequent investigations in 2003 were limited because of a lack of personnel; however, weekly roadside surveys resumed in 2004.

The third breeding population of Cerulean Warblers was discovered in 2004 along Hurricane Creek in the newly acquired 5,060 ha Forever Wild Walls of Jericho tract (Fig. 2), situated approximately seven miles east of Larkin Fork and adjacent to Skyline Wildlife Management Area (WMA). This site was surveyed weekly by foot from mid May to early July 2004 using USGS quadrangular topographic maps.

Additional areas exhibiting potential Cerulean Warbler habitat in Jackson County, AL, were chosen using quadrangular topographic maps and surveyed by foot and vehicle from May to July 2004, and included: Skyline WMA, Bucks Pocket State Park, Estill (located between Larkin Fork and Hurricane



Creek) and Lick forks, and Dry, Short, Guess, and Jones creeks.

Coordinates of all Cerulean Warbler encounters were recorded with a Global Positioning System (GPS) and taken under nests and singing males or as close to the individual as possible if it was heard from an inaccessible area. Furthermore, ArcGIS 9 software (Environmental Systems Research Institute 2004) was used to estimate distances from each encounter to the nearest stream, major road, and adjacent Cerulean Warbler.

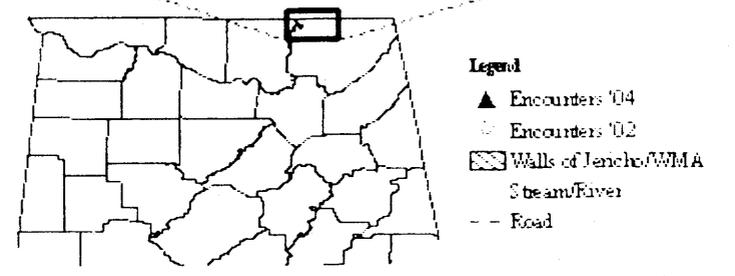
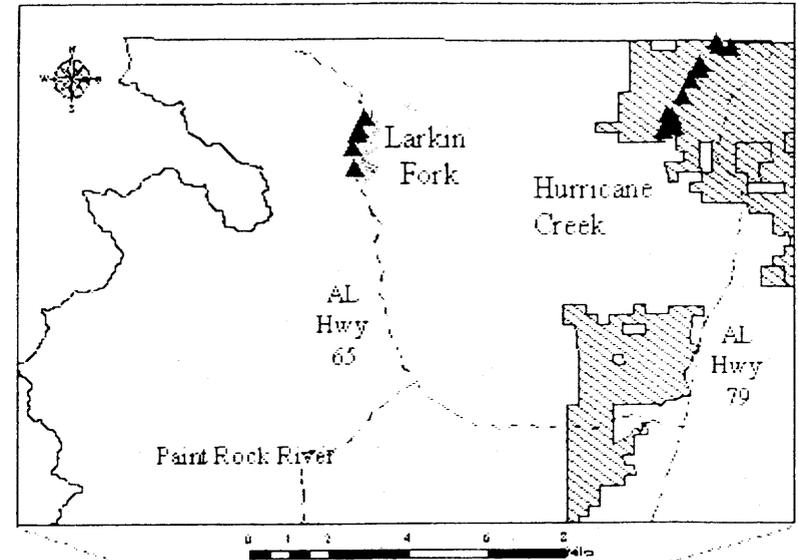


Figure 2. Cerulean Warblers detected in Jackson County, 2002 and 2004

Figure 1. Cerulean Warblers detected in Bankhead National Forest, 1999 - 2004.

## RESULTS

*Bankhead National Forest.* — From 1999 to 2004, a total of 30 males and 10 females was detected within BNF. Of the 16 established point count stations sampled, three yielded singing males. Most encounters occurred inside the Sipsey Wilderness Area along Borden and Flannagin creeks, and all birds were found in riparian hardwood habitat (Fig. 3A). In 2001, one female was observed collecting nesting material near Flannagin Creek. In 2004, an activeerulean Warbler nest (Table 1) was discovered just outside of the Sipsey Wilderness Area along Horse Creek near its confluence with Borden Creek (Behren 2004c).

*Larkin Fork.* — In 2002 and 2004, a total of 11 males, three females, two fledglings, and one nest (Table 1) was discovered along Larkin Fork. In 2004, a pair was observed performing a nest site selection ritual that included the male rubbing his cloaca in the fork of a branch before being bumped out and replaced by the female who would repeat the action; however, no nest was found in the vicinity. In 2002, a transient male was observed just northeast of a population on an upland clear-cut near Miller Mountain.

*Walls of Jericho.* — In 2004, the Walls of Jericho tract contained a total of 10 males, two females, and two nests (Table 1). This tract may support the highest density population in Alabama. Brown-headed Cowbirds were seen within roughly 90 m of a territorial Cerulean Warbler male; their effects on nesting success within the area were not determined. Both the Larkin Fork and Walls of Jericho populations occurred in riparian bottomland hardwood habitat and adjacent slopes at lower elevations (Fig. 3B). None of the additional searches throughout Jackson County revealed new populations.



FIGURE 3. Cerulean Warbler habitat and nesting areas along Horse Creek, Bankhead National Forest (A), and along Hurricane Creek, Walls of Jericho Forever Wild Tract (B) in 2004. Photographs by Eric Soehren.

*Geographic Information System Analysis.* — Compared to Larkin Fork and Walls of Jericho, Cerulean Warblers in BNF occurred closer to streams and further from roads and intraspecific neighbors, while encounters at Larkin Fork were farthest from water than those at BNF and Walls of Jericho (Fig. 4A-C, respectively). Despite the fact that many of the GPS coordinates recorded at Larkin Fork were exact Cerulean Warbler locations, several others represented only relative positions of males singing up or down slope from AL Hwy 65 on adjacent, private property. As a result, mean distance to nearest road was not calculated for this population, and mean distances to nearest neighbor and stream should be interpreted as close approximations.

Cerulean Warblers formed three distinct, clumped populations across northern Alabama, which supports theories of this species associating in breeding "colonies" (Griscom 1979, Oliarnyk and Robertson 1996, Hamel et al. 1994, Hamel 2000a). Furthermore, encounters at Walls of Jericho demonstrated a more aggregated distribution than the other two populations.

## DISCUSSION

Breeding Bird Survey (BBS) data provides the best large-scale population estimate for several species of Neotropical migrants; however, the reliability of these roadside surveys has been questioned in regard to the Cerulean Warbler because of its propensity for large forest tracts, which are often situated far from these types of corridors (Hamel 2000b). The Cerulean Warbler Atlas Project (CEWAP), in conjunction with Partners in Flight, the U.S. Fish and Wildlife Service and the Cornell Laboratory of Ornithology, was launched in

TABLE 1. Cerulean Warbler nesting records for northern Alabama, 1999 - 2004.

Date Found	Location	Nest Tree Species	Tree Height (m)	Nest Height (m)	Distance to stream (m)	Fate
5/2002	Larkin Fork	Basswood ( <i>Tilia americana</i> )	25	15	155	Success probable
5/2004	Horse Creek, Bankhead NF	Boxelder ( <i>Achillea negundo</i> )	24	16	28	Unknown
1/2004	Hurricane Creek, Walls of Jericho	Bitternut Hickory ( <i>Carya cordiformis</i> )	17	12.5	75	Depredated
1/2004	Hurricane Creek, Walls of Jericho	White Oak ( <i>Quercus alba</i> )	23	14	48	Abandoned

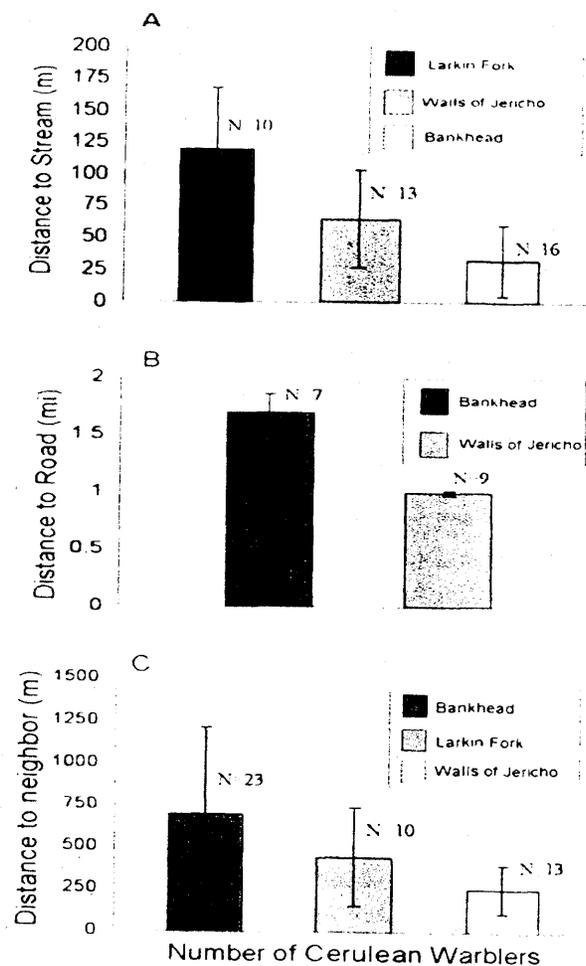


FIGURE 4. Mean distances ( $\pm$  SE) from Cerulean Warbler encounters to nearest stream (A), road (B), and intraspecific neighbors (C) during breeding seasons 1999 - 2004.

07 and outlined several ambitious goals. CEWAP examined regional population status, habitat and area requirements, and investigated potential breeding as not accessible by BBS protocol. The results were assumed to be most accurate in the periphery of the Cerulean Warbler's breeding range due to low abundance and consequently a higher detection probability (Rosenberg et al. 2000). While CEWAP included seven records from Bankhead National Forest, the Jackson County populations were undetected.

These results support an urgent need for Cerulean Warbler research to continue in northern Alabama with initiatives focused on locating "new" breeding populations, monitoring breeding success, and examining habitat characteristics. It is our hope that the future research efforts of ADCNR, USFS, and AAMU will provide the information necessary to facilitate the management and preservation of this unique species in Alabama.

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