

STATUS OF THE CERULEAN WARBLER IN THE ROANOKE RIVER BASIN OF NORTH CAROLINA

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Abstract.—The Cerulean Warbler breeds, or formerly bred, at several sites in the mountains and upper piedmont of North Carolina and was recently discovered in the coastal plain along the Roanoke River. This paper gives the current status of the Roanoke River population, identifies remaining habitat zones, describes essential habitat requirements, and makes recommendations concerning management and protection strategies.

The primary range of the Cerulean Warbler (*Dendroica cerulea*) lies west of the Blue Ridge Mountains in the north-central United States and in the Appalachian highlands. East of its main transalleghean range, the species breeds only locally. Small, disjunct populations are known from the fall belt of northeastern Maryland and from several sites on the Maryland piedmont (Stewart and Robbins 1958). Another disjunct population has been reported from the Chickahominy Swamp area of Henrico and Hanover Counties near Richmond, Virginia (Scott 1958). This site is on the western edge of the upper coastal plain.

Birds of North Carolina (Pearson et al. 1942) lists three Cerulean Warbler breeding records from the western piedmont: Morganton, Burke County, adult feeding young, 1909, Arthur Wayne; Greensboro, Guilford County, adult feeding young, 1929, E. E. and F. R. Brown; and Statesville, Iredell County, nest with young, 1930, M. E. Stimson. Forty-two years had elapsed since the last recorded nesting of the species in North Carolina when I discovered a sizable and previously unsuspected breeding population in the northern coastal plain in 1972 (Lynch 1973). Since then, five colonies have been reported from the North Carolina mountains during the breeding season and are assumed to be nesting populations although no nests or young have yet been found. These colonies are in the counties of Wilkes (Lynch 1973), Polk, Buncombe (McKenzie and Copenhaver 1975), Graham (LeGrand 1979), and Clay (Schultz 1980). The Polk County colony was found by Chris Marsh and Merrill Lynch in May and June 1975. On several dates during these months we observed three or four males singing near the Green River in the southwestern part of the county.

Figure 1 shows the general breeding range of the Cerulean Warbler, as stated in the A.O.U. *Check-list* (1957), with an enlarged map for Maryland, Virginia, and North Carolina. To the best of my knowledge, there are no breeding records for this species from South Carolina or Georgia.

The Cerulean Warbler breeding population in eastern North Carolina is situated along the Roanoke River flood plain in a four-county area, disjunct by over 185 miles from the nearest known North Carolina mountain populations and by about 80 miles from the Chickahominy Swamp population in Virginia. Roanoke River and Chickahominy Swamp are the only known breeding sites for the species in the coastal plain along the Atlantic seaboard.

The purposes of this paper are to update and define the current status of the Roanoke River population, identify remaining habitat zones, describe essential habitat requirements, and make recommendations concerning management and protection strategies. The Cerulean Warbler was suggested as a Threatened species in North Carolina by the Symposium on Endangered and Threatened Biota of North Carolina in 1975 (Parnell 1977) and was considered a candidate for predesignation study in 1979

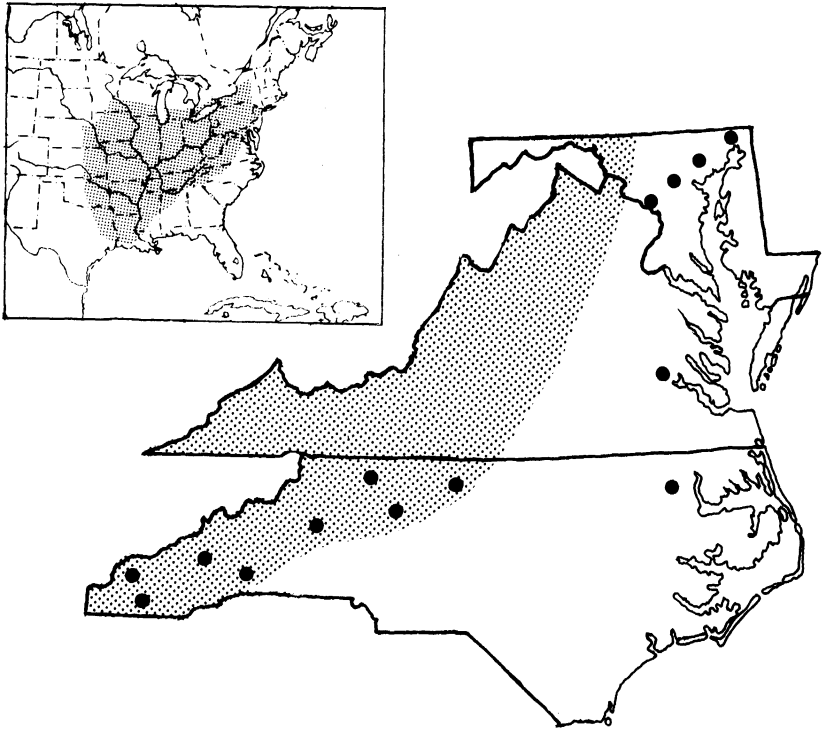


Fig. 1. Breeding range of the Cerulean Warbler. (Map by Steven P. Platania, North Carolina State Museum.)

(CBC Records Committee/N.C. Wildlife Resources Commission Endangered Species Advisory Committee).

Field work during May and June 1979 was implemented under contract with the North Carolina Natural Heritage Program, Division of Parks and Recreation, Department of Natural Resources and Community Development. Previous field work during the summer of 1975 was partially funded by the North Carolina State Museum of Natural History (NCSM).

The Roanoke River breeding population was discovered in June 1972 in the Occoneechee Neck section of Northampton County, and the 1973 breeding population at this site was estimated at 25 pairs (Lynch 1973). Field work sponsored by the NCSM in 1975 revealed a much more extensive population, extending from Weldon, Halifax County, downstream to Old Mill Landing near Windsor, Bertie County, a distance of 82 miles. This includes portions of Halifax, Northampton, Bertie, and Martin Counties. Based on ground surveys at access points along this segment of the Roanoke River, I estimated at least 40 pairs to be present in 1975 (Parnell 1977).

Boat surveys during May and June 1979 revealed a minimum of 28 pairs present along a 37-mile segment of the river between Halifax and Palmyra in Halifax County. This segment lies roughly in the geographical center of the entire 82-mile range (Fig. 2). Populations of highest density occur in this 37-mile segment. Boat surveys of the

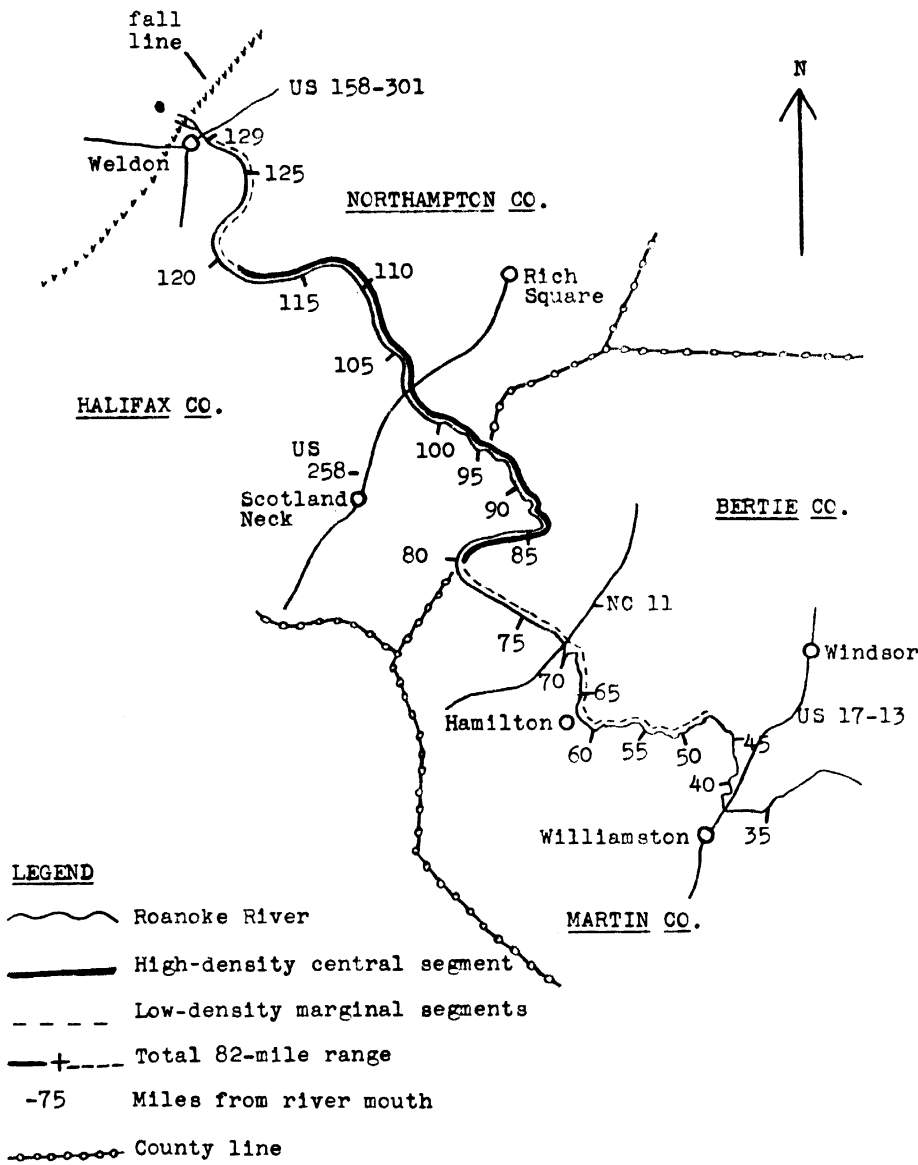


Fig. 2. The Roanoke River from Weldon to Williamston, N.C., showing the relative density of the Cerulean Warbler population along the 82-mile section where the birds occur.

remainder of the range (Weldon-Halifax and Palmyra-Old Mill Landing) indicated only five pairs present. Pairs were determined by counting singing males (assumed to be territorial) by boat during peak singing periods in early morning. Ground checks indicated that in several areas singing males were present on territories more than 110 yards from the river bank, and these birds were not recorded by the boat surveys. Because of this censusing flaw, it was not feasible to determine the entire breeding population during this survey. However, the boat surveys did enable a determination of high-density population zones along the river and the relationship of these zones to habitat types. Based on this, an estimated 80% of the population occurs along the central 37-mile segment.

HABITAT REQUIREMENTS

The Cerulean Warbler distribution in the Roanoke River basin is primarily restricted by habitat requirements, and pair density is directly correlated with specific habitats. Highest densities occur in old-growth, mature floodplain forest communities on well-drained natural levees within 330 yards of the river.

The dominant canopy species of this alluvial community are Sycamore (*Platanus occidentalis*), Green Ash (*Fraxinus pennsylvanica*), and Sugarberry (*Celtis laevigata*). Other species present in the canopy include Cherrybark Oak (*Quercus falcata* var. *pagodaefolia*), Sweetgum (*Liquidambar styraciflua*), cottonwoods (*Populus heterophylla* and *P. deltoides*), and Water Hickory (*Carya aquatica*). The subcanopy is typically dominated by Box-elder (*Acer negundo*). The shrub layer varies from sparse to well developed in the floodplain system and includes dominants Spicebush (*Lindera benzoin*), Pawpaw (*Asimina triloba*), and Buckeye (*Aesculus sylvatica*). Ground cover is usually 100%, with dominance by several species of grasses and sedges and with Cane (*Arundinaria gigantea*) locally abundant. At the highest-density sites the canopy height is 80 to 100 feet, the shrub layer is distinct, ground cover is 100%, and the canopy is closed. This alluvial community is restricted to essentially flat, well-drained, silty loam levees that occur in bands 30 to 1000 feet wide adjoining the river.

The natural levees are low, flat ridges that occur directly adjacent to the river and are best developed along the 37-mile central segment. These levees are formed by periodic flooding of the river and the subsequent deposition of sediment over a period of many thousands of years. As water rises over the river bank during flood stage and spreads out over the flood plain, it rapidly loses velocity and the capacity to carry sediments. The coarsest material (usually silt) is dropped at the top of the bank, where it forms the small ridge. Natural levees are characteristic of a large river, such as the Roanoke, which carries a heavy load of silt and fine sand at flood stage. Depending on the position of the flood plain relative to sea level, the elevation of the natural levees along the Roanoke ranges from a maximum of about 50 feet above mean sea level (msl) near Weldon to a minimum of 15 feet msl near Williamston.

Soils typically associated with the levees include the Chewacla and Congaree silty loam series (Goodwin 1979, Lee 1955, Richards 1950). The seasonal high water table ranges from 0.5 to 4.0 feet beneath the surface during late winter and early spring. The flood plain is frequently flooded for brief periods. The levees are typically bounded on one side by the river and on the other side by cypress-gum (*Taxodium distichum*-*Nyssa aquatica*) swamp embayments or upland slope communities.

Along the fall belt at Weldon, the alluvial floodplain community is replaced by upland piedmont oak-hickory-pine associations. The remainder of the Roanoke River basin upstream from Roanoke Rapids is now inundated by a series of hydro-electric reservoirs. Downstream from Hamilton, Martin County, the cypress-gum swamp community assumes increasing dominance in the river basin and the alluvial floodplain community is restricted to increasingly narrow bands adjoining the river. This community reaches its downstream limit near Williamston, Martin County. Thus, the

alluvial floodplain community occupies roughly a 90-mile section of the river, bounded on the upstream end by piedmont vegetation along the fall belt at Weldon and by cypress-gum swamp vegetation along the downstream limit near Williamston.

The high-density population zones of the warbler are clearly limited to the best-developed alluvial floodplain communities, which occur primarily in the 37-mile central segment. Of the 33 total singing males recorded on the 1979 boat survey, 28 occurred in the central segment. No singing males were observed in the adjoining cypress-gum embayments or in the upland slope communities. Minimum habitat requirements include: (1) a closed canopy, (2) presence of scattered, very tall, old-growth canopy trees, and (3) good development of vegetation strata, i.e., distinct zonation of canopy, subcanopy, shrub, and ground-cover layers. Floodplain areas of even-aged timber with no old-growth trees contain few, if any, breeding pairs.

BEHAVIOR

Singing males characteristically use the tallest available canopy trees for singing perches, alternately foraging and singing in a single tree for periods up to 35 minutes. These tallest trees, usually Sycamore, Ash, or Sugarberry, are also used as nesting sites. Males are persistent singers and may be heard throughout the day, although peak singing periods occur during early morning and late afternoon. Males arrive and establish territories in late April (earliest date, 22 April). Nest building and rearing of young probably occur from early May to early July. Males continue to sing until mid-July after which singing activity decreases rapidly. Birds remain in the area until at least mid-August (latest date, 26 August).

Both sexes spend a great deal of time foraging in the canopy of the taller trees, systematically hopping along the larger branches from the main trunk outward to the smaller, peripheral branches, gleaning the undersides of leaves and twigs. They rarely hover or perform aerial flycatching as some warblers do. Occasionally, a warbler will come down to the lower branches of the subcanopy, within 20 to 30 feet of the ground.

I have observed very few interactions of Cerulean Warblers with other birds. Only a few species locally occur with the warbler in the high canopy. The most common of these is the Red-eyed Vireo (*Vireo olivaceus*) which apparently coexists peacefully with the warbler. On two occasions I have seen male warblers chase vireos for short distances. A potential competitor is the Northern Parula (*Parula americana*). This is a canopy-subcanopy species over most of its range, but an interesting situation exists along the Roanoke River basin. In areas of mature, well-developed floodplain forest, (optimum Cerulean Warbler habitat) the Northern Parula is almost completely absent. Apparently it is restricted primarily to the cypress-gum swamp communities, particularly where Spanish Moss (*Tillandsia usneoides*) is abundant. Downstream from Hamilton, the alluvial floodplain community is largely replaced by the cypress-gum community with a corresponding replacement of Ceruleans by a sizable Parula population. The Yellow-throated Warbler (*Dendroica dominica*), another potential competitor, also seems to be restricted to the cypress-gum community in the river basin. Brown-headed Cowbirds (*Molothrus ater*) have undergone a significant range expansion and population increase in the North Carolina coastal plain in recent years. This species is common along the Roanoke during the breeding season and may be significantly affecting the warbler populations in the area, although I have no conclusive data or observations to support this hypothesis.

Two other warbler species are typically associated with the alluvial floodplain community, occurring in lower vegetation strata than the Cerulean Warbler, and therefore not competing with it. The Kentucky Warbler (*Oporornis formosus*) and the American Redstart (*Setophaga ruticilla*) are both common summer residents, occupying the ground-shrub and subcanopy layers, respectively. These species occur in high-density Cerulean Warbler zones but, not being confined to sites having a well-

developed canopy stratum, also occur in cut-over, second- or third-growth forest areas that contain few or no Ceruleans. Both Kentucky Warblers and American Redstarts are considered rare or local over most of the North Carolina coastal plain and are typically associated with rich, mesic hardwood forests of the piedmont and mountain provinces.

Other characteristic breeding species that occur in the alluvial floodplain forest areas include Mississippi Kite (*Ictinia mississippiensis*), Red-shouldered Hawk (*Buteo lineatus*), Turkey (*Meleagris gallopavo*), Barred Owl (*Strix varia*), Pileated Woodpecker (*Dryocopus pileatus*), White-breasted Nuthatch (*Sitta carolinensis*), Wood Thrush (*Hylocichla mustelina*), Prothonotary Warbler (*Protonotaria citrea*), and Swainson's Warbler (*Limnothlypis swainsonii*). The Mississippi Kite is very local and occurs only in the vicinity of Buzzard Neck, Halifax County, and Occoneechee Neck, Northampton County (LeGrand and Lynch 1973).

HABITAT ZONE DESIGNATION

Identification of the best remaining tracts of alluvial floodplain forest was accomplished by boat surveys of the central segment. A four-level priority classification system (A, A-B, B, C) was designed to rate the floodplain forest communities based on the following criteria: (1) canopy height, (2) presence of a closed canopy, (3) relative disturbance (frequency and intensity of timbering operations, etc.), and (4) presence of tall, old-growth canopy trees (singing perches). All floodplain areas within the central segment that were considered to be prime or potential breeding habitat for the warbler were mapped. Areas of non-potential habitat (cultivated fields, pastures, sandpits, etc.) were not mapped. A, A-B, and B levels represent 3579 acres of presently available breeding habitat. A is the best remaining habitat (1031 acres), B is good marginal habitat (1671 acres), and A-B is transition between A and B habitat (877 acres). C represents *potential* breeding habitat, i.e., floodplain forest that has been clearcut or heavily timbered within the past 20 to 40 years and thus is presently not suitable as breeding habitat (2826 acres). However, if left undisturbed for a number of years, the C areas may develop into a mature alluvial community enabling the warblers to reinvade. Topographic maps identifying the critical habitat zones (accompanied by written descriptions and ownership information) are on file at the Natural Heritage Program office, P.O. Box 27687, Raleigh, N.C. 27611.

DANGERS TO HABITAT INTEGRITY

The Cerulean Warbler population along the Roanoke River appears to be in serious jeopardy due to extensive timbering of the floodplain forest. Since 1950, clearcutting operations have reduced the available breeding habitat by an estimated 50%. This timber policy effectively removes valuable breeding habitat and, assuming no further cutting, requires a minimum of 50 to 90 years for re-establishment of a mature floodplain forest community essential to the species. Much of the floodplain timber is owned by or leased to large timber corporations, which are presently cutting on a 20-year rotation cycle, effectively preventing re-establishment of the mature alluvial community. Conversion of some floodplain areas to pasture has also had some detrimental effect on warbler populations, but this has a relatively small impact when compared to the extensive timbering operations.

The greatest hope for the warbler lies in the small tracts held by local landowners who have resisted pressure to clearcut their property and who have practiced more conventional forms of timber management, such as selective cutting. I have observed territorial pairs in areas where selective cutting is presently being practiced and believe the warbler populations in these areas are being maintained. Urgently needed are intensive, quantitative studies of the remaining breeding populations to determine what the critical habitat requirements are in terms of long-range successional management so that a workable policy can be designed to permit timber production and removal while providing adequate protection for Cerulean Warbler habitat.

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