

# DISTRIBUTION AND ABUNDANCE OF THE WOOD WARBLERS IN NORTH CAROLINA DURING THE SPRING, NESTING, AND FALL SEASONS

HARRY E. LeGRAND JR.

The amount of published records on warblers (*Parulidae*) in North Carolina is fairly large, but a great portion of these records are rare sightings or unusual arrival and departure dates. Abundance data, even for the common species, are incomplete for all seasons, especially for the spring and fall migrations. Even though three editions of the state book, *Birds of North Carolina*, have been published (Pearson et al., 1919, 1942, 1959), very little quantitative data on warblers are found in these books. Because of this scarcity of data and the relative obsolescence of the 1959 edition, I conducted a study on the distribution and abundance of warblers in the state during the spring and fall seasons. Nesting abundance data also were recorded for this study.

## MATERIALS AND METHODS

Data for this project were collected by two methods: (1) questionnaires to selected observers who have done considerable field work in North Carolina, and (2) published records in journals, state and regional bird books, and local and regional checklists. The approximate locations of ornithological field work in North Carolina, especially as related to studies of warblers, are shown in Figure 1.

Most of the published records for North Carolina were taken from three sources: *The Chat*, *Audubon Field Notes* (now *American Birds*), and *Birds of North Carolina*. The bulk of the data in *The Chat* was taken from spring count tables, "Briefs for the Files," and county and regional annotated lists. Most North Carolina data in *Audubon Field Notes* were found in the "Southern Atlantic Coast Region" section.

## STUDY AREA

North Carolina, the study area, contains three major physiographic regions: (1) mountains, (2) piedmont, and (3) coastal plain (Radford et al., 1968). These regions lie in narrow belts in the eastern United States running in northeast-southwest directions. In addition to the above regions, another section of the state is of major importance ornithologically. The immediate coastline, consisting almost exclusively of narrow barrier islands and estuaries paralleling the mainland, and an adjacent strip of mainland of a few miles in width, have been considered a fourth region in this study—the coast (see Figure 1 for locations of these regions).

## RESULTS

Figure 2 shows the abundances and distributions of the spring migrant, nesting, and fall migrant populations of the 37 regularly-occurring species of warblers in North Carolina. Several species and hybrids that have been recorded in the state are not included on this figure because they occur only casually or accidentally. These birds are the Bachman's Warbler (*Vermivora bachmanii*), Black-throated Gray Warbler (*Dendroica nigrescens*), Kirtland's Warbler (*Dendroica kirtlandii*), and the Brewster's and Lawrence's hybrids.

The abundance levels presented in this figure are based on (1) the number of birds of a given species an observer would expect to record on a 3-hour morning trip through its primary habitat, and on (2) the number of records the observer would expect to gather over a single season. The criteria for the abundance levels are: *abundant*—over 100 birds of the species recorded during the 3 hours in its primary habitat; *very com-*

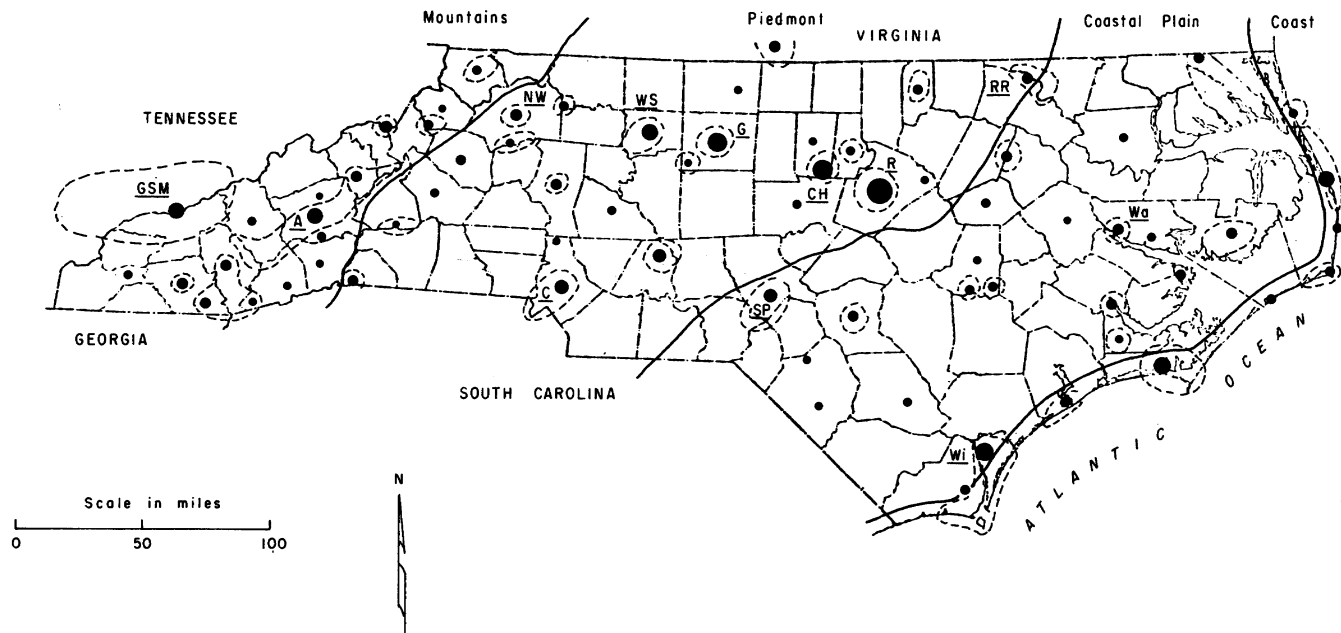


Fig. 1. Primary locations of ornithological field work in North Carolina (1880-1972). Solid dots are the centers of field work (the larger the dot, the more intensive the work). Dashed lines surrounding dots are approximate or estimated limits of associated field work. Abbreviations of key localities are: GSM—Great Smoky Mountains National Park, A—Asheville, NW—North Wilkesboro, WS—Winston-Salem, G—Greensboro, C—Charlotte, CH—Chapel Hill, R—Raleigh, RR—Roanoke Rapids, SP—Southern Pines, Wa—Washington, Wi—Wilmington. Boundaries of the piedmont based on Radford et al. (1968).

*mon*—21 to 100 birds; *common*—6 to 20 birds; *fairly common*—2 to 5 birds; *uncommon*—no more than two in a morning (except in unusual and irregular cases), generally one to several records per season each year if the observer actively birded; *rare*—seldom more than one record per season each year, one to five records over a period of 5 years; *very rare*—only one to several records expected over a 20-year period; *casual*—expected to occur only once to several times within a century; *absent*—applying primarily to breeding statuses, no records expected for the species at the locality (if a record does occur, it would be considered “accidental”). Abundances shown with two successive levels (e.g., FC-C) indicate that the abundance over the area is generally on the borderline between the two individual levels.

The status of a number of species of migrants is poorly known in the coastal plain and coast regions, especially in the spring, because of the scarcity of observers in those areas. Also, the migrant statuses of species that nest in North Carolina are poorly understood because of the difficulty in distinguishing between the migrants and the breeders. In both cases question marks have been added to Figure 2 to indicate that the abundance statuses of such species are not well known or understood.

The shape of North Carolina has been converted in Figure 2 to a single east-west band covering the four regions. The widths of the mountain, piedmont, and coastal plain regions on the figure are approximately in the same proportions as their true widths; however, the width of the coast region has been increased on the figure in order to allow space for the printing of abundance statuses within its borders. The natural northeast-southwest orientation of the regions in the state has been converted to vertical lines in the figure, and since the figure represents an east-west line (no north-south dimensions), points or towns which are on the same northeast-southwest line in North Carolina occur at the same point on the figure. Note that Charlotte and Greensboro are located nearly side-by-side. The figure has been set up as such because the warbler migrations in North Carolina are primarily in northeast-southwest directions and, therefore, are similar at points on a northeast-southwest line (such as Charlotte and Greensboro).

## DISCUSSION

One problem which occurred in this study was the bias in abundance figures for the three seasons concerned. Warblers are more vocal and easily detected in summer than spring and in spring than fall, and since the abundance data in Figure 2 are based on number of birds recorded in the field, there is a tendency to underestimate (fail to detect) numbers of birds in the spring and fall, especially in the latter season. Therefore, for example, at a given location the *actual* numbers of a fairly common fall migrant are greater than those of a fairly common spring migrant and much greater than those of a fairly common summer resident, even though the same numbers of each are recorded in the proper season in a single morning.

Another problem pertained to the relation of TV tower kill and airport ceilometer kill data to diurnal field data (with which this paper is concerned). Although the kill data are presumably unbiased in that they represent nearly the true proportion of warbler species and individuals that are migrating overhead, they are not necessarily the true proportion of species and individuals that are present at that location during the following day. For example, at two television towers in the coastal plain, Jay Carter (pers. com.) has found small numbers of several species of warblers that were considered rare or very rare by diurnal observers in the coastal plain. However, he has also found numbers of Seaside Sparrows (*Ammospiza maritima*) and Sharp-tailed Sparrows (*Ammospiza caudacuta*), coastal species which are only casually recorded inland by observers. His data indicate that many or most of these species are flying toward the coast with no intention of landing in the coastal plain. On the other hand, kill data of small passerines in the piedmont and mountains agree reasonably well with diurnal data in species abundances. The result of these disparities was that I incorporated



| Species  |   | Mts.     |    | Piedmont |      |    |   | Coastal Plain |      |    |    | Coast       |              |      |
|--|---|----------|----|----------|------|----|---|---------------|------|----|----|-------------|--------------|------|
|  |   | GSM A    | NW | WS       | G C  | CH | R | RR            | SP   | Wa | Wi |             |              |      |
|  |   | * *      | *  | *        | * *  | *  | * | *   *         | *    | *  | *  | *           |              |      |
| Blue-winged W.<br>( <u>Vermivora pinus</u> )     | S | U-R      |    |          | R    |    |   |               | U    |    |    | R-VR        | ?            |      |
|  | N | Ca-Abs ? |    |          |      |    |   |               | Abs  |    |    |             |              |      |
|  | F |          |    |          | R    |    |   |               | U    |    |    | R-VR        |              |      |
| Tennessee W.<br>( <u>Vermivora peregrina</u> )   | S | U        |    |          | R    |    |   |               | VR   |    |    | Ca-Abs      |              |      |
|  | N |          |    |          |      |    |   |               | Abs  |    |    |             |              |      |
|  | F | C        |    |          | FC   |    |   |               | U    |    |    | R-VR        | U            |      |
| Orange-crowned W.<br>( <u>Vermivora celata</u> ) | S | R        |    |          | VR   |    |   |               |      |    |    | Ca          | R            |      |
|  | N |          |    |          |      |    |   |               | Abs  |    |    |             |              |      |
|  | F | U        |    |          |      |    |   |               | R    |    |    |             | U            |      |
| Nashville W.<br>( <u>Vermivora ruficapilla</u> ) | S |          |    |          | R    |    |   |               | VR   |    |    | Ca-Abs      |              |      |
|  | N |          |    |          |      |    |   |               | Abs  |    |    |             |              |      |
|  | F | U        |    |          | R    |    |   |               |      |    |    | VR-Ca       | U            |      |
| Northern Parula<br>( <u>Parula americana</u> )   | S |          |    |          | FC ? |    |   |               |      |    |    | C           | ?            |      |
|  | N | FC       |    |          | U    |    |   |               | FC-C |    |    | C           |              |      |
|  | F |          |    |          | FC ? |    |   |               |      |    |    | FC-C        | U ?          |      |
| Yellow W.<br>( <u>Dendroica petechia</u> )       | S |          |    |          | FC-C |    |   |               |      |    |    | FC          | U-FC         |      |
|  | N |          |    |          | FC-C |    |   |               | U-R  |    |    | Ca(N) ?-Abs | U(N)<br>-Abs |      |
|  | F |          |    |          | FC   |    |   |               |      |    |    | U-R         | FC           |      |
| Magnolia W.<br>( <u>Dendroica magnolia</u> )     | S |          |    |          | FC   |    |   |               |      |    |    | U           | VR           | Ca ? |
|  | N | Abs ?    |    |          |      |    |   |               | Abs  |    |    |             |              |      |
|  | F | FC       |    |          |      |    |   |               | C    |    |    | U           |              | FC   |
| Cape May W.<br>( <u>Dendroica tigrina</u> )      | S | U-FC     |    |          | FC   |    |   |               |      |    |    |             | Ca           |      |
|  | N |          |    |          |      |    |   |               | Abs  |    |    |             |              |      |
|  | F |          |    |          |      |    |   |               | U-FC |    |    |             | R ?          | FC-C |

| Species   |   | Mts.   |       | Piedmont |        |        |      |   | Coastal Plain |          |        | Coast  |        |
|---|---|--------|-------|----------|--------|--------|------|---|---------------|----------|--------|--------|--------|
|   |   | GSM    | NW    | WS       | G      | C      | CH   | R | RR            | SP       | Wa     | Wi     |        |
|   |   | *      | *     | *        | *      | *      | *    | * | *             | *        | *      | *      |        |
| Black-throated Blue W.<br>( <i>Dendroica caerulescens</i> ) | S | FC-C ? |       |          | FC-C   |        |      |   |               | FC       |        | U-FC   | U-R    |
|   | N | C      |       |          |        |        |      |   |               | Abs      |        |        |        |
|   | F | FC ?   |       |          | FC     |        |      |   |               |          | U-FC ? |        | FC     |
| Yellow-rumped W.<br>( <i>Dendroica coronata</i> )           | S |        | C     |          |        |        |      |   |               | VC-A     |        |        |        |
|   | N |        |       |          |        |        |      |   | Abs           |          |        |        |        |
|   | F | C      |       |          |        |        |      |   | VC-A          |          |        | A      |        |
| Black-throated Green W.<br>( <i>Dendroica virens</i> )      | S | FC-C ? |       | FC       |        |        | U    |   |               |          |        | R-VR ? |        |
|   | N | FC-C   |       |          |        | Ca-Abs |      |   |               | Ca-Abs ? |        | U-FC   |        |
|   | F | FC-C   |       |          | FC     |        |      |   | U             |          |        | U-R    | U      |
| Cerulean W.<br>( <i>Dendroica cerulea</i> )                 | S |        | U-R   |          |        |        | R-VR |   |               |          |        | Ca     |        |
|   | N | VR-Ca  |       | Ca-Abs   |        |        |      |   |               |          |        | Abs    |        |
|   | F | VR     |       | R        |        |        | VR   |   |               |          |        | Ca     |        |
| Blackburnian W.<br>( <i>Dendroica fusca</i> )               | S | FC ?   |       | U        |        |        | R    |   |               |          |        | VR-Ca  | Ca-Abs |
|   | N | FC     |       |          |        |        |      |   | Abs           |          |        |        |        |
|   | F | FC ?   |       |          | FC     |        |      |   |               | U        |        | R      |        |
| Kentucky W.<br>( <i>Oporornis formosus</i> )                | S |        |       |          | U ?    |        |      |   |               |          |        | U-R ?  | Ca-Abs |
|   | N |        |       |          | FC     |        |      |   |               | R-VR     |        |        | Ca-Abs |
|   | F | U ?    |       |          | U-FC ? |        |      |   |               |          |        | U-R    |        |
| Connecticut W.<br>( <i>Oporornis agilis</i> )               | S | U-R    |       | VR       |        |        |      |   |               |          | Ca-Abs |        |        |
|   | N |        |       |          |        |        |      |   | Abs           |          |        |        |        |
|   | F | VR     |       |          | R-VR   |        |      |   |               |          | VR-Ca  |        | U      |
| Mourning W.<br>( <i>Oporornis philadelphia</i> )            | S |        | VR-Ca |          |        |        |      |   |               |          | Abs    |        |        |
|   | N |        |       |          |        |        |      |   | Abs           |          |        |        |        |
|   | F | U      |       |          | R-VR   |        |      |   |               |          | Ca     |        | VR     |

| Species  |   | Mts.   |      | Piedmont |     |      |        |    | Coastal Plain |      |      | Coast  |         |
|--|---|--------|------|----------|-----|------|--------|----|---------------|------|------|--------|---------|
|  |   | GSM    | A    | NW       | WS  | G    | C      | CH | R             | RR   | SP   | Wa     | Wi      |
|  |   | *      | *    | *        | *   | *    | *      | *  | *             | *    | *    | *      | *       |
| Common Yellowthroat<br>( <u>Geothlypis trichas</u> )   | S |        |      |          |     |      |        |    |               | C ?  |      |        |         |
|  | N |        | FC-C |          |     |      |        |    |               |      | C-VC |        |         |
|  | F |        | FC-C |          |     |      |        |    |               |      | C-VC |        |         |
| Yellow-breasted Chat<br>( <u>Icteria virens</u> )      | S |        |      |          |     |      |        |    |               | FC ? |      |        |         |
|  | N |        | FC-C |          |     |      | C      |    |               |      | FC-C |        | U       |
|  | F |        |      |          |     | FC   |        |    |               |      |      |        | U       |
| Hooded W.<br>( <u>Wilsonia citrina</u> )               | S |        |      |          |     |      |        |    |               | FC ? |      |        | R ?     |
|  | N |        |      |          |     |      |        |    |               | C    |      |        |         |
|  | F |        |      |          |     |      | FC-C ? |    |               |      |      | U ?    | R ?     |
| Wilson's W.<br>( <u>Wilsonia pusilla</u> )             | S |        |      |          | U-R |      |        |    |               |      |      | VR-Ca  |         |
|  | N |        |      |          |     |      |        |    |               | Abs  |      |        |         |
|  | F |        | U-R  |          |     |      | R      |    |               |      |      | Ca-Abs | R       |
| Canada W.<br>( <u>Wilsonia canadensis</u> )            | S | FC ?   |      |          |     | U    |        |    |               |      |      | Ca-Abs |         |
|  | N | FC-C   |      |          |     |      |        |    |               | Abs  |      |        |         |
|  | F |        | FC   |          |     |      |        | U  |               |      | R    | Ca     | R       |
| American Redstart<br>( <u>Setophaga ruticilla</u> )    | S | FC ?   |      |          |     | C    |        |    |               |      | FC   |        | U       |
|  | N | FC     |      |          |     | C    |        |    |               |      | U ?  |        | VR-Ca ? |
|  | F |        | FC-C |          |     |      |        |    |               | C-VC |      |        | VC      |
| Yellow-throated W.<br>( <u>Dendroica dominica</u> )    | S |        |      |          |     |      |        |    |               | U ?  |      |        |         |
|  | N |        |      |          |     | FC-C |        |    |               |      | C    |        |         |
|  | F |        |      |          |     |      |        |    |               | U ?  |      |        | R       |
| Chestnut-sided W.<br>( <u>Dendroica pensylvanica</u> ) | S | FC-C ? |      |          |     | FC   |        |    |               |      |      |        | Ca      |
|  | N | C      |      |          |     |      |        |    |               | Abs  |      |        |         |
|  | F | FC-C ? |      |          |     |      | FC     |    |               |      |      | U      | R       |

| Species   | Mts. |      | Piedmont |    |     |      | Coastal Plain |        |    |     | Coast     |               |
|---|------|------|----------|----|-----|------|---------------|--------|----|-----|-----------|---------------|
|   | GSM  | A    | NW       | WS | G   | C    | CH            | R      | Rk | SP  | Wa        | Wi            |
|   | *    | *    | *        | *  | *   | *    | *             | *      | *  | *   | *         | *             |
| Bay-breasted W.<br>( <u>Dendroica castanea</u> )          | S    |      | U        |    |     |      | R             |        |    |     | Ca-Abs    |               |
|   | N    |      |          |    |     |      |               | Abs    |    |     |           |               |
|   | F    | FC-C |          |    |     | U    |               |        |    |     | U-R       | R             |
| Blackpoll W.<br>( <u>Dendroica striata</u> )              | S    |      | FC       |    |     |      | C             |        |    |     |           | FC            |
|   | N    |      |          |    |     |      |               | Abs    |    |     |           |               |
|   | F    | VR   |          |    |     | U    |               |        |    |     | U-R ?     | FC(N)<br>-U ? |
| Pine W.<br>( <u>Dendroica pinus</u> )                     | S    | U ?  |          |    |     |      |               | FC-C ? |    |     |           |               |
|   | N    |      | U        |    |     |      |               |        |    | C   |           |               |
|   | F    | U ?  |          |    |     |      |               | C ?    |    |     |           | U             |
| Prairie W.<br>( <u>Dendroica discolor</u> )               | S    |      |          |    |     |      |               | U-FC ? |    |     |           |               |
|   | N    | U-FC |          | FC |     |      |               |        |    | C   |           | C-VC          |
|   | F    |      |          |    |     |      |               | U ?    |    |     |           | C             |
| Palm W.<br>( <u>Dendroica palmarum</u> )                  | S    | FC   |          |    |     | U-FC |               |        |    |     | R ?       | U             |
|   | N    |      |          |    |     |      |               | Abs    |    |     |           |               |
|   | F    | FC   |          |    |     |      |               | U-FC   |    |     |           | VC-A          |
| Ovenbird<br>( <u>Seiurus aurocapillus</u> )               | S    |      |          |    | C ? |      |               |        |    | FC  |           | U             |
|   | N    |      |          |    | C   |      |               |        |    |     | FC-Abs(S) |               |
|   | F    |      |          |    |     |      |               | C ?    |    |     |           | U ?           |
| Northern Waterthrush<br>( <u>Seiurus noveboracensis</u> ) | S    |      | U        |    |     |      |               | FC     |    |     |           | U             |
|   | N    |      |          |    |     |      |               |        |    | Abs |           | R-VR ?        |
|   | F    | U-R  |          |    |     |      | FC            |        |    |     |           | U-FC          |
| Louisiana Waterthrush<br>( <u>Seiurus motacilla</u> )     | S    |      |          |    |     | U ?  |               |        |    |     | U-R ?     | Ca-Abs        |
|   | N    |      |          |    |     | FC   |               |        |    |     | R(N)-Ca   | Abs           |
|   | F    |      |          |    |     |      | U-R ?         |        |    |     |           | Ca            |



data from the piedmont into the material in Figure 2 but mostly ignored the coastal plain kill data because of its misleading character.

The large number of question marks which appear on Figure 2 and the scarcity or lack of field work in many areas of North Carolina as shown on Figure 1 indicate that much is still to be learned about warbler distributions in the state. Relatively little field work has been conducted in the coastal plain region, both because of the scarcity of observers and the poverty of migrants in this region. Our knowledge of birds (of all species) north of a line from Rocky Mount to Lake Mattamuskeet and south of a line from Charlotte to New Bern (excepting the Wilmington area) is nearly lacking. Other areas of the state needing intensive field work in the near future include the northern border counties west of Henderson and the counties lying between Asheville and Charlotte. Intensive birding in counties in the corners of the state is also needed and could yield new or important breeding records.

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#### ADDENDA

Figure 2 was compiled during the spring of 1973. Since that time, a number of changes in warbler distributions have been recorded in North Carolina, due both to

actual changes in warbler populations and to ornithological field work in poorly-covered areas.

**SWAINSON'S WARBLER:** Recent summer records from Swift Creek just south of Raleigh in Wake County, and records from Polk County over many years indicate that the species breeds or may breed sparingly along the eastern and western borders of the piedmont. The current breeding status in the coastal plain perhaps should be listed as "uncommon" rather than "uncommon to rare."

**BLUE-WINGED WARBLER:** Recent breeding season records for Cherokee and Graham Counties indicate that the species is not a rare bird in the southwestern tip of the state; nevertheless, elsewhere in the mountains it is a very rare to absent breeding species. The Blue-winged seems to have increased somewhat as a migrant, throughout the state, within the last few years.

**TENNESSEE WARBLER, CAPE MAY WARBLER, and BAY-BREASTED WARBLER:** These three species have increased considerably in numbers as migrants through North Carolina in the last several years, especially in the mountain and piedmont sections. The migrant abundance statuses listed on the table for these species should be increased one level (change "U" to "FC," "FC" to "C," etc.) in the mountains and piedmont.

**CERULEAN WARBLER:** Field studies in key areas of the state have revealed sizable breeding populations in several localities. Small colonies have been found along the Blue Ridge in northeastern Wilkes County and in western Polk County, and a large population exists in the western coastal plain along the Roanoke River in the Halifax area, with smaller numbers downstream to Williamston (Merrill Lynch, pers. com.). Information on the breeding distribution of this species in the state is quite incomplete.

**YELLOW-THROATED WARBLER:** Either this species has declined considerably as a breeder, especially west of the fall line, or the data I accumulated were incorrect. This warbler now appears to be only uncommon to fairly common as a breeding species in most localities west of the fall line. The spring status of the species should be listed as "fairly common" in the eastern half of the piedmont, and probably also in the coastal plain.

**CHESTNUT-SIDED WARBLER:** Change the nesting status in the mountains from "common" to "very common."

**KENTUCKY WARBLER and AMERICAN REDSTART:** The abundance and distribution of these (and many) warblers in the coastal plain in summer are not well known. Large numbers of these two species along the Roanoke River in the Halifax area suggest they may well be more numerous than previously suspected in the western section of the coastal plain, at least north of the Tar River. The Kentucky Warbler is scarce to absent in the eastern coastal plain in summer, north of the Neuse River, but south of this river it may be a regular but uncommon to rare breeding bird.