

therefore does not meet the "discreteness" criterion.

**Significance:** Pursuant to our DPS policy, in addition to our consideration that a population segment is discrete, we further consider its biological and ecological significance to the taxon to which it belongs, within the context that the DPS policy be used "sparingly" while encouraging the conservation of genetic diversity (61 FR 4722; February 7, 1996). This consideration may include, but is not limited to: (1) Evidence of the persistence of the discrete population segment in an ecological setting that is unique for the taxon; (2) evidence that loss of the population segment would result in a significant gap in the range of the taxon; (3) evidence that the population segment represents the only surviving natural occurrence of a taxon that may be more abundant elsewhere as an introduced population outside its historical range; and (4) evidence that the discrete population segment differs markedly from other populations of the species in its genetic characteristics.

The petition does not address these factors. Therefore, based on the lack of information in the petition and the information readily available in our files, the upper tidal Potomac River population of the northern water snake is not significant in relation to the remainder of the taxon.

#### Finding

We reviewed the information presented in the petition, and evaluated that information in relation to information readily available in our files. On the basis of our review, we find that the petition does not provide substantial scientific or commercial information to indicate that the upper tidal Potomac River population of the northern water snake constitutes a valid DPS. This finding is based on the lack of substantial evidence indicating this population meets the discreteness element of the DPS policy and the lack of substantial scientific information that the upper tidal Potomac River population is significant in relation to the remainder of the taxon. Therefore, we conclude that the upper tidal Potomac River population of the northern water snake is not a listable entity pursuant to section 3(15) of the Act. We will not be commencing a status review in response to this petition. However, we encourage interested parties to continue to gather data that will assist with the conservation of the species. Information regarding this species may be submitted at any time to the Field Supervisor,

Chesapeake Bay Field Office (see **ADDRESSES** section).

#### References Cited

A complete list of all references cited herein is available, upon request, from the Chesapeake Bay Field Office (see **ADDRESSES** section).

#### Author

The primary author of this notice is Charisa Morris, U.S. Fish and Wildlife Service, Chesapeake Bay Field Office (see **ADDRESSES** section).

#### Authority

The authority for this action is section 4 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*).

Dated: November 28, 2006.

**Kenneth Stansell,**

*Acting Director, U.S. Fish and Wildlife Service.*

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**BILLING CODE 4310-55-P**

## DEPARTMENT OF THE INTERIOR

### Fish and Wildlife Service

#### 50 CFR Part 17

#### Endangered and Threatened Wildlife and Plants; 12-Month Finding on a Petition To List the Cerulean Warbler (*Dendroica cerulea*) as Threatened With Critical Habitat

**AGENCY:** Fish and Wildlife Service, Interior.

**ACTION:** Notice of a 12-month petition finding.

**SUMMARY:** We, the U.S. Fish and Wildlife Service (Service), announce a 12-month finding on a petition to list the cerulean warbler (*Dendroica cerulea*) as threatened under the Endangered Species Act of 1973, as amended (Act). The petition also asked that critical habitat be designated for the species. After reviewing the best available scientific and commercial information, we find that the petitioned action is not warranted. We ask the public to submit to us any new information that becomes available concerning the status of, or threats to, the species. This information will help us monitor and encourage the conservation of this species.

**DATES:** The finding announced in this document was made on November 28, 2006.

**ADDRESSES:** Comments and materials received, as well as supporting documentation used in the development

of this 12-month finding, will be available for inspection, by appointment, during normal business hours at the Columbia Ecological Services Field Office, 101 Park DeVillie Drive, Suite A, Columbia, Missouri 65203. Submit new information, materials, comments, or questions concerning this species to the Service at the above address.

#### FOR FURTHER INFORMATION CONTACT:

Charles Scott, Supervisor (see **ADDRESSES**), by telephone at 573-234-2132, by facsimile at 573-234-2181, or by electronic mail at [charlie\\_scott@fws.gov](mailto:charlie_scott@fws.gov). Individuals who are hearing-impaired or speech-impaired may call the Federal Relay Service at 1-800-877-8339 for TTY assistance.

#### SUPPLEMENTARY INFORMATION:

##### Background

Section 4(b)(3)(B) of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*), requires that, for any petition to revise the Lists of Endangered and Threatened Wildlife and Plants that contains substantial scientific or commercial information that the petitioned action may be warranted, we make a finding within 12 months of the date of the receipt of the petition on whether the petitioned action is: (a) Not warranted, (b) warranted, or (c) warranted, but that the immediate proposal of a regulation implementing the petitioned action is precluded by other pending proposals to determine whether any species is threatened or endangered, and expeditious progress is being made to add or remove qualified species from the List of Endangered and Threatened Species. Such 12-month findings are to be published promptly in the **Federal Register**. Section 4(b)(3)(C) of the Act requires that a petition for which the requested action is found to be warranted but precluded shall be treated as though resubmitted on the date of such finding, requiring a subsequent finding to be made within 12 months.

##### Previous Federal Actions

We added the cerulean warbler to our former Category 2 list of candidate species on November 21, 1991 (56 FR 58804). Category 2 candidate species were those species for which we possessed data indicating that proposing to list them as endangered or threatened was possibly appropriate, but for which conclusive data on biological vulnerability and threat were not available at that time to support proposed rules. Category 1 candidate species were those for which we

possessed sufficient information on biological vulnerability and threats to support proposals to list them as endangered or threatened species. The cerulean warbler was also in the November 15, 1994, Candidate Notice of Review (59 FR 58982) as a Category 2 candidate species. The list of Category 2 species was eliminated by the Service in 1996. Since then the Service has applied the term "candidate species" only to those species previously considered to be "Category 1" candidates, and we apply the same definition to these species (61 FR 7596; February 28, 1996). The cerulean warbler has never been a Category 1 candidate species or a candidate species, as defined, since 1996.

Due to concerns regarding the population trend of the species, in 1995, the Service contracted to Dr. Paul Hamel, of the U.S. Forest Service's Southern Forest Research Station in Stoneville, Mississippi, to develop a cerulean warbler rangewide status assessment report. Dr. Hamel completed his report in April of 2000 (Hamel 2000a), and we distributed it and posted it on our Web site at that time.

On November 6, 2000, the Service received an October 30, 2000, letter from Douglas A. Ruley of the Southern Environmental Law Center in Asheville, North Carolina. Mr. Ruley's letter conveyed a petition to list the cerulean warbler as a threatened species and to designate critical habitat for the species (Ruley 2000). The following organizations were listed as the petitioners: National Audubon Society, Defenders of Wildlife, Sierra Club, The Wilderness Society, American Lands Alliance, Western North Carolina Alliance, Southern Appalachian Biodiversity Project, Appalachian Voices, Cherokee Forest Voices, Southern Environmental Law Center, Southern Appalachian Forest Coalition, Heartwood, Dogwood Alliance, West Virginia Highlands Conservancy, Inc., Virginia Forest Watch, Buckeye Forest Council, Allegheny Defense Project, Vernon Civic Association, Conservation Action Project, Superior Wilderness Action Network, Indiana Forest Alliance, Regional Association of Concerned Environmentalists, Ouachita Watch League, Newton County Wildlife Association, Chattooga Conservancy, Wild Alabama, Georgia Forest Watch, and South Carolina Forest Watch.

On September 24, 2002, the Service made its initial 90-day finding on the petition, and a notice of that finding was published in the **Federal Register** on October 23, 2002 (67 FR 65083). Our finding was that the petition presented substantial information indicating that

the petitioned action of listing the species may be warranted. At that time, we initiated a status review, which included a 90-day comment period.

We received 290 responses to our request for additional information in our 90-day finding for the cerulean warbler (67 FR 65083; October 23, 2002). A large number of these responses were identical or similar comments. Comments and information were received from 12 State fish and wildlife agencies within the range of the warbler, 4 academic researchers, 2 county government agencies, the U.S. Forest Service (4 units), National Park Service (2 units), Department of Defense, U.S. Army Corps of Engineers, a U.S. Congressman, 7 corporations, 40 nongovernmental organizations, numerous private citizens, and several other entities. Additionally, we directly contacted, and received information from, wildlife agencies and biologists within the cerulean warbler's range in Canada and South America. We reviewed all responses received, and those that contained new, updated, or additional scientific or commercial data were thoroughly considered in this 12-month finding.

Due to budget shortfalls during subsequent fiscal years, the Service was unable to fund additional work on the petition until late in fiscal year 2005. Since that time, we have analyzed the comments received after the 2002 finding, reviewed new published and unpublished reports and data on the species and factors affecting its habitat, and brought together a panel of experts on the species to provide additional insight into the current status and trends of the cerulean warbler.

After our resumption of work on the petition in late 2005, a lawsuit was filed by five of the petitioners (National Audubon Society, Defenders of Wildlife, Southern Appalachian Biodiversity Project, Western North Carolina Alliance, and Heartwood) in the U.S. District Court for the District of Columbia on February 28, 2006. The suit asked the Court, among other things, to compel the Service to make and publish in the **Federal Register** a 12-month finding regarding the plaintiffs' petition to list the cerulean warbler as a threatened species. Although we had already resumed work on the petition, due to the lawsuit, we entered into a settlement agreement with plaintiffs in which we agreed to provide our 12-month finding to the **Federal Register** no later than November 30, 2006.

### Cerulean Warbler Natural History

The cerulean warbler is a small insectivorous neotropical migrant songbird (11.5 centimeters (4.5 inches) long and weighing 8 to 10 grams (0.3 to 0.4 ounces)). It breeds in mature deciduous forests primarily within the central hardwood region of eastern North America, primarily in the Ohio and Mississippi River Valleys and adjacent areas east of the Appalachians, in New England and southern Canada, and in the Great Lakes region. (Hamel 2000a, pp. 2–4). The breeding range generally extends from the eastern Great Plains, north to Minnesota, east to Massachusetts, and south to North Carolina and Louisiana (Hamel 2000a, p. 2), encompassing 33 States and 2 Canadian Provinces. The core area of the breeding range is currently within the Cumberland Plateau and Ohio Hills physiographic regions in eastern Tennessee, eastern Kentucky, southern and western West Virginia, southeastern Ohio, and southwestern Pennsylvania (Villard and Mauer 1996, p. 7 and Figure 7; Sauer et al. 2005a). This species undertakes a long migration compared to many other warblers and passerines of similar size (Hamel 2000b, p. 1), covering a distance of approximately 4,000 kilometers (km) (2,500 miles (mi)) between the central latitudes of North America and northern latitudes of South America. The migratory pathway between the breeding and wintering grounds is not well known, but for most individuals, it likely includes a flight across the Gulf of Mexico and stops at a limited number of locations in Central America and northern Colombia or Venezuela (Hamel 2000b, p. 4). The fall migration to South America might be along a more easterly path than that of the northward migration in the spring (Dunn and Garrett 1997, p. 405). Cerulean warblers winter in broad-leaved evergreen forests within a relatively narrow band of middle elevations (500 to 1,800 meters (m); 1,650 to 5,900 feet (ft)) in the northern Andes Mountains in Venezuela, Colombia, Ecuador, Peru, and Bolivia and possibly in the Guayana Highlands of southeastern Venezuela, especially the tabletop mountains (tepui) of this ecoregion (Robbins et al. 1992, p. 559; Moreno et al. 2006 unpublished report, p. 3).

On the breeding grounds, cerulean warblers prefer mature hardwood forests with tall, large-diameter trees and a structurally diverse canopy (multiple vegetation layers, often associated with uneven-aged forest stands). They occupy forests with these structural characteristics in both upland and

bottomland locations (Hamel 2000b, p. 4). In the Appalachian Mountains, they tend to occur more frequently and in higher abundance on ridge tops than in valley bottoms (Weakland and Wood 2005, pp. 503–504; Wood et al. 2006, pp. 160–161; Buehler et al. *in press*, p. 9). Throughout much of their breeding range, they prefer to breed in large forest patches, and so are considered “area-sensitive” (Robbins et al. 1989a, p. 25; Mueller et al. 2000, p. 15), although they might not be as sensitive to forest patch size in well-forested and less fragmented landscapes where avian nest predation and parasitism rates tend to be lower (Hamel 2000b, p. 4). In parts of their range, cerulean warblers exhibit positive associations with canopy gaps and relatively small internal forest openings (Perkins 2006, p. 26), but they avoid abrupt edges between forest and large areas of open land (Wood et al. 2006, p. 160). Post-fledging habitat for this species has not been studied, but assuming cerulean warblers are similar to other mature forest-associated birds, they might seek out areas where shrubby vegetation provides good cover from predators as well as an abundance of good foraging substrate. Such areas might include small forest openings or early successional habitats, but habitat use during this period of the year has not been described and the relative importance of different habitat types during the post-fledging period is not known.

Insects are the primary food source of cerulean warblers throughout the year. During the breeding season, their diet has been observed to consist primarily of Homoptera and Lepidoptera but also may include small amounts of Coleoptera, Hymenoptera, Diptera, Hemiptera, Araneae, and other arthropods (Hamel 2000b, p. 6). While no detailed studies of diet have been completed during the non-breeding period, cerulean warblers appear to use nectar resources, as well as insects, during at least some period of their residency on their non-breeding grounds in South America (Jones et al. 2000, p. 961; USFWS 2006, Appendix 5—M.I. Moreno’s PowerPoint presentation, slide 15) and have also been observed eating small amounts of plant material during migration (Hamel 2000b, p. 5). Their primary foraging mode for capturing insects is gleaning prey from the upper and lower surfaces of leaves. They also use sallying and hover-gleaning to a lesser extent (Hamel 2000b, p. 5).

Cerulean warblers build their nests high above ground (mean height of 11.4 m (37 ft); Hamel 2000b, p. 9) in the mid-story or canopy of trees. Clutch size is

normally 3 or 4 eggs with an incubation period of 11 to 12 days and a nestling period of 10 to 11 days. Their nests are known to be parasitized by brown-headed cowbirds, particularly in the western portion of the cerulean warbler breeding range where cowbirds are more abundant (Hamel 2000b, pp. 9–11). Nest success varies annually and regionally, with observed average annual nest success rates at specific study sites ranging from approximately 20 percent in southern Indiana and the lower Mississippi River valley to approximately 58 percent in Ontario and eastern Tennessee. The average number of young fledged per successful nest also varies, although somewhat less dramatically, with reports of annual values between 1.7 and 3.0 for most study sites (USFWS 2006, Appendix 5—D. Buehler’s PowerPoint presentation, slides 25–28). Cerulean warblers typically arrive on their breeding grounds between mid-April and mid-May, depending on latitude, and remain there until sometime between late July and mid-September (Dunn and Garrett 1997, pp. 405–406). Cerulean warblers usually raise a single brood during this period; multiple nesting attempts are commonly undertaken if initial nest attempts fail. It is rare for this species to raise two broods in the same breeding season.

Cerulean warblers are predominantly socially monogamous (one male mated with one female), but social bigamy (one male mated with two females) has been observed in the Ontario population (USFWS 2006, Appendix 4, Day 2–p. 2). This behavior has not been studied at other locations. Some researchers have also observed a clumped distribution of cerulean warbler territories within study sites, apparently independent of habitat features. However, these patterns have not been studied rigorously nor confirmed as being different from a random distribution or a result of habitat selection (Hamel 2000b, p. 8).

Analysis of genetic variability at the population level has revealed no significant variation in neutral genetic markers across the breeding range, suggesting a single genetic population for this species (Veit et al. 2005, pp. 165–166). A study of natal and breeding dispersal between years using stable isotope analysis corroborates this hypothesis by suggesting a relatively high level of interannual adult dispersal between regions, particularly within the central portions of the breeding range (USFWS 2006, Appendix 4, Day 1–p. 14). Adult dispersal to different breeding locations between years appears to be lower in both the southern and northern portions of the range than

in the center of the range, suggesting higher site fidelity to breeding locations in those portions of the range. Natal dispersal between regions within the breeding range did not appear to be any more pronounced than adult dispersal. This is different than many other warbler species, which typically exhibit much higher natal dispersal than adult dispersal. Dispersal characteristics of cerulean warblers probably influence source-sink dynamics of the population, and more information on dispersal is needed to understand the current population trend of the species.

On the wintering grounds, this species may prefer forests with old-growth conditions, but it has also been found in second-growth forests and shade-grown coffee plantations (Hamel 2000b, p. 5; Jones et al. 2000, p. 958). As with its breeding habitat, a structurally diverse canopy with multiple vegetation layers appears to be an important component of its wintering habitat. It is generally found in mixed-species flocks of canopy-dwelling birds, and this association with mixed-species flocks could be an important characteristic of their occurrence on the wintering grounds (Hamel 2000b, p. 5), although more study of their social behavior is needed. Cerulean warblers usually reside on their winter grounds from October to February (Hamel 2000b, p. 9—Figure 3).

Cerulean warblers are nocturnal migrants. Little is known about habitat preferences and other ecological aspects of this bird’s migration. Several stop-over locations for spring migration have been found in Belize (Parker 1994, p. 70), Honduras, and Guatemala (Welton et al. 2005, p. 1), but records of this species during migration elsewhere are scarce. To explain this, one hypothesis is that cerulean warblers could migrate in pulses of large groups of individuals that make relatively long flights between stops (for example, northern South America to middle Central America and then across the Gulf of Mexico to southern United States). Even fewer records exist for cerulean warblers during the southward migration in the fall, prompting the suggestion that these birds might fly non-stop from the southern U.S. all the way to the northern coast of South America. Isotope analyses indicate some level of migratory connectivity for this species (USFWS 2006, Appendix 4, Day 2—pp. 7–8), suggesting that individuals residing in the northern portions of the breeding range tend to go to more northerly portions of the wintering range and birds from the southern portions of the breeding range go to the

more southerly portions of the wintering range.

Survival rates of cerulean warblers have not been studied widely across their range. Only one study has published estimates of minimum survival rates. Jones et al. (2004, p. 17) reported an annual adult male survival rate of 0.49 over the period 1995 to 2001; or 0.54 in "normal years" and 0.40 following an ice storm in 1998. These estimates are minimum values because they do not account for adult dispersal and emigration between breeding seasons.

#### *Population Size and Trends*

##### *Background*

Since its inception in 1966, the North American Breeding Bird Survey (BBS) is the primary data source for estimating population trends of more than 400 species of birds breeding in North America (Droege 1990, p. 1). More than 4,000 BBS survey routes are distributed along secondary roads across the United States and southern Canada in a stratified random design. Each year, volunteer observers count birds along these routes, following standardized protocols. Surveys are conducted at approximately the same time each year, which is typically during the first half of June in most locations. Each survey route consists of 50 stops spaced 0.8 km (0.5 mi) apart. Observers count all the birds seen and heard within 0.4 km (0.25 mi) of each stop location during a three-minute period (Droege 1990, p. 1). The sum of the counts for each species over the 50 stops is used as an index of relative abundance for that route (Link and Sauer 2002, pp 2833).

Statistical analyses are performed on these index values across routes to estimate population trends for particular species or groups of species. Two statistical analysis techniques are currently employed by analysts working with the BBS data: The route-regression method (Geissler and Sauer 1990, pp. 54–56) and the hierarchical model method (Link and Sauer 2002, pp. 2,833–2,836). The hierarchical model method is the more recently developed method, and BBS analysts are in transition from using the route-regression method to using primarily the hierarchical model method, which is a less subjective and more efficient method for estimating trend (Link and Sauer 2002, p. 2,837). The presentation of BBS data in the 2000 petition (Ruley 2000) used the route-regression method. Throughout this finding we discuss BBS data using the newer hierarchical model method. As a result, the figures used herein to describe BBS population

trends differ from those used in the petition. Statistical analyses can be conducted across different time frames and spatial scales (for example, States, bird conservation regions, range-wide).

It is important to recognize that the BBS was designed to estimate trends (changes in population) and not actual abundance (population size) of birds. Much of the criticism that has been leveled at the BBS—including doubts expressed about the BBS in the Service's positive 90-day finding on the petition to list the cerulean warbler—stems from confusion about the survey's objective and the protocols required to meet that objective. The following discussion addresses four aspects of the BBS that contribute to this confusion and why these issues do not detract from the usefulness of BBS for tracking bird population trends.

(1) The point count survey methodology of the BBS does not result in a complete count of the birds present. The efficiency with which birds are counted varies between observers and within observers over time and space. In addition, a 3-minute count is not long enough to detect all birds present in a given location due to temporal variability (both daily and seasonally) in detectability of different species. However, the BBS methodology does provide an index of relative abundance of birds along the survey routes. This index can be scaled to different levels of abundance using different analysis methods and provides an appropriate means for assessing population change along the routes. An index of relative abundance is suitable for tracking changes in the size of the entire population if the ratio between the number of birds detected in the surveys and number of birds actually present across the landscape remains fairly constant and without any directional bias across years (Bart et al. 1998, pp. 212–214).

The statistical analyses of BBS data help to address some of the limitations pertaining to observer efficiency by incorporating variables that account for observer effects into the analyses. Such effects as differences in counts between observers in different years on the same route or the differences between an observer's first count and counts in subsequent years on the same route (the novice effect) are accounted for in the statistical analysis of the survey data (Sauer et al. 1994, pp. 59–60; Link and Sauer 2002, p. 2,834).

Another factor contributing to incomplete counts of all the birds present is that most detections of forest-associated songbirds are largely through observers hearing the songs of males.

Females of most forest songbirds do not sing and, therefore, are more difficult to detect during the breeding season. Thus, females of these species are greatly undersampled by the BBS. Again, this limitation is not relevant to the detection of population trends as long as trends in the male portion of the population are representative of trends in the entire population. For most small songbirds, such as the cerulean warbler, there is no substantial data indicating either a highly skewed sex ratio or a large difference in survival rates between the sexes such that trend data might be biased.

(2) BBS surveys are conducted along roadsides and might not accurately reflect habitats across entire landscapes. The proportion of different habitat types could be different across landscapes compared with what is sampled by BBS routes. However, this limitation, in and of itself, does not render the BBS ineffective in estimating trends of forest birds unless there is a consistent bias in the rate of change of habitats bordering roads compared to change of habitats away from roadsides. The fact that birds that avoid habitat edges might not be as abundant near roads as away from roads also does not influence trend estimates, except perhaps to reduce overall sample size for such species and require more years of data or more detections to achieve appropriate levels of statistical significance.

Experimental studies comparing roadside with off-road counts or modeling efforts to assess relative amounts of different habitats in the areas immediately surrounding BBS survey routes and areas away from routes are necessary to address the issue of roadside habitat bias for the BBS. Two published studies have evaluated the bias associated with roadsides in the eastern United States. These studies were conducted in Ohio and Maryland. They both concluded that, although BBS routes under-sampled forest habitats in the regions evaluated (areas adjacent to BBS routes tended to have proportionately less forest cover than did the region as a whole), they did not find a bias in the change in habitats over time along BBS roadside routes compared with the larger landscapes surrounding those routes (Bart et al. 1995, p. 760; Keller and Scallan 1999, pp. 53–55). These studies suggest that the roadside nature of the BBS does not create a substantial bias in the BBS data pertaining to habitat changes that are likely to influence bird population trends. In contrast with this apparent lack of bias in trend estimates, the indication from these studies that BBS routes might under-sample forest

habitats in the East could have implications for the population size estimates based on the Partners in Flight method (discussed below). However, an unpublished study from West Virginia (Weakland et al. 2003, p. 8) found no significant difference between the abundance estimates of cerulean warblers from off-road counts and from BBS routes. The study found a tendency for the off-road counts to be higher than counts on BBS routes, but the difference was not significant. The study concluded that, for cerulean warblers, data collected on BBS routes in West Virginia are comparable to data collected from off-road locations (Weakland et al. 2003, p. 8).

In the positive 90-day finding on the petition to list the cerulean warbler, the Service expressed doubt on the ability of BBS data to reliably determine bird population trends of mature forest-associated species, such as the cerulean warbler. Reasons for this doubt were primarily associated with concerns about a possible roadside bias and concerns about lack of uniform coverage of BBS routes across the range of the cerulean warbler. To date, the published evidence on the topic of the roadside bias suggests that the roadside nature of the BBS does not significantly bias its ability to accurately track population trends of mature forest species, such as cerulean warblers (Bart et al. 1995, p. 760; Keller and Scallan 1999, pp. 53–55). Furthermore, the more recently implemented hierarchical model method for analyzing BBS data estimates trends more efficiently (resulting in smaller confidence intervals around the trend estimate) based on the available data (Link and Sauer 2002, p. 2837), reducing concerns about lack of uniformity in coverage of BBS routes, particularly at the rangewide scale.

It is also worth noting that efforts to compare population trends calculated from BBS data with independent data sources have corroborated the trends indicated by the BBS for a variety of species, including independent trends based on the Christmas Bird Count, Mourning Dove Survey, raptor migration counts, and checklist programs (Droege 1990, p. 3). In addition, many peer-reviewed publications have been completed using BBS data (for example, Robbins et al. 1989b, Sauer et al. 1994, Link and Sauer 1997, Link and Sauer 1998, Royale et al. 2002, Sauer and Link 2002), indicating the overall robustness and scientific credibility of the BBS and its utility for monitoring bird population trends.

(3) A published analysis of BBS data using the hierarchical model method

indicates that at the range-wide level, cerulean warblers have declined at an average rate of 3.04 percent per year during the period of 1966 to 2000, with the 95 percent credible interval (confidence interval for hierarchical method; C.I.) for the trend estimate being  $-4.02$  to  $-2.07$  (Link and Sauer 2002, p. 2837). A more recent, but unpublished, analysis of the BBS data for the years 1966 to 2005 using the hierarchical model method indicates a similar result: cerulean warbler trend was  $-3.2$  percent per year (95 percent C.I.:  $-4.2$  to  $-2.0$ ) for this 40-year period (USFWS 2006, Appendix 5, slide 21 of J. Sauer's PowerPoint presentation). This recent estimate was based on data from 243 BBS routes on which cerulean warblers were detected at least once during that 40-year period. The rangewide relative abundance reported from this recent analysis was 0.25 birds per route, which is relatively low (less than 1 bird per route), and warrants some caution when considering the BBS results for this species, because a positive bias in the trend might occur with low counts, and because the variances are imprecise (Sauer et al. 2005b). Within the core of the species' range in the Appalachian Mountains (Bird Conservation Region 28), which currently supports an estimated 80 percent of the breeding population (as calculated using the methods described by Rosenberg and Blancher 2005), the relative abundance from the recent analysis was 1.03 birds per route and the 40-year trend was  $-3.1$  percent per year (95 percent C.I.:  $-4.4$  to  $-1.7$ ; USFWS 2006, Appendix 5, slides 17–19 from J. Sauer's presentation).

Analysis of the rangewide trend over the last 10 years (1996 to 2005) compared with the previous 30 years (1966 to 1995) indicated no significant change in the trend between those two periods (estimated change in trend =  $-0.5$  percent, 95 percent confidence interval =  $-3.8$ ,  $+3.4$ ). The trend estimate for cerulean warblers over the first 30 years of the BBS was  $-3.0$  percent per year (C.I.:  $-4.3$ ,  $-1.8$ ) and the estimate for the past ten years was  $-3.6$  percent per year (C.I.:  $-6.3$ ,  $-0.1$ ). Because 10 years is a smaller sample size than 30 years, the trend estimate based on the last 10 years is less precise than the estimate from the previous 30 years, so that the 10-year credible interval completely overlaps the 30-year credible interval. Thus, the available data suggest that the trend for cerulean warblers has not changed during the more recent period and the population continues to decline by

about 3 percent per year, including within the Appalachian core region (Sauer 2006).

(4) Partners in Flight produced estimates of global population size for North American land birds (Rich et al. 2004, pp. 69–77) based on a method developed by Rosenberg and Blancher (2005, pp. 58–61). The estimate of the cerulean warbler population was 560,000 individuals based on an average of counts made on BBS routes during the period of 1990 to 1999; it can be thought of as an estimate for the year 1995 (the mid-point of the time period). Partners in Flight rated the relative accuracy of their population estimates based on known sources of variation and limitations of the methodology pertaining to each species. Statistically derived confidence limits could not be provided because the variance has not been measured for some of the parameters and assumptions used in the method. Partners in Flight rated the accuracy of the population estimate for cerulean warblers as “moderate,” suggesting that they felt the estimate was likely to be within the correct order of magnitude (100,000's of birds rather than millions or 10,000's of birds) and could be within 50 percent of the true number (for example, 280,000 to 840,000).

The Partners in Flight method uses BBS relative abundance data along with several assumptions and correction factors to calculate the estimated population size for species covered by the BBS (Rosenberg and Blancher 2005, pp. 58–61). The method is based on the idea that, at each stop on a BBS route, an observer is recording birds within 400m (1,300 ft) of that stop location (per BBS survey protocol). Thus, the observer is effectively sampling an area equal to a circle with a 400m (1,300 ft) radius. Over the 50 stops of a BBS route, this sums to an effective sampling area of 25.1 km<sup>2</sup> (9.7 mi<sup>2</sup>). After making some assumptions regarding BBS routes adequately representing habitats across large landscapes and assumptions about the detectability of birds, the average number of birds counted on BBS routes within a particular region can be extrapolated across that region to calculate an estimated population size.

The following paragraphs present a list of the primary assumptions of the Partners in Flight method and discussion of the effects violations of these assumptions are likely to have on calculations of cerulean warbler population estimates.

(a) BBS routes are distributed randomly across regional strata. The BBS methodology prescribes random distribution of survey routes within

sampling strata, and the assumption that BBS routes are randomly distributed has not been questioned. However, the intensity of route allocation within particular strata and the topographic location of routes are two factors that could lead to biased population estimates. For example, if BBS routes in the Appalachian Mountains tend to be along roads that follow creek bottoms, and if cerulean warblers tend to be more abundant on ridge tops, as indicated in Weakland and Wood (2005, pp. 503–504), Wood et al. (2006, pp. 160–161), and Buehler et al. (in press, p. 9), then the BBS counts could be biased by undersampling the topographic locations where these birds are likely to be most abundant. Both the route allocation and topographic location biases could lead to an underestimation of total cerulean warbler population size.

(b) BBS routes sample habitats in proportion to their relative amounts within the regional strata. The possibility of a habitat bias from the roadside nature of BBS routes contributes to uncertainty about the accuracy of population estimates derived from the Partners in Flight method. As discussed above in relation to population trend estimation, the two studies that have been conducted in the eastern United States have shown that BBS routes in Ohio and Maryland undersample forest habitats compared to the surrounding landscape (Bart et al. 1995, pp. 759–761; Keller and Scallan 1999, pp. 53–55). If a similar bias toward underrepresenting forest habitat exists throughout much of the cerulean warbler's range, then such a bias would result in an underestimation of the total population size when using the Partners in Flight method. Various efforts are underway to evaluate the habitat bias of BBS routes across much of the United States, but results are not available yet.

(c) Detectability of different bird species is a function of their distance from the observer and time of day, and all species have a fixed, average maximum detection distance. Correction factors for detection distance and time of day were incorporated into the estimation method to address this assumption. For the detection distance, species were assigned to one of five categories corresponding to different average maximum distances at which these birds were likely to be detected based on habitat type, song quality, and likelihood of being detected in some way other than by song (for example, hawks soaring in the distance): 80m (260 ft), 125m (400 ft), 200m (650 ft), 400m (1,300 ft), and 800m (2,600 ft). These different detection distances result in different effective sampling

areas for BBS routes. Cerulean warblers were assigned a detection distance of 125m (400 ft), which is the assumed average maximum distance at which an observer will be able to detect a singing bird. This assumption has not been tested, and some experts believe that this detection distance might be an overestimate of the distance at which a singing cerulean warbler can always be heard; it is unlikely to be an under-estimate (USFWS 2006, Appendix 4, Day 2—pp. 1–2). If the real maximum detection distance for this species is less than 125m (400 ft), it would result in a larger population estimate based on the Partners in Flight method. For example, using a detection distance of 100m (325 ft) would result in a population estimate that is approximately 60 percent higher than the estimate using a 125m (400 ft) detection distance. The large influence of relatively small changes in detection distance on the resulting population estimate indicates that detection distance is a critical parameter in the population estimation methodology and contributes a large amount of uncertainty pertaining to the population estimate for a particular species when the accuracy of this parameter is unknown.

To correct for detection issues associated with time of day, Rosenberg and Blancher (2005, pp. 59–61) developed distribution curves of the detections for each species over the 50 stops of BBS routes. Based on these curves, peak detection probabilities were determined for each species and then a ratio of the peak detections to average detections was calculated. This ratio is used to adjust the average numbers of birds detected per route to peak numbers per route, reflecting numbers that would be expected if the peak detection probability lasted throughout the morning hours when BBS routes are surveyed. The time of day correction factor calculated for cerulean warbler is 1.35 (Rosenberg and Blancher 2005, p. 63—Table 2). The methods for deriving this correction factor are empirically based, and there is little reason to believe that it is biased or otherwise inappropriate for cerulean warblers.

One potential correction factor that was not incorporated into the Rosenberg and Blancher (2005) method and that could influence population estimates for cerulean warblers is a correction for detectability associated with the season. The song rate of most cerulean warbler males declines once they become mated and as the breeding season progresses (USFWS 2006, Appendix 4, Day 2—p. 2). The breeding season typically begins between mid-April and early May

throughout much of the breeding range. Most BBS routes are run during the first half of June, and overall song rate of mated males is likely to be lower at that time than earlier in the breeding season. Such a time of season effect could contribute to an under-estimate of the total cerulean warbler population size.

(d) Individuals detected during a count represent one member of a pair. A pair correction factor of two times the initial estimate was also incorporated into the method to address Assumption D. Most individuals in breeding populations are mated during the time of the BBS survey, but it is usually only one member of each pair that is detected (for example, a singing male). Rosenberg and Blancher (2005, p. 61) acknowledge that the appropriate pair correction factor for all species is somewhere between one and two, because not all individuals in a breeding population are mated. However, this correction factor has not been empirically established for any species yet. Field studies indicate that not all male cerulean warblers attract mates during the breeding season, although some males of this species are also known to be bigamous (USFWS 2006, Appendix 4, Day 2—p. 2). The proportion of unmated and bigamous males across the species range is unknown. The most appropriate pair correction factor for cerulean warblers might be a number less than two, but insufficient data currently exist to estimate what this number should be for the entire population. A pair correction factor less than two would result in a smaller population estimate, while a pair correction factor greater than two would result in a larger population estimate.

#### **Status of the Cerulean Warbler Population**

We used a stepwise approach to evaluate what single factor or combination of factors may affect the cerulean warbler's population trend in order to evaluate whether the species warrants listing as threatened or endangered under the Endangered Species Act. First, we used all available information, including that contained within the petition, scientific literature, and expert opinion (USFWS 2006) to identify potential factors that might explain the historical and projected population trends (see previous section "Population Size and Trend"). Next, we gathered information to assess whether the likelihood of occurrence or magnitude of effect of the factors were likely to result in population-level effects. We used the qualitative judgments of independent experts (USFWS 2006) to assess these potential

causal factors where quantitative data are unavailable. Then, we synthesized the information on the past and future factors with estimates of historical (Link and Sauer 2002, p. 2837, Sauer 2006) and projected (Thogmartin 2006) cerulean warbler population trends to estimate to what degree potential factors might influence the species' risk of extinction. Finally, we compared the results of our analysis to the five factors listed in the Act to ensure thorough consideration of potential threats, and, in light of the Act's five-factor analysis, we evaluated whether the species' current or projected status met the definitions of threatened and endangered.

### Summary of Factors Affecting the Species

Section 4 of the Act (16 U.S.C. 1533) and our implementing regulations at 50 CFR part 424 set forth the procedures for adding species to the Federal endangered and threatened species list. A species may be determined to be an endangered or threatened species due to one or more of the five factors described in section 4(a)(1), as follows: (A) The present or threatened destruction, modification, or curtailment of its habitat or range; (B) overutilization for commercial, recreational, scientific, or educational purposes; (C) disease or predation; (D) the inadequacy of existing regulatory mechanisms; or (E) other natural or manmade factors affecting its continued existence. In making this finding, information regarding the status of, and threats to, the cerulean warbler in relation to the five factors is discussed below.

In developing our 12-month finding for the cerulean warbler, we considered all scientific and commercial information on the status of the species that we received during the comment period following our 90-day finding. We also searched the scientific literature for relevant data and consulted experts on the cerulean warbler and threats to its habitat to ensure that this finding is based on the best scientific and commercial data available.

As noted earlier, we considered the population trend estimate of  $-3.2$  percent per year ( $CI = -4.2$  to  $-2.0$ ), which is based on Breeding Bird Survey data (Link and Sauer 2002, p. 2837; Sauer unpublished data 2006), to be the best available representation of the species population status. This trend estimate comprises all of the factors causing population change during the 40-year period of Breeding Bird Survey data collection. In other words, all the factors affecting cerulean warbler demographics have combined over the

past 40 years to produce an annual average decline of 3.2 percent per year, with 90 percent certainty that the true decline is between 4.2 and 2.0 percent per year (Link and Sauer 2002, p. 2837; Sauer unpublished data 2006). The information available suggests that the factors described in this section will continue affecting cerulean warbler habitats and demography in a similar manner, resulting in a continuing population decline of approximately 2 to 4 percent per year.

We describe the potential contributing factors to the species' approximately 3 percent annual decline in the following description of the five listing factors (iterated above).

#### *A. The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range*

After consideration of all available information, the Service has determined that four biological mechanisms operating throughout the species' annual range are likely to be primary contributors to the species' declining population trend. Each of these mechanisms is related to changes in habitat in North America, South America, and along the species' migration routes. These mechanisms are:

1. Reduction in available nesting sites and suitable breeding territory characteristics because of loss or degradation of habitat,
2. Reduction in foraging success resulting from decreased prey abundance, primarily on the wintering ground in South America,
3. Increased predation throughout the species' annual range and nest parasitism of cerulean warblers in the breeding grounds, resulting from habitat fragmentation, and
4. Loss of migration habitat.

Each of these four mechanisms results, either directly or indirectly, from the reductions in quality and quantity of cerulean warbler habitat (Factor A of the Act) and therefore, all will be discussed under Factor A.

1. Reduction in available nesting sites and suitable breeding territory characteristics because of loss or degradation of habitat:

Although we do not have a rangewide numerical relationship between habitat loss and population change, we do know that there is a positive relationship between cerulean warbler nest presence and mature and old-growth hardwood forests with large trees, small gaps, and vertical diversity in vegetation layers (Hamel 2000b, pp. 12–18; Weakland and Wood 2002, p. 13). Therefore, we can conclude that

degradation or removal of suitable mature and old-growth hardwood forestland will result in reductions in nesting opportunities, and that accumulation of habitat losses is likely to result in declines in cerulean warblers.

We do not know what happens to individual birds when breeding habitat is removed. Displacement of adults and mortality of nestlings is likely if removal of nesting stands occurs during the breeding season. Nestling or post-fledging mortality may also occur if habitat within nesting territories is eliminated or quality is reduced below an unknown threshold level. Results of recent studies suggest that cerulean warblers are capable of interannual movement (Veit et al. 2005, pp. 165–166; USFWS 2006, Appendix 5f, slide 17 of Jones PowerPoint); therefore, breeding habitat loss during the non-breeding season is likely to result in relocation of adults that return during the subsequent breeding season. However, the degree to which reproductive success or survival of displaced individuals is affected is likely dependent upon several variables, including whether the displaced birds relocate into already occupied or unoccupied, or whether remaining habitat is optimal or suboptimal. We do not have information to assess the degree and type of impact of breeding habitat of site-specific habitat loss, unless known occupied nests are removed.

Degradation of habitat quality can occur at several scales, and the resulting effect on cerulean warblers is likely to be context-dependent. Loss of a single dominant tree in a stand possessing numerous other dominant trees may have little or no effect on the reproductive success of breeding cerulean warblers, whereas loss of a single dominant tree in a stand having few other large trees may render a formerly suitable site unsuitable for nesting birds. Context is probably similarly important at larger scales. Reduction in patch size and introduction of hard edges may result in greater local population declines and habitat unsuitability where a forest stand is surrounded by an already fragmented landscape as opposed to largely intact forest. Thus, habitat content factors that operate at local scales (to include nest trees, prey base, etc.) and habitat context factors that operate at larger scales (to include things like habitat patch size, degree of landscape fragmentation, etc.) are both important determinants of overall habitat quality for breeding cerulean warblers.



The amount, distribution, and quality of habitat for breeding cerulean warblers has been altered dramatically since European settlement in the early 1600s. An estimate of total forestland in 1630 in 19 States in which cerulean warblers occur today and for which there was analyzed BBS data (Sauer 2006) was 133,000,000 ha (328,695,000 ac) (Smith et al. 2004, p. 33, citing Kellogg 1909). Today, the estimate of forest cover in those same States is 73,600,000 ha (181,850,000 ac) (Smith et al. 2004, p. 33), a total reduction of approximately 45 percent. The most dramatic change occurred between the early 1600s and 1900, when approximately 51 percent of forestland was converted to agricultural and other uses (Smith et al. 2004, p. 33). Since 1900, approximately 8,500,000 ha (21,000,000 ac) have reverted from primarily agricultural uses to forestland. Approximately 52 percent of today's hardwood forest within the eastern United States is in mature sawtimber (Smith et al. 2004, p. 64); some of this area is northern hardwood forest and outside the range of the cerulean warbler.

The cerulean warbler appears capable of using previously unoccupied stands that have matured to develop necessary habitat characteristics. Evidence of this capacity comes from New Jersey, New York, and parts of New England, where the species has recently expanded its range (Hamel 1992, pp. 385–400; Robbins et al. 1992, p. 551). Population information indicates that this expansion occurred during the later part of the 1900s, although experts suggest that the expansion does not appear to be continuing today (USFWS 2006, Appendix 4, Part II, p. 5). We do not know the distribution of cerulean warblers prior to 1966; therefore, we do not know whether this expansion is a reoccupation of restored forest or true expansion into an area not previously occupied.

Despite this recent, gradual increase in the total amount of forestland, cerulean warbler populations have declined since 1966, according to Breeding Bird Survey data. Several hypotheses could explain this phenomenon: (1) The amount of forest stands with diverse structure continues to decline even though total forestland acres increases; (2) local reductions in nesting opportunities in core breeding areas are having disproportionate effects at the population level; or (3) factors occurring elsewhere in the species annual range or not related to nesting opportunities are causing the decline. We will discuss each of the first two of these factors in the following text, and the third factor in subsequent sections.

Rangewide data are not available to quantitatively assess the amount of or change in habitat with desired characteristics for breeding birds. Nevertheless, several pieces of information are important for consideration. It takes hundreds of years for hardwood forests to naturally achieve complex structure of mature and old-growth forests (Hamel 2000, p. 12 citing Widman), which are characteristic of stands selected by cerulean warblers for breeding. Much of the reversion of agricultural lands to forestland has occurred since the early 1900s; therefore, much of the new acreage in forestland remains in relatively younger stands that have yet to achieve desired structural complexity. We note, however, that stand heterogeneity is likely a more important predictor of habitat quality than simply looking at stand age, because natural and anthropogenic disturbances can create desired stand complexity. Forest management practices, such as high-grading, may also affect habitat quality if the largest trees in the stand are removed, reducing structural complexity. Fire suppression, species-specific tree diseases, and locally or regionally high deer densities may also reduce the complexity of forest structure.

Effects in a relatively small portion of the species' range, compared to the species' entire breeding range, could contribute disproportionately to the population decline. This has likely happened in the past and may happen in the future. Historically, cerulean warblers were probably numerous in the bottomland hardwood forests of the Mississippi Alluvial Valley. Today, approximately 80 percent of forest in this area has been converted to nonforest uses (Brown et al. 2000, p. 6). Nesting cerulean warblers currently occur only in scattered locations within this region. It is important to note that most of this loss occurred before the Breeding Bird Survey began in 1966. Currently, large-scale habitat loss is occurring in the core of the species' range, Kentucky and West Virginia, where mountaintop coal mining and valley fill operations through 2012 are expected to remove 567,000 ha (1.4 million ac) of suitable forest habitat (USEPA 2005). The total cumulative forest loss from these activities will likely eliminate breeding habitat for 10 to 20 percent of the total cerulean warbler population currently occurring within that core area. The loss of breeding opportunities for birds in this area may have a disproportionate effect on the species' total population size.

The USDA Forest Service has projected forest change to the year 2050 (Alig and Butler 2004). These projections are based on prior trends in forest change, expected market conditions, and no change in forest management related policies. Under these conditions, the Forest Service expects a slight decline in hardwood forest area. Hardwoods will continue to dominate the southeastern United States; however hardwood forest area is expected to decline by up to 18 percent by 2050 (Alig and Butler 2004, pp. 32–33). Maple-beech-birch and oak-hickory forests are estimated to decrease by 6 percent and 15 percent, respectively (Alig and Butler 2004 p. 18). We note that small portions of the hardwood forest area contained within these estimates are outside the range of the cerulean warbler; refer to Alig and Butler (2004, p. 2) for a map of the forest survey area. We stress that changes in acreage or percent of forest landscape in hardwoods are only one determinant, and the actual composition and structure of hardwoods forests in future landscapes may be equally or more important.

In summary, a variety of factors has affected the quantity and quality of mature and old-growth hardwood forests within the range of the cerulean warbler. Overall, habitat loss beginning in the 1600s likely precipitated a decline in cerulean warblers; however, the conversion of forests stabilized with about 50 percent of forestland remaining in the early 1900s. Rangewide cerulean warbler population information did not become available until the 1960s; therefore, we do not know how the pre-1900s cerulean warbler population size changed as a result of this dramatic habitat loss, nor how it may have responded to post-1900 forest changes. Beginning in the 1900s, re-growth of forests previously converted to agriculture has added potential breeding habitat that may be reoccupied when stands achieve the characteristics selected for by cerulean warblers, as evidenced today in the Northeastern United States.

2. Reduction in foraging success resulting from decreased prey abundance, primarily on the wintering ground in South America:

Cerulean warblers feed exclusively on insects in North America, and on insects and nectar in South America. Availability of these resources is critical to an individual bird's survival. Insufficient fat storage before spring migration could increase an individual's risk of mortality and decrease reproductive success upon return to the breeding grounds. Insufficient fat



storage before fall migration could leave an individual at risk of mortality, especially if the migration route is over water where foraging opportunities are limited, as is currently hypothesized.

*Winter range*—Abundance of food resources in South America has likely declined because of the degradation and removal of tropical forests. Removal of overstory trees, as forests are cleared and shade-grown coffee plantations are converted to sun coffee plantations, is expected to result in losses of arthropods that are specialized for the canopy layers. For example, in Costa Rica, Perfecto (1996, p. 602) reported an average of 72 percent of the ants in a tropical forest tree canopy to be canopy specialists. However, that we do not know that cerulean warblers prey on ants. In a Costa Rican study, Perfecto et al. (1996, p. 602) reported similar arthropod diversity in overstory trees within shade-grown coffee plantations as within a native forest canopy. We do not have figures for arthropod diversity or abundance in the Northern Andes, but we expect that conditions may be similar. We do not have quantitative information on the differences in nectar resources between tropical forest and developed lands.

Moreno et al. (2006, p. 3) used a climatic and geospatial model to predict the potential maximum occurrence of cerulean warbler wintering habitat in the narrow elevation zone (500 to 1,500 m (1,650 to 5,000 ft)) in the Northern Andes and estimated a nearly 60 percent current reduction from maximum levels. The remaining habitat is tropical forest and shade-coffee plantations. Some field biologists believe that the model overestimates habitat availability, and they estimate that less than 10 percent remains (Moreno et al. 2006 unpublished report, pp. 3, 5).

Most of the loss of tropical forests in the Northern Andes occurred within the latter half of the 1900s. Approximately 15 percent of the species' modeled potential habitat (Moreno et al. 2006 unpublished report, p. 5) is managed under protective status. The effectiveness of this protective status for conserving cerulean warblers is uncertain because none of the documented cerulean warbler winter occurrences are within protected areas (Moreno et al. 2006 unpublished report, p. 5). The rate of loss of the remaining tropical forest is likely to be decreasing because remnant forests are in steep and inaccessible areas; however, removal of portions of the remaining tropical forests continues.

We know that cerulean warblers occupy shade-coffee plantations during

the non-breeding season, but we do not know whether shade-coffee plantations are optimal or sub-optimal habitat because data are not available to compare body condition of cerulean warbler on shade-coffee plantations with birds occupying tropical forests. In other words, presence does not necessarily equate to suitability of these habitats. The amount of habitat supplied by shade-coffee plantations is diminishing, as some of these plantations are converted to sun-coffee plantations that lack the overstory required by wintering cerulean warblers (Moreno et al. 2006 unpublished report, p. 2). Cerulean warblers are not known, and are highly unlikely, to occur in sun-coffee plantations due to the plainly inadequate structure of such vegetation.

In summary, the population-level effects of habitat loss and degradation on forage abundance and foraging success have not been quantified. It is reasonable to conclude, however, that a greater than 60 percent decline of wintering habitat in South America has contributed to the approximately 3 percent annual population decline of cerulean warblers through reduced forage availability and increased competition for remaining food resources.

*Breeding and Post-Fledging Range*—Under pre-European settlement conditions on the breeding grounds, the hardwood forests of the eastern United States were a mosaic of different seral stages (Williams 1989, pp. 22–49). Although the forests were predominately mature and old growth, patches of younger seral-stage forests occurred within small gaps (Lorimer 1989, pp. 565–566). Today, cerulean warblers occur in greater relative abundance within landscapes with similar mosaic characteristics. Information suggests that cerulean warblers select nests sites in stands where canopies are interrupted by small gaps and canopy closure is between 65 percent and 85 percent (Hamel 2000, p. 16). Nests are found in areas with large diameter trees and stands with complex canopies, but small patches of seedling-sapling aged trees within the mature forest mosaic may provide important habitat for post-fledging first-year birds.

Today's mature forest characteristics may not mimic the mosaic conditions of original hardwood forest because of alterations in the disturbance regimes through fire suppression, dense populations of deer, and certain timber harvest methods. The effects of this change in forest disturbance regimes on cerulean warblers are not well studied or understood. It is possible, however, that the replacement of the natural

disturbance regime—characterized by frequent, small-scale disturbances—with the less-frequent larger-scale disturbances (Lorimer 1989, pp. 565–566) may not produce understory conditions that favor foraging success for post-fledging birds because of the lack of interspersed seedling-sapling patches.

3. Increased predation throughout the species' annual range and nest parasitism of cerulean warblers in the breeding grounds, resulting from habitat fragmentation:

Fragmentation of cerulean warbler habitat has occurred throughout the species' range. High rates of predation and brood parasitism often accompany habitat loss and fragmentation, especially in forested landscapes interspersed with agricultural lands and grasslands (Hoover and Brittingham 1993, p. 234; Brittingham and Temple 1983, pp. 31–34; Faaborg et al. in Martin and Finch 1995, p. 361). Several studies have shown low rates of nest success (less than 40 percent) for cerulean warblers in areas of fragmented forest within agricultural landscapes due to high levels of predation and the presence of nest parasitism (Hamel 2000a, p. 4; Roth 2004, p. 43; Varble 2006 p. 3). Direct measurements of adult and post fledging mortality due to habitat loss and fragmentation during the breeding season on cerulean warblers do not exist; however, this phenomenon is well documented with other canopy and sub-canopy nesting songbird species. It is reasonable to conclude that brood parasitism and predation are exacerbated by habitat loss and fragmentation and that this is contributing to the approximately 3 percent annual population decline.

*Wintering Range*—Effects of habitat loss and fragmentation include increased risk of mortality from predation of neotropical migrant songbirds in the non-breeding range (Rappole et al. 1989, p. 407; Petit et al. in Martin and Finch 1995, pp. 179–180), especially if birds are forced to wander outside optimal habitat. Although no studies of predation on cerulean warblers in the non-breeding range have been conducted, it is reasonable to assume that predation-caused mortality of cerulean warblers is similar to that documented for other warbler species.

Approximately 60 to 90 percent of wintering habitat of cerulean warblers in South America has been converted to other land uses. This loss of habitat has resulted in a highly fragmented landscape. Geospatial modeling estimates that fragmentation of this habitat has more than doubled (Moreno et al. 2006, p. 14, unpublished report).

**Breeding Range**—Nest parasitism and predation usually result in mortality of nestlings and post-fledging birds. Brown-headed cowbirds (*Molothrus ater*) lay their eggs in the nests of other species, and when hatched, cowbird chicks outcompete the chicks of the natural parents. Likely nest predators are corvids, chipmunks, squirrels, and other arboreal animals.

Populations of cowbirds and avian predators are higher in highly fragmented forests and in areas where edges delineate sharp differences in land use between the forests and the adjacent stands. For example, cowbird abundance is greater along forest and agricultural edges than along edges created by different forest age classes (Rodewald and Yahner 2001, p. 1021) and are more common where human development provides new feeding sites, such as pastures. Overall, however, cowbird populations have declined since breeding bird surveys began in 1966 (Robbins et al. 1992, p. 7661). We do not know whether, or the degree to which, reductions in cowbird populations result in less pressure on cerulean warblers.

Effects of habitat loss and fragmentation on songbirds of North America have been relatively well studied compared with birds in South America; however, little specific information is available on cerulean warblers. In general, we know that increased fragmentation and decreased habitat patch size within the breeding range is likely to increase risk of predation and nest parasitism (Robinson et al. 1995, pp. 1988–1989; Donovan et al. 1995, p. 1393). Nest success was low (less than 25 percent) at Big Oaks National Wildlife Refuge in Indiana due to nest predation and nest parasitism; the breeding habitat on the refuge is surrounded by an agriculturally dominated landscape (Roth 2004, p. 43; Varble 2006, p. 3).

Studies on cerulean warblers have concluded that increased distance from edge was a significant positive predictor of cerulean warbler territory density (Bosworth 2003, p. 21; Weakland and Wood 2002, p. 505). The reason for decreased cerulean warbler density near edges is not known, but may be a result of lower availability of suitable or optimal habitat near edges, or edge habitat avoidance, possibly as a result of increased predation pressure or other factors. The effects of fragmentation are likely to be context-dependent, where increasingly fragmented landscapes lead to decreased reproductive success due to increased predation and brood parasitism (Donovan et al. 1995, p. 1393). Specifically, Donovan et al.

(1995) found that nest failures of three forest-nesting, neotropical migrants (ovenbird (*Seiurus aurocapillus*), red-eyed vireo (*Vireo olivaceus*), and wood thrush (*Hylocichla mustelina*)), were significantly higher in fragmented forests than in contiguous forests.

#### 4. Loss of migration habitat:

Migrating warblers that cross the Gulf of Mexico to and from breeding and wintering grounds depend on finding suitable patches of terrestrial habitat near coastlines. Such habitats are essential in providing food resources necessary to replenish energy and fat stores of enroute migrants and to provide shelter from predation and inclement weather events. As coastal forest habitat along the U.S. and Central American Gulf coasts is lost to development and conversion, compounding the adverse impacts of hurricanes and other natural factors, the vulnerability of cerulean warblers to mortality during migration has increased.

#### Conservation Actions Currently Underway

There are several existing conservation actions and programs that specifically focus on the cerulean warbler and its habitat. We did not rely on these ongoing conservation actions in our determination that listing the cerulean warbler is not warranted and, therefore, we did not evaluate them under our 2003 Policy for Evaluation of Conservation Efforts When Making Listing Decisions (68 FR 15100; March 28, 2003). The cerulean warbler Technical Group (CWTG) is a partnership of biologists, managers, and scientists from the forest-products industry, Federal and State agencies, nongovernmental organizations, and academia. It was formed in 2001 to develop a broad-based, technically sound approach to conservation of the cerulean warbler. By seizing the initiative and bringing key stakeholders and technical experts together, the CWTG seeks to keep the focus on identifying meaningful and proactive conservation solutions through sound science, clear communication, and trust. CWTG was loosely modeled after the highly successful Louisiana Black Bear Conservation Committee formed in the early 1990s. Collaborative actions of the CWTG on behalf of the species are coordinated by a Steering Committee charged to spur action and chart future activities and directions. There are currently 72 CWTG participants working on the following committees: Coordination, conservation, monitoring, research, international, and mining. Hamel et al. (2004, pp. 12–14) provides

a thorough discussion on the history, organization, and objectives of the CWTG.

In December 2002, the CWTG met at the National Conservation Training Center in Shepherdstown, West Virginia, at a workshop sponsored by the Service and the U.S. Geological Survey. This important workshop was attended by 65 people from a broad category of disciplines, including biologists from Colombia, Ecuador, and Venezuela. The main purpose of the workshop was to develop a proactive, broad-based, and cohesive strategy for cerulean warbler conservation. Four working groups were established; their goals and accomplishments are summarized below:

(1) The Breeding Season Research Group identified rangewide research priorities and designed a research experiment to test cerulean warbler response to commonly applied forest management practices, replicated at five study areas across the core of the breeding range. The project will provide information on cerulean warbler ecology and demography, and insights to key limiting factors and to management prescriptions that could benefit it and associated species. In 2003, the project was endorsed by the Northeast and Southeast working groups of Partners in Flight as the highest research priority for forest songbird conservation.

(2) Priorities for the Breeding Season Surveys and Monitoring Group are to map cerulean warbler distribution more completely, improve regional and global estimates of population size and trend, and integrate inventory and monitoring efforts with predictive modeling. Successes include bringing together major forest-products companies in the mid-Appalachians in partnership with the National Council for Air and Stream Improvement (NCASI) and the Cornell Laboratory of Ornithology to evaluate cerulean warbler status on as much as 100,000 ha (250,000 ac) of likely suitable habitat that have not previously been surveyed. During the nesting seasons of 2003 to 2005, the partners surveyed hundreds of points on private lands. The data are being used to test and refine predictive models, developed by University of Tennessee, the Service, and U.S. Geological Survey, on the spatial distribution, abundance, and habitat associations of cerulean warblers in their core breeding range.

(3) The Breeding Season Conservation Group is developing a vision and goals for long-term sustainability of cerulean warblers within the context of integrated ecosystem conservation and to develop habitat conservation and management recommendations for the

cerulean warbler that can be incorporated into management plans for public and private forestlands within its range. One venue for pursuing these goals is the Appalachian Mountains Bird Conservation Initiative (under the Atlantic Coast Joint Venture), a partnership organized to facilitate effective proactive conservation for all birds in the Appalachian Mountains region with an emphasis on cerulean warblers and ecologically related species.

(4) The Non-Breeding Season Group, *El Grupo Cerúleo*, promotes a multispecies approach to habitat conservation on the wintering grounds (including other resident at-risk species that co-occur with cerulean warblers). This group has compiled a database of documented observations of cerulean warblers, assessed non-breeding threats and conservation coverage, identified opportunities for outreach and education to communicate awareness of migratory bird issues, and (through the U.S.D.A. Forest Service and The Nature Conservancy) provided funding for South American biologists to conduct new research on cerulean warblers in the winters of 2003–2004 through 2005–2006. Two workshops (March 2003 and November 2005) in Ecuador with biologists and modelers from throughout northern South America resulted in GIS-based, spatially explicit models of cerulean warbler winter habitat. *El Grupo Cerúleo* recently assisted other conservation organizations in securing an important non-breeding habitat reserve for the cerulean warbler in Colombia (see more on this action in discussion of Important Bird Areas below).

The cerulean warbler Technical Group is moving forward on the premise that the most successful conservation efforts for cerulean warblers will be those that bring together broad partnerships to achieve common goals. To that end, the CWTG Steering Committee conducted two separate one-day meetings with forest and coal industry biologists and managers in March 2006 in Charlestown, West Virginia. The purpose of these meetings was to begin discussions with these two industries on cooperative efforts to broaden cerulean warbler conservation management. Both meetings explored the constraints and potential options for cerulean warbler conservation in the Appalachians and establishing a foundation for a broader conservation partnership summit in February of 2007 that will focus on actions.

There are several projects currently being conducted to study the response of cerulean warblers to targeted

management efforts to restore the quantity and quality of its breeding habitat. As previously discussed in this finding, quality cerulean warbler breeding habitat consists of mature forests with a diverse and vertically complex canopy structure, including canopy gaps and associated midstory and understory vegetation. Biologists and land managers are manipulating (managing) forest areas to create the complex canopy structure required by cerulean warblers. If these research and management studies are successful, these methods could be used in many public and private forests to restore the cerulean warbler's breeding habitat and enhance its reproductive capability in a shorter period of time.

The most comprehensive effort involving the scientific evaluation of managing and restoring cerulean warbler breeding habitat is the Cooperative Cerulean Warbler Forest Management Project, which was developed by the Cerulean Warbler Technical Group. Study areas include a national forest in eastern Kentucky, a State wildlife area in north-central Tennessee, a State wildlife area in southeastern Ohio, a State wildlife area in north-central West Virginia, national forests in eastern West Virginia, and an area of private forest industry lands in the coal fields of southern West Virginia. Each study area will consist of four sites representing different levels of forest management intensity: (1) No management, (2) selective harvest with 75 percent residual canopy cover, (3) selective harvest with 50 percent residual canopy cover, and (4) even-aged harvest (clearcutting, less than 10 percent residual canopy cover). Each site will be 20 ha (50 ac), with the management actions being applied on a 10 ha (25 ac) area in the center of each site. This configuration will allow for an undisturbed buffer at least 100 m (330 ft) to isolate the management activities and for assessing edge effects around the different levels of management intensity. Two years of pre-harvest monitoring (2005, 2006) and two years of post-harvest monitoring (2007, 2008) will occur on each site. The pre-harvest monitoring has been conducted and the forest management actions are scheduled to occur during the fall and winter of 2006–2007. A similar forest management-cerulean warbler study is being conducted on the Chattahoochee National Forest in northern Georgia.

In 2005, Fundacion Aves (the ProAves Foundation of Colombia) and the American Bird Conservancy were successful in securing a 1,250-ha (500-acre) reserve of Andean subtropical forest in the Rio Chucur basin of

Santander, Colombia (within the Serrania de los Yariguies Important Bird Area) to protect wintering habitat for the cerulean warbler. The area, one of the last natural forest fragments in the region, contains high populations of wintering cerulean warblers. This is the first South American reserve designed to protect a bird species that nests solely in the United States and Canada. The reserve is also a focal point for a continuing regional conservation campaign for the cerulean warbler. Another key area for wintering cerulean warblers—southwestern Antioquia, Colombia—has been targeted for further conservation efforts.

#### Factor A Summary

We believe that the combined effects of habitat loss have accumulated to produce the 40-year average annual decline of 3.2 percent per year, with 90 percent certainty that the true decline is between 4.2 and 2.0 percent per year. As stated earlier, we do not have information to suggest that the population trend will shift outside the credible interval (Link and Sauer 2002, p. 2837; Sauer 2006) in the future, and we, therefore, assume that the factors described above will continue to support the declining population trend between –4.2 and –2.0 per year. Notwithstanding this assumption, the Service does not find that the cerulean warbler is likely to become a threatened or endangered species within the foreseeable future throughout all or a significant portion of its range.

#### B. Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

We are not aware of any commercial, recreational, or educational uses that result in adverse impacts to the species or to individuals, nor do we envision any such threats developing in the foreseeable future.

There is a potential for adverse impacts resulting from scientific purposes, but data indicate that such impacts are negligible. All scientific activities in the United States that involve taking (for example, pursuing, capturing, hunting, shooting, wounding) cerulean warblers, their nests, or their eggs require a permit issued by the Service under authority of the Migratory Bird Treaty Act. In the United States, 13 cerulean warblers were taken under scientific research permits from the beginning of 2000 to the present, an average of fewer than 3 birds per year. Currently there are four valid and active scientific collection permits that allow the potential lethal take of up to 20 additional cerulean warblers through

March 31, 2008 (Andrea Kirk, Migratory Birds Permit Chief, USFWS Region 3, 2006, in litt.). This level of mortality is deemed to be of negligible impact on a species whose population is most likely in the hundreds of thousands of individuals.

Other research projects that include handling cerulean warblers, such as capturing and handling individuals for banding or applying other markings, may accidentally result in serious injury or death to a small percentage of the captured birds. Permits for these activities are issued by the Bird Banding Laboratory (BBL) of the Biological Resources Division of the U.S. Geological Survey. Data from the BBL show that only 1,879 cerulean warblers were banded during the 50-year period from 1955 to 2004 (BBL data, accessed on September 8, 2006, at <http://www.pwrc.usgs.gov/BBL/homepage/listalph.htm>). The number of cerulean warblers banded during this period is much lower than almost all other warbler species banded during this 50-year period (only four other warbler species had a lower number of bandings). For instance, 3,469 golden-cheeked warblers and 3,236 Kirtland's warblers (both endangered) were banded during this period and 26,919 Blackburnian warblers. Compared to banding activities involving other warbler species, this is a very low incidence of banding and handling, indicates that there has been little intentional or incidental banding activity with this species. The behavior of cerulean warblers generally keeps them high in the forest canopy, leading to a low frequency of capture in the mist nets used by bird banders. Thus, we conclude that there are few (if any) adverse population impacts resulting from banding or marking this species.

We have no data concerning the impacts of scientific research on this species along its migratory route or on its wintering grounds, but there is no reason to suspect those activities have or will produce significant adverse impacts on the species.

In summary, the best available scientific data indicate that there are no significant impacts occurring to the species from overutilization for commercial, recreational, scientific, or educational purposes.

### C. Disease or Predation

We found no evidence to suggest that avian diseases or parasites are affecting cerulean warblers beyond normal baseline levels.

The possible increased impacts of predation and nest parasitism are believed to be caused by changes in

habitat quality. Therefore, these impacts are discussed under Factor A, above.

### D. The Inadequacy of Existing Regulatory Mechanisms

Existing regulatory mechanisms that could provide some protection for the cerulean warbler include: (1) United States Federal laws, regulations, and Executive Orders; (2) Canadian Federal and Provincial Laws and Regulations; and (3) State wildlife laws, which are discussed below.

#### (1) U.S. Federal Laws, Regulations, and Executive Orders

The Migratory Bird Treaty Act (MBTA; 16 U.S.C. 703–712) prohibits “take” of any migratory bird. “Take” is defined as to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect.

The National Environmental Policy Act (NEPA; 42 U.S.C. 4321 *et seq.*) requires all Federal agencies to formally document, consider, and publicly disclose the environmental impacts of their actions and management decisions. NEPA documentation of these impacts is provided in an environmental impact statement, an environmental assessment, or a categorical exclusion, and may be subject to administrative or judicial appeal. In NEPA documents, Federal agencies may present scientific studies, evaluations, and management decisions involving actions that may impact the cerulean warbler or its habitat. Some Federal agencies may be required by their regulations, policies, and guidance to perform specific assessments under NEPA for actions that could impact the cerulean warbler. Examples include biological evaluations addressing actions by the U.S. Forest Service on national forests where the cerulean warbler is identified as a sensitive species by the Regional Forester.

The Multiple-Use Sustained-Yield Act of 1960, as amended (MUSY; 16 U.S.C. 528–531) provides direction that the national forests be managed using principles of multiple uses and to produce a sustained yield of products and services. Specifically, MUSY provides policy that the national forests are established and shall be administered for outdoor recreation, range, timber, watershed, and wildlife and fish purposes. Land management for multiple uses necessarily raises competing and conflicting issues. MUSY provides direction to the Forest Service that wildlife, including the cerulean warbler, is a value that must be managed for, though discretion is given to each forest when considering the

value of this species relative to the other uses for which it is managing. Although MUSY could provide some protection for the warbler, it does not have any provisions specific to the conservation of the warbler or its habitat.

The National Forest Management Act (NFMA) as amended (16 U.S.C. 1600–1614) is the primary law governing the administration of national forests by the U.S. Forest Service. NFMA requires all units of the National Forest System to have a Resource Management Plan (RMP), to revise the plans whenever significant changes occur in a unit, and to update the plans at least once every 15 years. The purpose of the RMP is to guide and set standards for all natural resource management activities over time. NFMA requires the Forest Service to incorporate standards and guidelines into RMPs, including provisions to support and manage plant and animal communities for diversity, and the long-term rangewide viability of native and desired nonnative species. Several national forests have identified the cerulean warbler as a “sensitive species,” which involves an additional assessment of the impact of individual management actions by the national forest on the cerulean warbler. National forests that have identified the cerulean warbler as a sensitive species have current information on the presence and condition of the warbler and its habitat on the national forests and within individual units where management actions are planned. Surveys for cerulean warblers may be conducted prior to undertaking management actions or to monitor population trends of cerulean warblers, including national forests where the species is not designated as a sensitive species. The cerulean warbler has also been identified as a Management Indicator Species on several national forests. In these cases, the cerulean warbler functions as a biological indicator of desired forest condition, and results in a higher level of awareness of the species' life history and habitat needs, which are considered during analysis of the impacts of site-specific management activities by the national forest. The NFMA allows for habitat management specifically to benefit cerulean warblers on national forests within the species' historical range.

The Surface Mining Control and Reclamation Act (SMCRA; 25 U.S.C. 1201) addresses the necessary approvals for surface mining operations, as well as inspection and enforcement of mine sites until reclamation responsibilities are completed and all performance bonds are released. This law, which regulates the recovery of coal by

mountaintop removal mining (commonly referred to as mountaintop mining), is administered by the U.S. Department of the Interior's Office of Surface Mining (OSM). SMCRA permits for mountaintop removal mining may be issued by the OSM or by individual States only if it has been shown that the proposed mining activities will satisfy general performance standards applicable to all surface coal mining operations. In the Appalachian States where mountaintop mining occurs, the SMCRA regulatory program has been delegated by the Federal Government to State agencies, except in Tennessee (Copeland 2005, p. 2). Among the general performance standards, SMCRA addresses disturbances at the mine-site and in associated offsite areas and approximate original contour (AOC) requirements, as well as the quality and quantity of water in surface and ground water systems both during and after surface coal mining operations (Copeland 2005, p. 2).

Before commencing mountaintop removal mining, a coal company must post a bond to pay for the reclamation of the site. To get this bond released, the company must reclaim the site to meet the standards set by the State responsible for implementing SMCRA. Reclamation at mountaintop mine sites has focused on erosion prevention and backfill stability and not on reclamation with trees. The compacted backfill material that is normally used for reclamation hinders tree establishment and growth. Furthermore, reclaimed soils are more conducive for growing grasses, which outcompeted tree seedlings; grasses are often planted as a fast-growing vegetative cover to reduce erosion. As a result, natural succession by trees and woody plants on reclaimed mined land (with intended post-mining land uses other than forest) is slowed (Environmental Protection Agency 2005, p. 4; Handel et al. 2003, p. 12).

Section 404 of the Clean Water Act (33 U.S.C. 1251 *et seq.*) is another principal environmental law involved in the regulation of mountaintop mining. The section 404 permit program, which regulates the discharge of dredge and fill material into waters of the United States, applies to the disposal of excess overburden associated with mountaintop mining. These permits are issued by the U.S. Army Corps of Engineers with oversight by the U.S. Environmental Protection Agency. In the past, the Corps of Engineers has generally permitted the disposal of mountaintop mining fill under Nationwide Permit 21 (NWP 21). This overburden has frequently been deposited in adjacent stream valleys in

a process known as valley fill. This nationwide permit authorizes discharges from surface coal mining activities that result in no more than minimal impacts (site-specifically and cumulatively) to the aquatic environment.

Cerulean warblers and their habitat are impacted by mountaintop mining both by the clearing of forests to remove the coal and by the associated disposal of mine overburden in adjacent valleys. In addition, the practice of establishing non-forested habitats, especially grasses, on reclaimed mine lands that were previously forested has further prevented the restoration of cerulean warbler habitat at these sites. The conservation of the cerulean warbler could be improved by additional focus by the regulatory programs under SMCRA and section 404 of the CWA on the additional protection and improved reclamation of the species' habitat.

The U.S. Department of the Interior (National Park Service and Fish and Wildlife Service) manages lands containing cerulean warblers. The National Park Service Organic Act (39 Stat. 535; 16 U.S.C. 1, 2, 3, and 4), states that the NPS will administer areas under their jurisdiction “\* \* \* by such means and measures as conform to the fundamental purpose of said parks, monuments, and reservations, which purpose is to conserve the scenery and the natural and historical objects and the wildlife therein and to provide for enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations.” Several National Parks are known to contain cerulean warbler populations and habitat.

The National Wildlife Refuge System Administration Act (NWRSA; 16 U.S.C. 668d–668e) provides guidelines and directives for administration and management of all areas in the National Wildlife Refuge System. National Wildlife Refuges (NWR) are managed for species conservation, consistent with the direction of the NWRSA, as amended, and related Service policies and guidance.

The Sikes Act (16 U.S.C. 670a–670o; 74 Stat 1052) authorizes the Secretary of Defense to develop cooperative plans for conservation and rehabilitation programs on military reservations and to establish outdoor recreation facilities. Under the authority of the Sikes Act, military installations prepare Integrated Natural Resources Management Plans (INRMP) that address how fish and wildlife resources will be managed. These plans reflect the mutual agreement of the military facility, the Service, and the appropriate State fish

and wildlife agency on the conservation, protection and management of fish and wildlife resources.

Executive Order 13186 (entitled Responsibilities of Federal Agencies to Protect Migratory Birds), signed by President Clinton on January 10, 2001, addresses the commitment by all Federal departments and agencies to conserve migratory birds in the United States. Executive Order 13186 directs Federal agencies that implement actions having a measurable negative effect on migratory bird populations to develop and implement a Memorandum of Understanding with the Service that will promote migratory bird conservation. The Executive Order identifies 15 conservation measures that each Federal agency is encouraged to implement. These measures involve a range of actions to be implemented by Federal agencies, including: (1) Integrating migratory bird conservation into agency plans, programs, and actions, including environmental analyses under NEPA; (2) adopting principles and practices in the design of agency actions that avoid or minimize adverse impacts on migratory birds; (3) incorporate comprehensive migratory bird programs, such as Partners-in-Flight, North American Waterfowl Management Plan, and North American Bird Conservation Initiative into agency management plans and guidance; (4) restore and enhance migratory bird habitat; (5) develop partnerships with non-Federal entities to further bird conservation; and (6) promote research and information exchange related to migratory birds, including coordinated inventorying and monitoring on agency lands. The first two Memorandum of Understandings under EO 13186, with the Department of Defense and Department of Energy, were signed on July 12, 2006.

#### (2) Canadian Federal and Provincial Laws and Regulations

All migratory birds (including cerulean warblers), nests, eggs, and their parts in Canada are protected by the Migratory Bird Conservation Action of 1994, as amended. This law is similar to the Migratory Bird Treaty Act in that it prohibits the taking, possession, transportation, and sale of migratory birds and establishes penalties for violations, but it provides no direct protections for migratory bird habitats. This Canadian law implements the 1916 Convention between the United States and Great Britain (for Canada) for the protection of migratory birds.

In Canada and the two Provinces where the species occurs (Ontario and Quebec), the cerulean warbler is a

Species of Special Concern under schedule 1 of the Species at Risk Act (Canada Gazette, Part III, Chapter 29, Vol. 25, No. 3 2002). Passed in 2002, the Species at Risk Act (SARA) is similar to the Endangered Species Act. Under SARA, a Species of Special Concern is a “wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats” (section 2, Species at Risk Act, 2002). Only those species listed as endangered, threatened, or extirpated are protected by the prohibitions of SARA. The prohibitions and other regulatory provisions of SARA do not apply to Species of Special Concern; however, SARA does require the preparation of management plans for Species of Special Concern, including measures for the conservation of the species and its habitat (SARA, sections 65–72). The objective of implementing these management plans is to prevent Species of Special Concern from becoming a threatened or endangered species.

#### (3) State Laws

All of the 33 States within range of the cerulean warbler have provisions in their Wildlife Codes that protect non-game migratory birds, including the cerulean warbler. These State laws generally prohibit the killing, capture, possession, and sale of migratory birds without proper authorization from the State wildlife agency. Delaware and Rhode Island list the cerulean warbler as a State Endangered Species and the species is listed as a State Threatened Species in Illinois and Wisconsin. The designation as Endangered or Threatened by these States provides additional protection, prohibitions, and conservation emphasis in accordance with their respective State Wildlife Codes. Tennessee has designated the cerulean warbler as a Species in Need of Management, which provides some additional protection and conservation emphasis. Eleven States have placed the cerulean warbler in a category of Species of Special Concern, Species of Special Interest, or Rare. In most of these States, these categories do not provide the cerulean warbler additional protection or prohibitions beyond what is in their general Wildlife Codes. The protections provided the cerulean warbler by the State wildlife laws generally do not include regulatory provisions to protect its habitat.

#### Summary of Factor D

We believe those existing laws, regulations, and Executive Orders that involve the management of Federal forest and wildlife resources (MUSY,

NFMA, National Wildlife Refuge System Administration Act, National Park Service Organic Act, Sikes Act, and Executive Order 13186) are not inadequate mechanisms to conserve the cerulean warbler and its habitat on these specific Federal lands. These laws provide the flexibility and framework to maintain or adjust habitat management objectives that benefit the cerulean warbler. Although these laws and regulations contain sufficient provisions for the conservation of the cerulean warbler, there are limitations in the ability of agencies to implement them in a manner most beneficial to the species they are intended to benefit or protect (for example, cerulean warblers). For instance, limited agency budgets, conflicting policies, lack of public support, and other factors can deter achieving the full management flexibility and benefits.

As discussed above, we believe that certain existing laws pertaining to the management of specific Federal lands in the United States are not inadequate regulatory mechanisms to conserve the cerulean warbler and its habitat. We also believe that some existing regulatory mechanisms are inadequate in protecting the cerulean warbler and its habitat. An example of this is the continued loss, without adequate reclamation, of cerulean warbler breeding habitat from mountain top mining, despite the application of the Surface Mining Control and Reclamation Act and section 404 of the Clean Water Act to these actions. Besides the regulation of mountain top mining under SMCRA and section 404 of the Clean Water Act, we are not aware of any Federal or State regulatory mechanisms that provide for the conservation of cerulean warbler habitat on the extensive private forest lands within the species' breeding range. Furthermore, we are not aware of any laws that protect the cerulean warbler or its habitat in its non-breeding (winter) range in South America.

#### *E. Other Natural or Manmade Factors Affecting Its Continued Existence*

We identified several other potential threats, but available information is insufficient to determine that these factors have contributed to or will likely cause a population level decline in cerulean warblers. These factors are:

#### **Mortality From Collisions With Structures**

The collision of birds with structures during migration has been well documented, especially since this issue began receiving major emphasis in the 1970s (Manville in press, p. 2).

Structures that pose a collision hazard to birds include buildings, communication towers (cell, radio, and television), wind power turbines, smoke stacks, and power lines. There is no confirmed, validated number or accurate estimate of the total number of birds killed by these structures, but estimates range from four to five millions of birds up to 40 million (Shire et al. 2000, p. 3; Manville in press, p. 3). Few studies have been carried out to document cerulean warbler mortalities from tall structures. The analysis by Shire et al. (2000, p. 9) of 149 reports of tower-caused mortalities identified 164 cerulean warblers killed at 5 sites. At this time, there have been insufficient studies conducted for the Service to be able to evaluate the threat of tall structures to cerulean warblers.

#### **Localized Areas of Calcium Depletion Because of Acid Rain**

Atmospheric acid deposition (acid rain) has been linked with reduced abundance of some songbird species (Hames et al. 2002, pp. 11238–11239; Hames et al. 2006). Under some conditions, calcium, which is needed for egg production, is leached from basic soils. Researchers have not studied the potential effect of this phenomenon on cerulean warblers.

#### **Reduction in Prey Availability Because of Climate Change**

Evidence from Europe indicates that climate change may advance the phenology of insect populations in temperate regions, and the peak in insect prey abundance may therefore occur before long-distance migratory birds arrive from the tropics, and prior to their need for abundant food for their young (Both et al. 2006, pp. 81–82; and Both and Visser 2001, pp. 296–298). We know of no information that indicates this is currently a problem for cerulean warblers.

#### **Small Population Phenomena**

We found no evidence that genetic isolation (Veit et al. 2005) or other phenomena associated with small populations are affecting cerulean warblers.

#### **Extinction Risk Analysis**

Since our knowledge of the factors that may lead to extinction is incomplete, and because extinction is inherently a probabilistic event (it may or may not happen at any specified time due to random events), extinction risk is best described by a likelihood or probability. The most direct method available to estimate extinction likelihood for cerulean warblers is to

calculate forward from the current total abundance using the average annual trend in abundance. The best available estimate for current global population size of cerulean warblers is based on the Partners in Flight estimate of 560,000 birds in 1995 (Rich et al. 2004, Appendix A—pp. 69–77), decreased by 11 years of declines that average 3.2 percent annually, resulting in an estimate of about 390,000 birds in 2006. Although the Partners in Flight estimate was imprecise (plus or minus 50 percent of the estimate) and may also be biased, most likely underestimating abundance (see Population Size Estimate Based on the Partners in Flight Method above), it is the best available data at the time of this finding. Expressed as a more general figure that reflects the substantial uncertainty about actual population size, we conclude that the current population of cerulean warblers may be around a half-million birds, and perhaps much larger. For the extinction risk analysis that follows, however, an estimate of 400,000 birds was used for 2006.

If the average 3.2 percent per year decline continues without variance, a population of 400,000 birds will decrease to approximately 200,000 in 20 years, 80,000 in about 50 years, and 15,000 in 100 years. In reality, population trends vary from year to year so future population change could be greater or less than these median or “deterministic” estimates. Thogmartin (2006, pp. 3–4) applied a statistical method called diffusion approximation (described in Dennis et al. 1991, and Holmes 2001, 2004) to the BBS data to estimate the probability of cerulean warbler population change to different levels over time. This method requires estimates for initial population size, average annual trend, and the year-to-year variance in population counts to project a statistical distribution of potential future population sizes over time—given the key assumption that past year-to-year fluctuations represent the plausible range (a statistical distribution) of annual changes that can happen randomly in the future. Given the available 40-years of BBS abundance indices and assuming the current population size is nearly 400,000 birds, Thogmartin (2006, p. 18) projected an 83 percent chance that the population will decrease to 40,000 birds (90 percent decline) in 100 years. The likelihood of extinction, modeled as a 99.999 percent population reduction or a decline to a few hundred birds, was close to zero in 100 years (Thogmartin 2006, p. 18). To date, there have been no published diffusion approximation models or

other extinction risk analyses for the cerulean warbler. Therefore, the work conducted by Thogmartin (2006) is the best scientific information currently available on this topic.

Thogmartin (2006, p. 19) subsequently evaluated whether the likelihood of population declines was sensitive to the uncertainty about current population size. He found that the estimated probabilities of declines differed for projections using the upper and lower ends of the interval estimated by Partners in Flight extrapolated to 2006, that is, 200,000 or 600,000 birds rather than the median or “best” estimate of 400,000 birds.

Thogmartin (2006, p. 20) also completed calculations for the eastern or Appalachian portion of the species’ range separately from the regions farther west to consider possible regional differences. Initial population in the east (Bird Conservation Regions 13 and 27 to 30) was 345,000 birds (86 percent of total abundance), and in the west (Bird Conservation Regions 22 to 25) it was 55,000 birds (14 percent of total abundance) (relative abundance between regions from Partners in Flight figures; Rich et al. 2004, Appendix A—pp. 69–77). Projected likelihood of a 90 percent decline in 100 years in these two regions was about 70 percent and 90 percent, respectively (Thogmartin 2006, p. 20). The projected risk of decline was actually lower for the Appalachian region alone than for the species rangewide due to relatively less year-to-year variance in counts in this higher density area compared with the estimates that include very small sample size counts in the western parts of the range.

These calculations are helpful in understanding the consequences of a continuation of the historical trend, but they do not address whether underlying population dynamics will differ as time passes. The 100-year time frame in Thogmartin’s (2006) analysis is simply a convention from theoretical modeling (e.g., Dennis et al. 1991, and Holmes 2001, 2004) and does not address the reliability of projecting that far forward based only upon historical data. It is clear that the farther into the future we attempt to predict, the less confident we can be that the historical trend will persist. Future population sizes will vary due to a variety of factors, both random events and progressive changes in causal environmental factors that we cannot foresee at this time. Thus we are more confident that the historical trends will continue over the next few decades, than over longer time frames such as 100 years.

## Determination of Status Under the Endangered Species Act

The Act defines an endangered species as “any species which is in danger of extinction throughout all or a significant portion of its range \* \* \*” (16 U.S.C. 1533 § 3(6)). The Act defines a threatened species as “any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range” (16 U.S.C. 1533 § 3(20)). For each species considered for listing, the Service must review the best available information on the likelihood of extinction over time and determine case-by-case whether the present risk is sufficient to constitute a “danger” of extinction, or whether projected future risk is “likely” to become a danger of extinction under “foreseeable” conditions.

The cerulean warbler has been declining by about 3 percent annually, on average, for the last 40 years, including within the Appalachian core breeding area (see Population Size and Trends). The biological factors most likely to have caused this trend include: (1) Reduction in available nesting sites and suitable breeding territory characteristics because of loss or degradation of nesting habitat; (2) reduction in foraging success resulting from decreased prey abundance, primarily on the wintering ground in South America; (3) increased predation throughout the species’ annual range and nest parasitism of cerulean warblers in the breeding grounds resulting from habitat fragmentation; and (4) increased mortality during migration due to coastal forest habitat loss (see The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range). The Service further concludes that those factors are ongoing and thus will likely continue to cause the species to decline, probably at a similar rate, as in the recent past. The best available projection for future trends is to assume that the persistent rate of decline documented by the BBS over the past 40 years will continue within the estimated credible interval, between 2.0 and 4.2 percent per year.

Since projections derived from the BBS data indicate effectively no chance for this species to become extinct in the next 100 years unless conditions change beyond what we can anticipate (see Extinction Risk Analysis above), we do not believe this species is likely to become endangered within the foreseeable future. In short, a species with a current population of perhaps half a million birds and quite possibly more, declining chronically by 2 to 4



percent annually, is neither in danger of extinction now or likely to become in danger of extinction in the future that we can reasonably foresee. Thus, the Service concludes that the cerulean warbler does not presently qualify for protection as an endangered species or a threatened species under the Act and the petitioned action is not warranted.

### Summary

The cerulean warbler population is decreasing by approximately three percent per year across its breeding range. A combination of habitat losses and structural changes and fragmentation in remaining forest habitats across the species' annual range are most likely the primary causal factors contributing to this decline. The available information on potential causal factors indicates these threats are, for the most part, both already operating and will continue to operate in the foreseeable future. Hence, we anticipate continued, gradual decline of this species. We also conclude, however, that abundance will remain high enough that the species effectively is in no danger of extinction in the near term, and that, if the historical trend continues, tens of thousands of cerulean warblers will remain in 100 years.

The Act defines an endangered species as a species in danger of extinction in all or a significant portion of its range. Given the available information including a population size approaching half a million, perhaps more, cerulean warblers are not currently facing extinction across their range. We do not consider the westernmost parts of the range, where local extirpation could possibly occur in the next few decades, as significant from the perspective of defining the entire species as endangered, because those portions already contain only a small fraction of the total population and their loss would not put the remainder of the range at risk of extinction. Therefore, those westernmost areas are not a significant portion of the species' range.

A threatened species, as defined in the Act, is a species likely to become endangered in the foreseeable future in all or a significant portion of its range. We do not believe that it is likely (more likely to happen than not) that cerulean warblers will decline to a point where they are endangered or facing extinction within the foreseeable future. This is our conclusion, even if conditions were on the worst end of the range for trends and abundance rather than the median or 'best' estimates indicated by 40 years of breeding bird surveys. Again, we do not consider those portions of the range with currently marginal populations

that may become at risk of extinction in less than 100 years as significant to the entire species' projected extinction risk, and thus they are not a significant portion of the range as used in the definition of threatened. Based on the trends recorded in breeding population counts and the assumption that those declines and their causal factors will continue unabated, the likelihood of species extinction, even as far into the future as 100 years, appears close to zero.

### Finding

We have carefully assessed the best scientific and commercial information available regarding the past, present, and future threats faced by the cerulean warbler. We reviewed the petition, available published and unpublished scientific and commercial information, and information submitted to us during the public comment period following our 90-day petition finding. This finding reflects and incorporates information we received during the public comment period and responds to significant issues. We also consulted with recognized experts on the cerulean warbler and its habitat from Federal and State agencies, non-governmental conservation organizations, academia, and the forest industry. On the basis of this review we have determined that the listing of cerulean warbler as threatened or endangered is not warranted under the Endangered Species Act, as amended.

If new impacts to the species arise in the future or if the Service finds that the populations are declining significantly faster than they were found to have done in the past or that threats are of greater magnitude than they are currently, the Service can reexamine the listing status of the cerulean warbler. We will continue to monitor the status of the cerulean warbler and its habitat and will continue to accept additional information and comments from all governmental agencies, the scientific community, industry, or any other interested party concerning this finding.

### Future Conservation

Even though we have determined in this 12-month petition finding that the cerulean warbler does not meet the definition of endangered or threatened, we believe it is essential that existing conservation efforts for the cerulean warbler be pursued and new actions implemented to address the steady decline of the species. Besides the ongoing conservation efforts addressed under Factor A of this finding, there are several important emerging efforts and programs, all involving multiple,

diverse partners. We did not rely on these future conservation actions in our determination that listing the cerulean warbler is not warranted and, therefore, we did not evaluate them under our 2003 Policy for Evaluation of Conservation Efforts When Making Listing Decisions (68 FR 15100; March 28, 2003).

In 2005, the Service's Migratory Bird Program initiated a new strategy to better measure its success in achieving its bird conservation priorities and strategies. The Focal Species Strategy involves campaigns for selected species to provide explicit, strategic, and adaptive sets of conservation actions required to return species to healthy and sustainable levels. The Service's list of Birds of Management Concern is a subset of species protected by the MBTA that pose special management challenges due to a variety of reasons. There are currently 412 species, subspecies, or populations of birds on the Birds of Management Concern list, including the cerulean warbler. Through a comprehensive review of the birds on this list and using a combination of evaluation factors, the Service's Migratory Bird Program identified 139 bird species for the development of Focal Species Strategies. The cerulean warbler is in the first group of birds to have focal species strategies developed in Fiscal Years 2005 and 2006. The cerulean warbler Focal Species Strategy, the first draft of which is scheduled to be completed in September 2006, will utilize management and conservation documents to form an action plan (a species-specific mix of monitoring, research, assessment, habitat and population management, and outreach) necessary to accomplish: (1) Desired status; (2) a summary of the responsibilities for actions within and outside the Migratory Bird Program; (3) a focus of Service resources on implementing those actions; and (4) communications to solicit support and cooperation for partners inside and outside the Service. The engagement of partners and stakeholders is essential for developing and implementing this focal species strategy for the future conservation of the cerulean warbler. The Service's Migratory Bird Program has involved cerulean warbler experts and other partners in identifying the future desired status and priority conservation measures for the focal species strategy. The Cerulean Warbler Focal Species Strategy will provide an important "blueprint" for use by Federal and State agencies, conservation organizations, researchers, corporations, private landowners, groups like the

Cerulean Warbler Technical Group (see below), and other bird conservation programs, such as the Important Bird Areas, in implementing actions for the conservation of the cerulean warbler.

BirdLife International's Important Bird Areas Program (administered by the National Audubon Society in the United States) identifies, monitors, and conserves a global network of Important Bird Areas (IBA) that provide important habitat for birds and focuses conservation efforts at these sites. The IBA Program recognizes that habitat loss and fragmentation are the most serious threats facing populations of birds. By working through partnerships, principally the North American Bird Conservation Initiative, to identify those places that are essential to birds, the National Audubon Society and its many IBA partners hope to minimize the effects of habitat loss on birds. The identification and inventory of IBAs has been a particularly effective way to prioritize conservation efforts. IBAs are key sites for conservation, often able to be conserved in their entirety and often already part of a conservation-area network. There are approximately 112 IBAs in the United States and six in the Canadian Province of Ontario that contain the cerulean warbler. Several of these IBAs contain large cerulean warbler populations and important breeding habitats (for example, Northern Montezuma Wetlands IBA in New York and Southern Cumberland Mountains IBA in Tennessee). Within the cerulean warbler's wintering range, there are 30 IBAs that contain the species (14 in Colombia, 14 in Venezuela, and 2 in Ecuador).

The State Wildlife Grants Program (SWG; administered by the Service's Federal Assistance Program), provides Federal funds to every State and territory for the development and implementation of programs that benefit wildlife and their habitat, including species that are not hunted or fished. A primary focus of the SWG Program is to target funds to States to implement conservation actions for rare or declining wildlife species to prevent these species from becoming endangered in the future. To be eligible for these funds, States and territories were required to submit to the Service by October 1, 2005, a State Wildlife Action Plan (also called a Comprehensive Wildlife Conservation Strategy) that, at a minimum, addressed the following seven items: (1) Information on the distribution and abundance of wildlife species, including low and declining populations, that are indicative of the diversity and health of the State's wildlife; (2) descriptions of

locations and relative condition of key habitats and community types essential to conservation of these species; (3) descriptions of problems which may adversely affect these species; (4) descriptions of conservation actions proposed to conserve these species and habitats and priorities for implementing actions; (5) proposed plans for monitoring these species and their habitats; (6) descriptions of procedures to review the Plan; and (7) plans for coordinating the development, implementation, review, and revision of the Plan. In appropriating funds for the SWG Program, Congress directed the States to place appropriate priority on "those species of greatest conservation need". In defining the species required by number 1 above, most State Wildlife Action Plans contain a list and description of the Species of Greatest Conservation Need (SGCN).

All 33 States within the range of cerulean warbler have completed their State Wildlife Action Plans. These plans have been reviewed and approved by the Service. Of these States, 23 have identified the cerulean warbler as a SGCN. In addition, nine States' Plans have identified priority conservation and management objectives and actions for the cerulean warbler. The actions in these nine Plans include monitoring populations, managing forests to provide high-quality nesting habitat, implementing measures to maintain appropriate habitat patch size and reduce forest fragmentation, and collaborating with others to conserve the species' wintering habitat in South America.

The integrated bird conservation efforts under the North American Bird Conservation Initiative and Partners-In-Flight will benefit the future conservation of the cerulean warbler. Concept Plans and Bird Conservation Plans have been completed or are being developed in Bird Conservation Regions (BCR) and Physiographic Areas that contain cerulean warblers. These plans have specific actions pertaining to the cerulean warbler, especially in the Appalachian Mountains Bird Conservation Region. This BCR, encompassing 42 million ha (105 million ac), contains the core breeding population of cerulean warbler and is essential to the future conservation of the species. A future critical need in this BCR is the establishment of a coordinator to integrate and expand conservation actions for the cerulean warbler and other birds in this region. The Partners-In-Flight program is addressing the decline of the cerulean warbler and its habitat in both its breeding and non-breeding range.

We believe these and other existing and emerging collaborative efforts provide an excellent opportunity to reverse the steady decline of the cerulean warbler and preclude the future need to list. The Service believes it is important to continue strong support for monitoring efforts for this species, especially long-term monitoring programs like the Breeding Bird Survey that provides valuable trend information. Tracking population changes is vital to the future conservation of the cerulean warbler and other neotropical migratory birds. We will provide strong support and develop partnerships around the Service's Cerulean Warbler Focal Species Strategy, which will become an important blueprint for helping to reverse the warbler's population decline through proactive conservation efforts. We will also continue to support and provide assistance to the Cerulean Warbler Technical Group because it has the opportunity to effect positive change for the species through its scientifically driven collaborative efforts. We will support and provide technical assistance in using the other integrated bird conservation programs (Partners-In-Flight, North American Bird Conservation Initiative, and Important Bird Areas) and the State's Wildlife Action Plans to further promote the future conservation of the cerulean warbler.

## References

A complete list of references used in the preparation of this finding is available upon request from Columbia Ecological Services Field Office (see **ADDRESSES**) or can be downloaded from our Web site at [http://www.fws.gov/midwest/eco\\_serv/soc/](http://www.fws.gov/midwest/eco_serv/soc/).

## Author

This finding was written by biologists from the Service's Endangered Species and Migratory Bird Programs in Region 3, 4, and 5 and Washington, DC.

## Authority

The authority for this action is the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*).

Dated: November 28, 2006.

## Kenneth Stansell,

Acting Director, U.S. Fish and Wildlife Service.

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