

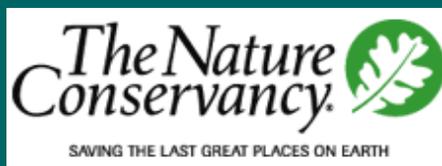
Modeling the South American Range of the Cerulean Warbler

Universidad San Francisco de Quito,
Cumbayá, Ecuador,
1-3 November 2005



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Conference Program and Proceedings





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Paul Hamel, USDA Forest Service
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This conference is a part of the Cerulean Warbler Conservation Initiative, an activity of El Grupo Cerúleo, subcommittee of the Cerulean Warbler Technical Group. It is financed in part by the National Fish and Wildlife Foundation. Other sponsors of the conference are USDA Forest Service Internacional Programs, The Nature Conservancy, National Council for Air and Stream Improvement (NCASI), the American Bird Conservancy, Birdlife International, and Aves & Conservación, Corporación Ornitológica del Ecuador.



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MODELING THE SOUTH AMERICAN RANGE OF THE CERULEAN WARBLER

Conference Agenda

1 November

- 0830 Welcome, Introduction to Ecuador, Quito, USFQ — David Romo for Dean Hugo Valdebenito, USFQ
- 0845 Introduction of Conference objectives & participants — Dave Mehlman, The Nature Conservancy, New Mexico, USA.
- 0900 Biology of Cerulean Warbler and Current ideas on status and Activities of the Cerulean Warbler Technical Group — Paul Hamel, USDA Forest Service, Mississippi, USA and Jason Jones, Department of Biology, Vassar College. USA.
- 0930 Study of non-breeding season occurrence of CERW in South America
- 0930 Behavioral Ecological Studies of the Cerulean Warbler in Venezuela — Paolo Ramoni - Perazzi, Universidad de los Andes, Merida, Venezuela.
- 1000 Habitat Use in Wintering Grounds by Cerulean Warbler (*Dendroica cerulea*) in Agroecosystems and Forested Habitats in Northern Colombia — Gabriel Colorado and Tomás Cuadros, Medellín, Colombia.

1030 Break

- 1100 Approaches to Modeling the distribution of Cerulean Warbler
- 1100 Predictive modeling of species distribution in Colombia using non- Euclidean distance statistics — Dolores Armenteras and Milton Romero, Instituto von Humboldt and Department of Geography, King's College London. Bogotá, Colombia.
- 1130 Ecological Niche Modeling of the Cerulean Warbler Habitat (*Dendroica cerulea*) in the Ecuadorian Andes — Francisco Cuesta, A. Ganzenmuller, K. Beltrán, and F. Baquero. Ecociencia, Quito, Ecuador.

1200 Lunch

- 1330 Empirical Analysis of Breeding Range in relation to Climate — Esra Ozdenerol-Garner and Jennifer Bulmanski. University of Memphis. Tennessee, USA.
- 1400 Status of the Cerulean Warbler (*Dendroica cerulea*) in Bolivia — Sebastian Herzog, A. Bennett Hennessey Aso ciación Armonía, Santa Cruz, Bolivia.
- 1430 Species Distribution Modeling: The Peruvian Yungas Case — Carolina Tovar Universidad Nacional Agraria La Molina. Facultad de Ciencias Lima, Peru.

1500 Break

- 1530 Integrating the Migrant with more precious Resident Species
- 1530 The Cerulean Warbler in the Northern Tropical Andes IBAs: Priority Areas for the Species Conservation in its Non-breeding Range — Ian Davidson, David F. Diaz, Birdlife International, Quito, Ecuador
- 1600 Northern Andes initiative - TNC experience — Silvia Benítez, The Nature Conservancy, Quito, Ecuador
- 1630 Conservation and Research of the Cerulean Warbler (*Dendroica cerulea*) in Colombia — Maria Isabel Moreno, Paul Salaman, Andrea Morales. Fundación ProAves and American Bird Conservancy, Bogotá, Colombia and Virginia, USA.
- 1631 The Northern Andes Ecoregional Program: Conservation Planning and action at different scales — Luis Germán Naranjo and Olga Lucía Hernández. WWF Cali, Colombia.
- 1730 Experience of Cornell Lab of Ornithology with Cerulean Warbler and use of the Internet for recording bird observations — Sara Barker and Ken Rosenberg. Cornell University Lab of Ornithology. New York, USA.
- 1800 Examining migratory connectivity in the Cerulean Warbler using stable isotopes — Kate Girvan. .Norval Outdoor School. Ontario, Canada.
- 1830 Alianza Alas Doradas — Maria Isabel Moreno, Fundación ProAves. Colombia, and Tom Will, US Fish and Wild life Service. USA.

Wrap-up, Questions and Answers- Introduce structure for remainder of workshop



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2 November

AM Fieldtrip

1200 Lunch

1330 Instructions for Small Group Workshops

1400 Concurrent Sessions to run until end of 2 Nov

Separate workshops for 1. Venezuela, 2. Colombia, 3. Ecuador, 4. Peru and Bolivia together, and 5. North America and Migratory Paths together. Address Tasks 1-3.

1500 Break

1530 Concurrent Sessions continue. Address Task 4.

1730 Summary and Questions relating to today's activities

3 November

0830 Review of Progress from 2 Nov, PM
Combined Groups in Plenary Session
Questions and observation of initial maps

0900 Revision of CERW distribution models
Same small group sessions
Address tasks 5 through 8

1000 Break

1030 Continue revision/development of distribution models
Same small group sessions
Address Task 9

1200 Lunch

1330 Continue revision/development of distribution models
Same small group sessions
Address Tasks 10 and 11

1500 Break

1530 Review and Development of Strategy for Cerulean Warbler Winter Survey
Combined Groups in Plenary Session

Task: Use and Limit of Usefulness of this Migratory Bird as vehicle to integrate conservation of rare birds and habitats in its nonbreeding range

1630 Alianza Alas Doradas: An effort on behalf of another migrant – Maria Isabel Moreno, ProAves, Bogota, Colombia

1700 Conference Summary
Combined Groups in Plenary Session
Which objectives did we meet, which ones not?

1730 End

1900 Closing Banquet



Breakout Groups

The charge for these groups is to summarize and model distribution of Cerulean Warbler in the respective country, by addressing the tasks listed below. Each of these groups requires computer with GIS capability

Group	Facilitator	GIS specialist
Colombia	Paul Salaman,	Milton Romero, Olga L.Hernandez
Ecuador	Silvia Benitez	Francisco Cuesta
Peru/Bolivia	Sebastián Herzog	to be determined
Venezuela	Paolo Ramoni-Perazzi	to be determined
North America*	Dave Mehlman	

*The charge here is Conservation Linkages and Passage Migration. This group probably won't need a computer.

Tasks for Small Group Sessions

1. Compile and summarize existing records of CERW electronically
2. Review available GIS coverages for the country
3. Construct a computer model of Cerulean Warbler distribution for the country
 - (a) Begin the process of determining criteria to include in distribution models for the Cerulean Warbler
 - (b) Formulate these criteria into a computer model, including ideas of relative priority of the criteria
4. Produce an initial GIS map based on these criteria to present to the other groups
5. Revise the map into a 2nd draft using criteria developed for neighboring countries
6. Revise the map into a 3rd draft through application of criteria developed for "distant" countries
7. Integrate the models represented by the three maps
 - a. Concordances: Examine areas selected by all models in common
 - b. Discordances: Examine areas of disagreement among the models
8. Overlay these maps with existing maps of known biodiversity, protected areas, and areas needing protection
9. Identify strategies to test these models in the field and to develop a nonbreeding survey of Cerulean Warbler in each country
10. Identify constraints on application of the identified strategy to carry out a non-breeding survey of Cerulean Warbler
11. Write Group Summary



Biology of Cerulean Warbler, Current Ideas on Status, and Activities of the Cerulean Warbler Technical Group

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Cerulean Warbler is a Neotropical Migratory bird, whose breeding distribution is confined to the eastern deciduous forests of the United States and Canada in North America. The birds establish territories, mate, and raise their young during late April through early July, and molt after breeding. During July to October, the entire population of this species migrates to the northern Andes in South America, into Venezuela, Colombia, Ecuador, Peru, and to a small extent into Bolivia, to spend the period from October to March in humid subtropical and lower montane forests. After molting their body plumage in South America in March, the birds return to North America. While the specifics of the distribution must yet be determined, a few generalizations seem to hold. Cerulean Warblers usually occur between 500-1800 msnm; they often though not always associate with canopy flocks of tanagers and other insectivores. The birds use a variety of habitats during their sojourn in South America, including primary and secondary forests, as well as shade coffee and other agroforestry crops like cacao. The species was listed as a vulnerable species by IUCN in 2004 because the breeding population has declined by 3% per year since 1966, due in part to habitat destruction and perhaps other factors. Conservationists are concerned also about effects of deforestation of some of its South American habitats. Sketchy details of its migratory route through the highlands of Central America and across the Gulf of Mexico suggest that numerous perils may affect the birds while they are migrating. The nonbreeding range of this species overlaps with the distributions of a number of rare South American birds. For example, in Colombia, as many as 46% of the species on the red list for the country occur within the range of Cerulean Warbler. Consequently, this bird may be a very good candidate to link efforts of North Americans and South Americans in the conservation of birds.

Some recent work is very useful to development of a predictive model of the distribution of Cerulean Warbler in the northern Andes. We will use recent data during this conference to develop several such models and then formulate a method by which they can be compared and validated using field data gathered in the next and subsequent nonbreeding periods.

Conservation interest in Cerulean Warbler is very high in North America because of identified population declines and perceived threats to breeding populations in the future. Uncertainty about the stability of nonbreeding habitats in South America and the birds' use of them is also great, and understanding of the routes of migration similarly is poor. For these reasons, the Cerulean Warbler Technical Group was formed beginning in 2001. Membership in this ad hoc group is encouraged among those interested in developing a strong technical basis to support conservation and management efforts directed to these birds and to their habitats. In 2005, CWTG was the recipient of a grant from the National Fish and Wildlife Foundation. This grant is a major source of funding for the current workshop.

Key words: Cerulean Warbler, distribution, Grupo Cerúleo, conservation, habitats, predictive model, status.



Behavioral Ecological Studies of the Cerulean Warbler in Venezuela

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Observations made between 1997 and 2003 lead us think about the following questions: (1) Does *Dendroica cerulea* maintains its gregarious and wandering behavior through the non-breeding season?; (2) Are sexes differentially distributed according to the elevation?; and (3) What is importance of *Inga* to the ecology of this species? To address questions (1) and (2) we made field trips to different localities in the Cordillera of Merida; additionally we conducted play-backs and evaluated the presence / absence of *Inga*. To answer question (3) we selected 18 individuals of *Inga vera*, 2 of *Inga edulis* and 1 of *Inga fastuosa* in a coffee growing region of the Altamira de Cáceres-Calderas, Barinas State. Between January and March 2004, we collected monthly a sample of a branch with leaves from each individual. We counted, measured (total length) and identified fauna present in these samples; further we recorded the total number of leaves, age classes (very young – young – mature) and estimated the extent of herbivory. We found that *D. cerulea* is sedentary and solitary in the non-breeding period (October -November), but more mobile and gregarious later (January – March; $\chi^2= 27.55$, $p < 0.001$). We observed that *D. cerulea* visits mainly *Inga* trees except for some individuals that visited *Erythrina poeppigiana* flowers. *Inga* occurred in all the places used by *D. cerulea*. However there is no correspondence because in some localities that were visited during this and other studies, *Inga* was recorded but *D. cerulea* was not. The males of this species were observed across a wider range of elevations than females, but the distributions overlapped with maximum apparently between 800 and 1000 m. The fauna of *Inga* was represented by arthropods (aracnids and insects) and data suggest that this is a scarce source of food during the sample period because few individuals ($n=791$ in three months) very small (20 mm total length, but mainly between 2 and 8 mm) and generally hard bodied (i.e., Coleoptera) or with chemical defenses (i.e., Cimicidae) were collected. These arthropods are randomly distributed on *Inga*, because we did not find a correlation between the number of leaves and the number of arthropods in each sample ($r=0,156$; $p=0,2342$). We concluded that the beginning of the boreal winter corresponds to the rainy season, when a greater abundance of food is expected, a condition which fosters the sedentariness in *D. cerulea*. With the subsequent drought, food availability diminishes and the birds have to move and join flocks to have success finding food. However, only a long term study will give a definitive answer for this. No significant differences exist between elevational gradients among sexes and the presence of *Inga* determines the presence of *D. cerulea*. Nevertheless other, perhaps historical factors, may play a key role in the distribution of these birds.

Key words: *Dendroica cerulea*, arthropods, *Inga*, behavior, ecology, winter, Venezuela.



Habitat Use in Wintering Grounds by Cerulean Warbler (*Dendroica cerulea*) in Agroecosystems and Forested Habitats in Northern Colombia

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We evaluated the habitat use by Cerulean Warbler on its wintering grounds in the three Cordilleras in northern Colombia, based on its occurrence, foraging behavior, sociability and site fidelity since 2003. The earliest date of observation of the species in Northern Colombia was September 3rd, 2004, in Norte de Santander Province, in the Eastern Cordillera; the latest record was on April 3rd, 2005, in Antioquia Province, in the Western Cordillera. Cerulean Warbler showed a definite preference for forested habitats and shaded plantations located at altitudes between 1000 and 2000 m.a.s.l. Our data reinforce the view of the Cerulean Warbler as a canopy and subcanopy dweller, with exclusively insectivorous feeding habits, and no records exploiting another resources. Cerulean Warbler showed site fidelity by returning to a particular wintering location. The species is largely a constituent of mixed-species flocks on its wintering grounds, exhibiting few interactions with other members of the flock. In its typical habitats the Cerulean Warbler is not common but by no means as rare as supposed by its previous literature records. We estimated frequency and abundance of Cerulean Warbler in suitable habitats based on censuses and capture-recapture methods. Finally, we analyzed the gaps of information and future directions in the study and conservation of the Cerulean Warbler on its wintering grounds of the Neotropics.

Key Words: Habitat, Cerulean Warbler, Cordilleras, Colombia, census, forests, agroecosystems.



Predictive Modeling of Species Distribution in Colombia Using non- Euclidean Distance Statistics.

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The Geographic Information Systems Unit (UNISIG) of the “Instituto de Investigaciones Alexander von Humboldt” has been working in gathering, organizing and standardizing the geographic information related to biodiversity in Colombia since 1998. Also has worked in the construction of methodologies to integrate spatial, alpha numeric, statistical and biological elements. Mapping ecosystems, defining conservation priorities, elaborating Red books, designing of stress response indicators, are some of those methodologies. These processes have been strengthened with the development of a methodology that allows systematization and standardization of the georeferencing biological records and leads to the development of applications as the digital Gazetteer of localities. The latter combined with the thematic cartography, and particularly the elaboration of the map of Colombian ecosystems (Etter, 1998), the map of the Colombian Andes (Rodríguez *et al*, 2003) and the map of the Colombian Orinoquia basin (Romero *et al*, 2004), as well as the elaboration of the Red Books of birds, plants and reptiles among others, have made a vital contribution to providing information about the actual status of knowledge of the Colombian biodiversity at the ecosystem and species levels. Along with these and multivariate statistical techniques through a doctoral thesis, a methodology and an algorithm that allows modeling the potential distribution of plant species is constructed, integrating the Geographic Information Systems (GIS) to supply a fast and effective method to characterize the biodiversity. This predictive model for the distribution has represented an important tool for greater understanding factors that determine species distribution and lead to its application in studies of biogeography, ecology, conservation, planning and management of the natural resources in the Institute. This methodology has been a base for a rapid identification of biodiverse areas and is actually being refined by the use of additional taxa that can aid future development of conservation and management strategies for the biodiversity in Colombia. The data used to validate the method come from scientific information deposited in museums, herbaria and universities. Thank to the georeferencing tools, locality information has been standardized and truly improved the databases of collection localities of biological specimens. The methodology represents a step toward achieving effective use of available data in Colombia providing a technique that requires only presence data for the species to model its potential distribution. It will provide an efficient sample and to examine plans to collect new information and identify areas of potentially biological interest for future scientific research. This methodology also identifies and analyzes those factors that control the Colombian biodiversity and directs attention to the role of climatic and biophysical factors as measurable indicators of the species diversity in spatially heterogeneous countries.

Key words: georeferencing, databases, biodiversity, methodology, modeling, distribution, algorithm, Colombia.



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Ecological Niche Modeling of the Cerulean Warbler Habitat (*Dendroica cerulea*) in the Ecuadorian Andes

Cuesta-Camacho, F., A. Ganzenmuller, K. Beltrán, and F. Baquero

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Predictive models of species' distribution use occurrence records and environmental data to produce a model of the species' requirements and a map of its potential distribution. To determine regions of suitable environmental conditions and assess biogeographical questions regarding their ranges, we modeled the potential geographical distributions of the cerulean warbler (Parulidae: *Dendroica cerulea*) in the Ecuadorian Andes. We used the Genetic Algorithm for Rule-Set Prediction (GARP), environmental data from GIS maps and geo-referenced occurrences from The Nature Conservancy database and records gathered by El Grupo Ceruleo of the cerulean warbler to produce the models. We created 100 models for the species, and for each one, we estimated intrinsic and extrinsic measures of omission and commission error. Extrinsic measures were highly correlated for both extrinsic errors of overall performance (chi-square) and commission index ($r = 0.88$; $p = 0.01$). The best models (10 out of 100) were consistently found at low levels of omission and moderate commission values. Because models are based only on presence data (and not all areas are adequately sampled), the commission index reflects not only true commission error but also a component that results from under-sampled areas that the species actually inhabits. The 10 best models were used afterwards to create a composite map of the predicted species distribution. According to our model the cerulean warbler is consistently present along the Eastern side of the Andes, while on the Western slope the model shows a disjunct distribution with two possible areas. The first one is located in the Carchi, Imbabura and Pichincha provinces (NW); whereas, the second one is located in the Azuay province (Macizo del Cajas: SW). The predicted distribution of this boreal winter migrant is congruent with the reported distribution for the country except for the predicted distribution in Azuay province.

Key words: Model, predictive, distribution, Cerulean Warbler, presence, Ecuadorian Andes, Genetic Algorithm.



Empirical Analysis of Breeding Range in relation to Climate.

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The species reaction of the cerulean warbler to climate variables over the summer breeding range of the Eastern United States is modeled at the continental scale for the years 1966 to 2003. Spatial filtering (Rushton and Lolonis ! 1997) is used to identify areas that are demographically significant using the occurrence rates (Schoener 1987) for each year of the study, to determine if and where clustering occurs. The research hypothesis is that cerulean warblers are dependent upon specific climate parameters and the resulting ecosystems. The calculated rates are used for correlation to determine which climate parameters may be more important to the species. The intersection of clusters represents the area where ceruleans are present at a high rate persistently over time, and is used to identify climate characteristics that are favorable. The union of the clusters is used to identify if there are differences in climate conditions preceding the survey when ceruleans are identified at a high rate versus years when they are not detected ! at a high rate. Temperature and moisture conditions as measured by cooling degree days and cumulative precipitation are significantly correlated ($p < 0.001$) at -0.47 and -0.24 respectively. Within the union, areas are more likely to be selected when their conditions more closely match the intersection conditions, and tend to be avoided when warmer and moister conditions occur.

Key words: climate, Cerulean warbler, demography, areas, breeding, range, clusters.



Status of the Cerulean Warbler (*Dendroica cerulea*) in Bolivia

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The drastic decline of the Cerulean Warbler on its North American breeding grounds has raised considerable concern among conservation biologists. In addition to investigating potential causes of the reduction in population size and breeding range in North America, an increasing amount of attention is being focused on the species' wintering distribution and ecology in South America. Bolivia contains the extreme southern end of the Cerulean Warbler's wintering range, and very little is known about the species in this area. In fact, it is almost unknown in life in Bolivia. Specimens were collected in the 19th century at two Andean sites in the Yungas of La Paz Department (Nairapi, 1300 m; Tilotilo, which is of uncertain reliability), and in 1937 at Puerto Salinas in the lowlands of Beni Department close to the Andean foothills. During the past three decades, the species has been observed only twice, by D. Pearson at Tumi Chucua in northern Beni Department, almost 400 km from the Andes, and by J. Tobias in the La Paz Yungas at Tunquini Biological Station (1600 m), Cotapata National Park, in 2005. Given the species' preference for Andean wintering areas further north, the two lowland records presumably represent transients or vagrants. Thus, the relatively dry Yungas of La Paz with mean annual precipitation values around 2000 mm are the most promising area for future Cerulean Warbler surveys. Here, rustic shade coffee plantations may hold the highest potential, given the species' preference for this habitat in Colombia and Venezuela. Nonetheless, it is expected that the Cerulean Warbler is a rare and perhaps irregular visitor in Bolivia, as the same is true for the other five species of nearctic-neotropical migrant wood-warblers (e.g., *Dendroica fusca*, *Wilsonia canadensis*) that have been recorded from the country.

Key words: Cerulean Warbler, distribution, range, South America, Andes, Yungas, Bolivia, shade coffee.



Species Distribution Modeling: The Peruvian Yungas Case

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The Peruvian Yungas or cloud forests ecoregion of the eastern slope of the Eastern Andes of Peru occurs between approximately 800 and 3600 meters. Because of different microclimates and a variable topography this 15 million hectare region supports a high concentration of endemic fauna as well as flora. The “Ecoregional Planning for the Conservation of the Peruvian Yungas” project developed by the Data Center for Conservation (CDC-UNALM) with the support of The Nature Conservancy (TNC), aims to find priority conservation areas based on the ecoregional planning methodology of The Nature Conservancy. The first step consists in choosing both coarse-grained targets -for that purpose terrestrial and aquatic ecosystems were mapped- and fine-grained targets, consisting of distributions of certain species. Ninety-four amphibians, 29 reptiles, 139 birds and 56 mammals, all of them endemic, with restricted distribution, and in one of the risk categories recognized by the IUCN, were selected. To identify important sites of concentration of species, theoretical distribution polygons were constructed for each species, based mainly on elevational gradient, the departments in which the species had been collected, and occurrence sites. Using the Arc View 3.2 program, the species distribution was modeled and resulting maps were submitted to the expert’s validation. The polygons were corrected based on the specialist’s experience, their knowledge of the species, and new occurrences were located. In some cases geographic barriers such as mountain ranges, canyons or large rivers represented a break in the distribution while in others, new localities known by the specialists were added. In a second stage, the study area was divided into continuous 1000 hectares hexagons and the total number of conservation targets per taxa registered in each one, was determined; in this way areas of highest concentration were identified. In the case of birds, three important core areas with about 49 species were found; one in the north around Chachapoyas, in the headwaters of the Huallabamba River; another in the center from the Chontayacu basin to Oxapampa and Villa Rica, and finally other in the south in the headwaters of the Timpía River, northeast of Quillabamba. The south core coincides with the most important core for mammals (including about 17 species). Unlike the birds, the lower elevation areas of the basins were more important for these taxa. The cores described for the center and the south represent the most important areas for the four taxa. A viability analysis for the study area was done; the major threat to the Yungas consists of loss of forest cover, due mainly to agriculture expansion that is directly related to the accessibility of the forested areas. Through a logistic regression analysis the probability for an area to be deforested was found in relation to altitude, slope, distance to the rivers, distance to the roads, and to the settled areas. To obtain a portfolio of priority areas, a spatial optimization tool (SPOT) that utilizes the distribution of coarse (ecological systems) and fine targets (polygons of species distribution) was used. SPOT assigns values to each hexagon, considers viability values, the conservation goal for each target, and an edge factor. In this way, the group of hexagons important to any of the targets, that additionally met certain criteria of viability degree a regular shape, were selected as priority areas because the program favors regular over sinuous shapes.

Key words: ecoregion, priority, areas, endemic, targets, Yungas, cloud forest, Peru.



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The Cerulean Warbler in the Northern Tropical Andes IBAs: Priority Areas for the Species Conservation in its Non-breeding Range.

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The Cerulean Warbler (*Dendroica cerulea*) has been recorded in a total of 53 Important Bird Areas (IBAs) throughout the Tropical Andes (18 in Venezuela, 19 in Colombia, 11 in Ecuador, 4 in Peru and 1 in Bolivia). Nevertheless, reconfirmation of the species occurrence in 12 IBA's is necessary because existing records were made in the vicinity but not within these IBAs (1 in Colombia, 2 in Ecuador and 9 in Peru). The species distribution is restricted to the foothills of the Andes, particularly in eastern Ecuador, Peru and Bolivia. This project presents relevant new records from the north-eastern region of Ecuador and the Tepuis of Venezuela, compared to Ridgely *et al's* (2003) proposed distribution, suggesting a greater need for research in those areas. Peru and Bolivia are the countries with a poorer understanding of the species distribution. Many IBA's lack information about dates of occurrence, habitat use, and data on abundance of the species, which emphasizes the need to focus research efforts on those issues. In this paper IBA's that require priority of action for species conservation are identified, as well as regions where major efforts are required to search for the species and to fill information gaps.

Key words: IBA's, Cerulean Warbler, Tropical Andes, priority, research, Colombia, Venezuela, Peru, Ecuador, Bolivia .



Initiatives in the Northern Andes

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The Nature Conservancy Northern Tropical Andes of South America Conservation Program (NTA) comprises Venezuela, Colombia, Ecuador and the northern portion of Peru, except the Amazonian areas. The program encompasses approximately 145 million terrestrial hectares including the Galapagos Islands and marine regions of the Caribbean Sea and the Pacific Ocean of these countries. This variety of ecosystems, habitats and ecoregions makes this one of the most diverse and ambitious programs in the world. With the help of our partners and allies we are implementing cohesive strategies focused to achieve an effectively global conservation goal for terrestrial, aquatic and marine habitats of the northern Tropical Andes of South America. In this way and working together, our regional efforts contribute to reach global conservation goals. These strategies are the result of a detailed study of threats, opportunities and challenges for the conservation of the region. The strategies include the following themes:

- Support for national and local governments for declaration of new public protected areas and strengthening the systems of protected natural areas in Colombia, Ecuador and Venezuela to achieve effective management.
- Generation and implementation of institutional capacity, legal and political frameworks, and economic models for private land conservation to increase new conservation agreements and secure effective conservation on selected private lands.
- Establishment of alliances with indigenous and ethnic groups, and local communities to promote the effective conservation of communal lands through the implementation of sustainable management of their territories, strengthening their capacity to administer their lands and putting into motion mechanisms and incentives for land management.
- Integration of biodiversity conservation in local and national policies and regulations, and in cycles of transactions of mega projects (emphasizing in petroleum and gas sectors, transportation and agriculture) to minimize negative environmental impacts and maximize contributions toward the conservation of terrestrial and marine sites identified as having high priority or importance.

The Conservation Program (NTA) marked by the latter strategies, develops its conservation work in many important areas for the Cerulean Warbler, among which the following are important to mention:

- Ecoregional evaluation of the Cordillera Real Oriental: identification of priority conservation areas where the Cerulean Warbler was selected as a conservation target.
- Work in the oak forest corridor: an example of an important place to conserve important habitat for this species.

Key words: ecoregion, Northern Tropical Andes, targets, conservation, private, protected areas, alliances.



Conservation and Research of the Cerulean Warbler (*Dendroica cerulea*) in Colombia.

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The ProAves and Conservation International Monitoring and Conservation Program in Colombia, has been continuously monitoring 27 stations located in all the biogeographical regions of Colombia (Chocó, the three Andean Mountain Ranges, the Sierra Nevada of Santa Marta, the Magdalena and the Cauca Valleys, Caribbean and Amazonia) since 2003. Approximately 140,450 net – hours (3027 banded individuals), 1190 point counts and 5863 observation hours (160.355 observed individuals) were done by 55 researchers. The Program has recorded 10.880 individuals of 81 Neotropical migratory species, equivalent to 79% of the migratory species of Colombia, and 3175 of them were banded. Additionally we have compiled migratory bird data with 14034 records. We assume that the most threatened terrestrial migratory bird – *Dendroica cerulea*- occurs in low densities along the subtropical Andes. In fact the Program has identified important non-breeding areas where high densities are registered (1-2 individuals per hectare). The bird specializes on remaining forest patches of the narrow band of subtropical forest located between 1100 – 1800 m in the inter-Andean valleys of the Magdalena and Cauca rivers. Two key areas with exceptional high population density of the Cerulean Warbler have been identified: one in the southwest of Antioquia and other in the Chucuri River basin in Santander. Much of its preferred habitat has been drastically altered by human settlements. Based on the Program data, ProAves and American Bird Conservancy bought 200 hectares of subtropical forest in the Chucuri River basin – one of the last remnants fragments of the original forest in the region on which the Cerulean Warbler depends-. The **Cerulean Warbler – Bird Reserve** represents the first protected area in Latin America designated to protect a Neotropical migratory bird. Despite its limited area, it is an important support for the Cerulean Warbler and other migratory birds in South America. Other additional activities that foster the conservation of the species are: initial steps to introduce the “Café Amigo de la Reinita Cerúlea” into the international market place; the creation of the football team **Deportivo Cerúlea**, as an initiative of the peasants and coffee producers of southwestern Antioquia; usufruct agreements of coffee shade farms in key places for the Cerulean Warbler, and print wide distributed posters about migratory birds, and the Migratory Bird Festival. The evaluation and monitoring of the distribution range of the Cerulean Warbler, a recently approved project financed by a grant from El Grupo Cerúleo, will be the starting point for future conservation actions for the species in Colombia.

Key words: *Dendroica cerulea*, threatened migratory birds , conservation, research, distribution, Colombia.



The Northern Andes Ecoregional Program: Conservation Planning and Action at Different Scales

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WWF and a number of governmental and non-governmental conservation organizations from Venezuela, Colombia, Ecuador and Perú, developed in 2000 a biodiversity vision for the Northern Andes. According to this vision, by 2025, every ecosystem type of the Northern Andes will be represented in the protected areas of these countries, and will be connected to other large tracts of natural vegetation through landscapes where human activities are compatible with conservation goals, ensuring the long term maintenance of ecological and evolutionary processes, and the well being of Andean people. To meet these ambitious expectations, the Northern Andes Ecoregional Program identified a portfolio of 65 priority areas based on geographic and ecological analyses in which more than 600 landscape units were examined at a scale of 1:1,500,000, using information on vegetation cover, climate, accessibility, distribution of select taxa, and accessibility, among other variables. The Action Plan for these conservation landscapes seeks to reconcile conservation planning at the ecoregion level (planning from the outside) with the local expectations of different stakeholders (planning from the inside). This approach is highly participatory and is based to a large extent on capacity building for conservation and sustainable development of a wide range of stakeholders. During the last three years, this line of action has included information on migratory birds for the design of management plans of private reserves in the three mountain ranges of Colombia, collected by reserve owners and youth groups (the *Heirs to the Planet*) specifically trained to monitor migratory birds. This initiative has resulted in the establishment of six monitoring stations, and more than 100 people trained, most of them in the Coffee Growing region. The project is in its third year of implementation and is already yielding valuable information, including the presence of the Cerulean Warbler in four reserves.

Key words: Conservation, ecoregional, Northern Andes, portfolio, migratory, private reserves, scale.



Experience of Cornell Lab of Ornithology with Cerulean Warbler and Use of the Internet for Recording Bird Observations

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The Cerulean Warbler Atlas Project (CEWAP), developed by the Cornell Lab, was conducted from 1997-2000 culminating in a final report with detailed accounts for each state within the breeding grounds. A cerulean atlas will be completed shortly with updated and additional data. Project objectives included identifying breeding populations, determining the conservation status of critical sites and the range of suitable habitats, and ultimately targeting key sites for acquisition and management. The approach was to develop the project kit and protocols, including a CD for playback in the field and customized data forms with specific habitat variables, as well as identifying key contacts to act as state coordinators, recruiting volunteer birders, professional biologists, and paid field assistants, and housing and analyzing project data. A detailed protocol with tape playback was initiated to increase detection rate and standardize effort. Over 3,000 sites were surveyed across the entire breeding range of the cerulean. Data was looked at on a broad (regional) and fine (state) scale. Critical populations were outlined as polygons in each state leading to population estimates and contributing to modeling efforts. The number of overall sites by habitat type (also broken out by region), some showing a bimodal distribution, and the number of sites by forest tract size in the southeast U.S. versus the northeast U.S., showing geographic variation and differences in area sensitivity, are examples of resulting summaries. The major finding was the identification of critical cerulean sites throughout the breeding range. We'd anticipate a set of these types of results from the wintering grounds to be a key conservation product. The species atlas approach was a success, generating knowledge of habitat distribution and enabling us to target sites of high conservation concern for future study. Limitations included a non-random sampling approach, although this approach proved effective with a low density species. We suggest adding an additional sampling design in the core of the range, such as a habitat sampling protocol, to determine the abundance of birds across habitat types. The next steps, setting up a longer term monitoring program and targets for conservation action, have been initiated via the Cerulean Warbler Atlas Project for Private Lands as part of a grant through the National Fish and Wildlife Foundation (NFWF). This involves targeted monitoring on industry land, addressing gaps in the core of the cerulean's range. In 2003/2004 surveys were conducted at over 400 sites. The effort tripled in 2005, focusing on Tennessee, West Virginia, and Kentucky in the core of the range. How might we apply a CEWAP like approach to the wintering grounds? eBird, both a project that captures observational data as well as a set of tools and applications using the same Internet based approach, can be developed for Latin American countries and birds on their wintering grounds. By creating tools to collect observational data over the web we have the building blocks for a set of applications and projects all linked conceptually to one database, making it easy for everyone to contribute bird observations. One of most innovative features of the application is the ability to locate an exact site using various map coverages, fixing that point on the screen, and automatically generating a georeferenced point in the database. The parameters and filters are defined by the project manager. The data can be used to manage personal birding lists or lists from frequently birded locations. Through the data visualization application users can make maps, view graphs, and summarize observations, customizing ebird tools to meet data out needs. Tracking the changing abundance of Ceruleans as they migrate through key regions is possible. From Great Backyard Bird Count, a simplified version of eBird conducted in February throughout the US, over a three day period snapshots of bird distribution are created that may be more accurate than maps seen in field guides via eBird maps that are generated in real time. There's tremendous potential for tracking distribution and abundance using these widespread methods. A Spanish version of eBird, *AverAves*, has been created in collaboration with the Mexican government and North American Bird Conservation Initiative (NABCI) and is being explored elsewhere in Central and South America. Cornell met with Bird Life and British Trust for Ornithology (BTO) last month to explore collaborations using eBird throughout the western hemisphere.



*Modeling the South American Range of the Cerulean Warbler
Cumbayá, Ecuador, 1-3 November 2005*

A new painted bunting (*Passerina ciris*: Emberizidae) initiative could expand eBird into an atlas application to collect habitat data targeting specific species protocols. We envision the eBird application being helpful for any country and is the tool needed to expand a CEWAP type project to the wintering grounds.

Key Words: Atlas, Cerulean Warbler, records, AverAves, eBird, internet, Cornell Lab of Ornithology.



*Modeling the South American Range of the Cerulean Warbler
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Examining Migratory Connectivity in the Cerulean Warbler Using Stable Isotopes

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As part of a master's thesis, migratory connectivity (the linking of breeding and wintering regions) was examined in Cerulean Warblers using stable isotopic analysis. During feather molt, the isotopic values of local food sources are incorporated into feather keratin, thus analysis of stable isotopes in feathers can be used to infer geographic origins and habitat associations at the time of molt. Feather samples were collected from 106 Cerulean Warblers from five populations throughout the breeding range, including Tennessee, West Virginia, Pennsylvania, Illinois, and Ontario. Migratory connectivity was examined through the analysis of δD isotope values in crown feathers. The results suggest Cerulean Warblers show mixed migratory connectivity, with southern breeding populations over-wintering in more southern regions of South America, and central/northern breeding populations over-wintering in northern regions of South America. Based on these findings, conservation efforts should be focused on the wintering grounds, particularly in the northern regions of South America.

Key words: Migratory connectivity, Cerulean Warbler, isotopes, South America, , non-breeding, molt.



Alianza Alas Doradas

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The Alianza Alas Doradas (AAD) has been designed by the members of the Non-breeding Season Research, Monitoring, and Conservation Committee as a working group of the larger Golden-winged Warbler Working Group met in Siren, Wisconsin, in August 2005. The objective of the AAD is to protect the Golden-Winged Warbler (GWWA - *Vermivora chrysoptera*: Parulidae), its habitats and associated species by implementing recommendations dealing with long term protection and non-breeding habitats. The Golden-winged Warbler is catalogued as a special concern species for conservation because its breeding population has experienced a reduction of more than 50% during the last 35 years. Causes include climatic change, habitat loss in breeding and non-breeding grounds, mortality during migration, and hybridization with the Blue-winged Warbler (*Vermivora pinus*). The Alianza Alas Doradas will test the hypothesis that population size of this species can be limited by conditions during migration and non-breeding residence in the Tropics, and will strengthen research and conservation initiatives that benefit this and other species with which it shares habitat in South and Central America. It is believed the species spend non-breeding period from Costa Rica through northern South America, specially in highlands and oak forests in Colombia, and that northern Central America is used only as a stop-over; however, this information must be verified, because late winter records exist of Pine-Oak forests in countries like Nicaragua and Guatemala. It is believed that lowland records come from transient birds and highland records from non-breeding birds. This broad partnership representing organizations and individuals, will foster a sustainable, effective and efficient long-term Plan to conserve GWWA, focused on:

- Develop a proposal for funding and improving the species distribution analysis and coordinate among countries initiative.
- Research and analyze the Golden-winged Warbler distribution in its non-breeding grounds.
- Coordinate research programs for evaluating quality and extent of habitat and identify migratory bottlenecks that may be affecting populations.
- Develop a conservation plan and determine where the important bird areas for the species are in each country, including information concerning other migrants, endangered species and habitat quality.
- Purchase land and/or promote incentives for the effective habitat and forest protection and promote conservation and sustainable management of the species.
- Assess land use changes in South and Central America and infer effects on migratory and resident birds
- Strengthen alliances among initiatives in breeding and non-breeding grounds (eg. Promote and support the Adopt a MoSI program)

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Key words: Golden-Winged Warbler, *Vermivora chrysoptera*, distribution, conservation, oak, Alianza Alas Doradas, Colombia, Nicaragua, Guatemala.



Cerulean Warbler Technical Group and El Grupo Cerúleo

Paul B. Hamel

Cerulean Warbler Technical Group (CWTG) is an ad hoc organization of biologists, land managers, conservationists, and scientists interested in Cerulean Warbler conservation. Participants include representatives of the forest products and other industry, federal and state agencies, non-governmental organizations, and academia, from Bolivia, Canada, Colombia, Ecuador, Peru, United States, and Venezuela. Membership in this group is open to anyone interested in pursuing a broad-based, proactive, and technically sound approach to conservation of this species. The CWTG is modeled after other efforts that have brought together individuals with diverse and sometimes conflicting goals in a common atmosphere to develop a sound technical basis for conservation action. It seeks to identify meaningful conservation solutions through sound science, clear communication, and trust. The primary aim of the CWTG is to develop a proactive, broad-based, and cohesive strategy for Cerulean Warbler conservation. Achieving this aim involves activities of a Coordinating Committee and several working groups, focused on research, surveys, monitoring, and conservation on both the breeding grounds and the non-breeding grounds. The Breeding Season Research Group developed a sound, replicated research design and common protocol to assess Cerulean Warbler responses to forest management activities. Priorities for the Breeding Season Surveys & Monitoring Group are to more completely map Cerulean Warbler distribution, to improve estimates of population size and trend, and to integrate monitoring with predictive modeling efforts. The Breeding Season Conservation Group is developing goals for long-term sustainability of Cerulean Warblers through integrated ecosystem conservation, involving establishment of an Appalachian bird conservation partnership, and developing recommendations for management on public and private forestlands. The Non-Breeding Season Group, El Grupo Cerúleo, promotes a multi-species approach to habitat conservation on the non-breeding grounds, which includes other at-risk species that co-occur with Cerulean Warblers. Other goals of El Grupo are (1) to develop a network of observers and a database of documented observations of Cerulean Warblers to better define their non-breeding range, (2) to assess threats and conservation coverage, (3) to encourage and support field research on Cerulean Warbler non-breeding ecology and response to land-use changes, and (4) to communicate awareness of non-breeding ground and migratory bird issues thereby promoting linkages between countries.

The CWTG has been dynamic, strong, and effective, and has already made significant achievements, promising much for the conservation of Cerulean Warblers, and forest songbirds in general. In 2004, CWTG received a substantial grant from the National Fish and Wildlife Foundation to support activities of each working group. A portion of this funding is supporting a conference in Quito, Ecuador, 1 - 3 November 2005, to address the highest priority activity identified by El Grupo Cerúleo; developing a testable GIS model of distribution and habitat of the species on its South American non-breeding grounds. These funds, combined with funds from USDA Forest Service, The Nature Conservancy, and Optics for the Tropics, will also support Cerulean Warbler research and surveys in the Northern Andes during November 2005 - March 2006.

Cochairpersons of the Cerulean Warbler Technical Group are **Deanna Dawson**, USGS Patuxent Wildlife Research Center, 11410 American Holly Drive, Laurel, MD 20708-4015, USA, email: deanna_dawson@usgs.gov; and **Patrick D. Keyser**, MeadWestvaco Corp., Forestry Division, Appalachian Region, 200 7th St., P.O. Box 577, Rupert, WV 25984, USA, email: pdk2@meadwestvaco.com. Interim chairperson of El Grupo Cerúleo is **Paul B. Hamel**, USDA Forest Service, P. O. Box 227, 432 Stoneville Rd., Stoneville, MS 38776 USA, email: phamel@fs.fed.us.