DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

[Docket No. FWS–R9–IA–2009–12; 4500030115]

RIN 1018–AV75

Endangered and Threatened Wildlife and Plants; Listing Five Foreign Bird Species in Colombia and Ecuador, South America, as Endangered Throughout Their Range

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Final rule.

SUMMARY: We, the U.S. Fish and Wildlife Service (Service), hereby list four Colombian species, the blue-billed curassow (*Crax alberti*), brown-banded antpitta (*Grallaria milleri*), Cauca guan (*Penelope perspicax*), and gorgeted wood-quail (*Odontophorus strophium*), and one Ecuadorian species, the Esmeraldas woodstar (*Chaetocercus berlepschi*), as endangered under the Endangered Species Act of 1973 (Act) (16 U.S.C. 1531 *et seq.*), as amended. This final rule implements the Federal protections provided by the Act for these species.

DATES: This rule becomes effective November 29, 2013.

ADDRESSES: This final rule is available on the Internet at *http://www.regulations.gov* and comments and materials received, as well as supporting documentation used in the preparation of this rule, will be available for public inspection, by appointment, during normal business hours at: U.S. Fish and Wildlife Service, 4401 N. Fairfax Drive, Suite 400, Arlington, VA 22203.

FOR FURTHER INFORMATION CONTACT: Janine Van Norman, Chief, Branch of Foreign Species, Endangered Species Program, U.S. Fish and Wildlife Service, 4401 N. Fairfax Drive, Room 420, Arlington, VA 22203; telephone 703–358–2171; facsimile 703–358–1735. If you use a telecommunications device for the deaf (TDD), you may call the Federal Information Relay Service (FIRS) at 800–877–8339.

SUPPLEMENTARY INFORMATION:

Executive Summary

I. Purpose of the Regulatory Action

Under the Endangered Species Act (Act), a species may warrant protection through listing if it is an endangered or threatened species throughout all or a significant portion of its range. Under the Act, if a species is determined to be endangered or threatened we are required to publish in the **Federal Register** a proposed rule to list the species and, within 1 year of publication of the proposed rule, a final rule to add the species to the Lists of Endangered and Threatened Wildlife and Plants. On July 7, 2009, we published a proposed rule in which we determined that the blue-billed curassow, brown-banded antpitta, Cauca guan, gorgeted wood-quail, and Esmeraldas woodstar currently face numerous threats and warrant listing under the Act as endangered species (74 FR 32308). Therefore, we proposed listing all five species as endangered. This final rule constitutes our final determination for these species as required by the Act.

II. Major Provision of the Regulatory Action

Under the Endangered Species Act, we are required to determine whether a species is endangered or threatened because of any of the following factors: (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. We have determined that the blue-billed curassow, Cauca guan, and gorgeted wood-quail are facing threats due to all of these five factors, and the brown-banded antpitta and Esmeraldas woodstar are facing threats due to four of these five factors (factors A, C, D, and E).

In this final rule, we utilize public comments and peer review to inform our final determination, as required under the Act. When we published the proposed rule on July 7, 2009, we opened a 60-day comment period on the proposed listing for these five species. On November 10, 2009, we reopened the comment period for an additional 60 days (74 FR 57987). During the comment periods, we sought comments from independent specialists (peer reviewers) on the specific assumptions and conclusions in our listing proposal to ensure that the designation of these species as endangered is based on scientifically sound data, assumptions, and analyses. In addition, we sought comments from interested parties and the general public. We considered all comments and information received during the comment periods. In this final rule, we present and respond to peer reviewer and public comments. This rule finalizes the protection proposed for these five foreign bird species as endangered, following careful consideration of all comments we received during the public comment periods.

III. Costs and Benefits

We have not analyzed the costs or benefits of this rulemaking action because the Act precludes consideration of such impacts on listing and delisting determinations. Instead, listing and delisting decisions are based solely on the best scientific and commercial information available regarding the status of the subject species.

Previous Federal Action

On November 24, 1980, the Service received a petition (1980 petition) from Dr. Warren B. King, Chairman of the International Council for Bird Preservation (ICBP), to add 60 foreign bird species to the List of Endangered and Threatened Wildlife (50 CFR 17.11(h)), including two species from Colombia (the Cauca guan and the gorgeted wood-quail). In response to the 1980 petition, we published a positive 90-day finding on May 12, 1981 (46 FR 26464), to initiate a status review for 58 foreign species, noting that two of the species identified in the petition were already listed under the Act. On January 20, 1984 (49 FR 2485), we published a 12-month finding within an annual review on pending petitions and description of progress on all species petition findings addressed therein. In that notice, we found that all 58 foreign bird species from the 1980 petition were warranted but precluded by higher-priority listing actions. On May 10, 1985, we published the first annual notice (50 FR 19761), in which we continued to find that listing all 58 foreign bird species from the 1980 petition was warranted but precluded. In our next annual notice, published on January 9, 1986 (51 FR 996), we found that listing 54 species from the 1980 petition, including the two Colombian species mentioned above, continued to be warranted but precluded, whereas new information caused us to find that listing four other species in the 1980 petition was no longer warranted. We published additional annual notices on the remaining 54 species included in the 1980 petition on July 7, 1988 (53 FR 25511); December 29, 1988 (53 FR 52746); and November 21, 1991 (56 FR 58664), in which we indicated that the Cauca guan and the gorgeted wood-quail, along with the remaining species in the 1980 petition, continued to be warranted but precluded.

On May 6, 1991, we received a petition (1991 petition) from Alison

Stattersfield, of ICBP, to add 53 species of foreign birds to the List of Endangered and Threatened Wildlife, including the blue-billed curassow and the brown-banded antpitta, from Colombia, and Esmeraldas woodstar, from Ecuador. In response to the 1991 petition, we published a positive 90-day finding on December 16, 1991 (56 FR 65207), for all 53 species and announced the initiation of a status review. On March 28, 1994 (59 FR 14496), we published a 12-month finding on the 1991 petition, along with a proposed rule to list 30 African birds under the Act (15 each from the 1980 petition and 1991 petition). In that document, we announced our finding that listing the remaining 38 species from the 1991 petition, including the blue-billed curassow and the brown-banded antpitta, from Colombia, and Esmeraldas woodstar, from Ecuador, was warranted but precluded by higher-priority listing actions. On January 12, 1995 (60 FR 2899), we reiterated the warranted-but-precluded status of the remaining species from the 1991 petition. We made subsequent warranted but precluded findings for all outstanding foreign species from the 1980 and 1991 petitions, including all five of the Colombian and Ecuadorian bird species that are the subject of this final rule, as published in our annual notices of review (ANOR) on May 21, 2004 (69 FR 29354), and April 23, 2007 (72 FR 20184).

Per the Service's listing priority guidelines (September 21, 1983; 48 FR 43098), we identified the listing priority numbers (LPNs) (ranging from 1 to 12) for all outstanding foreign species in our 2007 ANOR (72 FR 20184), published on April 23, 2007. In that notice, the five species included in this final rule were designated with an LPN of 2, and it was determined that their listing continued to be warranted but precluded because of other listing activity. A listing priority of 2 indicates that the subject species face imminent threats of high magnitude. With the exception of LPN 1, which addresses monotypic genera that face imminent threats of high magnitude, category 2 represents the Service's highest priority.

On July 29, 2008 (73 FR 44062), we published in the **Federal Register** a notice announcing our annual petition findings for foreign species (2008 ANOR). In that notice, we announced that listing was warranted for 30 foreign bird species, including the 5 species that are the subject of this final rule. The five species were selected from the list of warranted-but-precluded species because of their LPN, their similarity of habitat, and the similarity of threats to these species. Combining species that face similar threats within the same general geographic area into one proposed rule allows us to maximize our limited staff resources, thus increasing our ability to complete the listing process for warranted-but-precluded species.

On July 7, 2009, the Service published in the **Federal Register** a rule proposing to list these five foreign bird species as endangered under the Act (74 FR 32308). Following publication of the proposed rule, we implemented the Service's peer review process and opened a 60-day comment period to solicit scientific and commercial information on the species from all interested parties. For more detailed information on previous Federal actions, please refer to the July 2009 proposed rule.

On November 10, 2009, the Service published in the **Federal Register** a reopening of the public comment period (74 FR 57987) for a rule proposing to list these five foreign bird species as endangered under the Act (74 FR 32308). Following publication of the reopening of the public comment period, we implemented the Service's peer review process and opened a 60-day comment period to solicit scientific and commercial information on the species from all interested parties. For more detailed information on previous Federal actions, please refer to the July 2009 proposed rule.

Summary of Comments and Recommendations

We base this finding on a review of the best scientific and commercial information available, including all information received during the public comment period. In the July 7, 2009, proposed rule, we requested that all interested parties submit information that might contribute to development of a final rule. On November 10, 2009, we reopened the public comment period where we again requested that all interested parties submit information that might contribute to development of a final rule. We also contacted appropriate scientific experts and organizations and invited them to comment on the proposed listings. We received comments from five individuals; four of which were from peer reviewers.

We reviewed all comments we received from the public and peer reviewers for substantive issues and new information regarding the proposed listing of these species, and we address those comments below. All the commenters and peer reviewers supported the proposed listing. Two comments included additional information for consideration; the remaining three comments simply supported the proposed listing without providing scientific or commercial data.

Peer Review

In accordance with our policy published on July 1, 1994 (59 FR 34270), we solicited expert opinions from individuals with scientific expertise that included familiarity with the species, the geographic region in which the species occurs, and conservation biology principles. We received responses from four of the peer reviewers from whom we requested comments. They generally agreed that the description of the biology and habitat for the species was accurate and based on all relevant literature. Some new information was provided for one of the species, as described below. Some of the new information has been incorporated into this final rule. In some cases, it has been indicated in the citations by ''personal communication'' (pers. comm.), which indicates an email, facsimile, or telephone conversation; while in other cases, the research citation is provided.

Peer Reviewer Comments

(1) Comment: One peer reviewer stated that he found active blue-billed curassow nests and reproductive behaviors in June, July, and August confirming a second or alternative reproductive season.

Our Response: We reviewed additional literature and revised the blue-billed curassow life-history description to state that a breeding season also occurs from June through August.

(2) Comment: One peer reviewer commented that, despite the El Paujíl Bird Reserve's increased community environmental education effort, the program has little effect on a continually changing migratory worker population. These workers include loggers and coca plant cultivators, and their environmental impact negatively affects the blue-billed curassow's survival.

Our Response: Each year, the El Paujíl Bird Reserve's educational outreach efforts continue to expand. The 2012 Eighth Annual El Paujil Blue Billed Curassow Festival included over 400 participants and focused on raising conservation awareness among communities living near the El Paujíl Bird Reserve. However, these efforts are not aimed toward migratory workers. Therefore, we included information about the diminished impact of outreach efforts on transitory

populations in our discussion of blue-billed curassow conservation education.

(3) Comment: One peer reviewer commented that the El Paujíl Bird Reserve's acquisition of additional land since 2004 has created a shortage of field staff. The reviewer recommends an increase in funding to ensure adequate protection of the blue-billed curassow within the reserve.

Our Response: The Act authorizes the provision of limited financial assistance for the development and management of programs that the Secretary of the Interior determines to be necessary or useful for the conservation of endangered and threatened species in foreign countries. It is unknown at this time whether funds will be available to support the El Paujíl Bird Reserve.

(4) Comment: One peer reviewer commented on the need to establish new natural reserves for the blue-billed curassow in Cuchilla del Rio Minero and to support the recent reserves established in the Serrania de las Quinchas.

Our Response: The Service does not have the authority to purchase or similarly protect habitat in areas under the jurisdiction of other countries. However, recognition through listing results in public awareness, and encourages conservation actions by Federal and State governments, private agencies and groups, and individuals; these actions may address the conservation of habitat needed by foreign-listed species. The Act also authorizes the provision of limited financial assistance for the development and management of programs that the Secretary of the Interior determines to be necessary or useful for the conservation of endangered and threatened species in foreign countries; these programs may also be aimed at the conservation of habitat needed by listed species.

Summary of Changes to the Proposed Rule

Based on the comments we received during the comment period, we revised the blue-billed curassow life-history description to state that a breeding season also occurs in June through August. We also included information about the diminished impact of outreach efforts on transitory populations in our discussion of blue-billed curassow conservation education. In addition to these revisions, we made several minor editorial changes and corrections to text in this final rule.

Species Information and Factors Affecting the Species

Section 4 of the Act (16 U.S.C. 1533), and its implementing regulations at 50 CFR part 424, set forth the procedures for adding species to the Federal Lists of Endangered and Threatened Wildlife and Plants. 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) of the Act. The five factors are: (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; and (E) other natural or manmade factors affecting its continued existence.

Under the Act, we may determine a species to be endangered or threatened. An endangered species is defined as a species that is in danger of extinction throughout all or a significant portion of its range. A threatened species is defined as a species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. Therefore, we evaluated the best available scientific and commercial information on each species under the five listing factors to determine whether they met the definition of endangered or threatened.

On a species-by-species basis, a summary of the biology and distribution of each species, followed by information regarding the status of, and threats to, the species in relation to the five factors provided in section 4(a)(1) of the Act are discussed below. The Colombian species are considered first, in alphabetical order, as follows: Blue-billed curassow, brown-banded antpitta, Cauca guan, and gorgeted wood-quail. These are followed by the Ecuadorian species, the Esmeraldas woodstar.

Blue-billed Curassow (Crax Alberti) Biology and Distribution

Species Description

The blue-billed curassow, endemic to Colombia, is a large (82–92 centimeters (cm) (32–36 inches (in)), tree-dwelling member of the Cracid family (Cracidae) (Salaman *et al.* 2001, p. 183; del Hoyo 1994, p. 36; Collar *et al.* 1992, p. 154). The species is locally known as ''Paujíl de pico azul'' or ''Pavón Colombiano'' and is also referred to in English as the blue-knobbed curassow (United Nations Environment Programme-World Conservation Monitoring Centre (UNEP–WCMC) 2008c, p. 1; Cuervo 2002, p. 138). In older literature, the species is referred to as Prince Albert's curassow (Throp 1964, p. 124). The blue-billed curassow is described as mainly black with blue at the base of its bill. The male has a white-plumaged crissum (the area under the tail), whereas the female has a black and white crest and black and white barring on her wings (BirdLife International (BLI) 2007d, p. 1; Throp 1964, p. 124).

Taxonomy

The blue-billed currassow was first taxonomically described by Fraser in 1852 and placed in the family Cracidae, within the order Galliformes.

Habitat and Life History

Blue-billed curassows prefer undisturbed, heterogeneous primary forests in the humid lowlands of the Sierra Nevada de Santa Marta Mountains at elevations up to 1,200 meters (m) (3,937 feet (ft)) (Salaman *et al.* 2001, p. 183; del Hoyo 1994, p. 361; Collar *et al.* 1992, p. 154). The blue-billed curassow requires a large home range of primary tropical forest (Cuervo 2002, pp. 138–140). The species will rarely cross narrow deforested corridors, such as those caused by roads or oil pipelines, and will not cross large open areas between forest fragments (Cuervo and Salaman 1999, p. 7). The species is described as being trusting of humans (del Hoyo 1994, p. 336).

The blue-billed curassow is terrestrial and feeds mostly on fruit and leaves, and sometimes on worms and carrion. It plays an important role in dispersing seeds and regenerating tropical forests (BLI 2007d, p. 1; Brooks 2006, p. 17; Brooks and Strahl 2000, pp. 5–8; Cuervo and Salaman 1999, p. 8).

Cracids are slow to reproduce, with a replacement rate of at least 6 years (Silva and Strahl 1991, p. 50). Curassows reach sexual maturity in their second year (Throp 1964, p. 130). Blue-billed curassows form monogamous pairs that share responsibilities for young (Todd *et al.* 2008; Cuervo and Salaman 1999, p. 9). The breeding season begins in December and extends through March (Cuervo and Salaman 1999, p. 8). A breeding season also occurs from June through August (Urueña, 2008, p. 71).

During the mating season, the male blue-billed curassows make ''booming'' calls that can be heard 500 m (1,640 ft) away (Ochoa-Quintero *et al.* 2005, pp. 42, 44). Adults build large nests made of sticks and leaves in dense lianas (woody vines) (Cuervo and Salaman 1999, p. 8). The typical blue-billed curassow clutch size is 1–2 large white eggs, which is a small clutch size

relative to other species in the order Galliformes (del Hoyo 1994, p. 336; Throp 1964, p. 130). Young hatch in July after an approximately 29-day incubation period (del Hoyo 1994, p. 361; Hilty and Brown 1986, p. 129; Throp 1964, p. 131). In captivity, curassows are long-lived species (Todd *et al.* 2008, p. 7). Throp (1964, p. 132) recorded a blue-billed curassow still laying eggs at 20 years of age. However, in the wild, one generation is considered to be 10 years (Cuervo 2002, p. 141).

Historical Range and Distribution

The blue-billed curassow historically occurred in northern Colombia, from the base of the Sierra Nevada de Santa Marta (in the northern Departments of Magdalena La Guijaira, and Cesar), west to the Sinú valley (Department of Córdoba), through the Río Magdalena (through the Departments (from south to north) of Huila, Tolima, Caldas, Antioquia, Santander, Bolivar, Magdalena, and La Guajira) (BLI 2007a, p. 1; Cuervo and Salaman 1999, p. 7; del Hoyo 1994, p. 361). The species' historic range encompassed an area of approximately 106,700 square kilometers (km^2) (41,197 square miles (mi^2)) (Cuervo 2002, p. 141). There were no confirmed observations of blue-billed curassows between 1978 and 1997 (Brooks and Gonzalez-Garcia 2001, p. 183), and surveys conducted in 1998 failed to locate any males (BLI 2007d, p. 3) (as detailed under Factor B, below), prompting researchers to believe the species to be extinct in the wild (del Hoyo 1994, p. 361). However, a series of reported observations made in 1993 were confirmed in the year 2000 (Cuervo 2002, pp. 136–137).

Current Range and Distribution

The current range of the blue-billed curassow is estimated to be a 2,090-km^2 (807-mi^2) area (BLI 2007d, p. 2) of fragmented, disjunct, and isolated tropical moist and humid lowlands and premontane forested foothills in the Rio Magdalena and lower Cauca Valleys of the Sierra Nevada de Santa Marta Mountains. The species may be found at elevations up to 1,200 m (3,937 ft) (Donegan and Huertas 2005, p. 29; Salaman *et al.* 2001, p. 183; Cuervo and Salaman 1999, p. 7; del Hoyo 1994, p. 361; Collar *et al.* 1992, p. 154), but it is more commonly found below 600 m (del Hoyo 1994, p. 361). Little information is available on the size of the forest fragments where the species has been observed. However, researchers conducting fieldwork in the Department of Antioquía in 1999 and 2001 noted that the patch sizes varied from 3 km^2 (1.2 mi^2) to 10 km^2 (3.9 mi^2) in size (Ochoa-Quintero *et al.* 2005, p. 46).

In 1993, sightings were reported in the northern Departments of Córdoba (at La Terretera, near Alto Sinú) and Bolívar (in the Serranía de San Jacinto (San Jacinto Mountains)) (Williams, *in litt.,* as cited in BLI 2007d, p. 2). Additional observations were made in the northernmost Department of La Guajira in 2003 (in the Valle de San Salvador Valley) (Strewe and Navarro 2003, p. 32). More recently, individuals have been observed in the tropical forests of the central Departments of Antioquía (on the slopes of the Serranía de San Lucas and Bajo Cauca-Nechí Regional Reserve area), the Departments of Santander and Boyacá (on the slopes of the Serranía de las Quinchas), and in the southeastern Department of Cauca (in northeastern and lower Cauca Valley) (BLI 2007d, p. 2; Urueña *et al.* 2006, p. 42; Donegan and Huertas 2005, p. 29; Ochoa-Quintero *et al.* 2005, pp. 43–44; Cuervo 2002, pp. 135–138;). Experts consider the most important refuges for this species to be: (1) Serranía de San Lucas (Antioquía); (2) Paramillo National Park (Antioquía and Córdoba Departments); (3) Bajo Cauca-Nechí Regional Reserve (Antioquía and Córdoba Departments); and (4) Serranía de las Quinchas Bird Reserve (Santander and Boyacá Departments) (BLI 2007d, p. 3; Cuervo 2002, p. 139). These refugia are discussed under Factor A, below.

Population Estimates

There is little information on population numbers for the various reported locations of the species, and political instability within the country makes it difficult to know the exact population size of this species (Houston Zoo 2008). In 2002, Cuervo (2002, p. 141) considered the Serranía de las Quinchas and Serranía de San Lucas populations to be the stronghold of the species. However, surveys in 2003 led researchers to believe that Serranía de las Quinchas serves as the species' stronghold (BLI 2007d, pp. 2, 5–6). In 2003, the population at Serranía de las Quinchas (Boyacá Department) location was estimated to be between 250 and 1,000 birds. The only other information on the subpopulation level is a report from Strewe and Navarro (2003, p. 32), based on field studies conducted between 2000 and 2001, that hunting had nearly extirpated the blue-billed curassow from a site in San Salvador (La Guijara) (Factor B).

Using the International Union for Conservation of Nature and Natural Resources (IUCN) categories, the blue-billed curassow population was estimated according to IUCN criteria to be more than 1,000 but fewer than 2,500 in 1994 (BLI 2007d, p. 2). In 2001, Brooks and Gonzalez-Garcia (2001, p. 184) estimated the total population to be much fewer than 2,000 individuals. In 2002, it was estimated that the species had lost 88 percent of its habitat and half of its population within the last three generations, or 30 years (Cuervo 2002, p. 141). Local reports indicate an overall declining trend characterized by recent rapid declines of all subpopulations (BLI 2007d, p. 1; Cuervo 2002, p. 138; Strahl *et al.* 1995, p. 25). For further information on population size, see Factor E, below.

Conservation Status

The blue-billed curassow is identified as a critically endangered species under Colombian law (EcoLex 2002, p. 12). The species is considered one of the most threatened cracids by the IUCN Cracid Specialist Group. The species is categorized by the IUCN as 'Critically Endangered,' with habitat loss as a primary threat (BLI 2004b, p. 1; Cuervo 2002, p. 141; del Hoyo 1994 p. 340; Strahl *et al.* 1995, pp. 4–5; Urueña *et al.* 2006, pp. 41–42).

Summary of Factors Affecting the Blue-Billed Curassow

Factor A: The Present or Threatened Destruction, Modification, or Curtailment of the Habitat or Range

The blue-billed curassow prefers undisturbed, heterogeneous forests and is rarely found in secondary or even slightly disturbed forests (Cuervo and Salaman 1999, p. 7). The blue-billed curassow occurs today in several disjunct locations along a much-restricted part of its historic distribution (Brooks and Gonzalez-Garcia 2001, p. 183; Collar *et al.* 1992, pp. 61–62; Cuervo and Salaman 1999, p. 7). Researchers note that the blue-billed curassow requires large territories, but there is little information as to the actual size of the remaining forest fragments (Cuervo and Salaman 1999, p. 7). In 1999 and 2001, researchers conducting fieldwork in the Department of Antioquia noted that the patch sizes in which the species were observed or heard varied from 3 km^2 (1.2 mi^2) to 10 km^2 (3.9 mi^2) in size (Ochoa-Quintero *et al.* 2005, p. 46). Since the 1990s, the species has been observed in the Departments of Córdoba (at La Terretera, near Alto Sinú, 1993) and Bolívar (in the Serranía de San Jacinto, 1993) (Williams *in litt.,* as cited in BLI 2007d, p. 2); La Guajira (in the Valle de San Salvador Valley, 2003) (Strewe and

Navarro 2003, p. 32); Antioquía (on the slopes of the Serranía de San Lucas and Bajo Cauca-Nechí Regional Reserve area, 1999 and 2001) (Ochoa-Quintero *et al.* 2005, pp. 43–44); Santander and Boyacá (on the slopes of the Serranía de las Quinchas); and Cauca (in northeastern and lower Cauca Valley) (BLI 2007d, p. 2; Urueña *et al.* 2006, p. 42; Donegan and Huertas 2005, p. 29; Cuervo 2002, pp. 135–138.).

Deforestation

Primary forest habitats throughout Colombia have undergone extensive deforestation. Viña *et al.* (2004, pp. 123–124) used satellite imagery to analyze deforestation rates and patterns along the Colombian-Ecuadorian Border (in the Departments of Putumayo and Sucumbios, respectively), finding that, from 1973 to 1996, a total of 829 km^2 (320 mi^2) of tropical forests within the study area were converted to other uses. This corresponds to a nearly one-third total loss of primary forest habitat, or a nearly 2 percent mean annual rate of deforestation within the study area. During the study, the area within Colombia experienced a three-times-larger annual rate of loss than that in Ecuador, due to more intense pressures from human colonization and illegal crop cultivation (Viña *et al.* 2004, p. 124). The human population within the area increased from approximately 50,000 to over 250,000 people during the 23-year period (Perz *et al.* 2005, pp. 26–28). A similar phenomenon occurred in the Río Magdalena Valley, which coincides with the species' historic range as well as its disjunct and restricted current range. The Río Magdalena runs from south to north approximately 1,540 km (950 mi) through western Colombia and served as the main waterway connecting coffee (*Coffea* spp.) plantations to the ports on the Western Colombian coast in the 1920s, when the river was reportedly plagued by occasional droughts and erosion. In the 1930s, a railway was completed along much of the Río Magdalena Valley; this infrastructural improvement contributed to a growth in several industries, including coffee (throughout the Río Magdalena valley), bananas (*Musa* spp.) (in the Magdalena Department), and oil (in the Santander Department) (Ocampo and Botero 2000, pp. 76–78). Deforestation and habitat loss throughout the lowland forests across northern Colombia over the past 100 years contributed to the increasing rarity of the species, and extirpated the species from a large portion of its previous range by the 1980s (Brooks and Gonzalez-Garcia 2001, p. 183; Cuervo and Salaman 1999, p. 7; Collar *et al.* 1992, pp. 61–62.).

In a similar study specific to the western Andean Amazon area of Colombia (in the Departments of Arauca, Casemere, Meta, Vichada, Amazonas, Caquetá, Guainia, Guaviare, Putumayo, and Vaupés), deforestation between 1980 and 1990 totaled 52,320 km^2 (20,201 mi^2) (Perz *et al.* 2005, pp. 26–28). The most recent reports indicate that habitat loss is ongoing and may be accelerating. Between the years 1990 and 2005, Colombia lost a total of 7,920 km^2 (3,058 mi^2) of primary forest (Butler 2006a, pp. 1–3; Food and Agriculture Organization of the United Nations (FAO) 2003a, p. 1). Researchers have observed that road building and other infrastructure improvements in previously remote forested areas have increased accessibility and facilitated further habitat destruction, exploitation, and human settlement (Álvarez 2005, p. 2042; Cárdenas and Rodríguez Becerra 2004, pp. 125–130; Etter *et al.* 2006, p. 1; Hunter 1996, pp. 158–159; Viña *et al.* 2004, pp. 118–119). In Antioquia, cattle ranches are extensive in areas where the blue-billed curassow occurs; cattle ranching is considered a less labor-intensive land use, meaning that more people need to turn to alternative sources of income generation, such as cultivation or extractive industries (Melo and Ochoa 2004, as cited in Urueña *et al.* 2006, p. 42). In Serranía de las Quinchas, the economy is based principally on timber extraction, agriculture, and cattle ranching (Urueña and Quevedo unpubl. data 2004, as cited in Urueña *et al.* 2006, p. 47). These activities contribute to further habitat fragmentation and reduction. In terms of habitat destruction, an influx of settlers displaced from the Departments of Antioquia, Tolima, and Cundinamarca, due to violence and public disorder in these Departments, are the principal threat to the mountainous regions in these Departments (Urueña *et al.* 2006, p. 42).

The decline in blue-billed curassow population numbers (see Population estimates, above) is inextricably linked to habitat loss. The blue-billed curassow became increasingly rare during the 20th Century, as much of the lower-elevation forests in their historic range of the Río Magdalena and Río Cauca Valleys were deforested, forcing the blue-billed curassow to move to higher elevations (Cuervo and Salaman 1999, p. 8). By the 1980s, the species had disappeared from a large portion of its previous range (Collar *et al.* 1992, pp. 61–62), which historically encompassed approximately 106,700 km^2 (41,197 mi^2) (Cuervo 2002, p. 141). In 2002, it was estimated that, within the three prior generations (30 years), the species had lost 88 percent of its original habitat and that the remaining suitable habitat had been reduced to 13,300 km^2 (5,135 m^2) (Cuervo 2002, p. 141). The current range of the blue-billed curassow is estimated to be 2,090 km^2 (807 mi^2) (BLI 2007d, p. 2) (see also ''Small Population Size,'' Factor E).

Deforestation and fragmentation caused by human encroachment are ongoing throughout the blue-billed curassow's range, including: Antioquía (on the slopes of the Serranía de San Lucas and Bajo Cauca-Nechí Regional Reserve area); Santander and Boyacá Departments (on the slopes of the Serranía de las Quinchas); and in the southeastern Department of Cauca (in northeastern and lower Cauca Valley), where timber extraction and mining continue (Urueña *et al.* 2006, p. 42). Human activities that are contributing to habitat loss include: forest clearing for subsistence agriculture, cash crops (such as coffee), and grazing (BLI 2007d, p. 3; Urueña *et al.* 2006, p. 42; Álvarez 2005, p. 2,042; Cárdenas and Rodríguez Becerra 2004, p. 355; Oldham and Massey 2002, pp. 9–12) habitat alteration, human population displacement, and hunting as a result of armed conflict (Álvarez 2003, pp. 51–52; Álvarez 2001, p. 305), habitat destruction and alteration as a result of fire (Moreno *et al.* 2006, p. 1; Álvarez 2005, p. 2,041); habitat loss for dams and reservoir development (Kreger 2005, pp. 5–6; Cuervo 2002, p. 139); illicit crop cultivation (such as the coca plant (*Erythroxylum coca*)) (Álvarez 2007, pp. 133–135; Cárdenas and Rodríguez Becerra 2004, p. 355; Oldham and Massey 2002, pp. 9–12; Álvarez 2001, pp. 1086–1087); gold mining activities (Cuervo 2002, p. 139); habitat pollution due to oil development and distribution (Álvarez 2005, p. 2041; Cárdenas and Rodríguez Becerra 2004, p. 355); and increased access and habitat destruction resulting from road development (Cuervo 2002, pp. 139–140). Roads create barriers to animal movements, expose animals to traffic hazards, and increase human access into habitat, thus facilitating further exploitation and habitat destruction (Hunter 1996, pp. 158–159). Local human populations have recently settled in forested areas that previously provided habitat for blue-billed curassows. This human settlement is accelerating habitat loss and fragmentation with only 5 percent of the species' restricted range now covered by forest (Brooks and Gonzalez-Garcia 2001, pp. 183–184), and is leaving only

fragmented, disjunct, and isolated populations in the remaining four or five patches of tropical humid and premontane forests (Donegan and Huertas 2005, p. 29; Álvarez 2003, p. 51; Brooks and Strahl 2000, pp. 14–15; Cuervo and Salaman 1999, p. 7; Collar *et al.* 1994, pp. 61–62).

Illegal Crop Cultivation and Eradication

The cultivation of illegal crops (including coca) poses additional threats to the environment beyond encouraging the destruction of montane forests (Balslev 1993, p. 3). Van Schoik and Schulberg (1993, p. 21) noted that coca crop production destroys the soil quality by causing the soil to become more acidic, which depletes the soil nutrients and ultimately impedes the regrowth of secondary forests in abandoned fields. Although Colombia continues to be the leading coca bush producer (United Nations Office of Drugs and Crime (UNODC) *et al.* 2007, p. 7), since 2003, cocaine cultivation has remained stable at about 800 km² (309 mi²) of land under cultivation (UNODC *et al.* 2007, p. 8). This stabilization of production is partially attributed to alternative development projects that were implemented between 1999 and 2004 to encourage pursuits other than illegal crop cultivation (UNODC *et al.* 2007, p. 77). This sustained level is also attributed to heightened eradication efforts. Between 2002 and 2004, aerial spraying occurred over more than 1,300 km² (502 mi²) annually, peaking in 2004, when 1,360 km² (525 mi²) of illicit crops were sprayed (UNODC and the Government of Colombia (GOC) 2005, p. 11).

In 2006, eradication efforts were undertaken on over 2,130 km² (822 mi²) of land, which included spraying of 1,720 km² (664 mi²) and manual eradication on the remaining land. Eradication efforts undertaken in 2006 occurred over an area 2.7 times greater than the net cultivation area (UNODC *et al.* 2007, p. 8). Drug eradication efforts in Colombia have further degraded and destroyed primary forest habitat by using nonspecific aerial herbicides to destroy illegal crops (BLI 2007d, p. 3; Álvarez 2005, p. 2042; Cárdenas and Rodríguez Becerra 2004, p. 355; Oldham and Massey 2002, pp. 9–12). Herbicide spraying has introduced harmful chemicals into blue-billed curassow habitat and has led to further destruction of the habitat by forcing illicit growers to move to new, previously untouched forested areas (Álvarez 2007, pp. 133–143; BLI 2007d, p. 3; Álvarez 2005, p. 2042; Cárdenas and Rodríguez Becerra 2004, p. 355; Oldham and Massey 2002, pp. 9–12; Álvarez 2002, pp. 1,088–1,093). Between 1998 and 2002, cultivation of illicit crops increased by 21 percent each year, with a concomitant increase in deforestation of formerly pristine areas of approximately 60 percent (Álvarez 2002, pp. 1,088–1,093).

Effects of Habitat Fragmentation

A study conducted on the effects of habitat fragmentation on Andean birds within western Colombia determined two primary conditions that increased a species' vulnerability to habitat fragmentation and susceptibility to local extirpation and extinction: (1) Species that were located at the upper or lower limit of their altitudinal or geographical distribution (as is the case for the blue-billed curassow, which formerly occupied the now-cleared lower elevation forests and is relegated to isolated forest fragments within its current range), and (2) species that were large fruit-eating birds with limited distributions and narrow habitat preferences (also traits of the blue-billed curassow) (Kattan and Álvarez-Lopez 1996, pp. 5–6). The study also determined that 31 percent of the historical bird populations in western Colombia had become extinct or locally extirpated by 1990, largely as a result of habitat fragmentation from deforestation and human encroachment (Kattan and Álvarez-Lopez 1996, p. 5; Kattan *et al.* 1994, p. 141).

The most direct physical consequence of habitat fragmentation is loss of habitat heterogeneity (the variety, relative abundance, and spatial configuration of differing habitat types); habitat heterogeneity is a characteristic preferred by the blue-billed curassow (see Habitat and Life History, above) (Kattan and Álvarez-Lopez 1996, p. 6). Local reports indicate an overall declining trend, characterized by recent rapid declines of all populations of blue-billed curassows (BLI 2007d, p. 1; Cuervo 2002, p. 138; Strahl *et al.* 1995, p. 25). Moreover, the ability of the blue-billed curassow to repopulate an isolated patch of suitable habitat following decline or extirpation is highly unlikely due to the species' small overall population size, its tendency to avoid degraded habitats, and the large distances between the remaining primary forest fragments, in addition to the species' avoidance of crossing large areas of open habitat (Cuervo and Salaman 1999, p. 7; Hanski 1998, pp. 45–46).

In addition to the direct detrimental effect of habitat loss, blue-billed curassows and other cracids are susceptible to indirect effects of habitat disturbance and fragmentation (Brooks and Strahl 2000, p. 10; Silva and Strahl 1991, p. 38). A study conducted in northwestern Colombia suggests that habitat destruction and fragmentation may increase a species' vulnerability to predation (Arango-Vélez and Kattan 1997, pp. 140–142) (Factor C). Habitat fragmentation, in combination with growing numbers of human settlements, has made the species' habitat more accessible and more vulnerable to hunting (Factor B) and predation (Factor C). Habitat loss also compounds the species' decline in population numbers (estimated to be between 1,000 and 2,500 individuals) (BLI 2004b, p. 1) (see Factor E, Small population size).

Refugia

Several areas within the blue-billed curassow's current range are designated as national parks or other types of preserves, including Tayrona and Sierra Nevada de Santa Marta National Parks (both in Antioquía Department) (Cuervo 2002, p. 140) and the Colorados Sanctuary (Bolívar Department), which protects part of the Serranía de San Jacinto (BLI 2007d, pp. 2–3; Urueña *et al.* 2006, p. 42). Experts consider the most important refuges for this species, containing the largest remaining areas of suitable habitat, to be in the following areas (arranged geographically, from north to south): (1) Serranía de San Lucas, (2) Paramillo National Park, (3) Bajo Cauca-Nechí Regional Reserve, and (4) El Paujíl Bird Reserve (BLI 2007d, p. 3; Cuervo 2002, pp. 139–140; Urueña *et al.* 2006, p. 42), four of the five locations where the species has been observed in the 21st Century (see Current Range, above). The habitat within these refugia underserves the needs of the species for various reasons, including past and ongoing habitat destruction and incomplete habitat inclusion, as enumerated below. In addition, inadequate regulatory mechanisms hamper protection of the species and its habitat (Factor D).

(1) Serranía de San Lucas (Antioquía) is not a protected area, but is one of the largest remaining tracts of forest that is the least disturbed (WWF 2001b, p. 1). Even so, only a few isolated forest patches survive above 1,000 m (3,280 ft) in the northern lowlands (Antioquia Department) (Donegan and Salaman 1999, p. 4). Ongoing pressures on this habitat include human encroachment for natural resources, colonization, ranching, logging, and crop production, as well as pollution of the Magdelena and Cauca Rivers (WWF 2001b, p. 3). In 1996, there was a gold rush that led to deforestation for logging, settlements, conversion to agriculture, and coca production (BLI 2007d, p. 3). Using

satellite imagery and fieldwork, Cuervo (2002, p. 140) determined that deforestation on the eastern slopes of the Serranía de San Lucas was extensive between 1995 and 1996. In 2005, highway construction was underway as part of a national plan to connect the East Andes, the West Andes, and the Pacific ports, including roadbuilding through the Serranía de San Lucas and adjacent lowlands (Álvarez 2005, p. 2,042). Because the species prefers pristine habitat, this ongoing habitat alteration negatively impacts the integrity of this location and the survival of the species therein.

(2) The Paramillo National Park (Antioquía and Córdoba Departments), created in 1977, encompasses an area 4,600 km² (1,776 mi²) in size and includes moist and cloud forest habitats (Corantioquia 2008, p. 1). However, it only protects the upper elevational limit of the habitat occupied by the species, where the species is rarer (Cuervo 2002, p. 140). This Park is inhabited by an indigenous community (Emberá), for whom the Park was created. Farmers also inhabit the interior regions of the Park (BLI 2007a, pp. 1–2). The areas to the south of the Park have undergone intense habitat disturbance from logging, drug crop production, and inundation from flooding caused by the construction of the Urrá Dam (Cuervo 2002, p. 139). Deforestation has occurred throughout a large portion of the Park's buffer zone as well as in the extreme southern reaches within Park boundaries (Cuervo 2002, p. 140). Between 2003 and 2004, the area of cocaine cultivation within the Paramillo National Park increased from 1.1 km² to 4.6 km² (0.42 mi² to 1.8 mi²) (UNODC and GOC 2005, p. 45). The Urrá Dam was constructed on the Sinú River between 1993 and 1998; the Sinú River Valley was part of the blue-billed curassows' historic range (BirdLife International (BLI) 2007a, p. 1; Cuervo and Salaman 1999, p. 7; del Hoyo 1994, p. 361). The reservoir flooded the area and led to displacement of human populations and other habitat alterations, including fish kills caused by blocked spawning and migratory routes (NGO Working Group on Export Development Canada 2003, p. 31).

(3) The Bajo Cauca-Nechí Regional Reserve (Antioquía and Córdoba Departments), created in 1999, is located within a large tract (450 km² (174 mi²)) of forested land at an elevation of 800 m (2,625 ft). Bajo Cauca is the second most populated region in the Department of Antioquia. Logging is important in this region, and the Reserve allows commercial exploitation of wood (Fundación Viztaz 2007, p. 2). Surveys are scant in this area, which is believed to be home to many species as yet unidentified by science (Cuervo 2002, p. 137; Donegan and Salaman 1999, p. 12). Although the Reserve provides suitable habitat for the species, and the blue-billed curassow is presumed to inhabit this area, it has not been confirmed within the Reserve (BLI 2007d, p. 3).

(4) El Paujíl Bird Reserve (Santander and Boyacá Departments) is a private reserve established in Serranía de las Quinchas (WorldTwitch Colombia 2004, p. 3). In the early 1990s, the Serranía de las Quinchas (Boyacá Department, central Colombia) was considered one of the last remaining well-preserved cloud forests and the largest tract of lowland wet forest in the region, with up to 500 km² (193 mi²) of forest remaining. Within a decade, the forest had dwindled to 120 km² (46 mi²) (WorldTwitch Colombia 2004, p. 3). In 2002, the largest known subpopulation of blue-billed curassow was located in the Serranía de las Quinchas and became regarded as the stronghold of the species (BLI 2007d, p. 2). El Paujíl Bird Reserve was created in 2004 specifically to protect the blue-billed curassow and its habitat (BLI 2007b, p. 2). Originally comprising 10 km² (3.9 mi²) of lowland tropical forest up to elevations of 700 m (2,297 ft), the Reserve has expanded to 60 km² (23 mi²) (ProAves 2010, p. 1; American Bird Conservancy 2010, p. 1). The Reserve includes suitable habitat for the species. However, collection of eggs and chicks are ongoing within the region (Cuervo 2002, p. 139; Urueña *et al.* 2006, p. 42) (see Factor B), and there are questions as to the effectiveness of this Reserve to protect the species (see Factor D).

Summary of Factor A

The blue-billed curassow prefers undisturbed habitat, and the remaining small populations are limited to four or five small, disjunct, and isolated areas in seven different Departments. Within the past 30 years, or three generations, the species is estimated to have lost 88 percent of its habitat and half of its population. Deforestation and conversion of primary forests for human settlements and agriculture has led to habitat fragmentation throughout the species' range and to isolation of remaining populations. Habitat loss and fragmentation were factors in the species' historical decline (over the past 50 years) and caused localized extirpations, and continue to be factors negatively affecting the blue-billed curassow in the wild. Human encroachment into the species' preferred primary forest habitat has resulted in habitat alteration and disturbance activities that have caused declines in the blue-billed curassow population. Cultivation of illegal drug crops, such as cocaine, leads to further deforestation and alters soil compositions, hindering regeneration of abandoned fields. In addition, drug eradication programs involving the aerial spraying of nonspecific herbicides lead to further environmental degradation and destruction of primary forest habitat.

Three of the four most important refugia continue to undergo habitat destruction, and regulatory mechanisms are inadequate to mitigate the primary threats to this species (Factor D). A private refuge, the El Paujíl Bird Reserve, was formed to protect the blue-billed curassow and its habitat, which includes a large amount of suitable habitat, but may be lacking in its ability to adequately protect the species (Factors B and D). Habitat fragmentation contributes to the species' vulnerability to hunting (Factor B) and predation (Factor C) by increasing human and predator access to the habitat. The species' historic range, which encompassed approximately 106,700 km² (41,197 mi²), has been reduced to 2,090 km² (807 mi²). Experts estimate that 88 percent of this habitat loss has occurred within the last 30 years, or three generations. Habitat destruction and fragmentation of the remaining primary forest habitat is expected to continue, as human encroachment and associated activities continue within the blue-billed curassow's range. Therefore, we find that the present destruction, modification, and curtailment of habitat are threats to the blue-billed curassow throughout all of its range.

Factor B: Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

Blue-billed curassows are hunted by indigenous people and local residents for subsistence, sport, trade, and entertainment (Brooks and Gonzalez-Garcia 2001, p. 183; Brooks and Strahl 2000, p. 10; Cuervo and Salaman 1999, p. 9; Throp 1964, p. 127; Urueña *et al.* 2006, p. 42). Cracids, including the blue-billed curassow, are considered particularly vulnerable to hunting pressures and are among those species most rapidly depleted by hunting (Redford 1992, p. 419). Several factors contribute to the species' vulnerability to hunting and collection: their large size, ease of location during the breeding season, trusting nature, and low productivity (1–2 eggs) relative to other Galliformes (del Hoyo 1994, p. 336). Cracids are also slow to reproduce,

with a replacement rate of at least 6 years (Silva and Strahl 1991, p. 50), which makes it difficult for the species to rebound from hunting pressures.

Hunting affects the blue-billed curassow in all life stages. In 1999, hunters in Antioquío (where the blue-billed curassow is known on the slopes of the Serranía de San Lucas and Bajo Cauca-Nechí Regional Reserve area) reported killing as many as 20 blue-billed curassows within the prior 20 years (Donegan and Salaman 1999, p. 21). In 2004, it was reported that hunting had abated somewhat, because productive hunting grounds had become too remote from villages and because the communities have access to domestic meat (Melo and Ochoa 2004, as cited in Urueña *et al.* 2006, p. 42). However, both eggs and chicks continue to be collected in some areas (such as Serranía de las Quinchas, where El Paujíl Reserve is located) to be sold at local markets (Cuervo 2002, p. 139; Urueña *et al.* 2006, p. 42), despite measures to protect the species from collection (Factor D). In 1999, live trapped birds (typically chicks) sold for up to US$100 (greater than the average monthly income) (Donegan and Salaman 1999, p. 21). These birds are either consumed or maintained as captive animals. The blue-billed curassow, as well as other cracids (e.g., chachalacas (*Ortalis* spp.) and guans (*Penelope* spp.)) serve as a major source of protein for indigenous people and attract a great deal of ecotourism (Brooks and Strahl 2000, p. 8). People colonizing forested areas capture juvenile birds as pets and hold them in captivity in fenced yards or in cages (Cuervo and Salaman 1999, p. 8; Donegan and Salaman 1999, p. 21). Indigenous people also collect feathers and other body parts of curassows for rituals, ornamentation, arrowheads, and for sale to tourists (Silva and Strahl 1991, p. 38).

Most hunting occurs during the mating season, when males are more easily located by their booming mating calls (Cuervo and Salaman 1999, p. 9; del Hoyo 1994, p. 336), which can be heard from up to 500 m (1,640 ft) away (Ochoa-Quintero *et al.* 2005, pp. 42, 44). The direct take of males leads to disequilibrium of sex ratios for this species, which forms monogamous pairs (Cuervo and Salaman 1999, p. 9; Todd *et al.* 2008), and it also leads to the disruption of mating activities (Cuervo and Salaman 1999, p. 9; del Hoyo 1994, p. 336). Researchers attribute hunting pressure as the cause for the near extinction of the blue-billed curassow population in the San Salvador Valley (Strewe and Navarro 2003, p. 32). Researchers also attribute to hunting the absence of blue-billed curassows from parts of its historical range where suitable habitat (primary forest) still exists (Brooks and Strahl 2000, p. 10). In 1998, for instance, no males were observed during field surveys, prompting researchers to conclude that hunting continued to be a serious risk to the species (BLI 2007d, p. 3).

Habitat fragmentation and concomitant human encroachment (Factor A) have made the species' habitat more accessible, resulting in the species becoming more vulnerable to hunting. A study conducted in French Guiana provided a quantitative estimate of the effect of hunting on a related cracid species, the black curassow (*Crax alector*) (del Hoyo 1994, p. 336). The black curassow has similar habitat requirements (undisturbed primary tropical to subtropical humid forest at 0–1,400 m (0–4,600 ft) elevation) as the blue-billed curassow (BLI 2007e). The estimated population density of black curassows in nonhunted areas was between 7 and 9 birds per 1 km^2 (0.4 mi^2); in areas with intermittent hunting, the numbers fell to between 0.5 and 2.25 birds; and in areas where hunting was regular, numbers fell to between 0.5 and 0.73 birds (del Hoyo 1994, p. 336). We believe that the effects of hunting on the blue-billed curassow would result in similar population reductions based on its similarity of habitat requirements and life-history traits.

In 1988, Colombia listed the blue-billed curassow in Appendix III of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (UNEP–WCMC 2008c). An Appendix III listing requires that the listing range country (in this case, Colombia) must issue an export permit for all exports of the species when the Management Authority of Colombia is satisfied that specimens have been legally obtained and live specimens will be transported such that risk of injury, damage, and cruelty are minimized. Imports require the prior presentation of a certificate of origin and, where the import is from Colombia, an export permit. In the case of rexports, a reexport certificate issued by the country of re-export is required (UNEP–WCMC 2008a). According to the World Conservation Monitoring Centre (WCMC), a total of 12 live birds have been traded internationally since 1990 (UNEP–WCMC 2008e). This trade consisted of imports of two individuals into the United States and five birds into Mexico in the early 1990s, and exports of five captive-bred specimens from the United States to Colombia and Belgium. Therefore, commercial international trade in wild specimens over the past 20 years has not been extensive.

The blue-billed curassow has been collected from the wild for use in zoos and in captive-breeding programs, both domestically and abroad. A small number of birds have been collected by the Cali Zoo and Santa Fe de Medellin Zoo in Colombia (Cuervo 2002, p. 142), and small collections are held in the United States, including the Houston Zoo and San Diego Zoo, as well as in Japan and Mexico (Brooks and Strahl 2000, p. 15; Cuervo 2002, p. 142). The Cali and Houston Zoo collections are being used for captive breeding, which we consider vital to conserving and recovering this species (Factor E). International trade for zoos and captive-breeding purposes does not contribute to the endangerment of the species. We believe that this limited amount of international trade, controlled via CITES, is not a threat to the species.

Summary of Factor B

The blue-billed curassow is hunted and collected from the wild at all life stages throughout its current range. Blue-billed curassow eggs and chicks are collected for food and sale in local markets, or are often captured and held in captivity as pets or as a future food source. Hunting results in the direct removal of eggs, juveniles, and adults from the population. Blue-billed curassows are slow to reproduce, produce a low clutch size, and exhibit a poor replacement rate (see Habitat and Life History). Hunting can destroy pair bonds and remove potentially reproductive adults from the breeding pool. The species is particularly vulnerable to hunting and collection pressures due to the ease in locating this large bird during its breeding season. The majority of hunting occurs during the mating season, when males are heard calling for females, leading to disproportionate hunting of males. Hunting disturbances during the breeding season disrupt breeding activities, further compounding the threats associated with hunting mortalities. There are continued reports of hunting pressures on the species; these pressures have been and continue to be compounded by ongoing human encroachment into previously undisturbed forests (Factor A). Hunting and collection negatively affects the global population of the blue-billed curassow, due to its small population size and fragmented distribution. Hunting, combined with habitat fragmentation (Factor A), increases the possibility of local extirpation since the blue-billed curassow is unlikely to

reoccupy an area that has been depleted through hunting because it avoids crossing large, open areas between habitat fragments (see Factor E, Likelihood to Disperse). Therefore, we find that hunting, collection, and associated disturbances are threats to the blue-billed curassow.

Factor C: Disease or Predation

We are unaware of information regarding disease or the potential for significant disease outbreaks in the blue-billed curassow. As a result, we do not consider disease to be a threat to the species.

According to Delacour and Amadon (1973), predators of cracids include snakes (suborder Serpentes), foxes (family Canidae), wild cats (*Felis silvestris*), feral dogs (*Canus lupus familiaris*), and raptors (order Falconiformes). Arango-Vélez and Kattan (1997, pp. 137–143) studied predation rates on Andean bird nests within fragmented forest habitats of northwestern Colombia. Although not specific to the blue-billed curassow, the study focused on understory nesting birds with similar nesting habits and in forest fragment sizes similar to where the blue-billed curassow is currently found (Arango-Vélez and Kattan 1997, p. 138). The study found that nest predation by generalist predators is more prevalent in smaller, isolated forest patches. However, in the study, increased predation in smaller habitat fragments could not be solely attributed to the ''edge effect,'' whereby smaller patch sizes facilitate predators' access and ability to capture prey throughout the fragments. Rather, reduced habitat patch sizes caused a shift from larger to smaller predators, which tend to prey upon the eggs and juveniles of understory birds, rendering ground-dwelling birds, such as blue-billed curassows, particularly susceptible (Arango-Vélez and Kattan 1997, pp. 140–142).

Other studies concerning the effects of habitat fragmentation on avian predation show similar results (Keyser 2002, p. 186; Renjifo 1999, p. 1,133; Keyser *et al.* 1998, p. 991; Hoover *et al.* 1995, p. 151; Wilcove 1985, p. 1,214). Gibbs (1991, p. 157) found that a larger proportion of ground-nests and elevated nests were predated in patches smaller than 1 km^2 (0.39 mi^2) and that ground-nesting birds were predated more heavily than elevated-nesting birds. In addition to the importance of patch size for influencing the level of predation, the composition of the areas surrounding the patch is also important (Arango-Vélez and Kattan 1997, p. 141). For instance, in lowland Costa Rica, the edge effect (where predation is greater at the edge of forest patches than in the interior of the patch) was greatest in forest patches bordered by secondary growth than by pasture (Gibbs 1991, p. 157).

Summary of Factor C

Snakes, foxes, feral cats, feral dogs, and raptors are all predators of cracids. Predation results in the direct removal of eggs, juveniles, and adults from the population. Blue-billed curassows are slow to reproduce, produce a low clutch size, and exhibit a poor replacement rate (see Habitat and Life History). Predation can destroy pair bonds and remove potentially reproductive adults from the breeding pool. Studies on similar species in similar Andean habitats indicate that vulnerability to predation by generalist predators increases with increased habitat fragmentation and smaller patch sizes. Predation exacerbates the genetic complications associated with the species' small population size (Factor E). Because of the species' small population size and inability to recolonize isolated habitat fragments (Factor E), predation renders the species vulnerable to local extirpation. Therefore, we find that predation, compounded by ongoing habitat destruction (Factor A) and hunting (Factor B), is a threat to the blue-billed curassow.

Factor D: The Inadequacy of Existing Regulatory Mechanisms

Regulatory mechanisms may provide species-specific or habitat-specific protections. An evaluation of the adequacy of regulatory mechanisms within Colombia to mitigate or remove the threats to the blue-billed curassow is provided below, beginning with species-specific and followed by habitat-specific protection mechanisms.

The Colombian Government has enacted and ratified numerous domestic and international laws, decrees, and resolutions for managing and conserving wildlife and flora (Matallana-T 2005, p. 121). Colombian Law No. 99 of 1993 (Creating the Ministry of the Environment and Renewable Natural Resources and organizing the National Environmental System (SINA)) sets out the principles governing environmental policy in Colombia, and provides that the country's biodiversity be protected and used primarily in a sustainable manner (EcoLex 1993, p. 2). Resolution No. 584 of 2002 (Species that are endangered wildlife in the national territory) provides a list of Colombian wildlife and flora that are considered threatened. Threatened is defined as those species whose natural populations are at risk of extinction, as their habitat, range, or ecosystems that support them have been affected by either natural causes or human actions. Threatened species are further categorized as critically endangered, endangered, or vulnerable. A critically endangered species (CR) is one that faces a very high probability of extinction in the wild in the immediate future, based on a drastic reduction of its natural populations and a severe deterioration of its range; an endangered species (EN) is one that has a high probability of extinction in the wild in the near future, based on a declining trend of its natural populations and a deterioration of its range; and a vulnerable species (VU) is one that is not in imminent danger of extinction in the near future, but it could be if natural population trends continue downward and deterioration of its range continues (EcoLex 2002, p. 10).

The blue-billed curassow is considered a critically endangered species under Colombian law pursuant to paragraph 23 of Article 5 of Law No. 99, as outlined in Resolution No. 584 (EcoLex 2002, p. 12). This status confers certain protections upon the species. Resolution No. 849 of 1973 (laws governing commercial hunting of saínos, boas, anacondas, and birds throughout the country) and Resolution No. 787 of 1977 (laws governing sport hunting of mammals, birds, and reptiles of wildlife), regulate and prohibit commercial and sport hunting of all wild bird species, respectively, except those specifically identified by the Ministry of the Environment or otherwise permitted (EcoLex 1973, p. 1; EcoLex 1977, p. 3). The Ministry of the Environment does not permit the blue-billed curassow to be hunted commercially or for sport because of its status as a critically endangered species. Neither Resolution prohibits subsistence hunting. As discussed under Factor B, commercial and sport hunting are not threats to this species, but subsistence hunting continues to threaten the species throughout its range, including within protected areas. Thus, these Resolutions are ineffective at reducing the existing threat of subsistence hunting to the blue-billed curassow.

Additional efforts to protect the species from subsistence hunting are inadequate. Within El Paujíl Reserve, for instance, there are penalties for shooting or trapping the species (BLI 2007d, p. 3). However, as recently as 2006, it was reported that both chicks and eggs continued to be collected in the Serranía de las Quinchas region, where the Reserve is located, for domestic use and for sale at local markets (Cuervo 2002, p. 139; Urueña *et al.* 2006, p. 42) (Factor

B). Thus, private efforts to protect the species from hunting appear to be inadequate within a region where national laws are ineffective at protecting the species from such take.

The blue-billed curassow is listed in Appendix III of CITES (see Factor B). CITES is an international treaty among 177 nations, including Colombia (which became a Party in 1981) and the United States (which became a Party in 1975) (UNEP–WCMC 2008a, p. 1). In the United States, CITES is implemented through the U.S. Endangered Species Act (Act). The Act designates the Secretary of the Interior as the Scientific and Management Authorities to implement the treaty, with all functions carried out by the Service. Under this treaty, countries work together to ensure that international trade in animal and plant species is not detrimental to the survival of wild populations by regulating the import, export, reexport, and introduction from the sea of CITES-listed animal and plant species (USFWS 2008, p. 1). As discussed under Factor B, we do not consider commercial international trade to be a threat impacting the blue-billed curassow.

Colombia has numerous laws and regulations pertaining to forests and forestry management, including: The Forestry Law of 1959 (Law 2—[On] forest economy [of the] nation and conservation [of] renewable natural resources) (EcoLex 1959); the Forestry Code of 1974 (Decree 2,811—National code of renewable natural resources and protection of the environment) (Faolex 1974), and the forest plan of 1996 (Decree 1,791—Forest Improvement Plan) (Faolex 1996). A new forest law was developed and approved in 2006 (Law No. 1,021, General [Forestry] Law). The new law seeks to: (1) Further promote forest plantations and create financial mechanisms for investments, (2) provide for rigorous control and expanded sustainable use of natural forests, (3) and regulate and further develop forest concessions in the country (International Tropical Timber Organization (ITTO) 2006, p. 218). However, the ITTO considers the Colombian forestry sector to be lacking in law enforcement and on-the-ground control of forest resources, with no specific standards for large-scale forestry production, no forestry concession policies, and a lack of transparency in the application of the various laws regulating wildlife and their habitats (ITTO 2006, p. 222).

Resource management in Colombia is highly decentralized. Resources are managed within local municipalities by one of 33 Autonomous Regional Corporations known as CARs (Corporaciones Autónomas Regionales) (Matallana-T 2005, p. 121). CARs are corporate bodies of a public nature, endowed with administrative and financial autonomy to manage the environment and renewable natural resources (Law 99 of 1993). The blue-billed curassow is currently known to occur within seven different Departments, each of which is managed by a separate local entity. These corporations grant concessions, permits, and authorizations for forest harvesting (ITTO 2006, p. 219). Forty percent of Colombia's public resources are managed by local municipalities, making Colombia one of the most decentralized countries in terms of forestry management in Latin America (Matallana-T 2005, p. 121).

Monitoring of resource use and forest development authorized by these corporations is conducted mostly by local nongovernmental organizations. Governmental institutions responsible for oversight appear to be underresourced and unable to maintain an effective presence in the field (ITTO 2006, p. 222). Consequently, there is no vehicle for overall coordination of species management for multijurisdictional species such as the blue-billed curassow. The private Proaves-Colombia Foundation plans to generate a national strategy for the conservation of the blue-billed curassow through the project, ''Saving the Blue-billed Curassow'' (Quevedo *et al.* 2005, as cited in Urueña *et al.* 2006, p. 42). In 2004, this project evaluated and prioritized threats in Serranía de las Quinchas region (Machado 2004, as cited in Urueña *et al.* 2006, p. 42), assessed population density and structure (Arias 2005, as cited in Urueña *et al.* 2006, p. 42), studied habitat use and behavioral aspects in Paujíl de Pico Bird Reserve (Urueña 2005, as cited in Urueña *et al.* 2006, p. 42), and promoted an environmental education campaign and the creation of El Paujíl Bird Reserve (Urueña and Quevedo 2005, as cited in Urueña *et al.* 2006, p. 42). However, despite the increased community environmental education effort, the transitory nature of migrant workers in this region diminishes the program's effect (Urueña, 2009, pers. comm.).

Currently there are approximately 49 nationally recognized protected areas in Colombia (Matallano-T 2005, p. 121). The five most common categories of habitat protection are: (1) National Natural Park (an area whose ecosystems have not been substantially altered by human exploitation or occupation, and where plant and animal species, or complex geomorphological landscapes have historical, cultural, scientific, educational, aesthetic, or recreational value); (2) Wildlife Sanctuary for Fauna and Flora (an area dedicated to preserve species or communities of wildlife, and to conserve genetic resources of wildlife); (3) National Natural Reserve (an area that preserves flora and fauna and is established for the study of its natural wealth); (4) Panoramic Park (a parcel of land of panoramic, cultural, or natural value preserved for education and relaxation); and (5) Unique National Area (a rare or unique ecosystem) (Matallano-T 2005, p. 121). Several areas considered to be important refuges for the blue-billed curassow are protected areas and are managed by autonomous corporations, including: (1) The Paramillo National Natural Park (Antioquía and Córdoba Departments) and (2) The Bajo Cauca–Nechí Regional Natural Reserve (Antioquía and Córdoba Departments) (BLI 2007d, p. 3; Cuervo 2002, p. 139), both of which are managed by Corantioquia (Corantioquia 2008, p. 1).

(1) The Paramillo National Natural Park (Antioquía and Córdoba Departments) is a large Park, but no protective measures have been implemented to curb human impacts on the habitat and species by the indigenous and farming residents within the park (BLI 2007a, pp. 1–2; BLI 2007d, p. 3) (Factor A). Cocaine cultivation is occurring within the Park boundaries (UNODC and GOC 2005, p. 45). Dam construction on the Sinú River, part of the species' historic range (BLI 2007a, p. 1; Cuervo and Salaman 1999, p. 7; del Hoyo 1994, p. 361), has caused ongoing flooding in the area since its completion in 1998 (NGO Working Group on Export Development Canada 2003, p. 31; Cuervo 2002, p. 139). Thus, the designation of this area as a Park has not mitigated human-induced habitat destruction (Factor A).

(2) The Bajo Cauca-Nechí Regional Natural Reserve (Antioquía and Córdoba Departments) encompasses suitable habitat for the blue-billed curassow, but the species has not been confirmed within the Reserve (BLI 2007d, p. 3). Nonetheless, it is notable that this Reserve, which is designated to preserve and research flora and fauna, allows logging (Fundación Viztaz 2007, p. 2). Thus, should the species be located therein, this Reserve's designation as a preserve would not mitigate the threat from habitat destruction (Factor A).

The privately owned El Paujíl Bird Preserve, which was established specifically to protect the blue-billed curassow and its habitat (BLI 2007d, p. 2) (Factor A), has measures in place to penalize shooting or trapping the

species (BLI 2007d, p. 3). However, egg and chick collection are ongoing within the Serranía de las Quinchas area, where the private reserve is located (Factor B).

Aside from the Paramillo National Park, which includes habitat in the upper elevational limit of the blue-billed curassow's preferred range (Cuervo 2002, p. 140), no effective protective measures have been undertaken (BLI 2007d, p. 2; Brooks and Gonzalez-Garcia 2001, p. 183) in that the regulatory mechanisms in these protected areas do not mitigate habitat destruction, which is a primary risk factor for this species (Factor A). Thus, these protected areas do not provide sufficient protections to mitigate the effects from habitat loss (Factor A) or reduce threats from hunting and collection (Factor B).

Summary of Factor D

Colombia has numerous laws and regulatory mechanisms intended to protect and manage wildlife and their habitats. The blue-billed curassow is considered critically endangered under Colombian law and lives within several managed forests or protected areas. However, on-the-ground enforcement of existing wildlife protection and forestry laws and oversight of the local jurisdictions implementing and regulating activities are ineffective at mitigating the primary threats to the blue-billed curassow. As discussed in Factor A, habitat destruction, degradation, and fragmentation continue throughout the existing range of the blue-billed curassow. As discussed in Factor B, uncontrolled hunting and commercial use of the blue-billed curassow are ongoing and continue to negatively affect the continued existence of the species. Moreover, the lack of a species conservation strategy and the decentralized management of natural resources in Colombia provide no overall coordination in the conservation efforts for species including the blue-billed curassow, which ranges in multiple jurisdictions. Despite ongoing work toward developing a national conservation strategy for the species, it is not known whether it will be formally adopted by the Government of Colombia, and at this time we are unable to determine whether the strategy will be effective in reducing the threats to this species on a local or rangewide basis. Therefore, we find that the existing regulatory mechanisms currently in place for the blue-billed curassow do not reduce or remove the factors threatening the species, thus we find that Factor D is a threat to the blue-billed curassow.

Factor E: Other Natural or Manmade Factors Affecting the Continued Existence of the Species

Three additional factors affect the blue-billed curassow: Limited ability to disperse to unoccupied habitat; small population size, and unsuccessful captive-breeding programs.

Likelihood To Disperse

The blue-billed curassow exhibits several characteristics that make it unlikely to disperse into isolated habitat fragments in order to repopulate patches of suitable habitat. The blue-billed curassow requires a large home range of primary tropical forest (Cuervo 2002, pp. 138–140). The habitat patches within the blue-billed curassow's current range are described by researchers as fragmented, disjunct, and isolated (Donegan and Huertas 2005, p. 29; Salaman *et al.* 2001, p. 183; Cuervo and Salaman 1999, p. 7; del Hoyo 1994, p. 361; Collar *et al.* 1992, p. 154). The species will rarely cross narrow deforested corridors, such as those caused by roads or oil pipelines, and it will not cross large open areas between forest fragments (Cuervo and Salaman 1999, p. 7). In addition to the species' small overall population size (see below), researchers believe it is unlikely that the blue-billed curassow would repopulate an isolated patch of suitable habitat following decline or extirpation of the species from that patch (Cuervo and Salaman 1999, p. 7; Hanski 1998, pp. 45–46) (see Factor E, Captive Breeding Program).

Small Population Size

Deforestation and habitat loss throughout the blue-billed curassow's historic range has resulted in fragmented, disjunct, and isolated populations in the remaining four or five patches of tropical humid and premontane forests and caused regional extirpations of the blue-billed curassow (Brooks and Gonzalez-Garcia 2001, p. 183; Cuervo and Salaman 1999, p. 7; Collar *et al.* 1992, pp. 61–62). It is estimated that the largest subpopulation (in the Serranía de las Quinchas, Boyacá Department) contains between 250 and 999 birds (BLI 2007d, p. 2), and that the total population is much fewer than 2,000 individuals (Brooks and Gonzalez-Garcia 2001, p. 184). Cuervo (2002, p. 141) estimated that the species had lost more than half of its population over the last three generations, or 30 years. Further, it is estimated that, at the current rate of decline, the blue-billed curassow could lose up to 79 percent of its current population within the next 10 years and could be extinct within the next three generations, or 30 years (BLI 2007d, p. 3; Cuervo 2002, p. 141).

The blue-billed curassow's restricted and fragmented range, combined with its small population size (Cuervo 2002, p. 138; Cuervo and Salaman 1999, p. 7; del Hoyo 1994, p. 361), makes the species particularly vulnerable to the threat of adverse genetic effects and susceptible to extinction through natural or manmade events that destroy individuals and their habitat (BLI 2007d, pp. 1–2; Cuervo 2002, p. 140; Brooks and Gonzalez-Garcia 2001, pp. 185–190). Meta-population analysis involves the study of the dynamics of an entire population by studying movements within local populations (Hanski 1998, p. 41). ''A meta-population composed of extinction-prone local populations in a small patch network is necessarily more threatened than are meta-populations in large and well connected networks'' (Hanski 1998, p. 42). Considering that not all blue-billed curassow individuals in a population are breeding at any one time, the actual number of individuals contributing to population growth will be a smaller number than the total number of individuals.

Small population sizes render species vulnerable to any of several risks, including loss of genetic variation, inbreeding depression, and accumulation of deleterious genes. Inbreeding can have individual or population-level consequences either by increasing the phenotypic expression (the outward appearance or observable structure, function, or behavior of a living organism) of recessive, deleterious alleles or by reducing the overall fitness of individuals in the population (Charlesworth and Charlesworth 1987, p. 238; Shaffer 1981, p. 131). Small, isolated populations of wildlife species are also susceptible to demographic problems (Shaffer 1981, p. 131), which may include reduced reproductive success of individuals and chance disequilibrium of sex ratios. Chance disequilibrium of sex ratios would be further exacerbated by preferential hunting of male birds (Factor B). This species' risk of extinction is further compounded by ongoing collection of eggs and chicks, and by hunting-related disturbances that may disrupt breeding pairs (Factor B). Once a population is reduced below a certain number of individuals, it tends to rapidly decline towards extinction (Franklin 1980, pp. 147–148; Gilpin and Soulé 1986, p. 25; Holsinger 2000, pp. 64–65; Soulé 1987, p. 181).

Captive-Breeding Program

A captive-breeding program is being developed within the species' range (see Current Range and Distribution, above) by Fundación Ecolombia, based at the Wildlife Rehabilitation Centre in Los Farallones (Antioquía Department, Colombia). The captive-held population includes three males and two females. The program has met with little success because attempts to breed the species in captivity have been unsuccessful to date (two sterile eggs laid in 2003 and none since). The species is historically known to be a poor breeder in captivity (Throp 1964, p. 127). The program is exploring artificial insemination for future breeding (Wildlife Protection Foundation (WPF) 2007, p. 2). The Houston Zoo, however, which has maintained cracids since the 1960s, has bred the species for 30 years and has successfully raised at least 10 blue-billed curassows in captivity (Houston Zoo 2008, p. 2; Todd *et al.* 2008, p. 1). The Houston Zoo also conducts outreach and breeding research. While this has resulted in limited exports of captive-bred birds for scientific purposes (i.e., to zoos; see also Factor B), the number of birds in captivity has dropped worldwide. In addition, the number of specimens originally imported into the United States was small (Houston Zoo 2008, p. 2), which would limit the number of breeding pairs and offspring and, therefore, their conservation value for reintroduction into the wild. Thus, the captive breeding program is not currently contributing to reintroduction, but serves a conservation value by providing specimens for zoos that conduct outreach and breeding research. Further, reintroduction would appear to be important for recovery of this species because the species is not likely to disperse into or repopulate suitable habitat on its own.

Summary of Factor E

The blue-billed curassow's small population size increases its vulnerability to genetic risks associated with small population sizes that negatively impact the species' long-term viability and increase the possibility of localized extirpations of the remaining fragmented populations. Further, the species is unlikely to repopulate areas of suitable habitat from which a subpopulation has been extirpated because it avoids crossing the disturbed areas that separate the remaining suitable habitat for this species. Range-country attempts at captive breeding have been unsuccessful, and the stock in U.S. captive-breeding programs is limited; therefore, the captive-breeding program is not contributing to reintroduction of the species in the wild and so is not currently mitigating the problem of small population size. Therefore, we believe that, in combination with the risks to the species from habitat destruction (Factor A), hunting (Factor B), and predation (Factor C), the blue-billed curassow is vulnerable to localized extirpation or extinction from which the species would be unable to recover, due to its small population size and apparent inability to repopulate fragmented, isolated habitats such as those currently present within this species' range.

Blue-Billed Curassow Status Determination

The five primary factors that threaten the survival of the blue-billed curassow are: (1) Habitat destruction, fragmentation, and degradation (Factor A); (2) overexploitation due to hunting and collecting of eggs and chicks (Factor B); (3) predation (Factor C); (4) inadequacy of regulatory mechanisms to reduce the threats to the species (Factor D); and (5) small population size and isolation of remaining populations (Factor E).

The direct loss of habitat through widespread deforestation and conversion of primary forests to human settlement and agricultural uses has led to the fragmentation of habitat throughout the range of the blue-billed curassow and isolation of the remaining populations (Factor A). The species' historic range, which encompassed approximately 106,700 km^2 (41,197 mi^2), has been reduced to 2,090 km^2 (807 mi^2). Experts estimate that 88 percent of this habitat loss has occurred within the last 30 years, or three generations. The best available information indicates that the species' population was reduced by 50 percent in the 30 years prior to 2002 and that ongoing habitat destruction and degradation are continuing at a rate that would lead to the extinction of the blue-billed curassow within the next 30 years if measures are not taken to ameliorate the loss of habitat. Thus, habitat loss poses an imminent threat of extinction and is a factor that currently endangers the species.

The blue-billed curassow is hunted or collected, whole or in parts, in all life stages (eggs, juveniles, adults, feathers, and other body parts) throughout its current range by both indigenous people and by local settlers for both sustenance and sport; for domestic use in rituals; and for sale to tourists (Factor B). Several life-history traits of the species contribute to its vulnerability to hunting and collection: Its large size, ease of location during breeding season, trusting nature, low productivity (1–2 eggs), and a replacement rate of 6 years (taking an individual of the species an average of 6 years to replace itself). Adults are hunted mainly during the breeding season, when males are most vulnerable and more easily located by their loud mating calls that are audible at long distances. The direct take of males disrupts sex ratios in this species, which forms monogamous pairs, and this take also disrupts mating activities. Hunting pressure has caused severe depletion or near extirpation in portions of its historical range, despite the continued availability of suitable habitat (primary forest). The effects of hunting are exacerbated by ongoing habitat fragmentation (Factor A), which increases accessibility into the species' habitat, rendering it more vulnerable to hunting. Concomitantly, increased conversion of primary forest habitat has encouraged further human settlement within the blue-billed curassow's habitat. Hunting poses an imminent threat of extinction and is a factor that currently endangers the species.

Blue-billed curassows are vulnerable to predation by generalist predators, including snakes, foxes, feral cats, feral dogs, and raptors (Factor C). Habitat fragmentation (Factor A) contributes to this vulnerability, because research indicates that predation increases with increased habitat fragmentation and smaller patch sizes. Predation leads to the direct removal of eggs, juveniles, and adults from the population, exacerbating risks associated with the species' small population size (see below). Predation can destroy pair bonds and remove potentially reproductive adults from the breeding pool. The blue-billed curassow is slow to reproduce and produces a low clutch size, and predation exacerbates this species' already poor replacement rate (see Habitat and Life History).

The threats from habitat destruction, hunting, and predation are compounded by the species' small population size (Factor E). The blue-billed curassow's population has been reduced by 50 percent within the last 30 years. The species' low population estimate of fewer than 2,000 individuals, combined with its restricted, fragmented, and isolated habitat, makes the species particularly vulnerable to numerous human factors (e.g., agricultural development, armed conflict, fire, dams and reservoir development, increased human settlement, illicit drug production and control, mining activities, oil development and distribution, and road development).

Further, the species' reticence to cross large open areas makes it unlikely that the species would repopulate suitable habitat without human intervention in remaining isolated forest patches that are separated by large distances, all of which put the species at a risk of extinction.

Finally, despite numerous laws and regulatory mechanisms (Factor D) to administer and manage wildlife and their habitats, on-the-ground enforcement of these laws and oversight of the local jurisdictions implementing and regulating activities within the species' habitat are inadequate to mitigate the effects of habitat loss (Factor A) and hunting (Factor B). Habitat destruction and hunting continues within the species' range and, aside from El Paujíl Bird Preserve, no other areas provide effective protective measures for protecting the blue-billed curassow from ongoing hunting or its habitat from ongoing destruction.

We have carefully assessed the best available scientific and commercial information regarding the past, present, and potential future threats faced by the blue-billed curassow. We conclude that the ongoing threats to the blue-billed curassow, habitat destruction (Factor A), hunting (Factor B), and predation (Factor C), exacerbated by the species' small population size and limited dispersal ability (Factor E), and compounded by inadequate regulatory mechanisms to mitigate these threats (Factor D), to be equally present and of the same magnitude throughout the species' entire current range. We further conclude, based on the best available scientific and commercial information, that the magnitude of these threats are of an extent that places the species in danger of extinction at this time. Therefore, on the basis of our analysis of the best available scientific and commercial information, we conclude that the blue-billed curassow is endangered throughout its range, and thus should be designated an endangered species under the Act.

Brown-Banded Antpitta (Grallaria Milleri)

Species Description

The brown-banded antpitta is a member of the ground-antbird Family (Formicariidae), is approximately 18 cm (7 in) long from bill to tail, and endemic to the west slope of the central Andes of Colombia (Krabbe and Schulenberg 2003, p. 682; Fjeldså and Krabbe 1990, p. 414; Hilty and Brown 1986, p. 422). The species is locally known as ''Tororoi'' (Beltrán and Kattan 2002). This bird is a uniform dark brown, with a dingy white throat and underbelly.

Taxonomy

The brown-banded antpitta was first taxonomically described by Chapman in 1911 and placed in the Ground-Antbird Family (Formicariidae). The type specimen (the actual specimen that was first described by Chapman) was obtained from Laguneta (Quindío Department) (Beltrán and Kattan 2002, p. 327). Laguneta is, therefore, referred to as the ''type locality.''

Habitat and Life History

The brown-banded antpitta currently inhabits the humid understory and forest floor habitats of mid-montane and cloud forests between 2,400 and 2,600 m (7,874 and 8,530 ft) with high density of herbaceous plants and shrubs (Krabbe and Schulenberg 2003, p. 719; Kattan and Beltrán 1999, p. 272). The species has been observed in older (30-year-old) secondary-growth forest habitats and alder (*Alnus acuminata*) plantations (Cuervo 2002, pp. 326–327; Krabbe and Schulenberg 2003, p. 719).

Researchers consider antpitta life histories to be among the least known of Neotropical bird species (Dobbs *et al.* 2001, p. 225). The brown-banded antpitta, as with other antpittas, is a secretive species, with a low population density and high habitat specificity (Kattan and Beltrán 2002, p. 232). Antpittas are considered to be nearly flightless (Krabbe and Schulenberg 2003, p. 698) and their dispersal capabilities are not well known (Cuervo 2002, p. 327), except that one banded individual traveled a distance of 0.041 km^2 (0.02 mi^2) (Kattan and Beltrán 2002, p. 234). This ground-dwelling species lives either singly or in pairs (Beltrán and Kattan 2002, p. 327) and has a high territorial fidelity (Cuervo 2002, p. 327). It can be seen running along the forest floor picking up prey (Krabbe and Schulenberg 2003, p. 719), which apparently consists of beetles (*Coleoptera* spp.) and earthworms.

Nothing is known about the brown-banded antpitta's reproductive ecology, except that its peak reproductive period is between March and May (Beltrán and Kattan 2002, pp. 326–327) and that both parents feed the young (del Hoyo 2003, p. 719). Drawing from studies on similar species, including the Colombian species, scaled antpitta (*Grallaria guatimalensis*) and chestnut-crowned antpitta (*Grallaria ruficapilla*), the species tend to nest on fallen logs, on the forks of tree trunks, or atop the crowns of low-growing palms, situated at nearly groundlevel to no higher than 3 m (10 ft) off the ground (Dobbs *et al.* 2001, p. 226; Wiedenfeld 1982, p. 581). The typical clutch size for antpittas is considered to be two eggs (Dobbs *et al.* 2001, p. 227; Wiedenfeld 1982, p. 581). Antpitta nests are roughly circular cups, loosely constructed of dead leaves that are generally hard to distinguish from the surroundings (Dobbs *et al.* 2001, p. 227; Wiedenfeld 1982, p. 581). Antpittas appear to rely on camouflage, both to hide the location of their nests (Wiedenfeld 1982, p. 580), as well as in response to disturbance, when birds remain absolutely still to avoid detection by potential predators (Dobbs *et al.* 2001, p. 226).

Historical Range and Distribution

The brown-banded antpitta was historically known from a single location, near Laguneta in the central Andes (centrally located in the Department of Quindío), which ranges in altitude from 1,859 m (6,100 ft) in the surrounding valleys to 3,140 m (10,300 ft) at its highest point (Chapman 1917, pp. 35–36, 396). In 1917, the valley leading to Laguneta was described as gently rising until about 2,530 m (8,300 ft), when the terrain rose steeply up to 2,896 ft (9,500 ft). The vegetation was described as open, with scattered palms and little other vegetation until about 2,835 m (9,300 ft), where the forest began (Chapman 1917, p. 36). At 3,140 m (10,300 ft), the forest was described as dense with little undergrowth, except in occasional clearings dominated by dense shrubs so thick as to be impenetrable without a knife (Chapman 1917, p. 35). Eleven specimens were collected between 1911 and 1942; the species was last observed and collections were made at the type locality at Laguneta in 1942 (Beltrán and Kattan 2002, p. 325; Collar *et al.* 1992, p. 698).

Chapman (1917, p. 36) described the practice of slash-and-burn agriculture around Laguneta in 1917, noting that much of the hillside between 2,530 and 2,835 m (8,300–9,300 ft) was bare and close-cropped, having been burned and cleared. By 1994, the forested area providing habitat for the brown-banded antpitta in and around the type locality near Laguneta had been mostly destroyed (Collar *et al.* 1994, p. 136), and despite subsequent surveys (in 1986, 1988, and 1991), the species was not observed. In 1992, researchers considered the brown-banded antpitta to be locally extirpated, if not extinct throughout its range (Cuervo 2002, pp. 326–327; Kattan and Beltrán 1997, pp. 367–369; Collar *et al.* 1992, p. 689). Although the brown-banded antpitta was rediscovered in 1994 (Kattan and Beltrán 1997, pp. 367–369), researchers

continue to consider the species to be locally extinct (extirpated) from its type locality of Laguneta (Quindío Department) (Beltrán 2002 *in litt.,* as cited in Beltrán and Kattan, p. 327) due to extensive deforestation (Beltrán and Kattan 2002, p. 327).

Current Range and Distribution

The current range of the brown-banded antpitta is described as humid understory and forest floors of mid-montane and cloud forests, preferring altitudes between 2,400 and 2,600 m (7,874 and 8,530 ft), in areas with a high density of herbs and shrubs (Krabbe and Schulenberg 2003, p. 719; Kattan and Beltrán 1999, p. 272). The current range is estimated to be 300 km² (116 mi²) (BLI 2007f, p. 1). The species is known today from only three areas in the upper Río Magdalena valley. The first area is the humid forests in the Central Andes of Colombia's Ucumarí Regional Park (Risaralda Department), where it was first sighted in 1994 (Kattan and Beltrán 1997, pp. 369–370) and recently observed in 2000 (Beltrán and Kattan 2002, p. 326). The site is approximately 44 km² (17 mi²) in the Otún River watershed (Kattan and Beltrán 1999, p. 273). The second area is the southeastern slope of Volcán Tolima in the Río Toche Valley on private land (the house of La Carbonera) (Tolima Department), where it was first observed in 1998 and recently observed in 2000 (Beltrán and Kattan 2002, p. 325). This location is 0.05 km² (0.02 mi²) in size at elevations ranging from 2,750 to 2,900 m (9,022 to 9,514 ft) (Beltrán and Kattan 2002, p. 326). The third area is the Río Blanco river basin (Caldas Department), where it was most recently observed in 2000 (Beltrán and Kattan 2002, p. 326). This site is a strip of land less than 200 linear km (124 linear mi) on the Central Cordilla, between 2,300 and 3,100 m (7,546 and 10,171 ft) in elevation (BLI 2004c, p. 2; Kattan and Beltrán 2002, p. 238). Experts consider the most important refuges for this species to be: (1) The Ucumarí Regional Park (Risaralda Department), (2) the Río Toche Valley (Tolima), (3) the Río Blanco river basin (Caldas Department), and (4) the Reserve of Cañon and Quindío Departments, where suitable habitat exists but the species may be extirpated. These refugia are further discussed under Factor A, below.

Population Estimates

There have been few quantitative surveys of the brown-banded antpitta. Available population information is provided for the four areas considered to be important refugia for the species (as discussed in Factor A). The population located within the Ucumarí Regional Park has been surveyed twice. In the first survey, conducted from 1994 to 1997, 11 brown-banded antpittas were captured and banded. In a subsequent survey of a 0.17–1 km² (0.07–0.62 mi²) area within the Ucumarí Regional Park during 1995 to 2000, Kattan and Beltrán (2002, pp. 232–233) captured and banded 36 brown-banded antpittas. Based on these surveys, the subpopulation within the 0.63 km² (0.24 mi²) Park was estimated to include up to 106 individuals, averaging approximately 1.3 individuals per 0.01 km² (0.004 mi²) (Kattan and Beltrán 1999, p. 276; Kattan and Beltrán 1997, pp. 367–369). Thus, this subpopulation contains at least 36, and possibly as many as 106 individuals.

Qualitative surveys conducted from 1998 to 2000 in the Río Toche Valley determined that the brown-banded antpitta is uncommon and local (Beltrán and Kattan 2002, p. 326). One individual was observed in 1999 (Cuervo *in litt.,* as cited in Beltrán (2002 p. 326). There is no information on the estimated population size of brown-banded antpitta within the Río Toche. Thus, this subpopulation contains at least one individual, but there is no estimate of the upper limit of the population.

A census of the population in the Río Blanco river basin was undertaken in June 2000, within an approximately 5 km (3 mi) transect. Researchers inferred the presence of at least 30 individuals, based on vocalizations they elicited in response to recordings of the species' alarm call (Beltrán and Kattan 2002, p. 326). There is no information on the estimated population size of brown-banded antpitta within the Río Blanco area. Thus, this population may contain 30 individuals, but the upper limit of the population estimate is unknown.

The species is not currently known to inhabit the Reserve del Cañon del Quindío. Although the species was observed there in 1911 and 1942 (Beltrán and Kattan 2002, p. 325; Collar *et al.* 1992, p. 698) and the area contains suitable habitat, the species has not been observed there since 1942 (Beltrán and Kattan 2002, p. 235).

The IUCN estimates that the largest subpopulation contains 424 individuals (BLI 2007f, p. 4), but it is unclear as to which subpopulation this estimate refers. The global population of brown-banded antpitta is estimated by the IUCN to be larger than 250 individuals, but not more than 999 birds (BLI 2007f, p. 1), equating to approximately 338 to 756 individuals (BLI 2007f, p. 4). It is estimated that the species has lost up to 9 percent of its population in the last 10 years, or 3 generations, and that this rate of decline will continue over the next 10 years (BLI 2007f, p. 4). Additional information on the population size of this species is provided in the discussion of Factor E, below.

Conservation Status

The brown-banded antpitta is identified as an endangered species under Colombian law pursuant to paragraph 23 of Article 5 of the Law 99 of 1993, as outlined in Resolution No. 584 of 2002 (EcoLex 2002, p. 12). The IUCN has classified the species as 'Endangered' since 1994 because it is known from very few locations and occupies a very small range (BLI 2004c, p. 1).

Summary of Factors Affecting the Brown-Banded Antpitta

Factor A: The Present or Threatened Destruction, Modification, or Curtailment of the Habitat or Range

The brown-banded antpitta inhabits the humid understory and forest floor habitats of mid-montane and cloud forests between 1,800 and 2,600 m (5,905 and 8,530 ft) that have a high density of herbs and shrubs (Krabbe and Schulenberg 2003, p. 719; Kattan and Beltrán 1999, p. 272). The current range is estimated to be 300 km² (116 mi²) (BLI 2007f, p. 1), and the species is known today in only three locations: (1) Ucumarí Regional Park (Kattan and Beltrán 1997, pp. 369–370) (Risaralda Department), (2) the southeastern slope of Volcán Tolima in the Río Toche Valley (Tolima Department), and (3) the Río Blanco catchment (Caldas Department). These locations are discussed further under Refugia, below.

Deforestation

Colombia has experienced extensive deforestation in the last half of the 20th Century as a result of habitat conversion for human settlements, road building, agriculture, and timber extraction. A 23-year study, from 1973 to 1996, demonstrated that these activities reduced the amount of primary forest cover in Colombia by approximately 3,605 hectares (ha) (8,908 acres (ac)) annually, representing a nearly one-third total loss of primary forest habitat (Viña *et al.* 2004, pp. 123–124). Beginning in the 1980s, habitat loss increased dramatically as a result of influxes of people settling in formerly pristine areas (Perz *et al.* 2005, pp. 26–28; Viña *et al.* 2004, p. 124). More recent studies indicate that the rate of habitat destruction is accelerating. Between the years 1990 and 2005, Colombia lost approximately 52,800 ha (130,471 ac) of

primary forest annually (Butler 2006a, pp. 1–3; FAO 2003a, p. 1). Human activities, such as encroachment, cultivation, grazing, and infrastructural development, have resulted in extensive deforestation and environmental degradation of primary forests in the Río Magdalena valley, part of the brown-banded antpitta's range (Cuervo and Salaman 1999, p. 8; Ocampo and Botero 2000, pp. 76–78). These studies and activities in Colombia are described in greater detail under Factor A for the blue-billed curassow, above.

A study conducted on the effects of habitat fragmentation on Andean birds within western Colombia determined that 31 percent of the historical bird populations in western Colombia had become extinct or locally extirpated by 1990, largely as a result of habitat fragmentation from deforestation and human encroachment (Kattan and Álvarez-Lopez 1996, p. 5; Kattan *et al.* 1994, p. 141). Deforestation has led to local extirpation of the brown-banded antpitta in its type locality, near Laguneta in the central Andes (Quindío Department), where the natural vegetation has been reduced to 10 percent of its former area (Beltrán 2002 *in litt.,* as cited in Beltrán and Kattan, p. 327). Deforestation continues in mid-montane and cloud forests in the Departments Caldas and Risaralda, where this species has been observed (Dolphijn 2005, p. 2). Human encroachment and ongoing deforestation throughout this species' current range are discussed under Refugia, below.

In addition to the direct detrimental effect of habitat loss, there are several indirect effects of habitat disturbance and fragmentation (Brooks and Strahl 2000, p. 10; Silva and Strahl 1991, p. 38). Roads create barriers to animal movement, expose animals to traffic hazards, and increase human access to habitat, facilitating further exploitation and habitat destruction (Hunter 1996, pp. 158–159). Researchers have observed that road building and other infrastructure improvements in previously remote forested areas have increased accessibility and facilitated further habitat destruction, exploitation, and human settlement (Etter *et al.* 2006, p. 1; Álvarez 2005, p. 2,042; Cárdenas and Rodríguez Becerra 2004, pp. 125–130; Viña *et al.* 2004, pp. 118–119; Hunter 1996, pp. 158–159).

Illegal Crops and Their Eradication

Illegal drug crops are cultivated within the brown-banded antpitta's range. In 2003, nearly 80 percent of the heroin entering the United States came from opium (*Papaver somniferum*) farms in the Department of Tolima (Forero and Weiner 2003, p. 1). Cocaine cultivation occurs in other parts of the species' range. In 2003, authorities first detected cocaine cultivation in Caldas, traditionally the center of the Colombian coffee-growing industry; it was estimated that less than 1 km^2 of land was under cocaine cultivation (0.54 km^2 (0.21 mi^2)). By 2004, cultivation had risen 563 percent, covering a 36-km^2 (14-mi^2) area (UNODC and GOC 2005, p. 27). Coca crops deplete the soil of nutrients, which hampers regeneration following abandonment of fields (Van Schoik and Schulberg 1993, p. 21). Drug eradication efforts in Colombia have further degraded and destroyed primary forest habitat by using nonspecific aerial herbicides to destroy illegal crops (Álvarez 2005, p. 2,042; BLI 2007d, p. 3; Cárdenas and Rodríguez Becerra 2004, p. 355; Oldham and Massey 2002, pp. 9–12). Herbicide spraying has introduced harmful chemicals into brown-banded antpitta habitat and has led to further destruction of the habitat by forcing illicit growers to move to new, previously untouched forested areas (Álvarez 2007, pp. 133–143; BLI 2007d, p. 3; Álvarez 2005, p. 2,042; Cárdenas and Rodríguez Becerra 2004, p. 355; Álvarez 2002, pp. 1,088–1,093; Oldham and Massey 2002, pp. 9–12). Between 1998 and 2002, cultivation of illicit crops increased by 21 percent each year, with a concomitant increase in deforestation of formerly pristine areas of approximately 60 percent (Álvarez 2002, pp. 1,088–1,093).

Refugia

The most important refugia for the brown-banded antpitta include: (1) Ucumarí Regional Park, (2) the Río Toche Valley, (3) the Río Blanco catchment, and (4) Reserva Departamental del Cañon del Quindío. These refugia are discussed below.

(1) Ucumarí Regional Park (Risaralda Department) covers an area of approximately 44 km^2 (17 mi^2) in the Otún River watershed, with elevations ranging from 1,700 to 2,600 m (5,577 to 8,530 ft) (Beltrán and Kattan 2002, pp. 325–326; Kattan *et al.* 2006, pp. 301–302; Kattan and Beltrán 1999, p. 273). The brown-banded antpitta prefers habitat within the upper range limits of this Park, at altitudes between 2,400 and 2,600 m (7,874 and 8,530 ft) (Krabbe and Schulenberg 2003, p. 719; Kattan and Beltrán 1999, p. 272). Most of the forested habitat within the park was cleared in the 1960s for cattle ranching, leaving the remaining natural forests only on the steepest slopes (Kattan and Beltrán 1999, p. 273). Much of the Park has been allowed to naturally regenerate, and plantations of alder (*Alnus acuminata*) and ash (*Fraxinus chinensis)* are overgrown with natural vegetation (Kattan and Beltrán 1997, p. 369). The Park also contains a small area of private pasturelands (Kattan and Beltrán 1997, p. 369), and agricultural expansion, selective logging, and firewood collection are ongoing in the region (BLI 2008a, p. 1).

(2) In Río Toche Valley (Tolima Department), on the southeastern slope of Volcán Tolima, the brown-banded antpitta is considered uncommon and local (Beltrán and Kattan 2002, p. 326; BLI 2004c, p. 2; Kattan and Beltrán 2002, p. 238). This habitat is described as fragmented, and it is estimated that the natural cover has been reduced by 15 percent at elevations between 1,900 and 3,200 m (6,234 and 10,499 ft). The majority of suitable habitat is above 2,200 m (7,218 ft) in elevation, and Kattan and Beltrán (2002, p. 238) consider it to be of sufficient size to support a population of brown-banded antpitta, making this an important area of suitable habitat for the species (p. 327).

(3) Río Blanco catchment (Caldas Department) comprises a strip less than 200 km (124 mi) long on the Central Cordilla, between 2,300 and 3,100 m (7,546 and 10,171 ft) (BLI 2004c, p. 2; Beltrán and Kattan 2002, pp. 325, 238). The area is considered to be of sufficient size to support the species (Kattan and Beltrán 2002, p. 238). However, the species has been observed at this location only once, in the year 2000 (Beltrán and Kattan 2002, p. 328).

(4) Reserva Departamental del Cañon del Quindío (Quindío Department): The Department of Conservation and Management of Alto Quindío owns and manages this 56 km^2 (22 mi^2) reserve, which ranges in elevation from 2,600 to 4,000 m (ft) (8,530 to 13,123 ft) (Corporación Autónoma Regional del Quindío 2008). The type locality for the brown-banded antpitta (Laguneta) is located in the Department of Quindío (Beltrán and Kattan 2002, p. 325). Beltrán and Kattan (2002, pp. 238, 327) believe that this Reserve comprises habitat suitable for the brown-banded antpitta (as described under Current Range, above) and represents an important habitat conservation area for the species (Beltrán and Kattan 2002, p. 327). However, the species has not been observed in Quindío since 1942 (Beltrán and Kattan 2002, p. 325; Collar *et al.* 1992, p. 698) and is considered to be locally extinct there (Beltrán 2002 *in litt.,* as cited in Beltrán and Kattan 2002, p. 327).

Nearly all the other forested habitat below 3,300 m (10,827 ft) in the Central Andes where the brown-banded antpitta occurred historically has been deforested and cleared for agricultural land use (BLI 2004c, p. 2). The remaining forests providing suitable habitat for the brown-banded antpitta have become fragmented and isolated, and are surrounded by or being converted to pasture and agricultural crops (e.g., coffee plantations, potatoes, and beans) (BLI 2004c, p. 2). Approximately 85 percent of forested habitat at altitudes between 1,900 m (6,234 ft) and 3,200 m (10,499 ft) has been converted to other land uses (BLI 2004c, p. 2; Cuervo 2002, p. 327; Stattersfield *et al.* 1998, p. 205). In 1998, forest conversion within the range of the brown-banded antpitta was projected to continue (Stattersfield *et al.* 1998, p. 205). Cuervo (2002, p. 328) estimated that the available suitable habitat for this species totals no more than 500 km^2 (310 mi^2); BirdLife International estimated that the species currently occupies an area 300 km^2 (116 mi^2) in size (BLI 2007f, p. 1).

Deforestation has greatly affected the current population size and distributional range of the brown-banded antpitta (Kattan and Beltrán 1997, p. 367; Collar *et al.* 1992, p. 698). The species was thought to be extinct or on the verge of extinction (Beltrán and Kattan 2002, pp. 326–327; Kattan and Beltrán 1997, pp. 367–369; Collar *et al.* 1992, p. 689), until its rediscovery in 1994 (Kattan and Beltrán 1997, pp. 367–369). The brown-banded antpitta is now confirmed within three localities, including the Ucumarí Regional Park, the Río Toche Valley, and the Río Blanco basin. These habitats are characterized as heterogeneous and fragmented (Beltrán and Kattan 2002, p. 327; Kattan and Beltrán 2002, p. 237). The species is considered extirpated from its type locality (Beltrán 2002 *in litt.,* as cited in Beltrán and Kattan, p. 327), despite the existence of suitable habitat (Beltrán and Kattan 2002, p. 328), suggesting that the species is unable to recolonize areas from which it has been extirpated.

Summary of Factor A

The brown-banded antpitta prefers the humid understory and forest floor habitats of midmontane and cloud forests between 2,400 and 2,600 m (7,874 and 8,530 ft) and has been observed in older (30-year-old) secondary-growth forest habitats and alder plantations. Habitat destruction, alteration, conversion, and fragmentation continue to be factors affecting the brown-banded antpitta. The direct loss of habitat through widespread deforestation and conversion of primary forests for human settlement and agricultural uses has led to the habitat fragmentation throughout the brown-banded antpitta's range. Cultivation of illegal drug crops, such as cocaine, leads to further deforestation and alters soil compositions, hindering regeneration of abandoned fields. In addition, drug eradication programs involving the aerial spraying of nonspecific herbicides lead to further environmental degradation and destruction of primary forest habitat. The current populations are small, very localized, and limited to a narrow elevational band that contains fragmented, disjunct, and isolated habitat. The species does not appear capable of recolonizing areas of suitable habitat that are isolated from extant locations (see Factor E, Likelihood to Disperse).

Historically, the species was known only in one location, near Laguneta, which had been reduced to 10 percent of its original vegetative cover by 1994. Currently, the species' range is estimated to be 300 km^2. The destruction and fragmentation of the remaining primary forested habitat is expected to continue, with ongoing human encroachment bringing increased population pressures and drug crop production, along with infrastructural improvements that facilitate encroachment into previously inaccessible areas. Therefore, we find that the present destruction, modification, and curtailment of habitat are a threat to the brown-banded antpitta throughout all of its range.

Factor B: Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

We are not aware of any information currently available that addresses the occurrence of overutilization that may be causing a decline of the brown-banded antpitta. Therefore, we do not consider overutilization for commercial, recreational, scientific, or educational purposes to be a threat to the brown-banded antpitta.

Factor C: Disease or Predation

We are unaware of information regarding disease or the potential for significant disease outbreaks in the brown-banded antpitta. As a result, we do not consider disease to be impacting the status of the species in the wild.

Both terrestrial and avian predators prey upon antpittas, including the mountain coati (*Nasuella olivacea*), tayra (*Eira barbara*—in the weasel family), squirrel cuckoo (*Piaya cayana*), and crimson-rumped toucanet (*Aulacorhynchus haematopygus*) (Dobbs *et al.* 2001, p. 231). Brown-banded antpittas are a ground-dwelling, nearly flightless species (Krabbe and Schulenberg 2003, p. 719; Beltrán and Kattan 2002, p. 327). Antpittas generally react nonconfrontationally in response to potential predators, relying on camouflage as a defense mechanism. Nesting birds rarely call from atop their nests (Wiedenfeld 1982, p. 580); they rely on their cryptic plumage and remain still to avoid detection when potential predators approach (Dobbs *et al.* 2001, pp. 226, 230). As discussed in detail above for the blue-billed curassow (Factor C, Predation), research on Andean understory nesting birds that are similar to the ground-dwelling brown-banded antpitta (Beltrán and Kattan 2002, p. 327) indicated that predation rates increase in isolated and fragmented forest habitats, especially smaller forest patches that facilitate predator access to the understory (Keyser 2002, p. 186; Renjifo 1999, p. 1,133; Wilcove 1985, p. 1,214; Keyser *et al.* 1998, p. 991; Arango-Vélez and Kattan 1997, p. 138; Hoover *et al.* 1995, p. 151; Gibbs 1991, p. 157).

Summary of Factor C

Mountain coatis, tayras, squirrel cuckoos, and crimson-rumped toucanets are known antpitta predators. Predation results in the direct removal of eggs, juveniles, and adults from the population. The brown-banded antpitta produces a low clutch size (see Habitat and Life History), and predation can remove potentially reproductive adults from the breeding pool. Moreover, habitat fragmentation has occurred and is ongoing throughout the brown-banded antpitta's range (Factor A). Studies on similar species in similar Andean habitats indicate that vulnerability to predation increases with increased habitat fragmentation and smaller patch sizes. The brown-banded antpitta does not have sophisticated antipredator response mechanisms, making this species particularly vulnerable to an increased risk of predation. Predation exacerbates the genetic complications associated with the species' small population size (Factor E). Because of the species' small population size and inability to recolonize isolated habitat fragments (Factor E), predation renders the species vulnerable to local extirpation. Therefore, we find that predation, exacerbated by ongoing habitat destruction (Factor A), is a threat to the brown-banded antpitta.

Factor D: The Inadequacy of Existing Regulatory Mechanisms

Regulatory mechanisms may provide species-specific or habitat-specific protections. An evaluation of the adequacy of regulatory mechanisms within Colombia to mitigate or remove the threats to the brown-banded antpitta is provided below, beginning with species-specific and followed by habitat-specific protection mechanisms.

Colombia has enacted numerous laws to protect species and their habitats (Matallana-T 2005, p. 121). The brown-banded antpitta is listed as an endangered species under Colombian Law 99 of 1993 (EcoLex 1993, p. 2) and Resolution No. 584 of 2002 (EcoLex 2002, pp. 10, 12). A full description of these laws and the categorization of threatened species in Colombia were provided above, as part of the Factor D analysis for the blue-billed curassow. This threat status confers protections upon the species, including protection from commercial take under Resolution No. 849 of 1973 and Resolution No. 787 of 1977 (EcoLex 1977, p. 3; EcoLex 1973, p. 1). Hunting is not a threat to this species. Therefore, this law is not effective at reducing the primary threat to the species—habitat destruction.

Colombia has enacted numerous forestry laws and forestry management practices (Law No. 2 (EcoLex 1959); Decree No. 2,811 (Faolex 1974); Decree No. 1,791 (Faolex 1996); Law No. 1,021 (EcoLex 2006)). Weaknesses in the implementation of these laws and the decentralized nature of Colombian resource management are described in detail above for the blue-billed curassow (Factor D) (ITTO 2006, pp. 218–219, 222; Matallana-T 2005, pp. 121–122). The brown-banded antpitta ranges in multiple Departments (currently known in Risaralda, Caldas, and Tolima), all of which are administered by different autonomous corporations. Habitat destruction, the primary threat to the brown-banded antpitta, is ongoing throughout the species' range (Factor A). The lack of a national conservation strategy for the brown-banded antpitta, combined with decentralized natural resource management in Colombia, may hamper conservation of the brown-banded antpitta. The existing laws and the decentralized nature of forestry management are ineffective at protecting the brown-banded antpitta and its habitat even within protected areas (Brooks and Gonzalez-Garcia 2001, p. 183).

Colombia has several categories of national habitat protection (Matallana-T 2005, pp. 121–122), which were described above, as part of the Factor D analysis for the blue-billed curassow (Matallana-T 2005, pp. 121–122). Of the four areas identified as refugia for the brown-banded antpitta, two are considered protected areas under Colombian law: (1) The Ucumarí Regional Park and (2) Reserva del Cañon del Quindío.

(1) The Ucumarí Regional Park (Risaralda Department) is managed by the Corporación Autónoma Regional de Risaralda (CARDER) (BLI 2008a, p. 3), with the primary goals of conservation and ecotourism. The Park is managed for multiple uses, including agriculture and cattle grazing (BLI 2008a, p. 1), and includes recreation and commercial areas for activities such as camping and freshwater fishing (CARDER 1995, pp. 3–4). According to the management plan for the Park that was instituted in 1995, recreational and commercial activities are permitted only when they do not significantly alter the environment (CARDER 1995, pp. 3–4). However, according to BirdLife International (2008a, p. 3), there has been little in the way of conservation planning, and the habitat within the protected area continues to undergo pressures from agricultural expansion, firewood collection, and selective cutting. Consequently, the threat from habitat destruction (Factor A) is not reduced or ameliorated.

(2) Reserva del Cañon del Quindío (Quindío Department) is managed by the Corporación Autónoma Regional del Quindío (2008, p. 1). According to the management plan for the Department of Quindío (*www.crq.gov.co/documentos/PAT_CRQ_2007_2009.pdf*), between 2007 and 2009, forestry planning commenced for the entire Department with the goal of completing forest plans for four different areas within the Department by the end of 2009. However we are unaware of any information indicating that this planning process has been completed, or what protections may exist for brown-banded antpitta habitat within this Reserve. Moreover, as discussed under Factor A, although this Reserve contains suitable habitat for the brown-banded antpitta (Beltrán and Kattan 2002, p. 328), there are no known populations of the brown-banded antpitta within this Reserve (Beltrán and Kattan 2002, p. 325; Collar *et al.* 1992, p. 698). Therefore, the threat from habitat destruction (Factor A) is not reduced or ameliorated within this area.

Summary of Factor D

Colombia has numerous laws and regulatory mechanisms to administer and manage wildlife and their habitats. The brown-banded antpitta is listed as endangered under Colombian law and lives within forested or protected areas that are regulated by law. However, on-the-ground enforcement of existing wildlife protection and forestry laws and oversight of the local jurisdictions implementing and regulating activities are ineffective at mitigating the primary threat to the brown-banded antpitta. As discussed for Factor A, habitat destruction, degradation, and fragmentation continue throughout the existing range of the brown-banded antpitta. Under Colombian law, there are two protected areas containing suitable habitat for the brown-banded antpitta. The species is known to occur in only one of these areas, wherein resources are managed for commercial and recreational uses. Conservation planning within both areas is lacking, so that the existence of these protected areas does not mitigate the threat of habitat loss. Therefore, we find that the existing regulatory mechanisms currently in place are inadequate to mitigate the primary threats to the brown-banded antpitta.

Factor E: Other Natural or Manmade Factors Affecting the Continued Existence of the Species

Two additional factors affect the brown-banded antpitta: Its likelihood to disperse and small population size.

Likelihood To Disperse

The brown-banded antpitta exhibits several characteristics indicative of its vulnerability to local extirpation and inability to recolonize previously inhabited locations, despite the presence of suitable habitat. This ground-dwelling species (Beltrán and Kattan 2002, p. 327) has a high territorial fidelity and, although dispersal capabilities are not well-known (Cuervo 2002, p. 327), except those in the banding study by Kattan and Beltrán (2002, p. 234), the farthest known distance traveled by any one individual bird was 0.041 km^2 (0.02 mi^2). This suggests that the brown-banded antpitta is unable to repopulate an isolated patch of suitable habitat following decline or local extirpation of that patch (Cuervo and Salaman 1999, p. 7; Hanski 1998, pp. 45–46). The local extirpation of this species from its type locality in Laguneta, Quindío (Beltrán and Kattan 2002, p. 327), and the lack of recolonization despite the existence of suitable habitat in the Cañon del Quindío Reserve, support the hypothesis that the species may be incapable of dispersing to suitable habitat fragments without human intervention. To the best of our knowledge, there are no recovery or

reintroduction programs in place for this species.

Small Population Size

There have been few quantitative studies of brown-banded antpitta populations. A total of 48 individuals have been directly observed at 2 locations (Ucumarí Regional Park and Río Toche) (Cuervo *in litt.,* as cited in Beltrán 2002 p. 326; Kattan and Beltrán 2002, pp. 232–233; Kattan and Beltrán 1999, p. 276; Kattan and Beltrán 1997, pp. 367–369), 30 have been inferred at 1 location (Río Blanco) (Beltrán and Kattan 2002, p. 326), and up to 106 have been predicted to occur in 1 subpopulation within the brown-banded antpitta's current range (Ucumarí Regional Park) (Kattan and Beltrán 2002, pp. 232–233; Kattan and Beltrán 1999, p. 276; Kattan and Beltrán 1997, pp. 367–369). From work at Ucumarí Regional Park, Kattan and Beltrán (Kattan and Beltrán 1999, p. 276; Kattan and Beltrán 1997, pp. 367–369) predicted a population density of approximately 1.3 individuals per .01 km^2 (0.004 mi^2).

The IUCN has estimated the brown-banded antpitta's total population size to be more than 250 and fewer than 999 adult individuals in a 300-km^2 (116-mi^2) area (BLI 2007f, p. 1). However, this is a categorical approximation based on the following extrapolation: An expected average of 2.5 to 5.6 individuals per square kilometer multiplied by 45 percent of the extent of occurrence (300 km^2) (116 mi^2) (BLI 2007f, p. 1), leading to estimated population numbers between 338 and 756 individuals (BLI 2007f, p. 4). While this density is well within Kattan and Beltrán's (Kattan and Beltrán 1999, p. 276; Kattan and Beltrán 1997, pp. 367–369) predicted population density of 1.3 individuals per .01 km^2 (116 mi^2), it should be noted that extrapolating population sizes based on the availability of suitable habitat may result in an overestimate for the brown-banded antpitta for several reasons: (1) The species may not be randomly distributed within the given habitat; (2) extrapolation does not take into account human-induced threats, such as disturbance or hunting; and (3) not all individuals within the population are breeding at any one time, so that the actual number of individuals contributing to population growth will be a smaller number than the total number of individuals.

In a review by Jetz *et al.* (2008, p. 110) of 1,158 well-studied bird species in Australia, North America, and southern Africa, Jetz *et al.* (2008, p. 115) found that most species occurred in only 40–70 percent of the predicted range. They further noted that narrow-ranging species, such as the brown-banded antpitta, are particularly subject to population size overestimation, because they are unlikely to be randomly distributed within the habitat (Jetz *et al.* 2008, p. 116). Moreover, at-risk species, existing in declining, fragmented populations (as is the case for the brown-banded antpitta), are often absent from suitable but suboptimal habitat, thus exacerbating range overestimates (Jetz *et al.* 2008, p. 115). For instance, although suitable habitat exists in the species' type locality (Laguneta) in the Cañon del Quindío Reserve, the species has not been observed there since 1942 and is considered extirpated from this locality (Beltrán and Kattan 2002, p. 327; Collar *et al.* 1992, p. 698). Thus, the species appears to be incapable of repopulating suitable habitat on its own accord (Jetz *et al.* 2008, p. 115; Beltrán and Kattan 2002, p. 328) and the existence of suitable habitat does not connote the presence of the species.

This conclusion is supported by Beltrán and Kattan (2002, p. 328), who noted that, out of a potential habitat of 855 km^2 (330 mi^2), the species did not occupy two of the seven historical localities, prompting them to reduce the estimated area of occupancy to no more than 500 km^2. Thus, ground-truthing is essential to accurate population-size estimations. The IUCN is reviewing this situation to improve upon conservation assessments (Jetz *et al.* 2008, p. 117), and although it may be an overestimate, the figure ranging from 338 to 756 individuals represents the best information on population size.

Based on genetic considerations, in the absence of quantitative studies specific to this species, a generally accepted approximation of minimum viable population size is described by the 50/500 rule (Shaffer 1981, p. 133; Soulé 1980, pp. 160–162). According to this rule, the minimum viable population size is defined as the minimum number of individuals that is sufficient to respond over time to unexpected environmental conditions within the species' habitat (Shaffer 1981, pp. 132–133; Soulé 1980, pp. 160–162). This rule states that an effective population size (N_e) of 50 individuals is the minimum size required to avoid imminent risks from inbreeding. N_e represents the number of animals in a population that actually contribute to reproduction, and is often much smaller than the census, or total number of individuals in the population (N). Furthermore, the rule states that the long-term fitness of a population requires a N_e of at least 500 individuals, so that it will not lose its genetic diversity over time and will maintain an enhanced capacity to adapt to changing conditions. Therefore, an analysis of the fitness of this population would be a good indicator of the species' overall survivability. The available information for 2007 indicates that the total global population of the brown-banded antpitta may range between 338 and 756 individuals (BLI 2007f, p. 4); 338 is above the minimum effective population size required to avoid risks from inbreeding (N_e = 50), and 756 is above the upper threshold for long-term fitness (N_e = 500).

Given that the global population size is a qualitative assessment that may be an overestimate, that the actual number of breeding pairs is unknown but smaller than this number, and that the species exists in subpopulations that are unlikely to disperse into other locations, it is beneficial to analyze the fitness of the subpopulations that have been quantitatively assessed. The best-studied subpopulation is located within the Ucumarí Regional Park. A total of 47 individuals have been directly observed, and researchers estimate that the area may support as many as 106 individuals (Kattan and Beltrán 2002, pp. 232–233; Kattan and Beltrán 1999, p. 276; Kattan and Beltrán 1997, pp. 367–369). Forty-seven is just below the minimum effective population size required to avoid risks from inbreeding (N_e = 50 individuals). Moreover, the upper estimate of 106 individuals (not all of which will be reproducing) is approximately one-fifth of the upper threshold (N_e = 500 individuals) required for long-term fitness of a population that will not lose its genetic diversity over time and will maintain an enhanced capacity to adapt to changing conditions. Therefore, we currently consider the species to be at risk due to the lack of near- and long-term viability.

Small population sizes render species vulnerable to genetic risks that can have individual or population-level consequences on the genetic level and can increase the species' susceptibility to demographic problems, as explained in more detail above for the blue-billed curassow (Factor E, Small Population Size) (Charlesworth and Charlesworth 1987, p. 238; Shaffer 1981, p. 131). Once a population is reduced below a certain number of individuals, it tends to rapidly decline toward extinction (Holsinger 2000, pp. 64–65; Soulé 1987, p. 181; Gilpin and Soulé 1986, p. 25; Franklin 1980, pp. 147–148).

The brown-banded antpitta's restricted range, combined with its small population size (Cuervo 2002, p. 138; Cuervo and Salaman 1999, p. 7; del

Hoyo 1994, p. 361) and low prospect for dispersal (BLI 2004c, p. 2; Beltrán and Kattan 2002, p. 326; Kattan and Beltrán 2002, p. 238; Cuervo and Salaman 1999, p. 7; del Hoyo 1994, p. 361; Kattan and Beltrán 1997, pp. 369–370; Kattan and Beltrán 1999, p. 273) makes the species particularly vulnerable to the threat of adverse natural (e.g., genetic, demographic, or stochastic) and manmade (e.g., habitat alteration and destruction) events that destroy individuals and their habitats (Brooks and Gonzalez-Garcia 2001, pp. 185–190; Holsinger 2000, pp. 64–65; Young and Clarke 2000, pp. 361–366; Primack 1998, pp. 279–308;).

Summary of Factor E

The brown-banded antpitta's small population size increases its vulnerability to genetic risks associated with small population sizes that negatively impact the species' long-term viability and increase the possibility of localized extirpations of the remaining fragmented populations. Further, the species is unlikely to repopulate areas of suitable habitat from which it has been locally extirpated because it exhibits high territorial fidelity and has never repopulated suitable existing habitat within the Department of Quindío, where the species' type locality (Laguneta) is located and the species has not been observed since 1942. Consequently, we believe that, in combination with the risks to the species from habitat destruction (Factor A) and predation (Factor C), the brown-banded antpitta is vulnerable to localized extirpation or extinction from which the species would be unable to recover, due to its small population size and apparent inability to repopulate fragmented, isolated habitats such as that currently present within this species' range.

Brown-Banded Antpitta Status Determination

The four primary factors that threaten the survival of the brown-banded antpitta are: (1) Habitat destruction, fragmentation, and degradation (Factor A); (2) predation (Factor C); (3) inadequacy of regulatory mechanisms to reduce the threats to the species (Factor D); and (4) small population size and isolation of remaining populations (Factor E).

The direct loss of habitat through widespread deforestation and conversion of primary forests to human settlement and agricultural uses has led to the fragmentation of habitat throughout the range of the brown-banded antpitta and isolation of the remaining populations. The species has been locally extirpated in its type locality and has experienced a 55 percent reduction of suitable habitat, and its range is estimated to be 300 km^2 (116 mi^2).

Brown-banded antpittas are vulnerable to predation by mountain coatis, tayras, squirrel cuckoos, and crimson-rumped toucanets (Factor C). Habitat fragmentation (Factor A) contributes to this vulnerability, because research indicates that predation increases with increased habitat fragmentation and smaller patch sizes. Predation leads to the direct removal of eggs, juveniles, and adults from the population, exacerbating risks associated with the species' small population size and the risk of local extirpation (Factor E). Brown-banded antpittas, as with other antpittas, produce a low clutch size (see Habitat and Life History), and predation can destroy pair bonds and remove potentially reproductive adults from the breeding pool.

The threats from habitat destruction (Factor A) and predation (Factor C) are compounded by the species' small population size (Factor E). The brown-banded antpitta has undergone a population decline that is closely associated with a reduction in range caused by habitat destruction (Factor A). The brown-banded antpitta's small population size of between 338 and 756 individuals is likely to be an overestimate based on the fact that population sizes for narrow-ranging species are typically overestimated when based on extent of occurrence. The species' subpopulations, one of which is estimated to include only 46 to 106 individuals, are isolated from each other. The species' confirmed absence from suitable habitat within its historic range, combined with the species' high territorial fidelity, suggests that the species is incapable of repopulating suitable habitat without human intervention. We are unaware of any reintroduction or recovery programs for this species. The species' small population size increases its vulnerability to natural and human factors (e.g., genetic isolation, agricultural development, increased human settlement, and road development) that could lead to local extirpation, which the species has already experienced in its type locality due to habitat destruction. Within the last three generations, or 10 years, the brown-banded antpitta has undergone up to a 9 percent reduction in population size and, at the current level of habitat destruction, this rate of decline is projected to continue over the next 10 years. Below a certain number, species' populations are unable to recover and, given the small number and isolated nature of existing brown-banded antpitta populations, such reductions in numbers could lead to extinction of the brown-banded antpitta.

Although Colombia has adopted numerous laws and regulatory mechanisms to administer and manage wildlife and their habitats, on-the-ground enforcement of these laws and oversight of the local jurisdictions implementing and regulating activities are inadequate to address the primary threat to this species, which is habitat loss (Factor A). Several populations of brown-banded antpitta are within sanctuaries or preserves; however, habitat destruction and hunting continues within these areas, and regulations are not uniformly enforced, monitoring is limited, and management plans are not developed or implemented, resulting in ineffective protective measures for conservation of the species.

We have carefully assessed the best available scientific and commercial information regarding the past, present, and potential future threats faced by the brown-banded antpitta. We consider the ongoing threats to the brown-banded antpitta, habitat destruction (Factor A) and predation (Factor C), exacerbated by the species' small population size and limited dispersal ability (Factor E), and compounded by inadequate regulatory mechanisms to mitigate these threats (Factor D), to be equally present and of the same magnitude throughout the species' entire current range. Based on this information, we find that the brown-banded antpitta is in danger of extinction throughout all of its range.

Cauca Guan (Penelope perspicax) Biology and Distribution

Species Description

The Cauca guan, a member of the Cracid family, is endemic to the central and western slopes of the Andes of Colombia (Delacour and Amadon 2004, pp. 133–135; Brooks and Strahl 2000, p. 13; Hilty and Brown 1986, p. 125). It is a large bird, measuring approximately 76 cm (30 in) in length (Hilty and Brown 1986, p. 125). The species is locally known as ''Pava Caucana'' (Rios *et al.* 2006, p. 17; Renjifo 2002, p. 124). The Cauca guan is described as a ''drab'' brown-gray, with a chestnut-colored rear part and tail, and a bright red dewlap (a flap of skin hanging beneath its lower jaw) (BLI 2007h, p. 1).

Taxonomy

The Cauca guan was first taxonomically described by Bangs in

1911 and placed in the Cracidae family (BLI 2007h, p. 1).

Habitat and Life History

The Cauca guan has been observed in mature tropical humid forests and in fragmented secondary forests, forest edges, and plantations of the exotic Chinese ash (*Fraxinus chinensis*) trees that are located within 1 km (0.62 mi) of primary forest (Kattan *et al.* 2006, p. 299; Rios *et al.* 2006, pp. 17–18; Renjifo 2002, p. 127). Older reports indicate that the species once inhabited dry forests in the Cauca, Patía, and Dagua River valleys (Renjifo 2002, p. 126). The Cauca guan requires large territories for foraging (Kattan 2004, p. 11), but today is relegated mostly to small forest fragments (Kattan *et al.* 2006, p. 301). This species, as with other guans, tends to aggregate within its habitat, generally based on resource availability. For instance, Cauca guans tend to congregate around fruit trees at certain times of year. Thus, depending on the time of year, improper sampling might tend to overestimate or underestimate the population (Kattan *et al.* 2006, p. 305). Cauca guans are reportedly timid in the presence of humans (Rios *et al.* 2006, p. 21).

Cauca guans feed mostly on fruit and leaves (including those of the nonnative Chinese ash trees) and occasionally on invertebrates and flowers (Muñoz *et al.* 2006, p. 49; Rios *et al.* 2006, pp. 17–18; Renjifo 2002, p. 127). Although primarily terrestrial, the species is occasionally found in the upper stories of forests obtaining food. Because fruit availability within a forest is spatially and temporally variable, guans must undergo regional movements in pursuit of fruiting plants. The species is usually found singly, in pairs, or in groups of up to six individuals. The largest recorded gathering of Cauca guans was 30 individuals (Rios *et al.* 2006, p. 16). There are two breeding seasons coinciding with the rainy seasons, one at the beginning of the year and another in August (Rios *et al.* 2006, p. 17). Nests are circular cups made of leaves and small branches (Renjifo 2002, p. 127), and the typical clutch size is two eggs, which is considered low. Guans remain paired during the breeding period and until chicks are 1 year in age; this is considered a long fledging period (Rios *et al.* 2006, p. 17). Cracids are also slow to reproduce, with a replacement rate of at least 6 years (Silva and Strahl 1991, p. 50).

Historical Range and Distribution

The Cauca guan's historical distribution included the east slopes of the West Andes and the Cauca, Patía, and Dagua Valleys, in the Departments of Cauca, Quindío, Risaralda, and Valle de Cauca. The historic range is estimated to have been approximately 24,900 km² (9,614 mi²) (Renjifo 2002, p. 128). In the early part of the 20th Century, the Cauca guan inhabited the dry forests of the Cauca, Dagua, and Patía Valleys (Renjifo 2002, p. 128). The Cauca Valley lies between the central and western Andes and spans the Departments of Cauca, Valle de Cauca, Quindío, and Risaralda (WWF 2001a, p. 1). The Dagua Valley lies on the Pacific side of the western Andes, in Valle de Cauca; it is described as an isolated valley of dry forest that changes in elevation from 400 to 2,000 m (1,312 to 6,562 ft) and is surrounded at upper elevations by humid forest to the west and cloud forest to the north, south, and east (Silva 2003, p. 4). The Patía Valley lies between the central and western Andes in the Department of Cauca, in southwestern Colombia; it has a mean altitude of 600–900 m (1,969–2,953 ft) (WWF 2001c, p. 1). This area was once covered in wetlands, humid forests, and dry forests. Today, most of the dry forests have been eliminated and highly fragmented, such that continuous forest exists only above 2,000 m (6,562 ft) (Renjifo 2002, p. 128).

From the beginning of the 20th Century through the 1950s, the species was considered common (BLI 2007h, p. 1; Renjifo 2002, p. 126). Between the 1970s and 1980s, there was extensive deforestation in the Cauca Valley, and the species went unobserved during this time, leading researchers to suspect that the Cauca guan was either extinct or on the verge of extinction (Brooks and Strahl 2000, p. 14; del Hoyo 1994, pp. 337, 349; Hilty and Brown 1986, p. 125; Hilty 1985, p. 1,004). The species was rediscovered in 1987 (Renjifo 2002, p. 124).

Current Range and Distribution

Today, the Cauca guan inhabits the eastern and western slopes of the West and Central Andes Mountain ranges, in the Departments of Cauca, Quindío, Risaralda, and Valle de Cauca (BLI 2007h, p. 1; Kattan *et al.* 2006, pp. 299, 301; Renjifo 2002, pp. 124–126). Since 1987, most observations of this species have been at elevations ranging from 1,400 to 2,000 m (4,593 to 6,562 ft) (Renjifo 2002, pp. 124–125), with an occasional sighting at altitudes well below (i.e., 816 m (2,677 ft)) or well above (i.e., 2,690 m (8,825 ft)) this altitudinal range (Muñoz *et al.* 2006, p. 54; Rios *et al.* 2006, p. 17; Renjifo 2002, pp. 124–125). The Ucumarí Regional Park is considered the stronghold of the species (BLI 2007h, p. 1) (see Population Estimates).

The habitat consists primarily of forest fragments, and although continuous cover remains at elevations above 2,000 m (6,562 ft) (Kattan *et al.* 2006, p. 303), researchers have not ascertained whether the species inhabits these higher-altitude contiguous forest areas (Renjifo 2002, p. 129). The current range of the species totals less than 750 km² (290 mi²), of which only 560 km² (216 mi²) is considered suitable habitat (BLI 2007h, p. 1; Kattan *et al.* 2006, p. 299; Rios *et al.* 2006, p. 17).

Population Estimates

Cauca guan populations are characterized as small, ranging from only tens of individuals or, in rare instances, hundreds (Renjifo 2002, p. 12). BirdLife International reported that the largest subpopulation contained an estimated 50 to 249 individuals; however, they do not specify to which population this refers, and these figures are not found in any of the other literature regarding population surveys of the Cauca guan. Ucumarí Regional Park has been considered the stronghold of the species (BLI 2007h, p. 1). Sixteen individuals were counted in 1990, and the species was characterized as ''common'' in plantations in 1994–1995 (Wege and Long 1995, p. 141). Since then, there have been scant sightings of Cauca guan there (Renjifo 2002, p. 125; Wege and Long 1995, p. 141), including the observation of one individual in the Park in 2004 (Scanlon 2004, pp. 1–3). There have been no population surveys within the Park to determine the species' current population size therein.

Munchique National Natural Park (Cauca) is considered to be the most important locality for this species in the southern portion of its range because of the extensive remaining forest habitat, although habitat destruction is ongoing there (see Factor A). The species was last recorded in Munchique in 1987, but has not been confirmed there since (Kattan *et al.* 2006, p. 305; Muñoz *et al.* 2006, p. 54; Salaman *in litt.* 1999, 2000, as cited in BLI 2007h, p. 2).

Kattan *et al.* (2006, p. 302) conducted the only two population surveys in 2000 and 2001 (Muñoz *et al.* 2006 p. 55). They estimated population densities at two locations, Otún-Quimbaya Flora and Fauna Sanctuary (Risaralda) and Reserva Forestal de Yotoco (Valle de Cauca), to be 144–264 individuals and 35–61 individuals, respectively (Kattan *et al.* 2006, p. 304). Kattan *et al.* (2006, p. 302) also examined 10 additional localities, based on locality data reported by Renjifo (2002, pp. 124–125). Visual confirmations were made at only

2 of the 10 localities (Reserva La Sirena and Chorro de Plata, both in the Department of Valle de Cauca), where the extent and occurrence of the populations have yet to be determined (Kattan *et al.* 2006, p. 303). Auditory confirmations were made at 5 of the 10 localities, including: La Zulia, Chicoral, Las Brisas, San Antonio, and Planes de San Rafael (Kattan *et al.* 2006, p. 302).

In 2006, Kattan (*in litt.,* as cited in Muñoz *et al.* 2006 p. 55) estimated the global population to be between 196 and 342 individuals. The IUCN has placed the Cauca guan in the population category ranging from 250 to no more than 1,000 (BLI 2007h, pp. 1, 3). Overall, the population is considered to be in decline (BLI 2007h, p. 2; Kattan 2004, p. 6; Renjifo 2002, p. 129).

Conservation Status

The Cauca guan is listed as endangered under Colombian law (EcoLex 2002, p. 12). The IUCN categorizes the species as 'Endangered' due to its small, contracted range composed of widely fragmented patches of habitat (BLI 2004e, p. 1).

Summary of Factors Affecting the Cauca Guan

Factor A: The Present or Threatened Destruction, Modification, or Curtailment of the Habitat or Range

Historically, Cauca guans were considered common (BLI 2007h, p. 1; Renjifo 2002, p. 126). They inhabited the eastern slopes of the west Andes and the dry forests of the Cauca, Dagua, and Patía Valleys, in the Departments of Cauca, Quindío, and Valle del Cauca (Renjifo 2002, p. 124) (see Historical Distribution, above), in a range extending over approximately 24,900 km^2 (9,614 mi^2). Extensive habitat destruction and fragmentation since the 1950s has resulted in an estimated 95 percent range reduction (Chapman 1917, p. 195; Collar *et al.* 1992, p. 126; Kattan *et al.* 2006, p. 299; Renjifo 2002, pp. 126–127; Rios *et al.* 2006, p. 17). As a result, although it prefers mature tropical humid forests, the Cauca guan exists primarily in fragmented and isolated secondary forest remnants, forest edges, and in feral plantations of the exotic Chinese ash trees that are located within 1 km (0.62 mi) of primary forest (Kattan *et al.* 2006, p. 299; Renjifo 2002, p. 127; Rios *et al.* 2006, pp. 17–18). Its current range is estimated to be less than 750 km^2 (290 mi^2), of which only 560 km^2 (216 mi^2) is considered suitable habitat (BLI 2007h, p. 2; Kattan *et al.* 2006, p. 299; Rios *et al.* 2006, p. 17). It is estimated that more than 30 percent of this loss of habitat has occurred within the last three generations, or 30 years (Renjifo 2002, p. 129).

Deforestation

Colombia has experienced extensive deforestation in the last half of the 20th Century as a result of habitat conversion for human settlements, road building, agriculture, and timber extraction. A 23-year study, from 1973 to 1996, demonstrated that these activities reduced the amount of primary forest cover in Colombia by approximately 3,605 ha (8,908 ac) annually, representing a nearly one-third total loss of primary forest habitat (Viña *et al.* 2004, pp. 123–124). Beginning in the 1980s, habitat loss increased dramatically as a result of influxes of people settling in formerly pristine areas (Perz *et al.* 2005, pp. 26–28; Viña *et al.* 2004, p. 124). More recent studies indicate that the rate of habitat destruction is accelerating. During the period 1990–2005, Colombia lost approximately 52,800 ha (130,471 ac) of primary forest annually (Butler 2006a, pp. 1–3; FAO 2003a, p. 1). These studies and activities are described in greater detail under Factor A for the blue-billed curassow, above.

Human-induced deforestation and environmental degradation have caused the Cauca guan to shift its range and elevational distribution to the few remaining forest remnants. The Cauca guan was once considered to occur only on the eastern slopes of the West Andes and Cauca, Patía, and Dagua Valleys (Renjifo 2002, p. 128). Today, the species occurs on the western slopes of the central and western Andes of Colombia (BLI 2007h, p. 1; Kattan *et al.* 2006, p. 299; Delacour and Amadon 2004, p. 135; Renjifo 2002, p. 124). During the latter half of the 20th Century, much of the lower-elevation forests in the Río Cauca Valley, where the species was observed most often between 1937 and 1963, were deforested (Renjifo 2002, p. 124). Habitat destruction and alteration in the sub-Andean slopes around the Cauca, Dagua, and Patía Valleys has left only a few hundred hectares (100 hectares = 1 km^2 = 0.39 mi^2) of isolated, small, fragmented forest remnants, and the Cauca guan is absent from most of these fragments (Renjifo 2002, p. 128). The species has been extirpated from the Cauca and Dagua Valleys, but may still exist in patches within the Patía Valley (Renjifo 2002, p. 128). Beginning in 1989, the species was observed several times in the Department of Risaralda, in an area and at elevations that were not part of the species' historic range, but represent the extreme fringe of its former range (Renjifo 2002, pp. 124–125).

Habitat destruction and alteration, in addition to shifting the species to the fringes of its former range, have caused the Cauca guan to shift in its altitudinal distribution (Cuervo and Salaman 1999, p. 8). Nearly all the forested habitat below 3,300 m (10,827 ft) in the Central Andes, where the Cauca guan occurs today, has been deforested and cleared for agricultural land use, such as pasture, coffee plantations, potatoes, and beans (BLI 2004c, p. 2). Approximately 85 percent of forested habitat at altitudes between 1,900 m (6,234 ft) and 3,200 m (10,499 ft) has been converted to other land uses (BLI 2004c, p. 2; Cuervo 2002, p. 327; Stattersfield *et al.* 1998, p. 205). By 1994, in Quindío, extensive deforestation at elevations between 1,800 and 2,600 m (5,905 and 8,530 ft) led to the destruction of much of the Cauca guan's preferred habitat of mature humid forests (Collar *et al.* 1994, p. 136). Prior to the species' rediscovery in 1987, its altitudinal range was between 1,300 and 2,100 m (4,265 and 6,890 ft) (del Hoyo 1994, p. 349; Hilty and Brown 1986, p. 125), with occasional sightings at lower elevations in the Patía Valley (between 642 and 650 m (2,106 and 2,133 ft) (Renjifo 2002, pp. 124–125; Hilty and Brown 1986, p. 125).

Since 1987, the Cauca guan has been observed only in the remaining and much-restricted forest remnants of the following Departments: Cauca (in the years 1987, 1989, and 1992), Quindío (1995–1997), Risaralda (1989, 1995–1997, 2000, 2001), and Valle de Cauca (1988, 1999, 2000) (Delacour and Amadon 2004, p. 135; Kattan *et al.* 2006, p. 299; Renjifo 2002, pp. 124–125). Renjifo (2002, pp. 124–125) provided detailed observation records indicating that reports since 1987 ranged in altitude between one sighting at 900 m (2,953 ft) in the Patía Valley in 1992, and the rest between 1,350 and 2,690 m (4,429 and 8,825 ft). In 2006, Muñoz *et al.* (2006, p. 54) reported the species' range as being between 1,200 and 2,600 m (3,937 and 8,530 ft), and Rios *et al.* (2006, p. 17) reported the species' range as 1,000–2,500 m (3,281–8,202 ft). These ranges are consistent with recent observations of the species. Kattan *et al.* (2006, pp. 299, 301) reported its range as 1,000–2,000 m (3,281–6,562 ft), noting that recent sightings at higher elevations demonstrated that the species has shifted its altitudinal range, as deforestation throughout much of Cauca, Dagua, and Patía Valley has left only isolated forest fragments remaining at elevations below 2,000 m (6,562 ft).

Although continuous cover remains in some locations above 2,000 m (6,562 ft) (Kattan *et al.* 2006, p. 303), researchers are uncertain whether the species inhabits these areas (Renjifo 2002, p. 129). The midmontane and cloud forests in the Department of Risaralda, where this species was observed as recently as the year 2000 (Renjifo 2002, p. 124), continue to undergo deforestation (Dolphijn 2005, p. 2). In Cauca, timber extraction and mining are ongoing (Urueña *et al.* 2006, p. 42). Deforestation and habitat alteration are ongoing throughout the Cauca guan's limited range of 560 km² (216 mi²).

Illegal Crops and Their Eradication

Cocaine and opium have been cultivated throughout the Cauca guan's range. The cultivation of illegal crops (including coca and opium) in Colombia destroys montane forests (Balslev 1993, p. 3). Coca production destroys the soil quality by causing the soil to become more acidic, which depletes the soil nutrients and ultimately impedes the regrowth of secondary forests in abandoned fields (Van Schoik and Schulberg 1993, p. 21). As of 2004, the estimated total amount of land under cultivation for cocaine equaled 80,000 ha (197,683 ac); 4,000 ha (9,884 ac) of land are under opium cultivation (UNODC *et al.* 2007, pp. 7–8). These figures include habitat within the Cauca guan's range. Between 2003 and 2004, cocaine cultivation areas decreased from 1,445 to 1,266 ha (3,571 to 3,128 ac) in Cauca, and increased 22 percent from 37 ha (91 ac) to 45 ha (111 ac) in Valle de Cauca (UNODC and GOC 2005, p. 15). At the same time, opium cultivation decreased in Cauca from 600 ha (1,483 ac) to 450 ha (1,112 ac) (UNODC 2005, p. 50).

Colombia continues to be the leading coca bush producer (UNODC *et al.* 2007, p. 7). However, since 2003, cocaine cultivation has remained stable at about 800 km² (309 mi²) of land under cultivation (UNODC *et al.* 2007, p. 8). This is attributed, in part, to the implementation of alternative development projects, which encourage people to pursue alternative vocations to planting illegal crops (UNODC *et al.* 2007, p. 77). In 2004, the United Nations Office on Drugs and Crime and the Government of Colombia reported that no coca had been cultivated in the Departments of Quindío and Risaralda since the year 2000 (UNODC and GOC 2005, p. 48). This was attributed to alternative development programs being implemented between 1999 and 2007, for which US$200,000 was provided to Quindío and US$800,000 to Risaralda (UNODC and GOC 2005, p. 48). During the same period, at least US$12.1 million was spent in alternative development programs in Cauca, where coca production decreased, and another 1.6 million was spent in Valle de Cauca, where coca production increased (UNODC and GOC 2005, p. 48).

This stabilization of the amount of land under cultivation for illegal drug crops is also attributed to heightened eradication efforts. Between 2002 and 2004, aerial spraying occurred over more than 1,300 km² (502 mi²) annually, peaking in 2004, when 1,360 km² (525 mi²) of illicit crops were sprayed (UNODC and GOC 2005, p. 11). In 2006, eradication efforts were undertaken on over 2,130 km² (822 mi²) of land, consisting of 1,720 km² (664 mi²) of land being sprayed and manual eradication being used on the remaining land. Eradication efforts undertaken in 2006 occurred over an area representing 2.7 times more land than the net cultivation area (UNODC *et al.* 2007, p. 8). In Cauca alone, 1,811 ha (4,475 ac) of coca fields and 435 ha (1,075 ac) of opium fields were sprayed or manually eradicated in 2004 (UNODC 2005, p. 66).

Drug eradication efforts in Colombia have further degraded and destroyed primary forest habitat by using nonspecific aerial herbicides to destroy illegal crops (BLI 2007d, p. 3; Álvarez 2005, p. 2,042; Cárdenas and Rodríguez Becerra 2004, p. 355; Oldham and Massey 2002, pp. 9–12). Herbicide spraying has introduced harmful chemicals into Cauca guan habitat and has led to further destruction of the habitat by forcing illicit growers to move to new, previously untouched forested areas (Álvarez 2007, pp. 133–143; BLI 2007d, p. 3; Álvarez 2005, p. 2,042; Cárdenas and Rodríguez Becerra 2004, p. 355; Oldham and Massey 2002, pp. 9–12; Álvarez 2002, pp. 1,088–1,093). Between 1998 and 2002, cultivation of illicit crops increased 21 percent each year, with a concomitant increase in deforestation of formerly pristine areas of approximately 60 percent (Álvarez 2002, pp. 1,088–1,093).

Effects of Habitat Fragmentation

The Cauca guan requires large territories for foraging (Kattan 2004, p. 11), but today is relegated mostly to small forest fragments (Kattan *et al.* 2006, p. 301), making it more susceptible to habitat disturbance, further fragmentation, and destruction from human activity (Brooks and Strahl 2000, p. 10; Silva and Strahl 1991, p. 38).

An analysis of the effects of habitat fragmentation on Andean birds within western Colombia established that 31 percent of the historical bird populations in western Colombia had become extinct or locally extirpated by 1990, largely as a result of habitat fragmentation from deforestation caused by human encroachment (Kattan and Álvarez-Lopez 1996, p. 5; Kattan *et al.* 1994, p. 141). Kattan and Álvarez-Lopez (1996, pp. 5–6) also identified two conditions that increase a species' vulnerability to extinction or local extirpation as a result of habitat fragmentation: (1) Species at the upper or lower limit of their altitudinal distribution (which is the case for the Cauca guan) are more susceptible to local extirpation and extinction, and (2) large fruit-eating birds with limited distributions and narrow habitat preferences were most vulnerable to extinction (also the case for the Cauca guan). Deforestation has eradicated the Cauca guan from much of its historic range and has led to local extirpation (Kattan *et al.* 2006, p. 299; Collar *et al.* 1994, pp. 61–62) in the Cauca and Dagua Valleys (Renjifo 2002, p. 128), such as in San Antonio (Valle de Cauca), where the species has not been observed since 1917 (Renjifo 2002, p. 124). Moreover, in light of the species' characteristics, the Cauca guan is unlikely to repopulate an isolated patch of suitable habitat following decline or local extirpation (see Factor E, Likelihood to Disperse).

The Cauca guan, as with other cracids, is susceptible to indirect effects of habitat disturbance and fragmentation (Brooks and Strahl 2000, p. 10; Silva and Strahl 1991, p. 38). A study conducted in northwestern Colombia demonstrated that habitat destruction and fragmentation may increase a species' vulnerability to predation (Arango-Vélez and Kattan 1997, pp. 140–142) (Factor C). In addition, habitat fragmentation, combined with continuing human encroachment, increases the species' vulnerability to hunting (Factor B). Habitat fragmentation may affect population densities by shifting the availability of resources, such as food (Kattan *et al.* 2006, p. 305). Habitat fragmentation also compounds problems for species with small population sizes, such as the Cauca guan, which has an estimated population between 196 and 342 individuals (Kattan *in litt.,* as cited in Muñoz *et al.* 2006 p. 55) (Factor E).

Refugia

The Cauca guan has recently been confirmed in the following locations: (1) Otún-Quimbaya Flora and Fauna Sanctuary; (2) Reserva La Sirena; (3) Reserva Forestal de Yotoco; (4) Chorro

de Plata; and (5) Munchique National Natural Park (Kattan *et al.* 2006, pp. 299, 305; Delacour and Amadon 2004, p. 135; Renjifo 2002, pp. 124–125). These locations are discussed below.

(1) Otún-Quimbaya Flora and Fauna Sanctuary (Department of Risaralda), a 4.9-km² (1.9-mi²) reserve in the Department of Risaralda, contains a habitat mosaic of old-growth fragments and regenerating secondary forests, including abandoned ash plantations that cover 0.18 km² (0.07 mi²) (Kattan *et al.* 2006, p. 303; CARDER 2000, p. 1; Kattan and Beltrán 1997, p. 369). Most of the forested habitat in the area was cleared in the 1960s for cattle ranching, leaving the remaining natural forests only on the steepest slopes (Kattan and Beltrán 1999, p. 273). In population surveys conducted by Kattan *et al.* (2006, p. 304) in 2000 and 2001, this subpopulation was estimated to include between 144 and 264 individuals. Kattan (2004, pp. 12–13) also advised that the Otún-Quimbaya Sanctuary was not large enough to provide the space and resources needed to sustain a viable Cauca guan population.

This Sanctuary is adjacent to the Ucumarí Regional Park (Kattan *et al.* 2006, p. 302), which covers an area of approximately 44 km² (17 mi²), with elevations ranging from 1,700 to 2,600 m (5,577 to 8,530 ft) (Kattan and Beltrán 1999, p. 273; Kattan *et al.* 2006, pp. 301–302). Ucumarí Regional Park has been considered the stronghold of the species since the late 1990s (BLI 2007h, p. 1) (see Population Estimates, above). The largest number of Cauca guan individuals observed at this site was 16 in 1990 (Wege and Long 1995, p. 141), and a single individual was sighted in 2004 (Scanlon 2004, pp. 1–3); however, there have been no population surveys within the Park to determine the current population size. Subsistence hunting was reportedly prevalent within the Park in the late 1990s (Strahl *et al.* 1995, p. 81; del Hoyo 1994, p. 349; Collar *et al.* 1992, p. 60) (Factors B and D).

(2) Reserva La Sirena (Valle de Cauca) is located above 2,000 m (6,562 ft) and consists of fragmented riparian forest in various stages of succession (Kattan *et al.* 2006, pp. 302–303). Reserva La Sirena has an environmental education center, around which are located some protected areas as well as continuous forest above 2,000 m (6,562 ft). Visual confirmation of the Cauca guan was made in this locality in surveys conducted in 2000 and 2001, but the extent and occurrence of the population have yet to be determined (Kattan *et al.* 2006, p. 303).

(3) Reserva Forestal de Yotoco (Valle de Cauca) is an isolated 5.6-km² (2.16-mi²) reserve on the eastern slopes of the Western Andes, ranging in altitude from 1,400 to 1,600 m (4,593 to 5,249 ft) (Kattan *et al.* 2006, p. 302). In population surveys conducted by Kattan *et al.* (2006, p. 304) in 2000 and 2001, this subpopulation was estimated to include between 35 and 61 individuals. One of the last remaining humid tropical forests in the Valle de Cauca, the forest is mostly well-conserved, but human impacts are evidenced by an asphalt highway running through the middle of the Reserve and numerous footpaths crossing the Reserve to connect to coffee plantations, which, along with pasturelands, surround the forest (BLI 2007h, p. 13).

(4) Chorro de Plata (Valle de Cauca) is a 2-km² (0.77-mi²) forest located at 1,200 m (3,937 ft) (Kattan *et al.* 2006, p. 299; Renjifo 2002, p. 302). Visual confirmation of the Cauca guan was made in this locality in surveys conducted in 2000 and 2001, but the extent and occurrence of the population have yet to be determined (Kattan *et al.* 2006, p. 303).

(5) Munchique National Natural Park (Cauca) is considered an important locality in the southern portion of the species' range, because the species was historically seen there several times and because suitable habitat still exists there (Kattan *et al.* 2006, pp. 305–306). However, the Cauca guan has not been confirmed there since 1987 (Kattan *et al.* 2006, p. 305; Muñoz *et al.* 2006, p. 54; Salaman *in litt.* 1999, 2000, as cited in BLI 2007h, p. 2) (see Population Estimates, above). Moreover, the location of this park within the Pacific Region makes it particularly accessible and vulnerable to exploitation because of the numerous rivers in this part of the country, which facilitate movement of people and products through the region (Ojeda *et al.* 2001, pp. 308–309). In the 1960s and 1970s, the harvest of native ''naranjilla'' or ''lulo'' fruits (*Solanum quitoense*) became an important part of the local economy, which deterred logging. However, logging resumed in the 1980s after a fungal pathogen—anthracnose (*Colletotrichum acutatum*) (Caicedo and Higuera 2007, p. 41)—and invasion by a lepidopteran pest—tomato fruit borer (*Neoleucinodes elegantalis*) (Eiras and Blackmer 2003, p. 1)—destroyed the crops (BLI 2006, p. 2). Human pressures in the Pacific Region include unsustainable logging, colonization, and cash crop cultivation (Ojeda *et al.* 2001, pp. 308–309). Efforts are underway to replant lulo fruit trees to encourage a sustainable local economy, enhance local involvement in conservation, and provide technical skills for integrated pest management. However, logging is ongoing within the park, and human population pressures and associated deforestation, as well as dam construction, are ongoing in the area (BLI 2007h, p. 2).

There are several areas of suitable habitat in which the Cauca guan has not been observed, but that could serve as important potential habitat for the species (see Factor E, Likelihood to Disperse), including: (1) Bosques del Oriente del Risaralda, (2) Cañon del Rio Barbas y Bremen, (3) Finca la Betulia Reserva la Patasola,and (4) Reserva Natural Cajibío. These areas are described below.

(1) Bosques del Oriente del Risaralda (Risaralda): This 23-km² (8.9-mi²) forest is located on the western slopes of the Central Andes, in eastern Risaralda. It ranges in altitude between 1,300 and 3,800 m (5,905 and 12,467 ft). This high-altitude forest is important for the hydrology in lower-elevation areas, including the Otún-Quimbaya Flora and Fauna Sanctuary (Department of Risaralda), where the Cauca guan has been observed. The forest has been recovering from deforestation for the past 30 years and includes a contiguous patch of montane and premontane forest over 85 percent of the area. About 15 percent of the land is zoned for grazing and agriculture, leading to ongoing degradation of these deforested areas, along with conversion for human settlements within the forest (BLI 2007h, p. 6).

(2) Cañon del Rio Barbas y Bremen (Risaralda): This 51-km² (20-mi²) forest is located on the western slopes of the Central Andes. It ranges in altitude between 1,600 and 2,100 m (5,249 and 6,890 ft). This area includes most of the Reserva Forestal Bremen (BLI 2007h, p. 9), where the Cauca guan was observed several times between 1995 and 1997 (Renjifo 2002, pp. 124–125). The Bremen Forest Reserve was established in the 1970s to protect important waterways and is protected within the regional system of protected areas in the coffee-growing region. Today, the Bremen forest comprises 3.4 km² (1.31 mi²) of natural forest and 4.2 km² (1.62 mi²) of exotic plantation forests, which are now being allowed to regenerate to natural forest. A sustainable forestry management plan was implemented in 1996, and plans are underway to connect the isolated forest patches within the Cañon. Currently, the forest patches within the Cañon del Rio Barbas y Bremen are surrounded by cattle ranches and tree plantations, primarily including eucalyptus (*Eucalyptus* spp.) and Mexican weeping pine (*Pinus patula*). There is no further information on the progress of this project.

Currently, the forests located within the Cañon are isolated from each other, and urbanization, agricultural activities, and deforestation are ongoing within the area. The forest is also in close proximity to a main highway in the region—the highway between Armenia and Pereira. A survey of the Cañon in 2003 did not reconfirm the presence of the Cauca guan within this area (BLI 2007h, p. 9).

(3) Finca la Betulia Reserva la Patasola (Quindío): This 17-km² (7-mi²) forest is located on the western slopes of the Central Andes. It ranges in altitude between 2,050 and 2,600 m (6,726 and 8,530 ft). Most of this Reserve is covered by primary forest interspersed with scrub forest and streams. As of 2003, the Cauca guan has been reported but not confirmed within this Reserve. The western border of this Reserve abuts the Otún-Quimbaya Flora and Fauna Sanctuary (BLI 2007h, p. 12), where the population is estimated to be between 144 and 264 individuals (Kattan *et al.* 2006, p. 304).

(4) Reserva Natural Cajibío (Cauca): This 0.52-km² (0.2-mi²) reserve is located on the slopes of the West Andes. It ranges in altitude between 1,100 and 1,250 m (3,609 and 4,101 ft). The habitat is mainly secondary forest, interspersed with agricultural fields (sugarcane (*Saccharum officinarum*), coffee, bananas, and corn (*Zea mays*)) and cattle ranching. This Reserve has been altered by human encroachment and indiscriminate logging. The Cauca guan was not confirmed in this location in a 2003 survey (BLI 2007h, p. 15).

These refugia are limited in size, isolated from each other, and undergoing varying levels of human encroachment and deforestation (Kattan *et al.* 2006, p. 301; Renjifo 2002, p. 128; Brooks and Strahl 2000, pp. 13–14; Collar *et al.* 1994, pp. 61–62; del Hoyo 1994, pp. 337, 349). In addition, regulatory mechanisms within these areas are inadequate to protect the species from ongoing habitat destruction (Factor D).

Summary of Factor A

The habitat preferred by the Cauca guan—humid forests or secondary forests, forest edges, and plantations in proximity to humid forests—has been largely destroyed by cultivation, grazing, human settlements, road building, and other human activities. The species' range has been reduced from 24,900 km² (9,614 mi²) to approximately 560 km² (216 mi²), much of this within the past 30 years. Habitat fragmentation has isolated remaining populations, relegated the species to the edges of its former range, and led to a shift in the species' altitudinal range. Habitat destruction, alteration, conversion, and fragmentation have been factors in the Cauca guan's historical decline (which commenced in the second half of the 20th Century) and continue to be factors in the species' decline, even in areas designated as protected (see also Factor E). Therefore, we find that the present destruction, modification, and curtailment of habitat are a threat to the Cauca guan throughout all of its range.

Factor B: Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

Cracids are considered particularly vulnerable to hunting pressures and are among those species most rapidly depleted by hunting (Redford 1992, p. 419). Several factors contribute to the sensitivity of Cauca guans to hunting, including: their large size, ease of locating them during their breeding season, their trusting nature, their low productivity (1–2 eggs) relative to other Galliformes, their long generation time, their dependence upon specific habitat, and their poor dispersal qualities (Brooks 1999, p. 43; del Hoyo 1994, p. 336; Silva and Strahl 1991, p. 38). This species, as with other guans, tends to aggregate within its habitat, generally based on resource availability. For instance, Cauca guans tend to congregate around fruit trees at certain times of year (Kattan *et al.* 2006, p. 305). This aggregation of individuals may facilitate hunters in catching larger numbers of the species. Cracids are also slow to reproduce, with a replacement rate of at least 6 years (Silva and Strahl 1991, p. 50).

Cauca guans, and other cracids (e.g., chachalacas (*Ortalis* sp.), serve as major sources of protein for indigenous people (Brooks and Strahl 2000, p. 8). The Cauca guan is hunted by local residents for sustenance, although this activity is illegal (Muñoz *et al.* 2006, p. 50; Rios *et al.* 2006, pp. 22–23; Renjifo 2002, p. 128; del Hoyo 1994, p. 337) (Factor D). The species is sought after by hunters because it is the largest bird in its area of distribution (Renjifo 2002, p. 128). Rios *et al.* (2006, pp. 22–23) interviewed local settlers near the Otún-Quimbaya Flora and Fauna Sanctuary (in Risaralda), where the population is estimated to be between 144 and 264 individuals (Kattan *et al.* 2006, p. 304), who admitted to hunting the Cauca guan within the Sanctuary, claiming to take between 2 and 4 birds per month. This equates to approximately 100 Cauca guans per year (Rios *et al.* 2006, p. 23).

Subsistence hunting may play a role in the decline or possible local extirpation of the species from at least two locations. In the late 1990s, subsistence hunting was widespread in the Ucumarí Regional Park and Munchique National Natural Park (Strahl *et al.* 1995, p. 81; del Hoyo 1994, p. 349; Collar *et al.* 1992, p. 60). The Cauca guan may have been locally extirpated from the Munchique National Natural Park (Cauca) (BLI 2007h, p. 2: Renjifo 2002, p. 124), where the species was last observed in 1987 (Renjifo 2002, p. 124). Despite subsequent searches of the area (Wege and Long 1995, p. 149), there have been no recent confirmations at this locality (Kattan *et al.* 2006, p. 305; Muñoz *et al.* 2006, p. 54; Salaman *in litt.* 1999, 2000, as cited in BLI 2007h, p. 2). Ucumarí Regional Park is considered the stronghold of the Cauca guan (BLI 2007h, p. 1). Although Renjifo (2002, p. 128) notes that the species has recovered within this Park, there have only been scant reports of Cauca guan sightings there between 1994 and 2004 (Scanlon 2004, pp. 1–3; Renjifo 2002, p. 125; Wege and Long 1995, p. 141), and no population surveys have been undertaken there (see Population Estimates, above).

Habitat fragmentation and concomitant human encroachment (Factor A) have made the species' habitat more accessible and the species more vulnerable to hunting. A study conducted in French Guiana provided a quantitative estimate of the effect of hunting on a related cracid species, the black curassow (*Crax alector*) (del Hoyo 1994, p. 336). The black curassow has similar habitat requirements (undisturbed primary tropical to subtropical humid forest at 0–1,400 m (0–4,600 ft) elevation) as the Cauca guan (BLI 2007e). The estimated population density of black curassows in nonhunted areas was between 7 and 9 birds per 1 km² (0.4 mi²); in areas with intermittent hunting, the numbers fell to between 0.5 and 2.25 birds; and in areas where hunting was regular, numbers fell to between 0.5 and 0.73 birds (del Hoyo 1994, p. 336). We believe that the effects of hunting on the Cauca guan would result in similar population declines based on similarities of habitat and species characteristics.

Summary of Factor B

Cracids serve as a major food source in Colombia, and the Cauca guan, as the largest cracid living within its area of distribution, is sought after by locals. Hunting results in the direct removal of eggs, juveniles, and adults from the population. Cauca guans are slow to reproduce, produce a low clutch size,

require a long fledging period, and exhibit a poor replacement rate (see Habitat and Life History, above). Hunting can destroy pair bonds and remove potentially reproductive adults from the breeding pool. Hunting is facilitated by habitat fragmentation (Factor A), which increases access to the forest by hunters. The Cauca guan is hunted throughout its current range, including within protected areas, and hunting may be responsible for a decline or local extirpation of the species from at least two of these protected areas (Ucumarí Regional Park and Munchique National Natural Park). Therefore, we find that subsistence hunting for domestic consumption is a threat to the Cauca guan throughout its range.

Factor C: Disease or Predation

We are unaware of any information regarding disease or the potential for significant disease outbreaks in the Cauca guan populations. As a result, we do not consider disease to be a threat to the species.

Predators of cracids include snakes, foxes, feral cats, feral dogs, and raptors (Delacour and Amadon 1973). Cauca guans are also slow to reproduce, with a long fledging period (up to 1 year) and a replacement rate of at least 6 years (Rios *et al.* 2006, p. 17; Silva and Strahl 1991, p. 50). Cauca guans require large territories for foraging (Kattan 2004, p. 11), but today are relegated mostly to small forest fragments (Kattan *et al.* 2006, p. 301). As discussed in detail above for the blue-billed curassow (Factor C), studies have shown that habitat fragmentation increases the potential predation pressure within habitat fragments by facilitating the predators' access throughout the fragment and because smaller fragments support smaller predators, which tend to depredate on the more vulnerable life-history stages of the Cauca guan, eggs and juveniles (Keyser *et al.* 2002, p. 186; Renjifo 1999, p. 1,133; Keyser *et al.* 1998, p. 991; Arango-Vélez and Kattan 1997, pp. 137–143; Hoover *et al.* 1995, p. 151; Gibbs 1991, p. 157; Wilcove 1985, p. 1,214).

Summary of Factor C

Snakes, foxes, feral cats, feral dogs, and raptors are all predators of cracids. Predation results in the direct removal of eggs, juveniles, and adults from the population. Cauca guans are slow to reproduce, produce a low clutch size, require a long fledging period, and exhibit a poor replacement rate (see Habitat and Life History, above). Predation can destroy pair bonds and remove potentially reproductive adults from the breeding pool. Cauca guan habitat is fragmented and small (Factor A), and studies on similar species in similar Andean habitats indicate that vulnerability to predation by generalist predators increases with increased habitat fragmentation and smaller patch sizes. Predation exacerbates the genetic complications associated with the species' small population size (Factor E). Because of the species' small population size and inability to recolonize isolated habitat fragments (Factor E), predation renders the species vulnerable to local extirpation. Therefore, we find that predation, exacerbated by ongoing habitat destruction (Factor A) and hunting (Factor B), is a threat to the Cauca guan.

Factor D: The Inadequacy of Existing Regulatory Mechanisms

Regulatory mechanisms may provide species-specific or habitat-specific protections. An evaluation of the adequacy of regulatory mechanisms within Colombia to mitigate or remove the threats to the Cauca guan is provided below, beginning with species-specific and followed by habitat-specific protection mechanisms.

Colombia has enacted numerous laws to protect species and their habitats (Matallana-T 2005, p. 121). The Cauca guan is listed as an endangered species under Colombian Law 99 of 1993 (EcoLex 1993, p. 2) and Resolution No. 584 of 2002 (EcoLex 2002, pp. 10, 12). A full description of these laws and the categorization of threatened species in Colombia were provided above, as part of the Factor D analysis for the blue-billed curassow. This threat status confers protections upon the species, including protection from commercial take under Resolution No. 849 of 1973 and Resolution No. 787 of 1977 (EcoLex 1973, p. 1; EcoLex 1977, p. 3). Neither Resolution prohibits subsistence hunting. As discussed under Factor B, commercial and sport hunting are not threats to this species, but subsistence hunting continues to threaten the species throughout its range, including within protected areas.

Hunting may play a role in the decline or possible local extirpation of the species from two protected areas, Munchique National Natural Park and Ucumarí Regional Park, where subsistence hunting was widespread in the 1990s (Strahl *et al.* 1995, p. 81; del Hoyo 1994, p. 349; Collar *et al.* 1992, p. 60) (Factor B). Cauca guans have not been observed in Munchique National Natural Park since 1987 (BLI 2007h, p. 2: Renjifo 2002, p. 124), despite subsequent searches of the area (Wege and Long 1995, p. 149). Similarly, since 1994, there have been only scant sightings of Cauca guans in the Ucumarí Regional Park (Scanlon 2004, pp. 1–3; Renjifo 2002, p. 125; Wege and Long 1995, p. 141) (see Population Estimates, above). Researchers have indicated that local residents continue to hunt the Cauca guan despite the illegality of this activity (Muñoz *et al.* 2006, p. 50; Rios *et al.* 2006, pp. 22–23; Renjifo 2002, p. 128; del Hoyo 1994, p. 337), even within areas designated as ''protected'' under Colombian law (see also next paragraph). For instance, settlers in the Otún-Quimbaya Flora and Fauna Sanctuary admit to taking between 24 and 48 Cauca guans a year (Rios *et al.* 2006, pp. 22–23) (Factor B). Thus, these Resolutions are ineffective at reducing the existing threat of subsistence hunting to the Cauca guan.

Colombia has enacted numerous forestry laws and forestry management practices (Law No. 2 (EcoLex 1959); Decree No. 2,811 (Faolex 1974); Decree No. 1,791 (Faolex 1996); Law No. 1,021 (EcoLex 2006)). Weaknesses in the implementation of these laws and the decentralized nature of Colombian resource management are described in detail above for the blue-billed curassow (Factor D) (ITTO 2006, pp. 218–219, 222; Matallana-T 2005, pp. 121–122). Experts consider these decentralized management mechanisms ineffective at protecting the Cauca guan from habitat destruction (Factor A) or hunting (Factor B) (Muñoz *et al.* 2006, p. 50). Habitat destruction and hunting are ongoing throughout the species' range, indicating that forestry regulations are ineffective at mitigating the threats to the Cauca guan from habitat destruction (Factor A) or hunting (Factor B).

Colombia has several categories of national habitat protection (Matallana-T 2005, pp. 121–122), which were described above, as part of the Factor D analysis for the blue-billed curassow (Matallana-T 2005, pp. 121–122). The Cauca guan occurs within national parks (including the Ucumarí Regional Park, last confirmed Cauca guan sighting in 2004 (Scanlon 2004, pp. 1–3), and Munchique National Natural Park, confirmed in 1987 (Salaman *in litt.* 1999, 2000, as cited in BLI 2007h, p. 2; Kattan *et al.* 2006, p. 305; Muñoz *et al.* 2006, p. 54); reserves (Reserva Forestal de Bremen, confirmed in 1997 (Renjifo 2002, pp. 124–125), Reserva Forestal de Yotoco, confirmed in 2000–2001 (Renjifo 2002, pp. 124–125), and Reserva La Sirena, confirmed in 2000–2001 (Kattan *et al.* 2006, p. 302)); and sanctuaries (Otún-Quimbaya Flora and Fauna Sanctuary, confirmed in 2000–2001 (Kattan *et al.* 2006, p. 302)). Within the last 20 years, the Cauca guan

population may have declined or been extirpated from at least two Parks, the Munchique National Natural Park and the Ucumarí Regional Park, where the species has not been observed since 1987 (Renjifo 2002, pp. 124–125) and 2004 (Scanlon 2004, pp. 1–3), respectively. These Parks were subject to subsistence hunting in the late 1990s (Strahl *et al.* 1995, p. 81; del Hoyo 1994, p. 349; Collar *et al.* 1992, p. 60), and subsistence hunting of Cauca guan continues in these and other protected areas, such as Otún-Quimbaya Flora and Fauna Sanctuary (Rios *et al.* 2006, pp. 22–23) (Factor B). In addition, logging, population pressure, and agriculture are ongoing within these Parks. Ucumarí Regional Park, considered the stronghold for the species (BLI 2007h, p. 2), continues to be managed for multiple uses (including pasture land and other commercial ventures) (Factor A). In light of the multiple land uses allowed within the Park, and the ongoing human-induced habitat destruction, the park provides little or no protection to the species from the threat of habitat destruction (Factor A).

The Cauca guan ranges in multiple Departments (currently known in Cauca, Quindío, Risaralda, Valle de Cauca), each of which administers their own natural resources under different autonomous corporations (ITTO 2006, p. 219; Law 99 of 1993). We are unaware of any coordinated species management plan. Therefore, in view of the decentralized resource management structure, the absence of a conservation strategy for the species, the threats to the Cauca guan from habitat destruction (Factor A) and hunting (Factor B) are not mitigated.

Summary of Factor D

Colombia has numerous laws and regulatory mechanisms to administer and manage wildlife and their habitats. The Cauca guan is listed as endangered under Colombian law and occurs within several protected areas. However, on-the-ground enforcement of existing wildlife protection and forestry laws and oversight of the local jurisdictions implementing and regulating activities are ineffective at mitigating the primary threats to the Cauca guan. As discussed for Factor A, habitat destruction, degradation, and fragmentation continue throughout the existing range of the Cauca guan. As discussed for Factor B, uncontrolled subsistence hunting of the Cauca guan is ongoing and continues to negatively affect the continued existence of the species. Moreover, the lack of a species conservation strategy and the decentralized management of natural resources in Colombia provide no overall coordination in the conservation of species such as Cauca guans, which range in multiple jurisdictions. Therefore, we find that the existing regulatory mechanisms currently in place are inadequate to mitigate the primary threats to the Cauca guan.

Factor E: Other Natural or Manmade Factors Affecting the Continued Existence of the Species

Two additional factors affect the Cauca guan: Its minimal likelihood for dispersal and the species' small population size.

Likelihood To Disperse

The Cauca guan exhibits characteristics indicative of an inability to disperse into isolated habitat fragments and recolonize patches of suitable habitat that have undergone a localized extirpation. The Cauca guan prefers habitat of mature humid forests (Collar *et al.* 1994, p. 136), has generally been found only in secondary habitats that are situated within 1 km (0.62 mi) of primary forest (Renjifo 2002, p. 127), and is reported as timid in the presence of humans (Rios *et al.* 2006, p. 21). The remaining suitable habitat available to the Cauca guan is limited to a few disjunct and isolated forest fragments only a few hundred hectares (100 hectares = 1 km^2 = 0.39 mi^2) in size (Kattan *et al.* 2006, p. 301; Kattan 2004, p. 6; Renjifo 2002, p. 128).

Existing habitat for the Cauca guan is fragmented, with large distances between the remaining primary forest fragments (Cuervo and Salaman 1999, p. 7; Hanski 1998, pp. 45–46) and an ever-growing human presence in and around the species' existing habitat (BLI 2004c, p. 2; Cuervo 2002, p. 327; Renjifo 2002, pp. 124–128; Cuervo and Salaman 1999, p. 8; Stattersfield *et al.* 1998, p. 205). Without human intervention, the Cauca guan is unlikely to repopulate an isolated patch of suitable habitat following decline or local extirpation. Evidence for the Cauca guan's inability to disperse across fragmented habitat patches is provided by the fact that there are several areas of suitable habitat, located near previously reported localities for the species, in which the Cauca guan has not been observed (see Factor A, Refugia).

Small Population Size

Habitat destruction (Factor A) and hunting (Factor B) have affected the current population size and distributional range of the Cauca guan (Collar *et al.* 1994, p. 60; Collar *et al.* 1992, pp. 126–127). By the 1980s, the species was believed extinct or on the verge of extinction (Brooks and Strahl 2000, p. 14; del Hoyo 1994, pp. 337, 349; Hilty and Brown 1986, p. 125; Hilty 1985, p. 1,004). The Cauca guan is now confirmed only in several isolated locations. Overall, the population is considered to be in decline, with the current isolated populations ranging from tens of individuals to a few hundred individuals at best (BLI 2007h, p. 2; Kattan 2004, p. 6; Renjifo 2002, p. 129), but there have been few population surveys of the Cauca guan. In 2006, Kattan (*in litt.,* as cited in Muñoz *et al.* 2006, p. 55) estimated the global population to be between 196 and 342 individuals. Kattan *et al.* (2006, p. 302) conducted the only two population surveys, in 2000 and 2001 (Muñoz *et al.* 2006, p. 55). They estimated population densities at two locations, Otún-Quimbaya Flora and Fauna Sanctuary (Risaralda) and Reserva Forestal de Yotoco (Valle de Cauca), to be between 144 and 264 individuals, and 35 to 61 individuals, respectively (Kattan *et al.* 2006, p. 304).

Small population sizes render species vulnerable to genetic risks that can have individual or population-level consequences on the genetic level and can increase the species' susceptibility to demographic problems, as explained in more detail above for the blue-billed curassow (Factor E, Small Population Size) (Charlesworth and Charlesworth 1987, p. 238; Shaffer 1981, p. 131). Once a population is reduced below a certain number of individuals, it tends to rapidly decline towards extinction (Holsinger 2000, pp. 64–65; Soulé 1987, p. 181; Gilpin and Soulé 1986, p. 25; Franklin 1980, pp. 147–148).

In the absence of quantitative studies specific to this species, a general approximation of minimum viable population size is the 50/500 rule, as described above as part of the Factor E analysis for the brown-banded antpitta (Shaffer 1981, pp. 132–133; Soulé 1980, pp. 160–162). The total population size of the Cauca guan is estimated to be between 196 and 342 individuals. While 196 individuals is above the minimum population size required to avoid short-term genetic consequences, 342 falls below the threshold minimum number of 500 individuals required for long-term fitness of a population.

Moreover, because the Cauca guan exists in isolated forest fragments and is unlikely or incapable of dispersing to disjunct patches, each disjunct locality likely acts as a subpopulation. Therefore, the resiliency of each of these subpopulations will be lower than that of the global population. The largest reported subpopulation, in Otún-Quimbaya Flora and Fauna Sanctuary,

contains between 144 and 264 individuals (Kattan *et al.* 2006, p. 304). The lower figure, 144 individuals, is above the minimum effective population size required to avoid imminent risks from inbreeding (N_e = 50). The upper limit of the subpopulation, 264 birds, represents the maximum number of individuals in the subpopulation, but does not take into account that not all members of the population will be reproductive. This figure is well below the upper threshold (N_e = 500 individuals) required for long-term fitness of a population to ensure that the species will not lose its genetic diversity over time and will maintain an enhanced capacity to adapt to changing conditions. The only other subpopulation figures are for Reserva Forestal de Yotoco, with an estimated 35 to 61 individuals (Kattan *et al.* 2006, p. 304). Both of these figures are well below the 50/500 threshold. Therefore, we currently consider these subpopulations (and the species as a whole) to be at risk from genetic complications due to the lack of short- and long-term viability.

The Cauca guan's small population size, combined with its restricted range and inability to repopulate suitable habitat following local extirpations (Renjifo 2002, p. 138; Cuervo and Salaman 1999, p. 7; del Hoyo 1994, p. 361), makes the species particularly vulnerable to the threat of adverse natural (e.g., genetic, demographic, or environmental) and manmade (e.g., hunting or deforestation) events that destroy individuals and their habitat (BLI 2007, pp. 1–2; Renjifo 2002, p. 140; Holsinger 2000, pp. 64–65; Young and Clarke 2000, pp. 361–366).

Summary of Factor E

The Cauca guan is now confirmed only in several isolated locations. The Cauca guan is unlikely or incapable of dispersing into suitable habitat that is isolated from extant populations, and the species' overall small population size makes it vulnerable to genetic and demographic risks that negatively impact the species' short- and long-term viability. The Cauca guan's small population size, restricted range, and inability to repopulate suitable habitat following local extirpations expose the species to threats associated with adverse natural (e.g., genetic, demographic, or environmental) and manmade (e.g., hunting or deforestation) events that destroy individuals and their habitat. Therefore, we believe that, in combination with the risks to the species from habitat destruction (Factor A), hunting (Factor B), and predation (Factor C), the Cauca guan is vulnerable to localized extirpation or extinction from which the species would be unable to recover, due to its small population size and apparent inability to repopulate fragmented, isolated habitats such as those currently present within this species' range.

Cauca Guan Status Determination

The five primary factors that threaten the survival of the Cauca guan are: (1) Habitat destruction, fragmentation, and degradation (Factor A); (2) overexploitation due to hunting; (3) predation (Factor C); (4) inadequacy of regulatory mechanisms to reduce the threats to the species (Factor D); and (5) small population size and isolation of remaining populations (Factor E). The Cauca guan, a large, primarily terrestrial bird, prefers humid forests or secondary forests, forest edges, and plantations that are in close proximity (within 1 km (0.62 mi)) to humid forests.

Habitat destruction, alteration, conversion, and fragmentation were factors in the Cauca guan's historical decline. The species has experienced a 95 percent range reduction since the 1950s, such that the estimated suitable habitat available to the species is approximately 560 km^2 (216 mi^2). Experts estimate that more than 30 percent of this loss of habitat has occurred within the last three generations, or 30 years. Fifty years ago, the species' historic range was estimated to have been an approximately 24,900-km^2 (9,614-mi^2) area, encompassing humid forests on the eastern slopes of the West Andes and the dry forests of the Cauca, Patía, and Dagua Valleys, in the Departments of Cauca, Quindío, Risaralda, and Valle de Cauca. Today, the species has been locally extirpated from the Cauca and Dagua Valleys. The Cauca guan inhabits the western slopes of the central and western Andes in the few remaining upper-elevation forest remnants at altitudes exceeding those reported in the first half of the 20th Century. These shifts to the extremes of its range and shifts in elevational distribution have resulted from extensive habitat destruction throughout the species' range. The dry forests of the Cauca, Dauga, and Patía Valleys and the humid forests on the slopes of these valleys up to 2,000 m have been largely destroyed for cultivation, grazing, human settlements, road building, and other human-induced habitat alterations. Cultivation of illegal drug crops, such as cocaine, has led to further deforestation and altered soil compositions, hindering regeneration of abandoned fields. In addition, drug eradication programs involving the aerial spraying of nonspecific herbicides have led to further environmental degradation and habitat destruction (Factor A).

Although the Cauca guan, which is listed in Colombia as endangered, occurs on lands designated by the Colombian Government as ''protected areas,'' and it is illegal to commercially hunt the species, the existing laws and their enforcement are inadequate (Factor D) to mitigate the effects of ongoing habitat destruction (Factor A) and subsistence hunting (Factor B). Moreover, natural resource management within Colombia is highly decentralized, each district managing their resources autonomously. Thus, there is no overall coordination for the conservation and recovery of the Cauca guan, which ranges in several autonomous districts.

Widespread deforestation and conversion of primary forests has led to the fragmentation of habitat throughout the Cauca guan's range. The remaining suitable habitat is limited to a few disjunct and isolated forest fragments, only a few hundred hectares (100 hectares = 1 km^2 = 0.39 mi^2) in size. Habitat fragmentation affects resource availability for the Cauca guan, which requires large territories for foraging on its preferred food source: Seasonally available fruits. Experts believe that remaining refugia, such as the Otún-Quimbaya Sanctuary, may not be large enough to support viable populations, lacking sufficient space and resources needed for this large, terrestrial bird.

Habitat fragmentation also increases the species' susceptibility to hunting (Factor B). The Cauca guan is hunted throughout its current range. As the largest cracid living within its area of distribution, the Cauca guan is sought after by locals as a major food source. Despite being illegal (Factor D), subsistence hunting of Cauca guans continues throughout its range, including within protected areas. Hunting may be responsible for the species' local extirpation from the Ucumarí Regional Park, considered the stronghold for the species in the 1990s, and the Munchique National Natural Park.

Habitat fragmentation exposes the species to greater risk of extinction caused by adverse natural (e.g., genetic, demographic, or environmental) and manmade (e.g., hunting or deforestation) events (Factor E). At the beginning of the 20th Century through the 1950s, the species was considered common. Habitat fragmentation has led to the isolation of remaining subpopulations, which are estimated to range from tens of individuals or a few hundred individuals at most, thus affecting the

species' resiliency. The total population estimate of 196–342 individuals falls below the threshold minimum number of 500 individuals required for long-term fitness of a population. It is estimated that the species has lost up to 9 percent of its population in the last 10 years. Given that the Cauca guan is likely to interact as subpopulations and its inability to disperse between fragmented habitat patches, the species' effective population size is actually much less than the global population estimate would imply. The fitness of the subpopulations is vital to understanding the viability of the species. The largest subpopulation, estimated to contain between 144 and 264 individuals, falls below the threshold for long-term viability. The other subpopulation for which there is an estimate contains between 35 and 61 individuals, which figures are below the thresholds for both short-term and long-term viability.

Thus, the Cauca guan is at risk from both near-term genetic complications (such as inbreeding and demographic shifts) and the lack of long-term fitness (such as the ability to adapt to changing conditions). Because the species exists in isolated subpopulations, the risk from near-term genetic consequences, such as inbreeding and demographic shifts, is further magnified. These potential genetic problems are exacerbated by ongoing human-induced threats, such as habitat destruction (Factor A) and hunting (Factor B), factors which are not being mitigated by existing regulations (Factor D), and are further magnified by the species' inability to repopulate isolated, fragmented patches of suitable habitat, where Cauca guan populations have undergone decline or local extirpation (Factor E).

We have carefully assessed the best available scientific and commercial information regarding the past, present, and potential future threats faced by the Cauca guan. We consider the ongoing threats to the Cauca guan, habitat destruction (Factor A), hunting (Factor B), and predation (Factor C), exacerbated by the species' small population size and limited dispersal ability (Factor E), and compounded by inadequate regulatory mechanisms to mitigate these threats (Factor D), to be equally present and of the same magnitude throughout the species' entire current range. Based on this information, we find that the Cauca guan is in danger of extinction throughout all of its range.

Gorgeted Wood-Quail (Odontophorus strophium) Biology and Distribution

Species Description

The gorgeted wood-quail, endemic to Colombia and a member of the New World Quail Family (Odontophoridae), is approximately 25 cm (10 in) long (del Hoyo 1994, p. 431; Fjeldså and Krabbe 1990, p. 141; Hilty and Brown 1986, p. 133). The species is locally known as ''perdiz Santandereana'' or ''perdiz de monte'' (Sarria and Álvarez 2002, p. 158), and may be referred to by the more general term ''forest partridge'' in English (BLI 2007g, p. 1). Mainly dark brown with black spots on upper parts, the male has a speckled black and white face, and a white collar on his throat surrounded on the upper and lower side by a band of black. Underparts are rufous-chestnut colored with white spotting. The female appears similar to the male; however, the female has a black collar surrounded by white bands on her throat (BLI 2007g, p. 1).

Taxonomy

The gorgeted wood-quail was first taxonomically described in 1844 by Gould, who placed the species in the Odontophoridae family, also known as the New World Quails (BLI 2007g, p. 1). The type specimen (the actual specimen that was first described by Gould) was obtained in the Colombian Department of Cundinamarca (Hilty and Brown 1986, p. 133), although details on the location were not provided with the description (Warren 1966, p. 318). Therefore, we will refer to the Department of Cundinamarca as the ''type locality.''

Habitat and Life History

The gorgeted wood-quail prefers montane temperate and humid subtropical forests dominated by roble, *Tabebuia rosea,* and secondary-growth forests in proximity to mature forests (Sarria and Álvarez 2002, p. 159), especially those dominated by oak (*Quercus humboldtii*). The species is most often found at elevations between 1,750 and 2,050 m (5,741 and 6,726 ft) (BLI 2007g, p. 2; Turner 2006, p. 22; Donegan and Huertas 2005, p. 29; Donegan *et al.* 2003, p. 27; Sarria and Álvarez 2002, pp. 158–159; Wege and Long 1995, pp. 143–144). Fuller *et al.* (2000, pp. 27–28) suggested that the species' range may be up to 2,500 m (8,202 ft) in elevation. However, Sarria and Álvarez (2002, p. 160) noted that, despite the availability of suitable habitat adjacent to the species' current locations, these areas are above the elevational range of the species and are not used. Moreover, in the most recent population surveys in the Yarguíes Mountains (Serranía de los Yarguíes), which range up to 3,200 m (10,498 ft), researchers heard the species vocalizing primarily at elevations between 1,800 and 1,900 m (5,905 and 6,234 ft), and none were heard above 1,950–2,000 m (6,398–6,562 ft) (Donegan and Huertas 2005, p. 29; Donegan *et al.* 2003, p. 29; Donegan *et al.* 2004, p. 19). There are no recorded observations of this species at ranges above 2,050 m (6,726 ft) (BLI 2007g, p. 2; Turner 2006, p. 22; Donegan and Huertas 2005, p. 29; Donegan *et al.* 2003, p. 27; Sarria and Álvarez 2002, p. 160; Wege and Long 1995, pp. 143–144). Therefore, we conclude that the species' preferred range remains at elevations between 1,750 and 2,050 m (5,741 and 6,726 ft).

The gorgeted wood-quail is primarily terrestrial (Fuller *et al.* 2000, p. 2), living on the forest floor and feeding on fruit, seeds, and arthropods (Fuller *et al.* 2000, pp. 27–28; del Hoyo 1994, p. 431; Collar *et al.* 1992, pp. 171–172). There appear to be two breeding seasons per year, coinciding with the rainy seasons from March through May and September through November (BLI 2007g, p. 3). Gorgeted wood-quails are ground-nesting birds, laying their eggs in a small depression lined with vegetation and almost always covered with brush from the understory (Sarria and Álvarez 2002, p. 159). Similar to other wood-quails, gorgeted wood-quails associate in small groups and call to other groups by chorusing—singing together (Donegan *et al.* 2003, p. 29). Researchers consider this species to be dependent on primary forest for at least part of its life cycle (BLI 2007g, p. 3; Sarria and Álvarez 2002, p. 159).

Historical Range and Distribution

The gorgeted wood-quail historically occurred on the western slope of the East Andes, in the Departments of Santander and Cundinamarca in Colombia (del Hoyo 1994, p. 431; Fjeldså and Krabbe 1990, p. 141; Hilty and Brown 1986, p. 133). Since the 17th Century, extensive logging and land conversion in Cundimarca to agricultural uses nearly denuded all the forests of this area below 2,500 m (8,202 ft) (BLI 2007g, p. 3; Hilty and Brown 1986, p. 133). Habitat destruction is considered the primary factor that led to the historical decline and extirpation of this species from Cundinamarca (Fuller *et al.* 2000, pp. 4–5; Wege and Long 1995, p. 146).

For many years, the species was known only from two specimens collected in 1915 from its type locality in Cundinamarca (Hilty and Brown 1986, p. 133). Although the species was

reported at this site again in 1923 and 1954, it has not been seen there since that time (Wege and Long 1995, p. 146). The species was believed extinct until a record of a male bird and chicks was reported in 1970 in Santander Department in the Cuchilla del Ramo forest (Collar *et al.* 1992, p. 171; Fuller *et al.* 2000, p. 27).

Current Range and Distribution

The gorgeted wood-quail is endemic to the west slope of the East Andes, in the Magdalena Valley (Donegan and Huertas 2005, p. 29), and is known only in the central Colombian Department of Santander (del Hoyo 1994, p. 431; Fjeldså and Krabbe 1990, p. 141; Hilty and Brown 1986, p. 133). The current range of this species is between 10 km^2 (4 mi^2) (Sarria and Álvarez 2002, p. 160) and 27 km^2 (10.42 mi^2) (BLI 2007g, pp. 2, 5).

Since 1970, the species has only been reported in the central Colombian Department of Santander, with fewer than 10 sightings. Visual observations of this species have been scant; most reports have been inferred from auditory detections (Sarria and Álvarez 2002, pp. 158–159). In 1970, the species was observed in Cuchilla del Ramo forest (Wege and Long 1995, p. 143), but has not been confirmed there since that time (BLI 2007g, p. 2) (see also Factor A). The species has been observed and most recently confirmed in three locations: (1) Guanentá-Alto Rio Fonce Flora and Fauna Sanctuary, (2) Cachalú Biological Reserve, and (3) Serranía de los Yarguíes. These confirmed sightings are briefly described below.

(1) Guanentá-Alto Rio Fonce Flora and Fauna Sanctuary (Santander Department): The gorgeted wood-quail was confirmed at this location in 1979 (BLI 2007g, p. 2) and again in 1988 (Sarria and Álvarez 2002, p. 160; Wege and Long 1995, p. 144). In 2004, the species was reported in the oak forests within the Province of Guanentá (BLI 2007g, p. 2), but it is unclear whether these observations occurred within the Sanctuary.

(2) Cachalú Biological Reserve (Santander Department): The gorgeted wood-quail was confirmed in this Reserve in 1999, 2000, and 2001 (BLI 2007g, p. 2; Sarria and Álvarez 2002, pp. 158–159; Fuller *et al.* 2000, p. 27).

(3) Serranía de los Yarguíes (Santander Department): The species has also been confirmed at this location in 2003 and 2004 (BLI 2007g, p. 2; Turner 2006, p. 22; Donegan and Huertas 2005, p. 29; Donegan *et al.* 2003, p. 27). The Serranía de los Yarguíes locale reportedly harbors the largest known population and is the stronghold for the species (Turner 2006, p. 22; Donegan and Huertas 2005, p. 29) (see Population Estimates, below).

Generally speaking, these localities are in two disjunct locations within the Department of Santander. Serranía de los Yarguíes is in northern Santander and the other two localities are adjacent to each other in southern Santander (Rainforest Alliance 2008, p. 2; Donegan and Huertas 2005, p. 30). These habitats are described more fully under Factor A (Refugia).

Population Estimates

To the best of our knowledge, there have been no quantitative studies to determine the species' population size. The population estimates for the gorgeted wood-quail are based on qualitative surveys and extrapolations using suitable habitat estimates (BLI 2007g, p. 2; Turner 2006, p. 22; Donegan and Huertas 2005, p. 29; Donegan *et al.* 2003, p. 27; Sarria and Álvarez 2002, pp. 158–159; Fuller *et al.* 2000, p. 27;). As noted above (see Current Range), a total of three adults and two chicks were observed between 1923 and 1970 (Sarria and Álvarez 2002, p. 158; Wege and Long 1995, p. 143). The largest number of visual confirmations of individual birds has been reported in the Reserva Biológico Cachalú. In 1999, two groups of seven to nine individuals were observed. Between 2001 and 2002, six groups of 5–11 individuals were observed (Sarria *in litt.,* as cited in Sarria and Álvarez 2002, p. 159). Based on these direct observations, the population in the Reserva Biológico Cachalú may consist of between 30 and 66 individuals.

All other population estimates have been inferred from auditory calls or suitable habitat extrapolations. It is not unusual to infer population estimates for elusive, ground-dwelling species, such as the gorgeted wood-quail, for which direct observation is difficult. However, extrapolating population estimates based on suitable habitat can lead to overestimations of population sizes, especially for narrow-ranging species, such as the gorgeted wood-quail. The potential for overestimation was discussed above, in the analysis of the brown-banded antpitta (Factor E, Small Population Size). For instance, researchers recently estimated that the Serranía de los Yarguíes population may hold a significantly greater number of birds than ever known. Given the inferred density of the species (based on auditory observation) and the extent of forest cover in the Serranía de los Yarguíes, researchers predicted that an excess of 250 individuals was present at the site (Donegan and Huertas 2005, p. 30; Donegan *et al.* 2004, p. 19).

Turner (2006, p. 22) extrapolated the population size, based on satellite images of the area, which indicated that 30,000 ha (74,131 ac) of forest at elevations between 1,500 and 2,200 m (4,921 and 7,218 ft) on the western slope and 2,700 and 2,900 m (8,858 and 9,514 ft) on the eastern slope were available to the species. This yielded a predicted population size of between 1,800 and 3,300 individuals. However, we believe that this population estimate, based on the availability of suitable habitat, may be an overestimate for this species for two reasons: (1) The population may not be randomly distributed throughout the suitable habitat, as assumed by these researchers, and (2) the extrapolation does not take into account human-induced threats, such as hunting (Sarria and Álavarez 2002, pp. 160–161) (Factor B). Therefore, until Turner's (2006, p. 22) predictions have been ground-truthed, we are unable to consider the predicted population estimate of between 1,800 and 3,300 individuals to be a reliable reflection of the current population size. Consequently, we consider the population estimate of between 189 to 486 individuals (BLI 2007g, p. 1) to be the best available estimate of the gorgeted wood-quail.

Conservation Status

The gorgeted wood-quail is identified as a critically endangered species under Colombian law (EcoLex 2002, p. 12). The species is classified as 'Critically Endangered' on the IUCN Red List, due to its small and highly fragmented range, with recent population records from only two areas (BLI 2004d; BLI 2007g, pp. 1, 5).

Summary of Factors Affecting the Gorgeted Wood-Quail

Factor A: The Present or Threatened Destruction, Modification, or Curtailment of the Habitat or Range

In the early part of the 20th Century, the gorgeted wood-quail was known only in the oak forests in the Department of Cundinamarca. However, extensive deforestation and habitat conversion for agricultural use nearly denuded all the oak forests in Cundinamarca below 2,500 m (8,202 ft) (BLI 2007g, p. 3; Hilty and Brown 1986, p. 133). Deforestation left little remaining suitable habitat for the gorgeted wood-quail, which prefers primary forests and tolerates secondary-growth forests near primary forests (BLI 2007g, p. 3; Sarria and Álvarez 2002, p. 159) at altitudes from 1,500 to 2,500 m (4,921 to 8,202 ft) (Fuller *et al.* 2000, pp.

27–28; del Hoyo 1994, p. 431; Hilty and Brown 1986, p. 133). Subsequent surveys have not located the species in the Department of Cundinamarca since 1954 (Sarria and Álvarez 2002, p. 158; Fuller *et al.* 2000, p. 27; Collar *et al.* 1992, p. 171), and researchers consider the gorgeted wood-quail to be locally extirpated from Cundinamarca (BLI 2007g, p. 3; Sarria and Álvarez 2002, pp. 160–161; Fuller *et al.* 2000, pp. 4–5; Wege and Long 1995, p. 146).

Deforestation, in combination with hunting (Factor B), may have led to the local extirpation of the gorgeted wood-quail from another location. After no confirmed reports of the species in nearly 20 years (Sarria and Álvarez 2002, pp. 158–159), the species was rediscovered in Cuchilla del Ramo forest (in the Department of Santander) in 1970 (Sarria and Álvarez 2002, pp. 158–159; Wege and Long 1995, p. 143) and last confirmed there in 1988 (Collar *et al.* 1992, p. 172). However the species has not been confirmed at that location since that time (BLI 2007g, p. 2; Sarria and Álvarez 2002, pp. 158–159). According to Wege and Long (1995, p. 143), Cuchilla del Ramo, an unprotected area on the western slopes of the East Andes, has been largely cleared of its forest such that only fragments remain. Thus, it is possible that deforestation within the past 30 years has led to the extirpation of the gorgeted wood-quail from this location.

Today, the gorgeted wood-quail is endemic to the western slopes of the East Andes in the Department of Santander, Colombia (Collar *et al.* 1994, p. 70; del Hoyo 1994, p. 431; Fjeldså and Krabbe 1990, p. 141; Hilty and Brown 1986, p. 133). The gorgeted wood-quail is currently confirmed in three locations (see Refugia, below), and its current range is between 10 km² (4 mi²) (Sarria and Álvarez 2002, p. 160) and 27 km² (10.42 mi²) (BLI 2007g, pp. 2, 5). The species has lost 92 percent of its former habitat (Sarria and Álvarez 2002, p. 160), and habitat loss continues throughout its range (BLI 2007g, p. 2; Donegan *et al.* 2003, p. 26; Sarria and Álvarez 2002, pp. 159–160; Collar *et al.* 1994, p. 70; Collar *et al.* 1992, p. 172; Hilty and Brown 1986, p. 133).

Deforestation

Colombian forests have undergone extensive alteration during the 20th Century to establish human settlements, build roads, extract timber, and pursue agriculture. Between 1973 and 1996, these activities reduced the amount of primary forest cover in Colombia by approximately 3,605 ha (8,908 ac) annually, representing a nearly one-third total loss of primary forest habitat (Viña *et al.* 2004, pp. 123–124). Habitat loss accelerated dramatically in the 1980s as an influx of people settled in formerly pristine forests (Perz *et al.* 2005, pp. 26–28; Viña *et al.* 2004, p. 124). Recent studies indicate that the rate of habitat destruction is accelerating. Between the years 1990 and 2005, Colombia lost approximately 52,800 ha (130,471 ac) of primary forest annually (Butler 2006a, pp. 1–3; FAO 2003a, p. 1). These studies and activities were described in greater detail under Factor A for the blue-billed curassow, above. Logging is especially common in the flat lower-elevation areas and areas below 2,500 m (8,202 ft), where deforestation is nearly complete. Logging continues in steeper-sloped areas, where commercially valuable trees are still being extracted, and forested areas are being cleared for agricultural purposes (Fuller *et al.* 2000, p. 4; Stattersfield *et al.* 1998, p. 192).

Human-induced deforestation and environmental degradation have caused the gorgeted wood-quail to shift its range from the Department of Cundinamarca to the Department of Santander. The species was first observed in Santander within Cuchilla del Ramo forest in 1970 (Wege and Long 1995, p. 143), but has not been confirmed there since then (BLI 2007g, p. 2). The presence of the species has been documented only about 10 times, and most of these are based on auditory detections. The species has been most recently confirmed in the following three locations: (1) Guanentá-Alto Rio Fonce Flora and Fauna Sanctuary (BLI 2007g, p. 2; Sarria and Álvarez 2002, p. 160; Wege and Long 1995, p. 144), (2) Cachalú Biological Reserve (BLI 2007g, p. 2; Sarria and Álvarez 2002, pp. 158–159; Fuller *et al.* 2000, p. 27), and (3) the Serranía de los Yarguíes (BLI 2007g, p. 2; Turner 2006, p. 22; Donegan and Huertas 2005, p. 29; Donegan *et al.* 2003, p. 27).

Illegal Crops and Their Eradication

Cocaine and opium has been cultivated throughout the gorgeted wood-quail's range. The cultivation of illegal crops (including coca and opium) in Colombia destroys montane forests (Balslev 1993, p. 3). Coca crops also destroy the soil quality by causing the soil to become more acidic, which depletes the soil nutrients and ultimately impedes the regrowth of secondary forests in abandoned fields (Van Schoik and Schulberg 1993, p. 21). As of 2004, an estimated 80,000 ha (197,683 ac) were under cocaine cultivation and 4,000 ha (9,884 ac) were under opium cultivation (UNODC *et al.* 2007, pp. 7–8). These figures include habitat within the gorgeted wood-quail's range. Between 2003 and 2004, cocaine cultivation areas increased 25 percent in Cundinamarca, from 57 to 71 ha (140 to 175 ac), and by 78 percent in Santander, from 632 to 1,124 ha (1,562 to 2,777 ac) (UNODC and GOC 2005, p. 15).

Colombia continues to be the leading coca bush producer (UNODC *et al.* 2007, p. 7). However, since 2003, cocaine cultivation has remained stable, with about 800 km² (309 mi²) of land under cultivation (UNODC *et al.* 2007, p. 8). This stabilization of production is, in part, attributed to alternative development projects implemented between 1999 and 2004, to encourage pursuits other than illegal crop cultivation (UNODC *et al.* 2007, p. 77). This stabilization of production area is also attributed to heightened eradication efforts. Between 2002 and 2004, aerial spraying occurred over more than 1,300 km² (502 mi²) of land annually, peaking in 2004, when 1,360 km² (525 mi²) of illicit crops were sprayed (UNODC and GOC 2005, p. 11). In 2006, eradication efforts were undertaken on over 2,130 km² (822 mi²) of land, consisting of 1,720 km² (664 mi²) of land being sprayed and manual eradication being used on the remaining land. Eradication efforts undertaken in 2006 occurred over an area representing 2.7 times more land than the net cultivation area (UNODC *et al.* 2007, p. 8). In Santander alone, 1,855 ha (4,583 ac) of coca fields were sprayed or manually eradicated in 2004 (UNODC 2005, p. 66).

Drug eradication efforts in Colombia have further degraded and destroyed primary forest habitat by using nonspecific aerial herbicides to destroy illegal crops (BLI 2007d, p. 3; Álvarez 2005, p. 2042; Cárdenas and Rodríguez Becerra 2004, p. 355; Oldham and Massey 2002, pp. 9–12). Herbicide spraying has introduced harmful chemicals into gorgeted wood-quail habitat and has led to further destruction of the habitat by forcing illicit growers to move to new, previously untouched forested areas (Álvarez 2007, pp. 133–143; BLI 2007d, p. 3; Álvarez 2005, p. 2,042; Cárdenas and Rodríguez Becerra 2004, p. 355; Oldham and Massey 2002, pp. 9–12 Álvarez 2002, pp. 1088–1093). Between 1998 and 2002, cultivation of illicit crops increased by 21 percent each year, with a concomitant increase in deforestation of formerly pristine areas of approximately 60 percent (Álvarez 2002, pp. 1,088–1,093).

Effects of Habitat Fragmentation

An analysis of the effects of habitat fragmentation on Andean birds within western Colombia determined that 31

percent of the historical bird populations have become extinct, or were locally extirpated by 1990, largely as a result of habitat fragmentation from deforestation and human encroachment (Kattan and Álvarez-Lopez 1996, p. 5; Kattan *et al.* 1994, p. 141). The gorgeted wood-quail, which depends on primary forest for at least part of its life cycle (BLI 2007g, p. 3; Sarria and Álvarez 2002, p. 159), has been extirpated from its type locality in Cundinaramaca (Fuller *et al.* 2000, pp. 4–5; Wege and Long 1995, p. 146). The study also noted that species at the upper or lower limit of their altitudinal distribution are more susceptible to local extirpation and extinction (Kattan and Álvarez-Lopez 1996, pp. 5–6). This is the case for the gorgeted wood-quail; the species prefers habitat at 1,750–2,050 m (5,741–6,726 ft), most of which has been destroyed (BLI 2007g, p. 2; Turner 2006, p. 22; Donegan and Huertas 2005, p. 29; Donegan *et al.* 2003, p. 27; Sarria and Álvarez 2002, pp. 158–159; Wege and Long 1995, pp. 143–144), and it has not been documented at higher elevations, despite the availability of suitable habitat (BLI 2007g, p. 2; Turner 2006, p. 22; Donegan and Huertas 2005, p. 29; Donegan *et al.* 2003, p. 27; Sarria and Álvarez 2002, pp. 158–160; Wege and Long 1995, pp. 143–144). Another study on the effects of habitat fragmentation in Colombia found that habitat fragmentation facilitates predation and hunting pressure (Arango-Vélez and Kattan 1997, pp. 140–142) (Factors B and C).

Refugia

The gorgeted wood-quail has been observed, and most recently confirmed, in the following three locations: (1) Guanentá-Alto Rio Fonce Flora and Fauna Sanctuary, (2) Cachalú Biological Reserve, and (3) the Serranía de los Yarguíes.

(1) Guanentá-Alto Rio Fonce Flora and Fauna Sanctuary (Santander Department): This 10,420-ha (25,748-ac) humid subtropical and temperate oak forest on the western slope of the East Andes was declared a protected natural area in 1993 (Rainforest Alliance, 2008 p. 2; The Nature Conservancy (TNC) 2008, p. 1; Andrade and Repizzo 1994, p. 43). This area has long been considered the largest remaining sizeable oak forest tract remaining in the northern area of the East Andes, even as recently as the year 2005 (Donegan and Huertas 2005, p. 11; Sarria and Álvarez 2002, p. 160; Stattersfield *et al.* 1998, p. 193; Wege and Long 1995, p. 144). The gorgeted wood-quail was first observed in the Sanctuary in 1979 (BLI 2007g, p. 2) and again 1988 (Sarria and Álvarez 2002, p. 160; Wege and Long 1995, p. 144). In 2004, the species was reported in the oak forests within the Province of Guanentá (BLI 2007g, p. 2), but it is unclear whether these observations occurred within the Sanctuary.

Beginning in the 1960s, habitat conversion accelerated in the East Andes (Stattersfield *et al.* 1998, p. 192). The forests of the Colombian East Andes have been extensively degraded (Stattersfield *et al.* 1998, p. 192; Collar *et al.,* 1992, p. 172; Fjeldså and Krabbe 1990; Hilty and Brown 1986, p. 133). The western slopes have been largely converted to agricultural use and to pastureland for cattle (Stattersfield *et al.* 1998, p. 192), and deforestation continues on the lower slopes of the East Andes (Wege and Long 1995, p. 143). Selective logging affects birds in the lower part of the Guanenta Alto Rio Fonce (Sarria and Álvarez 2002, p. 160; Fuller *et al.* 2000, p. 28), including the gorgeted wood-quail. Stattersfield *et al.* (1998, p. 192) reported that forest loss below 2,500 m (8,202 ft) has been almost complete, although Fuller *et al.* (2000, p. 28) noted that the forest was ''largely intact'' above 1,950–2,200 m (6,398–7,218 ft). However, elevations above this altitude would not serve the needs of the gorgeted wood-quail, because this species is found most often at 1,750–2,050 m (5,741–6,726 ft) in altitude (BLI 2007g, p. 2; Turner 2006, p. 22; Donegan and Huertas 2005, p. 29; Donegan *et al.* 2003, p. 27; Sarria and Álvarez 2002, pp. 158–159; Wege and Long 1995, pp. 143–144) (see discussion under Habitat and Life History for the gorgeted wood-quail).

(2) Cachalú Biological Reserve: This 1,300-ha (3,212-ac) Reserve (TNC 2008, p. 1) was established in 1997 adjacent to Guanentá Alto Rio Fonce Flora and Fauna Sanctuary (Rainforest Alliance 2008, p. 2). It encompasses primarily mature oak forests and secondary areas (regenerating pastureland) at altitudes between 1,850 and 2,750 m (6,070 and 9,022 ft). Most of the secondary areas within the Reserve have been regenerating for 20 years. About 4 percent of land formerly used for pastureland and slash-and-burn agriculture has been left to regenerate within the last 8 years (BLI 2007g, p. 10). The species was first observed at this location in 1999 and again in 2000 and 2001 (BLI 2007g, p. 2; Sarria and Álvarez 2002, pp. 158–159; Fuller *et al.* 2000, p. 27).

While human population pressures in northern Santander have not been as great as in other parts of the Andes, 70 percent of the subsistence population living locally has had a major influence on the upper montane forest system. Slash-and-burn agriculture (clearing small plots of land for agriculture and settlement) and subsistence extractive activities (such as harvesting wood, plant fibers, and animals) have turned the upper montane forests into extraction forests (Rainforest Alliance 2008, p. 2). Ongoing slashing and burning on the outskirts of the Reserve could further degrade the integrity of the habitat within the Reserve (BLI 2007g, p. 11).

(3) Serranía de los Yarguíes (Yarguíes Mountains): This 175,000-ha (432,425-ac) forest is located in southern Santander and ranges in altitude between 200 and 3,200 m (656 and 10,499 ft) (BLI 2007g, p. 12; Donegan and Huertas 2005, p. 30). This area was previously unsurveyed for birds, due to political instability and occupation by revolutionary armed forces (Donegan and Huertas 2005, pp. 11, 29–30; Donegan *et al.* 2004, p. 19; Sarria and Álvarez 2002, p. 160). The gorgeted wood-quail was first observed in Yarguíes in 2003 and again in 2004 (BLI 2007g, p. 2; Turner 2006, p. 22; Donegan and Huertas 2005, p. 29; Donegan *et al.* 2003, p. 27). This site is now considered to be the stronghold for the species (Turner 2006, p. 22; Donegan and Huertas 2005, p. 29; Donegan *et al.* 2004, p. 19) (see Population Estimates, above). This forest does not have protected status (BLI 2007g, p. 13) and land clearing for slash-and-burn agriculture continues to be a problem within the Serranía de los Yarguíes (BLI 2007g, p. 13; Turner 2006, p. 22; Donegan and Huertas 2005, p. 29).

Summary of Factor A

Habitat destruction, alteration, conversion, and fragmentation were factors in the species' historical decline and continue to be factors affecting the gorgeted wood-quail. The direct loss of habitat through widespread deforestation and conversion of primary forests for agricultural uses has led to a 95 percent range reduction for the species, leading to extirpation of the species in its type locality (in Cundinamarca) and an apparent shift in the species' range (to Santander). The species is known only in three locations, where habitat conversion and poaching of the gorgeted wood-quail are ongoing. Deforestation, habitat conversion, and drug eradication efforts have reduced the amount of suitable habitat at elevations preferred by the species, such that its current range is between 10 and 27 km^2 (4 and 10 mi^2). The destruction and fragmentation of the remaining primary forested habitat are ongoing throughout the species' range and are expected to continue.

Therefore, we find that the present destruction, modification, and curtailment of habitat are threats to the gorgeted wood-quail throughout all of its range.

Factor B: Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

Galliformes such as the gorgeted wood-quail are chiefly terrestrial birds that are easily hunted or trapped, and they have been closely associated with humans throughout history as a source for food, ornamental collection, commercial trade, and recreational hunting (Fuller *et al.* 2000, p. 2). Hunting the gorgeted wood-quail is illegal in Colombia (Factor D) and is considered poaching. Poaching for subsistence use and for local food trade is ongoing throughout the species' range (BLI 2007g, pp. 7, 11–13; Turner 2006, p. 22; Donegan and Huertas 2005, p. 29) (BLI 2007g, p. 7). Hunting affects birds in the lower part of the Guanentá-Alto Rio Fonce Flora and Fauna Sanctuary (Sarria and Álvarez 2002, p. 160; Fuller *et al.* 2000, p. 28), including the gorgeted wood-quail. Illegal hunting is an ongoing problem on the outskirts of the Cachalú Biological Reserve, where the species has been observed within the past decade (BLI 2007g, p. 10; Sarria and Álvarez 2002, p. 158). Poaching of the gorgeted wood-quail continues to be a problem within the Serranía de los Yarguíes, considered the stronghold for the species (BLI 2007g, p. 13; Turner 2006, p. 22; Donegan and Huertas 2005, p. 29). The IUCN Partridge, Quail, and Francolin Specialist Group (PQF Specialist Group) considers unregulated hunting to be a factor affecting gorgeted wood-quail populations throughout the species' range (Fuller *et al.* 2000, p. 28).

Hunting, in combination with deforestation, may have led to the local extirpation of this species from Cuchilla del Ramo (Department of Santander), where the species was first observed in 1970 (Sarria and Álvarez 2002, pp. 158–159; Wege and Long 1995, p. 143) and last confirmed in 1988 (Collar *et al.* 1992, p. 172). The gorgeted wood-quail has not been confirmed at this location again (BLI 2007g, p. 2; Sarria and Álvarez 2002, pp. 158–159), which may be due to a combination of habitat destruction and hunting pressures. This unprotected area on the western slopes of the East Andes is severely fragmented due to deforestation (Factor A). In addition, active hunting was reported in this location in the late 1980s. Collar *et al.* (1992, p. 172) interpreted this level of hunting to imply that the species was capable of withstanding some hunting pressure. Andrade (*in litt.,* Collar *et al.* 1992, p. 172) noted that this would be the case only where the species is capable of retreating into suitable adjacent habitat. However, little suitable habitat is located in this area. Thus, hunting, in combination with deforestation, may have led to the extirpation of the gorgeted wood-quail from Cuchilla del Ramo.

In addition, Arango-Vélez and Kattan (1997, pp. 140–142) conducted a study on the effect of habitat fragmentation on birds in Colombia and found that habitat fragmentation facilitates hunting because smaller habitat patches allow hunters to more easily penetrate the entire plot (Arango-Vélez and Kattan 1997, pp. 140–142).

Summary of Factor B

The gorgeted wood-quail is hunted (poached) throughout its current range for local consumption or local food trade. Hunting results in the direct removal of individuals from the population and can remove potentially reproductive adults from the breeding pool. This primarily terrestrial species is particularly vulnerable to hunting pressures due to its small population size (Factor E) and fragmented distribution (Factor A). Researchers believe that the gorgeted wood-quail is only capable of escaping hunting pressures when adjacent suitable habitat exists. There are continued reports of hunting pressures on the species; these pressures have been and continue to be exacerbated by ongoing human encroachment into previously undisturbed forests (Factor A). Hunting, combined with habitat fragmentation (Factor A), increases the possibility of local extirpation since the gorgeted wood-quail is unlikely to reoccupy an area that has been depleted through hunting (Factor E, Likelihood to Disperse). Hunting may have led to the local extirpation of the species in a portion of its range. Hunting pressures are ongoing and affect the entire population of gorgeted wood-quail. Therefore, we find that hunting is a threat to the gorgeted wood-quail throughout its range.

Factor C: Disease or Predation

We are not aware of any information regarding disease or the potential for significant disease outbreaks in gorgeted wood-quail populations. As a result, we do not consider disease to be a threat to the species.

Potential quail predators include feral dogs, tayras, dwarf squirrels (*Microsciurus* sp.), tree squirrels (*Sciurus granatensis*), common opossums (*Didelphis marsupialis*), kinkajous (*Potos flavus*), Central American agoutis (*Dasyprocta punctata*), and South American coatis (*Nasua nasua*) (Arango-Vélez and Kattan 1997, p. 141). A predation study conducted in the Colombian Andes demonstrated that habitat fragmentation increased predation pressure on the eggs of the common quail (*Coturnix coturnix*) when situated within smaller, isolated habitat fragments (Arango-Vélez and Kattan 1997, pp. 137–143). Similar studies have found that nest predation is more prevalent in smaller, isolated forest patches because the small size of the patch facilitated predators' access to prey throughout the entire plot (Keyser *et al.* 2002, p. 186; Renjifo 1999, p. 1,133; Keyser *et al.* 1998, p. 991; Hoover *et al.* 1995, p. 151; Gibbs 1991, p. 157; Wilcove 1985, p. 1,214). Arango-Vélez and Kattan (1997, pp. 140–142) also found that smaller fragments support smaller predators, which tend to depredate on eggs and juveniles, rendering understory nesting birds, such as the gorgeted wood-quail, particularly vulnerable to predation during these life-history stages (Arango-Vélez and Kattan 1997, pp. 140–142). These studies were described in more detail above, as part of the Factor C analysis for the blue-billed curassow.

Summary of Factor C

Feral dogs, tayras, dwarf squirrels, tree squirrels, common opossums, kinkajous, Central American agoutis, and South American coatis are potential gorgeted wood-quail predators. Predation results in the direct removal of individuals from the population and can remove potentially reproductive adults from the breeding pool. This primarily terrestrial species is particularly vulnerable to predation pressures due to its small population size (Factor E) and fragmented distribution (Factor A). Habitat fragmentation has occurred and is ongoing throughout the species' range. Studies on similar species in similar Andean habitats indicate that vulnerability to predation increases with increased habitat fragmentation and smaller patch sizes. Predation exacerbates the genetic complications associated with the species' small population size (Factor E). Because of the species' small population size and inability to recolonize isolated habitat fragments (Factor E), predation renders the species vulnerable to local extirpation. Therefore, we find that predation, exacerbated by ongoing habitat destruction (Factor A) and hunting (Factor B), is a threat to the gorgeted wood-quail.

Factor D: The Inadequacy of Existing Regulatory Mechanisms

Regulatory mechanisms may provide species-specific or habitat-specific protections. An evaluation of the adequacy of regulatory mechanisms within Colombia to mitigate or remove the threats to the gorgeted wood-quail is provided below, beginning with species-specific and followed by habitat-specific protection mechanisms.

Colombia has enacted numerous laws to protect species and their habitats (Matallana-T 2005, p. 121). The gorgeted wood-quail is listed as a critically endangered species under Colombian Law 99 of 1993 (EcoLex 1993, p. 2) and Resolution No. 584 of 2002 (EcoLex 2002, pp. 10, 12). A full description of these laws and the categorization of threatened species in Colombia were provided above, as part of the Factor D analysis for the blue-billed curassow. Under Resolution No. 849 of 1973 and Resolution No. 787 of 1977, the Ministry of the Environment does not permit the gorgeted wood-quail to be hunted commercially or for sport because of its status as a critically endangered species (EcoLex 1973, p. 1; EcoLex 1977, p. 3). Neither Resolution prohibits subsistence hunting, which is a threat to the species throughout its range (Factor B). Gorgeted wood-quail is hunted within the Serranía de los Yarguíes, which has no protected status (BLI 2007g, p. 13), despite being considered the stronghold for the species (Turner 2006, p. 22; Donegan and Huertas 2005, p. 29). Thus, these Resolutions are ineffective at reducing the existing threat of subsistence hunting to the gorgeted wood-quail (Factor B).

Colombia has enacted numerous forestry laws and forestry management practices (Law No. 2 (EcoLex 1959); Decree No. 2,811 (Faolex 1974); Decree No. 1,791 (Faolex 1996); Law No. 1,021 (EcoLex 2006)). Weaknesses in the implementation of these laws and the decentralized nature of Colombian resource management are described in detail above for the blue-billed curassow (Factor D) (ITTO 2006, pp. 218–219, 222; Matallana-T 2005, pp. 121–122). These regulatory mechanisms are ineffective at protecting the gorgeted wood-quail (BLI 2007g, p. 13; ITTO 2006, p. 222). Habitat destruction continues to be a problem within the unprotected forests of Serranía de los Yarguíes (BLI 2007g, p. 13), considered the stronghold of the species (Turner 2006, p. 22; Donegan and Huertas 2005, p. 29), and on the outskirts of the Reserva Biológica Cachalú, where the species has also been observed (BLI 2007g, p. 10). Therefore, we determine that forestry regulations are not effective in mitigating the threats to the gorgeted wood-quail from habitat destruction (Factor A).

Colombia has several categories of national habitat protection (Matallana-T 2005, pp. 121–122), which were more fully described above, as part of the Factor D analysis for the blue-billed curassow (Matallana-T 2005, pp. 121–122). The gorgeted wood-quail occurs within two protected areas: the Guanentá-Alto Rio Fonce Flora and Fauna Sanctuary (Sarria and Álvarez 2002, p. 160; Fuller *et al.* 2000, p. 28) and the Cachalú Biological Reserve (BLI 2007g, p. 10; Sarria and Álvarez 2002, p. 158). Habitat destruction and subsistence hunting (poaching) are ongoing within these protected areas, despite being illegal (BLI 2007g, p. 10). Therefore, these sanctuaries and reserves provide little or no protection to the species from the threats of habitat destruction (Factor A) or poaching (Factor B).

Summary of Factor D

Colombia has adopted numerous laws and regulatory mechanisms to administer and manage wildlife and their habitats. The gorgeted wood-quail is considered critically endangered under Colombian law and lives within two protected areas. However, on-the-ground enforcement of existing wildlife protection and forestry laws and oversight of the local jurisdictions implementing and regulating activities are ineffective at mitigating the primary threats to the gorgeted wood-quail. As discussed for Factor A, habitat destruction, degradation, and fragmentation continue throughout the existing range of the gorgeted wood-quail. As discussed for Factor B, uncontrolled hunting of the gorgeted wood-quail is ongoing and negatively affects the continued existence of the species. Therefore, we find that the existing regulatory mechanisms currently in place are inadequate to mitigate the primary threats of habitat destruction (Factor A) and hunting (Factor B) to the gorgeted wood-quail.

Factor E: Other Natural or Manmade Factors Affecting the Continued Existence of the Species

Two additional factors affect the gorgeted wood-quail: its minimal likelihood for dispersal and the species' small population size.

Likelihood To Disperse

The gorgeted wood-quail is currently known in three localities in two disjunct locations within the Department of Santander: Serranía de los Yarguíes, in northern Santander, and Cachalú Biological Reserve and Guanentá-Alto Rio Fonce Flora and Fauna Sanctuary, in southern Santander (Rainforest Alliance 2008, p. 2; TNC 2008, p. 1; Donegan and Huertas 2005, p. 30). Although there is little information on the species' dispersal capabilities, the isolated, fragmented nature of the remaining suitable habitat is considered by researchers to be a hindrance to its ability to disperse because: (1) The gorgeted wood-quail is primarily a terrestrial species that is found at mid-to-upper-elevation forests (1,750–2,050 m (5,741–6,726 ft)) on the western slopes of the East Andes (BLI 2007g, p. 2; Sarria and Turner 2006, p. 22; Donegan and Huertas 2005, p. 29; Donegan *et al.* 2003, Álvarez 2002, pp. 158–159; Fuller *et al.* 2000, pp. 2, 27–28; del Hoyo 1994, p. 431; Wege and Long 1995, pp. 143–144; Collar *et al.* 1992, pp. 171–172; Wege and Long 1995, pp. 143–144); (2) the species is dependent on mature forest for at least part of its life cycle and is not found in secondary habitats that are not adjacent to primary forests (BLI 2007g, p. 3; Sarria and Álvarez 2002, p. 159); (3) researchers believe that the species is capable of escaping hunting pressures only when adjacent to suitable habitat (Andrade *in litt.,* as cited in Collar *et al.* 1992, p. 172); (4) the species is currently located in two disjunct areas, one in northern Santander and the other in southern Santander; and (5) most of the habitat below 1,950–2,500 m (6,398–8,202 ft) in the East Andes has been destroyed, leaving only isolated, fragmented habitat patches (Fuller *et al.* 2000, p. 28; Stattersfield *et al.* 1998, p. 192). Because the species has not demonstrated an aptitude to disperse into secondary-growth areas that are not adjacent to primary forest, and given the isolated, disjunct nature of remaining forest fragments, the gorgeted wood-quail, as with other narrow-ranging species found in fragmented habitat (Hanski 1998, pp. 45–46), is unlikely or incapable of dispersing to suitable habitat that is not adjacent to existing locales.

Small Population Size

Deforestation (Factor A) and overutilization (Factor B) have greatly affected the current population size and distributional range of the gorgeted wood-quail (Collar *et al.* 1994, p. 60; Collar *et al.* 1992, pp. 126–127). The species was thought to be extinct or on the verge of extinction until its rediscovery in 1970 (Fuller *et al.* 2000, pp. 4–5, 27; Wege and Long 1995, p. 146; Collar *et al.* 1992, p. 171). The gorgeted wood-quail is now confirmed

in three isolated areas: the Sanctuary of Fauna and Flora Guanentá-Alto Río Fonce, the Natural Reserve Cachalú, and the Serranía de los Yariguíes (Donegan and Huertas 2005, pp. 11, 29–30; Donegan *et al.* 2004, p. 19; Sarria and Álvarez 2002, p. 160). The population of the gorgeted wood-quail is currently estimated to include 189 to 486 individuals, with a declining population trend (BLI 2007g, pp. 1, 5).

The gorgeted wood-quail's restricted range, combined with its small population size (Sarria and Álvarez 2002, p. 138; Cuervo and Salaman 1999, p. 7; del Hoyo 1994, p. 361), makes the species particularly vulnerable to the threat of adverse natural (e.g., genetic, demographic, or environmental) and manmade (e.g., hunting or deforestation) events that destroy individuals and their habitat (Young and Clarke 2000, pp. 361–366; Holsinger 2000, pp. 64–65; Primack 1998, pp. 279–308). Small population sizes render species vulnerable to genetic risks that can have individual or population-level consequences on the genetic level and can increase the species' susceptibility to demographic problems, as explained in more detail above for the blue-billed curassow (Factor E, Small Population Size) (Charlesworth and Charlesworth 1987, p. 238; Shaffer 1981, p. 131). Once a population is reduced below a certain number of individuals, it tends to rapidly decline towards extinction (Holsinger 2000, pp. 64–65; Soulé 1987, p. 181; Gilpin and Soulé 1986, p. 25; Franklin 1980, pp. 147–148).

In the absence of quantitative studies specific to this species, a general approximation of minimum viable population size is the 50/500 rule, as described above as part of the Factor E analysis for the brown-banded antpitta (Shaffer 1981, pp. 132–133; Soulé 1980, pp. 160–162). The total population size of the gorgeted wood-quail is estimated to be between 186 and 486 individuals. While 186 individuals is above the minimum population size required to avoid short-term genetic consequences, 486 falls just below the threshold minimum number of 500 individuals required for long-term fitness of a population and does not take into account that not all members of the population will be contributing to population growth at any one time.

Because the gorgeted wood-quail exists in two isolated, disjunct habitat fragments, between which they are unlikely to disperse, an examination of the fitness of each subpopulation is more appropriate. For the purposes of this analysis, although we have reservations about the precision of these estimates (see Population Estimates discussion above), we will use the following two population estimates: 250 individuals in Northern Santander and 30–66 individuals in southern Santander. Upon examination of these estimates, both populations are clearly below the threshold required for long-term fitness in a population. The lower limit of the population estimate for the southern Santander population is below the threshold required to avoid short-term risks such as inbreeding and demographic shifts, whereas the upper limit is barely above the 50-individual threshold. Therefore, we currently consider these subpopulations (and the species as a whole) to be at risk due to the lack of short- and long-term viability.

Summary of Factor E

The gorgeted wood-quail is unlikely or incapable of dispersing into suitable habitat that is isolated from extant populations, and the species' overall small population size makes it vulnerable to genetic and demographic risks that negatively impact the species' short- and long-term viability. Habitat destruction through deforestation (Factor A) and overutilization through hunting (Factor B) have greatly affected the species' current population size. Believed to be extinct or on the verge of extinction within the past 30 years, the species is now confirmed in three areas of two disjunct locations. The gorgeted wood-quail's small population size, combined with its restricted range and inability to repopulate disjunct suitable habitat following local extirpations, makes the species particularly vulnerable to the threat of adverse natural (e.g., genetic, demographic, or environmental) and manmade (e.g., hunting or deforestation) events that destroy individuals and their habitat.

Gorgeted Wood-Quail Status Determination

The five primary factors that threaten the survival of the gorgeted wood-quail are: (1) Habitat destruction, fragmentation, and degradation (Factor A); (2) overexploitation due to hunting (Factor B); (3) predation (Factor C); (4) inadequacy of regulatory mechanisms to reduce the threats to the species (Factor D); and (5) small population size and isolation of remaining populations (Factor E). The gorgeted wood-quail, a small terrestrial bird, prefers primary montane forests or adjacent secondary forests at altitudes between 1,750 and 2,050 m (5,741 and 6,726 ft). The species' historic range has been reduced by 92 percent, extirpating the species from its type locality in the Department of Cundinamarca and causing the species to shift to the extremes of its range and elevational distribution (Factor A). The estimated suitable habitat available to the species is approximately 10–27 km^2 (4–10 mi^2).

Within the past decade, the gorgeted wood-quail has been confirmed in only three locations: Serranía de los Yarguíes, in northern Santander, and adjacent localities in the Guanentá-Alto Rio Fonce Flora and Fauna Sanctuary and Cachalú Biological Reserve, in southern Santander. Much of the primary forest, mid-elevation habitat preferred by the species has been destroyed by human activities, such as slash-and-burn agriculture, grazing, and extractive industries (Factor A). Illegal crop production, which continues throughout the species' range, has altered soil compositions, hindering regeneration of abandoned fields. In addition, drug eradication programs involving the aerial spraying of nonspecific herbicides have further degraded the environment and destroyed primary forest habitat.

In combination, these threats exacerbate the negative consequences to the species. For example, habitat fragmentation (Factor A) increases the species' vulnerability to hunting (Factor B). Poaching, in combination with habitat destruction, may have led to the local extirpation of the gorgeted wood-quail from Cuchilla del Ramo. This population was only discovered in 1970 and, amidst ongoing habitat destruction and hunting pressures, has not been observed there since 1988. Thus, deforestation and hunting within the past 30 years may have led to the extirpation of the gorgeted wood-quail from this location.

Habitat fragmentation also exposes the species to greater risk of extinction caused by adverse natural (e.g., genetic, demographic, or environmental) and manmade (e.g., hunting or deforestation) events (Factor E). The species' population has decreased by up to 9 percent in the past 10 years and has likely been extirpated from at least one location (Cundinamarca) due to habitat loss and from another locality (Cuchilla del Ramo) due to a combination of habitat loss and hunting. The global population of the gorgeted wood-quail is estimated to be between 187 and 486 individuals. Given that the gorgeted wood-quail is likely to interact as subpopulations and is unlikely to disperse between patches of fragmented habitat, the effective population size is actually much smaller than its estimated global population would imply. This small population size puts the gorgeted wood-quail at risk from both near-term genetic complications (such as

inbreeding and demographic shifts) and lack of long-term fitness (such as the ability to adapt to changing conditions). These potential genetic problems are exacerbated by ongoing human-induced threats, such as habitat destruction (Factor A) and hunting (Factor B), factors which are not being mitigated by existing regulations (Factor D) and are further magnified because the species is unlikely to repopulate isolated patches of suitable habitat where the species has undergone decline or local extirpation, increasing the likelihood of local extirpations (Factor E).

The gorgeted wood-quail is listed as critically endangered, making it illegal to hunt the species, and two of the three known localities are within protected areas. However, habitat destruction and poaching are ongoing throughout the species' range (Factor D). Thus, the regulations in place are ineffective in protecting the gorgeted wood-quail and its habitat.

We have carefully assessed the best available scientific and commercial information regarding the past, present, and potential future threats faced by the gorgeted wood-quail. We consider the ongoing threats to the gorgeted wood-quail, habitat destruction (Factor A), hunting (Factor B), and predation (Factor C), exacerbated by the species' small population size and limited dispersal ability (Factor E), and compounded by inadequate regulatory mechanisms to mitigate these threats (Factor D), to be equally present and of the same magnitude throughout the species' entire current range. Based on this information, we find that the gorgeted wood-quail is in danger of extinction throughout its range.

Esmeraldas woodstar (Chaetocercus berlepschi) Biology and Distribution

Species Description

Esmeraldas woodstar, a member of the hummingbird family (Trochilidae) and endemic to Ecuador, is approximately 6.5 cm (2.5 in.) in length (del Hoyo *et al.* 1999, p. 678; Ridgely and Greenfield 2001b, p. 295; Schuchmann 1999, p. 468; Williams and Tobias 1991, p. 39). The species is locally known as ''Colibrí de Esmeraldas'' or ''Estrellita esmeraldeña'' (UNEP–WCMC 2008b). Both sexes have striking violet, green, and white plumage. The male has a narrow band across its breast, whereas the female has a full white underbody (BLI 2007c, p. 1; Ridgely and Greenfield 2001b, plate 42).

Taxonomy

Esmeraldas woodstar was first taxonomically described by Simon in 1889 (BLI 2007e, p. 1). The type specimen (the actual specimen that was first described) of the Esmeraldas woodstar was obtained from the moist forest habitat near Esmeraldas City, in the Department of Esmeraldas (Collar *et al.* 1992, p. 533). Esmeraldas City is, therefore, referred to as the ''type locality.''

Simon placed the species in the Trochilidae family, under the name *Chaetocercus berlepschi.* The species is also known by the synonym *Acestrura berlepschi.* Both CITES and BirdLife International recognize the species as *Chaetocercus berlepschi* (UNEP–WCMC 2008b, p. 1; BLI 2007e, p. 1). Therefore, we accept the species as *Chaetocercus berlepschi,* which follows the Integrated Taxonomic Information System (ITIS 2008).

Habitat and Life History

Esmeraldas woodstar is a range-restricted, forest-dwelling species with highly localized populations (BLI 2007f, pp. 1–3; Schuchmann 1999, p. 532; Collar *et al.* 1992, p. 533). Esmeraldas woodstar prefers primary forest and is usually found in lowland semi-evergreen forests (cloud or fog forests) and has occasionally been seen in secondary-growth semihumid (moist) habitat during the breeding season (Best and Kessler 1995, p. 141; BLI 2007c, p. 3; Hummingbird Monitoring Network 2006, p. 1; BLI 2004, p. 2; Ridgely and Greenfield 2001b, p. 295; del Hoyo *et al.* 1999, p. 678; Schuchmann 1999, p. 468; Stattersfield *et al.* 1998, p. 211; Collar *et al.* 1992, p. 533; Williams and Tobias 1991, p. 39). Esmeraldas woodstar has not been seen in secondary-growth forests at any other time of year, and researchers are not certain that the species can survive in secondary forests year-round (BLI 2007c, p. 3). The species has mostly been recorded at elevations between 50 and 150 m (164 and 492 ft) (Ridgely and Greenfield 2001a, p. 390; Ridgely and Greenfield 2001b, p. 295), but has occasionally been observed above 500 m (1,640 ft) (i.e., at Loma Alta; Factor A) (Ridgely and Greenfield 2001b, p. 295; Best and Kessler 1995, p. 141; del Hoyo *et al.* 1999, p. 678; Schuchmann 1999, p. 468; Stattersfield *et al.* 1998, p. 211; Williams and Tobias 1991, p. 39).

Esmeraldas woodstar has been seen most often along forest borders, with females especially seen perching on dead twigs (Ridgely and Greenfield 2001b, p. 295). The species forages mainly in the canopy and has been recorded ''hawking'' insects from the air, as well as foraging nectar from flowers of the strawberry tree (*Muntingia calabura*), river koko (*Inga vera*), and mango tree (*Mangifera* spp.) (Ridgely and Greenfield 2001b, p. 295; Becker *et al.* 2000, p. 55; del Hoyo *et al.* 1999, p. 678). As recently as 1999, there were no known breeding sites for the Esmeraldas woodstar (del Hoyo *et al.* 1999, p. 678). Today, one breeding site has been located in the cloud forests of the Colonche Hills (Hummingbird Monitoring Network 2006, p. 1), in the Department of Guayas (Best and Kessler 1995, p. 54). The breeding season is from December to March (BLI 2007c, p. 3). Little else is known of the Esmeraldas woodstar's breeding habits or other activities during most of the year (Ridgely and Greenfield 2001a, pp. 389–390). The species seems to ''disappear'' from known locations during nonbreeding months (BLI 2007c, p. 2; Becker *et al.* 2000, p. 55). In general, male hummingbirds breed with several females in one breeding season and the females take responsibility for all remaining reproductive responsibilities, including nest building, incubation, and rearing. Hummingbirds typically produce two eggs per clutch (Schuchmann 1999, pp. 506, 509).

Historical Range and Distribution

The type locality for the Esmeraldas woodstar (the location of its first discovery) was in Esmeraldas, near Esmeraldas City, and the last specimen was observed there and in the Department of Manabi in 1912 (Collar *et al.* 1992, p. 533). The species' historic range has been reduced by 99 percent (Dodson and Gentry 1991, p. 293). The area around its type locality (Esmeraldas City) has been replaced by pastureland and is nearly devoid of all trees (Collar *et al.* 1992, p. 533). After the species went unobserved following the 1912 sightings, it was thought to be extinct, until it was rediscovered in 1990 (Ridgely and Greenfield 2001a, pp. 389–390; Williams and Tobias 1991, p. 39).

Current Range and Distribution

Today, Esmeraldas woodstar ranges in northwestern Ecuador, in the Departments of Esmeraldas, Manabi, and Guayas, along the slopes of the coastal cordillera up to 500 m (1,640 ft) (Ridgely and Greenfield 2001b, p. 295; Schuchmann 1999, p. 468; del Hoyo *et al.* 1999, p. 678; Williams and Tobias 1991, p. 39). The current extent of the species' range is approximately 1,155 km^2 (446 mi^2), in three disjunct and isolated areas (BLI 2004, p. 2; Dodson and Gentry 1991, p. 293).

The species was rediscovered on ridges above the lower Río Ayampe (in northwest Guayas/Manabi) in March 1990, near the Machalilla National Park (BLI 2007c, p. 2; Becker *et al.* 2000, p.

55; Williams and Tobias 1991, p. 39), and again in January 1991 (Ridgely and Greenfield 2001a, p. 389). Subsequent attempts to relocate the species at Río Ayampe (in August 1991 and July 1993) were unsuccessful (Ridgely and Greenfield 2001a, p. 389; Collar *et al.* 1992, p. 533). Researchers subsequently determined that the species occupies this habitat only seasonally, frequenting the Park from December through the spring (March), but is absent from this location during nonbreeding months (BLI 2007c, p. 2; and Greenfield 2001a, p. 389; Becker *et al.* 2000, p. 55) .

Since then, the species has been observed at the following locations: Esmeraldas: Suá, in January 1993, and Muisne, in 1994 (month unknown); Manabi: Isla de La Plata (part of the Machalilla National Park), December–January 1998 (BLI 2007c, p. 2; Ridgely and Greenfield 2001a, p. 389; Williams and Tobias 1991, p. 39). The species was not observed on Isla de La Plata during a bird survey conducted in June 2000 (Cisneros-Heredia 2005, p. 24), reconfirming their absence from this habitat during nonbreeding months.

Population Estimates

Esmeraldas woodstar is considered a rare, range-restricted species with highly localized populations in three general areas (BLI 2007c, pp. 1–3; Schuchmann 1999, p. 532). There have been no population surveys of this species. BirdLife International estimated that the population currently includes between 186 and 373 individuals, based on estimates using similar species of hummingbirds (BLI 2007c, p. 6).

Conservation Status

The Esmeraldas woodstar is identified as an endangered species under Ecuadorian law (EcoLex 2003b, p. 36). This species is classified as 'Endangered' on the IUCN Red List, due to severe fragmentation within the woodstar's restricted range (IUCN 2006).

Summary of Factors Affecting the Esmeraldas Woodstar

Factor A: The Present or Threatened Destruction, Modification, or Curtailment of the Habitat or Range

The Esmeraldas woodstar is restricted to the semihumid forests and woodlands from sealevel to 500 m (1,600 ft) along the Coastal Cordillera of western Ecuador (Ridgely and Greenfield 2001b, p. 295; del Hoyo *et al.* 1999, p. 678). The current extent of the species' range is approximately 1,155 km^2 (446 mi^2), in three disjunct and isolated areas (BLI 2004, p. 2).

Deforestation

The semihumid, semievergreen forest environment preferred by the Esmeraldas woodstar is one of the most threatened forest habitats in the Neotropics (Schuchmann 1999, p. 532; Collar *et al.* 1992, p. 533). This region is also known as the Tumbesian region (which encompasses the coast and foothills beginning in southwestern Ecuador and into the midcoastal area of northwestern Peru) (World Land Trust U.S. 2008, p. 1). This habitat type has been reduced by over 99 percent (Dodson and Gentry 1991, p. 293), making this region one of the most vulnerable endemic bird areas in South America (Stattersfield *et al.* 1998, p. 214). Deforestation, understory degradation, and limited habitat size are among the biggest impacts to resident birds in the Tumbesian region (Stattersfield *et al.* 1998, p. 214).

Forested habitat within western Ecuador, including that within the Esmeraldas woodstar's range, has diminished rapidly due to logging, clearing for agriculture, and road development (Dodson and Gentry 1991, pp. 283–293). The primary moist forest habitat at the species' type locality (Esmeraldas City) has been replaced with pastures and scattered trees (Collar *et al.* 1992, p. 533). Dodson and Gentry (1991, p. 293) indicated that rapid habitat loss is continuing and that extant forests will be eliminated in the near future if deforestation continues. Recent reports indicate that forest habitat loss continues in Ecuador. Between the years 1990 and 2005, Ecuador lost a total of 2.96 million ha (7.31 million ac) of primary forest, which represents a 16.7 percent deforestation rate and a total loss of 21.5 percent of forested habitat since 1990 (Butler 2006b, pp. 1–3; FAO 2003b, p. 1). Very little suitable habitat remains for the species, and remaining habitat is highly fragmented (BLI 2004a, p. 2).

Other Human Factors

Ongoing deforestation has transformed forested habitat within the region to a patchwork of cropland, with fewer than 5 percent of the forested areas remaining only on steep slopes that cannot be cultivated (Best and Kessler 1995, p. 35; Stattersfield *et al.* 1998, p. 214). Persistent grazing from goats and cattle has decimated the understory vegetation and any secondary forest growth (BLI 2004a, p. 2). Researchers have observed that road building and other infrastructure improvements in previously remote forested areas have increased accessibility and further facilitated habitat destruction, exploitation, and human settlement (Etter *et al.* 2006, p. 1; Álvarez 2005, p. 2,042; Cárdenas and Rodríguez Becerra 2004, pp. 125–130; Viña *et al.* 2004, pp. 118–119; Hunter 1996, pp. 158–159). Fragmented habitat also increases predator access to the forest, exposing the species to increased risk of predation (Factor C).

Refugia

The species is currently known in three localities: (1) Isla de la Plata, (2) Machalilla National Park, and (3) Loma Alta Communal Ecological Reserve.

(1) Isla de la Plata: This 1,420-ha (3,508-ac) island is approximately 27 km (17 mi) from the coast of the Department of Manabí and is actually part of the Machalilla National Park (see below). The species was last observed on the island in 1998 (BLI 2007c, p. 2; Becker *et al.* 2000, p. 55). The island is mostly uninhabited, but tourism for bird-watching occurs there year-round (BLI 2007c, p. 9), which occasionally disturbs the native birds. Nonnative domestic animals, including goats (*Capra hircus*), were introduced to the island many years ago (Curry 1993, p. 24). Nonnative predators, which have also been introduced to the island, are discussed below under Factor C. The grazing activity of the goats has destroyed understory habitat on the island. As of 2007, BirdLife International reports that an eradication program is underway to remove these feral animals from the island (BLI 2007c, p. 10). Despite a report, in 1991, that the goat population on the island had reportedly been reduced from an estimated 300 to 30 animals (Curry 1993, p. 24), the colony of goats apparently remains extant to this day (BLI 2007c, p. 10).

(2) Machalilla National Park: This 34,393-ha (84,985-ac) Park was established in 1979 (BLI 2007c, pp. 11, 13) and is designated as a Ramsar Wetland of International Importance (BLI 2007c, p. 13) (see Factor D). In addition to the male sighting on Isla de La Plata, a female was also observed within the Park in 1998 (Becker *et al.* 2000, p. 55). The Park encompasses a variety of habitats, including high-elevation humid and cloud forests and lower-elevation slopes covered with semideciduous and deciduous forests (BLI 2007c, pp. 11).

This park is populated, and residents subsist on farming and cattle-raising (BLI 2007c, pp. 11, 13; Lasso 1997, p. 3). Portions of land within the Park have been converted to pastures or cropland (Lasso 1997, p. 3). Some previously deforested areas have been left to regenerate (BLI 2007c, p. 13). However,

ongoing grazing is hindering understory development in forest areas left to regenerate (BLI 2007c, pp. 10, 13, 17). Residents continue to selectively harvest trees and nontimber products; this activity is not monitored and the extent of the impact is unknown (BLI 2007c, p. 13). The Park is surrounded by a matrix of altered habitat, dominated by agricultural crops such as bananas, corn, sugarcane, tomatoes (*Lycopersicon esculentum*), yucca (*Yucca* spp.), and pasturelands (BLI 2007c, p. 11; Lasso 1997, p. 3). A highway built around the outskirts of the park provides greater access to more areas within the Park (BLI 2007c, p. 13). Other activities in the area, including a fish meal processing plant, petroleum waste discharges into the sea, and accumulation of solid waste, are potential sources of pollution within the Park (Lasso 1997, p. 3).

(3) Loma Alta Communal Ecological Reserve: This 6,000-ha (14,826-ac) area was declared a Reserve in 1996 (BLI 2007c, p. 17). The Reserve was created to protect the watershed and to help preserve the land of four groups of indigenous inhabitants. The Reserve encompasses a variety of habitats from dry to cloud forests (BLI 2007c, p. 15). About 500 ha (1,235 ac) of the Reserve is dedicated to cultivation of the Panama hat plant (*Carludovica palmata,* locally known as ''Paja Toquilla''), which is processed and sold by the community. Cattle-raising has increased in recent years and the regenerating forests have again been decimated by overgrazing. Logging, agriculture, and slash-and-burn farming continue to impact this Reserve (BLI 2007c, p. 17).

Summary of Factor A

Esmeraldas woodstars are rare, range-restricted species with highly localized populations in three disjunct locations within an area of approximately 1,155 km^2 (446 mi^2) (BLI 2004, p. 2; Dodson and Gentry 1991, p. 293). The evergreen forests preferred by this species have undergone extensive deforestation, and remaining habitat is highly fragmented. Habitat alteration and human activities, such as slash-and-burn agriculture and cattle and goat grazing, are occurring throughout the species' range, including the protected areas in which the species occurs (Machalilla National Park, including Isla de la Plata, and Loma Alta Communal Ecological Reserve). Infrastructure development and economic activities (such as fish meal processing and nontimber forest product extraction) occur throughout the species' known breeding range. Logging, road development, and pollution from industrial activities occur within or near protected areas. Habitat destruction, alteration, and conversion have reduced the available habitat for this species by 99 percent. These activities are ongoing throughout the species' range, including within protected areas (Factor D), and are expected to continue.

Factor B: Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

Stattersfield *et al.* (1998, p. 214) reported that birds in the Tumbesian region are, in part, impacted by hunting and trade (Stattersfield *et al.* 1998, p. 214). However, we have no current information to suggest that hunting for domestic or international consumption or trade is impacting the Esmeraldas woodstar including BLI (2007c, p. 3, and Best and Kessler 1995? pp. 124, 141)). Locally, the communities in Loma Alta, where this species occurs, are involved in conservation activities, including protecting native species in Loma Alta Communal Ecological Reserve against hunting, timber harvest and agricultural expansion.

In 1987, the Esmeraldas woodstar was listed in CITES Appendix II (UNEP–WCMC 2008b, p. 1), which includes species that are not necessarily threatened with extinction, but which require regulation of international trade to ensure that trade of the species is compatible with the species' survival. International trade in specimens of Appendix-II species is authorized through permits or certificates under certain circumstances, including verification that trade will not be detrimental to the survival of the species in the wild and that the specimens were legally acquired (UNEP–WCMC 2008a, p. 1). According to the World Conservation Monitoring Centre (WCMC), there has been one international transaction permitted by CITES since listing. In 1993, 100 ''bodies'' were imported to Mexico through the United States. According to the trade data, the specimens were being traded for commercial purposes and were seized by inspectors (UNEP–WCMC 2008d, p. 1). No further CITES-recorded trade in this species has occurred since that time. Although we are no longer able to determine the exact details surrounding this seizure, we consider the seizure and lack of ensuing trade to be supportive that CITES has been effective in controlling commercial trade in this species. Therefore, we do not consider international trade for commercial purposes to be a threat to the species.

Tourism occurs year-round at Isla de la Plata and has been known to occasionally disturb the native birds (BLI 2007c, pp. 2, 9–10). There is no information regarding whether Esmeraldas woodstar is among the native species that is adversely affected by ecotourism or other human disturbance.

We are unaware of any other information currently available that addresses the occurrence of overutilization for commercial, recreational, scientific, or educational purposes that may be affecting the Esmeraldas woodstar population. Consequently, we do not consider this factor to be a threat to the species.

Factor C: Disease or Predation

We are unaware of information regarding disease or the potential for significant disease outbreaks in the Esmeraldas woodstar. As a result, we do not consider disease to be a threat to the species.

Hummingbird eggs and chicks are most vulnerable to predation. Known hummingbird predators that are found in cloud forest habitat in Ecuador include domestic cats (*Felis catus*), feral cats, hawks (family Accipitridae), owls (order Strigiformes), and snakes (suborder Serpentes) (Rosso 2006, p. 35; Borchardt 2004, p. 5; The Hummingbird Society, no date (n.d.), p. 1). Many insect-eating predators have been known to prey on hummingbirds because of their small size, including praying mantis (family Mantidae), spiders (class Arachnida), bees and wasps (order Hymenoptera), frogs (order Anura), and largemouth bass (*Micropterus salmoides*) (Rosso 2006, p. 35, Borchardt 2004, p. 5; The Hummingbird Society n.d., p. 1). According to the FAO–Fisheries and Aquaculture Department (2000, p. 1), largemouth bass is a nonnative invasive species that was introduced to Ecuador sometime prior to 1988. Many of these potential Esmeraldas woodstar predators are found within the Machalilla National Park (Emmons and Albuja 1992, pp. 120–121), both on the mainland and on Isla de La Plata (see Factor A).

On Isla de La Plata, nonnative predators, including cats and spiny rats (*Proechimys decumanus*), were introduced to the island many years ago (BLI 2007c, p. 10; Curry 1993, p. 24). Cats are opportunistic predators and their diet comprises a variety of animals, including birds (Rosero 2006, p. 5). It was conjectured that the wild cats on Isla de La Plata would keep the rat population in check. However, Curry (1993, p. 24) examined the stomach contents of several cats on the Island and found that they contained egg shell fragments, not mammal hair, indicating that the cats were preying upon bird

nests. Esmeraldas woodstar is observed on Isla de La Plata only during breeding season (BLI 2007c, p. 2; Cisneros-Heredia 2005, p. 24; Becker *et al.* 2000, p. 55), which renders the woodstar especially vulnerable to egg predation by cats. Cats are also considered among the most common predators of nonnesting hummingbirds, especially during torpor, a resting state induced in hummingbirds when energy levels are low (BLI 2008b, p. 1; The Hummingbird Society n.d., p. 1; Schuchmann 1999, p. 485). During torpor, hummingbirds are slow to react to external stimuli (Schuchmann 1999, p. 485). Cats are responsible for endangering other island-dwelling hummingbirds, including the critically endangered Fernández firecrown (*Sephanoides fernandensis*) (native to the Juan Fernández Islands, Chile) (BLI 2008b, p. 1; The Hummingbird Society n.d., p. 1).

According to BirdLife International, an eradication program is underway to remove feral animals from the island (BLI 2007c, p. 10). One project to control the introduced cat population on Isla De La Plata, being supported by the World Conservation Foundation, would trap the feral cats, neuter them, and return them to the wild, with the eventual goal of preventing further reproduction of the feral population. This project will also help to better quantify the extent of the invasion on the island (Rosero 2006, p. 5). However, predation on the island continues to be a threat to native bird species, including the Esmeraladas woodstar, both on the Island and in Machalilla National Park (BLI 2007c, p. 10; Rosero 2006, p. 5; Emmons and Albuja 1992, pp. 120–121).

The Esmeraldas woodstar's historic range has been reduced by 99 percent (Dodson and Gentry 1991, p. 293), and remaining suitable habitat is highly fragmented (BLI 2004a, p. 2; Stattersfield *et al.* 1998, p. 214; Best and Kessler 1995, p. 35). Studies have shown that habitat fragmentation increases the potential predation pressure within habitat fragments by facilitating the predators' access throughout the fragment and because smaller fragments support smaller predators, which tend to prey upon the more vulnerable life-history stages of the Esmeraldas woodstar, eggs and juveniles (Keyser *et al.* 2002, p. 186; Renjifo 1999, p. 1,133; Keyser *et al.* 1998, p. 991; Arango-Vélez and Kattan 1997, pp. 137–143; Hoover *et al.* 1995, p. 151; Gibbs 1991, p. 157; Wilcove 1985, p. 1,214). These studies were described in more detail above, as part of the Factor C analysis for the blue-billed curassow.

Summary of Factor C

Domestic and feral cats, rats, hawks, owls, snakes, praying mantis, spiders, bees, wasps, frogs, and largemouth bass are all predators of hummingbirds that are found in Esmeraldas woodstar habitat. Predation results in the direct removal of eggs, juveniles, and adults from the population. Esmeraldas woodstars produce a low clutch size and are particularly vulnerable to egg predation by cats on Isla de la Plata (see Habitat and Life History). Esmeraldas woodstar habitat is much reduced and highly fragmented (Factor A), and studies on similar species in similar Andean habitats indicate that vulnerability to predation by generalist predators increases with increased habitat fragmentation and smaller patch sizes. Predation can remove potentially reproductive adults from the breeding pool and exacerbates the genetic complications associated with the species' small population size (Factor E), increasing the species' vulnerability to local extirpation. Therefore, we find that predation, exacerbated by ongoing habitat destruction (Factor A), is a threat to the Esmeraldas woodstar.

Factor D: The Inadequacy of Existing Regulatory Mechanisms

Regulatory mechanisms may provide species-specific or habitat-specific protections. An evaluation of the adequacy of regulatory mechanisms within Ecuador to mitigate or remove the threats to the Esmeraldas woodstar is provided below, beginning with species-specific and followed by habitat-specific protection mechanisms.

The Esmeraldas woodstar is protected under Ecuadorian law by Decree No. 3,516 of 2003 (Unified Text of the Secondary Legislation of the Ministry of Environment (EcoLex 2003b, pp. 1–2 and 36). Decree No. 3,516 summarizes the laws governing environmental policy in Ecuador and provides that the country's biodiversity be protected and used primarily in a sustainable manner. Appendix 1 of Decree No. 3,516 lists the Ecuadorian fauna and flora that are categorized as critically endangered (En peligro critico), endangered (En peligro), or vulnerable (Vulnerable) (EcoLex 2003b, p.17). Under this law, Esmeraldas woodstar is categorized as endangered, under the synonym *Acestrura berlepschi* (EcoLex 2003b, p. 36). This threat status confers protections upon the species, including protection from hunting or commercial take, under Resolution No. 105 of 2000 (Regulatory control of hunting seasons and wildlife species in the country) and Agreement No. 143 of 2003 (Standards for the control of hunting seasons and licenses for hunting of wildlife). Resolution No. 105 and Agreement No. 143 regulate and prohibit commercial and sport hunting of all wild bird species, except those specifically identified by the Ministry of the Environment or otherwise permitted (EcoLex 2000, p.1; EcoLex 2003a, p. 1). Under this law, the Ministry of the Environment does not permit commercial or sport hunting of the Esmeraldas woodstar because of its status as a critically endangered species (EcoLex 2002b, p. 17). However, we do not consider hunting (Factor B) to be a current threat to the Esmeraldas woodstar and these laws do not mitigate threats to the species from habitat destruction (Factor A), predation (Factor C), or its small population size (Factor E). Therefore, protection under these laws does not reduce any existing threats to the species.

Esmeraldas woodstar is listed in Appendix II of CITES, to which Ecuador became a Party in 1975 (UNEP–WCMC 2008a, p. 1; USFWS 2008, p. 1). CITES was described in more detail above, as part of the Factor E analysis for the blue-billed curassow. As discussed under Factor B for the Esmeraldas woodstar, we consider that this international treaty has minimized the potential threat to the species from international trade and do not consider international trade to be a threat impacting the Esmeraldas woodstar. However, this treaty does not mitigate threats to the species from habitat destruction (Factor A), predation (Factor C), or its small population size (Factor E). Therefore, protection under this Treaty does not reduce any existing threats to the species.

Ecuador has numerous laws and regulations pertaining to forests and forestry management, including: the Forestry Act (comprising Law No. 74 of 1981—Forest Act and conservation of natural areas and wildlife (Faolex 1981, pp. 1–54) and Law No. 17 of 2004—Consolidation of the Forest Act and conservation of natural areas and wildlife (Faolex 2004, pp. 1–29)); a Forestry Action Plan (1991–1995); the Ecuadorian Strategy for Forest Sustainable Development of 2000 (Estrategia para el Desarrollo Forestal Sostenible); and Decree 346, which recognizes that natural forests are highly vulnerable (ITTO 2006, p. 225). However, the International Tropical Timber Organization considers ecosystem management and conservation in Ecuador, including effective implementation of mechanisms that would protect the Esmeraldas woodstar and its habitat, to be lacking

(ITTO 2006, p. 229). Habitat destruction is ongoing (Butler 2006b, pp. 1–3; FAO 2003b, p. 1) and extensive (BLI 2004a, p. 2; Stattersfield *et al.* 1998, p. 214; Best and Kessler 1995, p. 35) throughout the species' range (Factor A). Thus, these laws are ineffective at protecting Esmeraldas woodstar habitat.

Extractive harvest practices may pose a threat to the Esmeraldas woodstar (BLI 2007c, p. 13) (Factor A). In 2004, Law No. 17 (Faolex 2004, pp. 1–29) amended the Forest Act of 1981 (Law No. 74) (Faolex 1981, pp. 1–54) to include five criteria for sustainable forest management: (i) Sustainable timber production; (ii) the maintenance of forest cover; (iii) the conservation of biodiversity; (iv) coresponsibility in management; and (v) the reduction of negative social and environmental impacts (ITTO 2006, p. 225; Aguilar and Vlosky 2005, pp. 9–10). In 2001, the Ecuadorian Government worked with the private sector to develop a system of monitoring and control of forest harvest practices. However, in 2003, the Supreme Court of Ecuador declared that the control system was unconstitutional, and new control systems are now being developed (ITTO 2006, p. 225). Approximately 70 percent of the forest products harvested are harvested illegally, are used as fuel wood, or are discarded as waste (ITTO 2006, p. 226; Aguilar and Vlosky 2005, p. 4). Because the extractive harvesting industry is not monitored, the extent of the impact is unknown (BLI 2007c, p. 13). However, we find this law is currently inadequate in monitoring the impacts of extractive harvesting on the Esmeraldas woodstar or to protect the species from potential impacts of extractive harvesting (Factor A).

The governmental institutions responsible for natural resource oversight in Ecuador appear to be under-resourced, and there is a lack of law enforcement on the ground. Despite the creation of a national forest plan, there appears to be a lack of capacity to implement this plan due to insufficient political support, unclear or unrealistic forestry standards, inconsistencies in application of regulations, discrepancies between actual harvesting practices and forestry regulations, the lack of management plans for protected areas, and high bureaucratic costs. These inadequacies have facilitated logging (Dodson and Gentry 1991, pp. 283–293); cattle-raising and persistent grazing from goats and cattle (BLI 2007c, pp. 11, 13, 17; BLI 2004a, p. 2; Lasso 1997, p. 3; Curry 1993, p. 24); clearing for agriculture, subsistence farming, and small local industries (BLI 2007c, pp. 11, 13, 17; Lasso 1997, p. 3; Dodson and Gentry 1991, pp. 283–293); selective harvest of trees for fuelwood and nontimber products (BLI 2007c, p. 13; Aguilar and Vlosky 2005); road development (BLI 2007c, p. 13; Dodson and Gentry 1991, pp. 283–293); and pollution from industrial activities occur within or near protected areas (Lasso 1997, p. 3). In addition, most of Ecuador's forests are privately owned or owned by communities (ITTO 2006, p. 224; Lasso 1997, pp. 2–3), and the management and administration of Ecuador's forest resources and forest harvest practices is insufficient and unable to protect against unauthorized forest harvesting, degradation, and conversion (ITTO 2006, p. 229). Habitat conversion and alteration are ongoing throughout the range of the Esmeraldas woodstar, including within protected areas (BLI 2007c, pp. 10, 13, 17; Butler 2006b, pp. 1–3; FAO 2003b, p. 1). Thus, Ecuadorian forestry regulations have not mitigated the threat of habitat destruction (Factor A).

The Ecuadorian Government recognizes 31 different legal categories of protected lands (e.g., national parks, biological reserves, geo-botanical reserves, bird reserves, wildlife reserves, etc.). Currently, the amount of protected land (both forested and nonforested) in Ecuador totals approximately 4.67 million ha (11.5 million ac) (ITTO 2006, p. 228). However, only 38 percent of these lands have appropriate conservation measures in place to be considered protected areas according to international standards (i.e., areas that are managed for scientific study or wilderness protection, for ecosystem protection and recreation, for conservation of specific natural features, or for conservation through management intervention) (IUCN 1994, pp. 17–20). Moreover, only 11 percent have management plans, and fewer than 1 percent (13,000 ha (32,125 ac)) have implemented those management plans (ITTO 2006, p. 228).

The Esmeraldas woodstar has been recorded in or near two protected areas: (1) Machalilla National Park (Collar *et al.* 1992, p. 533) and (2) Loma Alta Communal Ecological Reserve. As described under Factor A, both of these protected areas are inhabited and, among other activities, deforestation, livestock grazing, and slash-and-burn agriculture are ongoing within these areas (BLI 2004, p. 2; Wege and Long 1995, p. 174). Thus, this protected area status does not mitigate the threats from habitat destruction (Factor A).

Esmeraldas woodstar occurs within the Machalilla National Park, which was included in the Ramsar List of Wetlands of International Importance in 1990 (BLI 2007c, p. 13). The Ramsar Convention, signed in Ramsar, Iran, in 1971, is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. There are presently 158 Contracting Parties to the Convention (including Ecuador, where the Esmeraldas woodstar occurs), with 1,828 wetland sites, totaling 169 million ha (418 million ac), designated for inclusion in the Ramsar List of Wetlands of International Importance (Ramsar Convention Secretariat 2008, p. 1). Experts consider Ramsar to provide only nominal protection of wetlands, noting that such a designation may increase international awareness of the site's ecological value (Jellison *et al.* 2004, p. 19). However, habitat alteration (Factor A) (BLI 2007c, pp. 10–11, 13; Lasso 1997, p. 3) and predation by feral animals (Factor C) (BLI 2007c, p. 10; Rosero 2006, p. 5; Curry 1993, p. 24), key threats to the Esmeraldas woodstar, are ongoing within the Park, and predation has not been considered as part of the most recent Ramsar site review (Lasso 1997, pp. 1–4). Therefore, this designation as a Ramsar Wetland of International Importance does not mitigate the threats from habitat destruction (Factor A).

Summary of Factor D

Ecuador has adopted numerous laws and regulatory mechanisms to administer and manage wildlife and their habitats. The Esmeraldas woodstar is protected under CITES, which we consider has been effective in mitigating the potential threat to this species from commercial trade (Factor B). Esmeraldas woodstar is listed as endangered and ranges within at least two protected areas (Machalilla National Park and Loma Alta Communal Ecological Reserve). However, on-the-ground enforcement of these laws and oversight of the local jurisdictions implementing and regulating activities is insufficient for these measures to be effective in conserving the Esmeraldas woodstar or its habitat. As discussed for Factor A, habitat destruction, degradation, and fragmentation continue throughout the species' range, including lands within protected areas. Therefore, we find that the existing regulatory mechanisms, as implemented, are inadequate to mitigate the primary threats to the Esmeraldas woodstar from habitat destruction (Factor A), predation (Factor C), or its small population size (Factor E).

Factor E: Other Natural or Manmade Factors Affecting the Continued Existence of the Species

Two additional factors affect the Esmeraldas woodstar: Its minimal likelihood for dispersal and the species' small population size.

Likelihood To Disperse

The Esmeraldas woodstar is confined to locations within the Departments of Esmeraldas, Manabi, and Guayas, in lowland moist forest patches that are disjunct and fragmented (BLI 2007f, pp. 1–3; del Hoyo *et al.* 1999, p. 678; Williams and Tobias 1991, p. 39). The distance between known occupied areas is between 125 and 200 km (78 and 124 mi), with minimal habitat between occupied sights (Best and Kessler 1995, p. 141). In light of the species' small overall population size and the distance between the remaining fragmented primary forested habitats, it is unlikely that the Esmeraldas woodstar would repopulate an isolated patch of suitable habitat following decline or extirpation of that patch (Hanski 1998, pp. 45–46).

Small Population Size

The Esmeraldas woodstar inhabits a very small and severely fragmented range, which is decreasing rapidly in size due to habitat destruction and various other human factors (Ridgely and Greenfield 2001a, pp. 389–390; Collar *et al.* 1992, p. 533). Ongoing declines in the bird's population are linked to persistent habitat destruction (BLI 2007c, p. 2). Before the species was rediscovered in 1991, it was thought to be extinct after not being seen since 1912 (Ridgely and Greenfield 2001a, pp. 389–390). Subsequent surveys of previously known occupied areas have not been successful in locating the species on a consistent basis, and little is known of breeding habits or other activities during most of the year (Ridgely and Greenfield 2001a, pp. 389–390). Experts estimate that the species has undergone a 50–79 percent reduction in population size within the past 10 years and predict that this trend will continue (BLI 2007c, p. 5). The current population estimate for this species is between 186 to 373 birds, with a decreasing population trend (BLI 2007, pp. 2, 6).

Small population sizes render species vulnerable to genetic risks that can have individual or population-level consequences on the genetic level and can increase the species' susceptibility to demographic problems, as explained in more detail above for the blue-billed curassow (Factor E, Small Population Size) (Charlesworth and Charlesworth 1987, p. 238; Shaffer 1981, p. 131). Once a population is reduced below a certain number of individuals, it tends to rapidly decline towards extinction (Holsinger 2000, pp. 64–65; Soulé 1987, p. 181; Gilpin and Soulé 1986, p. 25; Franklin 1980, pp. 147–148).

In the absence of quantitative studies specific to this species, a general approximation of minimum viable population size is the 50/500 rule, as described above, as part of the Factor E analysis for the brown-banded antpitta (Shaffer 1981, pp. 132–133; Soulé 1980, pp. 160–162). The total population size of the Esmeraldas woodstar is estimated to be between 186 and 373 individuals. The lower estimate of 186 individuals meets the theoretical threshold for the minimum effective population size required to avoid risks from inbreeding (N_e = 50 individuals). However, the upper limit of the population, 373 individuals, is below the minimum threshold (N_e = 500 individuals) required for long-term fitness of a population that will not lose its genetic diversity over time and will maintain an enhanced capacity to adapt to changing conditions.

The Esmeraldas woodstar's restricted range combined with its small population size (Cuervo 2002, p. 138; Cuervo and Salaman 1999, p. 7; del Hoyo 1994, p. 361) makes the species particularly vulnerable to the threat of adverse natural (e.g., genetic, demographic, or environmental) and manmade (e.g., deforestation, habitat alteration, wildfire) events that destroy individuals and their habitat (Young and Clarke 2000, pp. 361–366; Holsinger 2000, pp. 64–65; Primack 1998, pp. 279–308). Therefore, we currently consider the single Esmeraldas woodstar population to be at risk due to the lack of long-term viability.

Summary of Factor E

The Esmeraldas woodstar is currently limited to a few small populations within a limited habitat range, with a small estimated population size that leaves the species vulnerable to genetic and demographic risks that negatively impact its long-term viability. The species' population size is estimated to have declined considerably within the past 10 years (50–79 percent), and this rate of decline is expected to continue. Based on this information, we have determined that the species is particularly vulnerable to the threat of adverse natural (e.g., genetic, demographic, or predation) and manmade (e.g., slash-and-burn agriculture or infrastructural development) events that destroy individuals and their habitat, and that these genetic and demographic risks are exacerbated by ongoing habitat destruction (Factor A) and predation (Factor C).

Esmeraldas Woodstar Status Determination

The four primary factors that threaten the survival of the Esmeraldas woodstar are: (1) Habitat destruction, fragmentation, and degradation (Factor A); (2) predation (Factor C); (3) inadequate regulatory mechanisms (Factor D); and (4) limited size and isolation of remaining populations (Factor E). The Esmeraldas woodstar is a tiny hummingbird endemic to Ecuador. Esmeraldas woodstars are a rare, range-restricted species with highly localized populations in three disjunct locations—in the Ecuadorean Departments of Esmeraldas, Guayas, and Manabí. The species occurs in lowland semi-humid or semievergreen forests and woodlands, from sealevel to 500 m (1,600 ft) along the Coastal Cordillera of western Ecuador. Preferring primary evergreen forests, the species is also known to occupy low-altitude secondary-growth areas during the breeding season (December–March). The current extent of the species' range is approximately 1,155 km^2 (446 mi^2).

The primary threat to this species is habitat loss (Factor A), caused by widespread deforestation and conversion of primary forests for numerous human activities. The species' range has been reduced by 99 percent. The semihumid and semievergreen forests preferred by this species have undergone extensive deforestation. Habitat-altering activities that have occurred include: logging; cattle-raising and persistent grazing from goats and cattle; forest clearing for agriculture, subsistence farming, and small local industries; selective harvest of trees for fuelwood and nontimber products; road development; and pollution from industrial activities (Factors A). These activities are ongoing and occurring throughout the species' range—including within protected areas where the species occurs (Machalilla National Park, Isla de La Plata, and Loma Alta Communal Ecological Reserve). Because regulatory mechanisms are ineffective at reducing these activities (Factor D), habitat destruction and alteration are expected to continue.

The species' population is estimated to have declined 50 to 79 percent within the last 10 years, a decline which is attributed to habitat loss. The Esmeraldas woodstar has a small estimated population size (between 186 and 373 individuals), which renders the

species vulnerable to the threat of adverse natural (e.g., genetic, demographic, or predation) and manmade (e.g., slash-and-burn agriculture or infrastructural development) events that destroy individuals and their habitat (Factor E). In addition, the direct loss of habitat through widespread deforestation and conversion for human activities has led to habitat fragmentation and isolation of the remaining populations of the Esmeraldas woodstar. The Esmeraldas woodstar currently occupies three disjunct, isolated patches that are separated by large distances (between 125 and 200 km (78 and 124 mi)), with minimal suitable habitat between occupied sites. Given the species' small population size and the distance between the remaining fragmented primary forested habitats, the species is unlikely to repopulate an isolated patch of suitable habitat following decline or extirpation of the species within that patch (Factor E). This renders the species particularly vulnerable to local extirpation from ongoing habitat destruction (Factor A) and predation (Factor C).

Esmeraldas woodstars are vulnerable to predation by a variety of predators, including domestic and feral cats, rats, hawks, owls, snakes, praying mantis, spiders, bees, wasps, frogs, and largemouth bass (Factor C). Habitat fragmentation (Factor A) contributes to this vulnerability, because research indicates that predation increases with increased habitat fragmentation and smaller patch sizes. Predation leads to the direct removal of eggs, juveniles, and adults from the population, exacerbating risks associated with the species' small population size. Esmeraldas woodstars are particularly vulnerable to predation by wild cats during the breeding season on Isla de La Plata, where cats have been known to prey particularly upon bird eggs. Esmeraldas woodstars produce a low clutch size (see Habitat and Life History), and predation can remove potentially reproductive adults from the breeding pool.

The Esmeraldas woodstar is classified as an endangered species under Ecuadorian law, and part of the species' range is included within two protected areas. Despite numerous laws and regulatory mechanisms to administer and manage wildlife and their habitats, existing laws are inadequate (Factor D) to protect the species and its habitat from ongoing habitat loss (Factor A) and predation by nonnative animals (Factor C), even within the protected areas.

We have carefully assessed the best available scientific and commercial information regarding the past, present, and potential future threats faced by the Esmeraldas woodstar. We consider the ongoing threats to the Esmeraldas woodstar, habitat loss (Factor A) and predation (Factor C), exacerbated by the species' small population size and limited dispersal ability (Factor E), and compounded by inadequate regulatory mechanisms (Factor D), to be equally present and of the same magnitude throughout the species' entire current range. Based on this information, we find that the Esmeraldas woodstar is endangered throughout its range.

Available Conservation Measures

Conservation measures provided to species listed as endangered or threatened under the Act include recognition, requirements for Federal protection, and prohibitions against certain practices. Recognition through listing results in public awareness, and encourages and results in conservation actions by national governments, private agencies and groups, and individuals.

Section 7(a) of the Act, as amended, and as implemented by regulations at 50 CFR part 402, requires Federal agencies to evaluate their actions within the United States or on the high seas with respect to any species that is proposed or listed as endangered or threatened, and with respect to its critical habitat, if any is being designated. However, given that the blue-billed curassow, the brown-banded antpitta, the Cauca guan, the gorgeted wood-quail, and the Esmeraldas woodstar are not native to the United States, no critical habitat is being proposed for designation with this rule.

Section 8(a) of the Act authorizes limited financial assistance for the development and management of programs that the Secretary of the Interior determines to be necessary or useful for the conservation of endangered and threatened species in foreign countries. Sections 8(b) and 8(c) of the Act authorize the Secretary to encourage conservation programs for foreign endangered species and to provide assistance for such programs in the form of personnel and the training of personnel.

The Act and its implementing regulations set forth a series of general prohibitions and exceptions that apply to all endangered and threatened wildlife. Consequently, these prohibitions would be applicable to the blue-billed curassow, the brown-banded antpitta, the Cauca guan, the gorgeted wood-quail, and the Esmeraldas woodstar. These prohibitions, under 50 CFR 17.21, make it illegal for any person subject to the jurisdiction of the United States to ''take'' (take includes harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or to attempt any of these) within the United States or upon the high seas, import or export, deliver, receive, carry, transport, or ship in interstate or foreign commerce in the course of a commercial activity or to sell or offer for sale in interstate or foreign commerce, any endangered wildlife species. It also is illegal to possess, sell, deliver, carry, transport, or ship any such wildlife that has been taken in violation of the Act. Certain exceptions apply to agents of the Service and State conservation agencies.

We may issue permits to carry out otherwise prohibited activities involving endangered and threatened wildlife species under certain circumstances. Regulations governing permits are codified at 50 CFR 17.22 for endangered species, and at 17.32 for threatened species. With regard to endangered wildlife, a permit may be issued for the following purposes: for scientific purposes, to enhance the propagation or survival of the species; and for incidental take in connection with otherwise lawful activities.

Required Determinations

National Environmental Policy Act (NEPA)

We have determined that environmental assessments and environmental impact statements, as defined under the authority of the National Environmental Policy Act of 1969 (42 U.S.C. 4321 et seq.), need not be prepared in connection with regulations adopted under section 4(a) of the Act. We published a notice outlining our reasons for this determination in the **Federal Register** on October 25, 1983 (48 FR 49244).

References Cited

A list of the references cited in this final rule is available at *http://www.regulations.gov* at Docket No. FWS–R9–IA–2009–12 or upon request (see **FOR FURTHER INFORMATION CONTACT**).

Author(s)

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List of Subjects in 50 CFR Part 17

Endangered and threatened species, Exports, Imports, Reporting and recordkeeping requirements, Transportation.

Regulation Promulgation

Accordingly, we hereby amend part 17, subchapter B of chapter I, title 50 of the Code of Federal Regulations, as set forth below:

PART 17—[AMENDED]

■ 1. The authority citation for part 17 continues to read as follows:

Authority: 16 U.S.C. 1361–1407; 1531–1544; 4201–4245; unless otherwise noted.

■ 2. Amend § 17.11(h), by adding new entries for ''Antpitta, brown-banded'', ''Curassow, blue-billed'', ''Guan, Cauca'', ''Wood-quail, gorgeted'', and ''Woodstar, Esmeraldas'' in alphabetical order under ''Birds'' to the List of Endangered and Threatened Wildlife to read as follows:

§ 17.11 Endangered and threatened wildlife.

* * * * *

(h) * * *

Species		Historic range	Vertebrate population where endangered or threatened	Status	When listed	Critical habitat	Special rules
Common name	Scientific name						
*	*	*	*	*	*		*
Birds							
*	*	*	*	*	*		*
Antpitta, brown-banded	*Grallaria milleri*	Colombia, South America.	Entire	E	813	NA	NA
*	*	*	*	*	*		*
Curassow, blue-billed	*Crax alberti*	Colombia, South America.	Entire	E	813	NA	NA
*	*	*	*	*	*		*
Guan, cauca	*Penelope perspicax*.	Colombia, South America.	Entire	E	813	NA	NA
*	*	*	*	*	*		*
Wood-quail, gorgeted	*Odontophorus strophium*.	Colombia, South America.	Entire	E	813	NA	NA
*	*	*	*	*	*		*
Woodstar, Esmeraldas	*Chaetocercus berlepschi*.	Ecuador, South America.	Entire	E	813	NA	NA
*	*	*	*	*	*		*

Dated: September 20, 2013.

Rowan W. Gould,

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

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