DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

[FWS–R9–ES–2009–0084; MO 92210–1111F114 B6]

RIN 1018–AW39

Endangered and Threatened Wildlife and Plants; Listing Six Foreign Birds as Endangered Throughout Their Range

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Final rule.

SUMMARY: We, the U.S. Fish and Wildlife Service, determine endangered status for the following six foreign species found on islands in French Polynesia and in Europe, Southeast Asia, and Africa: Cantabrian capercaillie (*Tetrao urogallus cantabricus*); Marquesan imperial pigeon (*Ducula galeata*); the Eiao Marquesas reed-warbler (*Acrocephalus percernis aquilonis*), previously referred to as (*Acrocephalus mendanae aquilonis*); greater adjutant (*Leptoptilos dubius*); Jerdon's courser (*Rhinoptilus bitorquatus*); and slender-billed curlew (*Numenius tenuirostris*), under the Endangered Species Act of 1973 (Act), as amended. This final rule implements the Federal protections provided by the Act for these species.

DATES: This rule becomes effective September 12, 2011.

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 North 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), call the Federal Information Relay Service (FIRS) at 800–877–8339.

SUPPLEMENTARY INFORMATION:

Background

The Endangered Species Act of 1973, as amended (Act) (16 U.S.C. 1531 *et seq.*) is a law that was passed to prevent extinction of species by providing measures to help alleviate the loss of species and their habitats. Before a plant or animal species can receive the protection provided by the Act, it must first be added to the Federal Lists of Threatened and Endangered Wildlife and Plants; section 4 of the Act and its implementing regulations at 50 CFR part 424 set forth the procedures for adding species to these lists.

Previous Federal Actions

On January 5, 2010, the Service published in the **Federal Register** a rule proposing to list these six foreign bird species as endangered under the Act (75 FR 286). 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 January 2010 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 January 5, 2010, proposed rule, we 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 10 individuals; five 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. Overall, the commenters and peer reviewers supported the proposed listing. Nine comments included additional information for consideration; the remaining comment 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 21 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 five 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 some of the species, as well as technical clarifications, as described below. Technical corrections suggested by the peer reviewers have been incorporated into this final rule. In some cases, it has been indicated in the citations by ''personal communication'' (pers. comm.), which could indicate either an e-mail or telephone conversation; while in other cases, the research citation is provided.

Peer Reviewer Comments

(1) *Comment:* Two peer reviewers provided comments and additional literature regarding the Cantabrian capercaillie's diet, noting that the diet for the subspecies is unique compared to other capercaillie species.

Our Response: We reviewed the additional literature provided and updated the information on the subspecies' population estimate and diet, highlighting the use of different plants throughout the season.

(2) Comment: One peer reviewer stated that grouse, including capercaillie, do not have ''crests,'' but supraorbital combs and that the description of the bird given was not a good one. Another peer reviewer noted that the species description included only the male plumage and did not describe the female.

Our Response: The ''crests'' in the species description given in the proposed rule refers to a scarlet crest-shaped area above the eyes. We have replaced ''crests'' with ''supraorbital combs.'' We have also revised the species description to include more specific details of the species' traits and included a description of the female.

(3) Comment: One peer reviewer provided additional literature on differences in habitat selection within the Cantabrian capercaillie subspecies.

Our Response: We have reviewed the provided literature and have revised our discussion on the Cantabrian capercaillie habitat to reflect the slight differences in the preferred habitat of hens and cocks during the summer.

(4) Comment: One peer reviewer stated that there was not enough data available to support information on Cantabrian capercaillie population subdivision.

Our Response: The peer reviewer is referring to a study, conducted by Pollo *et al.* (2005), which we included in our discussion of the population decline in Cantabrian capercaillie. The study counted singing males in leks located across the southern slope of the

Cantabrian Mountains. The author considered a set of leks of a side-valley or a continuous forested habitat, generally separated by intervening ridges, to be a subpopulation. There is no information indicating that these groupings are true subpopulations. Based on this, we removed the language referring to subpopulations and reported the results of the study in total number of singing males across the southern slope.

(5) Comment: One peer reviewer stated there were updates on the phylogeography of the Cantabrian Capercaillie and its potential significance for future management, and provided additional literature.

Our Response: We reviewed the provided literature and incorporated the results of a genetic study under the Conservation Status section for this species.

(6) Comment: One peer reviewer provided clarification on the IUCN assessment process.

Our Response: Our discussion under the Conservation Status section of the proposed rule suggested that the International Union for Conservation of Nature (IUCN) had decided not to list the Cantabrian subspecies. All bird species are regularly assessed by the IUCN; however, subspecies are often omitted because of capacity limitations, although IUCN Red List categories and criteria can be applied to subspecies. We have revised the discussion per the peer reviewer's comment.

(7) Comment: One peer reviewer suggested that the common name Eiao Polynesian warbler was misleading and suggested a more specific English common name, Eiao Marquesas reed-warbler. This peer reviewer also provided additional citations for the Eiao Polynesian warbler and Marquesan imperial pigeon.

Our Response: The peer reviewer pointed out that species of the genus *Acrocephalus* are specifically reed-warblers and there are several species which inhabit the Polynesian region. We have changed our use of Eiao Polynesian warbler to Eiao Marquesas reed-warbler to more clearly refer to the reed-warbler that resides on Eiao Island in the Marquesas. We also reviewed the suggested citations and updated the information on clutch size for the Eiao Marquesas reed-warbler and population information for the Marquesan imperial pigeon.

(8) Comment: One peer reviewer provided additional citations regarding the description of the Jerdon's courser. This peer reviewer also provided information on hunting as a threat to the Jerdon't courser.

Our Response: We have reviewed the suggested citation and have corrected the species description for the Jerdon's courser. Also, we have added information on hunting as a potential threat to this species, but also note that there is no quantitative information on which to analyze this threat.

(9) Comment: One peer reviewer provided two additional citations for consideration regarding the slender-billed curlew.

Our Response: We reviewed the suggested citations and included additional information on nesting habitat and alterations to the nesting habitat described by Ushakov in 1924.

Public Comments

(10) Comment: One commenter suggested we also consider protecting the habitat of these six species.

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 and results in 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.

(11) Comment: One comment provided a technical correction to the status of the Cantabrian capercaillie under Spain's National Catalog of Endangered Species and provided the amendment changing its status to ''in danger of extinction.'' This commenter also provided additional literature regarding population estimates for the Cantabrian capercaillie and a recent decree approving a recovery plan for this subspecies.

Our Response: Under the Conservation Status section of the Cantabrian capercaillie, we have revised our text to indicate that this subspecies is listed as ''in danger of extinction'' based on the 2005 amendment changing its status from ''vulnerable.'' We also reviewed the information on population estimates along with the additional citations provided by two peer reviewers (discussed above under *Peer Reviewer Comments*). We have updated the information on the subspecies' population estimate. We added information under Factor D relating to the approved Recovery Plan and the protections and measures it provides.

(12) Comment: One commenter provided two citations and stated that the Cantabrian capercaillie habitat consists of Scots pine (*Pinus sylvestris*) and disappearance of pine trees in the Cantabrian Mountains threatens the Cantabrian capercaillie. The commenter further states that future habitat alteration due to climate change will likely further threaten and impact the species.

Our Response: After review of the two citations, we do not agree with the commenter's conclusions. It is our opinion that the first citation given by the commenter (Science Daily 2008, unpaginated) misinterprets the study and conclusions of Rubiales *et al.* (2008). To begin, the Cantabrian capercaillie occurs in entirely deciduous forests, not pine forests. In fact, this habitat difference is part of the basis for the Cantabrian capercaillie being described as a separate subspecies. Furthermore, the Rubiales *et al.* (2008) article describes the historical biogeography of Scots pine in the Cantabrian range and only briefly compares the trends in distribution of Scots pine and the capercaillie species as a whole, not just the Cantabrian capercaillie subspecies (Rubiales *et al.* 2008, pp. 6–7). The journal article does conclude that today's Scots pine and capercaillie populations are now highly fragmented and their future, given the predictions of global climate change, is uncertain (Rubiales *et al.* 2008, p. 1); however, this conclusion is referring to the species as a whole. Given that the other subspecies of capercaillie occur in entirely coniferous or mixed-coniferous forests, this statement is more appropriate to those subspecies and not to the Cantabrian capercaillie. We did not find, or receive, any information on climate change in the region of the Cantabrian capercaillie or information on the impact on deciduous forests in this area. Therefore, we did not add any information on the impact of climate change to the Cantabrian capercaillie.

(13) Comment: One commenter stated that the slender-billed curlew has been identified as a species threatened by climate change due to its small and declining population size and area of occupancy. The commenter also provided an additional citation to support this statement.

Our Response: We have reviewed the suggested literature and have included under Factor E additional information on climate change predictions within the African-Eurasian Waterbird Flyway

and potential impacts to slender-billed curlew based on these predictions.

Summary of Changes From Proposed Rule

We fully considered comments from the public and peer reviewers on the proposed rule to develop this final listing of these six foreign bird species. This final rule incorporates changes to our proposed listing based on the comments that we received that are discussed above and newly available scientific and commercial information. Reviewers generally commented that the proposed rule was very thorough and comprehensive. We made some technical corrections based on new, although limited, information. None of the information, however, changed our determination that listing these species as endangered is warranted.

One substantive change we have made is in our analysis of the slender-billed curlew. In our proposed rule, we concluded that *Factor A.* (*Present or threatened destruction, modification, or curtailment of habitat or range*) was a threat to the species throughout its range. However, after further analysis of the information, we find that the loss of habitat is historic and that other species that use the same types of habitat have not experienced the same population decline seen in the slender-billed curlew. Furthermore, since it is not known what habitat the slender-billed curlew currently uses when in its nesting grounds, passage areas, or wintering grounds, we cannot properly assess the current or potential future threat of habitat modification or the impacts on this species. Therefore, we find that *Factor A* is not a threat to the species. This change did not alter our overall determination that the slender-billed curlew is in danger of extinction and should be listed as endangered under the Act.

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. Under section 4(a)(1) of the Act, we may list a species based on any of the following five 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; and (E) other natural or manmade factors affecting its continued existence. Listing actions may be warranted based on any of the above threat factors, singly or in combination.

Despite the fact that global climate changes are occurring and affecting habitat, the climate change models that are currently available do not yet enable us to make meaningful predictions of climate change for specific, local areas (Parmesan and Matthews 2005, p. 354). We have obtained information on climate change for the slender-billed curlew and potential impacts to this species (See Factor E). However, we do not have models to predict how the climate in the range of the other Eurasian and Asian bird species will change, and we do not know how any change that may occur would affect these species. Nor do we have information on past and future weather patterns within the specific range of these species. Therefore, based on the current lack of information, we did not evaluate climate change as a threat to five of these species.

Below is a species-by-species description and analysis of the five factors. The species are considered in alphabetical order, beginning with the Cantabrian capercaillie, followed by the Eiao Marquesas reed-warbler, greater adjutant, Jerdon's courser, Marquesan Imperial Pigeon, and the slender-billed curlew.

I. Cantabrian capercaillie (*Tetrao urogallus cantabricus*)

Species Description

The Cantabrian capercaillie (*Tetrao urogallus cantabricus*) is a subspecies of the western capercaillie (*T. urogallus)* in the family Tetraonidae. The species in general is a large, very dark grouse of 80 to 115 centimeters (cm) in length (31 to 45 inches (in)), with the female being much smaller than the male. The species is characterized by having slate gray plumage with fine blackish vermiculation (wavelike pattern) around the head and neck. The breast is a glossy greenish-black. The wings are dark brown with a prominent white carpal patch and variable amount of white on the upper- and undertail-coverts (feathers) and the underparts. This bird has a long, rounded tail, an ivory white bill, and a scarlet supraorbital comb (above the eye). Females are mottled black, gray and buff with a large rusty patch on the breast (World Association of Zoos and Aquaria 2009, unpaginated). Based on ecological differences from other capercaillie subspecies (the Cantabrian capercaillie is the only subspecies that inhabits pure deciduous forests) and morphological differences from the Pyrenean capercaillie (*T. u. aquitanicus*) (Cantabrian capercaillie are lighter in color and have a smaller beak), the Cantabrian population was described as belonging to a different subspecies by Castroviejo 1976 (Rodríguez-Muñoz *et al.* 2007, pp. 660, 666).

The Cantabrian capercaillie once existed along the whole of the Cantabrian Mountain range from northern Portugal through Galicia, Asturias, and Leon, to Santander in northern Spain (IUCN Redbook 1979, p. 1). Currently its range is restricted to both the northern slope (Asturias and Cantabria provinces) and the southern slope (León and Palencia provinces) of the Cantabrian Mountains in northwest Spain. The subspecies inhabits an area of 1,700 square kilometers (km^2) (656 square miles (mi^2)), and its range is separated from its nearest neighboring subspecies of capercaillie (*T. u. aquitanus*) in the Pyrenees mountains by a distance of more than 300 km (186 mi) (Quevedo *et al.* 2006b, p. 268).

Unlike other capercaillie subspecies, the Cantabrian capercaillie occurs in entirely deciduous forests consisting of a rugged montane landscape of mature beech (*Fagus sylvatica*), sessile oak (*Quercus petraea*), and birch (*Betula pubescens*) (Rodríguez-Muñoz *et al.* 2007, pp. 659, 660; Banuelos *et al.* 2008, pp. 245–246) at elevations ranging from 800 to 1,800 m (2,600 to 5,900 ft). The Cantabrian capercaillie also uses other microhabitat types (broom (*Genista* spp.), meadow, and heath (*Erica* spp.)) selectively throughout the year (Quevedo *et al.* 2006b, p. 271). A recent study has found that some habitat partitioning occurs amongst the Cantabrian capercaillie. During the summer, hens and cocks are more associated with open areas than the forested spring display areas. Specifically, hens with broods are more associated with treeline birch forests, which are the most suitable areas for the species, and are characterized by a rich understory of shrubs such as heath and bilberry (*Vaccinium myrtillus*); hens without broods prefer a more rugged terrain; and cocks prefer beech or oak forests (Banuelos *et al.* 2008, p. 249).

Diet appears to be a driver of habitat selection (Blanco-Fontao *et al.* 2009, pp. 1, 6). In summer and autumn, the majority of the Cantabrian capercaillie diet consists of bilberry (mainly berries) and fern fronds. In winter, holly leaves (*Ilex aquifolium*), beech buds, bilberry shoots and fern fronds make up a majority of the diet, whereas only beech buds, bilberry shoots and fern fronds dominate the spring diet. Birch, oak, rowan (*Sorbus aucuparia*), heath, and broom are also consumed, but in much

smaller amounts (Blanco-Fontao *et al.* 2009, p. 4).

The current population is likely less than 1,000 birds; however, reliable estimates are lacking (Storch 2007, p. 49). Population estimates for species of grouse are commonly assessed by counting males that gather during the breeding season to sing and display at leks (traditional places where males assemble during the mating season and engage in competitive displays to attract females). In a 1981–1982 survey of the southern slope, Pollo *et al.* (2005, p. 401) estimated a minimum number of 274 singing male capercaillie; in subsequent surveys from 1987–1989, 1998, and 2000–2003, only 219, 94, and 81 males were recorded, respectively, indicating a 70 percent reduction. This is equivalent to an average decline of 3 percent per year, or 22 percent over 8 years (Storch *et al.* 2006, p. 654). A study conducted from 2005 to 2007 found that only 30 percent of all known leks were occupied in the northern watershed of the species' range, indicating an occupancy decline of 5.4 percent. In the southern watershed, only 34.5 percent of all known leks in the area remain occupied (Bañuelos and Quevedo 2008, p. 5).

The area occupied by Cantabrian capercaillie in 1981–1982 covered up to approximately 2,070 km² (799 mi²) of the southern slope (972 km² (375 mi²) in the west and 1,098 km² (424 mi²) in the east). Between 2000 and 2003, the area of occupancy had declined to 693 km² (268 mi²), specifically 413 km² (159 mi²) in the west and 280 km² (108 mi²) in the east. Thus, over a 22-year period, there was a 66-percent reduction in the areas occupied by this subspecies on the southern slope of the Cantabrian Mountains (Pollo *et al.* 2005, p. 401). Based on this data, the subpopulation in the eastern portion of the range appears to be declining at a faster rate than the subpopulation in the western portion of the range.

Conservation Status

Although Storch *et al.* (2006 p. 653) noted that the Cantabrian capercaillie meets the criteria to be listed as ''Endangered'' on the IUCN Redlist due to ''rapid population declines, small population size, and severely fragmented range,'' it is currently not classified as such by the IUCN. The species (western capercaillie (*Tetrao urogallus*)) has been evaluated and is listed as Least Concern (Birdlife International 2009, unpaginated); subspecies are generally omitted due to capacity limitations, although the IUCN categories and criteria can be applied to subspecies (Storch *et al.* 2006 p. 653). The species is classified as ''in danger of extinction'' in Spain under the National Catalog of Endangered Species (Ministry of the Environment MAM Order/2231/2005). The species has not been formally considered for listing in the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Appendices (*http://www.cites.org*). Recent phylogenetic studies indicate that the Cantabrian capercaillie forms a different clade from those of other European capercaillie, and factoring in ecological differences, qualifies as an Evolutionarily Significant Unit (Storch *et al.* 2006, p. 653; Rodríguez-Muñoz *et al.* 2007, p. 668). Combined with recent population trends and changes in distribution, Rodríguez-Muñoz *et al.* (2007, p. 668) suggest the status of this species should be defined as critical.

Summary of Factors Affecting the Cantabrian Capercaillie

A. Present or Threatened Destruction, Modification, or Curtailment of Habitat or Range

Numerous limiting factors influence the population dynamics of the Cantabrian capercaillie throughout its range, including habitat degradation, loss, and fragmentation (Storch 2000, p. 83; 2007, p. 96). Forest structure plays an important role in determining habitat suitability and occupancy. Quevedo *et al.* (2006b, p. 274) found that open forest structure with well-distributed bilberry shrubs were the preferred habitat type of Cantabrian capercaillie. Management of forest resources for timber production has caused and continues to cause significant changes in forest structure such as: Species composition, density and height of trees, forest patch size, and understory vegetation (Pollo *et al.* 2005, p. 406).

The historic range occupied by this subspecies (3,500 km² (1,350 mi²)) has declined by more than 50 percent (Quevedo *et al.* 2006b, p. 268). The current range is severely fragmented, with low forest habitat cover (22 percent of the landscape) and most of the suitable habitat remaining in small patches less than 10 hectares (ha) (25 acres (ac)) in size (Garcia *et al.* 2005, p. 34). Patches of good-quality habitat are scarce and discontinuous, particularly in the central parts of the range (Quevedo *et al.* 2006b, p. 269), and leks in the smaller forest patches have been abandoned during the last few decades. The leks that remain occupied are now located farther from forest edges than those occupied in the 1980s (Quevedo *et al.* 2006b, p. 271).

Based on population surveys, forest fragments containing occupied leks in 2000 were significantly larger than fragments containing leks in the 1980s that have since been abandoned (Quevedo *et al.* 2006b, p. 271). The forest fragments from which the Cantabrian capercaillie has disappeared since the 1980s are small in size, and are the most isolated from other forest patches. In addition, the Cantabrian capercaillie have disappeared from forest patches located closest to the edge of the range in both the eastern and western subpopulations of the south slope of the Cantabrian Mountains, suggesting that forest fragmentation is playing an important role in the population dynamics of this subspecies (Quevedo *et al.* 2006b, p. 271). Research conducted on other subspecies of capercaillie indicate that the size of forest patches is correlated to the number of males that gather in leks to display, and that below a certain forest patch size, leks are abandoned (Quevedo *et al.* 2006b, p. 273).

In highly fragmented landscapes, forest patches are embedded in a matrix of other habitats, and forest dwellers like capercaillies frequently encounter open areas within their home range. Quevedo *et al.* (2006a, p. 197) developed a habitat suitability model for the Cantabrian capercaillie that assessed the relationship between forest patch size and occupancy. He determined that the subspecies still remains in habitat units that show habitat suitability indices below the cut-off values of the two best predictive models (decline and general), which may indicate a high risk of local extinction. Other researchers suggested that, should further habitat or connectivity loss occur, the Cantabrian capercaillie population may become so disaggregated that the few isolated subpopulations will be too small to ensure their own long-term persistence (Grimm and Storch 2000, p. 224).

A demographic model based on Bavarian alpine populations of capercaillie suggests a minimum viable population size of the order of 500 birds (Grimm and Storch 2000, p. 222). However, genetic data show clear signs of reduced variability in populations with numbers of individuals in the range of fewer than 1,000 birds, which indicates that a demographic minimum population of 500 birds may be too small to maintain high genetic variability (Segelbacher *et al.* 2003, p. 1779). Genetic consequences of habitat fragmentation exist for this species in the form of increased genetic differentiation due to increased isolation of populations (Segelbacher *et al.* 2003, p. 1779). Therefore,

anthropogenic habitat deterioration and fragmentation not only leads to range contractions and extinctions, but may also have significant genetic, and thus, evolutionary consequences for the surviving populations (Segelbacher *et al.* 2003, p. 1779).

In summary, recent population surveys show this subspecies is continuing to decline throughout its current range, and subpopulations may be isolated from one another due to range contractions in the eastern and western portions of its range, leaving the central portion of the subspecies range abandoned (Pollo *et al.* 2005, p. 401). Some remaining populations may already have a high risk of local extinction (Quevedo *et al.* 2006a, p. 197). Management of forest resources for timber production continues to negatively affect forest structure, thereby affecting the quality, quantity, and distribution of suitable habitat available for this subspecies. In addition, the structure of the matrix of habitats located between forest patches is likely affecting the ability of capercaillies to disperse between subpopulations. Therefore, we find that present or threatened destruction, modification, or curtailment of the habitat or range is a threat to the continued existence of the Cantabrian capercaillie throughout its range.

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

Currently hunting of the Cantabrian capercaillie is illegal in Spain; however, illegal hunting still occurs (Storch 2000, p. 83; 2007, p. 96). Because this species congregates in leks, individuals are particularly easy targets, and poaching of protected grouse is considered common (Storch 2000, p. 15). It is unknown what the incidence of poaching is or what impact it is having on this subspecies; however, given the limited number of birds remaining and the reduced genetic variability already evident at current population levels, the further loss of breeding adults could have substantial impact on the subspecies. Therefore, we find that overutilization for recreational purposes is a threat to the continued existence of the Cantabrian capercaillie throughout its range.

C. Disease or Predation

Diseases and parasites have been proposed as factors associated with the decline of populations of other species within the same family of birds as the capercaillie (Tetraonidae) (Obeso *et al.* 2000, p. 191). In an attempt to determine if parasites were contributing to the decline of the Cantabrian capercaillie, researchers collected and analyzed fecal samples in 1998 from various localities across the range of this subspecies. The prevalence of common parasites (*Eimeria* sp. and *Capillaria* sp.) was present in 58 percent and 25 percent of the samples collected, respectively. However, both the intensity and average intensity of these parasites were very low compared to other populations of species of birds in the Tetraonidae family. Other parasites were found infrequently. The researchers concluded that it was unlikely that intestinal parasites were causing the decline of the Cantabrian capercaillie.

Based on the information above, we do not believe that parasite infestations are a significant factor in the decline of this subspecies. We are not aware of any species-specific information currently available that indicates that predation poses a threat to the species. Therefore, we are not considering disease or predation to be contributing threats to the continued existence of the Cantabrian capercaillie throughout its range.

D. Inadequacy of Existing Regulatory Mechanisms

This subspecies is currently classified as ''in danger of extinction'' in Spain under the National Catalog of Endangered Species, which affords it special protection (*e.g.,* additional regulation of activities in the forests of its range, regulation of trails and roads in the area, elimination of poaching, and protection of areas important to young). Although it is classified as ''in danger of extinction,'' as mentioned above (see Factor B), illegal hunting still occurs.

In conjunction with this subspecies being listed as ''in danger of extinction'' under the National Catalog of Endangered Species, a recovery plan for the Cantabrian capercaillie was approved by the Autonomous Community of Castilla and Leon. This official document approves the recovery plan and adopts measures for the protection of the species in the Community of Castilla and Leon (Decree 4/2009, dated January 15, 2009; Pollo 2010, pers. comm.). The purpose of the Recovery Plan is to foster necessary actions to allow the species to achieve a more favorable conservation status and to ensure its long-term viability and stop population decline. The Recovery Plan includes requirements that the effects to the Cantabrian capercaillie or its habitat be considered before a plan or activity can be implemented; restricting access to critical areas; suspension of resource exploitation activities following wildlife catastrophic events (*e.g.,* animal epidemics, poisoning, widespread wildfires) to allow for recovery; prohibiting certain activities within critical areas; and specific measures to meet the goals of the Recovery Plan.

The European Union (EU) Habitat Directive 92/43/EEC addresses the protection of habitat and species listed as endangered at the European scale (European Union 2008). Several habitat types valuable to capercaillie have been included in this Directive, such as in Appendix I, Section 9, Forests. The EU Bird Directive (79/407/EEC) lists the capercaillie in Annex I as a ''species that shall be subject to special habitat conservation measures in order to ensure their survival.'' Under this Directive, a network of Special Protected Areas (SPAs) comprising suitable habitat for Annex I species is to be designated. This network of SPAs and other protected sites are collectively referred to as Natura 2000. Several countries in Europe, including Spain, are in the process of establishing the network of SPAs. The remaining Cantabrian capercaillie populations occur primarily in recently established Natural Reserves in Spain that are part of the Natura 2000 network (Muniellos Biosphere Reserve). Management of natural resources by local communities is still allowed in areas designated as an SPA; however, the development of management plans to meet the various objectives of the Reserve network is required.

This subspecies is also afforded special protection under the Bern Convention (Convention on the Conservation of European Wildlife and Natural Habitats; European Treaty Series/104; Council of Europe 1979). The Cantabrian capercaillie is listed as ''strictly protected'' under Appendix II, which requires member states to ensure the conservation of the listed taxa and their habitats. Under this Convention, protections of Appendix-II species include the prohibition of: The deliberate capture, keeping, and killing of the species; deliberate damage or destruction of breeding sites; deliberate disturbance during the breeding season; deliberate taking or destruction of eggs; and the possession or trade of any individual of the species. We were unable to find information on the effectiveness of this designation in preventing further loss of Cantabrian capercaillie or its habitat; however, poaching of protected grouse is known to be common, suggesting that this designation has not been effectively implemented.

In November 2003, Spain enacted the ''Forest Law,'' which addresses the preservation and improvement of the forest and rangelands in Spain. This law requires development of plans for the management of forest resources, which are to include plans for fighting forest fires, establishment of danger zones based on fire risk, formulation of a defense plan in each established danger zone, the mandatory restoration of burned area, and the prohibition of changing forest use of a burned area into other uses for a period of 30 years. In addition, this law provides economic incentives for sustainable forest management by private landowners and local entities. We do not have information on the effectiveness of this law with regard to its ability to prevent negative impacts to Cantabrian capercaillie habitat.

Despite recent advances in protection of this subspecies and its habitat through EU Directives and protection under Spanish law and regulation, populations continue to decline (Bañuelos and Quevedo 2008, p. 5; Storch *et al.* 2006, p. 654; Pollo *et al.* 2005, p. 401), habitat continues to be degraded, lost, and fragmented (Storch 2000, p. 83; 2007, p. 96), and illegal poaching still occurs (Storch 2000, p. 83; 2007, p. 96). We were unable to find information on the effectiveness of any of these measures at reducing threats to the species. Therefore, we find that existing regulatory mechanisms are inadequate to ameliorate the current threats to the Cantabrian capercaillie throughout its range.

E. Other Natural or Manmade Factors Affecting the Species' Continued Existence

Suarez-Seoane and Roves (2004, pp. 395, 401) assessed the potential impacts of human disturbances in core populations of Cantabrian capercaillie in Natural Reserves in Spain. They found that locations selected as leks were located at the core of larger patches of forest and were less subject to human disturbance. They also found that Cantabrian capercaillie disappeared from leks situated in rolling hills at lower altitudes closer to houses, hunting sites, and repeatedly burned areas.

Recurring fires have also been implicated as a factor in the decline of the subspecies. An average of 85,652 ha (211,650 ac) of forested area per year over a 10-year period (1995–2005) has been consumed by fire in Spain (Lloyd 2007a, p. 1). On average, 80 percent of all fires in Spain are set intentionally by humans (Lloyd 2007a, p. 1). Suarez-Seoane and Garcia-Roves (2004, p. 405) found that the stability of Cantabrian capercaillie breeding areas throughout a 20-year period was mainly related to low fire recurrence in the surrounding area and few houses nearby. In addition, the species avoids areas that are recurrently burned because the areas lose their ability to regenerate and cannot produce the habitat the species requires (Suarez-Seoane and Garcia-Roves 2004, p. 406). We were unable to find information as to how many hectares of suitable Cantabrian capercaillie habitat is consumed by fire each year. However, since the species requires a low recurrence of fire, and both disturbance and fire frequency are likely to increase with human presence, this could be a potential threat to both habitat and individual birds where there is a high prevalence of disturbance and fire frequency.

In summary, disturbance from humans appears to impact the species; birds are typically found in areas of less anthropogenic disturbance and further from homes. Natural Protected Areas in Spain have seen an increase in human use for recreation and hunting. As human population centers expand and move closer to occupied habitat areas, increased disturbance to important breeding, feeding, and sheltering behaviors of this species is expected to occur. Additionally, as human presence increases, it is likely that both fires and disturbances will increase. Either or both of these factors have the potential to impact both individuals and their habitat. Therefore, we conclude that other natural or manmade factors, in the form of forest fires and disturbance, are threats to the continued existence of the Cantabrian capercaillie throughout its range.

Status Determination for the Cantabrian Capercaillie

We have carefully assessed the best available scientific and commercial information regarding the past, present, and potential future threats faced by the Cantabrian capercaillie. The species is currently at risk throughout all of its range due to ongoing threats of habitat destruction and modification (Factor A), overutilization (Factor B), inadequacy of existing regulatory mechanisms (Factor D), and other natural or manmade factors affecting its continued existence in the form of forest fires and disturbance (Factor E).

Section 3 of the Act defines an ''endangered species'' as ''any species which is in danger of extinction throughout all or a significant portion of its range'' and a ''threatened species'' as ''any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.''

The Cantabrian capercaillie is the most threatened subspecies of capercaillie; the current population is likely less than 1,000 individuals and continues to decline. Management of forest resources for timber production continues to negatively affect forest structure and the quality, quantity, and distribution of suitable habitat and the structure of the matrix between forest patches, which may be affecting the ability of capercaillie to disperse. In addition, hunting of Cantabrian capercaillie, although illegal, still occurs. Congregation at leks makes this species an easy target and particularly vulnerable as poaching of protected grouse is considered common. The level of poaching is unknown, but given the small population size and the already evident reduced genetic variability, further loss of breeding individuals could have a significant impact on the population. Regulatory mechanisms are in place to protect the subspecies and its habitat, but are inadequate to ameliorate current threats. Furthermore, as human population centers expand, increased disturbance to important breeding, feeding, and sheltering behaviors is expected, further affecting this subspecies. These threats are affecting the quality and quantity of suitable habitat, the ability of the species to disperse and expand their current range, and may affect the breeding capability of the populations. Without regulatory mechanisms to reduce or ameliorate these threats, negative impacts to the subspecies will continue. In considering these ongoing threats in combination with the currently small and declining Cantabrian capercaillie population, we determine that the magnitude of these threats are such that this subspecies is in danger of extinction throughout all of its range. Therefore, on the basis of the best available scientific and commercial information, we are listing the Cantabrian capercaillie as an endangered species throughout all of its range. Because we find that the Cantabrian capercaillie is endangered throughout all of its range, there is no reason to consider its status in a significant portion of its range.

II. Eiao Marquesas Reed-Warbler (*Acrocephalus percernis aquilonis*), Previously Referred to as Eiao Polynesian Warbler (*Acrocephalus mendanae aquilonis* and *Acrocephalus caffer aquilonis*)

Species Description

Due to the similarity of all the reed-warblers of Polynesia, these warblers

were once considered a single, widespread species known as the long-billed reed-warbler (*Acrocephalus caffer*). The 1980 petition from Dr. Warren B. King included the Eiao Polynesian warbler (*Acrocephalus caffer aquilonis*), a subspecies of reed-warbler. The subspecies *aquilonis* denoted those warblers found on Eiao Island. The species was later split into three separate species: those of the Society Islands (*Acrocephalus caffer*), Tuamotu (*A. atyphus*), and Marquesas (*A. mendanae*) (Cibois *et al.* 2007, p. 1151). This subspecies then became known as *A. mendanae aquilonis.* Recent genetic research on Marquesas reed-warblers found two independent lineages: warblers found in the northern islands of the Marquesas Archipelago (Nuku Hiva, Eiao, Hatuta'a, and Ua Huka) and those found on the southern islands (Hiva Oa, Tahuata, Ua Pou, and Fatu Iva). As a result, the Marquesas species was split into two separate species; those of the four most northern islands (*A. percernis*) and those in the southern islands (*A. mendanae*). The reed-warblers found on Eiao are now classified as a subspecies of Northern Marquesas reed-warblers (*A. percernis aquilonis*) (Cibois *et al.* 2007, pp. 1155, 1160), with a suggested common name of Eiao Marquesas reed-warbler (Cibois 2010, pers. comm.).

The Eiao Marquesas reed-warbler (Eiao reed-warbler) is a large, insectivorous reed-warbler of the family Acrocephalidae. It is characterized by brown plumage with bright yellow underparts (Cibois *et al.* 2007, p. 1151). The Eiao reed-warbler is endemic to the island of Eiao in the French Polynesian Marquesas Archipelago in the Pacific Ocean. The Marquesas Archipelago is a territory of France located approximately 1,600 km (994 mi) northeast of Tahiti. Eiao Island is one of the northernmost islands in the Archipelago and encompasses 40 km^2 (15 mi^2).

Population densities of the Eiao reed-warbler are thought to be high within the remaining suitable habitat; one singing bird was found nearly every 40–50 m (131–164 ft). The total population is estimated at more than 2,000 birds (Raust 2007, pers. comm.). This population estimate is much larger than the 100–200 individuals last reported in 1987 by Thibault (as reported in FR 72 20184). It is unknown if the population actually increased from 1987 to 2007, or if the differences in the population estimates are a result of using different survey methodologies. We have no reliable information on the population trend of this subspecies.

Reed-warblers of the Polynesian islands utilize various habitats, ranging from shrubby vegetation in dry, lowland areas to humid forest in wet montane areas (Cibois *et al.* 2007, pp. 1151, 1153). Reed-warblers in general display strong territorial behavior (Cibois *et al.* 2007, p. 1152). Like other reed-warblers, the female Marquesas reed-warblers build the nest with little help from the male; the male incubates and broods three to four times a day, but never for more than 20 minutes at a time (Bruner 1974, p. 93). Vines, coconut fiber, and grasses are the most common nesting material (Mosher and Fancy 2002, p. 8). Warbler nests are found in the tops of trees and on vertical branches (Thibault *et al.* 2002, pp. 166, 169). Bruner (1974, p. 93) found the eggs of *A. mendanae* vary in base color, even within a nest, but are all blotched and speckled with white, brown, and black and clutch sizes range from two to five eggs. Incubation lasts 9 days and the young leave the nest and follow their parents after 10 days (Bruner 1974, p. 94).

Conservation Status

Marquesas reed-warblers (*A. mendanae*) are classified as ''of least concern'' by the IUCN (IUCN 2009a, unpaginated). However, it appears that the recent split of the Marquesas reed-warblers into the Northern and Southern Marquesas reed-warblers is not yet reflected in the IUCN assessment. Northern Marquesas reed-warblers (*A. percernis*) are protected under Law Number 95–257 in French Polynesia. The species has not been formally considered for listing in the CITES Appendices (*http://www.cites.org*).

Summary of Factors Affecting the Species

A. Present or Threatened Destruction, Modification, or Curtailment of Habitat or Range

Eiao Island was declared a Nature Reserve in 1971 and is not currently inhabited by humans. However, the entire island has been heavily impacted by introduced domestic livestock that have become feral (Manu 2009, unpaginated). Feral sheep have been identified as the main threat to the forest on the island (Thibault *et al.* 2002, p. 167). Sheep and pigs have devastated much of the vegetation and soil on Eiao, and native plant species have been largely replaced by introduced species (Merlin and Juvik 1992, pp. 604–606). Sheep have overgrazed the island, leaving areas completely denuded of vegetation. The exposed soil erodes from rainfall, further preventing native plants from regenerating (WWF 2001, unpaginated). Currently, only 10–20 percent of the island contains suitable habitat for the Eiao reed-warbler (Raust 2007, pers. comm.). These areas of suitable habitat are likely restricted to small refugia inaccessible to the feral livestock. We are not aware of any current efforts or future plans to reduce the number of feral domestic livestock on the island.

In summary, the ongoing habitat degradation from overgrazing livestock continues to have significant and ongoing impacts to the natural habitat for this subspecies. The current level of grazing on the island prevents recovery of native vegetation. Without active management of the feral livestock population on the island, the population of Eiao reed-warblers will continue to be restricted to small portions of the island that are inaccessible to the feral livestock. Furthermore, although the current estimated population is 2,000 individuals, the subspecies will not be able to expand to the rest of the island and recover beyond this current population level due to habitat loss. Because the Eiao reed-warbler is limited to one small island, the continuing loss of habitat makes this subspecies extremely vulnerable to extinction. Therefore, we find that present or threatened destruction, modification, or curtailment of the habitat or range are threats to the continued existence of the Eiao reed-warbler throughout its range.

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

We are unaware of any information currently available that indicates the use of this subspecies for any commercial, recreational, scientific, or educational purpose. As a result, we are not considering overutilization for commercial, recreational, scientific, or educational purposes to be a contributing factor to the continued existence of the Eiao reed-warbler throughout its range.

C. Disease or Predation

Avian diseases are a concern for species with restricted ranges and small populations, especially if the species is restricted to an island. Hawaii's avian malaria is a limiting factor for many species of native passerines and is dominant on other remote oceanic islands, including French Polynesia (Beadell *et al.* 2006, p. 2935). This strain was found in 9 out of 11 Marquesas reed-warblers collected on Nuku Hiva in 1987. However, because these birds were thought to be more robust (all Marquesas reed-warblers were

considered *A. mendanae*), avian malaria was not thought to pose a threat to the species (Beadell *et al.* 2006, p. 2940). We have no data on whether Hawaii's avian malaria is present on Eiao or what effects it may have on the population of reed-warblers.

Black rats (*Rattus rattus*) were introduced to Eiao, Nuku Hiva, Ua Pou, Hiva Oa, Tahuata, and Fatu Iva of the Marquesas Archipelago in the early 20th century (Cibois *et al.* 2007, p. 1159); although Thibault *et al.* (2002, p. 169) state that the presence of black rats on Eiao is only suspected. A connection between the presence of rats and the decline and extirpation of birds has been well documented (Blanvillain *et al.* 2002, p. 146; Thibault *et al.* 2002, p. 162; Meyer and Butaud 2009, pp. 1169–1170). Specifically, predation on eggs, nestlings, or adults by rats has been implicated as an important factor in the extinction of Pacific island birds (Thibault *et al.* 2002, p. 162). However, Thibault *et al.* (2002, pp. 165, 169) did not find a significant effect of rats on the abundance of Polynesian warblers. It is thought that the position of warbler nests on vertical branches close to the tops of trees makes them less accessible to rats (Thibault *et al.* 2002, p. 169), even though rats are known to be good climbers.

The common myna (*Acridotheres tristis*), an introduced bird species, may contribute to the spread of invasive plant species by consuming their fruit and may also prey on the eggs and nestlings of native birds species or outcompete native bird species for nesting sites. The myna is thought to have contributed to the decline of another reed-warbler endemic to the Marquesas (*A. caffer mendanae*) (Global Invasive Species Database 2009, unpaginated). Mynas do not currently occur on Eiao Island. Furthermore, Thibault *et al.* (2002, p. 165) found no significant effect of mynas on Polynesian warblers in Marquesas. If the myna expands its range and colonizes Eiao Island, it is unknown to what extent predation would affect the Eiao reed-warbler.

In summary, although the presence of avian malaria has been documented on Eiao and the presence of introduced rats is suspected, there is no data indicating that either is affecting the warbler population on Eiao. Nest location appears to be high enough in the trees to avoid significant predation from the introduced rat. Mynas are not known to inhabit Eiao Island, and it is not clear that they would negatively impact the warbler population if they were to colonize Eiao. Therefore, we find that disease and predation are not a threat to the continued existence of the Eiao reed-warbler throughout its range.

D. Inadequacy of Existing Regulatory Mechanisms

The Eiao reed-warbler is a protected species in French Polynesia. Northern Marquesas reed-warblers (*A. percernis*) are classified as a Category A species under Law Number 95–257. Article 16 of this law prohibits the collection and exportation of species listed under Category A. In addition, under Part 23 of Law 95–257, the introduced myna bird species, which is commonly known to outcompete other bird species, is considered a danger to the local avifauna and is listed as ''threatening biodiversity.'' Part 23 also prohibits importation of all new specimens of species listed as ''threatening biodiversity,'' and translocation from one island to another is prohibited. As described above, Eiao Island is not currently inhabited by humans and we found that overutilization for commercial, recreational, scientific, or educational purposes is not a threat to this subspecies. Furthermore, mynas do not occur on Eiao Island and is not a threat to the Eiao reed-warbler. Although this law may provide adequate protection to this subspecies from these threats, it does not protect the Eiao reed-warbler from current threats such as habitat destruction.

The French Environmental Code, Article L411–1, prohibits the destruction or poaching of eggs or nests; mutilation, destruction, capture or poaching, intentional disturbance, the practice of taxidermy, transport, peddling, use, possession, offer for sale, and the sale or the purchase of non-domesticated species in need of conservation, including northern Marquesas reed-warblers (*A. percernis*). It also prohibits the destruction, alteration, or degradation of habitat for these species. As overutilization for commercial, recreational, scientific, or educational purposes is not a threat to this subspecies, this regulation may provide adequate protection against this threat; however, habitat destruction by overgrazing livestock remains a problem on Eiao Island. Therefore this regulation does not provide adequate protection against threats currently faced by this subspecies.

Hunting and destruction of all species of birds in French Polynesia were prohibited by a 1967 decree (Villard *et al.* 2003, p. 193); however, destruction of birds which have been listed as ''threatening biodiversity'' is legal. Furthermore, restrictions on possession of firearms in Marquesas are in place (Thorsen *et al.* 2002, p. 10). Hunting is not known to be a threat to the survival of this subspecies.

In addition, the entire Eiao Island was declared an officially protected area in 1971. It is classified as Category IV, an area managed for habitat or species. However, of the nine protected areas in French Polynesia, only one (Vaikivi on Ua Huka) is actively managed (Manu 2009, unpaginated). We found no information on the direct effects of this protective status on the Eiao reed-warbler or its habitat. However, Eiao Island is not actively managed and, as discussed under Factor A, the entire island has been heavily impacted by introduced domestic livestock, suggesting this regulatory mechanism is not effective at reducing or ameliorating threats to the species.

In summary, regulations exist that protect the subspecies and its habitat. However, as described under Factor A, habitat destruction continues to threaten this subspecies. Although legal protections are in place, there are none effectively protecting the suitable habitat on the island from damage from overgrazing sheep and other livestock as described in Factor A. Therefore, we find that the existing regulatory mechanisms are inadequate to ameliorate the current threats to the Eiao reed-warbler throughout its range.

E. Other Natural or Manmade Factors Affecting the Species' Continued Existence

Island populations have a higher risk of extinction than mainland populations. Ninety percent of bird species that have been driven to extinction were island species (as cited in Frankham 1997, p. 311). Based on genetics alone, endemic island species are predicted to have higher extinction rates than nonendemic island populations (Frankham 2007, p. 321). Small, isolated populations may experience decreased demographic viability (population birth and death rates, immigration and emigration rates, and sex ratios), increased susceptibility of extinction from stochastic environmental factors (*e.g.,* weather events, disease), and an increased threat of extinction from genetic isolation and subsequent inbreeding depression and genetic drift.

Because the population of Eiao reed-warblers is restricted to only one small island, it is vulnerable to stochastic events. Furthermore, the warblers are limited to the fraction of the island's area that contains suitable habitat. Eradication of feral livestock is needed to allow recovery of native vegetation and provide additional suitable habitat throughout the island. Expansion and

recovery of native vegetation will permit the subspecies to recover beyond the current population of 2,000 individuals and buffer the subspecies against impacts from stochastic events.

In summary, the limited range of the Eiao reed-warbler makes this subspecies extremely vulnerable to stochastic events and, therefore, extinction. Additional habitat is needed to expand the population and buffer the subspecies from the detrimental effects typical of small island populations. Therefore, we find that other natural or manmade factors threaten the continued existence of the Eiao reed-warbler throughout its range.

Status Determination for the Eiao Marquesas Reed-Warbler

We have carefully assessed the best available scientific and commercial information regarding the past, present, and potential future threats faced by the Eiao Marquesas reed-warbler. The subspecies is currently at risk on Eiao Island due to ongoing threats of habitat destruction and modification (Factor A) and stochastic events associated with the subspecies' restricted range (Factor E). Furthermore, we have determined that the existing regulatory mechanisms (Factor D) are not adequate to ameliorate the current threats to the subspecies.

Section 3 of the Act defines an ''endangered species'' as ''any species which is in danger of extinction throughout all or a significant portion of its range,'' and a ''threatened species'' as ''any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.''

The estimated 2,000 Eiao reed-warblers are isolated on one 40 km^2 (15 mi^2) island, of which only 10–20 percent contains suitable habitat. The ongoing habitat degradation from overgrazing livestock prevents recovery of native vegetation. Although the current estimated population is 2,000 individuals, without active management of the feral livestock population on the island, the population of Eiao reed-warblers will continue to be restricted to small portions of the island and will not be able to expand to the rest of the island and recover beyond this current population level. Because the Eiao reed-warbler is limited to one small island, the continuing loss of habitat makes this subspecies extremely vulnerable to stochastic events and extinction. Island populations are naturally at a higher risk of extinction. Detrimental effects typical of small island populations, such as, decreased demographic viability, environmental factors, and genetic isolation, may lead to inbreeding depression and reduced fitness. These genetic threats will exacerbate other threats to the species and likely increase the risk of extinction. There are regulatory mechanisms in place, but are inadequate to protect the Eiao reed-warbler's habitat from overgrazing and eradication of native species. Without regulatory mechanisms to reduce or ameliorate these threats, negative impacts to this subspecies will continue. Based on the magnitude of overgrazing livestock to the extremely restricted range and isolated population of the Eiao Marquesas reed-warbler, as described above, we determine that this subspecies is in danger of extinction throughout all of its range. Therefore, on the basis of the best available scientific and commercial information, we are listing the Eiao Marquesas reed-warbler as an endangered subspecies throughout all of its range. Because we find that the Eiao Polynesian warbler is endangered throughout all of its range, there is no reason to consider its status in a significant portion of its range.

III. Greater Adjutant (*Leptoptilos dubius*)

Species Description

The greater adjutant (*Leptoptilos dubius*) is a very large (145 to 150 cm long (4.7 to 4.9 ft)) species of stork in the family Ciconiidae. This species is characterized by a naked pink head and a low-hanging neck pouch. Its bill is very thick and yellow in color. The plumage ruff of the neck is white, and other than a pale grey leading edge on each wing, the rest of the greater adjutant's body is dark grey (Birdlife International (BLI) 2009a, unpaginated).

This species of bird once was common across much of Southeast Asia, occurring in India, Bangladesh, Burma, Thailand, Cambodia, Malaysia, Myanmar, Vietnam, Sumatra, Java, and Borneo. Large breeding colonies occurred in Myanmar, with the highest concentration found in Pegu; however, this colony collapsed in the mid-1900s (Singha and Rahmani 2006, p. 264).

The current distribution of this species consists of two breeding populations, one in India and the other in Cambodia. Recent sighting records of this species from the neighboring countries of Nepal, Bangladesh, Vietnam, and Thailand are presumed to be wandering birds from one of the two populations in India and Cambodia (BLI 2009a, unpaginated).

India: The most recent range-wide population estimate for this species in India (600 to 800 birds) comes from data collected in 1995 through 1996 (Singha *et al.* 2003, p. 146). Approximately 11 breeding sites are located in the Brahmaputra Valley in the State of Assam (Singha *et al.* 2003, p.147). Recent information indicates that populations of this species continue to decline in India. At two breeding sites near the city of Guwahati in the State of Assam, the most recent survey data show that the number of breeding birds has declined from 247 birds in 2005 to 118 birds in 2007 (Hindu 2007, unpaginated).

In India, much of the greater adjutant's native habitat has been lost. The greater adjutant uses habitat in three national parks in India; however, almost all nesting colonies in India are found outside of the national parks. The greater adjutant often occurs close to urban areas; the species feeds in and around wetlands in the breeding season, and disperses to scavenge at trash dumps, burial grounds, and slaughter houses at other times of the year. The natural diet of the greater adjutant consists primarily of fish, frogs, reptiles, small mammals and birds, crustaceans, and carrion (Singha and Rahmani 2006, p. 266).

This species breeds in colonies during the dry season (winter) in stands of tall trees near water sources. In India, the greater adjutant prefers to nest in large, widely branched trees in a tightly spaced colony with little foliage cover and food sources nearby (Singha *et al.* 2002, p. 214). The breeding sites are also commonly associated with bamboo forests which provide protection from heavy rain during the pre-monsoon season (Singha *et al.* 2002, p. 218). Each adult female greater adjutant commonly lays two eggs each year (Singha and Rahmani 2006, p. 266).

Cambodia: Currently there are two known breeding populations in Cambodia. The larger of these two populations occurs in the Tonle Sap Biosphere Reserve (TSBR) near Tonle Sap Lake and has recently been estimated at 77 breeding pairs (Clements *et al.* 2007, p. 7). The Tonle Sap floodplain (and associated rivers) is considered one of the few remaining remnants of freshwater swamp forest in the region. Approximately 5,490 km^2 (2,120 mi^2) of the freshwater swamp forest ecoregion is protected in Cambodia. Of this, the Tonle Sap Great Lake Protected Area (which includes the Tonle Sap floodplain) makes up 5,420 km^2 (2,092 mi^2) (WWF 2007, p. 3).

A smaller population of greater adjutants was recently discovered in the Kulen Promtep Wildlife Sanctuary in the Northern Plains of Cambodia. This population has been estimated at 40 birds (Clements 2008, pers. comm.; BLI 2009, unpaginated). Although other

breeding sites have not yet been found in Cambodia, researchers expect that the greater adjutant may nest along the Mekong River in the eastern provinces of Mondulkiri, Ratanakiri, Stung Treng, and Kratie in Cambodia (Clement 2008, pers. comm.).

In Cambodia, the greater adjutant breeds in freshwater flooded forest, and disperses to seasonally inundated forest, tall wet grasslands, mangroves, and intertidal flats to forage. These forests are characterized by deciduous tropical hardwoods (Dipterocarpaceae family) and semi-evergreen forest (containing a mix of deciduous and evergreen trees) interspersed with meadows, ponds, and other wetlands (WWF 2006b, p. 1).

Conservation Status

The IUCN classifies the greater adjutant as critically endangered. In India, the greater adjutant is listed under Schedule I of the Indian Wildlife Protection Act of 1972. The species is not listed in the Appendices of CITES (*http://www.cites.org*).

Summary of Factors Affecting the Greater Adjutant

A. Present or Threatened Destruction, Modification, or Curtailment of Habitat or Range

India: The greater adjutant occurs in Kaziranga, Manas, and Diburu-Saikhowa National Parks. However, nearly all breeding sites for this species are located outside of protected areas (Singha *et al.* 2003, p. 148). The ongoing loss of habitat through conversion for development and agriculture, and the clearing of trees that are suitable for breeding sites, is a primary threat to the greater adjutant. The recent decline in the population at the breeding colonies near Guwahai, India, is believed to be caused by tree removal at the breeding site and filling of wetlands in an area near the city that had been used by the greater adjutant as feeding areas (Hindu 2007, unpaginated). These activities were undertaken for the purpose of expanding residential developments in the city. The species is also seasonally dependent on wetlands for forage. These sites are impacted in India by drainage, encroachment, and overfishing. For instance, some sites have reportedly experienced encroachment from rice cultivation (BLI 2001, p. 284).

Singha *et al.* 2002 (pp. 218–219) found that preferred nest trees were significantly larger and different in structure to non-nest trees near Nagaon in central Assam. The nest trees were large and widely branched with thin foliage cover (Singha *et al.* 2002, p. 214). Researchers believe that removal of preferred nesting trees at breeding may result in adjutants nesting in suboptimal trees at existing nest sites or relocating to other suboptimal nest sites. The trees and their limbs at suboptimal breeding sites are smaller in diameter, and the structure of the limbs does not always support the combined weight of the nest, adults, and chicks. As chicks grow older, nest limbs often break, sending the half-grown chicks tumbling from the nest. Approximately 15 percent of chicks die after falling from their nests, for a variety of causes, including injuries and abandonment (Singha *et al.* 2006, p. 315). Some efforts have been made to reduce chick mortality, like those employed at two breeding sites near Nagaon from 2001 to 2003 (Singha *et al.* 2006, pp. 315–320). Safety nets are placed under the canopy of nest trees to catch falling chicks. Chicks are either replaced in their nest, if onsite monitors can determine which nest the chick came from, or raised in captivity and later released. Juvenile birds were monitored after their release, and the program is considered a success (Singha and Rahmani 2006, p. 268; Singha *et al.* 2006, pp. 315–320). Though some efforts have been undertaken to reduce chick mortality due to falls from nests, loss of chicks based on nesting in suboptimal breeding sites is likely still occurring at other breeding sites.

Cambodia: The largest breeding colonies are located in the Tonle Sap Biosphere Reserve, which consists primarily of the Tonle Sap Lake and its floodplain. A second breeding population occurs in the Kulen Promtep Wildlife Sanctuary in the Northern Plains. Poole (2002, p. 35) reported that large nesting trees around Cambodia's Tonle Sap floodplain, particularly crucial to greater adjutants for nesting, are under increasing pressure by felling for firewood and building material. Poole (2002, p. 35) concluded that a lack of nesting trees, both at Tonle Sap and in the Northern Plains, may be the most serious threat in the future to large water bird colonies.

The Mekong River Basin flows through several countries in Southeast Asia, including Tibet, China, Myanmar, Vietnam, Thailand, Cambodia, and Laos, traveling over 4,800 km (2,980 mi) from start to finish. In Cambodia, the Mekong River flows into the Tonle Sap floodplain. Tonle Sap Lake expands and contracts throughout the year as a result of rainfall from monsoons and the flow of the Mekong River. The lake acts as a storage reservoir at different times of the year to regulate flooding in the Mekong Delta (Davidson 2005, p. 3). This flooding also results in flooded forests and shrublands, which provides seasonal habitat to several species. The Tonle Sap Biosphere Reserve is one of Southeast Asia's most important wetlands for biodiversity and is particularly crucial for birds, reptiles, and plant assemblages (Davidson 2005, p. 6).

Upstream developments in the Mekong have already led to significant trapping of sediments and nutrients in upstream reservoirs, which could lead to increased bed and bank erosion downstream, as well as decreased productivity (Kummu and Varis 2007, pp. 289, 291). According to the Asian Development Bank (ADB 2005, p. 2), 13 dams have been built, are being built, or are proposed to be built along the Mekong River. Proposed hydroelectric dams along the Mekong River in countries upstream from Cambodia have the potential to adversely affect the habitat of the greater adjutant by affecting the hydrology of the basin and reducing the overall foraging habitat and the abundance of prey species during the breeding season (Clements *et al.* 2007, p. 59). In addition, decline in productivity of the habitat, and thereby prey species abundance, may increase competition for food, and increased releases from upstream dams during the dry season could result in permanent flooding of these forests that will eventually kill the trees in these areas (Clements *et al.* 2007, p. 59). Under some scenarios, up to half of the core area (21,342 ha (52,737 ac)) of the Prek Toal area in the Tonle Sap Biosphere Reserve could be affected.

In summary, this species continues to face significant ongoing threats to its breeding and foraging habitat in both India and Cambodia. In India, activities such as the draining and filling of wetlands (Hindu 2007, unpaginated), removal of nest trees, and encroachment on habitat significantly impact this species (BLI 2001, p. 284). In Cambodia, threats include tree removal (Poole 2002, p. 35) and large-scale hydrologic changes due to existing dams and proposed dam construction (Clements *et al.* 2007, p. 59; Kummu and Varis, pp. 287–288). The latter threat could potentially eliminate habitat in protected areas such as the Tonle Sap Biosphere Reserve, and it could additionally reduce productivity of these areas, which would further impact the species by affecting the foraging base and potentially increasing competition with other species (Clements *et al.* 2007, p. 59). Therefore, we find that the present or threatened destruction, modification, or curtailment of the habitat or range is a threat to the continued existence of the greater adjutant throughout its range.

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

The main threat to the greater adjutant is harvesting of eggs, chicks, or young fledglings (Clements 2008, pers. comm.). Local communities collect bird eggs and chicks for consumption and for trade in both India and Cambodia. Due to their rarity, greater adjutants are believed to have a high market value, which increases the likelihood this type of activity will continue. The implementation of bird nest protection programs has been developed by the Wildlife Conservation Society. Local people have been employed as nest protectors at Prek Toal and Kulen Promtep Wildlife Sanctuary (ACCB 2009, unpaginated; Clements 2008, pers. comm.). Although the impacts from large-scale collection of bird eggs and chicks have been reduced through these programs, collection still remains a threat to the species. Furthermore, unprotected colonies are likely disturbed every year and may not successfully breed (Clements 2008, pers. comm.). At the largest breeding sites for this species in India, reproductive success is low, less than one chick per nest per year (Singha and Rahmani 2006, p. 264). Because the total population of the greater adjutant is fewer than 1,000 birds, the loss of any eggs or chicks in populations in India and Cambodia is a significant threat to the species.

Accounts of poisoning, netting, trapping, and shooting of adult birds were also reported at various locations in both India and Cambodia during the 1990s (BLI 2001, pp. 285–286). In India, some birds were shot because of perceived impact on fish stocks; others, in hunts (BLI 2001, p. 285). In Cambodia, some birds were captured to be sold as food and for use as pets, and some were also hunted (BLI 2001, p. 286). Birds are also likely inadvertently injured or killed as a result of destructive fishing techniques in Cambodia such as electro-fishing and the use of poisons (Clements 2008, pers. comm.). In a 1999 article, the *Phnom Penh Post* (as reported in Environmental Justice Foundation 2002, p. 25) reported that pesticides are used to kill both fish and wildlife species at Tonle Sap.

In summary, although we are unaware of any scientific or educational purpose for which the adjutant is used, local communities are known to collect bird eggs, chicks, and adults for consumption and other purposes (*e.g.,* pet trade and perceived threat to fish stocks) in either or both India or Cambodia (BLI 2001, pp. 285–286). Incidence of local residents collecting eggs and chicks for consumption has been reduced in some areas due to educational and enforcement programs, however, these impacts still occur. Therefore, we find that overutilization due to commercial and recreational purposes is a threat to the continued existence of the greater adjutant throughout its range.

C. Disease or Predation

Highly pathogenic avian influenza (HPAI) H5N1 continues to be a serious problem for this species. This strain of avian influenza first appeared in Asia in 1996, and spread from country to country with rapid succession as found by Peterson *et al.* (2007, p. 1). By 2006, the virus was detected across most of Europe and in several African countries. Influenza A viruses, to which group strain H5N1 belongs, infects domestic animals and humans, but wildfowl and shorebirds are considered the primary source of this virus in nature (Olsen *et al.* 2006, p. 384). Though it is still unclear if the greater adjutant is a carrier, lack of an avian influenza wild bird surveillance program in Cambodia will make it difficult to resolve this question.

Until recently, there was no information on predation affecting the greater adjutant. However, recent research on other waterbirds suggests that predation may impact the greater adjutant in Cambodia. For example, nesting surveys for several waterbirds were conducted between 2004 and 2007 at the Prek Toal area in Tonle Sap Biosphere Reserve. These surveys included monitoring of nest sites. Human disturbances at nest sites due to illegal collection of chicks and eggs resulted in an increase of predation by crows (*Corvus* spp.) on spot-billed pelicans in the 2001–2002 breeding season, causing up to 100 percent loss of reproduction, and again in the 2002–2003 breeding season, resulting in up to 60 percent loss in reproduction due to a combination of collection and predation. In some locations, the spot-billed pelicans abandoned their nests for the remainder of the breeding season (Clements *et al.* 2007, p. 57). It is likely that other waterbirds, such as the greater adjutant, at Prek Toal would be similarly affected due to illegal collection of eggs by humans and nest site disturbance (see Factor B), and the subsequent increase in crow presence, thereby increasing the predation of their chicks and eggs.

In summary, we found no information indicating that avian diseases are impacting greater adjusts. However, research on other waterbirds in the same area as the greater adjutant found a significant impact on reproduction from predation by crows. Presence of crows was found in conjunction with human disturbances, such as illegal collection of eggs and chicks. Greater adjutant eggs and chicks are known to also be subjected to this type of human disturbance (See Factor B); therefore greater adjutants may also suffer impacts from predation by crows. Because the total population of the greater adjutant is fewer than 1,000 birds, and reproductive success for this species at the largest breeding sites in India is less than one chick per nest per year, the loss of any eggs and chicks in populations in India and Cambodia is a significant threat to the species. Therefore, we find that predation is a threat to the continued existence of the greater adjutant throughout its range.

D. Inadequacy of Existing Regulatory Mechanisms

Although there is evidence of commercial trade across the Cambodia border into Laos and Thailand, this species is currently not listed under CITES.

India: The greater adjutant is listed under Schedule I of the Indian Wildlife Protection Act of 1972 (IWPA). Schedule I provides absolute protection, with the greatest penalties for offenses. This law prohibits hunting, possession, sale, and transport of listed species. The IWPA also provides for the designation and management of sanctuaries and national parks for the purposes of protecting, propagating, or developing wildlife or its environment. As stated above in Factor A, the ongoing loss of habitat through habitat conversion for development and agriculture is a primary threat to this species. Furthermore, greater adjutant eggs and chicks are known to be taken for local consumption and trade, and adult birds are known to be poisoned, netted, and trapped for various reasons. Therefore, this regulatory mechanism is not adequate to ameliorate these threats to this species.

Protected areas in India allow for regulated levels of human use and disturbance and are managed to prevent widespread clearing and complete loss of suitable habitat. Although the greater adjutant uses habitat in three national parks in India, almost all nesting colonies of this species in India are found outside of protected areas (Singha *et al.* 2003, p. 148). Some of the species' foraging areas are also located outside of protected areas. Ongoing loss of habitat through habitat conversion for development and agriculture is a primary threat to this species; therefore,

it appears that regulatory mechanisms outside of protected areas, such as national parks, do not provide adequate protection of habitat for the greater adjutant.

Cambodia: Areas designated as natural areas by the Ministry of Environment, such as the Tonle Sap Biosphere Reserve, are to be managed for the protection of the natural resources contained within. Portions of the Biosphere Reserve have also been designated as areas of importance under the Convention of Wetlands of International Importance of 1971.

The Mekong River Commission (MRC) was formed between the governments of Cambodia, Lao PDR, Thailand, and Vietnam in 1995 as part of the Agreement on the Cooperation for the Sustainable Development of the Mekong River Basin. The signatories agreed to jointly manage their shared water resources and the economic development of the river (MRC 2007, p. 1–2). According to the Asian Development Bank, 13 dams have been built, are being built, or are proposed to be built along the Mekong River (ADB 2005, p. 2). The continued modification of greater adjutant habitat has been identified as a primary threat to this species (Factor A), and this regional regulatory mechanism is not effective at reducing that threat.

Several laws exist in Cambodia to protect the greater adjutant from two of the primary threats to the species: Habitat destruction and hunting. However, they are ineffective at reducing those threats. In Cambodia, Declaration No. 359, issued by the Ministry of Agriculture, Forestry and Fisheries in 1994, prohibits the hunting of greater adjutant. However, reports of severe hunting pressure within the greater adjutant's habitat exist and illegal poaching of wildlife in Cambodia continues (Bird *et al.* 2006, p. 23; Poole 2002, pp. 34–35; UNEP–SEF 2005, pp. 23, 27).

The Creation and Designation of Protected Areas regulation (November 1993) established a national system of protected areas. In 1994, through Declaration No. 1033 on the Protection of Natural Areas, the following activities were banned in all protected areas:

(1) Construction of saw mills, charcoal ovens, brick kilns, tile kilns, limestone ovens, tobacco ovens;

(2) Hunting or placement of traps for tusks, bones, feathers, horns, leather, or blood;

(3) Deforestation;

(4) Mining minerals or use of explosives;

(5) The use of domestic animals such as dogs;

(6) Dumping of pollutants;

(7) The use of machines or heavy cars which may cause smoke pollution;

(8) Noise pollution; and

(9) Unpermitted research and experiments.

In addition, the Law on Environmental Protection and Natural Resource Management of 1996 sets forth general provisions for environmental protection. Under Article 8 of this law, Cambodia declares that its natural resources (including wildlife) shall be conserved, developed, and managed and used in a rational and sustainable manner.

Protected Areas have been established within the range of the greater adjutant, such as the Tonle Sap Lake Biosphere Reserve. The Tonle Sap Great Lake protected area was designated a multipurpose protected area in 1993 (Matsui *et al.* 2006, p. 411). Under this decree, Multiple Use Management Areas are those areas which provide for the sustainable use of water resources, timber, wildlife, fish, pasture, and recreation; the conservation of nature is primarily oriented to support these economic activities. In 1997, the Tonle Sap region was nominated as a Biosphere Reserve under UNESCO's (United Nations Educational, Scientific and Cultural Organization) ''Man and the Biosphere Program.'' The Cambodian Government developed a National Environmental Action Plan (NEAP) in 1997, supporting the UNESCO site goals. Among the priority areas of intervention are fisheries and floodplain agriculture at Tonle Sap Lake, biodiversity and protected areas, and environmental education. NEAP was followed by the adoption of the Strategy and Action Plan for the Protection of Tonle Sap (SAPPTS) in February 1998 (Matsui *et al.* 2006, p. 411), and the issuance of a Royal Decree officially creating Tonle Sap Lake Biosphere Reserve (TSBR) on April 10, 2001. The royal decree was followed by a subdecree by the Prime Minister to establish a Secretariat, along with its roles and functions, for the TSBR with the understanding that its objectives could not be achieved without cooperation and coordination among relevant stakeholders (TSBR Secretariat 2007, p. 1).

Joint Declaration No. 1563, on the Suppression of Wildlife Destruction in the Kingdom of Cambodia, was issued by the Ministry of Agriculture, Forestry, and Fisheries in 1996. Although the Japan International Cooperation Agency (JICA 1999, p. 19) reported that this regulatory measure was ineffectively enforced, some strides have been made recently through the combined efforts of WCS, the Cambodian Government, and local communities at Tonle Sap Lake. WCS Cambodia (2009, unpaginated) reports that the illegal wildlife trade in Cambodia is ''enormous'' and driven by demand for meat and traditional medicines in Thailand, Vietnam, and China. Substantial progress has been made in protecting seven species of waterbirds at Prek Toal Core Area in the TSBR, increasing populations of some species tenfold by working with the primary management agencies and working at the field level to improve community engagement, law enforcement, and long-term research and monitoring (WCS Cambodia 2009, unpaginated).

The Forestry Law of 2002 strictly prohibits hunting, harming, or harassing wildlife (Article 49) (Law on Forestry 2003). This law further prohibits the possession, trapping, transport, or trade in rare and endangered wildlife (Article 49). However, to our knowledge, Cambodia has not yet published a list of endangered or rare species. Thus, this law is not currently effective at protecting the greater adjutant from threats by hunting.

In 2006, the Cambodian Government created Integrated Farming and Biodiversity Areas (IFBA), including over 161 km (100 mi) of grassland (over 30,000 ha (74,132 ac)) near Tonle Sap Lake to protect the Bengal florican, an endangered bird in that region (WWF 2006a, pp. 1–2). The above measures have focused attention on the conservation situation at TSBR and have begun to improve the conservation of the area and its wildlife there, but several management challenges remain. These challenges include overexploitation of flooded forests and fisheries; negative impacts from invasive species; lack of monitoring and enforcement; low level of public awareness of biodiversity values; and uncoordinated research, monitoring, and evaluation of species' populations (Matsui *et al.* 2006, pp. 409–418; TSBR Secretariat 2007, pp. 1–6).

Even though the wildlife laws discussed above exist, greater adjutant habitat within Cambodian protected areas faces several challenges. The legal framework governing wetlands management is institutionally complex. It rests upon legislation vested in government agencies responsible for land use planning (Land Law 2001), resource use (Fishery Law 1987), and environmental conservation (Environmental Law 1996, Royal Decree on the Designation and Creation of National Protected Areas System 1993); however, there is no interministerial coordinating mechanism nationally for

wetland planning and management (Bonheur *et al.* 2005, p. 9). As a result of this institutional complexity and lack of defined jurisdiction, natural resource use goes largely unregulated (Bonheur *et al.* 2005, p. 9). Thus, the protected areas system in Cambodia is ineffective in removing or reducing the threats of habitat modification and hunting faced by the greater adjutant.

Existing regulatory mechanisms in both India and Cambodia are ineffective at reducing or removing threats to the species such as habitat modification and collection of eggs and chicks for consumption. Although progress has been made recently in the protection of nests and birds at specific locations, this has largely been driven by measures from the private sector. We believe that the inadequacy of regulatory mechanisms, especially with regard to lack of law enforcement and habitat protection, is a significant risk factor for the greater adjutant. Therefore, we find that existing regulatory mechanisms are inadequate to ameliorate the current threats to the greater adjutant throughout its range.

E. Other Natural or Man-Made Factors Affecting the Species' Continued Existence

India: Due to a lack of natural foraging areas and availability of native wildlife carcasses to feed upon, the greater adjutant is known to commonly forage in refuge dumps and slaughterhouses during certain times of the year. Researchers believe that along with the refuse at these sites, these birds are inadvertently ingesting household contaminants and plastics that can adversely affect their health and reproductive capability (Singha *et al.* 2003, p. 148; BLI 2009a, unpaginated). In addition, pesticide has been used in winter to kill fish at a national park in India, and may be a widespread practice throughout the Brahmaputra lowlands (BLI 2001, p. 287). As the remaining natural foraging habitat for this species continues to shrink, the level of foraging at refuge dumps and slaughterhouses is expected to increase, thereby increasing the incidence of greater adjutants ingesting contaminants at these sites. Also, the use of pesticides in and near water sources in the Brahmaputra lowlands may result in further contamination to the species.

Cambodia: Increasing use of agro-chemicals, especially pesticides, is a major concern in the TSBR and throughout Cambodia. A survey conducted of Cambodian agricultural practices in 2000 showed that 67 percent of farms used pesticides. Of these farms, 44 percent began using pesticides in the 1980s, and 23 percent began using them in the 1990s (Environmental Justice Foundation (EJF) 2002, p. 13). All of the pesticides used in Cambodia are produced outside of the country, and the labels, which include information on the appropriate use of these chemicals, are often not written in a language understandable to local villagers (EJF 2002, p. 18). A Food and Agriculture Organization of the United Nations (FAO) study found that only 1 percent of vegetable farmers received technical training in pesticide use (EJF 2002, p. 17). This problem often leads to overuse of these highly toxic compounds.

In Cambodia, organochlorine insecticides, such as dichloro-diphenyl-trichloroethane (DDT), and organophosphate insecticides such as methyl-parathion are commonly used. Organochlorine insecticides are known to accumulate in aquatic systems and concentrate in the organs of species of waterbirds such as the greater adjutant. The effects of persistent organic pesticides are variable depending on concentration and species, but can include direct mortality, feminization of embryos, reduced hormones for egg-laying, and egg-shell thinning (EJF 2002, p. 24).

In the 1970s and 1980s, agricultural use of DDT was banned in most developed countries; however, it is still used for agriculture in Cambodia. In recent years, mong bean farmers in Siem Reap province are estimated to have applied 10 tons of a pesticide mix of DDT, Thiodan (endosulfan), and methyl-parathion on fields that are submerged in the wet season and thus capable of polluting the Tonle Sap basin (EJF 2002, p. 25). In addition, methyl-parathion and endosulfan are used in illegal fishing (EJF 2002, p. 14). Methyl-parathion is considered highly toxic to birds and may take 2 weeks to degrade in lakes and rivers. The decline in the number of some bird species from around the Tonle Sap Lake may be partly due to pesticide poisoning (EJF 2002, p. 25). Further, because higher levels of persistent organochlorines have been recorded in freshwater fish and mussels than marine fish and mussels, the source of these compounds is likely inland watersheds (EJF 2002, p. 24). Although we could not locate any specific contaminant reports on the amount of these toxic chemicals found in greater adjutants based on the above data, it is likely that the persistent use of these compounds is contributing to the decline of this species.

In summary, the use of pesticides occurs in both India and Cambodia for a variety of reasons, including agriculture, fishing, and insect control. As human interactions with the adjutant continue to increase, the chances of poisoning of the species, both directly and indirectly, also continue to rise. Therefore we find that other natural or manmade factors affecting the continued existence of the species in the form of pesticide use and ingesting other contaminants is a threat to the greater adjutant throughout its range.

Status Determination for the Greater Adjutant

We have carefully assessed the best available scientific and commercial information regarding the past, present, and potential future threats faced by the greater adjutant. The species is currently at risk throughout all of its range due to ongoing threats of habitat destruction and modification (Factor A); overutilization for commercial, recreational, scientific, or educational purposes in the form of hunting, egg and chick collection, and trapping (Factor B); predation (Factor C); inadequacy of existing regulatory mechanisms (Factor D); and other natural or manmade factors affecting its continued existence in the form of toxic compounds and other contaminants (Factor E).

Section 3 of the Act defines an ''endangered species'' as ''any species which is in danger of extinction throughout all or a significant portion of its range,'' and a ''threatened species'' as ''any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.''

In both India and Cambodia, breeding and foraging areas continue to be threatened by draining and filling of wetlands, removal of nest trees, and encroachment on habitat. Within Cambodia, existing dam construction and proposed dam construction have and are likely to continue to cause large-scale hydrologic changes and potentially eliminate habitat in protected areas. The types of changes could result in decreased productivity in these areas and increase competition with other species. In addition, local communities are known to collect greater adjutant eggs, chicks, and adults for consumption, for use as pets, and because of perceived threats to fish stocks. The use of pesticides occurs in both India and Cambodia for a variety of reasons, including agriculture, fishing, and insect control. As human interactions with the adjutant continue to increase, the chances of poisoning the species also continue to rise. Existing regulatory mechanisms are ineffective at reducing or removing threats to the species. Lack of enforcement and habitat

protection is a significant threat to the species. Furthermore, with a population estimated at fewer than 1,000 birds, loss of eggs, chicks, or adults is a significant threat to the survival of this species. Based on the magnitude of the ongoing threats to the small population of greater adjutant and its habitat throughout its entire range, as described above, we determine that this species is in danger of extinction throughout all of its range. Therefore, on the basis of the best available scientific and commercial information, we are listing the greater adjutant as an endangered species throughout all of its range. Because we find that the greater adjutant is endangered throughout all of its range, there is no reason to consider its status in a significant portion of its range.

IV. Jerdon's Courser (*Rhinoptilus bitorquatus*)

Species Description

The Jerdon's courser, also known as the double-banded courser (*Rhinoptilus bitorquatus*), is a small, nocturnal bird, which is specialized for running and belongs to the family Glareolidae (Bhushan 1986, pp. 1, 6; Jeganathan *et al.* 2004a, p. 225; Jeganathan *et al.* 2004b, p. 7). It was first described by T. C. Jerdon in 1848 (Bhushan 1986, p. 1; Jeganathan *et al.* 2004b, p. 1). This species averages 27 cm (11 in) in length, its plumage consists of a brown breast with two narrow white bands (bordered with black) below an orange-chestnut gorget (throat patch), a blackish colored crown with a white coronal stripe, a broad buff-colored supercilium (eyebrow stripe) over a dark cheek-patch, white lores (space between the eye and bill), and a short yellow bill with a black tip (Rasmussen and Anderton 2005, p. 183; BLI 2009b, unpaginated). Males and females are not known to differ, and juvenile plumage is unknown (Rasmussen and Anderton 2005, p. 184).

The Jerdon's courser is a rare species of bird that is endemic to the Eastern Ghats of the states of Andhra Pradesh and extreme southern Madhya Pradesh in India (BLI 2009b, unpaginated). The size of the population is not known. Historically, this species was reported in the Khamman, Nellore, and Anantapur districts of Andhra Pradesh and the Gadchiroli District of Maharashtra (Jeganathan *et al.* 2005, p. 5). Until 1900, its presence was periodically recorded, including some records in the Pennar and Godavari river valleys and near Anantapur (Bhushan 1986, p. 2; Jeganathan *et al.* 2004a, p. 225; Jeganathan *et al.* 2004b, p. 7; Jeganathan *et al.* 2006, p. 227). Efforts by various ornithologists in the early 1930s and mid to late 1970s to record the presence of this species failed, leading to the belief that the species was extinct (Bhushan 1986, p. 2; Jeganathan *et al.* 2004b, p. 7). In 1986, the Jerdon's courser was rediscovered near Reddipalli village, Cuddapah District, Andhra Pradesh (Bhushan 1986, pp. 8–9; Jeganathan *et al.* 2004a, p. 225; Jeganathan *et al.* 2004b, p. 7; Jeganathan *et al.* 2005, p. 3; Jeganathan *et al.* 2006, p. 227; Senapathi *et al.* 2007, p. 1).

The area where the species was rediscovered was designated as the Sri Lankamaleswara Wildlife Sanctuary (SLWS) (Jeganathan *et al.* 2004b, p. 7; Jeganathan *et al.* 2005, p. 3). After its rediscovery, it was only observed regularly at a few sites in and around the SLWS (Jeganathan *et al.* 2004b, p. 7, 18; Jeganathan *et al.* 2005, p. 5; Jeganathan *et al.* 2006, p. 227; Senapathi *et al.* 2007, p. 1), including reports of its presence in Sri Penusula Narasimha Wildlife Sanctuary (SPNWS) in the Cuddapah and Nellore districts, Andhra Pradesh (Jeganathan *et al.* 2005, p. 3). It has since been found at three additional localities in and around SLWL (Jeganathan *et al.* 2004a, p. 228; Jeganathan *et al.* 2004b, p. 20; BLI 2009b, unpaginated).

Due to the nocturnal nature of the species and the wooded nature of its habitat, individuals are rarely seen; therefore, very little information is available on the distribution, ecology, population size, and habitat requirements of the Jerdon's courser (Jeganathan *et al.* 2004a, p. 225; Jeganathan *et al.* 2004b, p. 7; Jeganathan *et al.* 2005, p. 3; Jeganathan *et al.* 2006, p. 227; Senapathi *et al.* 2007, p. 1). New survey techniques have allowed researchers to detect the presence and absence of Jerdon's courser using track strips and a tape playback of the species' call. These methods can be useful in mapping the geographic range of the Jerdon's courser and in estimating the population size, and have contributed to a better understanding of habitat preferences. Surveys have not been conducted in all areas with suitable habitat characteristics; additional surveys are needed to confirm the current range and population size of this species. Although the size of the population is not known, it is believed to be a small, declining population (Jeganathan 2004b, p. 7; BLI 2009b, unpaginated; IUCN 2009c, unpaginated).

The Jerdon's courser inhabits open patches within scrub-forest interspersed with patches of bare ground, in gently undulating, rocky foothills (Jeganathan *et al.* 2005, p. 5; Senapathi *et al.* 2007, p. 1). Studies show that this species is most likely to occur where the density of large bushes (greater than 2 m (6 ft) tall) ranges from 300 to 700 per ha (121–283 large bushes per acre) and the density of smaller bushes (less than 2 m (6 ft) tall) is less than 1,000 per ha (404 per acre) (Jeganathan *et al.* 2004a, p. 228; Jeganathan *et al.* 2004b, p. 22; Jeganathan *et al.* 2005, p. 5; Senapathi *et al.* 2007, p. 1). The dominant woody vegetation includes species of shrub, particularly *Zizyphus rugosa, Carissa carandas*, and *Acacia horrida* (Jeganathan *et al.* 2004a, p. 228; Jeganathan *et al.* 2004b, p. 22).

The amount of suitable habitat that existed for this species in 2000 was estimated to be approximately 3,847 km^2 (1,485 mi^2) of scrub habitat in the Cuddapah and Nellore districts of the State of Andhra Pradesh (Senapathi *et al.* 2007, p. 6). Jeganathan (2008, pers. comm.) further stated that the amount of suitable habitat available in and around the SLWS is approximately 132 km^2 (51 mi^2). A comprehensive habitat assessment of all the shrub habitat areas within the historic range of this species has not yet been completed; therefore, suitable habitat may occur elsewhere for this species.

Little information is known about feeding habits or feeding areas of this species. The only information known comes from the analysis of two Jerdon's courser fecal samples, which consisted mainly of termites and ants. Jeganathan (2004a, p. 234) suggested that despite being nocturnal and affected by the shadowing effects of the canopy, coursers may be able to see invertebrate prey on the ground by selecting relatively well-illuminated open areas.

There is no information on the life history of the Jerdon's courser; no nests or young birds have ever been found, although the footprints of a young bird along with an adult Jerdon's courser suggests successful breeding is taking place (Jeganathan *et al.* 2004b, pp. 17, 29). The calling period is brief, starting approximately 45 to 50 minutes after sunset and continuing for a few minutes to approximately 20 minutes.

Conservation Status

Due to the single, small, and declining population of the Jerdon's courser, it is classified as ''critically endangered'' by the IUCN (Jeganathan *et al.* 2004b, p. 7; Senapathi *et al.* 2007, p. 1; Jeganathan *et al.* 2008, p. 73; IUCN 2009c, unpaginated), a category assigned to species facing an extremely high risk of extinction in the wild. It is also listed under Schedule I of the Indian Wildlife Protection Act of 1972. The species has

not been formally considered for listing in the Appendices of CITES (*http://www.cites.org*).

In 2010, a recovery plan was published for the Jerdon's courser. The goals of this plan are to ''secure the long-term future of the Jerdon's courser and the scrub forest it is found in'' and improve the conservation status of the Jerdon's courser within the next 10 years (2010–11 to 2020–21) (Anon 2010, p. 13). The Recovery Plan lays out objectives with specific actions to reach those objectives and includes a time scale and parties responsible for each action. Objectives include protection of existing habitat, locating suitable habitat and determining if the species occurs in those areas, research and monitoring to support conservation efforts and track populations and habitat changes, and raising awareness of the conservation issues (Anon 2010, p. 16).

Summary of Factors Affecting the Jerdon's Courser

A. Present or Threatened Destruction, Modification, or Curtailment of Habitat or Range

The primary threat to the persistence of the Jerdon's courser is habitat destruction and alteration due to conversion of suitable habitat to agriculture lands, grazing, and construction within and around the SLWS and SPNWS, and increasing settlements (Jeganathan 2005 *et al.* 2005, p. 6; Norris 2008, pers. comm.; Jeganathan 2009, pers. comm.). Agriculture is the main occupation of the people living in the area. The State of Andhra Pradesh has experienced growth of intensive agricultural practices in recent years (Senapathi *et al.* 2007, p. 2), with paddy (*Oryza sativa*), sunflower (*Helianthus annuus*), cotton (*Gossypium* sp.), groundnut (*Arachis hypogaea*), finger millet (*Eleusince coracana*), turmeric (*Curcuma longa*), and onion (*Allium cepa*) being the major crops of the area (Jeganathan *et al.* 2008, p. 77). From 1991 to 2000, scrub habitat in the Cuddapah District and parts of the Nellore District in Andhra Pradesh decreased by 11–15 percent, while the area occupied by agricultural land more than doubled (109 percent increase) during the same time period. Remaining scrub patches were also found to be smaller (38.4 percent decrease) and further from human settlements (Senapathi *et al.* 2007, pp. 1, 4; Jeganathan *et al.* 2008, p. 76).

The main causes for the loss of scrub habitat were human settlements and subsequent conversions of scrub habitat to agriculture and cleared areas (Senapathi *et al.* 2007, p. 6). From 2001 to 2004, an estimated 480 ha (1,186 ac) of scrub habitat were cleared within and around the SLWS, 275 ha (680 ac) of which were cleared to provide land for agriculture to the people who were displaced by floods and for farming of lemons and forestry plantations. These cleared areas fall within 1 km (0.6 mi) of previously known and newly discovered Jerdon's courser areas (Jeganathan *et al.* 2008, p. 76). From 2000 to 2005, Jeganathan *et al.* (2008, p. 77) noted that approximately 215 ha (531 ac) of scrub habitat outside of the SLWS were cleared and most likely will become lemon farms. The irrigation required to sustain agricultural activities will likely further fragment any remaining suitable habitat (Senapathi *et al.* 2007, p. 7).

The Jerdon's courser inhabits open patches within scrub-forest and prefers areas with moderate densities of trees and bushes (Jeganathan *et al.* 2004a, p. 234). Researchers believe this open habitat is maintained by grazing animals and some woodcutting (Norris 2008, pers. comm.). Known Jerdon's courser sites are already being used for grazing livestock and woodcutting, but at moderate levels that maintain the appropriate vegetation structure (Jeganathan 2005, p. 15). Mechanical clearing of bushes to create pasture, orchards, and tilled land; high levels of woodcutting; and high level of use by domestic livestock are likely to cause deterioration in scrub habitat by creating a scrub forest that is too open for the Jerdon's courser. However, low levels of grazing by livestock or absence of woodcutting may also lead to habitat that is more closed and, therefore, unsuitable (Jeganathan *et al.* 2004a, p. 234; Jeganathan *et al.* 2004b, p. 23; Norris 2008, pers. comm.).

Land in SLWS and adjacent areas is used by the people from villages in Sagileru valley for grazing herds of domestic buffalo (*Bubalus bubalis*), sheep (*Ovis aries*), and goats (*Capra hircus*), and for woodcutting (Jeganathan *et al.* 2004b, p. 9). Jeganathan (2008, pers. comm.) states that most of the potentially suitable habitat for Jerdon's courser is located on the fringe of the forest and can be easily accessed by locals for grazing and woodcutting. Jeganathan *et al.* (2008, p. 77) notes three types of grazing within and around the SLWS and SPNWS. The first includes shepherds who bring goats, sheep, and buffalo into the scrub habitat in and around the sanctuaries every morning, grazing 2–3 km (1–2 mi) into the forest before returning to the villages in the evening. The second includes nomads with 200–300 cattle. Although they are invited by farmers to help fertilize the lemon farms, they stay 3 to 4 months and graze in the forested areas in and around the sanctuaries. The third includes sheep that graze inside the sanctuaries throughout the year; however, this type of grazing did not occur in scrub habitat. Furthermore, a common practice is to cut and bend the branches of scrub and tree species to facilitate better access for grazing (Jeganathan *et al.* 2008, p. 78). In addition, the people of the local villages also use the sanctuaries for timber and nontimber forest products; including fuel wood, illegal wood collecting, grass, and bamboo. From 2001 to 2003, Jeganathan *et al.* (2008, pp. 77–78) regularly observed wood loads being removed by either head loads, bullock cart, or tractor.

Development activities within the SLWS, including the construction of check dams and percolation ponds and digging of trenches, have been observed in known and newly recorded areas of the Jerdon's courser (Jeganathan *et al.* 2004a, pp. 26, 28; Jeganathan *et al.* 2008, p. 76). Approximately 0.5 to 1 ha (1–2 ac) of scrub forest was cleared for each of five percolation ponds dug near the main Jerdon's courser area and exotic plant species planted on the embankment. In addition, scrub habitat was thinned (removal of all scrub species except selected tree saplings), and pits for collecting rainwater were dug (Jeganathan *et al.* 2008, p. 76). Furthermore, various sizes of stones were collected from the scrub jungle within and around the SLWS for road construction every year. Collection included digging of stones with crowbars, collection of stones in heavy vehicles, and the excavation of 15 large pits (Jeganathan *et al.* 2008, p. 76).

Construction of dams and reservoirs and river floods in the area has resulted in the relocation of villages near the SLWS and SPNWS. Fifty-seven villages were relocated closer to SLWS after the construction of the Somasila dam. Fifteen were displaced due to the construction of the Sri Potuluri Veera Brahmendraswamy (SPVB) Reservoir. Currently, there are approximately 146 villages between the SLWS and SPNWS (Jeganathan *et al.* 2008, pp. 76–77). There are more villages in the area of Somasila and SPVB Reservoir that could be relocated near the sanctuaries in the future, and there are plans to increase the height of the Somasila dam, which will cause the displacement of more villages near the southeastern part of SLWS (Jeganathan *et al.* 2008, p. 77). With the relocation and expansion of human settlements, there is concern over additional land conversion for

agriculture, increased pressure for grazing and woodcutting, and further development.

At the time of the Jerdon's courser rediscovery in 1986, the only known site where the species was found was under threat from a project to construct the Telugu-Ganga canal through its habitat. The Andhra Pradesh Forestry Department (APFD) and the State Government of Andhra Pradesh responded by designating the site as the SLWS to protect the species. The proposed route of the canal was adjusted to avoid the sanctuary (Jeganathan *et al.* 2005, p. 6; Jeganathan *et al.* 2008, p. 78). However, in 2005, construction of the Telugu-Ganga canal began, illegally, within the SLWS. Construction was stopped immediately once the APFD was notified (Jeganathan *et al.* 2005, p. 6; Kohli 2006, unpaginated). Illegal excavation was reported even after construction was stopped and the contracting company fined (Kohli 2006, unpaginated).

Jeganathan *et al.* (2005, p. 12) found that 80 to 100 m (263 to 328 ft) were cleared for canals that were 16 to 20 m (53 to 66 ft) wide. They also found that approximately 22 ha (54 ac) of potentially suitable habitat were cleared and one of the three newly recorded sites for the Jerdon's courser was destroyed by the illegal construction within the SLWS (Jeganathan *et al.* 2005, p. 12; Jeganathan *et al.* 2008, p. 73). The potential impacts of the proposed realignment were also assessed and it was determined that the construction of the canal would still impact 650 ha (1,606 ac) of suitable habitat around the SLWS and would pass within 500 m (1640 ft) of recent records of the Jerdon's courser and pass very close to the only place where the species has been regularly sighted since 1986 (Jeganathan *et al.* 2005, p. 12; Jeganathan *et al.* 2008, p. 80). Plans for the Telugu-Ganga canal included another canal project along the western boundary of the SPNWS. Unauthorized work near the Sanctuary boundary was stopped by the Cuddapah Forest Division in October 2005. In some locations along the canal route, forest had been cleared and roads developed inside of the Sanctuary boundary (Jeganathan *et al.* 2005, p. 9). Approximately 163 ha (403 ac) were cleared for the construction of the canal in and around the SPNWS (Jeganathan *et al.* 2005; Jeganathan *et al.* 2008, p. 80). It is unknown how much of this area is occupied by the Jerdon's courser.

Following the illegal construction of the canal within the SLWS and SPNWS, the issue was raised to the Central Empowered Committee (CEC), a monitoring body on forest matters set up by the Supreme Court (Kholi 2006, unpaginated). The CEC ruled in favor of a realignment route completely avoiding courser habitat. Also, the government of Andhra Pradesh has transferred approximately 1,000 ha (2,4711 ac) of land between the canal and the SLWS to the APFD (BLI 2009b, unpaginated; Jeganathan 2009, pers. comm.).

During the construction of the Telugu-Ganga canal, Jeganathan *et al.* (2005, p. 13) identified additional threats in association with the construction. Roads were built along the canal route and from the main roads to the canal, which subsequently provided easy access to the forest for unauthorized woodcutting. Furthermore, the SLWS is known to have red sanders (*Pterocarpus santalinus*), a highly valued species of trees sought after by illegal woodcutters. APDF records from 1984 to 2003 show that more than 116,000 kilograms (255,736 pounds) of matured red sanders were seized from smugglers (Jeganathan *et al.* 2005, p. 13). Pressure from smugglers on mature red sanders, coupled with the increased access points into the SLWS due to canal construction activities, has caused extensive unauthorized woodcutting within the SLWS (Jeganathan *et al.* 2005, p. 13).

In summary, the scrub habitat known to be occupied by the species and potentially suitable habitat on adjacent lands in and around the SLWS and SPNWS in the Cuddapah District of India have been destroyed and diminished due to conversion of land for agricultural purposes, grazing livestock, construction, and woodcutting. These actions are a result of human expansion and the subsequent increase in human activity in and around the SLWS and SPNWS. Additional relocation of villages around SLWS and SPNWS is anticipated. Because the two most common livelihoods are agriculture and cattle rearing and because the establishment of additional villages will require more land to accommodate agriculture and livestock needs, the scrub habitat that is vital to the Jerdon's courser remains at risk of further curtailment. The population of the Jerdon's courser is extremely small and believed to be declining, so any further loss or degradation of remaining suitable habitat represents a significant threat to the species. Therefore, we find that present or threatened destruction, modification, or curtailment of the habitat or range are threats to the continued existence of the Jerdon's courser throughout its range.

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

Jeganathan *et al.* (2008, p. 78) noted a few encounters with illegal bird trapping within the peripheral areas of the eastern part of the SLWS; on one occasion a trapper was seen near the main Jerdon's courser area. Although trappers mainly target other species, such as Grey partridge (*Francolinus pondicerianus*) and Quail species, the traps consist of nooses and nets in which the Jerdon's courser could potentially get caught (Jeganathan *et al.* 2008, p. 78). However, there is no quantitative information on which to analyze the extent to which this threat may be acting on this species. In addition, we are not aware of any information currently available that indicates the use of this species for any scientific or educational purpose. As a result, we are not considering overutilization to be a contributing threat to the continued existence of the Jerdon's courser throughout its range.

C. Disease or Predation

We are not aware of any information currently available that indicates disease or predation pose a threat for this species. As a result, we are not considering disease or predation to be contributing threats to the continued existence of the Jerdon's courser throughout its range.

D. Inadequacy of Existing Regulatory Mechanisms

The Jerdon's courser is listed under Schedule I of the Indian Wildlife Protection Act of 1972. Schedule I provides absolute protection with the greatest penalties for offenses. This law prohibits hunting, possession, sale, and transport of listed species and allows the State Government to designate an area as a sanctuary or national park for the purpose of protecting, propagating, or developing wildlife or its environment. The Jerdon's courser is also listed as a priority species under the National Wildlife Action Plan (2002–2016) of India. This National Plan includes guidance to expand and strengthen the existing network of protected areas, develop management plans for protected areas in the country, restore and manage degraded habitats outside of protected areas, and control activities such as poaching and illegal trade, among others. We are unaware of any management plans for the protected areas in Andhra Pradesh where the Jerdon's courser occurs. This species is also proposed as a threatened species

under section 38 of the Biological Diversity Act, 2002 (Anon 2010, p. 6).

The SLWS and SPNWS were established for the purpose of protecting the habitat of the Jerdon's courser. The sanctuaries allow for regulated levels of human use and disturbance while preventing complete loss of scrub habitat (Senapathi *et al.* 2007, p. 8). The SLWS and SPNWS are protected by the Forest Conservation Act of 1980. Section 2 of this law restricts the use of forest land for nonforest purposes, such as the fragmentation or clearing of any forest. In addition, the SLWS and SNPWS are designated as Important Bird Areas (IBA) in India (Jeganathan *et al.* 2005, p. 5). IBAs are sites of international importance for the conservation of birds, as well as other animals and plants, and are meant to be used to focus conservation efforts and reinforce the existing protected areas network. However, designation as an IBA provides no legal protection of these areas (BNHS 2009, unpaginated).

In 2010, a recovery plan was published for the Jerdon's courser. The plan uses a multi-pronged approach to secure the long-term survival of this species. Elements of the plan include research, monitoring, advocacy, conservation education, habitat management, training, and funding. The actions outlined in the plan involve several national and international groups and the APFD, which has the primary responsibility for the management of Jerdon's courser habitat (Anon 2010, pp. 3, 5). Implementation of the recovery plan is dependent on funding (approximately 1.8 million U.S. dollars) and the cooperation of several agencies (Anon 2010, pp. 16–21). Although this plan was published by the APFD and submitted to The Ministry of Environment and Forests, Government of India, we could not determine that implementation of this plan is mandatory or binding; rather the plan is meant to serve as a reference for conservation managers, policy-makers, researchers, decision-makers, and serve as a basis for future conservation actions. Furthermore, as this recovery plan was just published in November 2010, it is too early to determine if this plan will be effective in providing protection to the species.

In summary, although protections for the species exist, the primary threat to this species is ongoing loss of habitat. Senapathi *et al.* (2007, pp. 7–8) found an extensive and rapid decline in scrub habitat, with most removal of scrub occurring up to sanctuary boundaries and little loss occurring within the wildlife sanctuaries. Due to the threat of an increasing number of settlements near the sanctuaries, and the subsequent further loss of scrub habitat to agriculture and livestock, protection of scrub habitat used by the Jerdon's courser will be important for the species' continued existence. Jeganathan *et al.* (2004, p. 28) classified many areas in the Cuddapah District as suitable habitat for the Jerdon's courser; however, with the exception of two sanctuaries, the rest of the suitable habitats are not protected. Therefore, current regulatory mechanisms do not provide enough protection of suitable habitat for this species outside of existing protected areas. We are also unaware of any grazing standards within SLWS and SPNWS to ensure the maintenance of open scrub habitat and prevent overgrazing by livestock. When combined with Factor A (the present or threatened destruction, modification, or curtailment of the habitat or range), we find that the existing regulatory mechanisms are inadequate to ameliorate the current threats to the Jerdon's courser throughout its range.

E. Other Natural or Manmade Factors Affecting the Species' Continued Existence

There are particular species characteristics that render a species vulnerable to extinction (Primack 2002, p. 193). For example, species with a narrow geographic range, small population size, declining population, and specialized habitat requirements are more susceptible to extinction than others without these characteristics (Primack 2002, pp. 193–200). Although exact population estimates and distribution of the Jerdon's courser are not available, the species has been reported as a small, declining population (Jeganathan 2004b, p. 7; BLI 2009b, unpaginated; IUCN 2009c, unpaginated) and only reported from a small patch of scrub habitat in and around the SLWS (Jeganathan *et al.* 2008, p. 73). Furthermore, certain species characteristics, such as those found in this species, predispose it to particular sources of extinction (Owens and Bennett 2000, p. 12147). Owens and Bennett (2000, p. 12147) found that extinction risks for birds with specialized habitat and small body size increased with habitat loss. The Jerdon's courser is a small bird dependent on scrub habitat of moderate density for survival. Habitat loss, as described under Factor A, is the primary threat to this species. Further loss of Jerdon's courser habitat may fragment remaining suitable habitat adjacent to the SLWS and increase the extinction risk for the species. In addition, small, isolated populations may experience decreased demographic viability and increased susceptibility to extinction from stochastic environmental factors (*e.g.,* weather events, disease) and an increased threat of extinction from genetic isolation and subsequent inbreeding depression and genetic drift.

In conclusion, the single known population of Jerdon's courser is likely to be vulnerable to threats associated with low population sizes. Because the known population is small in size, and restricted in range, and depends on a special habitat for survival, any factor (*i.e.,* habitat change, a loss of demographic viability, *etc.*) that results in a decline in habitat or individuals is problematic for the long-term survival of this species. Therefore, we find that other natural or manmade factors pose a threat to the Jerdon's courser throughout its range.

Status Determination for the Jerdon's Courser

We have carefully assessed the best available scientific and commercial information regarding the past, present, and potential future threats faced by the Jerdon's courser. The species is currently at risk throughout all of its range due to ongoing threats of habitat destruction and modification (Factor A), and demographic, genetic, and environmental stochastic events and other complications associated with the species' low population and restricted range (Factor E). Furthermore, we have determined that the existing regulatory mechanisms (Factor D) are not adequate to ameliorate the current threats to the species.

Section 3 of the Act defines an ''endangered species'' as ''any species which is in danger of extinction throughout all or a significant portion of its range'' and a ''threatened species'' as ''any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.''

Known occupied habitat and potentially suitable habitat have already been destroyed and diminished due to conversion of land for agriculture, grazing livestock, construction, and wood cutting. Additional relocation of villages around the SLWS and SPNWS is anticipated. The two most common livelihoods for people in this region are agriculture and cattle rearing; relocation of villages will require the conversion of additional land to accommodate these needs. Currently, there are protections in place for this species, but these do not provide enough protection to suitable habitat outside of protected areas. Within protected areas, grazing still occurs and there are no grazing

standards in place to ensure maintenance of open scrub habitat. Characteristics of the Jerdon's courser, such as small body size, small population, declining population, narrow geographic range, and specialized habitat requirements, naturally put this species more at risk of extinction.

Any factor (*i.e.,* habitat change, a loss of demographic viability, *etc.*) that results in a decline in habitat or individuals is problematic for the long-term survival of this species. Decreased demographic viability, environmental factors, and genetic isolation may lead to inbreeding depression and reduced fitness. These genetic threats will exacerbate other threats to the species and likely increase the risk of extinction. Based on the magnitude of the ongoing threats to the Jerdon's courser habitat throughout its entire range, as described above (Factor A and D), combined with the small population, restricted range, and specialized habitat requirements (Factor E), we determine that this species is in danger of extinction throughout all of its range. Therefore, on the basis of the best available scientific and commercial information, we are listing the Jerdon's courser as an endangered species throughout all of its range. Because we find that the Jerdon's courser is endangered throughout all of its range, there is no reason to consider its status in a significant portion of its range.

V. Marquesan Imperial Pigeon (*Ducula galeata*)

Species Description

The Marquesan Imperial Pigeon (*Ducula galeata*), known locally as Upe, is a very large arboreal pigeon belonging to the family Columbidae. It was first described by Charles Lucien Bonaparte in 1855 (Villard *et al.* 2003, p. 198; BLI 2009c, unpaginated). The species measures 55 cm (22 in) in length, is dark slate-grey with bronze-green reflections on the upperparts, rufous-chestnut undertail-coverts, white eyes, and a white and grey-black cere protruding almost to the tip of the bill (Blanvillain *et al.* 2007, unpaginated; BLI 2009c, unpaginated).

The pigeon is endemic to the French Polynesian Marquesas Archipelago in the Pacific Ocean. The Marquesas Archipelago is a territory of France located approximately 1,600 km (994 mi) northeast of Tahiti. Based on subfossil records, the pigeon was historically present on four islands in the Marquesas Archipelago, Hiva Oa, Ua Huka, Tahuata, and Nuku Hiva, as well as the Cook, the Pitcairn, and Society Island chains (Steadman 1997, p. 740; Thorsen *et al.* 2002, p. 6; Blanvillain and Thorsen 2003, p. 381; Blanvillain *et al.* 2007, unpaginated). At the time of its discovery, the pigeon was already restricted to Nuku Hiva, a 337 km^2 (130 sq mi^2) island. Researchers believe that hunting, degradation of local forest, invasive weeds and trees, and predation were the probable causes of its decline (Thorsen *et al.* 2002, pp. 8–9; Blanvillian *et al.* 2007, unpaginated). On Nuku Hiva, the pigeon is restricted to 7 sites which are difficult to access by hunters and livestock (Villard *et al.* 2003, p. 191; BLI 2009c, unpaginated). In an effort to protect the remaining population from extinction due to catastrophic events, the pigeon was reintroduced to Ua Huka, an island 50 km (31 mi) east of Nuku Hiva in 2000 (Thorsen *et al.* 2002, p. 14; Blanvillain and Thorsen 2003, p. 385; BLI 2009c, unpaginated). Ua Huka was chosen as a reintroduction site primarily because the pigeon was historically found on the island, and due to availability of suitable habitat located in a protected area, a lack of black rats (*Rattus rattus*), and a smaller human population compared to other Marquesan islands (Thorsen *et al.* 2002, p. 13).

Population estimates on Nuku Hiva have ranged from 75 to 300 birds since 1975; however, the most recent survey, conducted in 2000, estimated the population to be approximately 80–150 birds (Villard *et al.* 2003, p. 194). In 2000, five birds were translocated to Ua Huka and an additional five translocated in 2003. In 2006, approximately 32 birds were present. In 2008, another survey was conducted. Two groups of nine and six birds were observed within the initial translocation area (Gouni and Gustemme 2009, p. 4). Gouni and Gustemme (2009, p. 4) suggest that the population has expanded into inaccessible parts of the island where surveys are not possible and further speculate that, given the lack of limiting factors on the island, the population may have already reached 50 individuals.

The species is almost exclusively arboreal and prefers the intermediate and upper canopy forest layers consisting of *Guettarda speciosa, Cerbera manghas, Ficus* spp., *Terminalia cattapa,* and *Sapindus saponaria;* however, individuals have also been observed perched on shrubs (Blanvillain and Thorsen 2003, p. 382; Villard *et al.* 2003, p. 191). These pigeons heavily rely on this canopy forest for roosting and feeding. Based on observations of pigeons in 2000, this species appears to return to the same feeding and night roosting areas.

Species of *Ducula* are primarily frugivorous (fruit eaters). The diet of Marquesan imperial pigeons consists mainly of fruits, which are usually swallowed whole, from *Ficus* spp. and *Psidium guajava* (guava; an introduced species); however, it has been reported that caterpillars from *S. saponaria* and the foliage and flowers of other tree and shrub species also make up a portion of the pigeon's diet. The species' consumption of an introduced shrub species, the guava, is likely due to the degradation of native habitat (Blanvillain and Thorsen 2003, p. 384) and the subsequent loss of native fruits, foliage, and flowers. Gleaning, the catching of invertebrate prey items by plucking them from foliage, the ground, or from rock crevices, and browsing are the two main feeding methods (Blanvillain and Thorsen 2003, pp. 382–383).

Courtship behavior includes the male and female sitting next to one another and allopreening, preening the potential mate's breast and neck areas and mirroring each other's actions (Blanvillain and Thorsen 2003, p. 383). The breeding season is long, occurring from mid-May to December (Thorsen *et al.* 2002, p. 6). Nests are constructed of intermingled branches, approximately 60 cm (24 in) in diameter, 10 to 18 m (33 to 59 ft) above ground at the top of the canopy (Blanvillain and Thorsen 2003, p. 384); clutch size is only one egg (Villard *et al.* 2003, pp. 192, 195). Abundance of fruit is critical in determining the breeding success of frugivorous birds (Thorsen *et al.* 2002, p. 10). However, studies suggest that the pigeon is successfully breeding in different areas where it exists (Thorsen *et al.* 2002, p. 17; Villard *et al.* 2003, p. 195).

Conservation Status

The Marquesan imperial pigeon was originally classified as ''critically endangered'' by the IUCN. In 2008, however, this species was downlisted to ''endangered'' status due to the establishment of a second population through the translocation of birds to Ua Huka (IUCN 2009b, unpaginated). The Marquesan imperial pigeon is also protected under Law Number 95–257 in French Polynesia. The species has not been formally considered for listing in the Appendices of CITES (*http://www.cites.org*).

Summary of Factors Affecting the Marquesan Imperial Pigeon

A. Present or Threatened Destruction, Modification, or Curtailment of Habitat or Range

Destruction of habitat associated with human colonization is one of the main threats to the remaining populations of the Marquesan imperial pigeon. Since Polynesian occupation and discovery of the area by Europeans, substantial changes to the Nuku Hiva landscape have occurred (Thorsen *et al.* 2002, p. 8; Villard *et al.* 2003, p. 190) and are still occurring. These changes include clearing of land for agriculture and development, introduction of domestic livestock, introduction of exotic plants, and introduction of rats (*Rattus* spp.) and cats (*Felis catus*) (Thorsen *et al.* 2002, pp. 8–9).

Most of Nuku Hiva was originally covered by forest, with the exception of the drier northwestern plain where shrub savanna is predominant. Since colonization of Nuku Hiva, the native landscape has been cleared for agriculture and settlement. Fires have been used to clear land for agriculture and plantations (Manu 2009, unpaginated). In more recent times (between 1974 and 1989), all natural vegetation on a large area of the main plateau (de Toovii) on the island was cut down or burned to be converted into grassland for pasture, and 1,100 ha (2,718 ac) were planted with Caribbean pine (*Pinus caribaea*), an exotic tree species. By 2000, modern facilities, such as roads, an airport, and other buildings had been built (Villard *et al.* 2003, pp. 190, 195).

Suitable habitat for this species has also been modified and degraded by introduced domestic livestock and exotic plant species. Domestic livestock have become feral, and while cattle and horses are mostly controlled, feral goats (*Capra hircus*) and pigs (*Sus scrofa*) continue to be a major concern (Villard *et al.* 2003, p. 193). Goats are particularly destructive; they have caused devastation to natural habitats on several other islands (Sykes 1969, pp. 13–16; Parkes 1984, pp. 95–101; Thorsen *et al.* 2002, p. 9).

The Nuku Hiva goat population has been increasing since the 1970s, and both goats and pigs are found everywhere on the island (Villard *et al.* 2003, p. 195). Goats have the potential to damage and alter the vegetative composition of an area by overgrazing indigenous and endemic species to the point at which seedlings are consumed before they are able to mature to a height that is out of the reach of goats and, therefore, survive (Sykes 1969, p. 14; Parkes 1984, pp. 95, 96, 101; Villard *et al.* 2002, p. 189). Subsequently, exotic plant species are able to flourish and outcompete native species, which results in little or no regeneration of native trees (Sykes 1969, p. 15; Thorsen *et al.* 2002, p. 9). Large patches of natural forest have been destroyed by goats and pigs in areas where Marquesan imperial pigeons are found and there is poor natural forest regeneration (Villard *et al.* 2003, p. 193). Blanvillain and Thorsen (2003, pp. 382–383) found most of the ground covered by several introduced plant species, including guava, African basil (*Ocimum gratissimum*), and soft elephants foot (*Elephantopus mollis*). Overgrazing, combined with the introduction of exotic species, prohibits the tall trees that comprise the canopy layer of the forest from regenerating and from providing feeding and roosting sites needed by pigeons.

In addition, introduced rats on the island of Nuka Hiva inhibit regeneration of native trees because they consume the flowers, fruits, seeds, seedlings, leaves, buds, roots, and rhizomes (Thorsen *et al.* 2002, p. 9; Meyer and Butaud 2009, p. 1570), thus further contributing to the alteration of the vegetation composition. Thorsen *et al.* (2002, p. 9) noted that seed caches containing many seeds that are part of the Marquesan imperial pigeon's food supply were common.

Marquesan imperial pigeons are frugivorous birds and act as seed dispersal agents for those trees from which they feed and roost. Habitat loss, predation, or any other factor resulting in the decline of pigeons indirectly contributes to a decrease in seed dispersal, possibly contributing to low recruitment of the vital native tree species. Therefore, hunting may also contribute to the destruction and modification of habitat (See also Factor B).

The habitat in the Vaiviki Valley on the island of Ua Huka, where the pigeon was reintroduced, was classified as a protected area in 1997 (Thorsen *et al.* 2002, p. 13). There are no indications that ongoing habitat degradation from livestock grazing is occurring in this area.

In summary, the Marquesan imperial pigeon prefers to inhabit the canopy forest layer of mature forests and relies on the fruits of these trees as a food source. This habitat on Nuku Hiva has been destroyed, and continues to be destroyed by conversion of land for agriculture and development, overgrazing, and competition with exotic plant species. The species is currently restricted to seven small sites in the most remote areas of Nuku Hiva (Villard *et al.* 2003, p. 191). An intact canopy of native species is rare; in addition, the native understory and shrub layers are absent and composed mostly of browse-resistant species (Thorsen *et al.* 2002, p. 9). Poor natural forest regeneration is evident in areas where pigeons are found (Villard *et al.* 2003, p. 193). Overgrazing by goats and competition with exotic species remain a threat to the pigeon's habitat on Nuku Hiva; any additional loss of suitable habitat is likely to have a large impact on the distribution of this species.

The Marquesan imperial pigeon does not appear to experience habitat destruction on Ua Huka, as it is classified as a protected area and there is no indication of ongoing habitat degradation from livestock grazing in this area. However, the largest population of pigeons is located on Nuka Hiva, and impacts to the suitable habitat on this island are ongoing. Therefore, we find that present or threatened destruction, modification, or curtailment of the habitat or range is a threat to the continued existence of the Marquesan imperial pigeon.

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

Two researchers found that hunting is the primary reason for the current restricted range of the species to remote areas of Nuku Hiva (Thorsen *et al.* 2002, p. 8; Villard *et al.* 2003, p. 193). By 1922, most of the modification of habitat by man had already occurred, yet Marquesan imperial pigeons were still abundant (Villard *et al.* 2003, p. 195). In a 1922 expedition, 82 birds were killed; Villard *et al.* (2003, p. 194) theorized that this represented a significant portion of the estimated several hundred birds present at that time. After these killings, the pigeon was reported as ''not so abundant.'' In 1944, many birds were reported on the northern coast of Nuku Hiva and hunters were known to bring back full bags of birds. In 1951, the population of pigeons appeared to be decreasing and, with the introduction of shotguns in the 1950s, the effect was amplified. During the construction of the airport from 1978 to 1979, workers were known to hunt for pigeons (Villard *et al.* 2003, pp. 193, 195). On Ua Huka, a local agreement now exists not to hunt pigeons (Thorsen *et al.* 2002, p. 13).

Bird hunting in the French Polynesia was banned in 1967; however, the law is rarely enforced and hunting still occurs (Thorsen *et al.* 2002, p. 10) on Nuku Hiva. Most Marquesan imperial pigeons that are killed are opportunistic

kills by those hunting goats and pigs, but some intentionally target pigeons for sale to local inhabitants (Thorsen *et al.* 2002, p. 10). In an effort to reduce illegal hunting and engage the public in conservation of local endemic species, the Société d'Ornithologie de Polynésie (Manu), a conservation organization in French Polynesia, developed a public outreach and educational program for local schools about the importance of this species. Although this appears to have reduced illegal hunting, poaching remains a threat and has the potential to rapidly reduce to the remaining small population (BLI 2009c, unpaginated). To protect the remaining populations from hunting, an agreement by the inhabitants of Nuku Hiva to stop hunting pigeons or the appointment of a ranger to enforce current laws is needed (Thorsen *et al.* 2002, p. 11).

An adult Marquesan imperial pigeon lays only one egg per year, suggesting this species is long lived (Villard *et al.* 2003, pp. 192, 195). Populations of species that are long-lived with low fecundity rates tend to be more affected by loss of breeding adults than those species with shorter lifespans and high fecundity. Therefore, an increase in adult mortality due to illegal hunting would likely have a substantial impact on the survival of this species. Furthermore, because pigeons are frugivorous and act as seed dispersal agents for those trees from which they feed and roost, further declines in pigeons may indirectly contribute to low recruitment of the vital native tree species.

In summary, hunting was likely a major contributing factor to the current restricted range and small population of Marquesan imperial pigeon. On the island of Ua Huka, because the species is in a protected area, there is a smaller human population compared to other Marquesan islands, and since there is no information indicating hunting is a threat to this species on the island of Ua Huka, we find that overutilization is not a threat to the continued existence of the pigeon. On the island of Nuku Hiva, although hunting of pigeons is illegal, the law is not enforced and poaching remains a threat. Because this species has a clutch size of one egg, poaching would have a substantial impact on the species' continued existence. Therefore, we find that overutilization is a threat to the continued existence of Marquesan imperial pigeon on the island of Nuku Hiva.

C. Disease or Predation

Avian diseases are a concern for species with restricted ranges and small populations, especially if the species is restricted to an island. Extensive human activity in previously undisturbed or isolated areas can lead to the introduction and spread of exotic diseases, some of which (*e.g.,* West Nile virus) can negatively impact endemic bird populations (Naugle *et al.* 2004, p. 704). The introduction and transmittal of an avian disease could result in the extinction of the Marquesan imperial pigeon (Blanvillian *et al.* 2007, unpaginated). Beadell *et al.* (2006, p. 2940) found the presence of Hawaii's avian malaria in reed-warblers on Nuku Hiva; however, there is no data on the effects of this malaria on the population of pigeons on the island. Although large and stable populations of wildlife species have adapted to natural levels of disease and predation within their historic ranges, any additive mortality to the Marquesan imperial pigeon population or a decrease in its fitness due to an increase in the incidence of disease or predation could adversely impact the species' overall viability (see Factor E). However, while these potential influences remain a concern for future management of the species, we are not aware of any information currently available that specifically indicates the occurrence of disease in the Marquesan imperial pigeon. No other diseases are known to affect the pigeons. In addition, the reintroduction of the pigeons to the island of Ua Huka reduces the likelihood of diseases causing extinction of the species.

Black rats were introduced to Nuku Hiva in 1915 and are now found everywhere pigeons are located on Nuku Hiva (Villard *et al.* 2003, pp. 193, 195). Rats may prey upon the eggs and nestlings of Marquesan Imperial pigeons, even if the nests are located in the tops of trees (Thorsen *et al.* 2002, p. 10). However, due to the large size of this species, adult pigeons may be able to chase away rats from their nests (Villard *et al.* 2003, p. 195). Furthermore, Thorsen *et al.* (2002, p. 10) observed juveniles and Villard *et al.* (2003, p. 195) noted a significant proportion of young pigeons, suggesting that black rats are not affecting breeding success. Due to the potential threat of black rats, pigeons were introduced to Ua Huka where black rats were not present. As an additional measure, poison bait stations were established around the wharf area of Ua Huka to prevent introduction of black rats (Thorsen *et al.* 2002, p. 17).

Cats have also been introduced to both the islands of Nuku Hiva and Ua Huka. While predation of adult and juvenile birds by cats is possible when pigeons are forced to feed on low shrubs, such as guava, due to destruction and absence of native species (See Factor A) (Thorsen *et al.* 2002, p. 10), we are not aware of any information currently available that specifically indicates that predation by cats is a threat to the survival of this species.

In summary, while avian diseases such as avian malaria in reed-warblers was found to be present on Nuku Hiva, no avian diseases are known to affect Marquesan imperial pigeons. Although predation has been indicated as a contributing factor to the decline of the species (Thorsen *et al.* 2002, pp. 9, 10; Blanvillain *et al.* 2007, unpaginated), we did not find information to suggest that predation is currently a threat to the survival of this species. Further, while black rats are found everywhere pigeons are found on Nuku Hiva, the observation of a significant proportion of juveniles suggests that predation of pigeon eggs and nestlings by black rats on Nuku Hiva is not a significant threat to pigeons. Cats are present on both islands, and there is potential for predation when pigeons are forced to feed on low shrubs, such as guava; however, there is no information to substantiate cat predation as a threat to the species' survival. Therefore, we find that disease and predation are not contributing threats to the continued existence of the pigeon throughout its range.

D. Inadequacy of Existing Regulatory Mechanisms

The Marquesan imperial pigeon is a protected species in French Polynesia; it is classified as a Category A species under Law Number 95–257. Article 16 of this law prohibits the collection and exportation of species listed under Category A. Under Article L411–1 of the French Environmental Code, the destruction or poaching of eggs or nests, mutilation, destruction, capture or poaching, intentional disturbance, the practice of taxidermy, transport, peddling, use, possession, offer for sale, or the sale or the purchase of nondomestic species in need of conservation is prohibited. The French Environmental Code also prohibits the destruction, alteration, or degradation of habitat for these species.

Hunting of this species is believed to be one of the main reasons for the species' decline (Thorsen *et al.* 2002, p. 10; Villard *et al.* 2003, p. 195). Hunting and destruction of all species of birds in French Polynesia was prohibited by a decree enacted in 1967 (Villard *et al.* 2003, p. 193). Furthermore, although restrictions on possession of firearms in Marquesas are in place, firearms are made available through visiting boats

(Thorsen *et al.* 2002, p. 10). On Ua Huka, there is an agreement in force not to hunt pigeons (Thorsen *et al.* 2002, p. 13). Although this species is fully protected, and hunting has been banned, illegal hunting of the Marquesan Imperial pigeon still occurs (see Factor B) and remains a threat on Nuku Hiva.

The Marquesas Archipelago is designated as an Endemic Bird Area (EBA) (Manu 2009, unpaginated, BLI 2009c). EBAs are territories less than 50,000 km^2 (19,300 mi^2) where at least two bird species with restricted ranges are found together, and represent priority areas for biodiversity. Nord-Ouest de Nuku Hiva is 9,000 ha area designated as an Important Bird Area (IBA) (Manu 2009, unpaginated). Designation as an IBA constitutes recognition of the area as a critical site for conservation of birds. In addition, Nuku Hiva is designated as an Alliance for Zero Extinction (AZE) (Manu 2009, unpaginated). AZEs are considered areas that are in the most urgent need of conservation. Although Nuku Hiva and Ua Huka are designated as areas of importance to the conservation of birds, these designations only serve to identify areas of biodiversity and focus conservation efforts; there is no legal protection of these areas. There is one officially protected area on Ua Huka (Vaikivi), established in 1997, which is actively managed.

In summary, regulations exist to protect the species and its habitat. The threats that affect the species on each island are different. On the island of Ua Huka, also described under Factors A and B, destruction and modification of habitat are not known to threaten this species and illegal hunting is not occurring. This is likely because the protected area on Ua Huka is actively managed, the human population is less substantial, and there is a local agreement preventing hunting on this island. Furthermore, pigeons were reintroduced to Ua Huka due to the absence of threats to the species. Therefore, we find that the inadequacy of existing regulatory mechanisms is not applicable to Ua Huka. However, as described in Factors A and B, habitat destruction continues to threaten this species and illegal hunting continues to occur on the island of Nuku Hiva. Therefore, we find that the existing regulatory mechanisms are inadequate to ameliorate the current threats to the Marquesan imperial pigeon on the island of Nuku Hiva.

E. Other Natural or Manmade Factors Affecting the Species' Continued Existence

Introduced animal and plant species threaten the habitat and survival of the Marquesan imperial pigeon by inhibiting the growth of canopy tree species needed for nesting and roosting and creating competition for food sources.

As described under Factor A, the introduction of livestock, including cattle, horses, goats and pigs, has caused and continues to cause substantial changes in the forest composition, affecting the amount of suitable habitat available for pigeons. Horses are now under control and cattle were eradicated by hunters (Thorsen *et al.* 2002, p. 9; Villard *et al.* 2003, p. 193). However, goats, in particular, overgraze native species to a level at which seedlings are consumed before they mature to a height out of goats' reach (Sykes 1969, p. 14; Parkes 1984, pp. 95, 96, 101; Villard *et al.* 2002, p. 189). Consequently, exotic plant species such as guava are able to proliferate, preventing regeneration of natural forest (Sykes 1969, p. 15; Thorsen *et al.* 2002, p. 9). To restore native forests, measures to control feral goats are needed. Local inhabitants hunt goats and pigs (Thorsen *et al.* 2002, p. 10); however, overgrazing continues to be a problem. Fenced enclosures would exclude any livestock and allow regeneration of native species (Thorsen *et al.* 2002, p. 11). In addition, introduced rats on the island of Nuka Hiva inhibit regeneration of native trees by consuming the flowers, fruits, seeds, seedlings, leaves, buds, roots, and rhizomes (Thorsen *et al.* 2002, p. 9; Meyer and Butaud 2009, p. 1570) of native tree species, further contributing to the alteration of forest composition. Introduced species are not known to threaten pigeons on Ua Huka.

Introduced rats on Nuku Hiva may also be a source of competition for food resources that would otherwise be available to pigeons. The diet for the Marquesan imperial pigeon consists of fruits from *Ficus* spp. and guava, foliage of *S. saponaria, T. cattapa,* and *Misceltum* spp., and the flowers of *H. tiliaceus, C. manghas,* and *G. speciosa* (Blanvillain and Thorsen 2003, p. 382). Rats are known to consume the flowers, fruits, and leaves of the same tree species, including guava, *T. cattapa, Ficus* spp., and *S. saponaria* (Thorsen *et al.* 2002, p. 9). The consumption of these fruits and foliage by rats may reduce the available food supply for this frugivorous bird. Furthermore, during periods of limited fruit availability, the pigeons may also compete with the white-capped fruit pigeon (*Ptilinopus dupetitbouarsii*), a wider ranging pigeon found in French Polynesia (including Nuku Hiva and Ua Huka), for food sources (Thorsen *et al.* 2002, p. 10). Abundance of fruit is critical to the breeding success of frugivorous birds. When food resources are limited, breeding output and fledgling and adult survival may also be affected (Thorsen *et al.* 2002, p. 10). This may be especially critical to the Marquesan imperial pigeon since it is a long-lived species with low fecundity. An increase in adult mortality due to decreased food availability would likely have a substantial impact on the breeding success and, ultimately, on the survival of this species.

Island populations have a higher risk of extinction than mainland populations. Ninety percent of bird species driven to extinction were island species (as cited in Frankham 1997, p. 311). Based on genetics alone, endemic island species are predicted to have higher extinction rates than nonendemic island populations (Frankham 2007, p. 321). Small, isolated populations may experience decreased demographic viability (population birth and death rates, immigration and emigration rates, and sex ratios), increased susceptibility of extinction from stochastic environmental factors (*e.g.,* weather events, disease), and an increased threat of extinction from genetic isolation and subsequent inbreeding depression and genetic drift. As discussed above, there are two small extant populations of Marquesan imperial pigeons, one on Nuku Hiva and a reintroduced population on Ua Huka. Because the species now present on Ua Huka originated from the Nuku Hiva population, there is no genetic variation between the two populations. Furthermore, we have no indication that there is natural dispersion between the populations and, thus, no genetic interchange. The lack of genetic variation may lead to inbreeding and associated complications, including reduced fitness. Species with low fecundity, like the pigeon, are particularly vulnerable to inbreeding depression because they can withstand less decrease in survival before population growth rates are affected and they recover more slowly (Lacy 2000, p. 47). In addition, genetic threats associated with small populations will exacerbate other threats to the species and likely increase the risk of extinction of island populations (Frankham 1997, p. 321).

In summary, introduced livestock and rats are altering the native forests of Nuku Hiva on which the Marquesan

imperial pigeon depends. Native tree species are unable to regenerate due to overgrazing by goats; allowing graze-resistant exotic plant species to proliferate. Through consumption of fruits, flowers, seeds, and foliage, rats contribute to the alteration of the native forest and also serve as a source of competition for food. On Nuku Hiva and Ua Huka, the white-capped fruit pigeon may also serve as a source of competition for food during periods of limited fruit availability. When food resources are limited, breeding output and fledgling and adult survival may also be affected, which may be particularly critical for a species with low fecundity.

Both pigeon populations are subject to detrimental effects typical of small island populations. Decreased demographic viability, environmental factors, and genetic isolation may lead to inbreeding depression and associated complications, including reduced fitness. Species with low fecundity are particularly vulnerable because they can withstand less decrease in survival and recover more slowly. These genetic threats will exacerbate other threats to the species and likely increase the risk of extinction. Therefore, we find that other natural or manmade factors are threats to the continued existence of the Marquesan imperial pigeon on both Nuku Hiva and Ua Huka.

Status Determination for the Marquesan Imperial Pigeon

We have carefully assessed the best available scientific and commercial information regarding the past, present, and potential future threats faced by the Marquesan Imperial Pigeon. The species is currently at risk on Nuku Hiva due to ongoing threats of habitat destruction and modification (Factor A); illegal hunting (Factor B); and competition with rats for food on Nuku Hiva, as well as demographic, genetic, and environmental stochastic events associated with the species' low population, restricted range, and low fecundity (Factor E). Furthermore, we have determined that the existing regulatory mechanisms (Factor D) are not adequate to ameliorate the current threats to the species. In addition, we have determined that Factors A, B, C, and D are not factors affecting the continued existence of the species on Ua Huka. However, we have determined that the Ua Huka population is at risk due to demographic, genetic, and environmental stochastic events associated with the species' low population, restricted range, and low fecundity (Factor E).

Section 3 of the Act defines an ''endangered species'' as ''any species which is in danger of extinction throughout all or a significant portion of its range'' and a ''threatened species'' as ''any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.''

The Marquesas imperial pigeon is restricted to two islands and has a total maximum combined population estimate of 200 (80–150 on Nuku Hiva and 50 on Ua Huka). Intact canopy on Nuku Hiva is rare due to conversion of land to agriculture, overgrazing by goats and the subsequent poor natural forest regeneration, and competition with exotic plant species, which has restricted this population to seven small sites on the island. Further loss of suitable habitat could have a large impact on this small isolated population. Furthermore, hunting of pigeons is illegal, but is not enforced. Because this species is a long-lived species with low fecundity, it is particularly vulnerable to continued illegal hunting and, on both Nuku Hiva and Ua Huka, detrimental effects typical of small island populations.

Decreased demographic viability, environmental factors, and genetic isolation may lead to inbreeding depression and reduced fitness. Species with low fecundity are particularly vulnerable because they can withstand less decrease in survival and recover more slowly. These genetic threats will exacerbate other threats to the species and likely increase the risk of extinction. Based on the magnitude of the ongoing threats to the extremely small and isolated population of Marquesan Imperial Pigeon throughout its entire range, as described above, we determine that this species is in danger of extinction throughout all of its range. Therefore, on the basis of the best available scientific and commercial information, we are listing the Marquesan Imperial Pigeon as an endangered species throughout all of its range. Because we find that the Marquesan Imperial Pigeon is endangered throughout all of its range, there is no reason to consider its status in a significant portion of its range.

VI. Slender-Billed Curlew (*Numenius tenuirostris*)

Species Description

The slender-billed curlew (*Numenius tenuirostris*) is a species of wading bird, one of the six curlews of the same genus within the family Scolopacidae. It was described from Egypt in 1871 by Vieillot (Gretton 1991, p. 1). It is medium-sized and mottled brown-grey in color. It has white underparts marked with black heart-shaped spots on the flanks. It has a decurved bill that tapers to a distinctly fine tip. It has pale, barred inner primary feathers and its secondary feathers contrast markedly with its brown-black primary feathers. Its tail is virtually unmarked, with a few dark bars on a white background (BLI 2006, p. 1).

The species is believed to breed in Northwest Siberia (though the only two confirmed cases of breeding were in 1914 and 1924). The species migrates 5,000–6,000 km (3,100–3,700 mi) towards the west-southwest across Kazakhstan, passing north of the Caspian and Black Seas through southeastern and southern Europe to its wintering grounds in the Mediterranean and Middle East (Gretton 1996, p. 6; Chandrinos 2000, p. 1; Hirschfeld 2008, p. 139; Schmidt 2009, p. 46; Boere 2010, pers. comm.).

The species has been sighted in Eastern Europe, including Russia, Kazakhstan, Ukraine, Bulgaria, Hungary, Romania, and Yugoslavia; in Southern Europe, including Albania, Greece, Italy, and Turkey; in Western Europe, including France and Spain; in North Africa, including Algeria, Morocco, and Tunisia; and in the Middle East, including Iran and Iraq (van der Have *et al.* 1998, p. 36; Chandrinos 2002, unpaginated; Gretton *et al.* 2002, pp. 335, 342; Gretton 2006, pp. 10–15; BLI 2006, p. 2; Schmidt 2009, p. 44). It has also been reported in Slovenia, Uzbekistan, Turkmenistan, Oman, Saudi Arabia, and Yemen (BLI 2006, p. 2).

During the 19th Century, the slender-billed curlew was described as the most common curlew in countries such as Spain, Sicily, Malta, Tunisia, Morocco, and Algeria; described as abundant in Romania, southeast Hungary, and Italy; and regularly recorded in France (Gretton 1991, p. 16). Flocks were reported as hundreds, sometimes thousands, strong. Its population density frequently exceeded that of two relative species: The Eurasian curlew (*Nemenius arquata*) and the whimbrel (*Numenius phaeopus*) (Chandrinos 2000, p. 1). From 1900 to the 1930s, the species was still regularly recorded, although not as abundant as in the 1800s (Gretton 1991, p. 1). By 1940, a decline in slender-billed curlew populations was apparent and the species continued to decline, although flocks of more 100 birds were recorded in Morocco as late as the 1960s and 1970s (Gretton 1996, p. 6). In 1978, a flock of 150 birds was observed in Turkey (Nankinov 1991, p. 26). In the 1970s and 1980s, about 10–15 sightings

were reported annually. In the 1990s, annual records consist of sightings of 1 to 3 birds, with the exception of 19 birds sighted in Italy in 1995 and a group of up to 50 wintering along the southern coast of Iran (Baccetti *et al.* 1996, p. 53; Boere and Yurlov 1998, p. 35; BLI 2006, p. 3; Hirschfeld 2008, p. 139).

No nesting birds have been found since 1924, although in 1996 an adult slender-billed curlew in flight was reported west-north-west of Tara (Bojko and Nowak 1996, p. 79; Gretton *et al.* 2002, p. 342). Juveniles were reported in 1998 and 1999, indicating that the slender-billed curlew is still breeding somewhere (Gretton *et al.* 2002, p. 335; Schmidt 2009, p. 43). Between 1987 and 1995, 1 to 3 slender-billed curlews were regularly recorded in Merja Zergas (Morocco), the last known regular wintering site; however, it has not been recorded at this location since 1995 (van der Have *et al.* 1998, p. 36; Gretton 1996, p. 6; Chandrinos 2000, p. 2; Crockford 2009, p. 62). Most of the recent records have come from southeastern Europe in countries along the migration route (Chandrinos 2000, unpaginated). However, the last confirmed sighting of a slender-billed curlew was in 2001 in Hungary (Crockford 2009, p. 62; UNEP–AEWA 2009, unpaginated).

The most recent population estimate is fewer than 50 birds (BLI 2006, p. 3; Hirschfeld 2008, p. 139; BLI 2010, unpaginated). Surveys were conducted from 1987 through 2000 in various parts of the species' historic breeding range, which covered several thousand kilometers of habitat. No slender-billed curlews were found during these survey efforts (Gretton *et al.* 2002, p. 341; CMS update 2004, p. 2). In 2009–10 a search to find this species within the non-breeding range began; this survey involved teams of observers covering 35 countries around the Mediterranean, Middle East, and Indian subcontinent (UNEP–AEWA 2009, unpaginated). As of March 2010, no slender-billed curlews have been found, which may mean the population is below an absolute minimum to be able to recover (Boere 2010, pers. comm.).

Current breeding grounds are unknown. What is known about this species' nests and nesting habitat comes from the only two confirmed historical accounts of slender-billed curlew nests. These accounts were both in the early 1900s and are described in four papers by V.E. Ushakav that were later translated. These nests were located in a wet marsh at Krasnoperovaya, south of Tara, Siberia. The habitat was described as open marsh containing some birch (*Betula*) and marshy areas adjacent to pine (*Pinus*) forests. The nests were located in the middle of the marsh on grassy hillocks or on small dry islands (Gretton *et al.* 2002, pp. 335–336). Based on the historical habitat descriptions, breeding sites occurred in the forest-steppe zone, although it is unknown whether these sites were typical of the species; there is belief that the species may also breed in more northern areas in the southern taiga or in more southern areas in the northern parts of the steppe region (Belik 1994, pp. 37–38; Danilenko *et al.* 1996, pp. 71, 76; Boere 2010, pers. comm.). Danilenko *et al.* (1996, p. 72) provided a more general habitat description taking into consideration the historical descriptions and the marginal position of those sites described by Ushakav. This description is as follows: Open, locally wet areas with dense sedge or grass vegetation, with patches of bare ground, relief which is not flat (moderate elevations and depressions), and with adjacent shrubs or woodland patches formed mostly by deciduous trees and/or pines.

Based on the early accounts, complete clutch sizes were found to be four eggs per nest between May 11 and June 1, 1900. The young fledged in early July, and family groups of five to six birds were seen wandering around the marsh in early August. Overall, slender-billed curlews were seen in their nesting grounds in Siberia from mid-May until early August (Gretton *et al.* 2002, pp. 335–336).

During seasonal migrations and in the winter months, the species is known to be more of a habitat generalist, using a variety of habitats, including steppe grassland, saltmarsh, fishponds, brackish lagoons, saltpans, tidal mudflats, semidesert, brackish wetlands, and sandy farmland near lagoons (Gretton 1991, p. 35; Hirschfeld 2008, p. 139).

There is little information on the diet of this species. The birds at Merja Zerga (wintering ground in Morocco) have been recorded eating earthworms and tipulid larvae. Elsewhere, the species has been recorded eating other insects (grasshoppers, earwigs, and beetles), mollusks, and crustaceans (Gretton 1996, p. 7).

Conservation Status

The slender-billed curlew is classified as critically endangered by the IUCN and is listed CITES Appendix I. Species included in CITES Appendix I are the most endangered CITES-listed species. They are considered threatened with extinction, and international trade is permitted only under exceptional circumstances, which generally precludes commercial trade. The species is also listed on Annex I of the European Union (EU) Wild Bird Directive (Europa Environment 2009, unpaginated) and Appendix I of the Convention on the Conservation of Migratory Species of Wild Animals (also known as CMS or Bonn Convention), which encourages international cooperation for the conservation of species.

Summary of Factors Affecting the Slender-Billed Curlew

A. Present or Threatened Destruction, Modification, or Curtailment of Habitat or Range

Breeding Grounds

Surveys of the forest-steppe area of Novosibirsk, Siberia in 1989 revealed a considerable amount of arable land interspersed with grazing land, birch woods, and marshes (Gretton 1991, p. 35). Surveyors noted that in 1990 and 1994 there were still substantial areas of marsh at Krasnopervaya that were quite similar to that described by Ushakov, with possibly more trees being present than in the early 1900s. By 1997, the area had changed dramatically; the remaining steppe plots on the higher parts of the marshes had been converted to wheat fields and the marsh itself completely covered with young forest (Boere and Yurlov 1998, p. 37). Boere and Yurlov (1998, pp. 36–37) visited 7 of the 22 sites described by Danilenko *et al.* (1996, p. 77), based on the current understanding of what slender-billed curlews require for breeding habitat, as the best potential localities for recording breeding slender-billed curlews. Of these seven localities, they found that four were completely destroyed by human activities such as overgrazing, building of drainage/irrigation canals, and conversion into arable land. They also found that agricultural activities drained the water table in many lakes, stimulating the growth of trees on formerly wet marshes.

Threats on the breeding grounds are largely unknown due to the lack of information on this species' nesting localities. The impacts to the species from habitat modification would vary depending on which habitat types are used for nesting (Gretton 1996, p. 8). However, it should be noted that conversion to agriculture has not been limited to the later 20th Century; from 1825–1858, the area under crops more than doubled in Novosibirsk, Omsk, and Tomsk (Gretton 1991, p. 36).

Passage Areas

Passage areas are those sites along the migration route that the slender-billed curlew uses for resting and feeding.

Because of the lack of occurrence data for this species, it is difficult to assess how important certain areas are to the species and fully analyze the effects of habitat modification; however there is evidence that modification has occurred in Europe and Russia (Gretton 1991, p. 33). Coastal passages in Russia and Europe have been less modified than inland wetlands; however, these wetlands provide only a small portion of the species habitat needs as 75 percent or more of the slender-billed curlew's migration is over land (Gretton 1991, p. 34).

Gretton (1991, p. 34) noted that the conversion of the Russian steppe habitat, within northwest Kazakhstan, to arable agriculture may have significantly affected the slender-billed curlew. Within the 20th Century, central Europe experienced an immense loss of steppes and wetlands. For example, an important passage area, the Pannonian Plain, in southern Hungary and the former Yugoslavia has been almost entirely converted to arable farmland. The only natural remnants remaining are those protected by a reserve status. In Hungary, these protected areas combined comprise about 74,000 ha (182, 858 ac) but are scattered among a vast area of arable farmland. In the former Yugoslavia, the protected area equals about 6,600 ha (16,309 ac), which is only one percent of the area once comprised of steppes and wetlands (Gretton 1991, p. 34).

In the past, there have been records of slender-billed curlews from the Danube floodplain (Nankinov 1991, p. 26). The majority of marshes and floodplains along the Romanian Danube have been drained. More recent sightings have come from the Danube Delta and Dobrodja lagoons, which have remained relatively intact. In Italy, during the late 20th Century, the area of arable farmland drastically increased, and largely at the expense of steppe habitat in the south. Furthermore, low-lying areas, such as the Valli di Comacchio, in Italy have been almost entirely drained and converted to agriculture (Gretton 1991, p. 34).

Gretton (1991, p. 34) also noted that Turkish wetlands had been threatened with development in the late 20th Century. Also, some of the finest coastal wetlands in Greece have been damaged due to the creation of fish farms and expansion of agriculture (Gretton 1991, p. 34).

It is probable that the species historically used a series of traditional passage sites for rest and feeding during migration. As these sites were drained or otherwise damaged, the slender-billed curlew's migration became more difficult, forcing birds to make longer nonstop flights and possibly using suboptimal coastal sites (Gretton 1991, p. 35).

Wintering Grounds

Threats to potential wintering habitat are summarized in the 1996 version of the International Action Plan for the Slender-billed Curlew (Gretton 1996, pp. 8–9). Parts of the wintering grounds (*e.g.,* the Rharb plain of northwest Morocco) have undergone extensive drainage of wetlands. Only a few scattered lakes and marshes, such as Merja Zerga, remain (Gretton 1991, p. 35). Furthermore, in Tunisia, temporary freshwater marshes of the Metbassta region have been seriously damaged by construction of dams for flood control and the provision of water supplies. Due to the damming of several streams, it is expected that the region will dry more frequently, reducing the suitability of the sites as foraging areas (van der Have *et al.* 1998, p.37). In other parts of North Africa, other types of wetlands have been less affected, including coastal sites and inland sites, such as temporary brackish wetlands. In the Middle East, the permanent marshes in the central (Qurnah) area were reduced to 40 percent of their 1985 extent by 1992, from 1,133,000 ha to 457,000 ha (2,800,000 ac to 1,129,000 ac), with further loss expected (Gretton 1996, p. 8). Although wintering grounds have experienced habitat modification, it is not to the same extent as that of the passage areas.

In conclusion, this species annually migrates 5,000 to 6,500 km (3,100 to 4,000 mi) between its presumed breeding grounds in Siberia and the last known wintering ground in Morocco, passing though many European countries. Loss of breeding ground habitat would better explain the drastic population decline, since the species is thought to use a more specialized habitat for breeding. Belik (1994, p. 37) argued that the species may nest primarily in steppe areas. If this is the case, then the species population decline would be better explained by the extensive loss of this habitat type, particularly in Kazakhstan (Gretton 1996, p. 7). Many of the areas along the migratory route, such as steppe areas in central and eastern Europe, have experienced substantial anthropogenic impacts. Loss of passage sites may have made migration difficult for this species, especially if it is dependent on a series of traditional sites. However, since the species is thought to use a wide variety of habitats along its migratory route and in its wintering grounds, it is unlikely that habitat loss in these areas has played a substantial part in the decline of this species, especially since many other wading birds using these areas have not shown such a decline (Gretton 1996, pp. 7–8). Because Merja Zerga was the only known regular wintering site for the species, and the species has not been recorded there since 1995, the situation on wintering grounds is hard to assess. Although the loss of habitat does not fully explain the drastic reduction in this species, it certainly has contributed to the decline as a secondary factor.

There is evidence of habitat loss for the slender-billed curlew in breeding, passage, and wintering grounds, and species experts name habitat loss as a threat to this species. With a population estimated at fewer than 50 birds, any loss of habitat could have a negative impact on this species. However, the habitat loss described above is historical and there is no information on habitat currently used by the slender-billed curlew for breeding, passage, or wintering grounds or habitat modification within these areas. At this time, there is not enough information to adequately assess the current or potential future threat of habitat modification or the impacts on this species. Furthermore, other species of waders that use the same type of habitat have not undergone drastic population declines seen in the slender-billed curlew population. Therefore, we find that present or threatened destruction, modification, or curtailment of the habitat or range is not a threat to the continued existence of the slender-billed curlew throughout its range.

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

Being the largest waders, curlews are automatically a target for hunting, particularly as their meat is said to taste ''extremely good'' (Gretton 1991, p. 37). Large-scale hunting of waders was known to occur across most of Europe during the early 20th Century, with curlews being preferred (Gretton 1996, p. 8). Although slender-billed curlews are half the weight of Eurasian curlews, they are also subject to hunting due to the similarity in appearance. Slender-billed curlews have been seen and shot with the use of decoys for Eurasian curlews (Gretton 1991, p. 37). Because the bulk of the species' migration route is over land, it is likely to be more at risk for hunting as inland sites are more accessible to man and thus have a greater concentration of hunters (Gretton 1991, p. 40). Furthermore, this species has a reputation for being ''tame,'' in that it does not show fear of

humans, and was easily targeted during a hunt (Gretton 1996, p. 8).

A significant number of slender-billed curlew specimens from the early 20th Century were from markets, notably from Hungary and Italy (Gretton 1991, pp. 37–38). Between 1962 and 1987, 17 slender-billed curlews were known to have been shot (13 of these in Italy and former Yugoslovia) (Gretton 1996, p. 9). Accurate hunting records are not available for this species. The only records of shot slender-billed curlews are those that reach museum collections; Gretton (1991, p. 37) estimates that these most likely represent a small proportion, less than one percent, of all specimens of this species shot and sold and that thousands of this species were likely shot over Italy from 1880 to 1950. In parts of North Africa, hunting pressure was strong up to at least the 1970s (Gretton 1996, p. 9). In Morocco, the slender-billed curlew has not only been hunted by locals, but also by foreign hunters via tourist agencies (Gretton 1991, p. 38). One agency is known to shoot regularly in the northern part of Merja Zerga. As late as 1980, one guide described the taking of ''a great number'' from a flock of about 500 in Morocco (Gretton 1991, p. 38).

Information strongly indicates that hunting was a significant factor in the decline of the slender-billed curlew. Furthermore, loss of habitat may have concentrated this species in remaining suitable areas making the species more vulnerable to hunting at these sites. Although hunting played a significant role in the decline of slender-billed curlews in the early 20th Century, it still poses a serious threat to the species (Gretton 1991, p. 41). Even after the species became one of the rarest birds in Europe, 15 slender-billed curlews were shot between 1962 and 1987 in 5 countries. In at least two cases, the birds were shot to obtain a scientific specimen; in the other cases, it is not known whether the birds were purposely shot, but Gretton (1991, p. 41) suggests that there is considerable interest in the species for its rarity value. Although it seems unlikely that a slender-billed curlew could be found and shot with such a low population, in 1989 a slender-billed curlew was shot at Merja Zerga in Morocco.

In countries where the slender-billed curlew is protected from hunting, but other curlews can be legally shot, the slender-billed curlew is still at risk given the similarity of appearance and the inability of hunters to distinguish between species (Gretton 1991, p. 40). Italy has the most uncontrolled hunting in Europe, although hunting pressure is also heavy and often unregulated in Turkey, Greece, the former Yugoslavia, France, Spain, and Morocco. In Albania, the economic situation is such that curlews are likely at some risk due to hunting. Although all curlew species are protected in Bulgaria, there are problems with poaching and uncontrolled foreign hunters shooting globally threatened species. Intense hunting pressure in some areas of Greece puts adjacent areas historically used by slender-billed curlew at risk from illegal encroachment by hunters. Italy has problems with uncontrolled hunting next to and within protected areas. Hunting is allowed in the northern part of Merja Zerga, and as stated above, a slender-billed curlew was shot and wounded there in 1989. Slender-billed curlews and other species of curlews are protected in Turkey, but other waders are not protected and almost all waders are liable to be shot as there is little awareness or enforcement of existing laws (Gretton 1996, pp. 10–15). Given the similarity in appearance to the Eurasian curlew, what few slender-billed curlews remain are still threatened by the continued legal and illegal hunting of curlews.

In 1975, the slender-billed curlew was listed on Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). CITES is an international agreement between governments to ensure that the international trade of CITES-listed plant and animal species does not threaten species' survival in the wild. There are currently 175 CITES Parties (member countries or signatories to the Convention). Under this treaty, CITES Parties regulate the import, export, and reexport of CITES-protected plants and animal species (also see Factor D). Trade must be authorized through a system of permits and certificates that are provided by the designated CITES Scientific and Management Authorities of each CITES Party (CITES 2010a, unpaginated).

In 1983, the slender-billed curlew was uplisted to Appendix I of CITES. An Appendix-I listing includes species threatened with extinction whose trade is permitted only under exceptional circumstances, which generally precludes commercial trade. The import of an Appendix-I species requires the issuance of both an import and export permit. Import permits are issued only if findings are made that the import would be for purposes that are not detrimental to the survival of the species in the wild and that the specimen will not be used for primarily commercial purposes (CITES Article III(3)). Export permits are issued only if findings are made that the specimen was legally acquired and trade is not detrimental to the survival of the species in the wild (CITES Article III(2)).

On the same day the slender-billed curlew was listed in Appendix I, Austria entered a reservation stating that it would not be bound by the provisions of CITES relating to trade of slender-billed curlew (CITES 2010b, unpaginated). Since the species was first listed in CITES Appendix II in 1975, the only CITES trade reported to the United Nations Environment Programme—World Conservation Monitoring Center (UNEP–WCMC) occurred in 1986. Two bodies were imported into Denmark from Austria, and then reexported from Denmark to Austria, for commercial and scientific purposes (UNEP–WCMC 2010, unpaginated). In 1989, Austria withdrew its reservation (CITES 2010b, unpaginated). Based on the low numbers of slender-billed curlew reported to be in trade, with no trade reported since 1986, we believe that international trade is not a threat to the species. Furthermore, we have no information indicating that illegal trade is a threat to this species.

In summary, hunting has been indicated as a factor in the range-wide decline of this species during the first half of the 20th century. Today, both legal and illegal hunting of curlews is likely to still occur throughout the range of this species. Given the similarity in appearance with other curlew species and its rarity value, the slender-billed curlew is still at risk of hunting and based on the very small population size and the long-range migratory habits of this species, loss of individual birds is expected to have a significant impact on the remaining population. Therefore, we find that overutilization is a threat to the continued existence of the slender-billed curlew throughout its range.

C. Disease or Predation

We are unaware of any threats due to disease or predation for this subspecies. As a result, we are not considering disease or predation to be contributing threats to the continued existence of the slender-billed curlew.

D. Inadequacy of Existing Regulatory Mechanisms

As stated above, the slender-billed curlew is listed on Annex I of the European Union (EU) Wild Bird Directive, which includes protection for habitat, bans on activities that directly threaten wild birds, and a network of protected areas for wild birds found

within the EU (Europa Environment 2009, unpaginated).

The slender-billed curlew is listed in Appendix I of CITES. CITES is an international treaty among 175 nations, including Albania, Algeria, Bulgaria, France, Greece, Hungary, Iran, Italy, Kazakhstan, Morocco, Oman, Romania, Russia, Saudi Arabia, Slovenia, Spain, Tunisia, Turkey, Ukraine, Yemen, and the United States, entered into force in 1975. In the United States, CITES is implemented through the U.S. Endangered Species Act of 1973, as amended. The Secretary of the Interior has delegated the Department's responsibility for CITES to the Director of the Service and established the CITES Scientific and Management Authorities to implement the treaty. Under this treaty, member 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, and reexport of CITES-listed animal and plant species. As discussed under Factor B, we do not consider international trade to be a threat impacting this species. Therefore, protection under this Treaty is an adequate regulatory mechanism.

The Wild Bird Conservation Act (WBCA) provides restrictions on the importation of slender-billed curlew into the United States. The purpose of the WBCA is to promote the conservation of exotic birds by ensuring that all imports to the United States of exotic birds is biologically sustainable and is not detrimental to the species. The WBCA generally restricts the importation of most CITES-listed live or dead exotic birds except for certain limited purposes such as zoological display or cooperative breeding programs. Import of dead specimens is allowed for scientific specimens and museum specimens. To date, no request for importation of slender-billed curlew into the United States has been received.

This species is also listed in Appendix I of the CMS or Bonn Convention, which includes species threatened with extinction. This convention encourages international cooperation for the conservation of species. Inclusion in Appendix I of CMS means that member states work toward strict protection, conserving and restoring the habitat of the species, controlling other reasons for endangerment, and mitigating obstacles to migration, whereas Appendix II encourages multistate and regional cooperation for conservation (CMS 2009, unpaginated).

A Memorandum of Understanding (MOU) was developed under CMS auspices and became effective on September 10, 1994. The MOU area covers 30 Range States in Southern and Eastern Europe, Northern Africa, and the Middle East. The MOU has been signed by 18 Range States and 3 cooperating organizations (CMS 2010, p. 17). In early 1996, a status report was produced and distributed by the CMS Secretariat. An International Action Plan for the Conservation of the Slender-billed Curlew was prepared by BLI in 1996, which was later approved by the European Commission and endorsed by the Fifth Meeting of the CMS. The Action Plan is the main tool for conservation activities for the species under the MOU. Conservation priorities include: effective legal protection for the slender-billed curlew and its look-alikes; locating its breeding grounds and key wintering and passage sites; appropriate protection and management of its habitat; and increasing the awareness of politicians in the affected countries (CMS 2009, unpaginated).

The CMS Web site (CMS 2004) includes an update on the progress being made under the Slender-billed curlew MOU. It states that conservation activities have already been undertaken or are under way in Albania, Bulgaria, Greece, Italy, Morocco, the Russian Federation, Ukraine, and Iran (CMS 2009, unpaginated). However, no details of these activities are provided.

In Algeria, Tunisia, and Turkey, the slender-billed curlew is protected (Gretton 1996, pp. 10, 14); however, we have been unable to determine under what laws it is protected or the provisions of the protection. All *Numenius* species are protected, along with most other waders, in Bulgaria under Ordinance 342, 21/4/86. The penalty for shooting a slender-billed curlew is approximately 450 U.S. dollars (USD) (Gretton 1996, p. 10). The slender-billed curlew is also protected in Greece and Hungary with penalties of 300–3,000 USD and 1,185 USD with potentially one year in jail, respectively (Gretton 1996, p. 11). In the Islamic Republic of Iran, hunting of waders is not allowed and all species of waders are protected (Behrouzi-Rad 1991, p. 33). Curlews are not listed as legal quarry species in Italy, and are thus considered protected by Gretton (1996, p. 12). All curlew species are protected in Morocco; however, other species of waders are not (Gretton 1996, p. 13).

Based on the lack of information available on this species (location of breeding and wintering areas), it is difficult to assess the adequacy of existing regulatory mechanisms in preventing the extinction of this species. Although progress is under way in various countries to better protect the habitat, prevent loss of individuals from hunting and misidentification, and educate the public about the precarious status of this species, not all 30 Range States of this species have signed the MOU (CMS 2009, unpaginated). Furthermore, many of the range countries have provisions in place to protect the slender-billed curlew; however, legal and illegal hunting continues to be a threat to the species (See Factor B). In countries where the slender-billed curlew is protected from hunting, but other curlews can be legally shot, the slender-billed curlew is still at risk given the similarity of appearance and the inability of hunters to distinguish between species (Gretton 1991, p. 40). In addition, enforcement of existing laws is also a problem in many countries (See Factor B). Therefore, we find that the inadequacy of existing regulatory mechanisms is a threat to the continued existence of the slender-billed curlew throughout its range.

E. Other Natural or Manmade Factors Affecting the Species' Continued Existence

The status of the slender-billed curlew is extremely precarious. As stated above, the most recent population estimate for this species is fewer than 50 birds. Most sightings of this species in the 1990s were of groups consisting of no more than three birds, and the last confirmed sighting of a slender-billed curlew was of a single bird in 2001. Small, isolated populations may experience decreased demographic viability (population birth and death rates, immigration and emigration rates, and sex ratios), increased susceptibility of extinction from stochastic environmental factors (*e.g.,* weather events, disease), and an increased threat of extinction from genetic isolation and subsequent inbreeding depression and genetic drift. In smaller populations, additional threats to persistence and stability often surface, which can further lead to instability of population dynamics. Among these factors are rates of mate acquisition, breeding success, transmission of genetic material, dispersal, survival, and sex determination. Further, fluctuations in rates can couple with reduction in growth rates to act synergistically (Lacy 2000, pp. 39–40).

Due to the distance of annual migration, the geographic spread of the range, and the limited numbers of birds, the slender-billed curlew is likely vulnerable to one or more threats

associated with small population size. Early records of this species often referred to large flocks on migration and in winter. Based on what we know of other similar migratory bird species, it is likely that the experience of older birds was important in guiding such flocks along the migration route. As slender-billed curlew numbers declined, individuals would be more likely to join flocks of other species, notably the Eurasian curlew. The chances of slender-billed curlews meeting each other on the breeding grounds would become increasingly low (as was described for the Eskimo curlew by Bodsworth in 1954). The smaller the population, the less likely it is that this species would be able to locate another slender-billed curlew and successfully reproduce. Since this species has not been recorded on the only known historic breeding grounds for a number of years (Gretton 1996, p. 6), it is difficult to assess whether a breakdown of social behavior patterns has already occurred.

Migrant waterbirds are particularly vulnerable to climate change due to their reliance on a network of dispersed sites between which they must travel. Wetlands are one of the habitats likely to be most affected by climate change. Additionally, timing of migration between sites is extremely important as they must arrive at certain sites in time to benefit from resource abundance (Maclean *et al.* 2008, p. 22). Migration routes could also be affected by the amount and location of suitable habitat. The slender-billed curlew was found by Maclean *et al.* (2008, p. 57) to be critically threatened by climate change, after factoring in population size, range size, fragmentation, habitat, and food requirements.

It is predicted that the annual mean temperatures in Asia Minor (Turkey and Albania), the Middle East, and Europe will increase more than the global mean (Maclean *et al.* 2008, pp. 15–16). Within Asia Minor and the Middle East, temperature increases are predicted to be greater during the summer than winter and greater inland than coastal areas. Changes are predicted to be between 2–7 degree Celsius (°C) (3.6–12.6 degrees Fahrenheit (°F)), depending on the season and area. Asia Minor is predicted to experience significant decreases in rainfall, with a 20–30 percent decrease in summer and a 15–25 percent decrease in the winter. The northern Middle East is predicted to experience 30–50 percent reductions during the summer, but no major change during the winter. The southern Arabian Peninsula is predicted to be wetter throughout the year with a 5–20 percent increase in precipitation (Maclean *et al.* 2008, pp. 16, 18).

The warming in northern Europe is likely to be highest in winter with an increase of almost 10 °C (18 °F). In the Mediterranean, the warming is predicted to be highest in summer with a predicted increase of 5 °C (9 °F). Annual rainfall is likely to increase in most of northern Europe, but decrease in most of the Mediterranean area. In general, increases will be more pronounced in winter, whereas decreases will be more pronounced in summer. By 2100, southern Spain and Greece are expected to experience decreases in rainfall of 15–30 percent (Maclean *et al.* 2008, pp. 16, 18).

All of Africa is expected to be warmer this century and the annual average warming throughout the continent higher than the global average. By 2065, coastal Africa temperature is expected to increase by 1.5–3 °C (2.7–5.4 °F). Rainfall is predicted to decrease, with the Mediterranean coast experiencing less than half the present annual rainfall (Maclean *et al.* 2008, pp. 15, 17)

In addition to increases in temperature and fluctuations in rainfall, sea-level is projected to rise by 18 to 59 cm during the 21st Century, with an estimate of approximately 4 mm per year (Maclean *et al.* 2008, p. 19). However, it should be noted that these estimates do not incorporate uncertainty in certain factors, such as ice sheet flow. In light of these predictions associated with climate change, slender-billed curlew nesting habitat may be threatened by the expansion of agriculture into areas formally too cold for farming. Additionally, wintering habitat is likely to be threatened, to some degree, by sea-level rise, but more so by drier conditions in the Mediterranean and Black Seas areas, which may reduce the area covered by wetlands (Maclean *et al.* 2008, p. 63).

In summary, breakdown of social behavior patterns is increasingly likely to occur in addition to the general threats posed by small population size such as increased susceptibility to demographic, environmental, and genetic stochasticity, as this species' population levels decline. Because so few individuals have been found in recent years, it is difficult to assess whether the breakdown of social behavior patterns has already occurred. However, given the species' low numbers, this and other threats of small population size could already be occurring. Additionally, climate change could potentially alter slender-billed curlew habitat such that it negatively impacts the species. Although data on habitat currently used by slender-billed curlews is lacking, based on historical occurrence records nesting areas could be further threatened by agriculture expansion, and the amount of essential wetlands along passage and wintering areas could be significantly decreased. Therefore, we find that natural and manmade factors are threats to the continued existence of the slender-billed curlew throughout its range.

Status Determination for the Slender-Billed Curlew

We have carefully assessed the best available scientific and commercial information regarding the past, present, and potential future threats faced by the slender-billed curlew. The species is currently at risk throughout all of its range due to ongoing threats of overutilization for commercial, recreational, scientific, or educational purposes in the form of hunting (Factor B) and threats associated with small population size (Factor E). Furthermore, we have determined that the existing regulatory mechanisms (Factor D) are not adequate to ameliorate the threat of hunting to the species.

Section 3 of the Act defines an ''endangered species'' as ''any species which is in danger of extinction throughout all or a significant portion of its range'' and a ''threatened species'' as ''any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.''

The status of the slender-billed curlew is difficult to assess; species records and threats to the species are largely historical, the species has not been recorded since 2001, and recent studies have concentrated on locating the species rather than current threats to the species. However, total population for slender-billed curlew is estimated at fewer than 50 individuals. With a population of this size, the population may be below an absolute minimum to be able to recover, and genetic impacts and a breakdown of social behaviors will naturally occur, putting the species at a higher risk of extinction. Furthermore, the slender-billed curlew is at risk of being hunted either for its rarity value or due to the inability of hunters to distinguish between curlew species. Any loss of individuals from the remaining population would have a significant effect on the species' ability to recover. At this time, regulatory mechanisms, although in place, appear to be inadequate as the slender-billed curlew is still threatened with legal and illegal hunting. Based on the magnitude of the ongoing threats to the extremely small population of slender-billed curlew throughout its entire range, as

described above, we determine that this species is in danger of extinction throughout all of its range. Therefore, on the basis of the best available scientific and commercial information, we are listing the slender-billed curlew as an endangered species throughout all of its range. Because we find that the slender-billed curlew is endangered throughout all of its range, there is no reason to consider its status in a significant portion of 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 Federal and foreign governments, private agencies and interest 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 Cantabrian capercaillie, Marquesan imperial pigeon, Eiao Marquesas reed-warbler, greater adjutant, Jerdon's courser, and slender-billed curlew are not native to the United States, we are not proposing critical habitat for these species under section 4 of the Act.

Section 8(a) of the Act allows 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. As such, these prohibitions are applicable to the Cantabrian capercaillie, Marquesan imperial pigeon, Eiao Marquesas reed-warbler, greater adjutant, Jerdon's courser, and slender-billed curlew. 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 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 complete list of all references cited in this final rule is available on the Internet at *http://www.regulations.gov* at Docket No. FWS–R9–ES–2009–0084 or upon request from the Endangered Species Program, U.S. Fish and Wildlife Service (see the **FOR FURTHER INFORMATION CONTACT** section).

Author

The primary author of this final rule is staff of the Branch of Foreign Species, Endangered Species Program, U.S. Fish and Wildlife Service, 4401 N. Fairfax Drive, Arlington, Virginia 22203.

List of Subjects in 50 CFR Part 17

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

Regulation Promulgation

Accordingly, we 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; 16 U.S.C. 1531–1544; 16 U.S.C. 4201–4245; Pub. L. 99–625, 100 Stat. 3500; unless otherwise noted.

■ 2. Amend § 17.11(h) by adding new entries for ''Adjutant, greater,'' ''Capercaillie, Cantabrian,'' ''Courser, Jerdon's,'' ''Curlew, slender-billed,'' ''Pigeon, Marquesan imperial,'' and ''Warbler, Eiao Marquesas reed-'' in alphabetical order under BIRDS to the List of Endangered and Threatened Wildlife 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							
*	*	*	*	*	*	*	
Adjutant, greater	*Leptoptilos dubius*		Entire	E	783	NA	NA

Species		Historic range	Vertebrate population where endangered or threatened	Status	When listed	Critical habitat	Special rules
Common name	Scientific name						
*	*	*	*	*	*	*	
Capercaillie, Cantabrian.	*Tetrao urogallus cantabricus*.	.....	Entire	E	783	NA	NA
*	*	*	*	*	*	*	
Courser, Jerdon's ...	*Rhinoptilus bitorquatus*.	India	Entire	E	783	NA	NA
*	*	*	*	*	*	*	
Curlew, slender-billed.	*Numenius tenuirostris*.	.....	Entire	E	783	NA	NA
*	*	*	*	*	*	*	
Pigeon, Marquesan imperial.	*Ducula galeata*	French Polynesia ...	Entire	E	783	NA	NA
*	*	*	*	*	*	*	
Warbler, Eiao Marquesas reed-.	*Acrocephalus percernis aquilonis*.	.....	Entire	E	783	NA	NA
*	*	*	*	*	*	*	

Dated: June 21, 2011.

Gregory E. Siekaniec,

Acting Director, Fish and Wildlife Service.

[FR Doc. 2011–19953 Filed 8–10–11; 8:45 am]

BILLING CODE 4310–55–P