

**Puerto Rican plain pigeon or paloma sabanera**  
*(Patagioenas inornata wetmorei = Columba inornata wetmorei)*

**5-Year Review:  
Summary and Evaluation**



Photo: Carlos Ruiz-Lebrón

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**U.S. Fish and Wildlife Service  
Southeast Region  
Caribbean Ecological Services  
Boquerón, Puerto Rico**

## TABLE OF CONTENTS

	<b>Page</b>
I. GENERAL INFORMATION	
A. Methodology used to complete the review	1
B. Reviewers	1
C. Background	1
II. REVIEW ANALYSIS	
A. Application of the 1996 Distinct Population Segment (DPS) policy	3
B. Recovery Criteria	3
C. Updated Information and Current Species Status	4
D. Synthesis	
III. RESULTS	
A. Recommended Classification	17
IV. RECOMMENDATIONS FOR FUTURE ACTIONS	17
V. LITERATURE CITED	18

**5-YEAR REVIEW**  
**Puerto Rican Plain Pigeon or paloma sabanera**  
**(*Patagioenas inornata wetmorei*)**

**I. GENERAL INFORMATION**

**A. Methodology used to complete the review**

On September 12, 2005, the Service published a notice in the *Federal Register* (70 FR 53807-53808) announcing the 5-year review of the Puerto Rican plain pigeon (plain pigeon; *Patagioenas inornata wetmorei*, previously known as *Columba inornata wetmorei*) and requesting new information concerning the biology and status of the species. A 60-day comment period was opened. No information on the plain pigeon was received from the public. No part of the review was contracted to an outside party. The review was also sent to three peer reviewers (Appendix A).

This 5-year review was prepared by a Service biologist and includes information that the Service has gathered since the plain pigeon was listed on October 13, 1970 (35 FR 16047-16048). The review is based on available information from our species' file, including distribution and status reports, captive breeding reports, and the best available information on the species' biology and ecology. Sources of information included the Recovery Plan, peer-reviewed literature, unpublished field observations and reports by Commonwealth and Service biologists, and communications from other qualified biologists and experts.

**B. Reviewers**

**Lead Region:** Nikki Lamp, Southeast Regional Office, Atlanta, Georgia.  
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**Lead Field Office:** Dr. José A. Cruz-Burgos, Caribbean Ecological Services Field Office, Boquerón, Puerto Rico. (787) 851-7297 x208

**C. Background**

**1. FR Notice citation announcing initiation of this review:** September 12, 2005; 70 FR 53807-53808

**2. Species Status:** (2011 Recovery Data Call) Stable. The plain pigeon population declined after 1998 and is currently at low numbers (Rivera-Milán 2011, p. 5). In 2010, the estimated density and population size of the species was 0.02 individuals/hectare (ind/ha) and 5,809 individuals, respectively (Rivera-Milán 2011, p. 1). During April-

June 2011, the predicted density is 0.02 ind/ha, and predicted population size is 6,749 individuals (Rivera-Milán 2011, p. 1). However, the species continues to be threatened with extinction since it has not reached desirable density and abundance levels. Furthermore, stochasticity may drive population fluctuations at low numbers, which can be exacerbated in the face of climate change, habitat loss and other threatening factors. Overutilization for commercial or recreational purposes and inadequacy of existing regulatory mechanisms are not considered threats to the species. Habitat modification or destruction, disease or predation, and other natural or manmade factors continue to be threats to the species. Moreover, reproductive capacity, survival rate, and resource use and availability may all be very important, but data are lacking to elucidate the mechanisms driving the population dynamics of plain pigeons.

**3. Recovery Achieved:** 1 (0-25%) of species recovery objectives achieved. The following recovery tasks in the Recovery Plan have been completed: Task 22 (Establish captive reproducing flock of Puerto Rican plain pigeons), Task 2422 (Experimental release of captive-bred plain pigeons on limited scale), and Task 2423 (Monitor experimental release success through visual and telemetric methods). Tasks 11214 and 11312 (Education program) and Task 3 (Monitor population levels and range), are on-going.

#### **4. Listing History**

Original Listing:

FR notice: 35 (109) FR 16047-16048

Date listed: October 13, 1970

Entity listed: Subspecies

Classification: Endangered

Revised Listing: None

**5. Associated rulemakings:** None

**6. Review History:** The Puerto Rican Plain Pigeon Recovery Plan, approved and signed on October 14, 1982 (USFWS 1982) is the most recent published comprehensive analysis of the species' status and was used as the reference point document for this 5-year review. The species' status has also been reviewed annually since 2000 through our Recovery Data Call.

**7. Species' Recovery Priority Number at start of review:** 3c. The plain pigeon is recognized as a subspecies with a high degree of threat and high recovery potential. The "c" indicates conflict with development activities.

**8. Recovery Plan or Outline:**

Name of plan: Puerto Rican Plain Pigeon Recovery Plan

Date issued: October 14, 1982

**II. REVIEW ANALYSIS**

**A. Application of the 1996 Distinct Population Segment (DPS) policy**

- 1. Is the species under review listed as a DPS? No.**
- 2. Is there relevant information that would lead you to consider listing this species as a DPS in accordance with 1996 policy? No.**

**B. Recovery Criteria**

**1. Does the species have a final, approved recovery plan containing objective, measurable criteria? No.** The plain pigeon has an approved recovery plan establishing delisting as the recovery goal; however, it does not include objective and measurable delisting criteria.

**2. Adequacy of recovery criteria**

- a. Do the recovery criteria reflect the best available (most up-to-date) information on the biology of the species and its habitat? No.**
- b. Are all of the 5 listing factors that are relevant to the species addressed in the recovery criteria (and there is no new information to consider regarding existing or new threat)? No.** The plan did not include a 5-listing factor analysis.

**3. List the recovery criteria as they appear in the recovery plan, and discuss how each criterion has or has not been met, citing information. For threats-related recovery criteria, please note which of the 5 listing factors are addressed by that criterion. If any of the 5-listing factors are not relevant to this species, please note that here.**

The approved recovery plan established that the plain pigeon could be considered for delisting when the following objectives are accomplished:

- a. Achieve a minimum of two, distinct, wild plain pigeon populations, each consisting of at least 250 nesting pairs (5-year average).**

- b. Secure most of the existing plain pigeon habitat of the Cidra-Cayey population.
- c. Commit the Río Abajo Commonwealth Forest or its equivalent as a reintroduction and management site for a second, disjoint population of plain pigeons.

These objectives have not been met because efforts have not been initiated to establish two distinct populations of the plain pigeon; the existing plain pigeon habitat in Cidra and Cayey has not been secured; and steps have not been initiated to commit the Río Abajo Commonwealth Forest, or its equivalent, as a reintroduction and management site for a second plain pigeon population.

## C. Updated Information and Current Species Status

### 1. Biology and Habitat

**a. Is there relevant new information regarding the species' abundance, population trends (e.g. increasing, decreasing, stable), demographic features (e.g. age structure, sex ratio, family size, birth rate, age at mortality, mortality rate, etc.), or demographic trends? Yes.**

The Puerto Rican plain pigeon was considered almost extinct in the 1930s (Danforth 1931, p. 68), but in 1963 a small population of 52 individuals was found in Cidra. Under the Endangered Species Conservation Act of 1969, the species was listed as endangered throughout its range in 1970 and then received increased Federal protection with the passage of the Endangered Species Act (Act), as amended, in 1973. Until recently, information regarding the status of the plain pigeon population was incomplete. Pérez-Rivera (1977a, p. 77) stated that the plain pigeon population in east-central Puerto Rico was less than 200 individuals. Other estimates reflect that a population increase occurred between the 1970s and 1990s (Rivera-Milán et al. 2003a, p. 45). However, no census (detection probability  $P = 1$ ) or count ( $P < 1$ ) existed to estimate density and abundance of plain pigeons until distance sampling surveys started in 1986 (Rivera-Milán et al. 2003a, p. 45).

Plain pigeon density and abundance estimates were calculated from 1986-2010 based on point-transect distance sampling data collected during each of those years. This data shows that the species increased from low numbers in the 1980s until the late 1990s, although a population decline was observed in 1990 following the passage of hurricane Hugo in 1989 (Table 1). Then, an overall population increase was observed between 1991 and 1998, when hurricane Georges struck Puerto Rico (Table 1). The plain pigeon population showed signs of recovery after this hurricane, but declined again after 2001 and has not recovered to pre-hurricane densities, although an increase in population density has been observed from 2008-2010 (Table 1).

Table 1. Puerto Rican plain pigeon density and abundance estimates based on point-transect distance sampling data collected in Puerto Rico during 1986-2010 (Rivera-Milán, unpubl. manuscript).

Year	D	D SE	D CV	N Predicted Habitat	N SE	Surveyed Area (ha)	N Surveyed Area	N SE
1986	0.007	0.002	0.251	2,055	516	22,321	150	38
1987	0.015	0.003	0.212	4,724	1,001	22,321	344	73
1988	0.016	0.004	0.225	4,908	1,104	22,321	357	80
1989	0.014	0.003	0.251	4,264	1,070	22,321	310	78
1990	0.005	0.002	0.372	1,534	571	22,321	112	42
1991	0.013	0.004	0.351	3,834	1,346	22,321	279	98
1992	0.023	0.009	0.373	7,055	2,632	22,321	513	191
1993	0.024	0.009	0.372	7,209	2,682	22,321	525	195
1994	0.046	0.016	0.341	14,111	4,812	22,321	1,027	350
1995	0.041	0.012	0.303	12,577	3,811	22,321	915	277
1996	0.081	0.024	0.299	24,847	7,429	22,321	1,808	541
1997	0.075	0.027	0.360	23,007	8,289	22,321	1,674	603
1998	0.102	0.032	0.314	31,289	9,816	33,148	3,381	1,061
1999	0.037	0.019	0.514	11,350	5,828	33,148	1,226	630
2000	0.041	0.015	0.366	12,577	4,601	45,799	1,878	687
2001	0.058	0.018	0.310	17,792	5,522	62,829	3,644	1,131
2002	0.040	0.014	0.350	12,270	4,295	63,924	2,557	895
2003	0.033	0.012	0.364	10,123	3,681	70,553	2,328	847
2004	0.018	0.008	0.444	5,522	2,454	71,527	1,287	572
2005	0.016	0.006	0.375	4,908	1,841	73,411	1,175	440
2006	0.018	0.008	0.442	5,522	2,442	73,411	1,321	584
2007	0.019	0.009	0.463	5,828	2,696	69,215	1,315	608
2008	0.032	0.012	0.384	9,816	3,770	60,093	1,923	739
2009	0.036	0.006	0.167	11,043	1,841	83,629	3,011	502
2010	0.031	0.003	0.107	9,509	1,018	53,827	1,669	179

Notes:

1. D = density, N Predicted Habitat = population estimate in plain pigeon predicted habitat (PR GAP Project), N Surveyed Area = population estimate within surveyed area.

Notes: (continued)

2. Extrapolation of estimated density beyond the surveyed area is justified given that there is no difference in detection and abundance at on-road and off-road points. This argument based on 1,375 on-road and off-road points surveyed in March-July 1998-2010 (PRDNER Project W-16; Rivera-Milán et al., unpubl. data).

3. Not accounting for false absence due to imperfect detection, habitat covers at least 306,755 ha (Gould et al. 2008, PR GAP project).

4. Maps of probability of occurrence and abundance accounting for imperfect detection can be prepared using hierarchical distance sampling, count-removal sampling, and repeated-count sampling (Rivera-Milán et al., unpubl. data).

5. Based on a Bayesian state-space model of population dynamics, predicted density is 0.023 (95% credible interval = 0.013, 0.044) for 2011-2015 (Rivera-Milán et al., unpubl. manuscript).

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Based on the Bayesian state-space model for the population dynamics of game and nongame species, Rivera-Milán (unpubl. data), predicted an average plain pigeon density of 0.023 individuals/ha for 2011-2015. This density extrapolated to the 306,755 ha of the predicted plain pigeon habitat on the Island (Gould et al. 2008, p. 91, PR GAP Project), results in a predicted average abundance of 7,055 (3,988 to 13,498) individuals (Rivera-Milán, unpubl. data). Rivera Milán (pers. comm., 2011) indicates that the plain pigeon population never fully recovered from the impact of Hurricane Georges and the loss of habitat in east-central Puerto Rico. However, the species seems to be moving to montane forests surrounding farms in the karst region (e.g., in the municipalities of Corozal, Morovis, Ciales, and Florida) possibly due a rapid and largely unmitigated development occurring in similar habitats in Aguas Buenas, Caguas, Cidra, Comerio and other municipalities within their traditional range of distribution (Rivera-Milán 2011, p. 1).

Based on the distance sampling data collected during 1986-2010, the plain pigeon should reach carrying capacity at a density of 0.05 ind/ha in the 306,755 ha of the predicted habitat for the species on the Island (Rivera-Milán, unpubl. manuscript). The maximum intrinsic growth rate of the species is 0.31, which indicates that the plain pigeon population may increase rapidly under favorable conditions (Rivera-Milán, unpubl. manuscript).

The plain pigeon appears to nest year-round, since nests have been found in January, February, March through August, and November (Pérez-Rivera 1978, p. 95). However, a peak of nest density usually occurs between the second week of April and second week



of June, with flocking behavior becoming conspicuous in July-August (Rivera-Milán 2001, p. 335, Rivera-Milán et al. 2003b, p. 471-476).

Plain pigeon nesting success oscillated between 15 and 70%, with an average of 42%, between 1975 and 1995 in the municipality of Cidra (Pérez-Rivera and Ruiz-Lebrón, unpubl. data). During 1997 and 1998, 102 and 166 nests were found, respectively, along road PR 172 between the municipalities of Cidra and Comerio (PRDNER 2000, p. 6). Nest success in 1997 and 1998 was 48% and 47%, respectively (PRDNER 2000, p.7). Nest abundance and density were also estimated from data gathered during 1997 and 1998 along strip transects located in forested areas near a school and at Finca Longo, also at road PR 172. The total area covered by these strip transects was 8 ha. Nest density in strip transects was estimated at 13.56 nests/ha during 1997 and 40.26 nests/ ha during 1998 (PRDNER 2000, p. 6).

Between 1986 and 1999, 377 plain pigeon nests were monitored in east-central Puerto Rico (i.e., Aguas Buenas, Caguas, Cayey, Cidra and Comerio) and an average of 0.5 fledglings were produced per nesting pair (Rivera-Milán et al. 2003b, p 473). The overall nest survival was 40% during the nesting period, 63% during the incubation period, and 66% during the nestling period (Rivera-Milán et al. 2003b, p. 473). Based on this finding, Rivera-Milán et al. (2003b, p. 376) suggested that protection from hunting and poaching, as well as recovery of second-growth forest between the 1970s and 1990s, caused an increase in survival rate, which in turn resulted in an increase of the nesting population, and the number of hatching-year individuals reaching sexual maturity and reproducing successfully. Moreover, Rivera-Milán (2001, p. 340) found that food abundance was the most important predictor of changes in the nest density of columbids, including the plain pigeon.

A number of plain pigeon releases have been conducted by the PRDNER and telemetry data has been collected for captive-reared and wild plain pigeons (PRDNER 2005, p. 6). In these releases, the body mass of captive-reared plain pigeons (n = 28) decreased from 334.6 g to 316.9 g at the time of release (PRDNER 2005, p. 25), which probably lowered their 90-day survival rate ( $\phi = 0.50$ ; Rivera-Milán 2011, p. 3). In comparison, wild plain pigeons (n = 19, body mass = 339.1 g) had a 90-day survival rate of 0.80 (Rivera-Milán 2011, p. 3). However, these survival rate estimates are imprecise and most likely biased low due to small sample sizes (Rivera-Milán, 2011, p. 3).

**b. Is there relevant new information regarding the species' genetics, genetic variation, or trends in genetic variation (e.g., loss of genetic variation, genetic drift, inbreeding, etc.)? Yes.**

Miyamoto et al. (1994, p. 911) studied the genetic variation among 20 surviving founders (9 males and 11 females) of the plain pigeon captive breeding program held at the University of Puerto Rico, Humacao Campus. The purpose of the study was to relate

variability of founders to the captive-bred descendants and the population of plain pigeons from the municipality of Cidra. The variation was quantified for nuclear DNA by DNA fingerprinting and for mitochondrial DNA (mtDNA) by sequencing of its control region.

The results of this study suggested a similar level of nuclear DNA variation for the 20 founders (Miyamoto et al. 1994, p. 912). The results of the DNA fingerprinting and the mtDNA polymorphism were considered uncoupled, as expected for a random mating population (Miyamoto et al. 1994, p. 912). In conclusion, both sets of DNA data indicated that the 20 founders of the recovery program were characterized by low levels of genetic variability (Miyamoto et al. 1994, p. 914). As these 20 birds were initially sampled randomly from the Cidra population, the same conclusion would apply to the remaining wild flock in Puerto Rico, which endured a severe bottleneck between 1926 and 1958 (Miyamoto et al. 1994, p. 914). An alternative explanation for the low levels of variation found is that the DNA regions studied evolved at unusually slow rates, but this possibility is unlikely since the pattern was exhibited by both nuclear and mtDNA genomes (Miyamoto et al. 1994, p. 914).

**c. Is there relevant new information regarding taxonomic classification or changes in nomenclature? Yes.**

On the basis of studies by Johnson and Clayton (2000) and Johnson et al. (2001) of nuclear and mtDNA and reviews of morphological (Ridgway 1916), serological (Cumley and Irwin 1944), and behavioral (Johnston 1962) characters, New World pigeons formerly included in the genus *Columba* were placed in the genus *Patagioenas* Reichenbach, 1853 (Banks et al. 2003, p. 69 and 73). Therefore, while listed as *Columba inornata wetmorei*, taxonomic research has revealed that the Puerto Rican plain pigeon be recognized as *Patagioenas inornata wetmorei*. This taxonomic change has been accepted by the scientific community (Integrated Taxonomic Information System 2011).

Three subspecies of the plain pigeon were described in 1915 from very small samples, and the diagnostic color differences among them were rather minor (Banks 1986, p. 629). Further examination of samples found in the National Museum of Natural History (USNM) revealed that the quality of the material available in 1915 was poor and suggested that the supposed distinctive characters were not consistent (Banks 1986, p. 629) Banks (1986, p.630) concluded that *Columba inornata* (now *Patagioenas inornata*) should be considered a monotypic species, as previous taxonomic distinction of separate insular populations was based on samples that were inadequate in size to show the extent of intrapopulation variation in color.

The Puerto Rican plain pigeon is a large bird about the size and shape of a domestic pigeon (*Columba livia*), but with an overall grayish-brown coloration washed with a tinge of maroon color. It is one of three subspecies of plain pigeon recognized in the West

Indies: *P. inornata inornata* from Cuba, Isle of Youth (Isle of Pines), and Hispaniola; *P. inornata exigua* from Jamaica; and *P. inornata wetmorei* from Puerto Rico (Bowdish 1903, p. 23; Wetmore 1927, p. 392-394; Danforth 1929, p. 365; Del Hoyo et al. 1996, p. 127-128). However, Banks (1986, p. 631) indicated that the Puerto Rican plain pigeon population cannot be separated from other populations at the subspecies level. Banks (1986, p. 631) did not find specific indication that the specimen of plain pigeon taken in Puerto Rico in 1962 was identified by Alexander Wetmore as the Puerto Rican plain pigeon. Thus, the identification of such bird as the subspecies *wetmorei* cannot be accepted as evidence that the Puerto Rican population continued to exist, unreported by ornithologists from 1926 until 1958 (Banks 1986, p. 631). Banks (1986, p. 631) indicated that the specimen matched individuals from Hispaniola and Cuba taken in the 1920s. Later on, Pérez-Rivera (1990, p. 21) indicated that the data presented by Banks (1986) did not support his own hypotheses because the conclusions were drawn from small samples and Banks neither conducted cytogenetic nor behavioral studies. Pérez-Rivera (1990, p. 22) presented both morphometric and behavioral information that, according to him, suggested particular differences between plain pigeons from Hispaniola and Puerto Rico. Therefore, the Puerto Rican plain pigeon is still recognized as one of three subspecies of plain pigeon.

**d. Is there relevant new information regarding the species' spatial distribution, trends in spatial distribution (e.g., increasingly fragmented, increased numbers of corridors, etc.), or historic range (e.g., corrections to the historical range, change in distribution of the species within its historic range, etc.)? Yes.**

From the rediscovery of the plain pigeon in 1963 until the late 1980s, the only confirmed populations of Puerto Rican plain pigeons occurred in the municipality of Cidra, and parts of the surrounding municipalities of Aguas Buenas, Aibonito, Caguas, Cayey, and Comerío in east-central Puerto Rico (Pérez-Rivera and Collazo-Algarín 1976a, p. 52; Ruiz-Lebrón 1994, p. 6). However, additional sightings of the species have been recorded in other municipalities; such as Aguadilla, Cabo Rojo, Camuy, Guayama, Luquillo, Mayagüez, Corozal, Morovis, Orocovis, Ponce, Utuado, Vega Alta, and Vieques (Pérez-Rivera and Collazo-Algarín 1976a, p. 53; PRDNER 1999, p. 3; Rivera-Milán 2011, p. 3).

**e. Is there relevant new information addressing habitat or ecosystem conditions (e.g., amount, distribution, and suitability of the habitat or ecosystem)? Yes.**

Plain pigeons are habitat generalists that behave as an edge species, nesting, foraging, and roosting in trees at or near roads (Rivera-Milán et al. 2003a, p. 49). It also may be found in areas of continuous secondary growth forest (e.g., gallery forests) or flying through farmlands and urban areas when traveling to feeding or roosting sites (Ruiz-Lebrón et al. 1995, p. 6; Rivera-Milán et al. 2003a, p. 48-49). Plain pigeons also frequent dairy farms and croplands where they supplement their diet with grass seeds and grains leftover from

farming activities (Pérez-Rivera and Collazo-Algarín 1976a, p. 54). For breeding and roosting, the species seems to prefer areas of secondary mature forest, usually in close proximity to creeks or rivers. In fact, sites selected for nesting are always characterized by the presence of dense vegetation and proximity to water (Pérez-Rivera 1978, p. 90). These vegetation associations are common in the lower montane regions of Puerto Rico. Nests are constructed on the branches that radiate from a node of a bamboo (*Bambusa vulgaris*) stem, or in a cradle of vines which intertwine with the outer branches of the nest tree, or a crotch in a branch (Pérez-Rivera 1978, p. 91). The plain pigeon has not been observed nesting outside east-central Puerto Rico (Pérez-Rivera and Collazo-Algarín 1976a, p. 53-54; Rivera-Milán 2001, p. 339).

The massive deforestation in Puerto Rico during the early part of the twentieth century probably caused the decline of the plain pigeon. Extensive clearing of forests began early in the nineteenth century (Capó 1925, p. 48), and by 1828 about one-third of the island was cleared for agriculture (USFWS 1982). However, second-growth forests recovered as agriculture and pastureland were abandoned (Rivera-Milán et al. 2003b, p. 471). Indeed, forest recovery exceeded development between 1977 and 1989, but the contrary occurred between 1989 and 1995 (Ramos-González 2001, p. 103). Habitat destruction in the form of road construction, recreational activities, and land clearing, associated with agricultural, residential, and tourism development, has been identified as the primary factor threatening the Puerto Rican plain pigeon (Pérez-Rivera 1990, p. 24; Rivera-Milán 1996, p. 100 and 105; Rivera-Milán et al. 2003b, p. 467 and 477; Pérez-Rivera and Ruiz-Lebrón, unpubl. data). Therefore, the population status of plain pigeons depends primarily on the conservation and management of remaining forests and abandoned pasturelands (Rivera-Milán 2011, p. 4). Moreover, as detections of plain pigeons are increasing in the northern limestone and karst-belt region, it would not be surprising to find the species nesting outside their traditional range of distribution (Rivera-Milán 2011, p. 4).

**f. Is there any other relevant information on the species? Yes.**

After being considered extinct in the late 1940s, a small population of plain pigeons was found in 1963 in the municipality of Cidra. In 1982, an aviary was built at the University of Puerto Rico, Humacao Campus, and under a cooperative agreement between the University of Puerto Rico, Humacao Campus, PRDNER, and USFWS, in 1983 the first plain pigeon was brought to the aviary to begin a captive breeding program. The purpose of the captive breeding program was to produce enough plain pigeons to establish an additional sustainable flock outside the species' main range in east-central Puerto Rico.

In 1984, nine chicks were captured from wild nests and brought to the aviary. One of these did not survive. The first plain pigeon squab was produced in the aviary at the end of 1984 from an egg that was artificially incubated, and the squab was hand-raised. In 1988, captive plain pigeons successfully raised the first squab on their own. Some of the

captive-raised pigeons were released into the wild, whereas plain pigeons that were not considered suitable for release remained in the aviary. The first group of plain pigeons was released in 1993 in the Cidra area, after a period of acclimation in a flight cage at the release site. Thirty-one birds were released between 1993 and 1995 in the same area; five individuals were returned to the aviary because they lost weight or were too tame, two were illegally hunted, five were preyed upon presumably by red-tailed hawks (*Buteo jamaicensis*), and four moved outside of telemetry range (Ruiz-Lebrón et al. 1995, p. 5 and 7). Further plain pigeon releases were not conducted in Cidra because of the potential harmful interaction between pigeons and humans due to the close proximity of release sites to urban areas.

## **2. Five Factor Analysis**

### **(a) Present or threatened destruction, modification, or curtailment of its habitat or range**

The massive deforestation in Puerto Rico in the early part of the twentieth century probably caused the decline of the plain pigeon. Extensive clearing of forests began early in the nineteenth century (Capó 1925, p. 48), and by 1828 about one-third of the island had been cleared for agriculture (USFWS 1982). Forest cover reached a low of about 6% in the late 1940s, but increased to about 32 to 42% of the island's area by 1990 (Helmer 2004, p. 30). The economic shift away from agriculture resulted in agricultural lands reverting to forests, but urban expansion and land development have since led to the loss of agricultural and forest land and their associated wildlife (Helmer 2004, p. 30).

The recent rapid development (urbanization and industrialization) of Cidra (Pérez-Rivera 1978, p. 96) and the surrounding municipalities within the last 15 years is the most serious threat to the species' survival. These habitat modification processes have caused the fragmentation of remaining potential habitat for the plain pigeon, and apparently have been the cause of movement of plain pigeons outside their traditional range (Pérez-Rivera 1990, p. 24; Rivera-Milán 1996, p. 100 and 105; PRDNER 2000, p. 17; Rivera-Milán et al. 2003b, p. 467 and 477). Forest recovery in Cidra exceeded urban development between 1977 and 1989, but the contrary was evident between 1989 and 1995 (Ramos-González 2001, p. 103). Valuable roosting and nesting habitat of plain pigeons may presently be at a minimum level, and further alteration and increasing proximity of human activity to this habitat may further reduce available plain pigeon habitat and intensify human-pigeon interactions (Pérez-Rivera 1990, p. 24). Plain pigeons are not widely distributed, and unmitigated development is causing major land cover changes, which may be affecting the reproduction of plain pigeons through loss and fragmentation of second growth forests in east-central Puerto Rico (Rivera-Milán et al. 2003a, p. 47).

Demands of an increasing human population are promoting development, which in combination with catastrophic weather and other factors such as predation, may affect the reproduction of plain pigeons and cause an irreversible population decline (Rivera-Milán

et al. 2003b, p 477). Therefore, destruction, modification, or curtailment of the plain pigeon habitat or range continues to be an important factor threatening the survival and recovery of this species. The magnitude of this threat is high because the plain pigeon habitat is fragmented, and the majority of the breeding population is found on private lands, where an increased level of land development threatens to further reduce and fragment the species habitat and distribution.

**(b) Overutilization for commercial, recreational, scientific or educational purposes**

Collection of specimens of the plain pigeon for scientific or commercial purposes is not considered a threat to the species. There are no substantive data indicating that this factor could pose a threat to the species.

**(c) Disease or predation**

Potential sources of nest failure such as rats (*Rattus rattus*) and pearly-eyed thrashers (*Margarops fuscatus*) do not appear to be major problems for the plain pigeon (Pérez-Rivera, University of Puerto Rico, pers. comm., 2001). Rat predation is probably a secondary effect of human disturbance (e.g., rats may destroy the egg or chick after the adult has been flushed from the nest), at least in some cases (Pérez-Rivera, pers. comm. 2001). Red-tailed hawks prey upon adult and juvenile plain pigeons, while red-legged thrushes (*Turdus plumbeus*), pearly-eyed thrashers, night herons (*Nyctanassa violacea* and *Nycticorax nycticorax*), green herons (*Butorides virescens*), cats (*Felis domesticus*), and rats prey on eggs and young chicks (Pérez-Rivera 1978, p. 92; Ruiz-Lebrón et al. 1995, p. 6; PRDNER 1999, p. 7; PRDNER 2000, p. 19; Rivera-Milán et al. 2003b, p. 475.). Green herons also have been observed displacing plain pigeons from their nests (PRDNER 1999, p. 7). Rivera-Milán et al. (2003b, p. 476) found that predator density had a significant negative relationship with nesting success and number of fledglings produced by plain pigeons. However, because predator density was also negatively related to nest density and food abundance, they suggested that predators concentrated in secondary-growth forest fragments during periods of food scarcity and spread out more evenly across landscape when food became abundant.

Pérez-Rivera and Collazo-Algarín (1976b, p. 51) reported parasitism by the warble fly (*Philornis pici*). Fifteen out of 36 captive-raised plain pigeon nestlings (42%) examined by Pérez-Rivera and Ruiz-Lebrón were infected with *Philornis* larvae (Pérez-Rivera, pers. comm. 1999). One nestling infected with 12 warble fly larvae died apparently from the effects of these parasites. Although infestations from internal parasites, such as the trematode *Tanaisia bragai*, were documented only in captive birds (Arnizaut et. al. 1991, p. 203), such events may occur in wild plain pigeons. However, the effect of this trematode on the plain pigeon population is unknown. For instance, the intermediate host of *T. bragai* is a ground snail (*Subulina octona*) that is common throughout the range of the plain pigeon (Arnizaut et. al. 1991, p. 203). Three cases of *Chlamydia* infection were

detected in plain pigeons brought to captivity from the wild between 1995 and 1996 (Pérez-Rivera and Ruiz-Lebrón, unpubl. data), but no mortality from *Chlamydia* was reported. The severity of such infections in the wild population of plain pigeons also is unknown.

There have not been studies about how disease and predators may affect plain pigeon populations, and only circumstantial evidence has been found suggesting that the survival and recovery of the plain pigeon is threatened by disease or predation. Therefore, we believe that the magnitude of threat of this factor on the plain pigeon is moderate to high, but the immediacy of threat to the species is non-imminent.

**(d) Inadequacy of existing regulatory mechanisms**

Federal and Commonwealth laws protect the plain pigeon. Under the Migratory Bird Treaty Act (MBTA; 50 CFR Part 21), migratory birds, their parts, nests, or eggs may not be possessed, imported, exported, bartered, and offered for sale, purchase, or barter without a valid permit issued pursuant to the provisions of the MBTA. In 1999, the Commonwealth of Puerto Rico approved the Law No. 241 known as the “Nueva Ley de Vida Silvestre de Puerto Rico” (New Wildlife Law of Puerto Rico). The purpose of this law is to protect, conserve, and enhance both native and migratory wildlife species; declare property of Puerto Rico all wildlife species within its jurisdiction, and regulate permits, hunting activities, and exotic species, among others. In 2004, the PRDNER approved the “Reglamento para Regir el Manejo de las Especies Vulnerables y en Peligro de Extinción en el Estado Libre Asociado de Puerto Rico” (Regulation 6766 to regulate the management of threatened and endangered species in Puerto Rico). This regulation includes the list of all species designated as threatened and endangered by the Commonwealth of Puerto Rico and the Endangered Species Act of 1973, as amended. Thus, the Puerto Rican plain pigeon is included as an endangered species in Regulation 6766.

Based on the presence of Federal and Commonwealth laws and regulations protecting the plain pigeon, and the absence of evidence supporting lack of enforcement of regulations to protect this species, we believe that inadequacy of existing regulatory mechanisms should not be considered a threat to the Puerto Rican plain pigeon.

**(e) Other natural or manmade factors affecting its continued existence.**

Severe storms and hurricanes are potential threats to the plain pigeon population. Hurricanes may destroy nesting areas and strip trees of the fruits and seeds upon which plain pigeons feed, potentially causing starvation of adult and young pigeons (Pérez-Rivera 1990, p., 24; PRDNER 2000, p. 22; Rivera-Milán et al. 2003b, p. 477). Plain pigeons, however, have shown resilience through successful reproduction in response to forest regeneration and increased food availability after a hurricane (Rivera-Milán et al.

2003a, p. 48). For example, after the category 3 hurricane Georges in September 1998, density estimates remained depressed during February-October 1999, and rebounded in 2000-2001 (Rivera-Milán et al. 2003a, p. 48). However, opportunistic observations of foraging plain pigeons suggest that short-term survival after a hurricane depends on their capacity to disperse and find food (Rivera-Milán et al. 2003b, p. 477). Hurricanes may also act as agents of dispersion, since plain pigeons may move away from the storm or be carried by it to previously unoccupied areas. For example, less than a week after hurricane Georges hit Puerto Rico, plain pigeons were reported from Mayagüez, Aguadilla, and Cabo Rojo (PRDNER 1999, p.3; J. Saliva, USFWS, pers. observ., 1998) where they had not been observed for many years. However, plain pigeons have not been recently observed in these municipalities.

Pérez-Rivera (1977b, p. 39) suggested that dispersal of plain pigeons from the historic known nesting areas in Cidra may be partially the result of competition for nest-sites with the scaly-naped pigeon (*Patagioenas squamosa*). Although the scaly-naped pigeon has been thought to occupy a different niche than the plain pigeon due to its larger size (PRDNER 2000, p. 21), both species have similar diets, and nest in similar vegetation associations, at similar heights, and in similar places (Pérez-Rivera 1978, p. 89). Areas previously used for nesting by plain pigeons in 1976 were used by scaly-naped pigeons in 1977, but no plain pigeons were observed nesting in that same area in 1977 (Pérez-Rivera 1978, p. 95).

However, distance sampling data collected during 1986-2010 indicate that densities of both species are positively correlated (Rivera-Milán, unpubl. manuscript). A negative occupancy and abundance correlation would indicate interspecific competition; hence the occupancy and abundance of scaly-naped pigeons would increase, causing a decline and restricting the number of sites occupied by plain pigeons (Rivera-Milán 2011, p. 4). Instead, plain pigeon occupancy at counting points and nest transects is mainly explained by food abundance and not by the occupancy or abundance of scaly-naped pigeons (Rivera-Milán 2001, p. 340; Rivera-Milán et al. 2003b, p. 473). More complex co-occurrence models also indicate that nesting scaly-naped pigeons did not influence the colonization or extinction rates of nesting plain pigeons in second-growth forest patches (Rivera-Milán, unpubl. manuscript). Therefore, based on long-term independent data sets, Rivera-Milán (2011, p. 5) believes that competition with scaly-naped pigeons is not an important threat and does not play an important role in plain pigeon population limitation and regulation. A more parsimonious explanation would be that both species respond to similar or covarying resources in the environment (Rivera-Milán 2001, p.340).

Unintentional killing of plain pigeons may occur while legally hunting other columbid species. The plain pigeon is similar in size and shape to the legally hunted scaly-naped pigeon, thus plain pigeons could be mistakenly shot. Wetmore (1916, p. 55) stated that, because sportsmen were familiar with the plain pigeon, the species was no doubt shot in the early 1900s. Wetmore (1938, p. 52) reported plain pigeon bones collected by Dr.



Froelich G. Rainey from an extensive midden deposit in the municipality of Ponce; which may suggest that this species was hunted and consumed regularly. The plain pigeon displays exceptional tameness around humans, and besides being unwary, it flocks seasonally for roosting and feeding and sometimes nests in loose colonies (i.e., nesting pairs not necessarily close to one another) close to urban areas (Ruiz-Lebrón, Environmental Consultant, pers. comm., 2001). These behaviors may increase the ease of poaching the species. Plain pigeons have been observed eating livestock feed (Pérez-Rivera and Collazo-Algarín 1976a, p.54; Wiley, unpubl. data). Feeding of plain pigeons on crops, as reported by Cidra residents, may have also led to hunting of pigeons because they may have been perceived as competitors, pests (i.e., damaging crops), or easy targets attracted to feeding on crop fields. Records of poaching or unintentional killing of plain pigeons, however, are scant (Wetmore 1916, p. 300-303; Pérez-Rivera et al. 1994, p.7; PRDNER 2000, p. 18).

The plain pigeon population is interspersed between towns and urban areas, and nesting has been reported in the backyards of houses (PRDNER 1999, unpubl. report). During investigations in Cidra between December 1973 and September 1975, Wiley (unpubl. report) found that nest failures were primarily due to human-caused disturbances. The majority of "undetermined causes" of nest failures (31 percent of the total) were possibly related to human disturbances as well (Wiley, unpubl. report). Disturbances to breeding birds by people moving through and around nesting areas, harassing nesting birds, and stealing squabs from nests accounted for most of the failures during 1974 and 1975 (Pérez-Rivera and Collazo-Algarín 1976b, p. 53). However, human-induced disturbance was of secondary importance to habitat loss during 1986-1999 (Rivera-Milán et al. 2003b, p. 445).

Stochastic and deterministic factors such as hurricanes may decimate the existing population of plain pigeons, particularly because the frequency of these atmospheric events is expected to increase with climate change (Rivera-Milán 2011, p. 5). However, because there is no evidence indicating that unintentional killing or poaching of plain pigeons and human-induced disturbances are frequently occurring, we believe that as a whole, the magnitude of threat from other natural or manmade factors is low, and the immediacy of threat to the plain pigeon is non-imminent.

#### **D. Synthesis**

The Puerto Rican plain pigeon is one of three subspecies of plain pigeon recognized in the West Indies. It is a large pigeon about the size and shape of a domestic pigeon, but with an overall grayish-brown coloration washed with a tinge of maroon color. Although the plain pigeon seems to prefer areas of primary or secondary forest, sometimes in close proximity to a creek or river for breeding and roosting, it also uses areas of disturbed vegetation, croplands, along roads, and urban areas for feeding, roosting, or breeding. The plain pigeon was federally listed as an endangered species on October 13, 1970

because it was thought to be extinct or near extinction. After being considered extinct in the late 1940s, a small population was found in 1963 in the municipality of Cidra, prompting the capture of some individuals in an effort to establish a captive breeding program to produce plain pigeons for later release into the wild. Observations since 1989 indicate that the plain pigeon had increased its range into the east-central region of Puerto Rico, including the municipalities of Cidra, Cayey, Caguas, Comerío, Aibonito, Aguas Buenas, Gurabo, and San Lorenzo. The captive propagation program was discontinued in the late 1990s, since population estimates suggested an increase from the 1970s to the late 1990s. However, it seems that the plain pigeon population has not fully recovered from the impact of Hurricane Georges, although a density increase has been observed since 2008.

Primary factors threatening the plain pigeon include: habitat destruction or modification in the form of construction of roads (e.g., expansion or maintenance of roads, development of new roads and trails); land clearing associated with agricultural, residential, and tourism development (e.g., construction of new homes and commercial establishments); predation by birds, cats, and rats; internal and external parasites and pathogens; natural events such as hurricanes; and human-induced disturbances (e.g., poaching, unintentional killing, people moving through and around nesting areas, harassment of nesting birds, stealing of squabs).

Recovery criteria for the plain pigeon have not been met because efforts have not been initiated to establish two distinct populations of the plain pigeon; the existing plain pigeon habitat in Cidra and Cayey has not been secured and it no longer appears to hold the bulk of the plain pigeon population; and steps have not been initiated to commit the Río Abajo Commonwealth Forest, or its equivalent, as a reintroduction and management site for a second plain pigeon population.

The plain pigeon population density declined after 1998, particularly between 2004-2007 (Table 1). Although an increase is evident since 2008, threats have not been reduced or removed. Furthermore, stochasticity may drive population fluctuations at low numbers, which can be exacerbated in the face of climate change, habitat loss and other threatening factors. Overutilization for commercial or recreational purposes and inadequacy of existing regulatory mechanisms are not considered threats to the species. However, habitat modification or destruction, disease or predation, and other natural or manmade factors continue to be threats to the species. Reproductive capacity, survival rate, and resource use and availability may all be important, but data are lacking to elucidate the mechanisms driving the population dynamics of plain pigeons (Rivera-Milán 2011, p. 6). Therefore, this species continues to meet the definition of endangered.

### **III. RESULTS**

#### **A. Recommended Classification:**

  X   No change is needed.

### **IV. RECOMMENDATIONS FOR FUTURE ACTIONS**

1. Revise the Recovery Plan for the Puerto Rican Plain Pigeon.
2. Roost surveys conducted after the listing of the plain pigeon were poorly standardized and variable, making population trend monitoring unreliable. Point and line transect surveys serve as tools to estimate the plain pigeon population density. Therefore, the existing surveillance monitoring program should continue and be refined for management purposes (Rivera-Milán 2011, p. 6). In addition, a well-designed method to census the roosting sites should be implemented to complement the existing line transect surveys.
3. Groups of free ranging plain pigeons as well as fledglings should be fitted with radio transmitters and unique color leg band combinations to determine population movement patterns, habitat use, distribution, dispersal, and survival.
4. Incorporate GIS and remote sensing technologies to refine occupancy and abundance maps, and to identify potential areas to conduct management experiments, including habitat restoration efforts and experimental releases of plain pigeon flocks (cohorts) to increase the chances of survival and nesting outside the traditional center of abundance in east-central Puerto Rico (Rivera-Milán 2011, p. 6).
5. Incorporate existing private landowners programs (e.g., cooperative agreements, conservation plans, conservation easements, habitat mitigation banks, and economic incentives) to promote restoration, management, and conservation of private lands to help on the recovery of the plain pigeon.
6. Determine the effect of known predators (particularly red-tailed hawks), inter-specific competition with the scaly-naped pigeon, and parasites on the plain pigeon to develop management strategies to control possible adverse effects of these potential threats.
7. Contacts should be established with the media (television, radio, and newspaper) to assist in the preparation and dissemination of information on plain pigeon conservation issues. Traditional methods to disseminate information such as mass mailings and newspaper display ads should be explored as possible tools at key junctures to implement outreach plans.
8. Revise the current listing to reflect the taxonomic name change.

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**U.S. FISH AND WILDLIFE SERVICE**

Puerto Rican plain pigeon or paloma sabanera (*Patagioenas inornata wetmorei*)  
5-YEAR REVIEW

**Current Classification**    Endangered

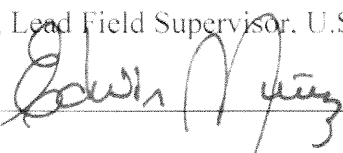
**Recommendation resulting from the 5-Year Review**

X No change is needed

**Review Conducted By** Drs. Jorge E. Saliva and José A. Cruz-Burgos, Caribbean Ecological Services Field Office


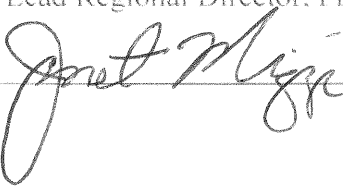
**FIELD OFFICE APPROVAL:**

Edwin E. Muñoz, Lead Field Supervisor, U.S. Fish and Wildlife Service

Approve  Date Nov 8, 2011

**REGIONAL OFFICE APPROVAL:**

Cynthia Dohner, Lead Regional Director, Fish and Wildlife Service

 Approve  Date 11/22/11



## Appendix A

### Summary of peer review for the 5-year review of the Puerto Rican Plain Pigeon or paloma sabanera (*Patagioenas inornata wetmorei*)

Marelisa T. Rivera, CESFO Assistant Field Supervisor, reviewed this 5-year review internally and provided editorial and technical comments that were included in the document. Dr. Frank A. Rivera-Milán, Office of International Affairs, USFWS, also reviewed this document and provided comments. Most comments and recommendations provided by Dr. Rivera-Milán were incorporated into the document and cited accordingly. The reference for his review comments was included in the Literature Cited section of the 5-year review and is available in the file of the Puerto Rican Plain Pigeon.

Additionally, we sent this 5-year review to three outside peer reviewers (see below) via electronic mail. Reviewers were selected based on their qualifications and knowledge of the species. We indicated our interest in all comments the reviewers may have about the plain pigeon, particularly any new additional information on the status and current threats to the species. We did not receive any comments from these peer reviewers.

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