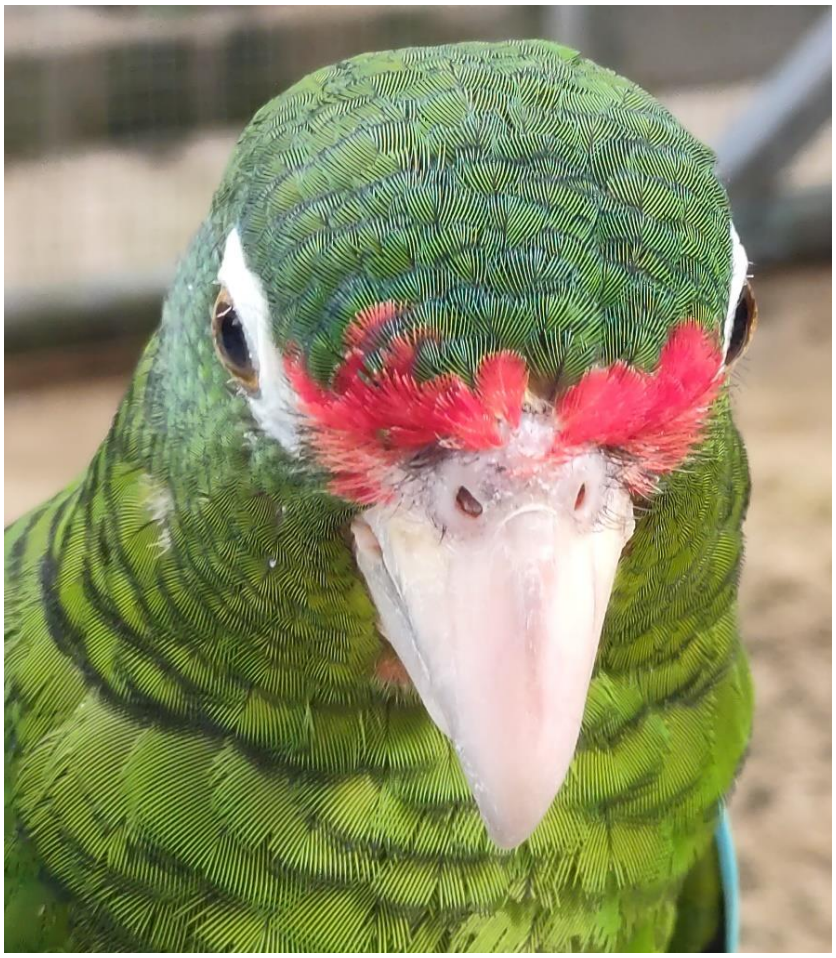
Puerto Rican Parrot
(*Amazona vittata*)

5-Year Review
Summary and Evaluation



(photo by: Marisel López Flores, Service)

U.S. Fish and Wildlife Service
Southeast Region
Caribbean Ecological Service Field Office
Puerto Rican Parrot Recovery Program

March 2023

U.S. Fish and Wildife Service
5-Year Review of the Puerto Rican Parrot
(*Amazona vittata*)

GENERAL INFORMATION

Current Classification: Endangered

Lead Field Office: Marisel López Flores, Caribbean Ecological Services Field Office (CESFO), Rio Grande, Puerto Rico. Marisel_lopez@fws.gov 305-304-7286

Reviewers:
Lead Region: Carrie Straight, Southeast Region, Atlanta GA. (404) 679-7226.

Date of Original Listing: March 11, 1967 (32 FR 4001)

Methodology used to complete the review
In accordance with section 4(c)(2) of the Endangered Species Act of 1973, as amended (Act), the purpose of a status review is to assess each threatened species or endangered species to determine whether its status has changed and if it should be classified differently or removed from the Lists of Threatened and Endangered Wildlife and Plants. The U.S. Fish and Wildlife Service (Service) evaluated the biology, habitat, and threats of the Puerto Rican Parrot (referred to as Parrot hereafter) to inform this status review. On July 14, 2021, the Service published a notice in the Federal Register (86 FR 37178) announcing the 5-year status review of the Parrot, and a 60-day comment period was opened. It requested new information and comments from species experts and biologists familiar with this endangered parrot concerning its biology and status. The Service did not receive any public comments related to the announcement. This review was completed by the U.S. Fish and Wildlife Service Caribbean Ecological Services Field Office (CESFO). All literature and documents used for this review are on file at the CESFO. All recommendations resulting from this review are the result of thoroughly reviewing the best available information on the Puerto Rican Parrot.

Federal Register Notice Citation Announcing Initiation of this Review:
July 14, 2021; 86 FR 37178

Species' Recovery Priority Number at start of review (48 FR 43105):
The Specie's Recovery Priority Number for the Parrot remains 2, which indicates the species faces a high degree of threat and high recovery potential.

Review History: The previous two 5-year reviews recommended that the Parrot continue to be listed as endangered. (Service 2008 and 2017). Between 2017 through 2022 the Recovery Program of the Puerto Rican Parrot has continued to implement actions of the Puerto Rican parrot recovery plan signed on May 9, 2009. The implementation is done by the collaborative

efforts of the Service, the Puerto Rico Department of Natural and Environmental Resources (PRDNER) and the USDA Forest Service (USFS).

REVIEW ANALYSIS

Listed Entity

Taxonomic and nomenclature

We are not aware of any changes to the taxonomy of this entity, and it is still considered valid by the Service.

Distinct Population Segment (DPS) (61 FR 4722)

The Act defines species as including any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate wildlife. This species was not listed as a DPS, and we have no new information that would indicate the species should be listed as a DPS under the Service's 1996 DPS Policy.

Recovery Criteria

Recovery Plan

Recovery Plan for the Puerto Rican Parrot (*Amazona vittata*), Revision 1, May 9, 2009.

Recovery plans are not regulatory documents and intended to provide guidance to the Service, States, and other partners on methods of minimizing threats to listed species and on criteria that may be used to determine when recovery is achieved. If the recovery criteria defined in the plan are still valid, meeting recovery criteria can indicate that the species no longer requires protections under the Act. However, when recommending whether a listed species should be delisted, the Service must apply the factors in section 4(a) of the Act (84 FR 45020).

The objective of the recovery plan is to provide direction for restoring the Puerto Rican parrot to a self-sustaining status, thereby permitting it to eventually be removed from the list (Service 2009). A viable population is a reproducing population that is large enough to maintain sufficient genetic variation to enable it to evolve and respond to natural habitat changes. The number of individuals needed, and the amount and quality of habitat required to meet these criteria will be determined for the species as one of the recoveries tasks and adjusted periodically during review of program accomplishments (i.e., milestones).

Downlisting the Puerto Rican parrot from endangered to threatened will be considered when the following criteria are met (Service 2009):

1) A wild population in the Luquillo Mountains exists with a population size (yet to be determined) that exhibits vital parameters consistent with a trajectory towards population maintenance. At present, population growth in the EYNF [El Yunque National Forest] could be expected if the breeding productivity is greater than or equal to 1.56 chicks per nesting attempt (average rate for the 1990s) and their survival rates should not drop below 90 percent for adults, 85 percent for subadults, and 50 percent for juveniles. These

projections assume that age of first breeding is four years old, and at least 60 percent of the adults engage in reproduction each year. A higher number of breeding pairs is essential for vigorous population growth and historically has been stagnant at 2-6 pairs;
2) A second wild population in the northwestern karst region exists with a population size (yet to be determined) that exhibits vital parameters consistent with a trajectory towards population maintenance;
3) The reintroduction or creation of at least a third wild population has been achieved in a suitable forested area in the island reflecting lessons and demographic expectations stemming from work with wild populations and release programs in the RAF [Río Abajo Forest] and EYNF;
4) Nesting and foraging habitats (yet to be determined) are protected to support growing populations.

Delisting The Puerto Rican parrot will be considered for delisting when:

1) At least three interacting populations exist in the wild and population growth is sustained for 10 years after downlisting has occurred. This length of time will allow monitoring the recruitment of breeding birds and other population attributes in a species that has been characterized by highly variable reproductive and survival rates, at least in the EYNF (Snyder et al. 1987, Muiznieks 2003, Beissinger et al. 2008, White et al 2021). Reviews of the recovery program prior to making a delisting determination will help define more explicitly the range of vital parameter values of a recovered population.
2) Long term protection of the habitat occupied by each wild population is achieved.
3) The effects of disease and predation factors are controlled to allow for population viability.

At present, there are three wild populations occurring with the release of captive reared birds into the wild as well as recruitment from wild breeding parrots. This species is breeding in the wild at El Yunque National Forest (EYNF), Río Abajo Forest (RAF), and Maricao State Forest (MSF). All three populations are geographically-isolated and distant from each other in different protected forests of Puerto Rico. Interaction between the RAF and MSF may occurred eventually as we have had records of a parrot moving to Lares, a municipality in central-western Puerto Rico, north of MSF and west of RAF). This bird was located about 9.5 miles from RAF, this birds also moved to Mayaguez, Añasco, Las Marias, and Adjuntas Municipalities (J. Rios-Cruz pers, comm. 2022). Additionally, efforts to continue establishing populations along the historical range of the species in Puerto Rico is ongoing since 2000. As a result of those reintroduction efforts, we have added two distinct new wild population since the species was listed in 1967. Due to this, a healthy population in the northern karst region (RAF) have been established and a third wild population was reinitiated in 2022 in the southern part of Puerto Rico (i.e., Maricao State Forest).

We are still determining the appropriate measure of flock behavior, predator avoidance, population size, population structure, and habitat conditions to assess the species' viability in each of the wild populations. Although recovery has progressed with the addition of a new southern population and increases in the number of Parrots in the wild, the current downlisting and delisting criteria have not been fully met.

Biology and Habitat Summary

Species' Abundance and Demography

The Puerto Rican parrot is the only native *Amazona* sp. in the United States. The Puerto Rican parrot is bright green, about a foot in length, with red forehead, blue primary wing feathers, and flesh-colored bill and feet. This bird feeds chiefly on wild fruits but may also consume flowers and tender shoots. When listed in 1967, there were an estimated 24 individuals within EYNF in eastern Puerto Rico. As of this document there are an estimated 32 released Parrots in the EYNF, over 210 in the RAF in north-west central Puerto Rico and 18 in the MSF in south-west central Puerto Rico (Table 1; Figure 1). There has been sighting of parrots outside of these areas, but are limited in number and not considered a population at this time. The captive population of Puerto Rican parrots consists of 288 individuals located at the Service's Iguaca Aviary and 210 individuals at the Rio Abajo Vivaldi Aviary. Hurricanes Irma and Maria heavily impacted populations of the Parrot in 2017. Puerto Rico was impacted by Hurricane Fiona in September 2022. No deaths occurred due to this environmental disturbance in any of our facilities and in the wild. Any hurricane impacts to specific populations are detailed below and discussed as part of the threats in the Five Factor Analysis below.

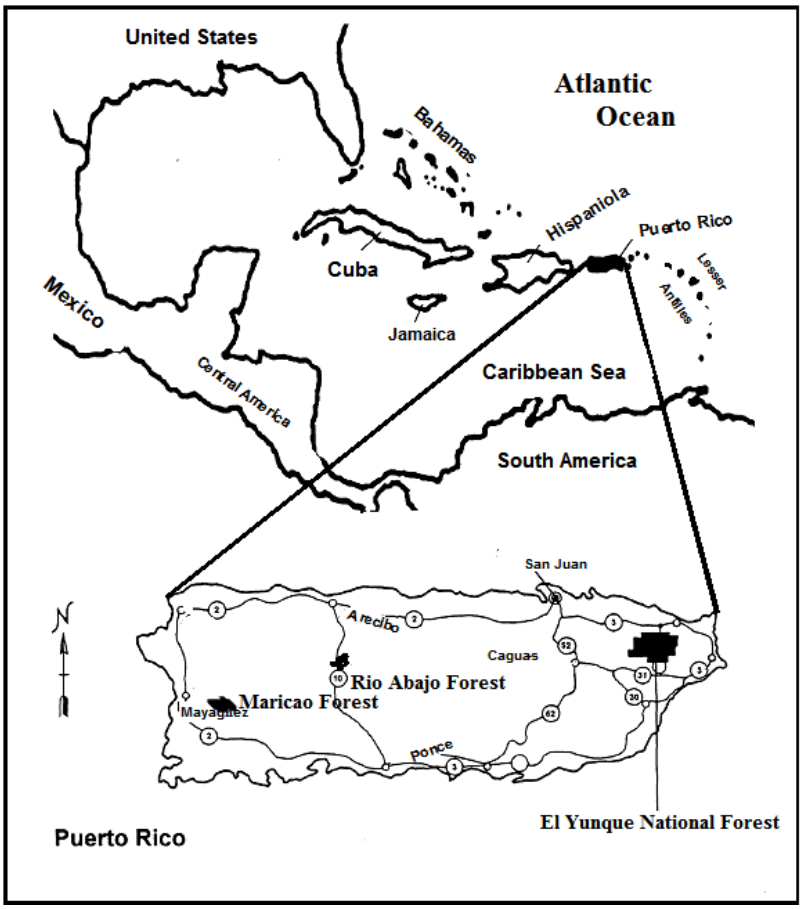


Figure 1. Map of Puerto Rico indicating Puerto Rican Parrot populations.

Table 1. Summary of wild Puerto Rican Parrots survey counts from 2017 to 2022 in the three populations. The numbers are the minimum observed counts of the Puerto Rican Parrot (L. Faust unpub. data). The first Parrots were introduced into Maricao State Forest in 2022.

Year	El Yunque National Forest	Río Abajo State Forest	Maricao State Forest
2017	53-56 (pre-hurricanes); 3 (post-hurricanes)*	130-136	3
2018	2	91	NA
2019	1 (recapture)	127	NA
2020	19	160	NA
2021	18	182	NA
2022	32	210	18

* The 2017 surveys for El Yunque National Forest include a survey before Hurricanes Irma and Maria and after the Hurricanes.

In addition to birds in the wild, three facilities hold more than 533 captive Parrots to support reintroduction efforts: the Iguaca Aviary, the José L. Vivaldi Aviary, and in the Maricao State Forest (MSF)/Puerto Rico Department of Natural and Environmental Resources (PRDNER) Fish Hatchery in south-west central, Puerto Rico. These captive facilities work together to safeguard the species to provide a sustainable source of captive reared parrots for fostering and releasing into the wild and serve as genetic reserves capable of mitigating natural catastrophes or disease outbreaks.

Detailed Species Occurrences and Captive Information

El Yunque National Forest: El Yunque National Forest is protected and under the management of the USFS. At EYNF the population size reached 53-56 parrots in early 2017. Soon after Hurricane Irma, 31 wild birds were observed in the release area. However, more parrots were certainly within the surroundings, as additional wild parrot vocalizations were heard. After the second hurricane, Hurricane Maria, 18 days passed before Service's staff were able to reach the wild population at EYNF. Only one bird was heard during those initial post-hurricane visits in the traditional site at EYNF. Soon after Maria, several wild birds were observed in the Iguaca Aviary. Intensive efforts to find the species were conducted and all potential sightings reported to our staff were investigated, but other than the single individual sited at Aguas Buenas, Puerto Rico about 20 miles south from EYNF the last seen where near the aviary and some stayed and other left the site. No other confirmed sightings of PRP's outside the Iguaca Aviary. One month after hurricane Maria only three birds were sighted at the Aviary. Eventually only a pair remain at the Iguaca Aviary for several months, however, one disappeared, and the last survivor was recaptured. This survivor was later released at the Iguaca Aviary with 29 captive reared parrots. This bird bred that year with one of the released Parrots from 2020 and later died by predation from a red-tailed hawk. The relict wild population of parrots at EYNF was reduced to three known individuals by Hurricane Maria. Currently there are an estimated 32 released, wild individuals at EYNF.

At the Iguaca Aviary, seven parrots died during the first weeks after the Hurricane Maria mainly because the extreme heat and stress. After extensive interagency discussion and evaluation of post-Maria species conservation actions, the decision was made to reintroduce the Parrot back into the EYNF, in the areas immediate to the Iguaca Aviary, rather than the previous wild population area known as "Palo Hueco", or South Fork. This new strategy represented an adaptation of the successful reintroduction strategy developed for the RAF, combined with tactical refinements developed throughout previous years in EYNF (White et al. 2021). Conducting the releases at the actual aviary has significant benefits associated with simplified logistics, immediate access to the population by personnel following any future hurricanes (as occurred at RAF), ease of post-release monitoring, and ready access to a free-flying population in case of a need to recapture and/or translocate any individuals in the future. Reintroduction at the Iguaca Aviary also constituted the most rapid means by which an additional population could be established following Hurricane Maria, thereby reducing the time in which the species was in the precarious demographic situation of only one wild population (RAF) at the time. Since 2017, the Service and partners have worked to restore conditions and activities at Iguaca Aviary and there are currently 288 individuals at the Aviary.

Río Abajo Forest. The Río Abajo Forest is protected and managed by the PRDNER. The reintroduction of the second wild population (i.e., in RAF) started in November 2006. From 2006-2017, a total of 166 parrots have been released in the RAF's karst region. The reintroduction within RAF has been considered a success due to the documented high survival rates of the reintroduced parrots, the increasing breeding behavior, record numbers in active artificial and natural nests and record numbers in recruitment of fledgling parrots from wild nests managed through structured collaboration between interagency members. The population size from RAF before Hurricane Maria was 130-136 individuals. After the hurricane a total of 91 birds were observed and some sightings outside the Forest were documented. There are currently an estimated 210 individuals in the wild at RAF.

José L. Vivaldi Aviary (Río Abajo Forest). Since the start of the captive propagation at the aviary, 225 individuals have been released into the Rio Abajo Forest. Unlike the Iguaca Aviary, all birds survived in captivity at the Vivaldi Aviary and no losses were reported as a result of impacts from hurricanes Irma and Maria. There are currently 210 individuals at the aviary.

Maricao State Forest. The Maricao State Forest is protected and managed by the PRDNER. On November 30, 2016, the first release of Puerto Rican Parrots took place at the MSF. The initial release flock consisted of 31 captive-reared parrots. A total of four birds survived this release. These birds were later captured and returned to the flight cage because of the low success of this effort (e.g., high dispersion, lack of use of supplemental feeders and complicated monitoring scenario). Using telemetry, we observed that birds returned to the release site after spending weeks in other areas within the MSF. This behavior has been seen with other released birds at the other released sites as well. There are currently an estimated 18 individuals in Maricao State Forest after releases in 2022. Although releases are conducted to increase number in the wild, mortality occurs. The effort to release birds in Maricao State Forest will continue to increase numbers and survival rates.

Maricao Fish Hatchery (Maricao State Forest). After Hurricane Maria, 43 captive-individuals located at the emergency room at the Fish Hatchery Hurricane Room located at MSF survived.

However, the hatchery received major damage and a decision of moving the parrots was made for the security of the parrots in this site. These birds were relocated on September 30, 2017, to the Iguaca Aviary. One of these parrot died at the Iguaca Aviary due to heat stroke in the flight cages.

During the months of January and February 2022, the Service also re-initiated the MSF releases. Thirty-five captive parrots were transferred in February 2021 from YNF to MSF. The goal was to continue establishing wild populations in its historical range. At the MSF, 32 Parrots were released in three small groups in January and February 2022. The technique of multiple releases separated by a few weeks apart has been successfully implemented in the Service's parrot project at EYNF, particularly after Hurricane Maria. To maintain a cohesive group, maximize survival, and promote breeding, the artificial nests, satellite cages, and supplemental feeders were installed in the release area. Also, an additional 35 captive Parrots were brought from the José L. Vivaldi Aviary and maintained in the flying cage. Of these 35 captive parrots, 7 additional parrots were released in June 2022 to increase the number in the wild after the first release post Hurricane Maria (i.e., supplement the current wild population). The remaining captive parrots are the release candidates for January 2023.

Additional Occurrences

It is normal that parrots disperse from the release site to private properties as well. The use of radio telemetry has been an important tool to determine the habitat use of these parrots within the release area and adjacent habitats. It has been documented for many years that natural populations and released birds move outside of the breeding and release areas.

A single bird was observed near the YNF on private property as well as a single bird in Aguas Buenas after Hurricane Maria. Near MSF, several individuals have moved to private properties, in Maricao, Las Marias, Mayaguez, Adjuntas and Lares Municipalities. Near RAF, birds have also been seeing in Hatillo, Arecibo, Lares, and Morovis Municipalities. Radio telemetry tracking shows birds moving in areas within and around the release sites.

Population Viability Analysis

An ongoing collaboration led by Lincoln Park Zoo (Chicago, IL, USA) is developing a population viability analysis (PVA) for the species. During this PVA, analysis of recent demographic trends for the subpopulations with good data were explored. This analysis considers both released individuals and wild-born individuals as part of the wild populations. Preliminary information on these analyses are provided below.

Based on studbook data, the growth rate over the past five years (2018-2022) for different subpopulations was:

- 1.019 for RAF CAPTIVE *(e.g., a 1.9% growth rate in the captive subpopulation)
- 1.167 for RAF WILD** (e.g., a 16.7% growth rate in the wild subpopulation)
- 1.084 for YNF WILD ***(e.g., a 8.4% growth rate in this wild subpopulation)

* Individuals held at José L. Vivaldi Aviary
** Rio Abajo Forest wild population
*** El Yunque National Forest wild population

These population growth rates include intrinsic and extrinsic factors – the RAF WILD population's growth rate is high due to releases from RAF CAPTIVE and, to a lesser extent, releases from YNF CAPTIVE. The RAF CAPTIVE and YNF WILD may have similar demographic output in terms of numbers of hatches and deaths, but their overall growth rates are influenced by how many birds are used for release during the past five years. In general, the aviary populations and RAF exhibited strong growth over the most recent five-year period (L. Faust unpubl. data). The newly-reintroduced wild population in EYNF has also exhibited encouraging results, with over 60% first-year survival and immediate nesting and successful reproduction following intitial release. The number of wild nesting pairs in this population has progressed from two pairs in each of the 2020 and 2021 seasons, to five pairs during the 2022 season.

Based on preliminary PVA results, in the baseline scenario (e.g., management continues as planned to include releases and cross-fostering for the next 25 years, reasonable risk of hurricanes) the three wild populations have low to moderate risks of extinction. The YNF WILD has the highest risk, at 31.1% within 100 years; RAF WILD and MSF WILD both have negligible extinction risk (0.4 and 1.2%, respectively). Strong growth occurs during the 25 years of releases, but after management stops all three have declining average stochastic growth rates (range -0.9% to -5.1%), although rates for RAF WILD and MSF WILD are close to stable. This long-term vulnerability is partially due to hurricane risks, but also due to intrinsic demographic patterns that are still being explored within the model. The PVA helps to evaluate the impact of different release strategies and changes in demographic rates and should yield information to help guide management of the species in the future. The final report should be finished in summer 2022 (L. Faust unpub. data).

Spatial Distribution

All indications suggest that the Parrot was once abundant and widespread on the Puerto Rican Archipelago's major islands (Snyder et al. 1987). Today, the Parrot is exclusively known from the island of Puerto Rico. In Puerto Rico, the current distribution of the Puerto Rican parrot is primarily in the protected forests of EYNF, RAF, and MSF with some occurrences in private lands outside of those main populations. However, due to impacts from Hurricane Irma and Hurricane Maria in 2017, the status of the Parrot in Puerto Rico appears to have declined slightly for the EYNF wild population. The spatial distribution has increased spatially since listing with the new release location and wild population in MSF.

Five Factor Analysis

The status of a species is determined from an assessment of factors specified in section 4 (a)(1) of the Act, including the five factors (A through E discussed below) that may affect the continuing existence of the species. These threats and stressors discussed below are affecting the captive, released and natural Parrot populations.

A. Present or threatened destruction, modification or curtailment of its habitat or range

Currently, the primary natural breeding areas in EYNF, RAF and MSF are relatively near or adjacent to one or several of the following manmade features: agricultural lands, recreational areas, roads, trails, or other manmade structures. The proximity of recreational areas, trails, and access road to the most significant breeding areas of the Parrot may increase the risk of disturbances during the cavity selection period, potential nest robbing, and increases encounters with humans during fledgling events at the end of the breeding cycle. Observations of Service staff indicate that if this species is disturbed in the early stages of nesting, the parrots may abandon the cavity and not return, which is problematic as they usually nest in the same cavity each year. Although it is unknown if they may return to those cavities in later years, this limits availability of nesting cavities. Therefore, we believe that any increase in human visitation to the breeding areas and through the access roads and trails could result in loss of nesting sites and could adversely affect the suitability of breeding areas. However, we recognize that psittacine species around the world have adapted to urban areas, secondary growth forest, cities, etc. where they forage, brood and breed near humans.

B. Overutilization for commercial, recreational, scientific or educational purposes

We are not currently aware of any over utilization for commercial, recreational, scientific, that is considered a threat to the species.

C. Disease or predation

Disease

As part of the care and husbandry of the Parrot at the captive facilities, a thorough and complete annual physical examination is performed on one-third of the captive birds in the aviaries at EYNF, RAF and MSF. An annual physical examination in the aviaries is performed to ensure the well-being of the species and to standardize health screening every year.

In August 2020 the sudden deaths of several parrots caused concern at the Iguaca Aviary. After documenting the death of 13 birds, an analysis of potential causes was assessed by Dr. H. L. Shivaprasad, California Animal Health and Food Safety Lab. Some carcasses were sent to the Southeastern Cooperative Wildlife Disease Study Unit to determine the cause; however, the findings were hepatic inflammation and pneumonia. On September 25, 2020, 13 parrots had a positive PCR result for *Chlamydia psittaci*. Birds that died had similar symptoms to other cases of *C. psittaci*. *C. psittaci* is a lethal intracellular bacterial species that may cause endemic avian chlamydiosis, epizootic outbreaks in mammals, and respiratory psittacosis in humans (Balsamo et al. 2017; Centers for Disease Control and Prevention 2022 and associated linked information pages). A team composed of Service Management officials, Veterinarians, and Safety Officers was established to implement actions and safety measures to ensure the well-being of staff and the parrots.

A total of 23 birds died due to this disease at the Iguaca Aviary at EYNF in the flight cages located east to the facilities (flight cages 1 and 2 and retention cage). From a total of 73 breeding cages, only one chick died due to the disease and this cage was located about 15 meters from flight cage 2. Parrots were administered Doxycycline antibiotics in the drinking water for a two-month period. All infected areas within the aviary were sampled on September 29, and sent to Dr, Branson Ritchie, DVM, University of Georgia, Infectious Disease Laboratory. Results from

those swabs samples were positive in flight cages 1 and 2 and the retention cage. Due to the positive test results, flight cages were sanitized with bleach every day for a four-month period. The disease was eradicated in a period of two months. The facilities were tested again six months afterwards and no trace of *Chlamydia psittaci* was found. Due to this disease, birds from these facilities were not transferred to any of the other facilities until the disease was verified to be eradicated.

Predation

It has been well documented that the red-tailed hawk (*Buteo jamaicensis*) is the major predator of the Parrot and has been documented at each of the release sites. In EYNF since 2020, of 81 released individuals at the Iguaca Aviary, we have documented at least 16-20 predated by red-tailed hawks and 6-8 in 2021 by a merlin (*Falco columbarius*). In RAF, the red-tailed hawk is responsible for 75-80% of known Puerto Rican parrot depredations. This species is considered a threat to both Parrot fledglings and adults throughout its range and can be particularly problematic at locations where newly released Parrots are exposed to this predator for the first time. We continue with the efforts to trap red-tailed hawks and are identifying ways to deter further attacks and improve Parrot predator avoidance; focusing these efforts on the released individuals and release locations. In addition to potential predation by red-tailed hawks, broad-winged hawks (*Buteo platypterus brunnescens*) are potential predators found in RAF.

Predation of eggs and chicks by the Puerto Rican boa (*Chilabothrus inornatus*) may also pose a threat. Another possible factor yet to be determined, is the potential impact of the non-native red-tailed boa (*Boa constrictor constrictor*). At least twelve red tailed boas have been recorded near and surrounding the release cage in MSF. Individuals near the release cage were removed; however, the occurrence of this species on the island has increased since 2015. On June 1, 2022, in the Municipality of Mayagüez, a fecal pellet containing feathers, radio collar, and a Puerto Rican parrot band was found near the edge of a secondary forest. The pellet was sent to Dr. Alberto Puente at the University of Puerto Rico, Mayaguez Campus. Evidence of pellet condition and contents suggest that the Parrot was ingested by a boa, however, the species of boa is unknown.

Parasitism by warble flies (*Philornis pici*) is another threat, to bird species in Puerto Rico. Pearly-eyed thrashers (*Margarops fuscatus*) also predate eggs and chicks.

Along with native species that are predators, non-native species pose a large predation threat. Feral/domestic cats (*Felis catus* were documented as a predator in EYNF. Feral cats occur throughout much of Puerto Rico, and although not documented at the other locations are considered a threat to the species throughout its range. Rats (*Rattus rattus* and *R. norvegicus*) are also nonnative and found in both urban and natural setting and can consume eggs and impact nesting birds. Predation by Small Indian mongoose (*Herpestes auropunctatus*) also poses a threat to fledglings that land on the forest floor.

D. Inadequacy of existing regulatory mechanisms

The Service is not aware of information indicating that lack of regulatory mechanisms is a stressor that may negatively affect the continued existence of the species. The species is still protected under the same laws and regulations as discussed in the 2017 5-year status review.

However, despite the protection of the Parrot by existing laws, the enforcement of such laws and regulations, particularly as the number of individuals in the wild increases and their range expands, will continue to be a challenge due to the lack of knowledge of the species and confusion with exotic introduced psittacines by regulatory agencies, landowners, and law enforcement officers. While the laws and regulations are in place, the Parrots continue to move into new areas, where elimination, degradation, and modification of their roosting, feeding, and breeding habitat has occurred. Moreover, permits to implement agricultural practices (e.g., deforestation and use of pesticides for pest control), residential, industrial, touristic, and commercial development within and near the Parrot's wild populations are prevalent and not prevented by regulatory mechanisms.

E. Other natural or manmade factors affecting its continued existence

The anthropogenic and natural factors that may affect the continued existence of the Parrot continue being the same as described in the 2017 5-year review (Service 2017). The Parrot continues to be threatened by the effects of hurricanes, introduced fauna, potentially by feral cats and dogs, and human disturbance at EYNF, RAF and MSF impacting nesting, feeding, or other behaviors of the species in the wild.

Other compounding conditions include low numbers of individuals, scarcity of nesting cavities, and a limited distribution that have the potential to be impacted by single catastrophic events (e.g., see discussion of hurricanes below). These conditions put the species at added risk due to potential declines in genetic diversity, limits in habitat for range expansion, and ability to recover after catastrophic impacts to populations. Competition for cavities by European and Africanized honeybees (*Apis mellifera*), and pearly-eyed thrashers and other non-native species of psittacines that use the same types of nesting habitat may impact the species.

Climate Change

Climate change can have several direct and indirect impacts on the Parrot, such as increases in temperature within the artificial nesting cavities (made of polyvinyl chloride (PVC)) that could exceed critical temperature thresholds and directly affect the development of embryos in fertile eggs. Increases in the number and intensity of hurricanes and extreme storm events, length of the hurricane season and changes in rain patterns may impact the species. Changes in availability of key wild fruit such as Sierra palm seeds (*Prestoea montana*), etc. may also impact the species. However, since climate change is expected to affect the Parrot in a long-term process and may occur over a long period of time, the scope of this threat should be considered as moderate. Since the last 5-year review, three extreme weather events, e.g., Hurricanes Irma and Maria in 2017 and Hurricane Fiona in 2022 (Figure 2). On September 6, 2017, Hurricane Irma, a Category 5 hurricane passed 92.6 km north of Puerto Rico with sustained winds of 88.9 km/hr (55 mph) and gusts of up to 118.5 km/hr (74mph) experienced in the entire island of Puerto Rico (Cangialosi et al. 2018). Two weeks later, on September 20, 2017, Puerto Rico was directly affected by Hurricane María, a Category 4 storm considered one of the strongest hurricanes on record to affect Puerto Rico with winds of 250 km/h (155 mph) before making landfall on the southeastern corner of the Island (Pasch et al. 2018). Catastrophic winds and rain from these two hurricanes resulted in landslides, tree defoliation, and tree loss and likely resulted in reduced availability of natural food sources for the Parrots. The main path of Hurricane Fiona, which had maximum winds of 209 km.hr (130 mph), skirted Puerto Rico but had heavy impacts to the island. Extreme

weather events, such as both the natural nesting and foraging habitat as well as aviaries where the captive populations are being held. In advance of hurricanes, staff secure captive individuals and resources at the aviaries to minimize impacts.

Furthermore, over the decades, the Puerto Rican parrots, and similar taxonomic species (e.g., *Amazona leucocephala leucocephala* in Cuba, *A. l. bahamensis* in The Bahamas) has demonstrated its resilience to adapt to new conditions after severe atmospheric disturbances, changes in the landscape, and availability of new sources of food. These species have evolved with tropical storms and is expected to be resilient to some level of disturbance. Once populations of this species increase and are fully established and sustaining in the wild, we will be able to assess their resiliency to these extreme weather events.

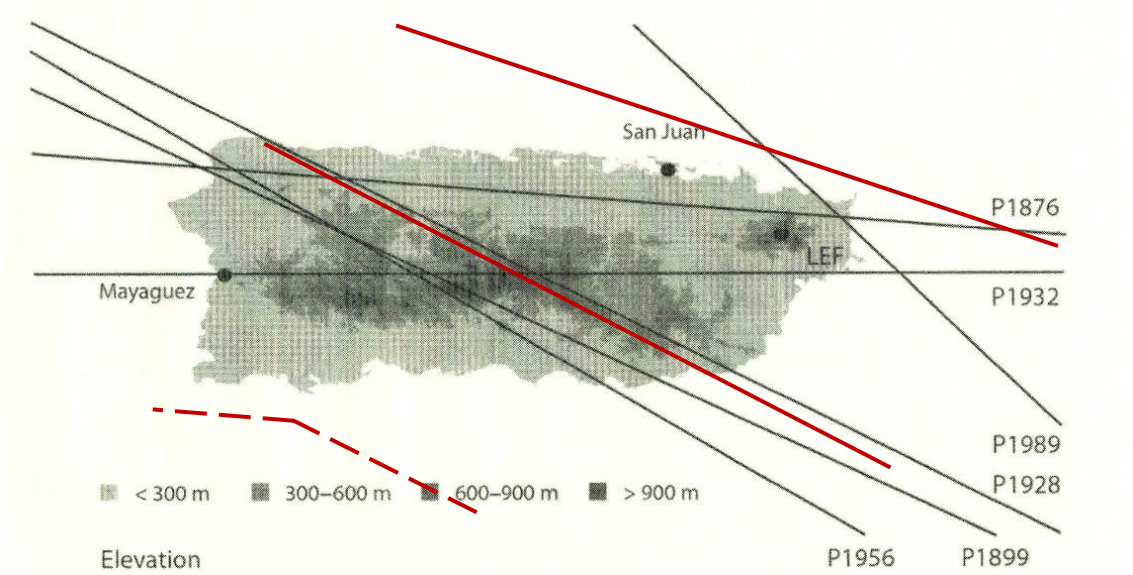


Figure 2. Map of tracks of six hurricanes from 1851-1997 that passed over Puerto Rico (adapted from Boose et. al. 1994) and modified by adding the approximate tracks of hurricanes Irma and Maria (solid red) in 2017 and Hurricane Fiona (dashed red) in 2022. Additional hurricanes occurred in other years but are not pictured. In 2017 and 2022, hurricane impacts occurred island-wide.

Invasive species

In the islands of Puerto Rico, we have several invasive species of psittacines, some of them of the same Genus as the Puerto Rican parrot (i.e., *Amazona*). The following are the most common species:

1. Orange-winged Parrot / Orange-winged Amazon (*Amazona amazonica*)
2. Red-crowned Parrot / Red-crowned Amazon (*Amazona viridigenalis*)
3. Yellow-crowned Parrot / Yellow-crowned Amazon (*Amazona ochrocephala*
4. Yellow-headed Parrot / Yellow head Amazon (*Amazona oratrix*)
5. Turquoise-fronted Parrot / Blue Fronted Amazon (*Amazona aestiva*)
6. White-fronted Parrot / White-fronted Amazon (*Amazona albifrons*)

7. Hispaniolan Parrot / Hispaniolan Amazon (*Amazona ventralis*)
8. Orange-fronted parakeet (*Eupsittula canicularis*)
9. Monk Parakeet (*Myiopsitta monachus*)
10. White-winged Parakeet (*Brotogeris versicolurus*)
11. Red-masked Parakeet (*Psittacara erythrogenys*)
12. Red-and-green Macaw (*Ara chloropterus*)
13. Blue-and-yellow Macaw / Blue and Gold Macaw (*Ara ararauna*)
14. Scarlet Macaw (*Ara macao*)
15. Salmon-crested Cockatoo (*Cacatua moluccensis*)
16. White Cockatoo / Umbrella Cockatoo (*Cacatua alba*)
17. Tanimbar Corella / Goffin Cockatoo (*Cacatua goffiniana*)
18. Budgerigar / Australian Parakeet (*Melopsittacus undulatus*)

Based in the best information available (Camacho-Rodríguez et. al. 1999) all of these species and several other has been in Puerto Rico for over 40 years and none of them have been known to compete directly with the Puerto Rican parrot for territories, food and/or breeding areas/cavities. Due to the limited areas where the Puerto Rican Parrot is distributed and the current management strategies, parrots have been staying near the release site. However, over the years we have documented that some of our radiomarked birds moving to other areas and have interacted with other psittacine species. Populations that have exhibited this behavior have been birds from EYNF and RAF (e.g., road 186 at EYNF and Morovis Municipality parrots from RAF). These birds have returned to the release and breeding site occasionally. This is a common behavior of this social bird species. Competition for cavities or food resources have not been documented. As previously noted, these species may be confused with the Puerto Rican parrot and complicate enforcement of regulations that protect it.

Synthesis

The Puerto Rican parrot is bright green, about a foot in length, with red forehead, blue primary wing feathers, and flesh-colored bill and feet. This is the only native parrot in the genus *Amazona* to the United States. The total number of individuals has increased from about 577 individuals in 2016 to about 862 individuals in 2022 (in three aviaries and three wild populations). There are three known wild populations found in the Río Abajo State Forest (approximately 210 birds), El Yunque National Forest (approximately 32 birds), and Maricao State Forest (approximately 18 birds). Only the Río Abajo State Forest population seems relatively stable at this time. Since 2017, the Parrot suffered from a major reduction in the wild populations due by Hurricanes Irma and Maria. The species has been slowly recovering after the impacts of the two hurricanes. One captive population was impacted for a period of time from negative health impacts and mortality caused by *Chlamydia psittaci*. The Parrot continues to be threatened by Factor A (present or threatened destruction, modification, or curtailment of its habitat and range), Factor C (Disease or predation), and Factor E (Other natural or manmade factor affecting its continued existence). Natural and human factors such as native and non- native predators (e.g., hawks, and cats,), habitat modification by catastrophic events (i.e., hurricanes, storms and climate change,), and newly discover diseases for the parrots can be devastating for the species and has resulted in documented deaths in the wild. Each of the threats represent a variety of direct and indirect impacts to the species. Based on the continued threats, small population sizes and limited ability to regulate many of the threats, we believe that the species continues to meet the definition of an

endangered species, in danger of extinction throughout all or a significant portion of its range within the foreseeable future.

RECOMMENDATIONS FOR FUTURE ACTIVITIES

Based on the available information on the species, we recommend the following actions:

- Continue to manage the aviaries to maximize production of captive birds suitable for releases and continue working cooperatively to maximize the needs for the wild populations.
- Continue monitoring wild populations and active nests to maximize their success by assuring the adaptation in its habitat and reproducing successfully.
- Continued support with augmentation and other activities to improve chances of a viable third wild population in MSF.
- Control depredation by red-tailed hawks in MSF and EYNF and by other predators (i.e., rats, mongoose, and cats) in all breeding areas.
- Supplement wild populations in the EYNF and RAF by releasing individuals produced in the aviaries.
- Continue releasing birds in large groups (i.e., 25-30) in MSF and continue implementing management strategies in this new habitat due to the different needs (i.e., implement landowners' approach to conduct habitat improvements), topography (i.e., difficulties conducting telemetry) and challenges due to dispersion.
- Continue developing public education and outreach programs for the Parrot, especially in areas with recently reintroduced populations.
- Conduct quantitative efforts to estimate relative abundance of the species at all known populations.

REFERENCES

Balsamo, G., A.M. Maxted, J.W. Milda, J.M. Murphy, R.Wohrle, T.M. Edling, P.H. Fish, K. Flammer, D. Hyde, P.K. Kutty, M. Kobayashi, B. Helm, B. Oiulfstad, B.W. Ritchie, M.G. Stobierski, K. Ehnert, and T.N. Tully. 2017. Compendium of Measures to Control *Chlamydia psittaci* Infection Among Humans (Psittacosis) and Pet Birds (Avian Chlamydiosis). Journal of Avian Medicine and Surgery 31:262-282.

Boose, E.M., D.R. Foster and M. Fluet. 1994. Hurricane Impacts to Tropical and Temperate Forest Landscapes. Ecological Monographs 64(4):369-400.

Beissinger, S.R., J.M. Wunderle, Jr., J.M. Meyers, B-E. Saether, and S. Engen. 2008. Anatomy of a bottleneck: diagnosing factors limiting population growth in the Puerto Rican parrot. Ecological Monographs 78:185-203.

Cangialosi, J.P., A.S. Latto, and R. Berg. 2018. Tropical Cyclone Report. Hurricane Irma. https://www.nhc.noaa.gov/data/tcr/.

Camacho-Rodriguez, M., J. Chabert-Llompart and M. Lopez Flores. 1999. Guía para la identificación de las aves exóticas en Puerto Rico. 52pp

Centers for Disease Control and Prevention. 2022. Psittacosis. https://www.cdc.gov/pneumonia/atypical/psittacosis/index.html. Accessed December 2, 2022.

Helmer, E. H., O. Ramos, T. del M. López, M. Quiñonez, and W. Díaz. 2002. Mapping the forest type and land cover of Puerto Rico, a Component of the Caribbean Biodiversity Hotspot. Caribbean Journal of Science 38:165-183.

Muiznieks, B. D. 2003. Population viability analysis of the Puerto Rican parrot: an evaluation of its current status and prognosis for recovery. M.S. Thesis, North Carolina State University. 88 pp. (http://www.lib.ncsu.edu/ETD-db/ETD-browse/browse).

Pasch, R.J., A.B. Penny, and R. Berg. 2018. Tropical Cyclone Report. Hurricane Maria. https://www.nhc.noaa.gov/data/tcr/.

Rios-Cruz, J. 2022. Personal Communication. Email communication from Jesus Rios-Cruz, U.S. Fish and Wildlife Service to Edwin Muniz, U.S. Fish and Wildlife Service on April 18, 2022.

Snyder, N.F.R., J.W. Wiley, and C.B. Kepler. 1987. The parrots of Luquillo: Natural history and conservation of the Puerto Rican parrot. Western Foundation of Vertebrate Zoology, Los Angeles, CA, 384pp.

Thompson-Baranello, J.J. 2000. Resource and population modeling of the Puerto Rican parrot (*Amazona vittata*). M.S. Thesis. University of Puerto Rico, Río Piedras Campus. 208pp.

Trujillo, A.M. 2005. Evaluation of the suitability of the karst region of north-central Puerto Rico for the reintroduction of Puerto Rican parrot (*Amazona. vittata*). M.S. Thesis, University of Puerto Rico, Mayagüez Campus.

U.S. Fish and Wildlife Service (Service). 2008. Puerto Rican Parrot (*Amazona vittata*) 5-Year Review: Summary and Evaluation. Rio Grande, Puerto Rico. 22 pp.

U.S. Fish and Wildlife Service (Service). 2009. Recovery Plan for the Puerto Rican Parrot (*Amazona vittata*), Revision 1. Atlanta, Georgia. 75 pp.

U.S. Fish and Wildlife Service (Service). 2017. Puerto Rican Parrot (*Amazona vittata*) 5-Year Review: Summary and Evaluation. Rio Grande, Puerto Rico. 30 pp.

White, T.H., Jr., W. Abreu, G. Benitez, A. Jhonson, M. Lopez, L. Ramirez, I. Rodriguez, M. Toledo, P. Torres, and J. Velez. 2021. Minimizing potential Allee effects in Psittacine reintroductions: an example from Puerto Rico. Diversity 13(1):13. https //doi.org/10.3390/d13010013.

RESULTS / SIGNATURES

U.S. Fish and Wildlife Service
Status Review of Puerto Rican Parrot (*Amazona vittata*)

Status Recommendation:

On the basis of this review, we recommend the following status for this species. A 5-year review presents a recommendation of the species status. Any change to the status requires a separate rulemaking process that includes public review and comment, as defined in the Act.

____ Downlist to Threatened
____ Uplist to Endangered
____ Delist:
____ *The species is extinct*
____ *The species does not meet the definition of an endangered or threatened species*
____ *The listed entity does not meet the statutory definition of a species*
_X_ No change needed

FIELD OFFICE APPROVAL:
Field Supervisor, Caribbean Ecological Services Field Office, Fish and Wildlife Service

Approve EDWIN MUNIZ Digitally signed by EDWIN MUNIZ Date: 2023.03.31 14:21:10 -04'00'

LEAD REGIONAL OFFICE APPROVAL:
Assistant Regional Director – Ecological Services, Fish and Wildlife Service

Approve LAWRENCE WILLIAMS Digitally signed by LAWRENCE WILLIAMS Date: 2023.03.31 15:00:07 -04'00'