Palma de Manaca
(*Calyptronoma rivalis*)

5-Year Review:
Summary and Evaluation

Photo Credit: USFWS 2007

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

5-YEAR REVIEW
Palma de manaca *(Calyptronoma rivalis)*

I. GENERAL INFORMATION

A. Methodology used to complete the review: On September 21, 2007, the Service published a notice in the *Federal Register* (72 FR 54061) announcing the 5-year review of palma de manaca (*Calyptronoma rivalis*). This notice requested new information concerning the biology and status of this plant species. A 60-day comment period was opened. No information on the palma de manaca was received from the public during the comment period.

A Service biologist prepared this 5-year review that summarizes the best available information on this plant. New information consists of publications on research projects conducted by species experts from 1993 to 2008. The 5-year review was also sent to six peer reviewers (see Appendix A). No comments were received from the peer reviewers.

B. Reviewers

Lead Region: Kelly Bibb, Southeast Region. (404) 679-7132.

Lead Field Office: Maritza Vargas, Caribbean Field Office, Boquerón, Puerto Rico. (787) 851-7297, extension 240.

C. Background

1. FR Notice citation announcing initiation of this review: September 21, 2007; 72 FR 54061.

2. Species Status: 2009 Recovery Data Call: Improving. The species is present in three natural populations in the municipalities of San Sebastian, Quebradillas and Camuy. In addition, there are five introduced populations in various Commonwealth Forests.

3. Recovery Achieved 2 (25-50 %) of species recovery objectives achieved.

4. Listing History
Original Listing
FR notice: 55 FR 4157
Date listed: February 6, 1990
Entity listed: Species
Classification: Threatened

5. Associated rulemakings: Not Applicable.

6. Review History: February 6, 1990 Final Rule (55 FR 4157), Palma de Manaca (C*alyptronoma rivalis*) Recovery Plan [U.S. Fish and Wildlife Service (USFWS) 1992]

Palma de manaca is an arborescent palm that grows along stream banks in the northwestern karsts region of Puerto Rico. When the recovery plan was signed, about 259 individuals of palma de manaca were known from three naturally occurring populations (Quebrada Collazo in San Sebastian; along the Río Camuy area between the municipalities of Camuy and Hatillo; and the Río Guajataca gorge between the municipalities of Isabela and Quebradillas).

In addition, at the time of listing, palma de manaca had been planted in an area managed as a Boy Scout Camp adjacent to Guajataca Lake in the municipality of Quebradillas and in the Río Abajo Commonwealth Forest, which is managed by the Puerto Rico Department of Natural and Environmental Resources (DNER) in Utuado.

Every year the Service reviews the status of listed species and incorporates the information in the annual Recovery Data Call. In the 2008 and 2009 Recovery Data Call, we concluded that the status of the species was improving.

The Service conducted a five-year review for the palma de manaca in 1991(56 FR 56882). In this review, the status of many species was simultaneously evaluated with no in-depth assessment of the five factors or threats as they pertain to the individual species. The notice stated that the Service was seeking any new or additional information reflecting the necessity of a change in the status of the species under review. The notice indicated that if significant data were available warranting a change in a species' classification, the Service would propose a rule to modify the species' status. No change in the palma de manaca's listing classification was found to be appropriate.

7. Species' Recovery Priority Number at start of review (48 FR 43098): 8 - At the time of listing, palma de manaca was recognized as a species with a moderate degree of threat and high recovery potential.

8. Recovery Plan:
Name of plan: Palma de Manaca (*Calyptronoma rivalis*) Recovery Plan.
Date issued: June 25, 1992.

II. Review Analysis

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

1. Is the species under review listed as a DPS? No.
The Act defines species to include any distinct population segment of any species of vertebrate wildlife. This definition limits listings as distinct population segments (DPS) only to vertebrate species of fish and wildlife. Because DPS policy is not applicable to this plant species, it is not addressed further in this review.

B. Recovery Criteria

1. Does the species have a final, approved recovery plan containing objective, measurable criteria? No. The species has an approved recovery plan. However, it establishes only non-measurable criteria to delist the species. It does not define the number of individuals needed for a sustainable population.

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**.** The plan does not include up-to-date information about the species distribution. At the time of listing, the species was considered endemic to Puerto Rico but it is now also known from the Dominican Republic and Haiti (Hispaniola). Knowledge about its distribution and *ex-situ* individuals has expanded.

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**.**

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 Plan specifies that palma de manaca could be considered for delisting when:

1. The known populations are placed under protective status; and

2. At least three new populations capable of self-perpetuation have been established within protective units, such as Conservation Trust property or Commonwealth Forests.

The plan specifies that these criteria must be considered minimum requirements, and should be expanded upon if the regenerative potential of natural and *ex situ* populations proves insufficient. The plan also states that if new populations are discovered, it might be preferable to place greater emphasis on protection, rather than propagation, to achieve a minimum number of plants (number not specified).

Criterion 1 has not been met. The three natural populations (Quebrada Collazo, Río Camuy, and Río Guajataca) located in private lands have not been placed in protective status.

Criterion 2 has been partially met. Various propagation efforts were conducted at various Commonwealth Forests of Puerto Rico. Currently, there are five introduced populations

on Commonwealth Forests: four in the Río Abajo Commonwealth Forest and one in the Guajataca Commonwealth Forest (DNER 2006, p.95; Victor Rodríguez, DNER, pers. comm., 2008; Omar Monsegur, USFWS, pers. comm., 2008). Two of the populations of Río Abajo Commonwealth Forest have been reported to fructify. However, there has been no documentation on any recruitment. In addition, in 2007, the Service introduced saplings of palma de manaca on El Tallonal farm (a private conservation area) under the Partner's for Fish and Wildlife Program.

C. Updated Information and Current Species Status

1. Biology and Habitat

a. Abundance, population trends, demographic features, or demographic trends:

Historically, palma de manaca was known from the northern karst region of Puerto Rico. When listed, 44 palma de manaca individuals persisted along the bank of Quebrada Collazo in San Sebastian; aproximately 200 individuals were located along Río Camuy and about 10-15 individuals were located along the Río Guajataca (USFWS 1992, p.2).

Santiago-Valentín and Rojas-Vázquez (2000, p.1-14) surveyed the known populations to study aspects of the distribution, population structure, phenology, and threats. They found 554 individuals (Table 1) and about 1300 seedlings (Table 2). Only about 10 % of the total individuals were reproducing at the time of the survey. Quebrada Collazo had fewer individuals than the other two sites but had a higher percentage (27%) of reproducing individuals.

Table 1. Number of individuals reported (Santiago-Valentín and Rojas-Váquez 2000, p. 1-4). Seedling not included in these numbers.

Locality Name	Reproducing	Not Reproducing	Total
Quebrada Collazo	35	97	132
Río Camuy	6	221	227
Río Guajataca	12	183	195
Total	**53**	**501**	**554**

Table 2. Number of Seedlings reported (Santiago-Valentín and Rojas-Vázquez 2000, p. 6-7).

Locality Name	Number of seedlings
Quebrada Collazo	<100
Río Camuy	>1000
Río Guajataca	About 200

The population structure of palma de manaca given by Santiago-Valentín and Rojas-Vázquez Report (2000, p.14) was based on dividing the growth stages of palma de manaca into four categories (roughly estimating age categories). Seedlings were not included in these categories (individuals with one leaf were considered seedlings).

Class I - individuals with two or more leaves and less than a meter in length
Class II - individuals with developed leaves higher than a meter in length and no visible stem.
Class III - individual with fully developed fronds and a trunk less than 1.3 meters in height
Class IV- individuals with trunks taller than 1.3 meters in height

Class I (the youngest plants) was the dominant category on all sites (Table 3). Based on their analysis, most individuals (86%) are young and non-reproductive (Classes I, II, and III) with only about 14% of the populations in Class IV - the Class expected to be reproducing. However, only 69% of individuals found in Class IV were reproducing at the time of the survey.

Table 3. Palma de manaca population structure (Santiago-Valentín and Rojas-Vázquez (2000, p. 14)

Locality Name	Class I	Class II	Class III	Class IV
Quebrada Collazo	64	24	6	38
Río Camuy	176	27	7	17
Río Guajataca	113	54	6	22
Total	**353**	**105**	**19**	**77**

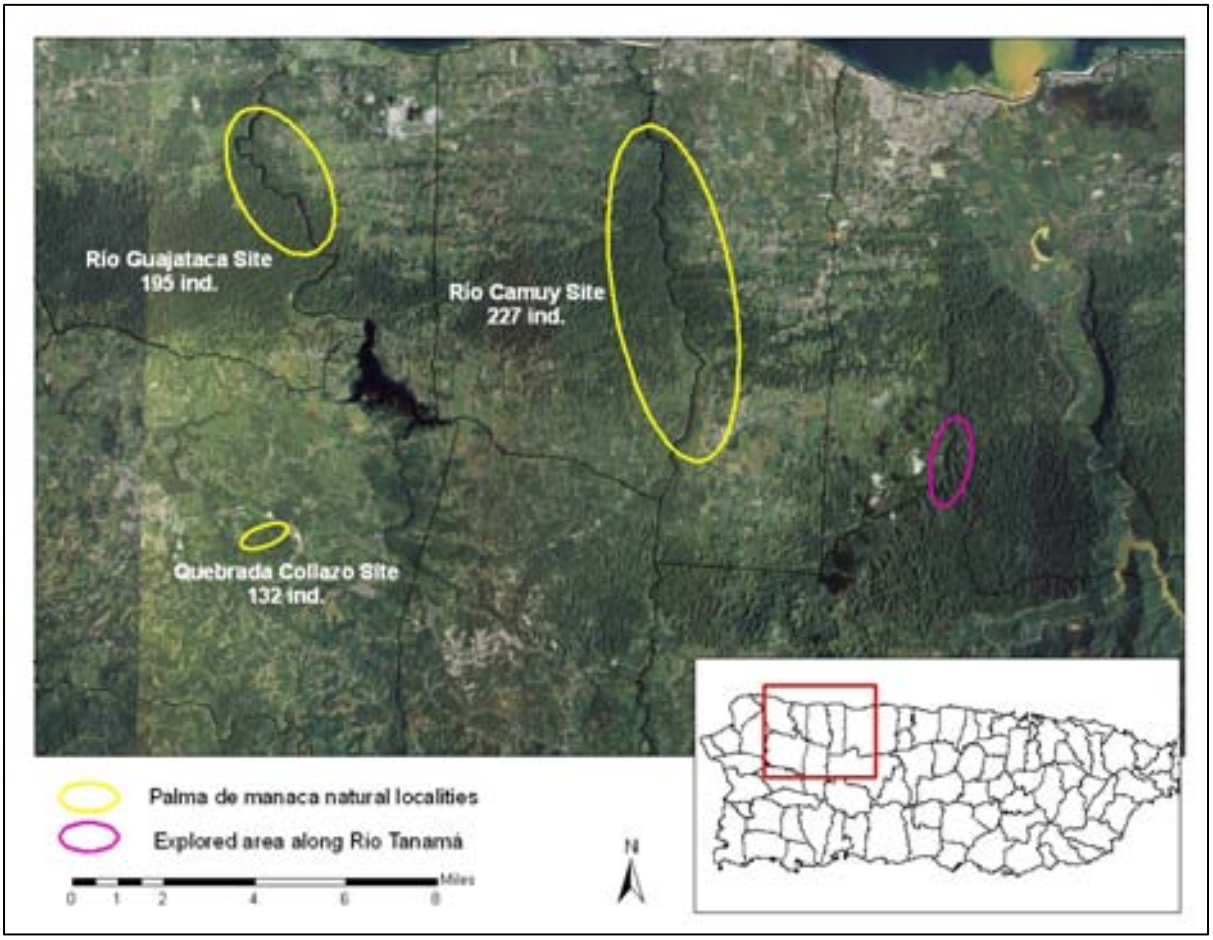
Santiago-Valentín and Rojas-Vázquez (2000, p. 4) surveyed for additional populations of the species in the northwestern karst region (Figure 2) where the ecology of the area was similar to the existing natural sites - mainly in Río Tanamá, between the municipality of Arecibo and Utuado. No additional plants/populations were found.

There has been an effort to introduce the species into other suitable areas. Four populations of about 50-100 individuals of palma de manaca were introduced in the Río Abajo Commonwealth Forest. Three of the populations are adults where two have been reported to produce viable seeds but there is no documentation on any recruitment (DNER 2006, p. 95; Victor Rodriguez, DNER, pers.comm. 2008). The fourth population of Río Abajo Commonwealth Forest was planted on October of last year (Omar Monsegur, USFWS, pers. comm. 2008). Another population of about 150 individuals was recently introduced to the Guajataca Commonwealth Forest. An undetermined number of individuals of palma de manaca have been planted sporadically in the Commonwealth Forests of Maricao and Guilarte.

DNER has an endangered species plant nursery were they propagate and maintain species to be introduced into protected areas. Palma de manaca is one of the numerous endangered species they are propagating and introducing to different Commonwealth

Forests. In addition, the DNER provide plants to the Service for planting on private lands that have wildlife cooperative extension agreements, conservation easements, or other conservation mechanisms. For example, in 2007, 50 individuals of palma de manaca were planted in El Tallonal farm (private land designated as a conservation area) in the municipality of Arecibo. During a recent site visit to the farm (June 2009), Service personnel observed the introduced palms growing successfully and reported a 100% survival rate (Silmarie Padrón, USFWS, pers. comm.,2009).

Figure 2. Palma de Manaca localities searched by Santiago-Valentín and Rojas-Vázquez (2000, p.1-4)



b. Genetics, genetic variation, or trends in genetic variation. There is no new information on genetics related to this plant.

c. Taxonomic classification or changes in nomenclature.

Kingdom:	Plantae
Division:	Magnoliophyta
Class:	Liliopsida
Order:	Arecales
Family:	Arecaceae
Genus:	*Calyptronoma*
Species:	*C. rivalis* (O.F. Cook) L.H. Bailey 1938
Common name:	Palma de Manaca, Manac palm

Species synonyms (Zona 1995, p. 149): *Cocops rivalis* (O.F. Cook) 1901; *Calyptrogyne rivalis* (O.F. Cook) León 1944; *Calyptronoma quisqueyana* (L.H. Bailey) 1938; and *Calyptrogyne quisqueyana* (L.H. Bailey) León 1994.

L.M. Underwood and R.F. Griggs first collected this species in 1901 in San Sebastian, Puerto Rico (USFWS 1992, p. 1). There is controversy in the placement of the genus *Calyptronoma* within the family Arecaceae. Some scientists believe that this genus is monophyletic because of its morphological and anatomical characteristics and others believe it should be in the same group of *Calyptrogyne*.

Calyptronoma is confined to the Greater Antilles. Palma de manaca (*Calyptronoma rivalis*) has been described with the names *Cocops rivalis* and *Calyptrogyne rivalis*. A revision of the genus *Calyptronoma* made by Zona (1995, p. 149; Santiago-Valentín and Rojas-Vázquez, 2000, p. 1; and Proctor 2005, p. 140) places *Calyptronoma quisqueyana* and/or *Calyptrogyne quisqueyana* as a synonym of *Calyptronoma rivalis*. Hence, this information extends the species range to Hispaniola (Dominican Republic and Haiti).

d. Spatial distribution, trends in spatial distribution, **or historic range**.

Historically, palma de manaca was thought to be endemic to Puerto Rico. However, Zona (1995, p. 149) recognized *Calyptronoma quisqueyana* and *Calyptrogyne quisqueyana* as synonymous with *Calyptronoma rivalis,* extending the species range to Hispaniola were the author states that it occurs throughout a wide area. Zona *et al.* (2007, p.303) states that this change in species distribution "has had a profound impact on the conservation status" of the species. This range expansion diminished the global threat to the species resulting in changes to the Red List of the International Union for Conservation of Nature (IUCN). The species was considered Vulnerable by the IUCN in 1988-96 but was dropped from the Red List in 2006 (Zona *et al.* 2007, Appendix 1, p. 1; and IUCN, 2007).

Calyptronoma rivalis in Puerto Rico occurs in three natural localities: Quebrada Collazo, Río Camuy and Río Guajataca. In addition, DNER is propagating this threatened species

and has introduced populations in the Río Abajo and Guajataca Commonwealth Forests. In addition, there are a number of individuals in the Guajataca Lake area near the Boy Scout camp in Quebradillas, in Maricao Commonwealth Forest between Maricao and San Germán and in Guilarte Commonwealth Forest in Adjuntas. The Service has also introduced this species to El Tallonal farm in Arecibo.

e. Habitat or ecosystem conditions.

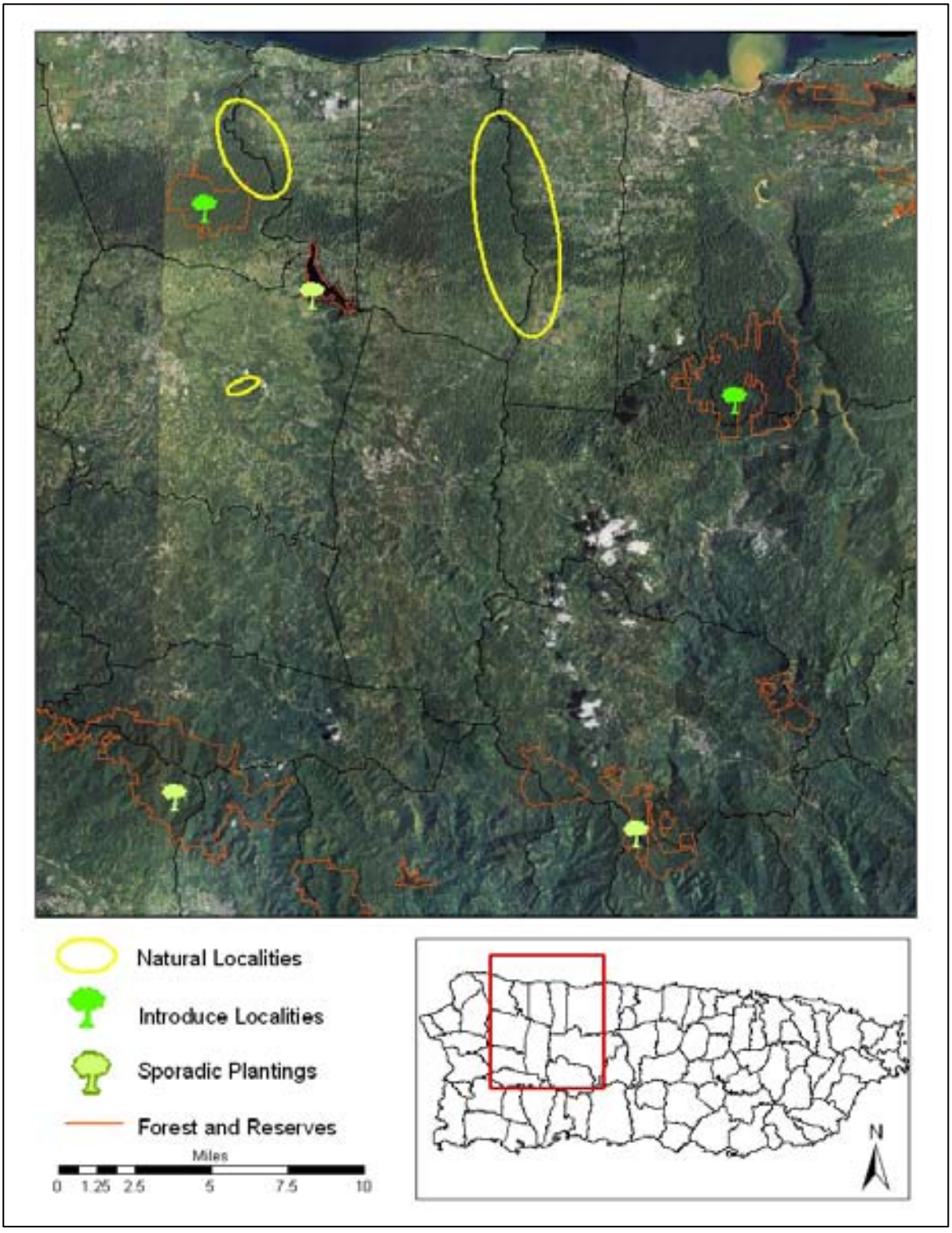
Palma de manaca is a riparian species and is found in the northwest limestone region of Puerto Rico. The natural populations of palma de manaca are located within the mature and young moist limestone evergreen and semideciduous forest, and the montane wet evergreen forest (Gould *et al*., 2008, p. 37). Observations made by Santiago-Valentín and Rojas-Vázquez (2000, p. 8) identify that early stages of palma de manaca appear to need more moisture and shade to survive than mature palms which can tolerate more sun exposure.

We do not have any information on the species habitat or ecosystem condition in Hispaniola.

f. **Other relevant information**.

Research made on the phenology of palma de manaca by Santiago-Valentín and Rojas-Vázquez (2000, p. 7) indicate that the palm flowers mainly from November to April and fruiting occurs in the summer months. Santiago-Valentín and Rojas-Vázquez (2000, p. 8) state that the common honeybee (*Apis mellifera*) was the only insect they noted visiting the flowers of palma de manaca.

Figure 3. Currently known and introduced populations (general areas) of palma de manaca in Puerto Rico.



2. Five Factor Analysis

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

In the final rule, destruction of plants due to deforestation and associated flash flooding and habitat modification were identified as the most significant factors affecting the species. In addition, the final rule stated that road construction eliminated part of the Río Camuy population.

Santiago-Valentín and Rojas-Vázquez (2000, p. 9) consider habitat destruction and flash flooding to be the major threats to the species in the three privately owned areas. They observed land clearing for agriculture and pasture farming reaching the borders of the creek without erosion-control practices at the Quebrada Collazo site in San Sebastian. These authors also mentioned that habitat modification related to land clearing can exacerbate the effects of flash flooding on the species at the Quebrada Collazo area. Additionally, they observed conversion of agricultural lands to residential development in this same area. This could be indicative of the increase in land use in rural areas where the species could disappear by clearing the surrounding area altering the natural habitat of the species. Information gathered by Santiago-Valentín and Rojas-Vázquez (2000, p. 8) indicate that early stages of this species need more moisture and shade to be established, hence, if the area surrounding the natural populations are cleared the populations may not recruit or establish more individuals. Santiago-Valentín and Rojas also reported erosion resulting from deforestation and believe that is a major threat to the species in the Río Camuy site. They observed two mature palms that had been knocked down by another tree because of a landslide after heavy rains in which the area was eroded by deforestation activities. In addition, they reported that the site near Río Guajataca is threatened by a proposed tourist and housing development project.

Based on the information from our files, during the last four years, we have received numerous projects in the northern karst region of Puerto Rico. For example, we have provided technical assistance to the Puerto Rico Highway Authority for the expansion of the Highway PR-22 from Hatillo to Aguadilla to minimize possible adverse effects to the Puerto Rican boa (*Epicrates inornatus*) and several plant species. The currently proposed route is located north of the existing populations of palma de manaca, and adverse effects are not anticipated on this species. However, if the proposed route is moved southward, this proposed highway may affect the species. The aerial photographs of the area show that urban development is expanding between the Guajataca Gorge and the Río Camuy area.

The population located in San Sebastian is close to rural housing projects and Road PR-111. Increasing rural development creates a need for roads to be expanded and additional deforestation to take place. Land clearing activities adjacent to rivers and creeks make the populations susceptible to flash flooding (e.g. uproot of palms, mortality of seedlings and juveniles caused by bigger trees). Thus, the expansion of the current residential areas and the possible expansion of the existing roads may affect the population. The aerial photograph of the San Sebastian site shows development encroachment for housing in the

area. Based on the above, the modification of habitat for housing development and infrastructure continues to be a threat to the species. The Service has not found information on the status of the species and current threats on Hispaniola.

(b) Overutilization for commercial, recreational, scientific or educational purposes;
At the time of listing, overutilization for commercial, recreational, scientific or educational purposes was not considered a threat to the species. At present time, the Service is not aware of overutilization of this species for commercial, recreational, scientific, or educational purposes in Puerto Rico.

(c) Disease or predation;
At the time of listing, disease or predation was not considered a threat to the species. At the present time, the Service is not aware of any disease or predation that may threaten the species.

(d) Inadequacy of existing regulatory mechanisms; and
When the final rule was published, palma de manaca was not on the Commonwealth of Puerto Rico's list of protected species. Regulations have since been enacted that protect the species. In 1999, the Commonwealth of Puerto Rico approved Law # 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, regulate permits, regulate hunting activities, and regulate exotic species among others. The Puerto Rico Department of Natural and Environmental Resources approved in 2004 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 the Commonwealth of Puerto Rico). Palma de manaca (*Calyptronoma rivalis*) is designated as "endangered" by the DNER. Regulation 6766 under Article 2.06 prohibits collecting, cutting, removing, among other activities, listed plant individuals within the jurisdiction of Puerto Rico.

Based on the presence of Federal and Commonwealth laws and regulations protecting the palma de manaca, and the absence of evidence supporting lack of enforcement of regulations to protect this species, we believe that inadequacy of existing regulatory mechanisms should no longer be considered a threat to this species.

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

The final rule indicated that the natural populations are known to inhabit areas that are susceptible to flash flooding and that germination may occur readily, however, the establishment of seedlings is often impossible due to the frequency of such occurrences.

At the present time, we do not have information on how this species disperses naturally. The majority of saplings and seedlings are found very close to parent trees. It is unclear if this species has a vertebrate (bird/bat) fruit disperser or if seeds are dispersed by flooding.

At the present time, the Service is not aware of any natural or manmade factors that may threaten the species.

3. Synthesis

At the time of listing, palma de manaca was believed to be endemic to Puerto Rico and the species abundance was estimated at about 259 individuals. Currently, there are an estimated of 554 individuals in three naturally occurring populations (Quebrada Collazo, Río Camy and Río Guajataca). In addition, the species has been introduced in five additional areas: the Río Abajo Commonwealth Forest (about 400 individuals in four different localities), 150 individuals in the Guajataca Commonwealth Forest, 50 individuals in El Tallonal in Arecibo. The species has also been planted sporadically in other public areas like Maricao and Guilarte Commonwealth Forests. Two of the four populations planted in the Rio Abajo Commonwealth Forest have been reported to fructify, however, there has been no documentation on any recruitment. The viable seeds produced in the Río Abajo Commonwealth Forest are used in the propagation program developed and implemented by DNER (Victor Rodriguez, DNER, pers. comm. 2008).

The natural populations of palma de manaca are located within the mature and young moist limestone evergreen and semideciduous forest, and the montane wet evergreen forest in the northern karst area in Puerto Rico where they are typically found growing in association with ravines and creeks. Seedlings and saplings appear to need more moisture and shade to survive than mature palms, which can tolerate more sun exposure.

A recent revision of the genus *Calyptronoma* joined a synonymous species widely spread on the island of Hispaniola, considerably expanding the range of the species. The Service does not have additional information regarding palma de manaca in Hispaniola. Additional information is needed to determine the overall status of the species throughout its entire range. However, in Puerto Rico, the natural populations are located in privately owned lands threatened by modification of habitat for housing development and infrastructure. Additionally, bad management practices upstream; for example, land movement (clearing) activities without erosion control measures adjacent to rivers and creeks can exacerbate the effects of flash flooding on the species.

The recovery criteria establish that delisting of the species could be considered when the natural populations are placed under protective status, and at least three new populations capable of self-perpetuating are established in protected areas. Based on the information gathered for this review, criterion one has not been met and criterion two has been partially met.

Based on the analysis of the 5-listing factors, we believe that the species continues to be threatened by habitat modification for residential development and possible expansion of roads and or highways and continues to meet the definition of a threatened species.

III. RESULTS

A. Recommended Classification:

__X__ No, no change is needed.

Although the species is no longer considered endemic to Puerto Rico (the species also occurs in the Hispaniola), up-to-date information on the species status and threats in Hispaniola is not currently available. However, the species status in Puerto Rico is currently threatened by Factor A.

IV. RECOMMENDATIONS FOR FUTURE ACTIONS

- Update the recovery plan to revise and better define objective measurable criteria for this palm.
- Determine how many individuals constitute a self-sustainable population, in cooperation with DNER and the academia.
- Implement private-lands initiatives to further protect the stream and rivers where palma de manaca are known (Quebrada Collazo, Río Camuy and Río Guajataca).
- Foster a working partnership with regulatory agencies to address and minimize potential adverse effects of development projects on the species and its habitat.
- Continue the propagation efforts of palma de manaca with DNER, Puerto Rico Conservation Trust, and the University of Puerto Rico. Current efforts should be carefully evaluated to ensure that these efforts are more effective, consistent with the biological and ecological limiting factors of the species, and to ensure establishment of viable populations in protected areas.
- Undertake efforts to obtain information on the status and threats to the species in Hispaniola.
- Conduct periodic surveys of introduced populations to assess the success of planting efforts (e.g., fructifying, recruiting, age classes, reproductive stages).

REFERENCES

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U.S. FISH AND WILDLIFE SERVICE
5 YEAR REVIEW of *Calyptronoma rivalis* (No common name)

Current Classification Threatened

Recommendation resulting from the 5-Year Review

_X_ No change is needed

Review Conducted By Maritza Vargas, Caribbean Field Office, Boquerón, Puerto Rico

FIELD OFFICE APPROVAL:

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

Approve Edwin Muñiz Date Sept 4, 2009

REGIONAL OFFICE APPROVAL:
Acting for
Cynthia Dohner, Acting Regional Director, Fish and Wildlife Service

Approve [signature] Date 9-18-09

Appendix A

Summary of peer review for the 5-year review of Palma de manaca *(Calyptronoma rivalis)*

The document was reviewed internally by Marelisa Rivera, Carlos A. Díaz and Edwin E. Muñiz. They mostly provided editorial comments. Once the comments were added to the document, it was sent to six outside peer reviewers (see below). The outside peer reviewers were chosen based on their qualifications and knowledge of the species. We indicated our interest in all comments the reviewers may have about palma de manaca, specifically in any additional information on the status and the current threats of the species.

The due date of the peer review comments was on June 22, 2009. No comments were received during the comment period.

List of Pier Reviewers

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