

Palo de Nigua
(*Cornutia obovata*)

5-Year Review:
Summary and Evaluation

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



Flower of Palo de Nigua
Photo by Omar Monsegur (USFWS)

5-YEAR REVIEW
Palo de Nigua / *Cornutia obovata*

I. GENERAL INFORMATION

- A. Methodology used to complete the review:** On April 9, 2010, the U.S. Fish and Wildlife Service (USFWS) published a notice in the *Federal Register* (75 FR 18232) announcing the 5-year review for Palo de Nigua (*Cornutia obovata*), and requested new information concerning the biology and status of the species. A 60-day comment period was opened; however, no information was received from the public during the comment period.

This 5-year review was prepared by the recovery lead biologist and summarizes the information that the Service has gathered in the Palo de Nigua file since the plant was listed on April 7, 1988. The sources of information used for this review included the original listing rule for the species, the recovery plan for Palo de Nigua, and information provided by the University of Puerto Rico, Mayagüez Campus (UPRM), the Puerto Rico Department of Natural and Environmental Resources (PRDNER), the Puerto Rico Conservation Trust (PRCT), and the USDA Forest Service.

The Service and UPRM signed a cooperative agreement to gather and summarize new information on Palo de Nigua. Under this agreement, botanists from UPRM, Drs. Duane A. Kolterman and Jesús D. Chinaea, conducted literature research on the species, consulted with other specialists, and examined herbarium data from the University of Puerto Rico at Mayagüez (MAPR), Río Piedras Botanical Garden (UPR), University of Puerto Rico at Río Piedras (UPRRP), PRDNER, New York Botanical Garden (NY), U.S. National Herbarium (US), and the University of Illinois (ILL). Service biologists then completed the 5-year review and assessed and determined the appropriate status recommendation for these species. Since the few known experts on the species compiled most of the information or were consulted for this 5-year review, we did not obtain additional peer review.

B. Reviewers

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

Lead Field Office: Omar A. Monsegur, Caribbean Ecological Services Field Office, Boquerón, Puerto Rico. (787) 851-7297, extension 217.

C. Background

- 1. FR Notice citation announcing initiation of this review:** April 9, 2010; 75 FR 18232.

2. Species Status:

As of the date of this 5-year review, we believe the status of *C. obovata* is uncertain. Little monitoring has been conducted on the natural populations of the species. Only one natural population has been monitored (Monte Torrecilla site in 2012). Therefore, we deemed the status of the species as uncertain.

3. Recovery Achieved:

1 (1-25%) of species recovery objectives achieved for *C. obovata*.

4. Listing History

Original Listing

FR notice: 53 FR 11610

Date listed: April 7, 1988

Entity listed: species

Classification: endangered

5. Associated rulemakings: Not Applicable.

6. Review History:

Cornutia obovata was first collected in 1885 by the German collector Paul Sintenis on the area of Monte Torrecilla in the municipality of Barranquitas in central Puerto Rico. By the time of listing, the species was known from the type locality, the Río Abajo Commonwealth Forest, and from an additional locality in the vicinity of the Arecibo Observatory (USFWS 1988).

The final rule (53 FR 11610), and the Recovery Plan for *Cornutia obovata* and *Daphnopsis helleriana* (hereafter the “Plan”), approved on August 7, 1992 (USFWS 1992), are the most comprehensive analyses of the status of the species. Thus, these documents were used as baseline reference documents for this 5-year review. In the 1988 final rule, the Service reviewed the best available scientific and commercial information, analyzed the five listing factors and their application to the species, and listed *C. obovata* as endangered. The Service identified Factor A (present or threatened destruction, modification, or curtailment of its habitat or range), Factor D (the inadequacy of existing regulatory mechanisms), and Factor E (other natural or manmade factors affecting its continued existence) as the main threats for the species. The recovery plan included the description of the species and information about its distribution, habitat characteristics, reproductive biology, and conservation. Hence, the information included in the plan will not be repeated in this review.

The Service conducted a 5-year review for *C. obovata* 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 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 also indicated that if

significant data were available warranting a change in a species' classification, the Service would propose a rule to modify its status. No new information was received. Therefore, the Service did not recommend a change in this plant's listing classification.

Every year the Service reviews the status of listed species and update species information in the Recovery Data Call (RDC). The last RDC for *C. obovata* was completed in 2013.

Recovery Data Call: 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012 and 2013.

7. Species' Recovery Priority Number at start of review (48 FR 43098): 5

At the time of listing, *C. obovata* was recognized as species with a high degree of threat and a low recovery potential.

8. Recovery Plan:

Name of plan: Recovery Plan for *Cornutia obovata* and *Daphnopsis hellerana*

Date issued: August 7, 1992

II. REVIEW ANALYSIS

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

The Endangered Species Act (Act) defines species to include any distinct population segment of any species of vertebrate wildlife. This definition limits listing as distinct population segments (DPS) only to vertebrate species of fish and wildlife. Because the DPS policy is not applicable to plant species, it is not further addressed in this review.

B. Recovery Criteria

1. Does the species have a final, approved recovery plan containing objective, measurable criteria? The species has an approved recovery plan establishing delisting as the recovery objective. However, the plan does not contain specific measurable recovery criteria for delisting.

2. Adequacy of recovery criteria

a. Do the recovery criteria reflect the best available and 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 and abundance. Knowledge about the spatial distribution and habitat requirements for the species has increased since the time of listing.

b. Are all of the 5 listing factors that are relevant to the species addressed in the recovery criteria?

All listing factors that were considered threats at the time of listing are addressed in the recovery criteria.

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.

1. The privately owned populations are given protected status.
2. At least three new self-sustaining populations in Commonwealth Forest units such as Río Abajo or Guajataca have been established.

Criterion 1 has not been initiated. The private land that harbors *C. obovata* populations has not been acquired or given any other protected status. The only natural populations that occur within areas managed for conservation are within the Río Abajo Commonwealth Forest and the Susúa Commonwealth Forest (Figure 1). However, the status of these populations remains unknown due to the lack of monitoring. The type locality and largest known population (Monte Torrecilla) remains as privately owned lands (G. Hernandez, PRDNER; pers. comm. 2013).

Criterion 2 has been partially initiated. One experimental population was established within the Toro Negro Commonwealth Forest and further individuals have been established within Cañon San Cristobal (natural area managed by the Puerto Rico Conservation Trust, PRCT). However, the minimal information collected in or from these sites indicates these populations cannot be considering self-sustaining at this point and long-term monitoring is needed.

C. Updated Information and Current Species Status

1. Biology and Habitat

a. Species' abundance, population trends (e.g. increasing, decreasing, stable), demographic features, or demographic trends

Cornutia obovata is a rare shrub or small tree, up to 10 m in height, endemic to Puerto Rico (Little et al., 1974; Liogier, 1995). It is known from several localities in northern and south central Puerto Rico, occurring at elevations of 250 to 925 m (830 to 3,071 ft) (Axelrod, 2011). It appears to occur primarily on limestone derived soils although one population extends to volcanic substrates (i.e., Monte Torrecilla population). Only seven individuals in three populations were known at the time the species recovery plan was approved (USFWS, 1992): five from Río Abajo Commonwealth Forest, one from the Arecibo Observatory area, and one from Monte Torrecilla in the municipality of Barranquitas.

According to the information currently available to the Service, about 19 individuals of *C. obovata* exist within the following natural areas: Monte Torrecilla, Susúa Commonwealth Forest, Río Abajo Commonwealth Forest, Sumidero Tres Pueblos, and the Arecibo Observatory (Table 1). However, there is no long-term monitoring of these natural populations, so population trends, demographic features, phenology, and demographic trends are unknown.

The species is in cultivation at the Caguas Botanical Garden, the Río Piedras Botanical Garden, Cañon San Cristobal (natural reserve managed by PRCT), and Parque Doña Ines (Figure 1; Luis Muñoz Marín Foundation) (Santiago 2011, Monsegur, USFWS, pers. obs. 2013).

Table 1. Status of the known *C. obovata* populations in Puerto Rico.

Site Name	Municipality	Number of individuals	Source of Information / Reference
Monte Torrecilla	Barranquitas	9	Geraldo Hernández, PRDNER pers. comm., 2013
Susúa Commonwealth Forest	Sabana Grande	3	Woodbury and Vivaldi, report, USFWS file, 1981
Río Abajo Commonwealth Forest (I)	Utua/Arecibo	5	USFWS, Recovery Plan, 1992
Sumidero Tres Pueblos	Camuy	1	Miguel “Papo” Vives, pers. comm., 1982
Arecibo Observatory	Arecibo	1	USFWS, Recovery Plan, 1992
*Toro Negro Commonwealth Forest	Orocovis	*6	Geraldo Hernández, PRDNER pers. comm., 2013
*Fundación Luis M. Marín	San Juan	*2	Alberto Areces, FLMM pers. comm., 2012
*Cañon San Cristóbal	Barranquitas	*20	María de Lourdes González, PRCT, 2013
*Caguas Botanical Garden	Caguas	1	O. Monsegur, USFWS pers. obs., 2013
*Río Piedras Botanical Garden	San Juan	1	Eugenio Santiago, UPRRP, 2011
Total number of individuals		At least 49 individuals in the wild (30 planted)	

* Experimental populations and planted individuals. See comments and further description under section F. “Other relevant information”.

b. Genetics, genetic variation, or trends in genetic variation

There is no new information on genetics, genetic variation, or trends in genetic variation of *C. obovata*. However, it would be reasonable to expect some genetic differentiation between the populations in northern and south central Puerto Rico, given their disjunction and the differences in elevation, substrate, and rainfall between these regions.

c. Taxonomic classification or changes in nomenclature

There are no recent taxonomic or nomenclatural changes for the species. *Cornutia obovata* is the accepted name in the most recent checklists for the flora of Puerto Rico (Axelrod 2011) and the West Indies (Acevedo-Rodríguez and Strong 2012).

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

Cornutia obovata is considered as endemic to the main island of Puerto Rico. At the time of listing (1988) the species was known from the type locality at Monte Torrecilla, the Río Abajo Commonwealth Forest, the Arcibo Observatory, and an additional unconfirmed population at the Susúa Commonwealth Forest (Figure 1). A single individual was later recorded by Miguel “Papo” Vives from the *Sumidero Tres Pueblos* (Figure 1), an area managed by the *Compañía de Parques Nacionales de Puerto Rico* in the municipalities of Camuy, Hatillo and Lares. This locality lies within the same geographical area as the Río Abajo Commonwealth Forest and the Arcibo Observatory, and thus, it is not considered as a change in the spatial distribution or the range of the species.

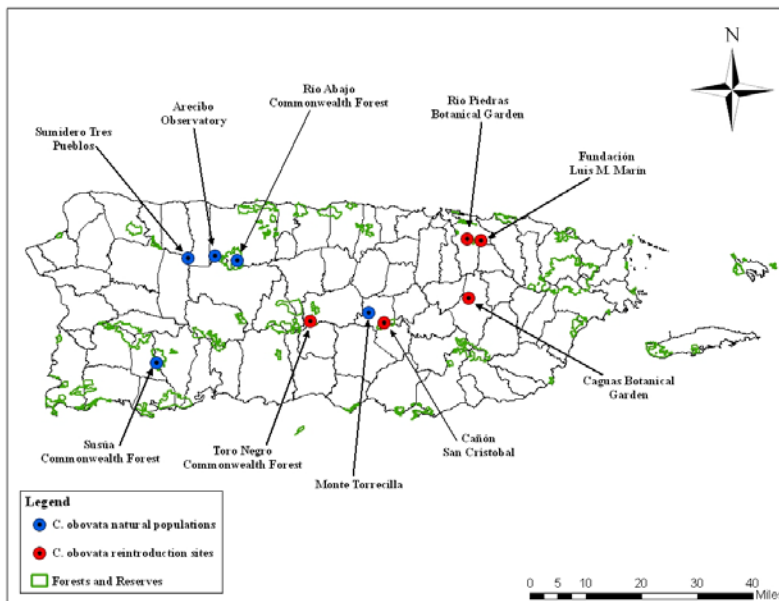


Figure 1. Map showing the general distribution of *Cornutia obovata* (blue circles) (USFWS data). The red circles indicate experimental populations or areas where the species is under cultivation.

e. Habitat or ecosystem condition

Cornutia obovata occurs within the subtropical moist forest and subtropical wet forest life zones of northern and south central Puerto Rico (Ewel and Whitmore, 1973). Rainfall ranges from 1,100 to 2,200 mm (44-88 in.) per year in the subtropical moist forest, and from ca. 2,000 to 4,000 mm (ca. 80-160 in.) per year in the subtropical wet forest (Ewel and Whitmore, 1973). The Susúa population occurs on soils derived from serpentinite bedrock of the El Cacique-La Taína complex. The Arecibo populations occur on soils derived from limestone of the Rock outcrop-Tanama complex and the Soller-rock outcrop complex. The Barranquitas population occurs on soils derived from igneous bedrock of the Humatas clay series. Elevations at all these sites range from 220 to 1,000 meters (730-3,300 ft) asl.

The northern karst region of Puerto Rico harbors several protected areas (i.e., Río Abajo, Guajataca, and Cambalache Commonwealth Forests) that include mature secondary forest and remnants of native forest that may include suitable habitat and probably undetected populations of *C. obovata*. This is a cryptic species that can be difficult to identify in the wild, unless it is flowering or fruiting. Thus, it is highly probable that the distribution of *C. obovata* extends along the northern karst region, and probably also to the Susúa Commonwealth Forest given historical records are correct.

f. Other relevant information

Santiago (2011) collected seeds of *C. obovata* at Monte Torrecilla and germinated them in 2003. He reported evidence suggesting that the seeds were produced via selfing and obtained a low germination rate of 15% (6/40). He mentioned ongoing efforts by the PRCT to collect and propagate seeds of the species. Such efforts have continued, and the species is being successfully propagated from seeds by the PRCT. As indicated on Table 1, the PRCT have planted at least 20 individuals within a property they manage at the municipality of Barranquitas (Cañon San Cristobal).

On December 2012, the PRCT provided the Service with 32 individuals of *C. obovata* to be planted for recovery purposes. The Service transferred 22 of these individuals to Tropic Ventures Research and Education Foundation to be planted within Las Casas de la Selva, an area adjacent to the Carite Commonwealth Forest and managed for conservation. This effort is part of an agreement between the Service and Tropic Ventures to establish populations of several listed plants within Las Casas de la Selva property. The remaining 10 individuals provided by the PRCT will be transferred to the manager of the Guajataca Commonwealth Forest to be planted within the forest boundaries. These two actions are in accordance with the recovery actions established in the recovery plan for the species (USFWS 1992).

2. Five Factor Analysis

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

Forest management and deforestation for urban development.

At the time of listing, deforestation for agriculture and urban development, and construction of communication facilities were identified as a threat to *C. obovata*. Based on the best available information, the known natural populations and the core of the suitable habitat for *C. obovata* occur within areas managed for conservation (e.g., Río Abajo Commonwealth Forest). Furthermore, the Service has no evidence about plans to expand the Arecibo Observatory. However, the largest natural population, and type locality at Monte Torrecilla (located on private land), remains threatened by future expansion or maintenance of communication facilities.

We believe the present or threatened destruction, modification, or curtailment of the species' habitat or range remains a threat to *C. obovata* on private lands. Since we have no evidence of direct impacts to known individuals, and the majority of known populations lie within properties managed for conservation, we consider the threat of habitat destruction or modification to be low in magnitude and non-imminent.

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

Overutilization for commercial, recreational, scientific, or educational purposes was not identified as a threat to the species in the final listing rule. The Service has no evidence that *C. obovata* is being threatened by this factor. Therefore, the overutilization for commercial, recreational, or educational purposes is not considered a current threat to the species.

(c) Disease or predation:

Disease or predation was not identified as a threat to the species at the time of listing. Based on the best available information, this factor is not a current threat to *C. obovata*.

(d) Inadequacy of existing regulatory mechanisms:

The Río Abajo Commonwealth Forest is protected by Law No.133 (12 L.P.R.A. sec. 191) 1975, as amended, known as *Ley de Bosques de Puerto Rico* (Forest Law of Puerto Rico), as amended in 2000. Section 8 (A) of Law No. 133, prohibits cutting, killing, destroying, uprooting, extracting, or in any way hurting any tree or vegetation within a Commonwealth forest without authorization from

the Secretary of the PRDNER. The Río Abajo Commonwealth Forest is also a designated Critical Wildlife Area (CWA) by the Commonwealth of Puerto Rico. The CWA designation constitutes a special recognition by the Commonwealth with the purpose of providing information to Commonwealth and Federal agencies about the conservation importance and needs of CWAs, and assisting permitting agencies in precluding negative impacts as a result of permit approvals or endorsements (PRDNER 2005).

The Commonwealth of Puerto Rico also approved Law No. 241 in 1999, known as *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 as the property of Puerto Rico all wildlife species within its jurisdiction, regulate permits, hunting activities, and exotic species, among other activities. This law also has provisions to protect habitat for all wildlife species, including plants. In 2004, the PRDNER approved Regulation 6766, *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). Article 2.06 of this regulation prohibits collecting, cutting, and removing, among other activities, listed plant individuals within the jurisdiction of Puerto Rico. *Cornutia obovata* was listed under Regulation 6766 as critically endangered.

Despite the existence of the laws and regulations mentioned above, *C. obovata* extends to private lands. The enforcement of laws and regulations within private properties continues to be a challenge as accidental damage or extirpation of individuals has occurred due to lack of knowledge of the species by private landowners and law enforcement officers. However, at present we are unaware of any damage to *C. obovata* on private properties. Therefore, based on the existence of Commonwealth and Federal laws and regulations protecting listed species, we believe the inadequacy of existing regulatory mechanisms is no longer a threat to the species.

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

Hurricanes, Landslides and Climate Change. Due to the low number of populations and individuals, hurricanes were identified as a threat to *C. obavata* on the final rule. As an endemic to the Caribbean, this tree species should be well adapted to tropical storms disturbance. However, as stated in the final rule, the low number of populations and individuals pose a threat to the species by making it susceptible to stochastic events such as hurricanes. In fact, there is no evidence on the extent of the damage to *C. obovata* populations caused by Hurricane Georges, which affected the entire island of Puerto Rico in 1998.

The heavy rains associated with tropical storms and hurricanes in the mountains of Puerto Rico often lead to landslides, which are part of the forest dynamics.

However, the effects of landslides are exacerbated for small relic populations as is the case of *C. obovata*. Moreover, the frequency of landslides may increase, as landslides are triggered by severe rain events, whose frequency and severity is expected to increase due to climate change (Hopkinson et al. 2008). For example, given the steep topography of Monte Torrecilla, a massive landslide may extirpate the largest known population of *C. obovata*.

Vulnerability to climate change impacts is a function of sensitivity and exposure to those changes, and the adaptive capacity of the species (Glick et al. 2011). Therefore, shifts of vegetation communities are expected as temperatures and moisture regimes are altered by climate change. Under this scenario, the populations of *C. obovata* may be displaced or outcompeted by native or exotic species with wider environmental plasticity. Climate change may also compromise natural recruitment by affecting seed germination and/or the survival of seedlings.

Despite the low number of populations and individuals of *C. obovata*, at this time the Service considers hurricanes, landslides and climate change as moderate and non-imminent threats to the species. Climate change is occurring gradually and the frequency of severe hurricanes in Puerto Rico is low.

Genetic Variation. Along with reduced population size, negative impacts of habitat fragmentation may result in erosion of genetic variation through the loss of alleles by random genetic drift (Honnay and Jacquemyn 2007). These factors may limit the ability of a species to respond to a changing environment (Booy et al. 2000). Given the extremely small population size and low number of known natural populations of *C. obovata*, it is likely that their genetic variability is low. As previously indicated, only the population at Monte Torrecilla is composed by 9 individuals, the remaining sites are comprised by 1-5 individuals.

Based on the above, we consider that lack of genetic variation is a high and imminent threat to *C. obovata*.

Lack of Natural Recruitment. Lack of natural recruitment represents one of the major threats to *C. obovata* as there is no evidence of seedlings on the wild despite the production of fruits (Geraldo Hernández, PRDNER, pers. comm. 2013). According to Santiago (2011) germination under nursery conditions seem to be low, suggesting the possibility of selfing on the wild populations. Without natural recruitment or successful augmentation from captive propagated individuals, populations (natural and reintroduced) of *C. obovata* are likely to become extirpated as older individuals naturally die. Despite future efforts to enhance natural populations by planting seedlings and saplings, it is unknown if planted individuals will develop into mature plants capable of reproduction. Therefore, we consider the lack of natural recruitment a high and imminent threat to *C. obovata*.

Overall, hurricanes, landslides, climate change, genetic variation, and lack of natural recruitment are threats to *C. obovata*. Due to the small number and size of populations, the Service considers these threats as high in magnitude and imminent.

3. Synthesis

Cornutia obovata was listed as endangered in 1988. Only seven individuals in three populations were known: five from Río Abajo Commonwealth Forest, one from the Arecibo Observatory area, and one from Monte Torrecilla in the municipality of Barranquitas.

According to the information currently available to the Service, about 19 individuals exist in the wild within the following natural areas: Monte Torrecilla, Susúa Commonwealth Forest, Río Abajo Commonwealth Forest, *Sumidero Tres Pueblos* and the Arecibo Observatory. Despite the slight increase in the known number of individuals, the majority of the localities are comprised of single individuals. Furthermore, no monitoring of those natural populations has occurred. Thus, we believe that during the last decade the overall status of this species was uncertain.

The largest known population of *C. obovata* (i.e., Monte Torrecilla) is represented by about nine individuals. No natural recruitment has been documented for this population. Due to the low number and small size of existing populations, the species remain threatened by deforestation, hurricanes, landslides, climate change, genetic variation, and lack of natural recruitment.

IV. RECOMMENDATIONS FOR FUTURE ACTION

1. Studies should be conducted on the species phenology and reproductive biology to address other limiting factors affecting the species (e.g., lack of pollinators or seed dispersers).
2. The population at Monte Torrecilla should be monitored to collect seed material for recovery purposes. A protocol to collect seed material should be developed and implemented to avoid impacting the natural recruitment of the species.
3. All known populations should be marked and monitored on a regular basis, and additional visits should be made after hurricanes or other major disturbances to determine any possible adverse effects on the populations.
4. Studies should be conducted of the patterns of genetic variation, in order to develop a plan to preserve the species' germplasm.

5. The very small wild populations should urgently be enhanced, using seeds or vegetative propagation (e.g., air layering, tissue culture, etc.) if necessary, taking into account the species' patterns of genetic variation.

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U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of *Cornutia obovata*

Current Classification: Endangered

Recommendation resulting from the 5-Year Review:

- Downlist to Threatened
- Uplist to Endangered
- Delist
- No change needed

Review Conducted By: Omar A. Monsegur, Caribbean Ecological Services Field Office,
Boquerón, Puerto Rico.

FIELD OFFICE APPROVAL:

Lead Field Supervisor, Fish and Wildlife Service

Approve *Mauricio Pi*

Date March 25, 2014

REGIONAL OFFICE APPROVAL:

^{For}
Lead Regional Director, Fish and Wildlife Service

Approve *David O. Pi*

Date July 15, 2014