Catesbaea melanocarpa

(no common name)

5-Year Review: Summary and Evaluation

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

5-YEAR REVIEW
***Catesbaea melanocarpa* (No common name)**

I. GENERAL INFORMATION

A. Methodology used to complete the review: On September 27, 2006, the Service published a notice in the *Federal Register* (71 FR 56545) announcing the 5-year review of the plant *Catesbaea melanocarpa* and requesting new information concerning the biology and status of the species. A 60-day comment period was opened. No information on *Catesbaea melanocarpa* was received from the public.

This 5-year review was prepared by a Service biologist and summarizes new information that the Service has gathered on the species since it was listed in 1999, the recovery plan was signed in 2005, and critical habitat was finalized. Very little new information regarding the species distribution and status is available. The plant has been rediscovered in two additional sites.

Please see Addendum I (pages 12-23) for updated information on this plant that we have gained while conducting our new five-year review initiated in 2016 (81 FR 56692). Our new signature page is included on page 11. What precedes this new information (pp. 2-10) is the first five-year review announced in September 27, 2006 (71 FR 56545) and completed and signed in 2011.

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

Lead Field Office: Omar 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: September 27, 2006; 71 FR 56545.

2. Species Status: 2010 Recovery Data Call: Stable. The species is currently present in four localities within Puerto Rico and the U.S. Virgin Islands. The species continues to be known from St. Croix, and from the Guánica Forest and Cabo Rojo, Puerto Rico. The Service is working with the owner of the Cabo Rojo property to protect the individuals from a proposed residential development project. In 2009, a new locality was discovered within Encarnación ward in the municipality of Peñuelas. Only one individual was located at this site. No evident increase or decline within these populations was observed in 2010. In Puerto Rico, approximately 25 adult individuals are known to occur. The number of individuals in St. Croix, which is the biggest population, has stayed at approximately 100 individuals since 1995.

3. Recovery Achieved: 1 (1=0-25%) of species' recovery objectives achieved.

4. Listing History

Original Listing
FR notice: 64 FR 13116
Date listed: March 17, 1999
Entity listed: Species
Classification: Endangered

5. Associated rulemakings: Critical habitat, August 28, 2007 (72 FR 49212)

6. Review History: The March 17, 1999 final rule (64 FR 13116), the recovery plan for *Catesbaea melanocarpa*, signed on July 15, 2005 (U.S. Fish and Wildlife Service 2005), and the designation of critical habitat for *Catesbaea melanocarpa* (71 FR 48883; 72 FR 49212) are the most recent comprehensive analyses of the species status and are used as the referenced point documents for this 5-year review.

Every year the Service reviews a species' status and incorporates the information in the Recovery Data Call. In the 2010 Recovery Data Call, we established that the status of the species was stable because we were not aware of any significant changes to distribution, abundance and amount and imminence of threats.

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

Catesbaea melanocarpa was historically known from Puerto Rico, St. Croix in the U.S. Virgin Islands (USVI), Barbuda, Antigua, and Guadeloupe (Proctor 1991). At the time of listing in 1999, the species was known from at least one individual located on the Peñones de Melones in Cabo Rojo, Puerto Rico. Since 2002, Service observations indicate that this site has experienced periodic land clearing and dirt road construction. Several survey efforts have been conducted by Service biologists and a local botanist to locate the specific site of Peñones de Melones; however, to date, this population has not been located (Foote, personal observation 2002; Axelrod, personal communication 2004; Axelrod, personal communication 2006; Oikos Environmental Services 2005). The species was also known from about 24 individuals located on one privately owned farm in Halfpenny Bay near Christiansted in St. Croix. However, a systematic survey conducted on 2002 on the St. Croix population indicates that it is composed of approximately 100 individuals. The number of individuals on Barbuda, Antigua, and Guadeloupe remains undetermined as these islands are part of the historical distribution of the species and the occurrence of the species is known only from herbarium vouchers and the literature. At the time the critical habitat was designated, the species was found in three localities: approximately 100 individuals at a privately owned farm in Halfpenny Bay (Lombard 2002), approximately 12 individuals located at El Fuerte Trail in the Guánica Commonwealth Forest (Trejo-Torres 2001, Axelrod 2004), and one individual located at the Susúa Commonwealth Forest (Trejo-Torres 2006). The individual at Peñones de Melones was considered extirpated.

7. Species' Recovery Priority Number at start of review: 5. At the time of listing, *Catesbaea melanocarpa* was recognized as a species with a high degree of threat. Only three localities were known with the largest population consisting of approximately 24 individuals in a privately-owned land. Recovery potential for the species was considered to be low.

8. Recovery Plan:
Name of plan: Recovery Plan for *Catesbaea melanocarpa*.
Date issued: July 15, 2005

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? Yes. The recovery plan established downlisting and delisting criteria.

2. Adequacy of recovery criteria

a. Do the recovery criteria reflect the best available (most up- to-date) information on the biology of the species and its habitat? Yes.

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)? Yes.

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.

Downlisting of the species from endangered to threatened status will be considered when: (1) the habitat known to support the two extant populations (St. Croix and Peñones de Melones) is enhanced and protected through landowner conservation agreements or easements; (2) extant populations are enhanced through the planting of additional propagated individuals to augment the number of adult individuals to at least 250; (3) at least one population within each of the following previously occupied habitat is found and/or established: Guánica Commonwealth Forest (PR), Susúa Commonwealth Forest

(PR), Barbuda, Antigua, and Guadalupe; and (4) research is conducted on key biological and genetic issues, including effective propagation techniques, and number of individuals within a population and number of populations needed for the establishment of self-sustaining populations and a viable overall population.

Catesbaea melanocarpa will be considered for delisting when: (1) a number of viable populations (to be determined following the appropriate studies) are protected by long term conservation strategies; (2) viable populations (the number of which should be determined following the appropriate studies) are established in previously unoccupied but suitable habitat at Sandy Point National Wildlife Refuge (USVI), Cabo Rojo National Wildlife Refuge (PR), La Tinaja in Sierra Bermeja (Laguna Cartagena National Wildlife Refuge, PR), and any other identified suitable conservation area within the dry forest zone; and (3) the numbers of populations, their sizes, genetic makeup and distribution needed to ensure self-sustainability are determined and achieved.

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. Number of adult plants and amount of suitable habitat necessary to maintain self-sustaining populations, will be determined following appropriate population dynamic studies.

At least one of the criteria has been partially met as one viable population of twelve individuals was discovered within the Guánica Forest Reserve. Furthermore, a new self sustainable population was located within a private property on Peñones de Melones. Also, Service effort has led to the identification of a single individual within the municipality of Peñuelas, Puerto Rico.

While a propagation program has not been initiated, Service biologists have transplanted seedlings founded within the Peñones de Melones population in Cabo Rojo, Puerto Rico. So far, seedlings have rooted and are producing new branches under nursery conditions, indicating that relocation of seedlings is a feasible technique.

C. Updated Information and Current Species Status

1. Biology and Habitat

a. Is there relevant new information regarding the species' abundance, population trends, demographic features, or demographic trends? Yes.

When the recovery plan was approved in 2005, the number of individuals was estimated at approximately one hundred plants in the island of St. Croix (USFWS 2005) and one individual in the Susúa Forest. The latter was based on the misidentification of material of *Machaonia portoricensis* by Carlos Trejo. As part of the field work for the designation of the critical habitat of the species, a population of 12 individuals was located within the Guánica Forest in Puerto Rico. Further work led to the discovery of 12 adult individuals and 7 seedlings on Peñones de Melones in Cabo Rojo. Furthermore, technical assistance provided to the Puerto Rico Electric and Power Authority (PREPA)

during the evaluation of Gasoducto del Sur let to discovery of an individual on the municipality of Peñuelas.

According to the information available at our office as of January 2011, the total number of populations in Puerto Rico and St. Croix is estimated to be at least four. Based on the data currently available at our office, the number of individuals is estimated at 132 plants (adults and seedlings).

b. Is there relevant new information regarding the species' genetics, genetic variation, or trends in genetic variation (*e.g.*, loss of genetic variation, genetic drift, inbreeding, etc.)? No.

c. Is there relevant new information regarding taxonomic classification or changes in nomenclature? No.

d. Is there relevant new information regarding the species' spatial distribution, trends in spatial distribution, or historic range ? Yes.

The natural distribution of the species that included the Susúa Forest is currently questionable. The last analysis of the data available at our office indicates that the Susúa Forest report was based on the misidentification of material from *Machaonia portoricensis*. Also, a specimen from the Susúa Forest that was misidentified as *Catesbaea melanocarpa* was later identified as *Catesbaea parviflora*. These imply that the distribution of *C. melanocarpa* is restricted to the subtropical dry forest life zone.

Service efforts have also led to the identification of a new population within the municipality of Peñuelas. This site was located along the proposed route for the Gasoducto del Sur. The habitat conditions on this site are similar to the site at the Guánica Forest and Peñones de Melones. Since this area, as well as the Guánica Forest, had little agricultural value and have remained relatively undisturbed, the occurrence of further individuals and/or populations within private properties in Guayanilla is anticipated.

e. Is there relevant new information addressing habitat or ecosystem conditions? No.

2. Five Factor Analysis (threats, conservation measures, and regulatory mechanisms)

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

When the species was listed in 1999, the Service identified habitat destruction and modification as important factors affecting the species. Deforestation for residential and tourist development may pose imminent threats to the survival of the species. In Puerto Rico, a single individual was reported on a privately-owned land known as Peñones de

Melones. This locality was threatened with a proposed high density residential/tourist development. Although the residential/tourism project has not been developed yet, on March 2006, we visited the site and documented that the area has been subjected to land clearing activities with heavy equipment.

Subsequent visits to the area of Peñones de Melones on 2008 led to the identification of a new population of at least 12 individuals. Further visits by Service biologist Carlos Pacheco suggest that these individuals may no longer exist as deforestation and fires associated with human activity continue within this area. However, this observation has not been confirmed. The individual recently discovered at Peñuelas is also threatened by possible dirt road expansion or realignment of the natural gas pipeline if the government decides to continue with the proposed "Gasoducto del Sur" (gas pipeline). Therefore, about 20 of the wild individuals occurring in Puerto Rico are currently threatened by habitat destruction or modification. Only the 12 individuals occurring within the boundaries of the Guánica Forest are not threatened by this factor.

In St. Croix, approximately 100 individuals are present in a privately-owned land. This population is subject to impacts from grazing activities. Also, the development of a golf course has been proposed for the site. Therefore, this listing factor continues to threaten the species in St. Croix.

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

In the final rule, this was not a factor in the decline of the species. At present time, we are not aware that overutilization for commercial, recreational, scientific or educational purposes constitutes a limiting factor for the species.

(c) Disease or predation;

In the final rule, this was not a factor in the decline of the species. At present time, we are not aware that disease or predation constitutes a limiting factor for the species.

(d) Inadequacy of existing regulatory mechanisms; and

In the final rule, the inadequacy of existing regulatory mechanisms to protect the species was identified as a threat. In 1999, the Commonwealth of Puerto Rico approved the 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). *Catesbaea melanocarpa* has been included in the list of protected species and designated as "critically endangered". This regulation under Article 2.06 prohibits

collecting, cutting, removing, among other activities, listed plant individuals within the jurisdiction of Puerto Rico. Following the listing of this species, the U.S. Virgin Islands Department of Planning and Natural Resources also began protecting this species through its local law known as the Virgin Islands' Indigenous and Endangered Species Act (Act No. 5665).

The Service has signed Cooperative Agreements with both Commonwealth and Territorial governments under section 6 of the ESA to support vigorous endangered species programs for all federally-listed species within their jurisdictional areas. Based on the presence of Commonwealth and other Federal laws and regulations protecting this species, we believe that inadequacy of existing regulatory mechanisms should no longer be considered a threat.

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

Limited distribution of the species was also identified as an important factor affecting the species. Catastrophic natural events, such as hurricanes, may dramatically affect forest species composition and structure, felling large trees and creating numerous canopy gaps. Breckon and Kolterman (1993) documented the loss of individuals in St. Croix following the passing of Hurricane Hugo in 1989. Fire may also be a threat to the known population on the island of St. Croix. Fire is not a natural component of subtropical dry forest in Puerto Rico and Virgin Islands. Species found in this type of forest are not fire adapted. The St. Croix location is adjacent to an existing road and human-induced fires may affect the long term survival of these individuals.

3. Synthesis

Catesbaea melanocarpa is currently known from seven areas: the Guánica Commonwealth Forest in Puerto Rico, two privately owned localities in Puerto Rico (Peñones de Melones and Encarnación), one privately-owned locality in St. Croix in the U.S. Virgin Islands, Barbuda, Antigua, and Guadeloupe. At least 132 individual (including seedlings) are known from four localities within the U.S. Caribbean. The species is currently threatened by habitat destruction and modification in St. Croix, and natural and human-induced catastrophic events due to its limited distribution. The St. Croix population is the population with the greatest number of individuals (100 plants). The majority of the individuals within Puerto Rico are located within privately owned areas subject to urban development. The Service designated an area in Halfpenny Bay near Christiansted in St. Croix as critical habitat for the species in 2007.

III. RESULTS

A. Recommended Classification:

__X__ No, no change is needed.

IV. RECOMMENDATIONS FOR FUTURE ACTIONS

Initiate propagation efforts and establish new populations in protected areas.

V. REFERENCES

Breckon, G. and D. Kolterman. 1993. Final Report for Cooperative Agreement No. 14- 16-0004-92-970. Unpublished report submitted to the U.S. Fish and Wildlife Service. 115 pp.

Oikos Environmental Services. 2005. Environmental Studies Villas de Bahía Boquerón Project. Report submitted to Gregory L. Morris Engineering, San Juan, Puerto Rico. 83pp.

Proctor, G.R. 1991. Status report on *Catesbaea melanocarpa* Krug & Urban. Unpublished report submitted to the U.S. Fish and Wildlife Service. 7 pp.

U.S. Fish and Wildlife Service. 2005. Recovery Plan for *Catesbaea melanocarpa*. Atlanta, Georgia, 32pp

U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of *Catesbaea melanocarpa* (No common name)

Current Classification Endangered

Recommendation resulting from the 5-Year Review

X **No change is needed**

Review Conducted By: Omar Monsegur, Caribbean Ecological Services Field Office

FIELD OFFICE APPROVAL:

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

Approve Edwin Muñiz Date 12 Apr 2011

REGIONAL OFFICE APPROVAL:

Cynthia Dohner, Lead Regional Director, Fish and Wildlife Service

for Approve [signature] Date 4/26/11

FY 2018 APPROVAL*

Lead Field Supervisor, Fish and Wildlife Service

Approve Marelisa Rivera Date 9/25/2018

*In 2014, Southeast Region Field Supervisors have been delegated authority to approve 5-year reviews that do not recommend a status change.
Field Supervisor signature on this document reflects:
1. _____ We have no new information, received no new public comments, and the original five factor analysis remains an accurate reflection of the species current status.
2. __X__ We have obtained a small amount of new information that we have summarized in Addendum 1, received no new public comments, and the original five factor analysis remains an accurate reflection of the species current status.

Addendum to the 2011 *Catesbaea melanocarpa* Five Year Status Review

I. Summary of new information obtained since the 2011 5-Year Status Review.

On August 22, 2016, the U.S. Fish and Wildlife Service (Service) published a notice in the Federal Register (81FR56692) announcing the five-year status review of *Catesbaea melanocarpa*. It requested new information and comments from species experts and biologists familiar with the endangered plant concerning its biology and status. No comments were received from the public. Comments and suggestions regarding the review were received from peer reviewers from outside the Service (see Summary of Peer Review section). We evaluated and incorporated comments as appropriate in this review. No part of the review was contracted to an outside party. This addendum summarizes information that the Service has gathered since the last *Catesbaea melanocarpa* Five Year Review approved on April 26, 2011.

Updated information

Between 2011 and 2018, cooperative efforts between the Service, the U. S. Virgin Islands Department of Planning and Natural Resources (VIDPNR), the Puerto Rico Department of Natural and Environmental Resources (PRDNER) and the University of the Virgin Islands (UVI) continued to implement actions of the *Catesbaea melanocarpa* Recovery Plan signed on August 18, 2005. The total number of individuals has increased from approximately 132 individuals (125 adult plants and 7 wild seedlings) in 2011 to approximately 547 individuals in 2018. Of these, 12 were grown in the UVI greenhouse, and 116 are wild seedlings counted only once in 2013 at Ha'Penny (and carried over here as an estimate). We also believe the present count can be attributed to an increase in survey efforts in the U. S. Virgin Islands. Most importantly, the total number of known population locations decreased from four (3 in PR and 1 in USVI) to three (2 in PR and 1 in USVI) with only one individual making up one of the populations in Puerto Rico. *C. melanocarpa* is now being referred to by the English common name, Tropical Thorn Lily, by species experts (Morgan and Zimmerman, UVI, poster presentation, 2016). No common name in Spanish has been published. This addendum is based on the best scientific and commercial data available regarding the biological and ecological needs of the species.

Populations

U.S. Virgin Islands

In the publications regarding the Ha'Penny population site, there are references to the 'east' and 'west' segments of the population. A dirt road runs through the known population area and these designations refer to which side of the beach access road in which the individuals are located, east or west of the dirt road. Although they have been referred to as sub-populations (Morgan and Zimmerman, UVI, poster presentation, 2016), all of the individuals at the Ha'Penny location are considered one population.

On January 17, 2013, Geographic Consulting conducted a one-day rapid assessment on the east side segment of the population of *C. melanocarpa* at Ha'Penny Beach, St. Croix. A total of 72 adult plants and 92 seedlings were identified, every plant was found to be associated with large trees or clump of scrub and trees. Sooty mold was observed on four plants, two plants were

flowering, 15 had fruits, and 11 contained ripe fruits. It was acknowledged that the survey yielded insufficient data to predict the true extent of the population and a crude estimate of 200 adults was produced (Daley and Valiulis 2013).

On January 30, 2013, Service biologists conducted another rapid population assessment of the *C. melanocarpa* population at Ha'Penny on the east side of the road within designated critical habitat. A total of 54 plants were marked of which 42 percent were over a meter high and bore fruit. Although an abundance of fruits and 24 seedlings were identified, an absence of recruitment was noted (USFWS 2013).

In 2016, Morgan (Agroforestry Researcher at the University of Virgin Islands [UVI] in St. Croix) estimated that the Ha'Penny population consisted of approximately 400 plants (Morgan and Zimmerman, UVI, poster presentation, 2016). In 2016, a survey by Morgan yielded a total of 312 *C. melanocarpa* individuals with 107 of those located since April 2015 (Morgan 2016). On the poster, it was also noted that the population structure on the west side of Ha'Penny road grows in the shade of a gallery forest that lines a seasonally dry stream and contains more juveniles than the east side population that grows on a previously grazed plane dotted with tree islands and contains more adult plants (capable of flowering and fruiting) and that the west side population is colonizing west of the gut stream (Morgan and Zimmerman, UVI, poster presentation, 2016). Trees that commonly make up these 'tree islands' are tamarind (*Tamarindus indica*), divi (*Caesalpinia coriaria*), logwood (*Haematoxylon campechianum*) and white manjack (*Cordia alba*). It is worth noting that the first three species are nitrogen fixers and the fourth has white edible berries that attract birds. The pipe-organ cactus (*Pilosoceresus royennii*) is also a frequent component of these islands. What is generally not found in these tree islands is tan-tan (*Leucaeana leucocephala*), even though it fixes nitrogen and is the most common tree on St. Croix (Morgan and Zimmerman, 2017). This is consistent with the populations in Puerto Rico that occurs on forested habitat dominated by native species. *C. melanocarpa* may favor these tree islands due to the shade the trees provide. This shade inhibits the growth of grasses, which outcompete *C. melanocarpa* seedlings (Morgan and Zimmerman, 2017).

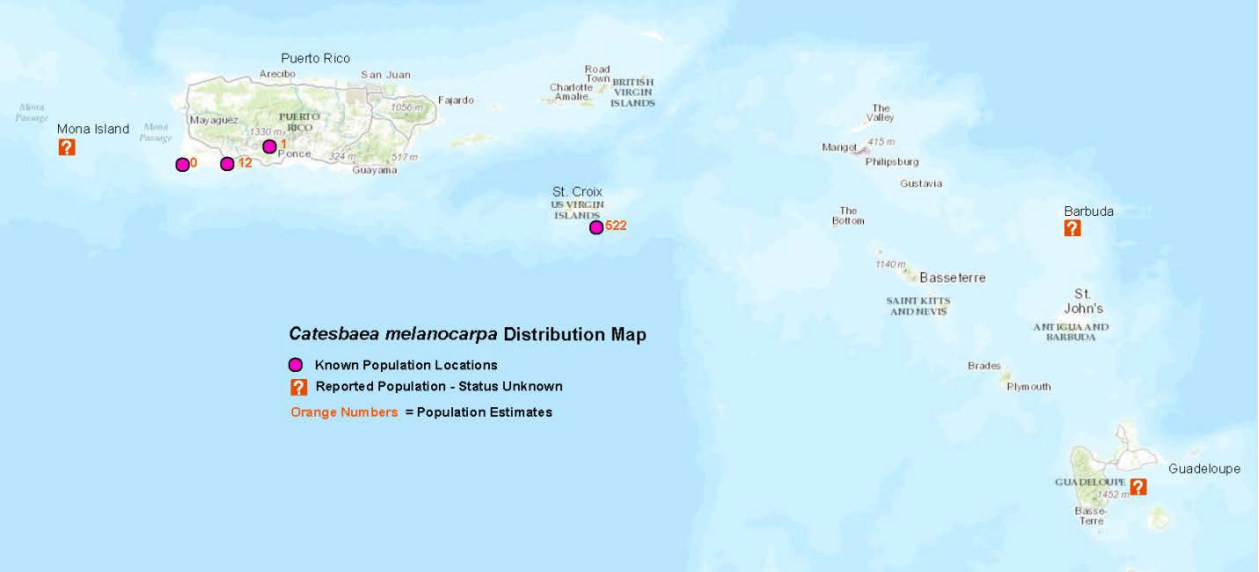
In 2017, at the Ha'Penny population site on St. Croix, Morgan reported identifying 165 *C. melanocarpa* individuals on the west side of Ha'Penny road and 205 individuals on the east side of the road (Morgan, UVI, pers. comm., 2017). He also reported identifying 4 additional individuals on the adjacent property owned by The Nature Conservancy and 2-3 more in the Ha'Penny area (Morgan, UVI, pers. comm., 2017).

In February 2017, Geographic Consulting identified three new *C. melanocarpa* individuals while conducting habitat surveys on Estate Grenard, a property adjacent to Ha'Penny (Geographic Consulting 2017).

In 2018, Morgan (UVI, pers. comm., 2018) estimated the population at the Ha'penny site could be close to 600 individuals. He explained that in 2018 he has already located an additional 7 individuals in the Ha'Penny populations during random area surveys and 19 new individuals near Estate Grenard (Morgan, UVI, pers. comm., 2018). Morgan's 2018 estimate does not include natural recruits under 15 cm, although they have been observed at the site (Morgan, UVI, pers. comm., 2018). Service biologists have suggested, however, that microhabitat conditions necessary for seedling establishment and recruitment of further adult plants are not present at the original known group of individuals at the Ha'Penny location as this area is degraded and dominated by exotic grasses (area designated as critical habitat and subject to human induced

fires; USFWS 2013). Nonetheless, Morgan believes the population (including the recently discovered individuals within forested habitat) is stable and increasing with low mortality and plenty of natural recruitment (Morgan, UVI, pers. comm., 2018) and the species is likely present on un-surveyed, adjacent properties. These recent discoveries bring the current total population estimate of *C. melanocarpa* in St. Croix to 406 individuals. At the Ha'Penny location it was also noted that *C. melanocarpa* are capable of producing fruit and flower when they are 50 cm tall in droughty sunlit spots, however, in moister, shadier sites they need to reach about 100 cm tall and flowering and fruiting occurs year- round. Bees and wasps are thought to be the primary pollinators for the species. Morgan and Zimmerman (2017) identify that the role of birds as dispersers needs further research.

Figure 1: Current Distribution of *Catesbaea melanocarpa.*



Puerto Rico

Twelve individuals were reported in 2001 near El Fuerte Trail at the Guánica Commonwealth Forest (USFWS 2011). No new data has been reported for this population since 2004; however, the Service anticipates this population remains viable due to its protected location within the boundaries of the Commonwealth Forest.

From 2014 to 2015, PRDNER was unable to identify any individuals of *C. melanocarpa* in the area proposed for the gas pipeline, Gasoducto Sur in the municipality of Peñuelas (USFWS 2011, PRDNER 2015); however, one individual may be present since these surveys may not have been conducted at the exact location of the single individual described in 2011.

In 2009, Service biologist discovered a population of *C. melanocarpa* in the Punta Melones area of Cabo Rojo and reported that the population consisted of 12 adult individuals and 7 seedlings. In April of 2012, personnel from PRDNER and the Service re-visited the area and were unable to locate any of these *C. melanocarpa* individuals (PRDNER 2013).

This new information indicates a decrease in the number of *C. melanocarpa* known individuals in Puerto Rico from 32 to 13, and a decrease in active sites from 3 to 2. The only population in

Puerto Rico that was not considered threatened by habitat modification in 2011 was the one located within the boundaries of the Guánica Commowealth Forest (USFWS 2011).

The species was recorded in 2018 from Carlisle Bay, Antigua in 2018 and Brian Daley also confirmed its presence on Antigua 2017 (Morgan,UVI, pers.comm. 2018), but no details are available of the species abundance (Hamilton, KEW, pers. comm. 2018). Hamilton further states he observed the species near Nelson's Dockyard in the English Bay area between 2007 and2008. The status of the species on the islands of Barbuda, and Guadeloupe remain undetermined. *C. melanocarpa* was also listed as present on Mona Island, PR (Lindsay et al., 2015).

Table 1: Population estimates of *Catesbaea melanocarpa*.

Location	Adults/Seedlings (year)					
	2011‡	**2013**	**2015**	**2016**	**2017**	**2018**
Ha'Penny (St. Croix, USVI)	100†/?	126*/116*	126†/116†	312*/116†	380*/116†	406*/116†
Guánica, PR	12†/0†	12†/0†	12†/0†	12†/0†	12†/0†	12†/0†
Peñuelas, PR	1*/0*	1†/0†	1†/0†	1†/0†	1†/0†	1†/0†
Punta Melones, PR	12*/7*	0*/0*	0†/0†	0†/0†	0†/0†	0†/0†
Population Estimate	125/7 (132)**	139/116 (255)**	139/116 (255)**	325/116 (441)**	393/116 (509)**	419/116 (535)** +12 @ UVI greenhouse

NOTE: The increase in numbers is most likely due to an increase in effort in the USVI and not necessarily of an increase in numbers over time. Surveys conducted (*), estimate where no new data was available (†), data from 2011 5 Year Review (‡).

Propagation and Re-introduction Efforts

Through a research grant provided by the Service the UVI Agroforestry and Biotechnology Program is studying the phenology, population and distribution of *C. melanocarpa* and is working on developing propagation protocol. Seeds extracted from ripe black berries and planted in a mix of 50:50 fine sand and peat moss have yielded 60% germination. Seeds germinate at about 17 days and are transplanted into pots filled with a planting solution of 50% peat moss, 25%, sand and 25% topsoil. Individuals are best planted at heights of one, two or three feet (Morgan and Zimmerman, 2017).

During February of 2015, two *C. melanocarpa* plants grown in the UVI greenhouse were planted in the permanent UVI agroforestry plot as a source for seeds. These plants flowered in 2017 (Morgan, UVI, pers. comm., 2018). Morgan collected seeds in December of 2015 and again in May of 2016. Some of the seeds were germinated in the greenhouse and in test tubes filled with a mix of agar and gel as a source for future efforts to test micro propagation of this

plant (Morgan, UVI, pers. comm., 2016). The micro-propagation (via tissue culture) at UVI has only produced sprouts with callus tissue around the base instead of roots (Morgan, UVI, pers. comm., 2018).

Morgan (UVI, pers. comm., 2018) informed the Service that he has approximately 12 *C. melanocarpa* plants, grown by seeds collected from the Ha'Penny population, at the UVI greenhouse in order to establish or reinforce existing protected populations at Sandy Point National Wildlife Refuge (Morgan and Zimmerman, 2017).

Threat Factors Analysis

In the 2011 five year review, C. *melanocarpa* was considered threatened by present or threatened destruction, modification, or curtailment of its habitat or range (Factor A) and by other natural or manmade factors affecting its continued existence (Factor E). Currently, the Service believes that these threats continue to apply.

Habitat destruction/modification and wildfires are important factors affecting the species. Deforestation and land clearing for residential, commercial and tourist development continue to pose imminent threats to the survival of the species.

In the U.S. Virgin Islands, land clearing remains a threat with unregulated harvesting of hay as observed in 2018 by Morgan within *C. melanocarpa* critical habitat at the Ha'Penny site (Morgan, UVI, pers. comm., 2018). Changing land use patterns in close proximity of the designated critical habitat may be affecting these populations. Although hay harvesting may aid in reducing the fuel load for potential wildfires, it may also limit *C. melanocarpa*'s ability to expand within its habitat. Assessments were conducted with respect to the expansion of Tibbar Energy's Biogas project on St. Croix with a field crop near the critical habitat at the Ha'Penny site. In January 2013, Ha'Penny land cleared for Tibbar's biogas project was noted within 50 feet of *C. melanocarpa* plants (Daley and Valiulis 2013). In April 2013, Geographic Consulting conducted a rapid assessment for Tibbar Energy where 12 plant locations were identified and mapped with recommended 50 meter buffers generated and designated as areas safe for the protection of the species (Daley and Valiulis 2013). The Service (2013) further provided recommendations (e.g.., establishment of 75 feet buffer, forested corridors and the establishment of a long term monitoring project) to minimize the possible adverse effects on the species.

In July of 2014, Tibbar Energy, LLC released the 'Farm Land Endangered Species Report', prepared by Bioimpact, Inc. environmental consultants. Tibbar secured 1,500 plus acres of leased farmland to grow its preferred biomass crops giant king grass (*Pennisetumpurpureum*)/Schumach (*Pennisetum glaucum*), guinea grass (*Panicum maximum'Mambasa', Sorghum bicolor* and sorghum (*Sorghum bicolor x sudanense)*. One of the identified sites is adjacent to land designated as critical habitat for *C. melanocarpa*. The Service concluded informal section 7 consultation on this project on June 24, 2013 (Dempsey 2014).

Out of 17 farms leased by Tibbar, 12 farms were surveyed for endangered plants and one was found to contain *C. melanocarpa* (Dempsey 2014). At the time of Dempsey's report (2013), no impact to endangered species or land designated as critical habitat had been detected. The report states that greater than 150 ft. of unaltered buffer was present around all of the located *C. melanocarpa* plants and a 50 ft. wide corridor would be maintained between plants to allow for natural recruitment (Dempsey

2014). Tibbar Energy also reported maintaining mowing boundaries near endangered species, to reduce the fuel load and help prevent fires that could impact the species. Although full scale operations were slated to commence in late 2015 (Dempsey 2014), the Virgin Islands Water and Power Authority (WAPA) terminated agreements with Tibbar Energy in 2016 (VI Consortium 2016, website and St. Croix Source 2016, website).

Land clearing with 50 m buffers around *C. melanocarpa* individuals (Daley and Valiulis 2013) and fire breaks maintained by Tibbar Energy (Dempsey 2014, pp. 14) was documented in 2013. However, these buffers and firebreaks are no longer maintained since Tibbar Energy's biofuel area is now partially under cultivation by row crops (Yrigoyen, USFWS, pers. obs., 2018).

Daley and Valiulis also list spreading of the noxious weed cattail (*Typha latifolia*), and land clearing as additional threats to *C. melanocarpa* (Daley and Valiulis 2013). However, the effects of these threats on this species have not been investigated. The cattail is a wetland species and it is not anticipated to colonize upland habitat.

Although there are laws, regulations and cooperative agreements to protect endangered *C. malanocarpa* with both Territorial (U.S. Virgin Islands) and Commonwealth (Puerto Rico) governments, the capacity of the Territory and Commonwealth to enforce these mechanisms may be insufficient. Since the 2011 5-Year Status Review, the Commonwealth of Puerto Rico has lost *C. melanocarpa* at one previously known site at Punta Melones to land clearing and in the Territory of the US Virgin Islands, hay harvesting has been observed in close proximity the largest population in St. Croix on land designated as critical habitat (Yrigoyen, USFWS, pers. obs., 2018).

As for natural and manmade factors, in 2013, a fast moving grass fire was reported at the Ha'Penny site that passed through the center of the population that left at least three *C. melanocarpa* individuals singed and at least six individuals dead (Daley and Valiulis 2013). Service biologists have reported that the historic land use of this area for cattle and hay production impedes the establishment of native trees and shrubs, exacerbating the risk of fire in the area (USFWS 2013). The Ha'Penny area experiences wildfires every dry season. An increased fuel load (due to the cessation of grazing) and the proximity to the road leave the population with a real threat from fires (Daley and Valiulis 2013). A fire also was observed on December 2017 just upwind of the Ha'Penny site, near Many Paws road. This was a demonstration burn conducted to illustrate the incineration process proposed to reduce the vegetative debris left by Hurricanes Irma and Maria. The Army Corps of Engineers did not sanction this demonstration (Gilbert, VI Consortium, 2017; Pott, DPNR CZM, pers. comm., 2017).

The Service believes the *C. melanocarpa* population at Peñones de Melones may no longer exist due to deforestation and fires associated with human activities in the area (USFWS 2011). In 2013, no individuals were found at this location and threats at this site were listed as: disturbance by cattle, use of the area for illegal off road racing, and fire (PRDNER 2013). The site where *C. melanocarpa* had been found previously was reported as being deforested (PRDNER 2012).

On September 2017, Hurricane Irma and Hurricane Maria, two major hurricanes affected Puerto Rico and the U.S.Virgin Islands. Hurricane Maria affected the island of St. Croix, USVI more severely. Limited information after the hurricane regarding *C. melanocarpa* is available.

Morgan observed that although he has found a few dead *C. melanocarpa* individuals at the Ha'Penny location, he believes Hurricanes Irma or Maria (Morgan, UVI, pers. comm., 2018) minimally impacted the population. In Puerto Rico, impacts from hurricane Maria to *C. melanocarpa* are unknown.

Synthesis

Catesbaea melanocarpa is currently only known from five islands in the Caribbean; U. S. Virgin Islands, Puerto Rico, Barbuda, Antigua, and Guadeloupe. In 2011, the population was estimated to be 132 individuals from 4 populations in the USVI and PR (USFWS 2011). In 2018, there are approximately 547 individuals known from three locations within the U.S. Territories in the Caribbean, 522 individuals in the U.S. Virgin Islands, and 13 in Puerto Rico. Although increased effort has led to the discovery of more individuals in the USVI, the number of individuals in Puerto Rico has gone down and one of the populations in Puerto Rico appears to have disappeared since 2011. The species currently continues to be threatened by habitat destruction or modification and natural or human induced stochastic events due to its limited distribution. The population at the Guánica Commonwealth Forest in Puerto Rico remains relatively protected at this time.

Recommendations

- Conduct a full population assessment, including developing maps (GIS) with spatial information of the species for each area and information on recruitment. Historic data and observation records should be compiled into a single electronic database to inform a full population assessment.
- Establish a sound propagation protocol and subsequent plant production program; identity additional suitable habitat and develop partnerships to aid in the reintroduction of the species within its historic range in identified suitable habitat.
- Further studies to confirm the presence or absence of *C. melanocarpa* at potential sites in Puerto Rico including an updated status on the population at the Guánica Commonwealth Forest.
- Identify Territorial and Commonwealth agencies able to monitor current populations and inform those agencies of the status and threats to the species.

Literature Cited

Daley, B. and J. Valiulis. 2013. Rapid Assessment of Four Endangered Plant Populations of St. Croix, US Virgin Islands. Geographic Consulting. Prepared for the Virgin Islands Department of Planning and Natural Resources, Fish and Wildlife Division.

Dempsey, A. 2014. Farm Land Endangered Species Report. Prepared for Tibbar Energy, LLC. By Bioimpact Inc.

Geographic Consulting, LLC. 2013. Endangered Plant Survey and Mapping of Ha' Penny Beach for Tibbar Energy. April 12, 2013.

Geographic Consulting, LLC. 2017. Botanical Field Survey of No. 2 Estate Grenard.

Gilbert, E. 2017. Demonstration of Debris Burning Takes Place Today on St. Croix. The Virgin Islands Consortium, viconsortium.com. December 13, 2017.

Hamilton, M. 2018. Royal Botanic Gardens, Kew. Personal communication with U. S. Fish and Wildlife Service. January 31, 2018.

Lindsay, K.C., E. Gibney, T. Thomas, J.P. Bacle. 2015. Plants of Conservation Concern: Herbs and Plants of the United States Virgin Islands.

Morgan M. 2016. Monitoring Existing Populations of *Buxus vahlii* and *Catesbaea melanocarpa* and Efforts at Propagation and reintroduction on St. Croix, USVI. Univ. of the Virgin Islands- Agricultural Experiment Station. Report period November 2014-August 2016.

Morgan, M. 2016. University of the Virgin Islands. E-mail to U. S. Fish and Wildlife Service. September 29, 2016.

Morgan, M. 2017. University of the Virgin Islands. E-mail to U. S. Fish and Wildlife Service. April 25, 2017.

Morgan, M. 2018. University of the Virgin Islands. Personal communication with U. S. Fish and Wildlife Service. April 11, 2018.

Morgan, M. 2018. University of the Virgin Islands. E-mail to Matthew Dekar (USFWS). June 18, 2018.

Morgan, M. and T.W. Zimmerman. 2016. Population Distribution and Structure of *Catesbaea melanocarpa* on St. Croix, US Virgin Islands, Poster presentation. Agricultural Experiment Station, University of Virgin Island Poster.

Morgan, M. and T.W. Zimmerman. 2017. Tropical Lily Thorn (*Catesbaea melanocarpa* Krug & Urb.): A Federally Endangered Tree on St. Croix. Agricultural Experiment Station 2017 Annual Report, University of The Virgin Islands.

Pott, C. 2017. East End Marine Park. Personal communication with U. S. Fish and Wildlife. December 2017.

Puerto Rico Department of Natural and Environmental Resources. 2012. Recovery of Several Listed Plants throughout Propagation Program. Progress Report ES-1-29 Study 21.

Puerto Rico Department of Natural and Environmental Resources. 2013. Recovery of Several Listed Plants throughout Propagation Program. Final Report ES-1-29 Study 21.

Puerto Rico Department of Natural and Environmental Resources. 2015. Recovery of Several Listed Plants throughout Propagation Program. Final Report ES-1-29 Study 21.

The St. Croix Source. 2016. WAPA Cancels Tibbar BioEnergy Contract. stcroixsource.com. October 20, 2016.

U.S. Fish and Wildlife Service. 2013. Report on the assessment of the federally listed plants of St. Croix, U.S. Virgin Islands (*Catesbaea melanocarpa*, *Buxus vahlii* and *Agave eggersiana*). Unpublished report.

U.S. Fish and Wildlife Service. 2011. *Catesbaea melanocarpa* 5 Year Status Review.

VI Consortium. 2016. WAPA Terminates 25-Year Agreement with Tibbar Energy. viconsortium.com. October 21, 2016.

Yrigoyen, J. U.S. Fish and Wildlife Service. 2018. Personal observation.

Appendix A to the Addendum: Summary of Peer Review for the *Catesbaea melanocarpa* 2nd Round 5 Year Review

This 2nd Round 5-Year Review was internally reviewed by José A. Cruz-Burgos (Caribbean Ecological Services Field Office [CESFO] Endangered Species Program Coordinator), Marelisa T. Rivera (CESFO Deputy Field Supervisor) and Edwin E. Muñiz (CESFO Field Supervisor). They provided editorial and technical comments that were included in the document. Once the comments were added to the document, it was sent to three independent peer reviewers (see below) via electronic mail. 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 this species, specifically on any additional information on the status and current threats to the species. Most comments and recommendations provided by the reviewers were incorporated into the document and cited accordingly. The deadline for submission of peer review comments was July 16, 2018. Comments were received from the peer reviewers during the comment period.

List of Peer Reviewers

Dr. Martin A. Hamilton, Caribbean Plants Expert, Research Leader (UKOTs), Conservation Science Department, The Herbarium, Kew Richmond, Surrey, TW9 3AE United Kingdom, ++(0)2083325020, m.hamilton@kew.org

Michael Morgan, Species Expert, Research Specialist II Provost's Office and Researcher for the Agricultural Experiment Station at University of the Virgin Islands, RR1 Box 10000, Kingshill, St. Croix, USVI 00850, (340) 692-4078, mmorgan@uvi.edu

Brian Daley PhD, Species Expert, Researcher and Partner for Geographic Consulting LLC, PO Box 6530, Christiansted, VI 00823, (340) 277-7804, bdaley@geographicconsulting.com

Summary of Peer Review Comments

Overall, the reviewers found the review to be a complete and thorough review of the best available information regarding the status of the species. Peer reviewers' comments (C) and the Service's responses (R) are provided below.

Comments by Dr. Martin A. Hamilton

C: Dr. Hamilton suggested a map would be useful to illustrate population distributions.
R: A map of the current distribution of *C. melanocarpa* was incorporated in this 5 Year Review.

C: Dr. Hamilton provided a literature citation to reflect information from a paper by Lindsay, K.C. et al. (2015) which he indicated may contain additional information on the current distribution of the species.
R: The information and citation were incorporated into the document.

C: Dr. Hamilton suggested the wording 'estimate based on new data' in place of 'Actual estimate' in the Note to Table 1.
R: This information was considered for the document.

C: Dr. Hamilton suggested rewording the section 'Efforts for Recovery' for clarity. He suggested clarification on the use of the term micro propagation in this section and that the source of the seeds be added to the information regarding the *C. melanocarpa* to be planted at Sandy Point Wildlife Refuge.
R: This information was incorporated into the document.

C: Dr. Hamilton pointed out that some of the scientific names of preferred biomass crops for the Tibbar Energy project were not correctly written.
R: This information was incorporated into the document.

C: Dr. Hamilton explained that there are many hybrids of the crops used for biofuel and most of those have cultivar and/or trade names associated with them and if this information is not known, it would be better to describe the '*Sorghum bicolor x sudanese'* as *'Sorghum bicolor* and *S. Sudanese* hybrids.
R: This information was incorporated into the document.

C: Dr. Hamilton requested that the sentence 'The area adjacent to these plants will remain as a nursery and test plot area and will be gradually phased out over the next 10 years' be reworded for clarity.
R: This information was incorporated into the document.

C: Dr. Hamilton explained that 'scorched' is generally used to describe fire damage to plants rather than 'singed', the word used in the report by Daley and Valiulis (2013).
R: This information was considered for the document.

C: Dr. Hamilton suggested the terms 'off-road' be used in place of 'for illegal road racing' in the PRDNER.
R: This suggestion was incorporated into the document.

C: Dr. Hamilton suggested rewording of the first sentence in 'Recommendations' for clarity.
R: His suggestion was incorporated into the document.

C: In the Recommendations section, Dr. Hamilton asked if the term 'enforcement was needed in the following sentence; 'Identify Territorial and Commonwealth enforcement agencies able to monitor current populations and inform those agencies of the current status and threats to the species'.
R: This information was incorporated into the document.

Comments by Michael Morgan

C: Mr. Morgan commented: That hay cutting and grazing on the East Side property is less of a threat to *Cateasbaea* plants than fire. Grazing and hay cutting would reduce the fuel load by removing flammable grasses. The *Catesbaea* plants are almost never found growing in the open, but rather on the edges and inside of tree islands. Some of the tree islands are impenetrable, composed of the thorny tree, logwood (*Haematoxylum campechianum L.*). Cattle are not going it these thickets nor will hay cutting machines.
R: This information was considered for the document.

C: Mr. Morgan commented that Brian Daley confirmed the presence of *C. melanocarpa* on Antigua at the end of 2017 to beginning of 2018.
R: This information was incorporated into the document.

Comments by Brian Daley, PhD

C: Dr. Daley commented that they also developed a germination protocol for the species that resulted in 80% successful germination and that he would be glad to be part of the propagation program in the future.
R: This information was considered for the document.