**Bariaco**
**(*Trichilia triacantha*)**

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

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

**Photos by Frank Suárez (UPRM)**

**5-YEAR REVIEW**
**Bariaco (*Trichilia triacantha*)**

## I. GENERAL INFORMATION

### A. Methodology used to complete the review:

On April 9, 2010, the Service published a notice in the *Federal Register* (75 FR 18232) announcing the 5-year review of bariaco (*Trichilia triacantha*) and requested new information concerning the biology and status of the species. A 60-day comment period was opened; however, no information on the species was received from the public during the comment period.

A cooperative agreement between the Service and the University of Puerto Rico, Mayagüez campus (UPRM), was signed to gather and summarize new information on bariaco. The UPRM reviewed available literature, consulted with specialists, and examined herbarium data, including specimens from University of Puerto Rico at Mayaguez (MAPR), Río Piedras Botanical Garden (UPR), University of Puerto Rico at Río Piedras (UPRRP), Department of Natural and Environmental Resources of Puerto Rico (SJ), New York Botanical Garden (NY), US National Herbarium (US), and University of Illinois (ILL). In addition, they conducted a field trip to the Guánica Commonwealth Forest, Puerto Rico on October 30, 2010 to evaluate the status of several populations of *T. tracantha*. Under this agreement, Dr. Duane A. Kolterman and Dr. Jesús D. Chinea prepared a draft review. Service biologists then completed the 5-year review and assessed and determined the appropriate status recommendation for the species.

### 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. Federal Register Notice citation announcing initiation of this review:** April 9, 2010; 75 FR 18232.

**2. Species Status: 2011 Recovery Data Call:** Stable. In 2011, no information about new populations was received.

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

**4. Listing History**

Original Listing
FR notice: 53 FR 3565
Date listed: February 5, 1988
Entity listed: species
Classification: endangered

**5. Associated rulemakings:** Not Applicable.

**6. Review History:**

A species' review was conducted for bariaco 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 bariaco's listing classification was found to be appropriate.

The February, 5, 1988 final rule (53 FR 3565) and the Bariaco (*Trichilia triacantha*) Recovery Plan, approved and signed on August 20, 1991 (US Fish and Wildlife Service 1991), are the most comprehensive analyses of the species' status and are used as the reference point documents for this 5-year review.

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

**7. Species' Recovery Priority Number at start of review (48 FR 43098):** 11. At the time of listing, bariaco was recognized as a species with a moderate degree of threat and a low recovery potential.

**8. Recovery Plan:**

Name of plan: Bariaco (*Trichilia triacantha*) Recovery Plan
Date issued: August 20, 1991

## II. Review Analysis

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

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 the DPS policy is not applicable to 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 species has an approved recovery plan (USFWS 1991). However, the plan establishes downlisting as the recovery objective and does not contain measurable recovery criteria for delisting. In addition, 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 and abundance. Knowledge about its spatial distribution has expanded.

**b. Are all of the 5 listing factors that are relevant to the species addressed in the recovery criteria?** No. The plan should be updated to include and emphasize the importance of identifying, surveying and protecting potential habitat. It was assumed the majority of the populations were restricted to Guánica. However, the current information indicates that it occurs from Guánica to Ponce (southern coast of Puerto Rico), and those populations are seriously threatened by urban development. The plan should also include determining the possible adverse effects of other threats like competition with exotics.

**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.**

The Plan specifies that *T. triacantha* could be considered for reclassification to a threatened species when:

1. the known population at Punta Guaniquilla is placed under protective status, and

2. at least three new populations capable of self-perpetuation have been established within protected units such as Puerto Rico Conservation Trust property or Commonwealth Forests.

The Plan specifies that these should be considered minimum requirements, and should be expanded upon if the regenerative or propagative potential of natural and *ex situ* populations proves to be insufficient. On the other hand, if new populations of the species are discovered, it may be preferable to place greater emphasis on protection, rather than propagation, in order to achieve a minimum number of plants.

Criterion 1 has not been met. The Punta Guaniquilla population remains as a private property and the area is under current pressure for development.

Criterion 2 has not been met. So far a strong propagation program for the species has not been initiated nor has any population been established within a protected area. Nonetheless, propagation of the species has proved to be successful as showed by Ventosa (2007) and new populations have been identified along the southern coast of Puerto Rico.

The discovery of the Trichilia creek population in Guánica Commonwealth Forest is a great step toward recovery especially because it seems to be the best example of a healthy and self sustainable population. Since the listing of the species, *Trichilia triacantha* has expanded in numbers and in documented natural populations. Currently, the majority (78%) of the only 162 known individuals are in a Commonwealth Forest. However, the majority of the new populations and the suitable habitat occur on private properties subject to urban development.

## 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

Recent information on the distribution and habitat characteristics of *T. triacantha* was presented by Ventosa (2007), based largely on his master's thesis research (Ventosa 1997). He reported 109 individuals distributed in ten populations, mostly within the Guánica Commonwealth Forest (see Table 1).

On October 30, 2010, the botanists from the UPRM visited the Guánica Commonwealth Forest, where they located 27 trees of *T. triacantha* in an area that corresponds to portions of two of the populations cited by Ventosa (1997): Carbonera (where he reported 22 plants) and Hoya (where he reported 35 plants).

The 27 trees found on October 30, 2010 had either one main stem or several (up to four) main stems. These trees ranged from 1.0 to 5.8 m in height (mean = 3.8 m, s.d. = 1.15) and from 0.72 to 100.91 $cm^2$ in basal area (mean = 18.8 $cm^2$, s.d. = 21.78), basal stem diameters ranged from 0.45 to 6.8 cm. Four of the trees were in reproductive stage (buds, open flowers and/or old flowers) and seven seedlings were observed next to one of the trees.

Of the 27 trees, 16 were labeled with metal tags from previous studies. Data on the number of main stems, estimated height (m), and basal stem diameter (cm)/basal area ($cm^2$) were available for those trees. After 1½ decades, 75% of the trees showed an increase in height, from a mean of 3.0 m (s.d. = 0.77) to a mean of 3.7 m (s.d. = 1.03); showing a highly significant difference on the height of the individuals ($P = 0.0014$). Over the same time period, all of the trees showed an increase in basal area, from a mean of 6.1 $cm^2$ (s.d. = 3.71) to a mean of 14.2 $cm^2$ (s.d. = 7.08). There was a highly significant difference on the increase of the basal area for the sampled individuals ($P < 0.001$).

In addition, preliminary results obtained by UPRM botanists on a visit to "Trichilia Creek" in the Guánica Commonwealth Forest on August 28, 2003, accounted for a total of 24 trees and saplings of different sizes, as well as 46 seedlings (Breckon et al. 2003). The first large tree was arching, approximately 12 m high, with two trunks from the base (diameter breast height) = 6.4 cm and 8.9 cm), flower buds, and 26 seedlings around it, some of them chlorotic (white color; an indicator of some illness or insufficiency of nutrients). A bit farther along, on the west-facing slope above the creek, was another large tree, branched into two trunks above the base (dbh = 15.3 cm and 11.6 cm), with open flowers and a sapling < 1 m tall, and five small seedlings approximately 4-5 cm tall nearby. Further visits to the same area by Service staff indicate that this population extends beyond the reported area sampled by

Kolterman and Breckon et al. in 2003 (Omar Monsegur, Service, pers. obs. 2011.). In fact, Service staff observed about 10 additional adult trees, several saplings (different sizes) and abundant seedlings in the area. One of the observed individuals was particularly large for the species, with a dbh of about 10 cm. The size of the individuals observed in this area is noteworthy as well as the associated native vegetation, which may indicate that the area is a remnant of a relatively undisturbed forest. Further conversations with Marcos Caraballo in 2009 (former UPR herbarium technician) indicate that this population is interconnected with other populations along small ravines on the boundaries of the Yauco landfill where he observed the species. The species is currently known from about 15 populations: the ten populations described by Ventosa (2007) (seven within Guánica Commonwealth Forest and the other three in Cabo Rojo, Sabana Grande and Yauco); "Trichilia Creek" in Guánica Commonwealth Forest and about four other sites from Yauco to Ponce. The current number of individuals is estimated at 162 plants (not including seedlings) (Table 1.).

Table 1. Known populations of Bariaco.

| **Bariaco populations** | **Number of individuals*** | **Reference** |
|---|---|---|
| Guaniquilla (Cabo Rojo) | 3 | Ventosa, 2007 |
| Carbonera (Guánica Commonwealth Forest) | 22 | Ventosa, 2007 |
| La Hoya (Guánica Commonwealth Forest) | 35 | Ventosa, 2007 |
| Picúa Trail (Guánica Commonwealth Forest) | 2 | Ventosa, 2007 |
| Lluveras (Guánica Commonwealth Forest) | 4 | Ventosa, 2007 |
| Cobana Trail (Guánica Commonwealth Forest) | 26 | Ventosa, 2007 |
| Barinas (Guánica Commonwealth Forest) | 12 | Ventosa, 2007 |
| Jacana (Fam. Catalá) (Yauco) | 1 | Ventosa, 2007 |
| Sabana Grande (Ruben Padrón) | 3 | Ventosa, 2007 |
| Cedro (Guayanilla) | 1 | Ventosa, 2007 |
| Trichilia creek (Guánica Commonwealth Forest) | 24 (*36) | Breckon and Kolterman 2003 |

| | | |
|---|---|---|
| Gasoducto Sur (Ponce) | 24 | CSA Group 2007 |
| El Peñon de Ponce (Ponce) | 3 | Omar Monsegur (USFWS) |
| Finca Catalá (Yauco) | 1 | Alcides Morales, SOPI, 2011 |
| Ponce Landfill (Ponce) | 1 | Carlos Pacheco (USFWS) |
| **Total** | **162** | |

*Seedlings

**b. Genetics, genetic variation, or trends in genetic variation (e.g. loss of genetic variation, genetic drift, inbreeding, etc).**

There is no new information on genetics, genetic variation, or trends in genetic variation.

**c. Taxonomic classification or changes in nomenclature.**

There is no new information on taxonomic classification or changes in nomenclature.

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

According to Liogier and Martorell (2000), *Trichilia triacantha* is endemic to Puerto Rico. This species was first collected by Plee in Peñuelas (U.S. Fish and Wildlife Service 1991). Additional collections were made by Sintenis in 1886 and by Gregory in 1939-1940 in Guánica. By 1991, only two populations of *T. triacantha* in the Guánica and Cabo Rojo areas were known (U.S. Fish and Wildlife Service 1991). Populations of this species have been more recently reported from the Sabana Grande, Yauco, Guayanilla, Peñuelas, and Ponce municipalities (Figures 1 and 2).

Plant specimens deposited in herbaria can be mapped using the information provided in their labels. The botanist from the University of Puerto Rico at Mayaguez used the point-circle method (Chapman and Wieczorek 2006) that assigns coordinates for the location of the collection as well as an estimate of the uncertainty (in meters), based on the locality descriptions obtained from the specimen labels of such localities, to allow the creation of an accurate species distribution map.

Specimens (Figure 1 and Appendix I) and population sites (Figure 2) located with uncertainties smaller than 300 m occur at

elevations from 25 to 175 m above sea level (Ventosa, 2007), on soils of the following series: Pitahaya-Limestone outcrop-Seboruco complex, La Covana-Limestone outcrop-Seboruco complex, Seboruco gravelly clay, El Papayo gravelly clay loam, Aguilita stony clay, San Germán-Duey complex, Tuque stony clay, and Yauco silty clay loam, most of them on slopes of 20-60%. Other specimen localities, but with inaccurate locality descriptions (inaccuracies from 2,000 to 15,620 m), were collected within the municipalities of Guánica, Yauco or Peñuelas (Figure 2).

The rediscovery of this species within the Peñuelas municipality suggests that it may have not disappeared from the area originally visited by Plee, but that the population may have been considerably reduced by land use practices.

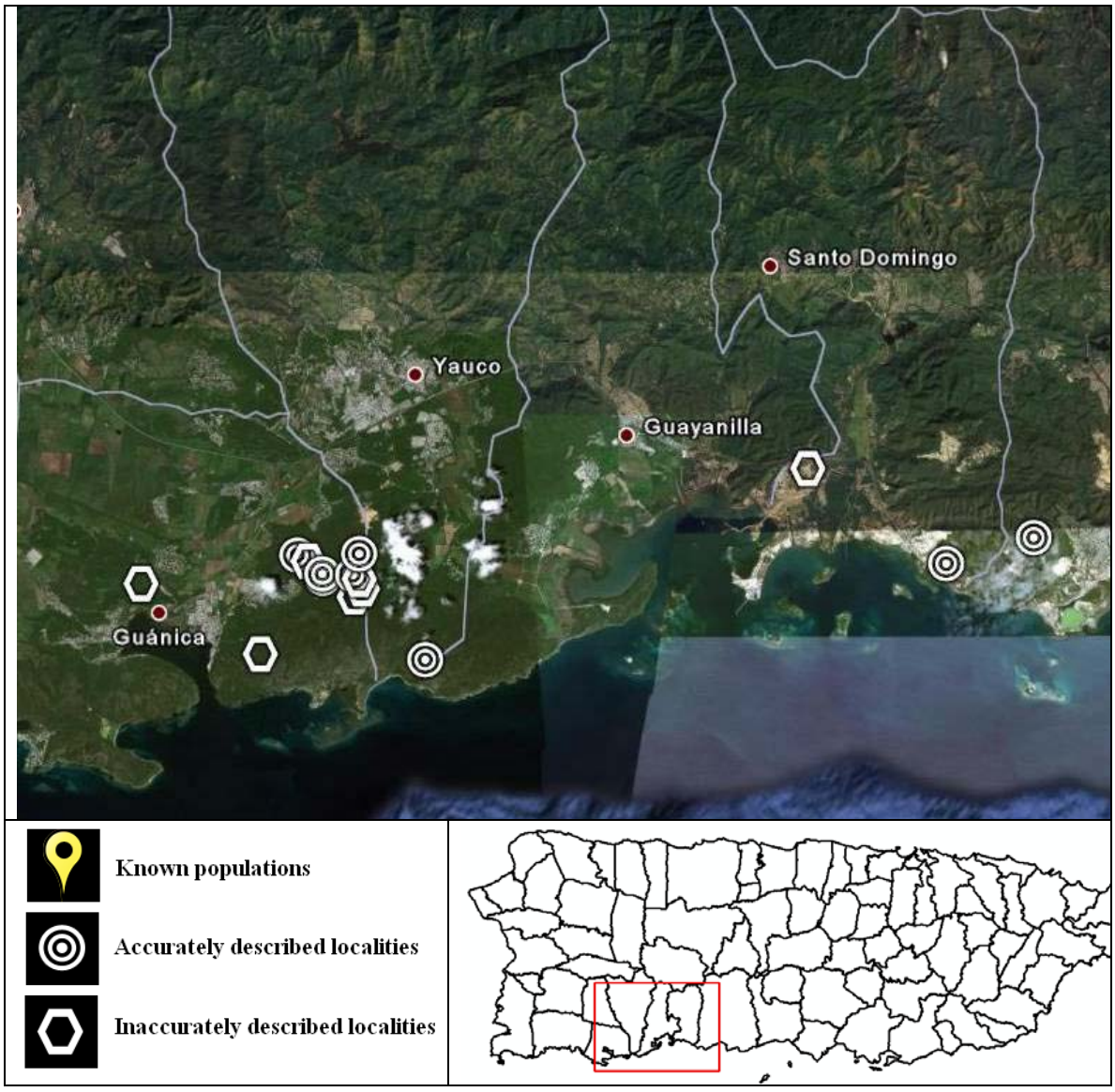

Figure 1. Reported specimen localities for *Trichilia triacantha*. Accurate specimen localities are those with uncertainties below 300 meters. Map includes only information from herbarium specimens.

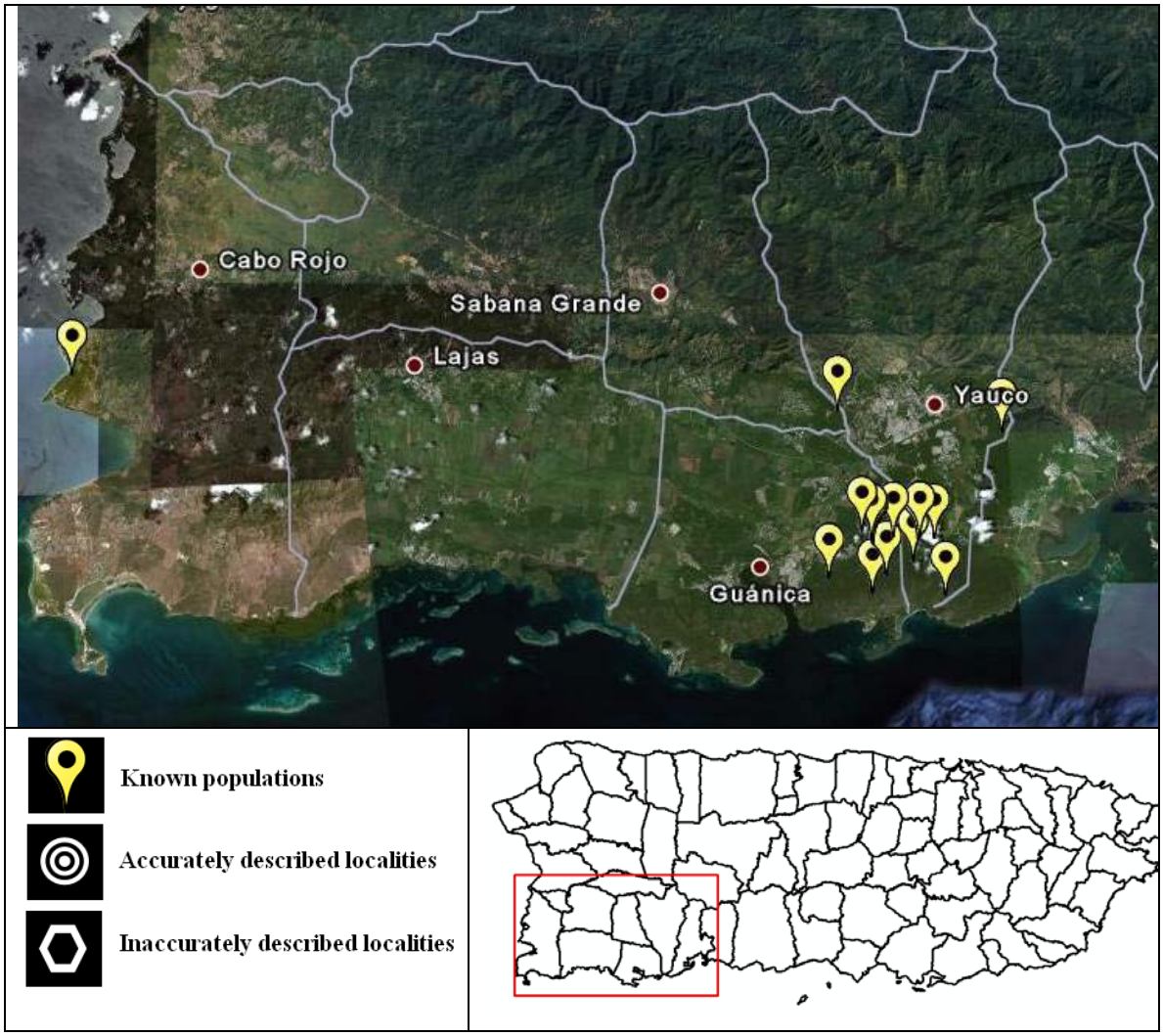


Figure 2. Reported populations of *Trichilia triacantha*. The largest cluster in the southern Guánica and Yauco municipalities is located within the Guánica Commonwealth Forest. Map includes only information from herbarium specimens.

**e. Habitat**

*Trichilia triacantha* is endemic to southwestern Puerto Rico and occurs primarily within the subtropical dry forest life zone, perhaps extending into the subtropical moist forest zone (Ewel and Whitmore, 1973). Rainfall ranges from 600 to 1,100 mm (24-44

in.) per year in the subtropical dry forest, and from 1,100 to 2,200 mm (44-88 in.) per year in the subtropical moist forest.

These life zones occupy areas that were extensively deforested for agriculture (Ewel and Whitmore, 1973). Areas in which agricultural activities have been abandoned and reforestation has occurred may provide possible sites for the establishment of new populations of *T. triacantha*.

**f. Other relevant information**

It is interesting to note that, within the genus *Trichilia*, *T. triacantha* belongs to a small group of spiny-leaved species endemic to the Greater Antilles, almost all of which are at best very rare (Pennington, 1981). *Trichilia monacantha* is known only from the type collection, which was collected in the central Dominican Republic in the late nineteenth century. There is no information on the current status of *T. stenophylla*, endemic to the northwestern tip of Haiti, but it is understood to be a critically endangered species (Duane Kolterman, UPRM, pers. comm., 2011). *Trichilia pungens* is endemic to eastern Cuba, where it is quite rare (Duane Kolterman, pers. obs. 2011). Of the five species, *T. aquifolia*, endemic to southern Hispaniola, is the least rare, but it is by no means common or abundant (Duane Kolterman, pers. obs. 2011).

**2. Five Factor Analysis**

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

The species' rarity and restricted distribution makes it vulnerable to habitat destruction and modification. However, most of the known populations and individuals are located on public lands within the Guánica Commonwealth Forest, which has been declared as a Biosphere Reserve by UNESCO and is managed for conservation. According to Ventosa (1997), about 60% of the known populations during his study were located within the Forest. Furthermore, these populations represent about 93% of the known individuals. In the Guánica Commonwealth Forest, *T. triacantha* is mostly found on the edge of trails, making the species more prone to be affected by management activities (*e.g.*, widening of trails, clearing activities). Moreover, these populations consist of isolated clusters of adult individuals, and the majority of the seedlings are located adjacent to the parent shrub and there is no evidence of natural dispersion despite showy red seeds, which may

have been dispersed by an unknown bird species. The evidence of very limited dispersal of this plant may suggest that a former natural disperser like a forest bird species may be reduced in number or no longer in this area.

Despite the low number of natural populations on private lands reported by Ventosa (1997, 2007), recent assessments have led to the identification of new populations of *T. triacantha* outside the Guánica Commonwealth Forest. This may indicate bias on previous sampling efforts. On the other hand, the number of *T. triacantha* populations found within the Guánica Commonwealth Forest is probably due to the extensive botanical and ecological studies that have been conducted within the boundaries of the forest. It also highlights the importance of surveying further areas that harbors suitable habitat for the species from Ponce to Cabo Rojo. Searching these areas is critical as some of them are actually adjacent to recently discovered populations of *T. triacantha* and have been proposed for urban and tourism developments. It is unknown if these recently found small populations contain genotypes that are not found in Guánica or may be part of a bigger population that has not been identified.

In Peñuelas, *T. triacantha* is found in an area that is currently under pressure for urban development. In 2007, Service biologist Omar Monsegur (pers. obs.) as part of a study for the status of *Cordia rupicola*, reported a new population of *T. triacantha* on a drainage area located at El Peñón de Ponce, which is adjacent to a residential development called "Urbanización El Peñón". In 2007, Monsegur and Breckon (2007) reported that one individual of *Cordia rupicola* on this area was extirpated by the construction of a staging area for the improvement of the Puerto Rico Highway Num. 2. According to the authors, the vegetation was removed and the area was bulldozed, apparently to control run-off from the ravine. It is unknown if the individuals of *T. triacantha* were affected by the vegetation clearing. Future development projects are proposed for the surrounding areas threatening this population, making it more isolated, and possibly eliminating its connectivity with adjacent populations (genetic flow).

In Yauco, the species occurs within a private property (Finca Catala) that may be subject to urban or agricultural development (Carlos Pacheco, Service, pers. comm., 2011). Urban development has encroached remnants of native dry forest areas in Yauco, resulting in the isolation or disjunction of rare plant populations, hence, reducing suitable habitat for the species. The area is also threatened by deforestation for agricultural practices such as cattle

and for the extraction of live fence posts (Alcides Morales, pers. comm., Sociedad Ornitologica Puertorriqueña, Inc., 2011).

Based on the above discussion, the present or threatened destruction, modification, or curtailment of the species habitat or range is a current threat to the species. Since the majority of the known populations are affected by habitat destruction or modification, we consider this threat as high in magnitude and imminent.

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

Taking for these purposes was not documented as a factor in the decline of the species in the final listing rule. The species is an attractive small tree and might have some cultivation potential, but based on available information; we have no evidence that *T. triacantha* is used for such purposes. Furthermore, there is no evidence that it has been affected by overutilization for scientific, recreational, or educational purposes. Therefore, we continue to consider that the species is not threatened by this factor.

**(c) Disease or predation:**

At the time of listing, disease or predation was not considered a threat to the species. Based on the best available information, we continue to consider that the species is not threatened by this factor.

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

The Commonwealth of Puerto Rico 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 others. This law has provisions that protect habitat of this endangered plant. In 2004, the Puerto Rico Department of Natural and Environmental Resources (PRDNER) approved the "Reglamento para Regir el Manejo de las Especies Vulnerables y en Peligro de Extinción en el Estado Libre Asociado de Puerto Rico" (Regulation 6766 to regulate the management of threatened and endangered species in Puerto Rico). Bariaco has been included in the list of protected species and designated as endangered under Regulation 6766. Under Article 2.06, this

regulation prohibits collecting, cutting, removing, among other activities, listed plant individuals within the jurisdiction of Puerto Rico. Based on the presence of Commonwealth laws and regulations protecting *T. triacantha*, we believe that the inadequacy of existing regulatory mechanisms should no longer be considered a threat to this species. However, it is important to note that enforcement on private lands continues to be a challenge as accidental damage or extirpation of individuals has occurred due to lack of knowledge of the species by private land owners.

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

In the Caribbean, native plant species, particularly endemics with limited distribution, may be vulnerable to natural or anthropogenic events such as hurricanes and human-induced fires.

Human-Induced Fires. Fire is not a natural event in subtropical dry or moist forest in Puerto Rico and the U. S. Virgin Islands. Thus, most species found in this type of forest are not fire-adapted. Human induced fires may lead to destruction of the native vegetation seed bank and may create conditions favorable for the establishment of exotic plant species (e.g., *Leucaena leucocephala* and *Megathyrsus maximus*) that may outcompete *T. triacantha*. The *T. triacantha* populations that occur between Peñuelas and Ponce may be susceptible to forest fires, particularly on private lands where fire could be accidentally or deliberately ignited. Evidence of recent fires in the habitat and adjacent to known populations have been observed recently at Ponce (Omar A. Monsegur, Service, pers. obs. 2011). However, there is no direct evidence of fires affecting these populations. Furthermore, the core of the populations and individuals lies within the Guánica Commonwealth Forest. This protected area has an active fire control program and recent evidence of fire has frequently been seen in the coastal portions of the Guánica Commonwealth Forest (Omar A. Monsegur, Service, pers. obs. 2011).

Hurricanes and Climate Change.

Hurricanes and tropical storms frequently affect the islands of the Caribbean. As a species endemic to the central Caribbean, and with a wide distribution in Puerto Rico, *T. triacantha* should be well adapted to tropical storms. Hence, cumulative effects of severe tropical storms may jeopardize small relict populations. *Trichilia triacantha* may be threatened by climate change to some extent, which is predicted to increase the frequency and strength of

tropical storms. In addition, the possibility of severe droughts may contribute to an increase in the quantity and frequency of fires on the southern coast of Puerto Rico.

Since the population dynamics of this species are poorly known and we do not have enough information to determine what constitutes a viable population, we believe that the impacts discussed above could be detrimental to the species as a whole. However, based on current information and since the majority of the known populations' lie within a protected area, we consider fires, hurricanes and climate change as a low and non imminent threat to the species.

## 3. Synthesis

Bariaco was listed as an endangered species on February 5, 1988. In this status review we found that the known natural populations of Bariaco have expanded, and natural populations now extend east to the municipality of Ponce, Puerto Rico. The species is currently known from about 15 populations: ten populations described by Ventosa (2007) (seven within Guánica Commonwealth Forest and the other three in Cabo Rojo, Sabana Grande and Yauco); "Trichilia Creek" in the Guánica Commonwealth Forest, and about four other sites from Yauco to Ponce. The current number of individuals is estimated at 162 plants (not including seedlings).

Although the species has expanded its range and the number of natural individuals, the plant is threatened by urban and tourism development. Despite the increase in the number of populations and the finding of a new population with an outstanding number of individuals and apparently natural recruitment, down listing criteria have not been met and an evaluation of all currently known populations and the threats of those populations is required in order to proceed with a change in classification.

Furthermore, originally it was assumed that the majority of the populations were restricted to the Guánica Commonwealth Forest. However, the current information indicates that it occurs from Guánica to Ponce, and this particular habitat is seriously threatened by urban development. Based on the new information we can infer that the species was more widespread and common within the dry forests of Puerto Rico, and that the current populations within the Guánica Commonwealth Forest are relicts of the original genetic diversity of the species. Therefore, protection of populations outside the Guánica Commonwealth Forest should be a priority. The Recovery Plan should emphasize the importance of identifying, surveying and protecting the potential habitat. The plan should also include determining the possible adverse effects of other threats like invasive exotic species and global warming to this species.

The recovery plan establishes that the species can be considered for delisting when the known populations at Punta Guaniquilla are placed under protective status, and at least three new populations capable of self-perpetuation have been established within protected units such as Puerto Rico Conservation Trust property or Commonwealth Forests. None of these have been accomplished.

An analysis of the five listing factors was conducted based on available information. The species is currently threatened by habitat destruction and modification. Despite the increase in the number of known populations, this area is threatened by activities conducted at rock quarries and the development of housing projects. The inadequacy of existing regulatory mechanisms is no longer considered a threat to the species. However, we consider that the species is also threatened by factor E. Since the population dynamics of the species is unknown and we do not have enough information to determine what constitutes a viable population, we understand that the effects of severe tropical storms, human induced fires and climate change could be detrimental to some populations as it may kill the few trees that are reproducing. Therefore, we believe this plant continues to meet the definition of an endangered species.

## III. RESULTS

**A. Recommended Classification:**
**__X__ No, no change is needed.**

**B. New Recovery Priority Number**: 5

**Rationale**: The original recovery priority number identified a moderate degree of threat because the number of populations at the time of listing were primarily within the Guánica Forest. Despite the number of new populations, the majority of the suitable habitat for the species lies within private lands subject to urban development. The fact that the majority of the populations lie within the Guánica Forest is due to the high rate of research and botanical exploration within forest boundaries. However, there is little ecological or botanical exploration outside the Guánica Forest and the prime habitat for the species may remain unprotected. These areas are subject to urban development and the inability to protect these areas may compromise the recovery potential of the species.

Furthermore, this change is based on observations there is almost no recruitment and seed dispersal of the species within most of the known populations. The only healthy population is the Trichilia Creek, which contains different size classes and natural recruitment is evident (despite lack of dispersal).

## IV. RECOMMENDATIONS FOR FUTURE ACTION

1. The recovery of the species should focus on the protection of the known populations and its suitable habitat. Conservation Agreements should be signed between the Service and private landowners to protect natural populations.

2. The populations that are actively reproducing need to be identified and monitored to collect seed material for propagation purposes. A protocol to collect seed should be created and implemented to avoid altering the natural recruitment of the species.

3. The recently discovered populations should be visited, and monitored on a regular basis; additional visits should be made after hurricanes, fires, or other major disturbances to determine their impacts on the populations.

4. The recovery plan should be revised to establish measurable criteria, including how many individuals constitute a self-sustainable population and how many populations would be needed to delist the species.

5. Studies should be conducted to determine the patterns of genetic variation within and among populations, in order to develop a plan to preserve the species germplasm.

## V. REFERENCES:


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**U.S. FISH AND WILDLIFE SERVICE**
**5-YEAR REVIEW of Bariaco (*Trichilia triacantha*)**

Current Classification: Endangered

Recommendation resulting from the 5-Year Review:

__X__ No change is needed

Review Conducted By: Omar A. Monsegur, Caribbean Ecological Service Field Office, Boqueron, Puerto Rico

**FIELD OFFICE APPROVAL:**

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

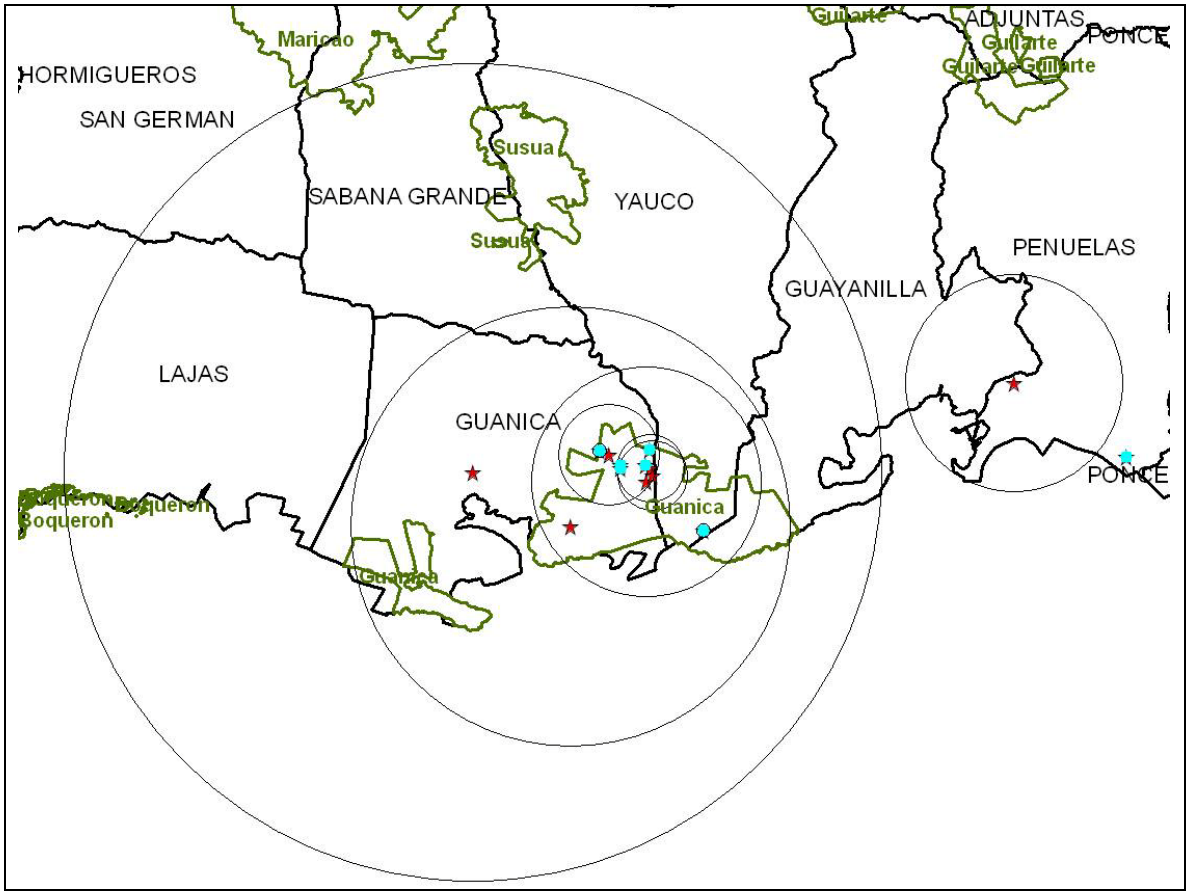
Approve: Edwin Muñiz Date: 7/24/2012

**REGIONAL OFFICE APPROVAL:**

Lead Regional Director, Fish and Wildlife Service

for Approve: Date: 8/21/12

**Appendix I.**




Point-circle representations of specimen localities and their uncertainties for the specimens included in Figure 1 (above in this review). Circles of very small uncertainties (< 300 m) are highlighted in light blue because their uncertainty circles are too small to be seen at this scale. State forests are shown in green.