Bariaco (*Trichilia triacantha*) Recovery Plan
U.S. Fish and Wildlife Service (USFWS). 1991. Bariaco (*Trichilia triacantha*) recovery plan. Atlanta, GA. 21 pp.

Original Approved: 1991
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AMENDMENT 1

We have identified best available information that indicates the need to amend recovery criteria for the endangered shrub *Trichilia triacantha* (bariaco) since the recovery plan was completed. In this modification, we synthesize the currently available information, identify amended recovery criteria, and provide the rationale supporting the recovery plan modification. The modification is shown as an addendum that supplements the recovery plan (USFWS 1991), superseding only Part II A page 7 of the recovery plan. Recovery plans are a non-regulatory document that provides guidance on how best to help recover the species.

For
U.S. Fish and Wildlife Service
Atlanta, Georgia

Approved: _____
Acting **Regional Director, U.S. Fish and Wildlife Service**

Date: 9/24/19

METHODOLOGY USED TO COMPLETE THE RECOVERY PLAN AMENDMENT

The amendments to the recovery criteria were developed using the 2017 5-year review and the most recent studies on bariaco. This information was synthesized by U.S. Fish and Wildlife Service (Service) biologists and managers in the Caribbean Ecological Services Field Office (CESFO) in order to develop the delisting criteria for bariaco.

ADEQUACY OF RECOVERY CRITERIA

Section 4(f)(1)(B)(ii) of the Endangered Species Act (Act) requires that each recovery plan shall incorporate, to the maximum extent practicable, "objective, measurable criteria which, when met, would result in a determination…that the species be removed from the list." Legal challenges to recovery plans (see Fund for Animals v. Babbitt, 903 F. Supp. 96 (D.D.C. 1995)) and a Government Accountability Audit (GAO 2006) also have affirmed the need to frame recovery criteria in terms of threats assessed under the five listing factors.

Recovery Criteria

See previous version of criteria in Bariaco (*Trichilia triacantha*) Recovery Plan on page 7.

Synthesis

At present, there are 7 known populations of bariaco: Punta Guaniquilla, Sierra Bermeja, Guánica Commonwealth Forest (GCF), Montes de Barinas, Sabana Grande, Guayanilla and Ponce-Peñuelas, all located in southern Puerto Rico. The most recent information on the distribution and habitat characteristics of bariaco was presented by Ventosa (2007). According to the available information, the number of known individuals of bariaco is estimated at 163 (not including seedlings) in 16 localities or subpopulations (USFWS 2017; Ventosa 2007). This information includes a recently located population within the boundaries of the Laguna Cartagena National Wildlife Refuge (Morales-Pérez 2013).

Chinea and Kolterman (2010) assessed some of the populations surveyed by Ventosa (1997) and found that individuals had one to four main stems that ranged from 1.0 to 5.8 m (3.3 to 19 feet) in height, and from 0.72 to 100.91 cm^2 (0.28 to 39.73 square inches) in basal area. We do not have empirical data on the genetic variability of bariaco. However, the species occurs in a wide range of habitats and environmental conditions, suggesting ample genetic plasticity.

Although the current distribution and number of individuals of bariaco have increased since its listing, the plant remains threatened by development (Factor A). The current information indicates that additional populations extend east to the municipalities of Peñuelas and Ponce, an area particularly threatened by development (USFWS 2017). In 2007, Service biologist Omar Monsegur (pers. obs.) reported a new population of bariaco on a drainage area located at El Peñón de Ponce, which is adjacent to a residential development (USFWS 2017). At Montes de Barinas in the municipality of Yauco, the species occurs within a private property threatened by the development pressures due to urbanization (Pacheco, 2011, pers. comm.). This area also is threatened by deforestation due to agricultural activities and forestry practices (Morales-Perez, 2011, pers. comm.).

Based on the available information, bariaco was once more widespread and common within the dry forests of Puerto Rico, the current populations within the GCF and other areas are remnants of the species. Therefore, protection of populations outside the GCF should be a recovery priority. We further consider that the species is threatened by severe tropical storms, climate change, and habitat intrusion by exotics and human-induced fires (Factor E).

AMENDED RECOVERY CRITERIA

Recovery criteria serve as objective, measurable guidelines to assist in determining when an endangered species has recovered to the point that it may be downlisted to threatened, or that the protections afforded by the Act are no longer necessary and the bariaco may be delisted. Delisting is the removal of a species from the Federal Lists of Endangered and Threatened Wildlife and Plants. Downlisting is the reclassification of a species from endangered to threatened. The term "endangered species" means any species (species, sub-species, or DPS)

which is in danger of extinction throughout all or a significant portion of its range. The term "threatened species" means any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Revisions to the Lists, including delisting or downlisting a species, must reflect determinations made in accordance with sections 4(a)(1) and 4(b) of the Act. Section 4(a)(1) requires that the Secretary determine whether a species is an endangered species or threatened species (or not) because of threats to the species. Section 4(b) of the Act requires that the determination be made "solely on the basis of the best scientific and commercial data available." Thus, while recovery plans provide important guidance to the Service, States, and other partners on methods of minimizing threats to listed species and measurable objectives against which to measure progress towards recovery, they are guidance and not regulatory documents.

Recovery criteria should help indicate when we would anticipate that an analysis of the species' status under section 4(a)(1) would result in a determination that the species is no longer an endangered species or threatened species. A decision to revise the status of or remove a species from the Federal Lists of Endangered and Threatened Wildlife and Plants, however, is ultimately based on an analysis of the best scientific and commercial data then available, regardless of whether that information differs from the recovery plan. When changing the status of a species, we first propose the action in the *Federal Register* to seek public comment and peer review, followed by a final decision announced in the *Federal Register*.

We provide new delisting criteria for bariaco, which will supersede those included in its Recovery Plan. The recovery criteria presented below represent our best assessment of the conditions that would most likely result in a determination that delisting of bariaco warranted as the outcome of a formal five-factor analysis in a subsequent regulatory rulemaking. Achieving the prescribed recovery criteria is an indication that the species is no longer threatened or endangered, but this must be confirmed by a thorough analysis of the five factors.

Amended Delisting Recovery Criteria:

The amended delisting criteria for bariaco are as follows:

1. Five (5) of the existing natural populations show a stable or increasing trend, evidenced by natural recruitment and multiple age classes, and four (4) of these population must occur on lands protected via a conservation mechanism (addresses Factor A and E).

2. At least three (3) new populations containing genetic representation from Montes de Barinas, Guayanilla and Ponce-Peñuelas are established or discovered on lands protected via a conservation mechanism, and these populations show a stable or increasing trend, evidenced by natural recruitment and multiple age classes (addresses Factors A and E).

3. Threat reduction and management activities have been implemented to a degree that the species will remain viable into the foreseeable future (addresses Factor A and E).

Rationale for Recovery Criteria

The principal threats affecting bariaco are habitat destruction and modification due to activities such as rock quarries, urban development, and agriculture (Factor A). Additional threats include the dynamics of small populations, severe tropical storms, human-induced fires, and climate change (Factor E). The recovery criteria reflect the best available and most up-to date information on the biology, distribution, and habitat of bariaco. The currently known populations of bariaco, with the exception of the GCF population, have a relatively low number of individuals and little recruitment (USFWS 2017). Thus, we are using the GCF population as a reference of a healthy and self-sustaining population whose population's parameters should be replicated at other natural populations to recover the species. In order to maintain the genetic integrity of the species, and to provide adequate representation throughout the species range, the recovery criteria have been designed to protect and manage the known populations, enhance or augment the number of individuals on those populations and to establish new self-sustaining populations to ensure long-term viability of the species.

Our recovery approach is to protect four (4) natural viable populations of bariaco occurring in private lands in the following areas: Montes de Barinas, Sabana Grande, Guayanilla and Ponce-Peñuelas, through long-term conservation mechanisms (e.g., land acquisition, conservation easements and conservation agreements). These geographically distinct areas harbor populations of bariaco that might be genetically different based on substrate and environmental conditions, and thus, their conservation will help improve the resiliency, redundancy and representation of the species. In addition, these areas still harbor a substantial amount of native dry forest. In fact, some of these areas (e.g., Ponce-Peñuelas) are considered remnants of pristine habitat, and thus, may harbor unidentified populations of bariaco, providing microhabitat conditions necessary for the germination and establishment of seedlings (natural recruitment). In addition, the extensive stands of native forest provides a buffer area that precludes habitat intrusion by exotic plants and reduces the risk of human-induced fires because of the absence of exotic grasses that serve as fuel for fires.

The approach of establishing or discovering at least three (3) new populations on lands managed for conservation aims to perpetuate the genetic representation of populations that occur on private lands and whose habitat is severely fragmented or vulnerable to urban or tourism development. Lands managed for conservation where new populations of bariaco can be established may include Cartagena Lagoon National Wildlife Refuge and Punta Guaniquilla, El Conuco, Salinas Fortuna, and El Convento, which are managed by *Para la Naturaleza, Inc.* (PLN).

ADDITIONAL SITE SPECIFIC RECOVERY ACTIONS.

A protocol for the propagation and reintroduction of bariaco should be developed in collaboration with partners. The protocol should address the feasibility of seed banking, and if deemed necessary, seed material should be storage at the Millennium Seed Bank (KEW) and USDA National Laboratory for Genetic Resources Preservation (NLGRP). Studies on the species genetics should be conducted to determined patterns of genetic diversity, and to provide baseline information for sound management of the species.

Due to the low number of populations and individuals, along with the little evidence of natural recruitment and limited dispersal, the reproductive biology and ecology of bariaco should be determined. In particular, the factors limiting seed dispersal and seedling recruitment should be studied. This should include the establishment of a long-term monitoring program (including permanent parcels) to document seedling recruitment and survival, and the conditions necessary for their establishment.

Due to the quality of the habitat, surveys of the Ponce-Peñuelas, Guayanilla, and Montes de Barinas should be conducted in order to identify potential new populations of bariaco.

LITERATURE CITED

Morales-Pérez A. 2013. Mapping of Six Federally Endangered Listed Plants and Surveying the Population Status of *Eugenia woodburyana* at La Tinaja, Laguna Cartagena National Wildlife Refuge. Lajas, Puerto Rico. Under USFWS contract F13PX00848. 20 pp.

U.S. Fish and Wildlife Service (USFWS). 1991. Bariaco (*Trichilia triacantha*) recovery plan. Atlanta, GA. 21 pp.

U.S. Fish and Wildlife Service (USFWS). 2014. Final Rule. Endangered and threatened wildlife and plants; Designation of Critical Habitat for *Agave eggersiana, Gonocalyx concolor* and *Varronia rupicola*. Final rule.

U.S. Fish and Wildlife Service (USFWS). 2017. Bariaco (*Trichilia triacantha*) five-year review: summary and evaluation: Addendum to 2012 five-year review. US Fish & Wildlife Service Southeast Region Caribbean Ecological Services Field Office, Boquerón, Puerto Rico.

Ventosa F., E.A. 1997. Ecology and reproductive biology of *Trichilia triacantha* Urb. (Meliaceae). Masters thesis, University of Puerto Rico, Mayagüez Campus. 131 pp.

Ventosa F., E.A. 2007. Distribution and habitat characteristics of *Trichilia triacantha* (Meliaceae) in Puerto Rico. Endangered Species Research 3: 267-271.