

**Recovery Plan for Beautiful Pawpaw (*Deeringothamnus pulchellus*)**

<https://www.fws.gov/verobeach/MSRPPDFs/Beautiful.PDF>

**Current Plan Approved:** May 18, 1999

**Current Plan Prepared by:** South Florida Ecological Services Office staff

**AMENDMENT 1**

We have identified the best available information that indicates the need to amend recovery criteria for *Deeringothamnus pulchellus* (beautiful pawpaw) since the recovery plan was completed. In this modification, we synthesize the adequacy of the existing recovery criteria, show amended recovery criteria, and provide the rationale supporting the recovery plan modification. The modification will be shown as an addendum that supplements the South Florida Multi-Species Recovery Plan (MSRP; U.S. Fish and Wildlife Service [Service] 1999), superseding only the recovery criteria on page 4-959. Recovery plans are a non-regulatory document that provide guidance on how best to help recover species.

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

Approved: Franklin J. Arnold  
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 are based on recent studies of the species, information contained in the 2009 5-year review (Service 2009), and data managed by the Florida Natural Areas Inventory (FNAI). These were discussed with U.S. Fish and Wildlife Service (Service) biologists and managers in the South Florida Ecological Services Field Office in order to develop delisting criteria for the beautiful pawpaw.

**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

The MSRP only provides downlisting criteria, and they can be found on page 4-959 (<https://www.fws.gov/verobeach/MSRPPDFs/Beautiful.PDF>).

## Synthesis

The beautiful pawpaw is a low-growing, diminutive, flowering shrub of the Annonaceae family, rarely exceeding 0.5 meters (m) (1.6 feet (ft)) in height. The stems may be annual or perennial and arise from a stout taproot that averages 32.5 centimeters (cm) (12.8 inches (in)) long and is about 2.5 cm (.98 in) wide at its widest point.

Research on the beautiful pawpaw has been conducted in the areas of phenology, pollination, reproductive structures, breeding system, germination, and hybridization (Norman 2003). Available information suggests that this species has poor fertilization, seed-setting, germination, and recruitment rates. Pollinators for this species are few, but those noted are a tumbling beetle (*Mordella atrata*) and two species of thrips (*Frankliniella bispinosa* and *Thrips hawaiiensis*) (Norman 2003). The reproductive biology of the species is not thoroughly understood, but the plant is thought to reproduce entirely by seed. Gopher tortoises (*Gopherus polyphemus*) may be an important seed disperser. On Pine Island, Lee County, Florida, plants begin flowering by mid-March and are at the peak of flowering the last week of April. Likewise, flowering was observed in Orange County, Florida in mid-March and lasted for 6 weeks (Norman 2003). Fruit is likely produced and dispersed during the summer.

Beautiful pawpaw occurs in pine flatwood habitat, which require prescribed fire and active land management practices to ensure successful conservation and recovery of the pawpaw. The species does not persist where it must compete for light with tall grasses and larger shrubs. Habitat management is typically needed to reduce competition, especially from exotic plant species (Factor E) (Service 1999). Fire suppression and lack of management has led to the overgrowth and degradation of habitat (Factor A). Beautiful pawpaw depends on fires to limit competition with larger grasses and shrubs. The species takes advantage of fire-created openings by flowering and setting fruit the first growing season after a fire.

Surveys have indicated that the beautiful pawpaw occurs throughout its historical range, but the species range is now fragmented, with populations occurring primarily in two disjunct areas - in Lee and Charlotte Counties on Florida's Gulf Coast, and Orange County to the northeast (FNAI 2008). Based on the most comprehensive data available, the total number of beautiful pawpaw last estimated was approximately 5,000 plants (FNAI 2008). The population sizes ranged from 1 to 2 plants on some sites to over 1,000 individuals on 3 sites (FNAI 2008). Nearly one-third of the occurrences were comprised of 15 or fewer plants (FNAI 2008). Small populations tend to lack genetic diversity and may not be self-sustaining over time (Ellstrand and Elam 1993). They may also be more vulnerable to stochastic events but are very important to the recovery of the species. Currently, there are 39 populations of the species reported in Charlotte, Lee, and Orange Counties (FNAI 2015). Approximately 59 percent of the populations are on public or managed lands and

41 percent are on private lands (FNAI 2015).

## **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 beautiful pawpaw 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 are providing delisting criteria for the beautiful pawpaw, which will supersede those downlisting criteria included in the MSRP.

### **Delisting Recovery Criteria**

Beautiful pawpaw will be considered for delisting when:

1. At least 30 populations exhibit a stable or increasing trend, evidenced by natural recruitment and multiple age classes. (Factor A)
2. Populations (as defined in criterion 1) occur in pine flatwoods habitat distributed across the historical range of the species in order to maintain and enhance the species geographic patterns of genetic diversity. (Factor A)

3. Populations (as defined in criterion 1) must be protected via a conservation mechanism and managed such that enough suitable habitat is present for the species to remain viable for the foreseeable future. (Factors A, E)

### **Justification**

The recovery criteria reflect the best available and most up-to date information on the biology of the species and its habitat. The principal threats when this species was listed as endangered in 1985 (50 FR 45634) were present or threatened destruction, modification or curtailment of its habitat or range (Factor A) and other natural or manmade factors affecting its continued existence (Factor E). Information regarding the threats associated with each factor are detailed in the most recent 5-year review (Service 2009). The beautiful pawpaw continues to be threatened with extinction from habitat loss due to agricultural, residential, and commercial conversion of land. The exclusion of fire is also responsible for habitat degradation throughout much of the species' range. Where plants occur on private sites, development has led to both direct destruction of habitat as a result of land clearing and habitat degradation from lack of management. Lack of management is also a concern on protected sites. The survival and recovery of beautiful pawpaw requires that additional habitat be protected and managed (Service 1999). Therefore, recovery criteria are focused on actions that address the threats associated with Factors A and E, ensuring the species is no longer vulnerable to habitat loss or degradation by protecting and managing enough resilient populations within the historical range of the species.

Achievement of Criteria 1, 2, and 3 will ensure that at least 30 robust populations are adequately protected and sufficiently managed to maintain and/or increase population resiliency, redundancy, and representation throughout the current range. Narrow ranging endemic species that re-sprout from root-stocks following regular natural disturbances such as fire, rather than relying solely on regeneration from the soil seed bank, and/or are long-lived are less vulnerable to extirpation by stochastic events and demographic fluctuations, such that populations numbering in hundreds of plants are resilient. Nearly 60 percent of known occurrences are on public lands. If managed properly, all existing public lands and lands proposed for public acquisition that contained beautiful pawpaw would probably be sufficient to ensure the persistence of the species (Service 1999). However, many of these occurrences, as well as occurrences on private lands, are declining due to lack of management. Implementing species- specific habitat management plans could improve habitat conditions so that populations are no longer declining due to habitat degradation and are instead stable or increasing. Because the species is thought to be long-lived, reproductive success is not critical every year and recruitment is low (Service 1999); therefore, population trends may take several years to emerge.

The species' limited distribution and its limited reproductive capacity also renders it vulnerable to random natural events, such as hurricanes and drought. However, beautiful pawpaw populations did not experience damage when Hurricane Charley crossed the northwest portion of the species' range in Lee and Charlotte Counties in 2004 (Woodmansee and Barry 2007). During this hurricane, storm surge did not impact the occurrences but could in cases where storm surge is greater. There is currently beautiful pawpaw representation in each of the three counties

identified within the historical range of the species. Achievement of these recovery criteria will provide enough robust populations across the historical range to ensure sufficient species resiliency, representation, and redundancy.

### **Rationale for Amended Recovery Criteria**

The existing criteria for beautiful pawpaw on page 4-959 in the MSRP (Service 1999) (<https://www.fws.gov/verobeach/MSRPPDFs/Beautiful.PDF>) included only downlisting criteria. With these amendments, delisting has been clearly defined with measurable, objective criteria in keeping with the recovery strategy and goals outlined in the MSRP. These criteria address what is necessary to ensure resiliency, redundancy, and representation by addressing factors that threaten the species. In achieving these criteria, we expect the beautiful pawpaw to have a low probability of extinction for the foreseeable future and have robust, stable populations needed for long-term recovery. We will work together with our partners to strategically and efficiently implement the new criteria.

### **LITERATURE CITED**

- Ellstrand, N.C., and D.R. Elam. 1993. Population genetic consequences of small population size: implications for plant conservation. *Annual Review of Ecology and Systematics* 24: 217-242.
- Florida Natural Areas Inventory. 2008. Unpublished element occurrence point data. Submitted to the U.S. Fish and Wildlife Service. Vero Beach, Florida.
- Florida Natural Areas Inventory. 2011. Unpublished element occurrence point data. Submitted to the U.S. Fish and Wildlife Service. Vero Beach, Florida.
- Florida Natural Areas Inventory (FNAI). 2015. FNAI – Element Tracking Summary. Florida Natural Areas Inventory; Tallahassee, FL.
- Norman, E.M. 2003. Reproductive biology of *Deeringothamnus rugelii* and *D. pulchellus* (Annonaceae). *Taxon* 52: 547-555.
- U.S. Fish and Wildlife Service. 1999. South Florida multi-species recovery plan. U.S. Fish and Wildlife Service, Vero Beach, Florida.  
<https://www.fws.gov/verobeach/ListedSpeciesMSRP.html>
- U.S. Fish and Wildlife Service. 2009. Beautiful pawpaw (*Deeringothamnus pulchellus*) 5-Year Review: Summary and Evaluation. U.S. Fish and Wildlife Service, Atlanta, Georgia.  
[https://ecos.fws.gov/docs/five\\_year\\_review/doc2588.pdf](https://ecos.fws.gov/docs/five_year_review/doc2588.pdf)
- Woodmansee, S.W., and M.J. Barry. 2007. Post-hurricane field assessment of beautiful false pawpaw (*Deeringothamnus pulchellus* Small). Pages 5-31 in S.W. Woodmansee, M.J. Barry, K.A. Bradley, S.E. Green, and J.M. Mahoney. Post-hurricane field assessments of six

federally endangered and candidate plant species. Final report to the U.S. Fish and Wildlife Service. Vero Beach, Florida.