

**Green pitcher plant
(*Sarracenia oreophila*)**

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

Addendum 1 – September 2020



**U.S. Fish and Wildlife Service
South Atlantic–Gulf and Mississippi Basin Integrated Regions
Southeast Legacy Region
Mississippi Field Office
Jackson, Mississippi**

U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW OF Green Pitcher Plant
(*Sarracenia oreophila*)

Addendum 1. Summary of new information obtained since the 2014 5-year review.

The *Federal Register* notice announcing the initiation of this 5-year review was published on June 20, 2019 (84 FR 28850).

I. GENERAL INFORMATION

There are limited updates to this section since completion of the 2014 5-year review (U.S. Fish and Wildlife Service [Service] 2014; available online at https://ecos.fws.gov/docs/five_year_review/doc4366.pdf). Updated information is presented below.

B. Reviewers

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C. Background

2. Species status: Decreasing.

II. REVIEW ANALYSIS

C. Updated Information and Current Species Status

1. Biology and Habitat

Information on abundance, population trends, distribution, biology, ecology, and habitat were summarized in the 2014 5-year review. New information is summarized below.

a. New information on the species' biology and life history:

Recent studies have focused on various aspects of arthropod (Stephens 2017; Folkerts and Tjelmeland 2019) and microbial associates (Stephens 2017) of green pitcher plant and other pitcher plant species in the southeastern United States. Folkerts and Tjelmeland (2019) studied associations between green pitcher plant and other pitcher plant species with various arthropods, including the pitcher plant moth (*Exyra semicrocea*), an obligate pitcher plant associate. Folkerts and Tjelmeland (2019) did not find *E. semicrocea* or various other previously common fly associates during surveys of four green pitcher plant sites. Furthermore, only two species of mites were

regularly found in green pitcher plants during surveys. These observations suggest that current prescribed fire management regimes that promote winter fires may be linked with the observed pitcher plant associate arthropod declines. The authors suggested that arthropod communities associated with green pitcher plants may be best maintained and managed by focusing on summer prescribed fires over winter fires and that fires be conducted in such a manner as to leave unburned patches within larger burned areas. Furthermore, only two species of mites were regularly found in green pitcher plants during surveys. Garden plot studies by Stephens (2017) focused on prey captured by and microbial communities within pitchers of green pitcher plant and other pitcher plant species. Conducted in an outdoor garden in Gainesville, Georgia, these studies found that green pitcher plants captured comparatively more flying insects than crawling insects, likely due to the species' overall stature and pitcher size. Stephens (2017) also characterized the bacterial and microbial eukaryote communities (together, the microbiome community) across a suite of pitcher plant species, noting that these microbiome communities differed by host pitcher plant species, but did not discuss potential implications for green pitcher plant.

b. Abundance, population trends, demographic features, or demographic trends:

Populations

Based on the provisional population definition presented in the 2014 5-year review (i.e., populations are considered distinct when plants are separated from their nearest neighbors by at least 1 mile), there are currently 13 extant, natural populations known, which has declined from 15 in 2014 (Service 2014). Currently, eight populations or portions of populations are found on public or non-governmental conservation lands and, as such, these populations receive enhanced protections and conservation considerations. These conservation lands populations include, two on DeSoto State Park (DSP; Alabama), three on Little River Canyon National Preserve (LRCNP; Alabama), and three on The Nature Conservancy preserves (TNC; Alabama, Georgia, and North Carolina). Several sites in Alabama also continue to receive some conservation considerations under voluntary conservation agreements with the Service.

Some green pitcher plant element occurrences have been updated in State Natural Heritage Program databases since completion of the 2014 5-year review (e.g., North Carolina Natural Heritage Program [NCNHP] 2019). Updated state summaries are provided for Alabama and North Carolina, below. No new information is available for Georgia's population.

Alabama

Green pitcher plants on public lands in Alabama continue to represent some of the best populations in the state. However, recent surveys of streambank sites along the Little River in the LRCNP failed to relocate all but two known sites (Zach Irick, pers. comms., 2020a, b), which, together, represent only one streambank population within the preserve. Repeated intense flooding events of the Little River in recent years has likely contributed to the local extirpation of these sites (Irick, pers. comm., 2020b;

Mary Shew, pers. comm., 2020), but other factors, such as long-term encroachment of competing plants, may have also played a role. Continued monitoring and surveys of other potentially suitable streambank habitats within LRCNP are needed. While the streambank sites have suffered severe losses in recent years at LRCNP, upland “bog” sites are being monitored (cf. Irick, pers. comm., 2020a) and are apparently stable, generally benefitting from periodic prescribed fires and hand thinning of competing vegetation (Shew, pers. comm., 2020). Drought stress followed by pine beetle-caused tree mortality may have unexpectedly benefitted the upland sites at LRCNP by opening up the overstory and allowing increased light to reach the ground layer where green pitcher plants are found (Shew, pers. comm., 2020). Indeed, recent searches have continued to expand known locations within LRCNP’s largest upland population (M.S. Wiggers, U.S. Fish and Wildlife Service, personal observations, 21-23 April 2015; Shew, pers. comm., 2015; Irick, pers. comm., 2019). Due to the loss of most known streambank sites within the preserve, LRCNP is now home to only three known populations. Green pitcher plant continues to be represented on LRCNP’s state-managed neighbor, DSP The Alabama Plant Conservation Alliance has been assisting staff at DSP to manage and monitor the park’s populations, and have also begun augmenting the park’s natural populations (see “Transplanting and Population Establishment” for more information) (Thompson 2018; Patrick Thompson, pers. comm., 2020).

TNC, with support from the Service, continues to provide management, monitoring, and landowner relations for most of the known extant green pitcher plant sites on private lands (including TNC-owned preserves) in Alabama (e.g., Byrd 2019). While many private landowners are supportive of green pitcher plant conservation on their lands, lack of landowner cooperation continues to present a conservation challenge for other privately owned populations (Byrd 2019). TNC’s management efforts with cooperative landowners and Service support have promoted the continued survival of green pitcher plants on private lands. However, despite active management, including prescribed fire, plants at one TNC preserve continue to struggle. It is unclear why this population is struggling to survive and more investigation is needed.

North Carolina

North Carolina’s one remaining extant population occurs on a TNC preserve and has remained generally stable over the past two decades, with over 300 clumps of green pitcher plants (NCNHP 2019). Furthermore, NCNHP (2019) assigned TNC’s green pitcher plant population an “A” rank (excellent condition), although the species as a whole within North Carolina has been assigned a state status of “S1” (critically imperiled; Robinson 2018).

c. Genetics, genetic variation, or trends in genetic variation:

Studies have continued to build on and refine phylogenetic work described in the 2014 5-year review (Stephens 2015, 2017; Stephens *et al.* 2015). This recent work has suggested that green pitcher plant may be part of a larger grouping, the “*oreophila* clade”, consisting of several sister taxa, including the Alabama canebrake

pitcher plant. These genetic analyses have also provided further insight into the biogeography of *Sarracenia* species in the Southeast.

g. Other:

Propagation and Safeguarding

A study by Khanna *et al.* (2014) was conducted to improve long-term storage and safeguarding of five southeastern United States pitcher plant species, including green pitcher plant, building on earlier work by Northcutt *et al.* (2012; discussed in the 2014 5-year review). The authors investigated the effects of cryopreservation, stratification, and scarification on seed survival and germination, noting reduced germination after cryopreservation and increased germination following stratification *vs.* scarified seeds. The authors attributed reduced germination following cryopreservation to seed coat damage during rapid cooling by liquid nitrogen.

Atlanta Botanical Garden (ABG) continues to maintain and expand the most extensive *ex situ* (off-site) safeguarding collection of green pitcher plants in cultivation (Dr. Emily Coffey, pers. comm., 2020). In addition, both Auburn University's Davis Arboretum and Huntsville Botanical Gardens maintain small safeguarding collections of green pitcher plants (Thompson 2018).

Transplanting and Population Establishment

Recently, the Alabama Plant Conservation Alliance (APCA) has made attempts to augment DeSoto State Park's (DSP) local green pitcher plant populations by undertaking experimental outplantings of juvenile plants on State lands in cooperation with the Alabama Department of Conservation and Natural Resources (ADCNR), Auburn University's Davis Arboretum, and the Huntsville Botanical Gardens. These efforts used progeny from local genotypes maintained in safeguarding collections of ABG and were supported in part by funding from the Service's section 6 grants program (Yawn and Thompson 2018; Thompson, pers. comm. 2020). Continued monitoring is needed to determine the short- and long-term success of these outplantings, and provide valuable insight to inform any future population augmentation and/or establishment projects.

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

Available information on threats was summarized in the 2014 5-year review. Updated information on applicable threats is provided below.

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

Periodic, scouring floods can help to maintain the open habitat that green pitcher plants found along streambanks need. Such events are necessary to maintain the unique plant communities found within these riverscour communities. However, powerful floods in Alabama's Little River during recent years have caused apparent losses of most known streambank sites along the river (Irick, pers. comm., 2020b;

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Shew, pers. comm., 2020), resulting in the extirpation of two populations from LRCNP (only one population, consisting of two sites, now remains along the Little River in LRCNP). Because of their periodic exposure to intense scouring flood events, streambank sites are considered naturally ephemeral (Service 2014); however, it is unknown what the long-term impacts of recent floods will have on future recruitment of green pitcher plants from extant upstream and/or upland sites.

In the absence of natural fire regimes at upland sites, green pitcher plants continue to require regular habitat management (e.g., prescribed fires and/or hand/mechanical removal of competing vegetation) to maintain suitable habitat. Without such habitat management, encroaching vegetation can quickly degrade habitat and outcompete green pitcher plants for available resources.

- b. Overutilization for commercial, recreational, scientific, or educational purposes:** Green pitcher plant populations remain the targets of illegal poaching activities, particularly in Alabama, but the overall severity of this threat has declined since the species was listed.
- d. Inadequacy of existing regulatory mechanisms:** Green pitcher plant's legal and regulatory protections remain largely unchanged; however, plants are now eligible to receive conservation funding from the Service pursuant to section 6 of the Act in Alabama. Consequently, green pitcher plant has received section 6 funding for conservation activities on State lands in Alabama.

D. Synthesis

At this time, green pitcher plant continues to meet the definition of endangered under the ESA. Since completion of the last 5-year review (available online at https://ecos.fws.gov/docs/five_year_review/doc4366.pdf), available information on the species' populations and trends indicate that the species is in an overall decline. This overall trend is driven in large part by the apparent losses of two populations within the Little River system in Alabama. As such, there are currently 13 extant populations of green pitcher plant. Continued conservation work (e.g., habitat management) has contributed to the species' continued existence throughout its historic range. However, inconsistent and unavailable monitoring of various populations increases the uncertainty associated with this assessment. Continued and improved monitoring is needed to adequately understand and assess the status, trends, and threats to green pitcher plant, particularly for populations occurring on public and conservation lands. Currently, eight populations occur at least in part on public or conservation lands, which is less than occurred on such lands at the time of the 2014 5-year review. Conservation of the remaining populations requires continued support and cooperation of private landowners, without which, these populations may decline and become extirpated. Green pitcher plant conservation efforts have been encouraged, engaged in, and/or funded by the U.S. Fish and Wildlife Service, National Park Service, TNC, universities, state Plant Conservation Alliances, and various state agencies.

III. RESULTS

- A. Recommended Classification:** No change is needed.

IV. RECOMMENDATIONS FOR FUTURE ACTION

The previous 5-year review included a list of recommendations to improve recovery of the species. Accomplishments toward these recommended actions are summarized below.

- The Service, non-government conservation organizations (e.g., TNC, APCA), State (ADCNR) and Federal (NPS) agencies, are cooperating together and with private landowners to manage existing populations. One site with green pitcher plant in Alabama has been purchased by NPS, expanding federal ownership and protections of this species.
- Prescribed fires continue to be implemented on private and publicly owned green pitcher plant populations where appropriate. The Service and partners (e.g., TNC) continue to promote and support prescribed fires on private lands.
- While prescribed fires are being implemented, no new studies have been conducted to improve prescribed fire's efficacy as a management tool.
- No new studies have been conducted to improve prescribed fire's efficacy as a management tool.
- Monitoring has continued to be conducted at various populations, including some population mapping. Attempts to relocate populations that have not been revisited in years have been made with limited success.
- Characterizing genetic diversity and representation of current *ex situ* safeguarded collections remains a need, as does expansion of *ex situ* safeguarding collections.
- Some genetics work has been conducted, but key conservation genetics questions remain, such as effective population sizes and inclusion of all known populations to genetics studies.

V. REFERENCES

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FY 2020 APPROVAL*

Lead Field Supervisor, U.S. Fish and Wildlife Service

Approve _____ Date _____

*In 2014, Southeast Region Field Supervisors were 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.