Alabama Canebrake Pitcher-Plant
(*Sarracenia rubra* ssp. *alabamensis*)

5-Year Review:
Summary and Evaluation[†]

January 2012

Photo: Wayne Barger, Alabama DCNR

U.S. Fish and Wildlife Service
Southeast Region
Mississippi Ecological Services Field Office
Jackson, Mississippi

[†]Please see Addendum 1 at the end of this, our original 5-year review document. The Addendum provides the limited new information we have gathered for our second 5-year review for this threatened plant that was initiated in the Federal Register (June 30, 2017, 82 FR 29916) and the analysis we have shared to explain the basis for continuing to recommend no change in status for this species.

5-YEAR REVIEW
Alabama canebrake pitcher plant (*Sarracenia rubra* ssp. *alabamensis*)

I. GENERAL INFORMATION

A. Methodology used to complete the review: In preparing this 5-year review, we relied on the best available information pertaining to historical and contemporary accounts on distribution, population dynamics, habitat preferences, disturbances, and potential threats of this species. We announced initiation of this review and requested information in a published *Federal Register* notice with a 60-day comment period (73 FR 43947). In an effort to acquire the most current information available, various resources were solicited, including data housed at the Alabama Natural Heritage Program, internet searches, and knowledgeable individuals associated with academia and state conservation departments. Specific sources included the final rule listing this species under the Endangered Species Act; the Recovery Plan; peer reviewed scientific publications; unpublished field observations by the U.S. Fish and Wildlife Service, state and other experienced biologists; unpublished studies and survey reports; and notes and communications from other qualified individuals. The initial draft of this review (excluding the status evaluation) was prepared by the Alabama Natural Heritage Program's botanist, Al Schotz. This initial draft was then completed by U.S. Fish and Wildlife Service (Service) lead field office staff and sent to other pertinent Service offices and three peer reviewers for their review (see Appendix A). Comments are incorporated into this final document as appropriate.

B. Reviewers

Lead Region – Southeast Region Office: Kelly Bibb, (404) 679-7132

Lead Field Office – Jackson, Mississippi: M. Scott Wiggers, (601) 364-6910

Cooperating Field Office – Daphne, Alabama: Shannon Holbrook, (251) 441-5837

C. Background

1. **Federal Register Notice citation announcing initiation of this review**: July 29, 2008 (73 FR 43947)

2. **Species status**: Stable (2011 Recovery Data Call) There are 11 populations known for this species; however, only 5 of these are of significant size (>10 clumps). Active management, through prescribed burning, is needed to maintain appropriate habitat for the species. The largest population is under The Nature Conservancy ownership and is thriving due to regular

management. Another of the top 3 populations is a U.S. Natural Resources Conservation Service (NRCS) Wetland Reserve Program (WRP) easement which should receive protection and consistent management. Other sites are on private lands and the Service assists with management at several of these sites. We are working with landowners to monitor and manage sites; however, funds for consistent management are unreliable. We have 2 voluntary protection agreements for this species. Population trends will be stable as long as consistent management is implemented.

3. **Recovery achieved**: 1 (1=0-25% recovery objectives achieved)

4. **Listing history**

Original Listing
FR notice: 54 FR 10150
Date listed: April 10, 1989
Entity listed: Species
Classification: Endangered

5. **Review history**

Recovery Plan: 1992
Recovery Data Call: annually from 2000-2011
Five-year review: November 6, 1991

In the 1991 five-year review (56 FR 56882), different species were simultaneously evaluated with no species-specific, in-depth assessment of the five factors as they pertained to the different species' recovery. In particular, no changes were proposed for the status of this plant in the review.

6. **Species' Recovery Priority Number at start of review (48 FR 43098):** 6

Degree of Threat: High
Recovery Potential: Low
Taxonomy: Subspecies

7. **Recovery Plan**

Name of plan: Alabama Canebrake Pitcher Plant (*Sarracenia rubra* ssp. *alabamensis*) Recovery Plan
Date issued: October 8, 1992

II. REVIEW ANALYSIS

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

Not applicable. The Alabama canebrake pitcher-plant is a plant, and therefore, is not covered by the DPS policy.

B. Recovery Plan and Criteria

1. **Does the species have a final, approved recovery plan?** Yes

2. **Does the recovery plan contain objective, measurable recovery (i.e., downlisting or delisting) criteria**? Yes. Reclassification to threatened status could be considered when 10 viable populations are protected and being appropriately managed.

3. **Adequacy of recovery criteria**

   a. **Do the recovery criteria reflect the best available (i.e., most up-to-date) information on the biology of the species and its habitat?** Yes. Though the recovery criteria are not specific as to the number of individuals per population, the recovery criteria of 10 viable, protected populations are appropriate.

   b. **Are all of the 5 listing factors that are relevant to the species addressed in the recovery criteria?** The recovery criteria do take into account any threats to this species in association with the five listing factors, since the assurance that populations are self-sustaining and secure from any foreseeable threats, is part of the criteria.

4. **List the recovery criteria as they appear in the recovery plan, and discuss how each criterion has or has not been met, citing information.**

   Criteria: The plant species will be considered for reclassification to threatened status when there are at least 10 viable populations within the Coosa River drainage that are assessed as viable for at least a 15-year period. Populations should have appropriate legal protection and active management such that the sites are thriving and secure from any foreseeable threats. A viable population is defined as a population that is shown by monitoring data to be reproducing and relatively stable or increasing in size. No delisting criteria were established.

   Status: Criteria have not been met. Only three populations are considered protected from outright habitat destruction. Of these protected populations two are actively managed and likely self-sustaining, while the other is not actively managed and is in decline. Of the actively managed sites, one population occurs on landholdings of The Nature Conservancy (TNC), while the other population occurs on private property protected by a NRCS WRP easement.

The third protected population is on private property protected with a conservation easement held by TNC, but lack of cooperation from the owners has limited management opportunities. In addition, TNC is cooperating with the Boy Scouts of America (BSA) to protect a fourth site owned by BSA. TNC has proposed to expand their Roberta Case Pine Hills Preserve to encompass an additional population in Autauga County, Alabama (Tassin *in litt.* 2011a,c). The remaining known sites are privately owned, several of which are actively maintained to protect the plants through voluntary conservation agreements with the U.S. Fish and Wildlife Service and management assistance from TNC (Martin 2008, Byrd 2011).

Annual long-term monitoring of select sites by scientists and TNC personnel has shown that most populations appear to be stable or are increasing in size. Some populations have demonstrated decreased viability largely attributed to habitat degradation (e.g., fire exclusion and altered hydrology) (Byrd 2011). Continued long-term habitat management is essential to maintaining viable populations.

C. Updated Information and Current Species Status

1. Biology and Habitat

Surveys have been ongoing in an effort to locate additional populations since the plant was listed in 1989 (Schotz 2006). No new populations have been located since 2000 when the Alabama Natural Heritage Program (ALNHP) discovered two separate populations, each containing several plants near Prattville in Autauga County, Alabama.

Currently, the Alabama canebrake pitcher-plant is endemic to Alabama, having been documented from Autauga, Chilton, and Elmore Counties (Figure 1). Surveys since the species was listed in 1989 have resulted in the discovery of five populations, bringing the total number of known extant populations to 11, with six in Autauga County and five in Chilton County. Populations in Elmore County have not been observed since 1991 and are presumed extirpated. Historically, the species was documented from 28 sites (Alabama Natural Heritage Program 2011, Byrd 2011). Population size estimates from 2010 (most recent census data available for the species) range from two clumps at one site to nearly 170 clumps at another. Four sites contain 10 clumps or less; two are estimated to have between 10 and 50 clumps; and three populations have between 50 and 170 clumps (Alabama Natural Heritage Program 2011, Byrd 2011).

Three populations receive formal protection from adverse habitat modification: one site owned by TNC represents one of the finest occurrences known for the species and the other two are protected by easements. Another high quality site with a large population is owned by BSA. Currently, BSA is working with TNC

to manage and protect this population. The remaining populations are privately owned, and several of these private landowners have entered into non-binding agreements with the Service and TNC to manage and maintain the plants (Martin 2008, Byrd 2011, Tassin *in litt*. 2011c).

Population censuses have been tabulated at selected sites and general biological information has been obtained for each site, including soil types, associated species, disturbances and potential threats, and general habitat characteristics (Murphy and Boyd 1999, Schotz 2006, Martin 2008, Byrd 2011). Only limited detailed quantitative analyses have been done for this species (Brewer and Chesser 2009). Long-term monitoring has been implemented at selected sites to assess population trends. The U.S. Fish and Wildlife Service has provided annual funding to TNC to implement yearly monitoring of all populations and management actions on selected populations; however, Folkerts (*in litt*. 2011) has recommended a more aggressive fire management regime at these sites. Seeds have been obtained from several populations and placed under propagation at the Atlanta Botanical Garden, Georgia (Byrd 2011).

Sarracenia rubra ssp. *alabamensis* inhabits two distinct habitat types that share similar floristic composition. The majority of sites are characterized as hillside seepage bogs, permanently saturated areas that attain their greatest development where an impervious layer of clay lies in close proximity to the ground surface. Precipitation, once reaching this clay zone, becomes restricted and is gradually propelled along a sloping gradient until surfacing further downslope. The other habitat type occurs in association with bottomland or streamside vegetation. Unlike the foregoing habitat, moisture conditions are generally maintained with greater connection to topography and precipitation amounts.

All extant populations of *S. rubra* ssp. *alabamensis* occur in close association with the following combination of arborescent and herbaceous species (which therefore serve as the best indicators of suitable habitat): *Osmunda cinnamomea* (cinnamon fern), *Rhynchospora chalarocephala* (loosehead beak sedge), *Dichanthelium scoparium* (velvet panicgrass), *Xyris torta* (twisted yellow-eyed grass), *Eriocaulon decangulare* (tenangle pipewort), *Arundinaria gigantea* (giant cane), *Cleistes bifaria* (small spreading pogonia), *Calopogon tuberosus* (tuberous grass pink), *Platanthera ciliaris* (yellow-fringed orchid), *Viola primulifolia* (white violet), *Rhexia nashii* (maid Marian), *Eryngium integrifolium* (blue coyote-thistle), *Asclepias rubra* (red milkweed), *Magnolia virginiana* (sweetbay magnolia), *Solidago rugosa* (wrinkle-leaf goldenrod), *Eupatorium fistulosum* (joe pye weed), *Fuirena squarrosa* (hairy umbrella-sedge), and *Sphagnum* spp. Bottomland and streamside populations generally contain a greater proportion of woody species and *A. gigantea* (U.S. Fish and Wildlife Service 1992, Garrett 2004, Schotz 2006). More detailed information on the Alabama canebrake pitcher-plant's habitat and associated species can be found in Case and Case

(1974, 1976), McDaniel and Troup (1982), Kral (1983), and Murphy and Boyd (1999).

Brewer and Chesser (2009) at the University of Mississippi recently completed a study correlating seedling recruitment and population dynamics in relation to site differences. They found that seedling recruitment was greater on sites with higher soil moisture content as opposed to drier sites. This correlation held true even when comparing unmanaged wet sites to managed dry sites.

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

a. Present or threatened destruction, modification or curtailment of its habitat or range: Public outreach by the U.S. Fish and Wildlife Service, ALNHP, TNC, the Alabama Department of Conservation and Natural Resources, and the newly established Alabama Plant Conservation Alliance, has encouraged many conservation efforts by the private sector and government agencies. However, since its description as a valid taxon in 1974, 17 populations of the species have been destroyed as a result of human-related causes (Schotz 2006, Alabama Natural Heritage Program 2011). *Sarracenia rubra* ssp. *alabamensis* continues to be threatened by development, gravel excavation, agriculture, and livestock management (Godt and Hamrick 1998), all of which are directly correlated to two additional threats, fire exclusion and the invasion of exotic plant species. Plants have nearly disappeared at one site along a highway margin due to incompatible mowing operations and vegetation succession (Byrd 2011).

All populations occur in fire-maintained habitat, requiring an active prescribed burning regimen to sustain species viability and site integrity. As with all pitcher-plants, *S. rubra* ssp. *alabamensis* is intolerant of shade, quickly becoming depauperate and unable to reproduce with the encroachment of woody vegetation. Therefore, site integrity and viability of all populations are inherently linked to regular prescribed burning. Efforts by U.S. Fish and Wildlife Service, ALNHP, TNC, and Atlanta Botanical Gardens to adequately maintain specific populations have been hampered by difficulties in obtaining permission to apply prescribed fires at some of the known populations and unfavorable burning conditions.

In addition, altered hydrology may favor encroachment of competing species, thus causing habitats to become unsuitable for *S. rubra* ssp. *alabamensis*. Two populations have been subjected to hydrological alterations as a result of beaver (*Castor canadensis*) activities, one of which was noted to have been nearly extirpated by flooding. Gravel mining in close proximity to another

population has adversely altered the hydrology of the site, further hampering recovery efforts (Byrd 2011, Tassin *in litt.* 2011b).

Alabama canebrake pitcher plant populations continue to be threatened by development and incompatible land use, such as drainage for agriculture and livestock grazing. The inability to regularly burn some sites has reduced habitat suitability by allowing continued encroachment of woody species that increase shade for this shade-intolerant species. Similarly, altered hydrologic regimes, whether increasing or decreasing water availability, have negatively impacted some populations and increased encroachment of competitors.

b. Overutilization for commercial, recreational, scientific, or educational purposes: The species has periodically been threatened by poaching in the past, and overutilization continues to threaten this plant at some sites (Byrd 2011). However, most populations are fairly isolated and are monitored by the landowners.

c. Disease or predation: Disease and predation are not considered threats to this species at this time.

d. Inadequacy of existing regulatory mechanisms: Alabama has no state laws affording protection to *Sarracenia rubra* ssp. *alabamensis* and its habitat. Otherwise, the species is protected under section 7 and section 9 of the Endangered Species Act (ESA). It is also included in Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

e. Other natural or manmade factors affecting its continued existence: The Alabama canebrake pitcher-plant continues to be extremely vulnerable due to the small number of populations and small population size at many of these sites. Most populations support less than 50 plants (Byrd 2011). Godt and Hamrick (1998) note that populations with a small number of plants likely have limited genetic diversity and are at greater risk of increased inbreeding and genetic drift, thus making their future survival uncertain.

Seedling recruitment was reported to be absent from the majority of populations (Brewer and Chesser 2009), further inhibiting recovery efforts, as well as long-term viability and evolutionary potential. Because the species can reproduce vegetatively, seedling recruitment may not be paramount at sites experiencing light to moderate levels of fire exclusion; however, vegetative reproduction may not compensate for mortality or the lack of sexual reproduction at some sites (Brewer and Chesser 2009).

Climate change may present a challenge to long-term recovery potential of this species, particularly within upland sites where ground water is more likely to become impacted by prolonged droughts (Tassin *in litt.* 2011a).

Together, limited numbers of populations, small population size, low seedling recruitment, and climate change all threaten the continued survival of not only individual populations, but the species as a whole.

D. Synthesis

When listed as endangered in 1989, there were 12 populations of the Alabama canebrake pitcher-plant found in three counties in central Alabama. While approximately half of these are no longer considered extant, five populations have been discovered since the time of listing. Therefore, there are currently 11 populations distributed between two counties (6-Autuaga, 5-Chilton); plants are now considered historic in Elmore County, having not been observed there since 1991 despite repeated searches.

Progress has been made in the recovery efforts for *S. rubra* ssp. *alabamensis*, with one of the largest and most viable populations (Autauga County) now permanently protected and managed by TNC. Cooperative efforts between BSA and TNC to protect another high quality population are underway. Furthermore, two additional populations have been protected through conservation easements. Although there is no formal protection for the remaining seven sites, several landowners have entered into non-binding agreements to manage and safeguard populations on their properties.

At this time, the Alabama canebrake pitcher-plant continues to meet the definition of endangered under the ESA. Three populations, including one of the largest populations, are protected and efforts are underway to protect a fourth population, but the remaining populations exist on privately owned landholdings where conservation efforts are subject to the discretion of the landowner. Six populations contain less than 50 clumps, with four of these having fewer than 10 clumps. Vegetation succession, incompatible forestry practices, and highway maintenance have been responsible for the decline of the species and continue as the most pervasive threats. The lack of formal protection for eight of the 11 sites illustrates this species' extreme vulnerability. However, since pitcher-plants are long-lived perennials (60+ years) that can exist in a relatively dormant state (1-2 small leaves appearing at a time), it is possible that some populations not witnessed in recent years could reappear under more favorable growing conditions.

III. RESULTS

A. Recommended Classification: No change is needed.

IV. RECOMMENDATIONS FOR FUTURE ACTION

A. Continue use of prescribed fires at protected sites and encourage owners of unprotected sites to conduct prescribed fires as frequently as possible.

B. Continue to track population trends and evaluate management needs as a means to gather baseline data and implement long-term monitoring efforts.

C. Continue surveys in vicinity of known populations and revisit all known historical sites regularly.

D. Work to secure protection, either through conservation easements or acquisition, of privately-owned populations.

E. Renew contact with state and county highway departments to ensure proper protective measures are implemented for those areas where plants occur on roadside rights-of-way.

F. Continue to preserve genetic material from all populations to the extent possible through long-term seed storage and propagation efforts at the Atlanta Botanical Gardens, Georgia.

G. Implement all other tasks identified in the recovery plan, as appropriate.

H. Update the recovery plan, as appropriate.

V. REFERENCES

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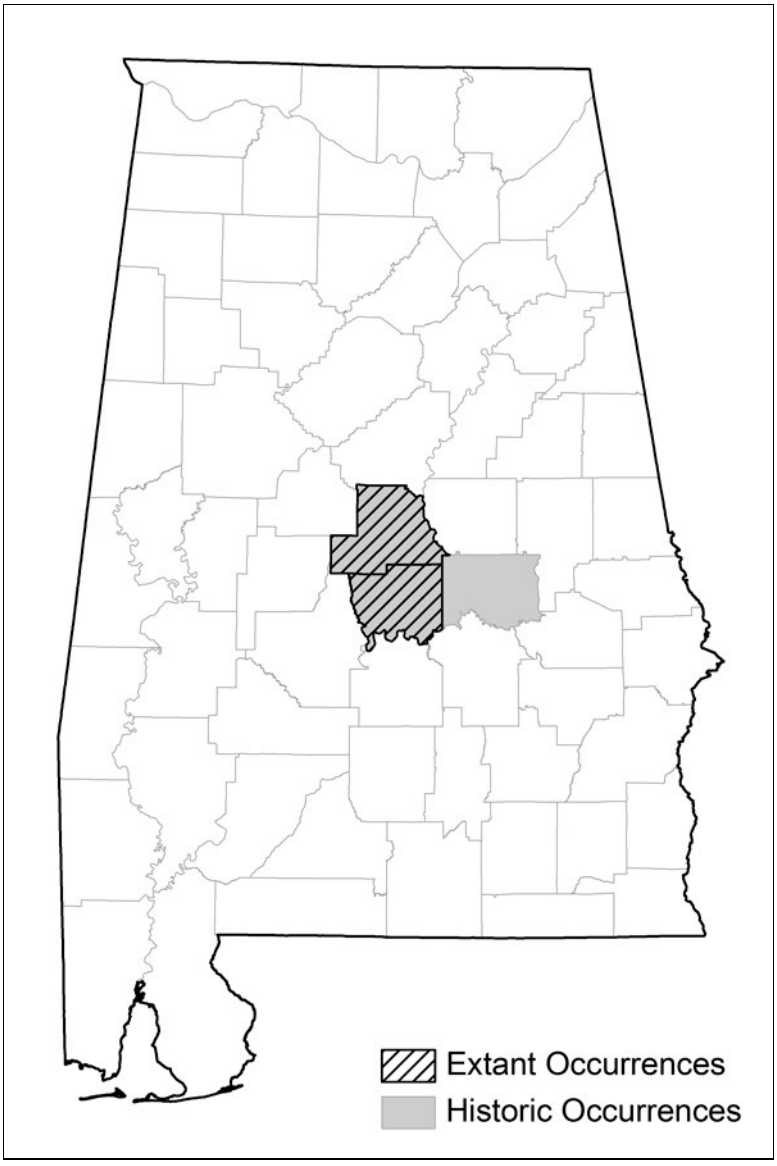
Peer Reviewers

Wayne Barger – Botanist, Natural Heritage Section, Alabama Department of Conservation and Natural Resources; Dr. Debbie Folkerts – Assistant Professor, Department of Biological Sciences, Auburn University; Keith Tassin – Director of Science and Stewardship, The Nature Conservancy of Alabama

Figure 1. Alabama canebrake pitcher plant range.



U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of ALABAMA CANEBRAKE PITCHER PLANT

Current Classification: Endangered

Recommendation resulting from the 5-Year Review:

____ Downlist to Threatened
____ Uplist to Endangered
____ Delist
_X_ No change needed

Appropriate Listing/Reclassification Priority Number, if applicable: Not applicable.

Review Conducted By: M. Scott Wiggers

FIELD OFFICE APPROVAL:

Lead Field Supervisor, Fish and Wildlife Service

Approve _____ Date 7/28/11

REGIONAL OFFICE APPROVAL:

Lead Regional Director, Fish and Wildlife Service

Approve _____ Date 1/2/12

APPENDIX A: Summary of peer review for the 5-year review of Alabama canebrake pitcher-plant (*Sarracenia rubra* ssp. *alabamensis*)

A. **Peer Review Method:** The draft 5-year review document was sent to biologists at the cooperating U.S. Fish and Wildlife Service office in Daphne, Alabama. In addition, the document was also sent to three independent peer reviewers including: Wayne Barger, Botanist with the Natural Heritage Section of the Alabama Department of Conservation and Natural Resources; Dr. Debbie Folkerts, Assistant Professor in the Department of Biological Sciences of Auburn University; and Keith Tassin, Director of Science and Stewardship for The Nature Conservancy of Alabama.

B. **Peer Review Charge:** The following cover letter was sent along with the draft 5-year review (excluding signature page) to the peer reviewers:

On July 29, 2008, the U.S. Fish and Wildlife Service published a notice in the Federal Register (73 FR 43947) announcing a 5-year review of 20 federally listed species, including the Alabama canebrake pitcher plant (*Sarracenia rubra* ssp. *alabamensis*). The purpose of the 5-year review is to ensure that the classification of species as threatened or endangered is accurate and reflects the best available information.

You have provided data used to review the status of this species and/or you have been identified as knowledgeable about this species. Therefore, in order to ensure that the best available information has been used to conduct this 5-year review, we now request your peer review of the attached document. Specifically we ask for comments on the validity of the data used, and identification of any additional new information on any of these species that has not been considered in this review. Please note that we are not seeking your opinion of the legal status of these species, but rather that the best available data and analyses were considered in reassessing their status.

We appreciate your interest in furthering the conservation of rare plants and animals by becoming directly involved in the review process of our Nation's threatened and endangered species. Your review and comments will become a part of the administrative record for this species, and you can be certain that your information, comments, and recommendations will receive serious consideration.

We hope that you view this peer review process as a worthwhile undertaking. Please give me a call (601-364-6910) or send me an e-mail (marion_wiggers@fws.gov) if you have any questions. Please feel free to respond by email or letter. Thank you for your assistance.

Sincerely,

M. Scott Wiggers
Botanist, U.S. Fish and Wildlife Service
6578 Dogwood View Parkway
Jackson, MS 39213

C. **Summary of Peer Review Comments/Report:** All peer reviewers supported analyses and information in the document. Some reviewers provided editorial comments. One reviewer encouraged increased use of fire management. Another reviewer provided additional information on protected populations, encouraged expanding conservation efforts to the larger landscape, and recommended establishing new populations.

D. **Response to Peer Review:** Suggested editorial changes were made to the document. Recommendations to increase use of fire management regimes were incorporated into the "Updated Information and Current Species Status" and "Recommendations for Future Actions" sections. Updated information regarding protected populations was incorporated into the document; however, comments regarding landscape conservation and

establishment of new populations were not incorporated into the 5-year review because the Recovery Plan already addresses these issues.

Alabama Canebrake Pitcher Plant
(*Sarracenia rubra* ssp. *alabamensis*)

5-Year Review:
Summary and Evaluation


Photo by T. Wayne Barger, Alabama DCNR

July 2018

U.S. Fish and Wildlife Service
Southeast Region
Mississippi Field Office
Jackson, Mississippi

U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW OF ALABAMA CANEBRAKE PITCHER PLANT
(*Sarracenia rubra* ssp. *alabamensis*)

Addendum 1. Summary of new information obtained since the 2012 5-year review.

The *Federal Register* notice announcing the initiation of this 5-year review was published on June 30, 2017 (82 FR 29916). No substantive comments were received during the 60-day public comment period following this notice.

I. GENERAL INFORMATION

There are limited updates to this section since completion of the 2012 5-year review (U.S. Fish and Wildlife Service [Service] 2012). Updated information is presented below. In addition, as required, we conducted independent peer review on new information (see Appendix A). We sought review from four knowledgeable experts on this species and its habitats. Comments have been incorporated into this addendum as appropriate.

B. Reviewers

Lead Region: Southeast Region, Kelly Bibb (404) 679-7132

Lead Field Office: Mississippi Field Office, M. Scott Wiggers, (228) 475-0765

Cooperating Field Office: Daphne Ecological Services Field Office, Shannon Holbrook, (251) 441-5837

C. Background

2. **Species Status:** Stable. Although there are fewer sites extant than when the species was listed (i.e., a long-term decline), short-term trends since the 2012 5-year review indicate that the species has likely remained stable during this time. Currently, there are seven natural, extant populations of this species, which incorporates the use of a provisional population definition requiring plants to be separated by at least 1 mile to be considered as distinct populations, as well as the extirpation of one population since the 2012 5-year review and the erroneous inclusion of one extirpated population as extant in the previous review. Three populations have permanent protection from outright habitat destruction: one as a preserve owned by The Nature Conservancy (TNC), one protected by a conservation easement held by TNC, and one protected by a Natural Resources Conservation Service (NRCS) Wetlands Reserve Program (WRP) easement. In addition, two populations receive some temporary (renewed annually) protection through voluntary conservation agreements between willing landowners and the Service. All populations require continued habitat management to maintain their viability. The Service, TNC, and Alabama Plant Conservation Alliance (APCA) work with willing landowners to protect and manage most populations. The Atlanta Botanical Garden (ABG), with increasing assistance from Auburn University's Donald E. Davis Arboretum, maintain *ex situ* (off-site) living plant collections of most extant populations and two extirpated populations for safeguarding. In addition, several attempts to augment

existing populations and establish new populations have occurred, but additional data and evaluation are needed to assess these efforts contributions to the recovery of this species.

II. REVIEW ANALYSIS

C. Updated Information and Current Species Status

1. Biology and Habitat

Data on abundance, population trends, distribution, biology, ecology, and habitat were summarized in the 2012 5-year review. There is some new information on the species' biology and distribution since the last 5-year review, which is summarized below.

Biology and Life History

Recent studies have focused on various aspects of arthropod (Folkerts and Tjelmeland 2014, 2015, 2017, Stephens 2017) and microbial associates (Stephens 2017) of Alabama canebrake pitcher plants. Folkerts and Tjelmeland (2014, 2015, 2016, 2017) studied interactions between Alabama canebrake pitcher plant and the pitcher plant moth (*Exyra semicrocea*), an obligate pitcher plant associate. These investigators found that despite *E. semicrocea* larvae feeding on pitchers, pitcher plants are able to regain some of the nutrients consumed in the form of larval fecal deposits. In addition, Folkerts and Tjelmeland (2014, 2015, 2017) did not find *E. semicrocea* during surveys of three Alabama canebrake pitcher plant sites, despite the moth having been found at these sites over 20 years ago (Thompson 2016). These observations of *E. semicrocea* are in line with earlier studies documenting the apparent decline of this moth (Stephens *et al*. 2011, Stephens and Folkerts 2012). Further, only two species of mites were regularly found in the pitcher plants during Folkerts and Tjelmeland's (2017) surveys. These studies have not yet explored potential conservation implications for Alabama canebrake pitcher plant or its habitats. Garden plot studies, by Stephens (2017) focused on prey captured by and microbial communities within pitchers of Alabama canebrake pitcher plant and other pitcher plant species. Conducted in an outdoor garden in Gainesville, Georgia, these studies found that Alabama canebrake pitcher plants captured comparatively more flying insects than crawling insects, likely due to the species' relatively tall stature. 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 Alabama canebrake pitcher plant.

Other studies in recent years focused on seed germination and phenotypic variation of Alabama pitcher plants. Khanna *et al*. (2014) found that seeds germinated following acid scarification and cold stratification, whereas Yawn (2018) noted a variety of phenotypic characters (e.g., pigmentation, size, pubescence) that differed within and among five Alabama pitcher plant sites.

Abundance and Population Trends

For this 5-year review, a provisional population definition of 1 mile has been used to delimit individual populations. As such, individuals or groups of Alabama canebrake

pitcher plant that are separated by at least 1 mile from their nearest known neighbors are considered to be a distinct population. This provisional definition is based on potential flight distances of likely pollinators for this species—small bumblebees (*Bombus* spp.) (Schnell 1977)—and aligns with the provisional population definition of the federally listed green pitcher plant (*S. oreophila*), which uses flight distances of queen bumblebees (Folkerts 1992, Service 2014). At distances greater than 1 mile, pollen flow (and consequent gene flow) is restricted by the inability of pollinators to traverse this distance. This provisional population definition does not incorporate seed dispersal distance, which is poorly understood for this species. However, a study of a related, wide-spread pitcher plant species, purple pitcher plant (*S. purpurea*), indicates that seed dispersal distance from parent plants is typically only a few inches (Ellison and Parker 2002). These authors further suggest that water may facilitate dispersal over longer distances for *Sarracenia* species, a concept that has been echoed by others (e.g., Stephens 2017), but the importance of this potential dispersal mechanism remains unstudied for Alabama canebrake pitcher plant. Others (Harper 1918, Bayer *et al.* 1996) have also suggested that birds may be dispersal agents of members of the Sarraceniaceae, but provided no empirical evidence to support this supposition.

Under this provisional population definition, there are currently seven natural, extant populations of Alabama canebrake pitcher plant known (Autauga County – 3; Chilton County – 4). The 11 populations identified in the Service's 2012 5-year review, correspond to 9 populations under the current definition. The 2012 5-year review considered Chilton County to have five extant populations—one of which was erroneously considered extant, but has been extirpated since the late 1990s. As such, Chilton County is currently considered to have four natural, extant populations, one of which consists of two subpopulations considered to be separate populations in the previous review. In addition, the Service learned of one previously unrecorded population, but known to local residents since at least the early 1980s, in Chilton County is currently considered to have extirpated by pond construction in that decade (Thompson pers. comms. 2012, 2018, Thompson 2013). The 2012 5-year review also considered Autauga County to have six extant populations, but one population has since been extirpated (Byrd 2016) and the remaining five now represent three populations, with two populations continuing as distinct populations and three of the former populations now representing three sub-populations comprising one population. No extant populations are known to occur in Elmore County. In addition, no new populations have been discovered since 2012.

Currently, three populations occur on lands receiving permanent protection from habitat destruction (Service 2012). Two populations receive protection from conservation easements (one held by The Nature Conservancy [TNC] and another that is part of the Natural Resources Conservation Service's [NRCS] Wetlands Reserve Program [WRP]. Most of the third protected population occurs on a TNC preserve, while one of this larger population's subpopulations receives temporary (i.e., renewed annually) protection under a voluntary conservation agreement between the landowner and the Service. A fourth population also receives temporary protection and management under a voluntary conservation agreement between the landowner and the Service (Service 2012, Byrd 2016, Alabama Natural Heritage Program [ANHP] 2018).

Little quantitative data (e.g., counts, estimates) are available regarding current population sizes. Currently, individual subpopulations range in size from 3 or 4 plants to well over 200. Only 3 populations are comprised of 100 or more individuals, while 2 populations have fewer than 10 individuals (Byrd 2016, 2017, Yawn 2018). Furthermore, available data and population assessments indicate that the species has undergone a long-term decline since it was listed, with fewer sites known to be extant and apparent declines in local populations at a number of sites (Service 1992, Emanuel 2000, Byrd 2016, 2017, ANHP 2018, Yawn 2018). However, apparent short-term trends (since completion of the 2012 5-year review), indicate that the population of the species as a whole has likely remained stable during this time, despite the recent loss of one small population and apparent local population declines at some sites (Byrd 2016, 2017, ANHP 2018, Yawn 2018). These local population declines are likely offset by population increases at the largest sites (Byrd 2016, 2017, Yawn 2018), making the conservation and management of these sites even more important to the species' long-term survival. Indeed, positive population responses (e.g., seedling recruitment, increased vigor and size of plants) observed following application of prescribed fires and hand clearing of competing vegetation (e.g., Byrd 2016, 2017, Yawn 2018) indicate that declines of populations due to insufficient habitat management and associated encroachment of competing vegetation may be halted and reversed following implementation of necessary habitat management. The potential contribution to recovery of two recently revealed privately owned transplant sites (discussed in more detail, below; Thompson pers. comms. 2012, 2018, Thompson 2013, Byrd pers. comms. 2013a,b) needs to be assessed as additional data and information (e.g., population size, management, protection) about these sites becomes available.

Genetics

Limited attention has been paid to genetics as it pertains to the conservation of Alabama canebrake pitcher plant. Studies by Godt and Hamrick (1996, 1998) found that Alabama canebrake pitcher plant had comparatively greater allozyme diversity than either the more widespread sweet pitcher plant (*S. rubra* ssp. *rubra*) or two other federally listed pitcher plant species (green pitcher plant, *S. oreophila*, and mountain sweet pitcher plant, *S. rubra* ssp. *jonesii*). Likewise, a more recent genetic study also found that Alabama canebrake pitcher plant had comparatively higher genetic diversity than either the green pitcher plant or mountain sweet pitcher plant (Furches *et al.* 2013b). In contrast to Godt and Hamrick (1998), Furches *et al*. (2013b) found that Alabama canebrake pitcher plant had comparatively lower genetic diversity overall than the three more widespread pitcher plant species. However, the authors also noted that within-population diversity was comparable to the widespread yellow trumpet pitcher plant (*S. alata*). Whereas Godt and Hamrick (1998) found no significant population differentiation in their study, Furches *et al*. (2013b) found slight, but statistically significant differentiation between the populations sampled. Finally, the species' relatively high genetic diversity noted by Godt and Hamrick (1998) and Furches *et al*. (2013b) increases its recovery potential, provided that adequate protection and management are in place.

Much of the genetic work with Alabama canebrake pitcher plant has sought to further elucidate and clarify taxonomic and phylogenetic relationships within the genus

Sarracenia, which has been the subject of much dispute (Neyland and Merchant 2006, Ellison *et al*. 2012, 2014). Despite this work, relationships among species of *Sarracenia* and, in particular, among members of the *Sarracenia rubra* complex (a group of species with similar appearance believed to be closely related), remain uncertain. For example, some studies have found little differentiation among members of the *S. rubra* complex (e.g., Bayer *et al*. 1996, Godt and Hamrick 1998, Neyland and Merchant 2006). Ellison *et al*. (2012) suggested that rapid diversification within the genus *Sarracenia* and the proclivity for species within this genus to hybridize may partially explain difficulties resolving taxonomic relationships between *Sarracenia* species and, in particular, the *S. rubra* complex. Furches *et al.*'s (2013b) analysis of microsatellites supported the species status of *S. alabamensis*. As with Furches *et al*., Stephens *et al.*'s (2015) study also supported *S. alabamensis* as a unique species and further did not support the inclusion of subspecies under the taxon. However, Stephens *et al*. also suggested that these myriad results warrant a taxonomic revision of the *rubra* complex and other taxa within *Sarracenia*. Given these ongoing taxonomic uncertainties, it is appropriate to maintain the current designation of *Sarracenia rubra* ssp. *alabamensis* at this time (see "Taxonomic Classification", below).

Finally, biogeographic analyses by Ellison *et al*. (2012) indicate that members of the Sarraceniaceae (pitcher plant family) arose 44 to 53 million years ago in South America. The authors further note that taxa from this family had spread throughout North and South America 25 to 44 million years ago. *Sarracenia rubra* ssp. *alabamensis*, however, arose comparatively more recently, as Levin and Scarpino (2016) estimated—using time-calibrated molecular phylogenetic techniques—that the taxon originated approximately 1 to 3 million years ago. Moreover, Stephens *et al*. (2015) suggested that *S. alabamensis*'s closest living relative is *S. oreophila* (a federally listed species found in northeastern Alabama and adjacent states).

Taxonomic Classification

As noted when the species was listed (54 FR 10150), the taxon has been the subject of much taxonomic dispute and remains so, which reflects the challenging systematics and taxonomic uncertainty within the genus *Sarracenia* as a whole (Neyland and Merchant 2006, Ellison *et al*. 2012, 2014, Stephens *et al*. 2015). The Service and others (e.g., Schnell 2002, McPherson 2006, 2010, NatureServe 2017) recognize the taxon as a subspecies within the "*rubra* complex" (i.e., *Sarracenia rubra* ssp. *alabamensis*). Other authorities (e.g., Mellichamp and Case 2009, Weakley 2015, Spaulding 2017, Integrated Taxonomic Information System 2018) treat the entity as the subspecies *S. alabamensis* ssp. *alabamensis* and sibling of *S. alabamensis* ssp. *wherryi* (syn. *S. rubra* ssp. *wherryi*). However, as noted above, recent genetic work (e.g., Furches *et al.* 2013b, Stephens *et al.* 2015) has lent weight to the contention that the taxon is most accurately recognized as a distinct species, *S. alabamensis*, with no subspecies. In light of recent genetic research and continued taxonomic dispute, Stephens *et al.* (2015) suggested that the "*rubra* complex's" taxonomic designations be reassessed. Given continued uncertainty over the taxonomic classification of the taxon and its close relatives, it is appropriate to maintain the current nomenclatural designation as *S. rubra* ssp. *alabamensis* at this time.

Population Augmentation and Establishment

Several attempts to augment and establish populations are known. A small test project to expand an existing Alabama canebrake pitcher plant population was conducted during 2005–2007 on private property in Chilton County by ABG (Denhof and Determann 2006). First year survival of transplants was high (73%), but the current status of these transplants is unknown as recent attempts to access this site have been hampered by lack of permission from the landowner. More recently, there have been two small attempts to augment local populations on lands owned by the Boy Scouts of America (BSA) and The Nature Conservancy (TNC). These transplants are currently persisting and represent successful augmentations of the parent population (Thompson 2013, 2016, Byrd pers. comm. 2018). Furthermore, these augmentation efforts represent successful conservation partnerships among ABG, APCA, BSA, and TNC. Two sites on private lands were established by their owners using off-site plants and are reported to be thriving (e.g., Thompson pers. comms. 2012, 2018, Thompson 2013, Byrd pers. comms. 2013a,b). One of these sites may represent plants from a previously unknown Chilton County population that may have since been extirpated (Thompson pers. comm. 2018). Information on these sites is limited and, as such, their potential contribution to the recovery of Alabama canebrake pitcher plant is uncertain and requires further evaluation as additional data and information become available.

Ex Situ (Off-site) Safeguarding

Plants from most natural, extant populations (six of seven) and two extirpated populations (from Autauga and Chilton counties) are being maintained *ex situ* in cultivation at the Atlanta Botanical Gardens (Determann pers. comm. 2018) and Auburn University's Donald E. Davis Arboretum (Thompson pers. comms. 2012, 2018, Thompson 2013). These plants represent valuable genetic material from each of these populations and serve as parent material for use in potential future population augmentation and establishment attempts. In addition, Botanic Gardens Conservation International's (BGCI) PlantSearch internet database indicates that at least 26 of their worldwide affiliated institutions maintain Alabama canebrake pitcher plants in their collections (BGCI 2018). However, given the limited information available about these collections noted by BGCI, it is unknown what, if any, conservation value they have.

In addition, one study investigated cryopreservation of Alabama canebrake pitcher plant seeds and two other species of pitcher plants with the intent of informing appropriate cryopreservation and post-cryogenic storage germination protocols for these species (Khanna *et al.* 2014). These studies may improve long-term *ex situ* storage of seeds for Alabama canebrake pitcher plants.

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

a. Present or threatened destruction, modification or curtailment of its habitat or range: The species continues to be threatened by development, agricultural activities, gravel mining, and livestock management (Schotz 2006, Byrd 2016, 2017, ANHP 2018, Yawn 2018), which can exacerbate threats posed by inadequate habitat

management (e.g., fire exclusion) and encroachment of competing vegetation (including non-native invasive species).

Hydrologic alterations have been deleterious to Alabama canebrake pitcher plant populations. Two populations have historically been subjected to hydrological alterations as a result of beaver (*Castor canadensis*) activities, one of which was nearly extirpated by flooding. Beaver trapping has occurred at one of these populations to reduce their impact. In addition, gravel mining in close proximity to one population has adversely altered the hydrology of the site, thereby favoring encroachment of competing species and reducing habitat suitability for Alabama canebrake pitcher plants. However, the cooperation and interest in conserving this site by the landowner has allowed land management activities to reduce the impacts of gravel mining induced hydrologic alterations (Byrd 2016, 2017, ANHP 2018, Yawn 2018).

b. Overutilization for commercial, recreational, scientific, or educational purposes: The species has periodically been threatened by poaching in the past, but the isolated nature of these populations and attentiveness of their landowners likely reduces the severity of this threat. However, poaching of plants and seeds is still occasionally noted (e.g., Yawn 2018). Recently, Shirey *et al.* (2013) noted that plant material (plants and seeds) and hybrids of Alabama canebrake pitcher plant were available for sale in the United States, Europe, and New Zealand. The authors provided overviews of commercial trade's potential benefits and negative consequences, but did not provide any direct evidence that specific negative effects of commercial trade are threatening Alabama canebrake pitcher plant. Likewise, the authors did not link commercial trade to increased poaching threats to this species. Currently, poaching and any associated illegal trade of this species are apparently limited in scope and extent and, as such, likely represent negligible threats to this species. Lawful, permitted commercial trade does not appear to pose a threat at this time.

c. Disease or predation: Disease and predation are not considered threats to this species at this time.

d. Inadequacy of existing regulatory mechanisms: Alabama has no state laws affording specific protections to Alabama canebrake pitcher plant or its habitat. However, ADCNR has recently designated the species as a Plant of Conservation Concern in the state's *Wildlife Action Plan* (ADCNR 2016). However, this designation does not carry any legal protections. Otherwise, the species is protected under sections 7 and 9 of the Endangered Species Act (ESA). It is also included in Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES 2017), which limits international trade of species listed pursuant to the treaty.

e. Other natural or manmade factors affecting its continued existence: Inadequate habitat management threatens the long-term viability of some populations. All populations occur in habitat requiring periodic fire to maintain site ecological integrity and population viability. The lack of prescribed fire or periodic mowing and hand clearing of competing vegetation at some sites allows for unchecked growth of

woody species and other fast-growing herbaceous species that can increase shade and competition for resources. Alabama canebrake pitcher plant is intolerant of shade, with individual plants and, ultimately, populations, quickly becoming depauperate and unable to reproduce following woody species encroachment and consequent increased shade. Prescribed fires and other vegetation clearing activities help to maintain Alabama canebrake pitcher plant's necessary open, sunny habitat. In addition, over the years, ANHP, TNC, and ABG have occasionally had difficulties obtaining landowner permission to apply prescribed fires at some sites, thus hampering necessary efforts to adequately maintain these sites (Byrd 2016, ANHP 2018). One small population was recently lost, possibly due to incompatible road right-of-way maintenance, such as herbicide application (Byrd 2016).

Habitat management is need to promote seedling recruitment. While seedling recruitment has been reported to be absent from most populations (Brewer and Chesser 2009), further inhibiting recovery efforts, as well as long-term viability and evolutionary potential, seedling recruitment has been observed at three sites in recent years (Byrd 2016, Yawn 2018). Seedling recruitment at these sites has likely been favored by habitat management activities that increase the abundance of suitable seedling recruitment sites (e.g., bare ground). Continued habitat management at these sites and expanded habitat management efforts at other sites is expected to increase seedling recruitment.

Alabama canebrake pitcher plant continues to be extremely vulnerable due to the small number of populations and small population size at many of these sites. Only 3 populations have 100 plants or more, while 2 populations have fewer than 10 plants (Byrd 2016, 2017, ANHP 2018, Yawn 2018). Godt and Hamrick (1998) note that populations with a small number of plants likely have limited genetic diversity and are at greater risk of increased inbreeding and genetic drift, thus making their future survival uncertain. Similarly, Furches *et al.* (2013b) note that, despite the species' relatively high genetic diversity, its small number of populations increase its susceptibility to stochastic events (e.g., drought) and habitat degradation and loss, which could ultimately lead to a loss of genetic diversity within the species. However, the disjunct distribution of Alabama pitcher plant populations, which occur in isolation from other pitcher plant species, likely prevents hybridization with these other species, thereby limiting any threats posed by genetic swamping from these species (Furches *et al.* 2013a).

D. Synthesis

The Service has supported and engaged in Alabama canebrake pitcher plant conservation efforts in cooperation with ANHP, TNC, ADCNR, and the APCA and its affiliates. Despite these efforts, three populations have been extirpated since the species was listed (Autauga – 1; Chilton – 1; Elmore – 1). Although most natural populations known to be extant during the 2012 5-year review are currently extant, one population in Autauga County was recently extirpated and one population was erroneously considered extant during the previous review. Today, only seven populations of Alabama canebrake pitcher plant are known to be extant in two (Autauga and Chilton) of the three (Autauga, Chilton, and Elmore) counties comprising the species' known

range. Plants have not been observed in Elmore County since the early 1990s and no new populations have been discovered in recent years, despite repeated searches.

Overall, recovery progress has been made for Alabama canebrake pitcher plant, with three populations permanently protected. One of the largest and most viable populations is now permanently protected and managed by TNC. One population is protected by a conservation easement held by TNC; however, management efforts have been hampered by access limitations, which has led to a substantial population decline at this site. A third population is protected under a NRCS WRP easement and receives periodic habitat management. Furthermore, two additional locations have received temporary protections through voluntary conservation agreements—that assist with conservation and management of Alabama canebrake pitcher plants—with willing landowners. Finally, cooperative efforts between BSA and TNC to manage a large, high quality population are underway, but the site does not currently receive any permanent protection via conservation easement or similar legal instrument.

Safeguarding efforts aim to protect the genetic diversity of populations. Plant material has been collected and is maintained for most populations, including two extirpated populations which serves as a potential source of plants for future population augmentation and introduction efforts. However, it is unknown how much of Alabama canebrake pitcher plant's genetic diversity is represented by current safeguarding collections. Such efforts likely need to be expanded to increase their utility for long-term conservation and recovery of this species.

The Alabama canebrake pitcher plant continues to meet the definition of endangered under the ESA. All populations are privately owned. While three populations have permanent protection against outright habitat destruction—one of which is in decline due to insufficient land management—the remaining four populations do not receive any such protections. Most populations and subpopulations are small, with fewer than 100 plants, increasing their vulnerability to stochastic environmental events, habitat degradation, inbreeding, and genetic drift. Hydrologic alteration, vegetation encroachment, and incompatible land management practices, have been responsible for the decline of the species and continue as the most pervasive threats. Incompatible highway right-of-way maintenance has likely extirpated one population in recent years.

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.

A. Prescribed fire, along with mowing and hand thinning, has been conducted on most sites, where willing landowners have been supportive; however, application of prescribed fire has not been consistently applied across each of these sites. These efforts need to continue in perpetuity to ensure the recovery and long-term survival of the species.
B. Most sites have been regularly monitored; however, access restrictions have limited the ability to monitor some sites and improved monitoring methods are needed to increase our knowledge and evaluation of population trends and management effects.

C. No new surveys are known to have been conducted since completion of the last 5-year review.
D. No additional privately owned sites have been protected, as funding for these efforts has not been available.
E. Increased communication with state and county highway departments is needed, as demonstrated by the apparent extirpation of one population by incompatible right-of-way management.
F. Genetic stock continues to be safeguarded *ex situ* at Atlanta Botanical Gardens. These efforts have been expanded to include Auburn University's Donald E. Davis Arboretum.
G. Some genetic and biological work has been conducted by universities and others. Funding has been unreliable to implement remaining recovery tasks.
H. The recovery plan has not been updated.

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U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of ALABAMA CANEBRAKE PITCHER PLANT

Current Classification: Endangered

Recommendation resulting from the 5-Year Review:

___ Downlist to Threatened
___ Uplist to Endangered
___ Delist
_X_ No change needed

Review Conducted By: M. Scott Wiggers, Jackson Ecological Services Field Office

FIELD OFFICE APPROVAL:

for **Lead Field Supervisor, Fish and Wildlife Service**

Approve Cary Norquist Date 7/23/18

APPENDIX A: Summary of peer review for the 5-year review of Alabama canebrake pitcher plant (*Sarracenia rubra* ssp. *alabamensis*)

A. **Peer Review Method:** Peer review was coordinated by the Service's Raleigh Ecological Services Field Office, North Carolina. Four peer reviewers were selected by the Service for their knowledge of and expertise with Alabama canebrake pitcher plant. Individual responses were received from two of the four invited peer reviewers.

Peer Reviewers: Dr. T. Wayne Barger, State Botanist, Alabama Department of Conservation and Natural Resources, State Lands Division, Natural Heritage Section, Montgomery, Alabama; Dr. Debbie Folkerts, Assistant Professor, Department of Biological Sciences, Auburn University, Alabama; Al Schotz, Botanist/Ecologist, Alabama Natural Heritage Program, Auburn University, Alabama; Keith Tassin, Director of Science and Stewardship, The Nature Conservancy, Birmingham, Alabama.

B. Peer Review Charge: See attached text from the peer review invitation letter.

C. Summary of Peer Review Comments: Both peer reviewer's provided editorial comments and corrections, such as spelling, grammar, punctuation, usage, style, and word choice. One reviewer provided additional information on plant safeguarding protocols at the Donald E. Davis Arboretum at Auburn University. No substantive changes or corrections to the review's findings were suggested by either of the peer reviewers.

D. Response to Peer Review: Suggested editorial corrections were incorporated and addressed, as appropriate and necessary. The additional information on the Donald E. Davis Arboretum's safeguarding protocols was used to update the "Safeguarding" subsection of the review. As such, the sentence noting the lack of information on the arboretum's safeguarding protocols was deleted.

Peer Review Invitation Letter Text

On June 30, 2017, the U.S. Fish and Wildlife Service published a notice in the *Federal Register* (82 FR 29916) announcing a five-year review of 23 federally listed species, including the Alabama canebrake pitcher plant (*Sarracenia rubra* ssp. *alabamensis*). The purpose of five-year reviews is to ensure that the classification of species as threatened or endangered is accurate and reflects the best available information.

Following Service current policy and guidelines on the process to conduct independent peer review, we are assisting our Mississippi Field Office to complete peer review of the science in the 5-year review for the Alabama canebrake pitcher plant. You have provided data used to review the status of Alabama canebrake pitcher plant and/or are knowledgeable about it. Therefore, in order to ensure that the best available information has been used to conduct this five-year review, we now request your peer review of the attached document. Specifically we ask for comments on:

- Have we assembled the best available scientific and commercial information?
- Is our analysis of this information correct and properly applied?
- Can you identify any additional new information on Alabama canebrake pitcher plant that has not been considered in this review?

Please note that we are not seeking your opinion of the legal status of this species, but rather that the best available data and analyses were considered in reassessing its status.

As part of the peer review process, we must evaluate the potential for conflicts of interest with the subject species or the action. We therefore ask that you fill out the enclosed Conflict of Interest form and return it to this office with any notes, comments, or questions that you are willing to provide as your review.

We appreciate your interest in furthering the conservation of rare plants and animals by becoming directly involved in the review process of our Nation's threatened and endangered species. Your review and comments will become a part of the administrative record for this species, and you can be certain that your information, comments, and recommendations will receive serious consideration.

We hope that you view this peer review process as a worthwhile undertaking. Please give me a call (919-856-4520 ×18) or send me an e-mail (dale_suiter@fws.gov) if you have any questions on this peer review. We have enclosed additional guidance to help you in this evaluation. Please share your response by email or letter by June 4, 2018. Thank you in advance for your assistance.