

Draft Amendment for the Recovery Plan for Three Granite Outcrop Plant Species, Little Amphianthus (*Amphianthus pusillus*), Black-spored Quillwort (*Isoetes melanospora*), and Mat-forming Quillwort (*Isoetes tegetiformans*)

https://ecos.fws.gov/docs/recovery_plan/930707.pdf

Original Approved: 1993

Original Prepared by: Jim Allison, Georgia Department of Natural Resources for the Jackson Mississippi Fish and Wildlife Office

DRAFT AMENDMENT 1

We have identified best available information that indicates the need to amend recovery criteria for little amphianthus (*Amphianthus pusillus*), black-spored quillwort (*Isoetes melanospora*), and mat-forming quillwort (*Isoetes tegetiformans*) since the recovery plan was completed. In this proposed modification, we synthesize the adequacy of the existing recovery criteria, show amended recovery criteria, and the rationale supporting the proposed recovery plan modification. The proposed modification is shown as an addendum that supplements the recovery plan by adding delisting criteria for both quillwort species, which were not developed at the time the original recovery plan was completed. The existing delisting criteria for little amphianthus is clarified. Additionally, the existing downlisting criteria for both quillwort species are clarified. The proposed modification is shown as an addendum that supplements the recovery plan, superseding only Section II. A. (page 14) of the recovery plan (USFWS 1993). Recovery plans are a non-regulatory documents that provide guidance on how best to help recover species.

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

December 2018

METHODOLOGY USED TO COMPLETE THE RECOVERY PLAN AMENDMENT

This proposed amendment is based on information from our files, data maintained by the Georgia Department of Natural Resources, and information from species experts. This information was analyzed by U.S. Fish and Wildlife Service (Service) biologists and managers in the Georgia Fish and Wildlife Office in order to develop recovery criteria for the species. The new scientific information presented in this amendment will be peer reviewed in accordance with the OMB Peer Review Bulletin following the publication of the Notice of Availability.

ADEQUACY OF RECOVERY CRITERIA

Section 4(f)(1)(B)(ii) of the Endangered Species Act (Act) requires that each recovery plan shall incorporate, to the maximum extent practicable, “objective, measurable criteria which, when met, would result in a determination...that the species be removed from the list.” Legal challenges to recovery plans (see *Fund for Animals v. Babbitt*, 903 F. Supp. 96 (D.D.C. 1995))

and a Government Accountability Audit (GAO 2006) also have affirmed the need to frame recovery criteria in terms of threats assessed under the five listing factors.

Recovery Criteria

See previous version of criteria in recovery plan (USFWS 1993, page 14, https://ecos.fws.gov/docs/recovery_plan/930707.pdf).

Synthesis

Black-spored quillwort and mat-forming quillwort were listed as endangered and little amphianthus was listed as threatened in 1988 due to habitat destruction (53 FR 3560). Because of the threat of additional collections and vandalism, critical habitat for these species has not been designated. The last 5-year review for the species was conducted in 2008 (USFWS 2008) and a current 5-year review is underway. The 2008 review did not recommend a change to the status of any of the three granite outcrop species. All three species occur in small depressions, or pools, formed in granite outcrops, which hold water for sufficient periods to support growth and reproduction (USFWS 2008). Populations for all three species are defined as geographically distinct granite outcrops.

Black-spored quillwort. Black-spored quillwort was historically known from 13 populations and can now be found at 10 or 11 granite outcrops in Georgia. There are six known extirpated populations, and the extant populations consist of seven natural populations, two introduced populations, and one created population (e.g. plant introduced to artificially created pools). Of the two introduced populations, one is in a single pool at an arboretum and the other is in a single pool on private property. Both of these introduced populations are considered not self-sustaining because of introductions in less than ideal outcrop habitat. In addition, both populations are outside the range of black-spored quillwort with introductions of more than one species of *Isoetes* in the same pool. Artificial pools were created at one granite outcrop that was previously treated as an extirpated population, and those pools are now on protected property. Five of the extant populations occur on protected lands (e.g. state, county, and private conservation lands). Of the nine extant populations that are within the natural range of black-spored quillwort, four are on protected lands and three have had a decline in status.

Mat-forming quillwort. Mat-forming quillwort historically occurred at 10 granite outcrops across Georgia. There are currently 12 extant populations, including two of unknown condition, three introduced populations, one created population and six populations in various extant conditions. The three introduced populations of mat-forming quillworts are currently considered not self-sustaining because of introductions in less than ideal outcrops and/or introductions of more than one species of *Isoetes* into the same pool. Since the last 5-year review (USFWS 2008), one new population was found in Warren County, one population was created, and one population has increased in its condition status. Three of the natural extant populations and one introduced population occur on protected lands (e.g. state, county, and private conservation lands).

Little amphianthus. Cumulatively, between the three states, there has been 77 populations of

little amphianthus. Twenty known populations of amphianthus have been documented as extirpated. Of the non-extirpated populations, three occur in Alabama, 51 occur in Georgia, and three occur in South Carolina. Forty-six populations are currently considered extant and 11 populations are in an unknown condition. Fifteen of the extant populations occur on protected lands (e.g. state, county, and private conservation lands). Two additional populations were introduced into a single pool on each protected site outside of the known historic range of the species (Cobb and Jackson Counties, Georgia). Of the known populations, 24 are listed in poor condition because of either low pool redundancy (the population consists of less than three pools) and/or populations occur at outcrops where there still is active quarrying. The populations in Alabama consist of some occupied pools with a limited number of plants, which could indicate the potential of the species being extirpated in that state in the near future (Frings and Davenport 2017). Nine new populations have been discovered in Georgia since the last 5-year review (USFWS 2008), but five of those populations are already classified as poor condition. Nine of the past extant populations have declined in status and three have been classified as extirpated since the last 5-year review (USFWS 2008). Seed bank sources may provide some adaptive capabilities of amphianthus to respond to poor reproductive years, but as the number of plants decline in individual pools the seed bank also declines making population recovery more unlikely (Boyd and Bartig 1992).

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 black-spored quillwort, mat-forming quillwort, or little amphianthus 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 an endangered species to a threatened species. 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, which triggers rulemaking. When changing the status of a species, we first propose the action in the *Federal Register* to seek public comment and peer review, followed by a final decision announced in the *Federal Register*.

We provide both updated downlisting and delisting criteria for the black-spored quillwort and mat-forming quillwort, and updated delisting criteria for little amphianthus, which will supersede those included in the Three Granite Outcrop Plants recovery plan (USFWS 1993), as follows:

Amended Downlisting Recovery Criteria

Black-spored quillwort and mat-forming quillwort.

We are amending the existing downlisting criteria for the two quillwort species to include a clarification of conditions (refer to page 14 of the species Recovery Plan).

Reclassification of **black-spored quillwort** or **mat-forming quillwort** to threatened will be considered when the following conditions are met:

1. Ten (10) populations exhibit a stable or increasing trend, evidenced by natural recruitment.

Justification: This ensures redundancy through the establishment stable patterns of occupancy over the range of both black-spored quillwort and mat-forming quillwort at 10 different granite outcrops (populations), each. This will help guard the species against the effects of climate change and differential threats across the range from recreation, development, and granite quarrying. A stable or increasing population size indicates that threats overall are not adversely affecting the population.

2. All 10 populations occur on lands protected via a conservation mechanism (addressed listing Factor A and D).

Justification: This criterion will help ameliorate threats to any population through proper management of the human-induced recreation threats to the population and protection from quarrying.

3. All 10 populations consist of at least 2 pools each, the 2 pools for black-spored quillwort must be at least 6 m² (65 ft²) in size, and the 2 pools for mat-forming quillwort must be at least 5 m² (54 ft²) in size (addresses listing factor E).

Justification: This establishes a resilient population, which is able to withstand the threat of demographic and environmental stochasticity. For the spore-producing perennial quillworts, two pools for each population may be appropriate number of pools for long-term viability. Pool size may also be important to the resiliency of the population. The pool sizes listed here represent the size of over 75% of the naturally occurring pools that have continued to persist with the species over the last 25 years and have been resilient to changes in pool conditions through that time. Other pools of smaller sizes have been less resilient to drying and invasive species.

Amended Delisting Recovery Criteria

The **black-spored quillwort** and **mat-forming quillwort** will be considered for delisting when:

1. Fifteen (15) populations exhibit a stable or increasing trend, evidenced by natural recruitment.

Justification: This ensures redundancy through the establishment stable patterns of occupancy over the range of little amphianthus at 15 different granite outcrops (populations). This will help guard the species against the effects of climate change and differential threats across the range from recreation, development, and granite quarrying. A stable or increasing population size indicates that threats overall are not adversely affecting the population.

2. All 15 populations occur on lands protected via a conservation mechanism (addressed listing factor A and D).

Justification: This criterion will help ameliorate threats to any population through proper management of the human-induced recreation threats to the population and protection from quarrying.

3. All 15 populations consist of at least 2 pools each, the 2 pools for black-spored quillwort must be at least 6 m² (65 ft²) in size, and the 2 pools for mat-forming quillwort must be at least 5 m² (54 ft²) in size (addresses listing factor E).

Justification: This establishes a resilient population, which is able to withstand the threat of demographic and environmental stochasticity. For the spore-producing perennial quillworts, two pools for each population may be appropriate number of pools for long-term viability. Pool size may also be important to the resiliency of the population. The pool sizes listed here represent the size of over 75% of the naturally occurring pools that have continued to persist with the species over the last 25 years and have been resilient to changes in pool conditions through that time. Other pools of smaller sizes have been less resilient to drying and invasive species.

The **little amphianthus** will be considered for delisting when:

1. Twenty (20) populations exhibit a stable or increasing trend, evidenced by natural recruitment.

Justification: This ensures redundancy through the establishment stable patterns of occupancy over the range of little amphianthus at 20 different granite outcrops (populations). This will help guard the species against the effects of climate change and differential threats across the range from recreation, development, and granite quarrying. A stable or increasing population size indicates that threats overall are not adversely affecting the population.

2. All 20 populations occur on lands protected via a conservation mechanism (addressed listing Factor A and D).

Justification: This criterion will help ameliorate threats to any population through proper management of the human-induced recreation threats to the population and protection from quarrying.

3. All 20 populations consist of at least 3 occupied pools at least 2.4 m² (26 ft²) in size (addresses listing factor E).

Justification: This establishes a resilient population, which is able to withstand the threat of demographic and environmental stochasticity. For the annual seed-producing

amphianthus, at least three pools for each population may be appropriate number of pools for long-term viability. Pool size may also be important to the resiliency of the population. The pool sizes listed here represent the size of over 75% of the naturally occurring pools that have continued to persist with the species over the last 25 years and have been resilient to changes in pool conditions through that time. Other pools of smaller sizes have been less resilient to drying and invasive species.

4. At least 2 populations occur in Alabama and 2 populations occur in South Carolina.
Justification: This ensures redundancy across the species range and will help guard the species against the effects of climate change and differential threats across the range from recreation, development, and granite quarrying.

Rationale for Amended Recovery Criteria

The proposed delisting recovery criteria reflect the best available and most up-to-date information of the three granite outcrop species. This amendment further defines what conditions need to occur to meet the definition of protected lands and what conditions need to occur to have viable populations of all three species. The primary threat to granite outcrop plants is still habitat destruction from quarrying, grazing, dumping, recreational use, and vehicular traffic. Protection of granite outcrops from these threats and appropriate management plans to ensure protection are the only way to provide persistence of the species into the future.

In the previous recovery plan, only two occupied pools were required to support delisting criteria for little amphianthus. For the spore-producing perennial quillworts, two pools for each population may be the appropriate number of pools for long-term viability. Because little amphianthus is an annual, we increased the minimum number of pools per population to increase species resiliency to withstand stochastic events.

We classified a minimum size of pools and minimum number of plants (amphianthus) and coverage (quillworts) to ensure the likelihood of persistence and to provide clarity for recovery goals. All three plants in smaller pools appear to be more likely to succumb to succession, be outcompeted by invasive species, and have limited resiliency. To assess biological meaningful assessments of pool size, we analyzed data collected at known natural pools containing black-spored quillwort and mat-forming quillwort. Of the 12 pools containing black-spored quillwort that were measured, 10 pools (80%) were approximately 6 m² (65 ft²) or larger and 6 pools (50%) were approximately 13 m² (140 ft²) or larger. Of the 38 pools containing mat-forming quillwort that were measured, 31 (82%) were 4.8 m² (52 ft²) or larger and 19 were 12.9 m² (139 ft²) or larger. These data were used to identify a minimum pool size for populations that would likely result in resiliency to competition with invasive species and impacts from succession.

The main dispersal method of amphianthus is thought to be through water movement out of source populations and into “downstream” pools. These “downstream” pools may provide additional habitat for the species persistence, but would likely provide very little benefit to recolonization of an uphill source pool. Many downstream pools have been classified as poor quality pools because of their edge location (shade, invasive species, higher disturbance) and poor characteristics for holding water. In 581 pools where amphianthus occurred naturally, 465 pools (80%) were equal to or greater than 2.4 m² (26 ft²) and 291 pools (50%) were greater than

6.2 m² (67 ft²). Larger pools increase the period that a pool will hold water, increase plant area, and will have larger seed banks to respond to poor reproductive years.

ADDITIONAL SITE SPECIFIC RECOVERY ACTIONS

Because of the extirpation of the amphianthus population at Rusty Rock (II.B.1.1.4. (page 16)), we strike this portion of the Recovery Actions. The amphianthus population is considered extirpated and has been since 1998.

Since the last recovery plan, several efforts have been made to artificially create pools and augment populations of all three granite outcrop species. To Section II.B.5. “Reestablish populations and augment populations at protected locations, if deemed necessary” (page 20), we would like to add the following information about population augmentation.

Through partnerships with state, non-government, and other sources, populations at Heggie’s Rock, Greensboro South, Bradley Mountain, Arabia Mountain, and Stone Mountain have all been modified through pool creation and/or pool modification. Artificial deepening of existing pools or artificially created pools should target the minimum pool size identified in the recovery criteria for the species. Pool creation should target areas at the highest elevation (top of the watershed) of the outcrop and minimize impacts to surrounding landscape. Because of the natural geology of the sites, site choice should also assess likelihood of exfoliation fissures beneath the surface. When intersected, these fissures result in the failure of the pool to hold water. Coordination with the Service in determining locations, size, depth, and source populations should occur.

LITERATURE CITED

- Allison, J.R. 2013. Status of Rare Plant Species on Outcrops of Lithonia Gneiss and on Granite Outcrops in Heard County. Report submitted to the Georgia Department of Natural Resources. 309 pp.
- Boyd, R.S. and J. L. Bartig. 1992. Ecologic studies of the Endangered Plant, *Amphianthus pusillus*. Report submitted to the U.S. Fish and Wildlife Service by Alabama Cooperative Fish and Wildlife Research Unit, Department of Botany and Microbiology, Auburn University, AL. 8 pp.
- Frings, D.M. and L.J. Davenport. 2017. Current status of the granite pool sprite, *Gratiola amphiantha* (Plantaginaceae), in Alabama. *Southeastern Naturalist* 16:59-39.
- U.S. Fish and Wildlife Service. 1993. Recovery Plan for Three Granite Outcrop Plant Species. Jackson, Mississippi. 41 pp.
- U.S. Fish and Wildlife Service. 2008. Three Granite Outcrop Plants: Black-spored Quillwort (*Isoetes melanospora*), Mat-forming Quillwort (*Isoetes tegetiformans*), Little Amphianthus (*Amphianthus pusillus*). Five-Year Review: Summary and Evaluation. Athens, Georgia. 28 pp.