Alabama streak-sorus fern
Thelypteris pilosa var. *alabamensis* (= *T. burksiorum*)

5-Year Review:
Summary and Evaluation

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U.S. Fish and Wildlife Service
South Atlantic-Gulf Region
Alabama Ecological Services Field Office
Daphne, Alabama

5-YEAR REVIEW

Alabama Streak-sorus Fern

***Thelypteris pilosa* var. *alabamensis* (=*T. burksiorum*) J.E. Watkins and D.R. Farrar**

I. GENERAL INFORMATION

A. Methodology used to complete the review:

In conducting this 5-year review, we relied on the best available information pertaining to historical and current distributions, life histories, genetics, habitats, and potential threats to the species. We announced initiation of this review on June 20, 2019, and requested information in a published Federal Register notice with a 60-day comment period (84 FR 28850). Information sources used for this review include the final rule listing this species under the Endangered Species Act of 1973, as amended (ESA) (57 FR 30164), the Recovery Plan (U.S. Fish and Wildlife Service (USFWS or Service) 1996), the previous 5-year review (USFWS 2014), peer reviewed scientific publications; unpublished field observations by Federal, State and other experienced biologists; unpublished survey reports; and notes and communications from other qualified biologists or experts. The species' recovery lead biologist in the Alabama Ecological Services Field Office compiled known and pertinent data on the status of the species since the previous 5-year review and completed the review. All literature and documents used for this review are on file at the Alabama Field Office.

Although Alabama streak-sorus fern was listed as *Thelypteris pilosa* var. *alabamensis*, current scientific information and species experts consider this a distinct species identified as *Thelypteris burksiorum*. See the taxonomic section below for additional details. For the remainder of this document we will refer to this entity as *T. burksiorum*.

B. Reviewers

Lead Region: South Atlantic-Gulf Region, Carrie Straight, 404-679-7226

Lead Field Office: Alabama Ecological Services Field Office, Shannon Holbrook, 251-441-5871

C. Background

1. **Federal Register Notice citation announcing initiation of this review:** June 20, 2019 (84 FR 28850)

2. **Listing history**
   Original Listing
   FR notice: 57 FR 30164
   Date listed: July 8, 1992
   Entity listed: subspecies
   Classification: Threatened

3. **Associated rulemakings:** None

4. **Review History:**

   Each year, the U.S. Fish and Wildlife Service (Service) reviews and updates listed species information to benefit the required Recovery Report to Congress. Through 2013, we performed a yearly recovery data call that included status recommendations for each species. The most recent evaluation for this plant was completed in 2014.

   The Service conducted a 5-year review for this species in 2014. The Service did not propose a change for the status of Alabama streak-sorus fern in the 2014 review.

5. **Species' Recovery Priority Number at start of review (48 FR 43098)*:* 9.**

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

6. **Recovery Plan:**

   Name of plan: Alabama Streak-sorus Fern Recovery Plan
   Date issued: October 25, 1996

II. REVIEW ANALYSIS

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

The Endangered Species Act (ESA) defines species as including any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate wildlife. This definition limits listing DPSs to only vertebrate species of fish and wildlife. Because the species under review is a plant, the DPS policy is not applicable.

B. Recovery Criteria:

1. **Does the species have a final, approved recovery plan containing objective, measurable criteria?** Yes

2. **Adequacy of recovery criteria.**

a. **Do the recovery criteria reflect the best available and most up-to date information on the biology of the species and its habitat? Yes.**

b. **Are all of the 5 listing factors that are relevant to the species addressed in the recovery criteria (and there is no new information to consider regarding existing or new threats)? Yes**

The recovery criteria are not linked to specific threats but address the five listing factors by assessing population persistence over time.

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

The Service will consider Alabama streak-sorus fern for delisting when the species meets the following criteria:

*Recovery Criteria***:** *This species will be considered for delisting when the population on the Sipsey Fork, and at least two other populations in different drainages, are protected and determined to be viable. A protected population is one which is secure from any present or foreseeable threats and is being appropriately managed (if management is needed). A viable population is one which is stable or increasing in size as determined through long-term monitoring for at least a 10-year period.*

Status: The criterion has not been met. Currently, the Alabama streak-sorus fern is only known from one drainage, the Sipsey Fork. The Alabama Natural Heritage Program (ALNHP), which is part of Auburn University's Museum of Natural History, conducted a 5-year inventory and monitoring effort of the Alabama Streak-sorus fern within the Bankhead National Forest, a multi-year project that began in 2013. The purpose of this study was designed to address the following three parameters: 1) To update census data of existing records, redefining occurrence boundaries in accordance to Element Occurrence specifications under the guidelines of Natural Heritage protocol developed by NatureServe; 2) to establish long-term monitoring plots for *T. burksiorum* to assess population trends associated with climate change; and 3) to conduct systematic inventory efforts for new occurrences. These status surveys revisited some of the original 19 locations as well as sites in between known sites and did not discover any new populations of the fern in adjacent drainages, nor have new populations been reported by other botanical surveys in the Bankhead National Forest or surrounding area. U.S. Forest Service biologists have also revisited some of the original 19 locations as well as sites in between known sites but found no new occurrences.

C. Updated Information and Current Species Status

1. Biology and Habitat

a. Summary of new information of species biology and life history:

Little new research on the biology and habitat of the species has been conducted since the recovery plan was signed in 1996. A thorough description on the species biology and life history of Alabama streak-sorus fern can be found in the 2014 5 year review (USFWS 2014).

b. Abundance, population trends, demography:

In 1992, when the Alabama streak-sorus fern was listed, 17 distinct populations were known along a 4.25-mile segment of the Sipsey Fork, a tributary of the Black Warrior River, in the Bankhead National Forest, Winston County, Alabama. The preferred habitat is on semi-shaded, moist ceilings of sandstone overhangs (rockhouses), and sandstone ledges and rockfaces. Plants can be found growing between 3 and 18 meters (10 to 60 feet) above the elevation of the river. The fern occurs on both private and federal lands upstream of Lewis Smith Lake.

The Forest Service was engaged through a Participating Agreement with ALNHP to conduct an inventory and monitoring effort of the Alabama Streak-sorus fern (*Thelypteris burksiorum*) within the Bankhead National Forest, a multi-year project that began in 2013. One of the goals of this study was to establish long-term monitoring plots for *T. burksiorum* to assess population trends associated with climate change.

Prior to the ALNHP study, 19 occurrences were identified as containing the species, primarily based on surveys conducted in 1992. As part of this study, all of these previously known occurrences were revisited. Plants were not able to be located at five of these original occurrences, although the range of the species appears to be unchanged. In an effort to place a greater emphasis in following NatureServe guidelines defining a population and the distances that separate them, boundaries of existing populations were redefined. As part of this project and in an effort to better document trends for the species, the 14 remaining occurrences documented previously in ALNHP's data system have been combined and delineated to represent two populations according the Natural Heritage Network's definition of what constitutes a population.

In an effort to establish a long term monitoring base, four permanent plots were established at two locations within the larger of the two populations as an effort to monitor population dynamics. Site selection was based on ease of accessibility, and each plot was delimited by inserting nails affixed with numbered metal tags in rock crevices. It is anticipated that long-term monitoring will serve as a platform to evaluate the impacts of climate change. These four permanent plots were monitored from 2013-2017.

According to data gathered by Godwin and Schotz 2017, *T. burksiorum* appears to be maintaining itself under the current conditions and can be expected to do so in

the long-term as long as present conditions are sustained. Periodic and long-term monitoring is encouraged and essential to assess population trends, habitat integrity and species viability, specifically in relation to climate change.

Data gathered through the ALNHP study, determined the estimate of *T. burksiorum* to be between 8,100 and 9,475 plants distributed among 14 remaining occurrences Godwin and Schotz 2017). No discernable trends were apparent in number of plants among the four monitoring plots sampled during the project from 2013-2017.

c. Genetics:

Little new research on the genetics of the species has been conducted since the recovery plan was signed in 1996. A thorough description on the genetics of Alabama streak-sorus fern can be found in the 2014 5-year review (USFWS 2014).

d. Taxonomic classification or changes in nomenclature:

According to information in the Flora of the Southern and Mid-Atlantic States (Weakley 2012), Watkins & Farrar (2002, 2005) present evidence for the Alabama streak-sorus fern (*T. burksiorum*) recognition as a species distinct from *T. pilosa* and discuss its likely evolution as an ancient relictual taxon.

e. Distribution and trends in spatial distribution:

Searches of promising habitat elsewhere in Bankhead National Forest were conducted in 2014, 2015, and 2016, through the Participating Agreement with ALNHP including portions of the Sipsey Fork and segments of Brushy, Caney, Rush, and Capsey creeks. Despite ideal habitat conditions, no new occurrences of *T. burksiorum* were observed elsewhere beyond the original locations discovered in 1992. Although five of the original occurrences have not been relocated, the range of the species has not changed since the time of listing.

f. Habitat or ecosystem conditions:
Little new research on the biology and habitat of the species has been conducted since the recovery plan was signed in 1996. A thorough description on the species biology and life history of Alabama streak-sorus fern can be found in the 2014 5-year review (USFWS 2014).

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

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

The modification and alteration of habitat within the species range remains the primary and major threat for this species. Of the known *T. burksiorum* locations, four sites, and a portion of a fifth site containing the greatest number of plants, are located on privately owned inholdings within Bankhead National Forest that are not subject to U.S. Forest Service management. No specific coordination with private landowners has occurred to date; however, the Forest Service plans to initiate this in the near future. Due to the location of the species in the canyons within the Sipsey Wilderness, the Forest Service is not doing active management besides protecting the existing populations from disturbance. There is no written management plan or specific population growth objectives other than language within the Forest plan to that states the species will be protected and populations will be maintained and expanded.

This species continues to be threatened by future road or dam construction projects, and subsequent pool elevation rises in the downstream reservoir; however, long term changes in reservoir pool levels are not possible without significant structural modifications to Lewis Smith Dam. The species also continues to be threatened by recreational use of the river corridor, loss of forest cover from fire, timbering on the slopes overlooking the river, or loss of hemlock trees leading to changes in shade, humidity, and moisture gradients that this species relies on for survival, and loss of habitat through development of private inholdings.

b. Overutilization for commercial, recreational, scientific, or educational purposes:

We have no new documentation of overutilization occurring and continue to believe it is not a threat to this plant.

c. Disease or predation:

At the time of listing, disease or predation were not believed to be a threat. We have no new information concerning this factor and continue to believe it is not a threat to this plant.

d. Inadequacy of existing regulatory mechanisms:

There are no State laws in Alabama protecting the Alabama streak-sorus fern and its habitat. Otherwise, protection is afforded to this species on federal land under Section 7 of the ESA. Two of the occurrences occur fall within the project boundary for the Smith Lake Project boundary and are afforded protection under the Federal Power Act through consultation with FERC. Bankhead National Forest has a Forest Plan that contains standards and protective measures including the Canyon Corridor prescription that provides protection for the species. Bankhead National Forest management practices do not apply to the potential development of private inholdings within the Forest. ESA take provisions also do

not apply to plants on private lands, where a significant portion of the fern population is found.

e. Other natural or manmade factors affecting its continued existence:

The greatest threat to the Alabama streak-sorus fern is its vulnerability due to its extremely restricted range and the relatively small number of plants comprising its population. Because the fern is located in a linear stretch of the Sipsey Fork, a single, natural or human-induced catastrophic disturbance could eliminate or seriously reduce the size of the existing populations. Natural threats, such as severe flooding or drought, or erosional collapse of sandstone overhangs, could dramatically reduce the number of plants throughout the range, or completely eliminate some sites.

Negative effects of flooding and drought have already been observed (Gunn 1991), and an impoundment has already permanently inundated over half of the known historic range (Short and Freeman 1978). Although the effects of climate change, including changes in drought or flood frequency and duration, are unknown, any habitat- or climate-related altering events could seriously impact the species.

Incidental impact or acts of disturbance from recreational users of the rockhouses are also potential threats, including heat and smoke from campfires built under some of these natural shelters (Gunn 1991, Ryan Shurette, USFS, February 14, 2014, pers. comm.).

D. Synthesis

At the time of listing, this species was only known from 17 distinct occurrences along a single 4 mile reach of the Sipsey Fork within the Bankhead National Forest, in Winston County, Alabama. Two additional occurrences were documented since the time of listing, however the species continues to only be found in one drainage. Five of the original occurrences were revisited in 2014, 2015 and 2016 without relocating plants, however, the range of the species remains the same. Due to the close proximity of the existing sites to each other, all of the sites have been regrouped into two populations according to Alabama Natural Heritage Networks definition of what constitutes an individual population (Al Schotz, Alabama Natural Heritage Program, February 12, 2021, pers. comm.). Most of this reach of Sipsey Fork where the populations occur is protected under Forest Service management, but some of the stream bank is in private ownership not subject to Forest Service management guidelines or take provisions of the ESA. Most of the occurrences are located in Bankhead National Forest; however, at least four sites and a portion of a fifth site, are located on private inholdings.

Although the Bankhead National Forest provides for standards and protective measures for the fern, this species could be threatened by a rise in impoundment level of the downstream reservoir, loss of forest cover from fire, timbering on the slopes overlooking

the river, or loss of hemlock trees leading to changes in shade, humidity, and moisture gradients in fern habitat, development of private inholdings, and recreational use of the river corridor.

According to data gathered by Godwin and Schotz 2017, *T. burksiorum* appears to be maintaining itself under the current conditions. A.t this time, the Alabama streak-sorus fern continues to meet the definition of a threatened species under the Act since it is not in imminent danger of extinction. However, the species could become vulnerable to extinction due to its highly restricted range.

III. RESULTS

A. Recommended Classification:

No change is needed.

IV. RECOMMENDATIONS FOR FUTURE ACTIONS

- Initiate at least semi-annual long-term monitoring on sites located on the Sipsey Fork.
- Attempt to locate additional populations in nearby drainages.
- Work to obtain protection for sites on privately-owned lands.
- Research life history parameters and propagation techniques.
- Continue to work cooperatively with the Bankhead National Forest to evaluate potential impacts to the plant from recreational use and implement corrective measures.
- Enter into an MOU to work toward the recovery of this plant through the development of conservation measures.
- Periodic monitoring is encouraged to assess population trends, specifically in relation to climate change. Because of the species' narrow ecological niche, ongoing research is recommended to assess the impacts of climate change on the plants themselves and their habitat.

V. REFERENCES

Crawford, L.C. 1951. A new fern for the United States. American Fern Journal 41:15-20.

Dean, B.E. 1969. Ferns of Alabama, 2nd ed. Southern University Press, Birmingham, AL. 222 pp.

Godwin, J. and A. Schotz. 2014. Black Warrior Waterdog, Flattened Musk Turtle, Streak Sorus Fern, and Kral's Water Plantain Studies in the Bankhead National Forest, Alabama. 2014 Annual Report submitted to U.S. Forest Service, Bankhead National Forest, Double Springs, AL. 17 pp.

Godwin, J. and A. Schotz. 2015. Black Warrior Waterdog, Flattened Musk Turtle, Streak Sorus Fern, and Kral's Water Plantain Studies in the Bankhead National Forest, Alabama. 2015 Annual Report submitted to U.S. Forest Service, Bankhead National Forest, Double Springs, AL. 17 pp.

Godwin, J. and A. Schotz. 2016. Black Warrior Waterdog, Flattened Musk Turtle, Streak Sorus Fern, and Kral's Water Plantain Studies in the Bankhead National Forest, Alabama. 2016 Annual Report submitted to U.S. Forest Service, Bankhead National Forest, Double Springs, AL. 17 pp.

Godwin, J. and A. Schotz. 2017. Black Warrior Waterdog, Flattened Musk Turtle, Streak Sorus Fern, and Kral's Water Plantain Studies in the Bankhead National Forest, Alabama. 2017 Annual Report submitted to U.S. Forest Service, Bankhead National Forest, Double Springs, AL. 17 pp.

Gunn, S.C. 1991. An update on the status of Thelypteris pilosa var. alabamensis. Report to the US Fish and Wildlife Service, Jackson, MS. 18pp.

Kral, R. 1983. A report on some rare, threatened, or endangered forest-related vascular plants of the South. U.S. Dept. of Agriculture Forest Service Technical Publication R8-TP2, Athens, GA. 1305 pp.

Mickel, J. T. 1989. Current status of *Thelypteris pilosa* var. *alabamensis*. Unpubl. man. 5 pp.

Schotz, A. 2017. Status Update and Monitoring for Alabama Streak-sorus Fern (Stegnogramma burksiorum (J.E. Watkins & Farrar) Weakley) and Kral's Water-Plantain (Sagittaria secundifolia Kral) in Bankhead National Forest, Alabama. Alabama Natural Heritage Program, Auburn University, Alabama. Unpublished report prepared for United States Forest Service, Montgomery, AL. 24 pp.

Short, J.W., and J.D. Freeman. 1978. Rediscovery, distribution, and phytogeographic affinities of Leptogramma pilosa in Alabama. American Fern J. 68(1): 1-2

U.S. Fish and Wildlife Service. 1996. Alabama Streak-sorus Fern (*Thelypteris pilosa* var. *alabamensis*) Recovery Plan, Atlanta, Georgia. 27 pp.

U.S. Fish and Wildlife Service. 2014. Alabama Streak-sorus Fern (*Thelypteris pilosa* var. *alabamensis*) 5 Year Review: Summary and Evaluation, Daphne, Alabama. 13 pp.

U.S. Forest Service (USDA). 2004. Revised Land and Resource Management Plan: Natural Forests in Alabama. Management Bulletin R8-MB 112A

Weakley, A.S. 2012. Flora of the Southern and Mid-Atlantic States. UNC Herbarium, North Carolina Botanical Garden. 1225 pp.

Watkins, Jr., James E., and Donald R. Farrar. 2000. Biosystematic investigation of the rare, disjunct rockhouse fern *Thelypteris pilosa* var. *alabamensis* (Thelypteridaceae: *Stegnogramma*). Abstract from Botany 2000! Conference, August 2000, Portland, Oregon.

Watkins, Jr., James E., and Donald R. Farrar. 2002. A New Name for an Old Fern from North America. American Fern Journal, Vol. 92, No. 2, pp. 171-178.

Watkins, Jr., James E., and Donald R. Farrar. 2005. Origin and Taxonomic Affinities of Thelypteris (Subgen. Stenogramma) burksiorum (Thelypteridaceae). Brittonia, Vol. 57, No. 2. Pp. 183-201.

U.S. FISH AND WILDLIFE SERVICE
5-year Review of Alabama streak sorus fern (*Thelypteris burksiorum)*

Current Classification: Threatened
Recommendation resulting from the 5-Year Review

____ Downlist to Threatened
____ Uplist to Endangered
____ Delist
__X__ No change is needed

Review Conducted By: Dan Everson and Shannon Holbrook, Alabama Ecological Services Field Office

FIELD OFFICE APPROVAL:

Lead Field Supervisor, Fish and Wildlife Service

Approve WILLIAM PEARSON Digitally signed by WILLIAM PEARSON Date: 2021.05.20 13:39:14 -05'00' Date_____

** Since 2014, Southeast Region Field Supervisors have been delegated authority to approve 5-year reviews that do not recommend a status change.*