Kral's Water-Plantain
(*Sagittaria secundifolia*)

5-Year Review:
Summary and Evaluation

USFWS photo

U.S. Fish and Wildlife Service
Southeast Region
Alabama Ecological Services Field Office
Daphne, Alabama

5-YEAR REVIEW
Kral's water-plantain (*Sagittaria secundifolia* Kral)

I. GENERAL INFORMATION

A. Methodology used to complete the review: In conducting this 5-year review, we relied on available information pertaining to historic and current distributions, life histories, and habitats of this species. We announced initiation of this review on September 8, 2006 and requested information in a published *Federal Register* notice (71 FR 53127). We conducted an internet search, reviewed all information in our files, and solicited information from all knowledgeable individuals including those associated with academia and state conservation programs. Our sources include the final rule listing this species under the Act; the Recovery Plan; peer reviewed scientific publications; unpublished field observations by Service, State and other experienced biologists; unpublished survey reports; and notes and communications from other qualified biologists or experts. All literature and documents used for this review are on file at the Alabama ES Field Office. All recommendations resulting from this review are the result of thoroughly reviewing the best available information on the plant. Comments and suggestions regarding this review were received from peer reviewers from outside the U.S. Fish and Wildlife Service (Service). See Appendix A for a summary of peer reviewer comments. Comments received were evaluated and incorporated as appropriate. No part of the review was contracted to an outside party. During the comment period, we did not receive any additional information about this plant from the general public.

B. Reviewers

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

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

Cooperating Field Offices: Jackson, Mississippi Ecological Services Field Office: Marion Scott Wiggers, 601-364-6910: Athens, Georgia, Ecological Services Field Office: Pete Pattavina, 706-613-9493

C. Background

1. Federal Register Notice citation announcing initiation of this review: September 8, 2006: 71 FR 53127

2. Species status: Stable (2013) There were no reports of reduced numbers of plant aggregations in FY 2013 in any of the known locations of Kral's water-plantain.

3. Recovery achieved: 2= 26-50% recovery objectives achieved

4. Listing history
Original Listing
FR notice: 55 FR 13907
Date listed: April 13, 1990
Entity listed: species
Classification: threatened

5. Review History:
Recovery Plan: 1991
Recovery Data Call: 2013, 2012, 2011, 2010, 2009, 2008, 2007, 2006, 2005, 2004, 2003, 2002, 2001, 2000, 1999, and 1998

FWS conducted a 5-year review for this species in l991 (56 FR 56882). In this review, the status of many species was simultaneously evaluated with no in-depth assessment of the five factors, threats, etc. as they pertained to the individual species. The notices summarily listed these species and stated that no changes in the designation of these species were warranted at that time. In particular, no changes were proposed for the status of the species in this review.

6. Species' Recovery Priority Number at start of review (48 FR 43098)*:* 5 (degree of threat is high; recovery potential is low)

7. Recovery Plan:
Name of plan: Recovery Plan: Kral's Water-Plantain
Date issued: August 12, 1991

II. REVIEW ANALYSIS

A. Application of the 1996 Distinct Population Segment (DPS) policy: The Act 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 Plan and 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 (i.e., most up-to date) information on the biology of the species and its habitat? Yes, except that the Hatchet Creek population reported in 2003 is a range expansion outside of the Cumberland Plateau, suggesting that recovery goals should not be limited to the Cumberland Plateau.

   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)? The recovery criteria do take into account the 5 listing factors.

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.**

   Criteria: Species will be considered for delisting when viable populations have been documented in three or more river basins within the Cumberland Plateau and within three or more tributaries of each river basin. A viable population is a reproducing population of sufficient size and genetic variability to sustain itself in perpetuity.

   Status: Criteria have not been met. In addition to the original population found in the Little River drainage (Cherokee and Dekalb Counties, Alabama and Chattooga, County, Georgia), Kral's water-plantain has been found in one additional river basin within the Cumberland Plateau (found in two upper tributaries of the Sipsey Fork on Bankhead National Forest), and one river basin outside of the Cumberland Plateau (Hatchet Creek of the Coosa River basin) (Threlkeld and Sohren 2003).

   Criteria: Each population has been found to be viable through periodic monitoring for 15 or more years.

   Status: Limited surveys by U.S. Fish and Wildlife Service and National Park Service biologists report that some of the populations on Little River are extant as of 2006, indicating that at least some aggregations of the Little River population have been viable more than 15 years. A new population was reported on Brushy Creek, a tributary of Sipsey Fork that runs into Lewis Smith Lake, in Bankhead National Forest as recently as 2005. The U.S. Forest Service is currently working with the Alabama Natural Heritage Heritage Program(ALNHP) to conduct surveys for Kral's water plantain and other rare species in the Bankhead National Forest

(Forest). During surveys in spring of 2013, a new population was discovered along the Sipsey River, in Winston County, Alabama (Ryan Shurette, USFS, February 2014, pers. comm.). This makes a total of 3 known locations (1 in Brushy Creek, 2 in Sipsey Fork) on Bankhead National Forest. More species-specific surveys by the ALNHP are planned in 2015-16.

Criteria: Populations and supporting habitat in each river basin have sufficient long-term protection that the species no longer qualifies for protection under the Endangered Species Act.

Status: The Little River population is now largely surrounded by publicly-owned parkland (Little River Canyon National Preserve managed by the National Park Service, and the Little River Wildlife Management Area managed by Alabama Department of Conservation and Natural Resources (ADCNR). The two small populations in the Sipsey Fork basin are managed primarily by the U.S. Forest Service: the Brushy Creek population is within the area of the Forest managed for timber and other uses, while the Sipsey Fork population is within a section of the river that receives additional protection by its Wild and Scenic River status. The Hatchet Creek population of the Coosa River basin is surrounded by private lands. Overall, most populations are surrounded by lands managed by State and Federal natural resource agencies. Point and non-point source pollutants, including the cumulative effects of sedimentation, are still a concern despite the degree of public ownership of riparian zones along these waterbodies.

4. List the recovery tasks and discuss how each task has or has not been achieved.

(1) Protect populations and habitat.
Status: The National Park Service has managed portions of the Little River Canyon since the mid-1990s; therefore, providing long-term protection of the watershed.

Forest biologists and managers are aware of populations in the Forest and have policies and practices in place to protect these, as well as other federally-listed species. These policies and land use practices provide information about riparian/canyon restrictions, and management activities (disturbance, herbicide, etc.) near threatened and endangered species can be found in the Forest Plan.

In 2010, a bridge replacement project in Little River Canyon National Preserve replaced the existing bridge over Little River on SR-35 with a new structure located immediately north of the current structure. The Service required monitoring surveys to be conducted each year for a

minimum of three years following completion of the new bridge. The data collected from the surveys showed that there were no negative impacts to the species. It also showed that the distribution of the species has not changed, and in some cases, remains locally abundant (ALDOT 2010, 2012, 2013).

There is one population in the Little River, in Chattooga County, Georgia. In this section, there is a bridge that is spanning a few aggregations of plants is anticipated to be replaced in 2015; however, no impacts are expected (Pete Pattavina, FWS, pers comm 2014).

(2) Initiate a monitoring program.
Status: A formal monitoring program has not been initiated. The National Park Service has expressed an interest in monitoring plant populations in Little River Canyon Preserve, but lacks the resources to accomplish this at this time (Mary Shew, NPS, pers. comm. 2014). McCartney (1999) revisited all of Whetstone's (1988) sites in Little River Canyon and reported that *S. secundifolia* appears to be thriving within the confines of Little River Canyon National Preserve especially, in the East and West forks of Little River, but three formerly documented populations appear to be extirpated due to unknown causes. Bankhead National Forest has plans to survey and monitor Kral's water plantain as part of a Federal Energy Regulatory Commission (FERC) Settlement Agreement, with Alabama Power Company, as well as an informal schedule of National Forest of Alabama in-house monitoring of T&E species. However, they have no specific long term monitoring plan in place for the species.

(3) Determine habitat characteristics and conduct life history studies.
Status: Research by McCartney *et. al* 1998 showed greater genetic diversity than expected compared to other *Sagittaria* species, suggesting that low flowering frequency and sexual reproduction may not be a limiting factor in maintaining genetic diversity. Habitat for all populations found thus far includes crevices of bedrock slabs, and cobble-boulder habitats in relatively shallow, moderately sloped, free-flowing medium sized streams.

(4) Determine habitat management needs and techniques, implement if necessary.
Status: Experiments to determine habitat needs have not been conducted, though it is assumed, based on location of existing populations, the plant prefers shallow riffles, jointed, flat sandstone slabs, and substrates that include cobbles, small boulders, and sand. The plant is not found in areas with deep pools, large boulders or highly turbulent water. Anecdotal observations by researchers and National Park Service biologists suggest flowering is triggered by low-flow periods in Little River Canyon that allow the inflorescence to remain above water, and allow submerged

leaves access to sunlight (Mary Shew, pers. comm. 2014, McCartney 1999). Periods of high flow may also be necessary to reduce competition from algal mats and other plants. This suggests that maintaining natural cycles of low and high water flows will help retain the viability of the species.

(5) Preserve genetic stock
Status: Seed or other materials for the species have not been collected at this time but could be attempted if necessary (Ryan Shurette, USFS, February 2014, pers. comm.)

(6) Reintroduce population(s) within historic range, if deemed necessary.
Status: Reintroductions are not considered necessary at this time because of the discovery of additional populations.

(7) Develop public awareness program.
Status: Web sites maintained by Alabama Department of Conservation and Natural Resources, and Georgia Department of Natural Resources, as well as other websites focusing on rare, threatened and endangered species of Alabama and the Southeast include descriptions of Kral's water-plantain along with many other species. The National Park Service includes information on rare, threatened and endangered species of Little River Canyon in some of their interpretive programs. The U.S. Fish and Wildlife Service includes Kral's water-plantain in brochures describing the listed species of Alabama. A program that focuses specifically on Kral's water-plantain has not been developed.

C. Updated Information and Current Species Status

1. Biology and Habitat

Kral's water-plantain is a member of the water-plantain family (Alismataceae) and is in the "graminea" complex of *Sagittaria*. Distinguishing characteristics include a stout, elongated rhizome, hairy filaments, linear leaves, and spreading or reflexed sepals (Kral 1982, Whetstone 1988). Kral's water plantain is a submersed to emersed aquatic, perennial herb that arises from a stiff, elongated rhizome up to 10 centimeters (cm) (4 inches) in length. It can float above or below the water. The shape of its leaves depends upon the velocity and depth of the water it inhabits. In swift shallows, the leaves are linear, rigid, and sickle-shaped, 5 to 8 cm (2 to 3 inches) long and 2 to 5 millimeters (mm) (0.08 to 0.20 inches) wide. In quiet, deep waters, the leaves are more quill-like, being longer (10 to 30 cm) (4 to 12 inches), linear in shape, and tapering. Separate male and female flowers are produced on a stalk, 10 to 50 cm (4 to 20 inches) long. The petals are inconspicuous in the female flowers;

however, in the male flowers, they are white and 1.0 to 1.5 cm (0.4 to 0.6 inches) long. The fruit consists of a cluster of achenes approximately 2 mm (0.08 inch) in length. Although infrequent, flowering occurs from May into July, and intermittently into the fall (Kral 1982, 1983).

Kral's water-plantain typically occurs on frequently exposed shoals or rooted among loose boulders in quiet pools up to 1 meter (3.2 feet) in depth. Plants are locally distributed, where suitable habitat exists, and grow in pure stands or in association with various submergents (below-water plants), including pondweed (*Potamogeton),* naiads *(Najas*), and water-milfoil (*Myriophyllum*), and emergents (above-water plants), such as smartweed (*Polygonum*), false pimpernels (*Lindernia*), and water-willow (*Justicia americana*). The immediate banks are often dominated by thickets of shrubs including alder (*Alnus*), wild azalea (*Rhododendron*), mountain laurel (*Kalmia*), fetter-bush (*Lyonia*), and holly (*Ilex*). Sphagnous seeps commonly contain sedges (*Carex*), beak rush (*Rhynchospora*), pipe wort (*Eriocaulon*), panic-grass (*Panicum*), yellow-eyed grass (*Xyris*), and meadow beauty (*Rhexia*). The stream bottoms are typically narrow and bounded by steep slopes (Kral 1982, Whetstone 1988). Two endangered plants, the green pitcher plant (*Sarracenia oreophila*) and harperella, and three candidate plants, dodder (*Cuscuta harperi*), tick seed (*Coreopsis pulchra*), and an onion species (*Allium speculae*) also occur in associated habitats at several sites.

At its time of listing, Kral's water-plantain was known from only a single population in the Little River system in northeast Alabama (DeKalb and Cherokee Counties) and northwest Georgia (Chattooga County) (55 FR 13907). A historical population from Town Creek (DeKalb County, Alabama) had not been located and was believed to be extirpated from the area. On August 11, 1993, Scott C. Gunn, Alabama Natural Heritage Coordinator, discovered a population of Kral's water-plantain growing in shoals at the confluence of Caney Creek and Sipsey Fork in the Bankhead National Forest, Winston County, Alabama (Reichert 1993). On July 26, 2001, Kral's water-plantain was found growing with Cahaba lilies in crevices along Hatchet Creek, Coosa County, Alabama (Threlkeld 2001). On April 16, 2005, two clusters of Kral's water-plantain were discovered attached to bedrock at the bottom of Brushy Creek, Winston County, Alabama (Threlkeld 2005).

New information related to the biology and habitat for the species includes its discovery in several additional river drainages in Alabama including the Sipsey Fork in the Bankhead National Forest, and in Hatchet Creek, outside of the Cumberland Plateau. McCartney et. al (1998) found a greater genetic diversity than expected compared to other *Sagittaria* species, showing that, while reproduction is primarily clonal, some sexual

reproduction occurs as well; therefore, loss of genetic diversity is unlikely to be a factor in maintaining populations over time.

Kral's water-plantain is clonal and reproduction is primarily asexual, which suggests there may be low genetic variability within the isolated populations. Although capable of sexual reproduction, Kral's water-plantain spreads primarily by growth of its underwater stems (rhizomes). Female and male flowers occur separately on the same plant, with male flowers held on upper branches, female on lower. Plants flower only in full sun and where low water levels permit growth of abovewater leaves. Bees are likely pollinators but little is known about Kral's water-plantain reproduction.

Whetstone (1988) observed flowering in only 1 percent of this *Sagittaria* and only in areas of direct sunlight and at a water level that allowed emergent leaves. Many of the sites supporting local populations are in less than these optimum conditions for flowering: therefore, it is important to maintain as much suitable habitat as possible to encourage reproduction by sexual means. Sexual reproduction increases genetic variability, which enables species to adapt to changing conditions.

2. Five Factor Analysis

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

Land use changes: Land-use changes in the watersheds where Kral's water-plantain is found remain a threat to the species. Accelerated development of private land near Little River Canyon, increased recreational uses of streams and stream bottom habitats, mining, and silvicultural practices can directly impact plants and lead to changes in water quality and hydrology that can be harmful to the species. For example, Kral (1983) documented the loss of one population (in Town Creek,) due to excessive siltation. McCartney (1999) also documented the loss of several aggregations in the Little River drainage, though the cause is unknown.

Small population size: A major threat to this species is the elimination or adverse modification of its already limited habitat. Clearing of the adjacent river banks for silvicultural, residential, recreational, surface mining, or agricultural purposes poses a significant threat for this species. A small number of sites are accessible by fords (a shallow place in a river/stream that you can walk or drive across) and are often a center for recreational activity, subjecting them to damage by off-road vehicle traffic. These activities contribute to water quality degradation and

increase stream turbidity and siltation from erosion (Kral 1983, Whetstone 1988). Similar impacts likely caused the loss of the population and much of the suitable habitat in the Town Creek watershed (Kral 1982, 1983). The Little River population may be adversely affected by eutrophication from garbage dumping and leaking sewage systems. In 1988, large quantities of human coliform bacteria were present in water samples taken at several sites along the Little River (Whetstone 1988). This eutrophication increases the presence of filamentous algae, which clings to individuals of Kral's water-plantain. Extreme water turbidity and dense filamentous algae decrease the amount of light available to the plants for growth and flowering. Because of the small number of extant populations, stochastic disturbance events related to habitat quality and quantity have the potential to affect a large percentage of existing plants.

Impoundments: Impoundments exist over large areas of presumed suitable habitat on the Little River and may have destroyed undocumented populations (Department of the Interior 1990). Four large impoundments exist along a five mile stretch of the West Fork of the Little River and two are present below the Georgia locality on the East Fork. The impoundment of Lake Weiss in Cherokee County, Alabama, in the 1960s flooded suitable habitat along Yellow Creek and several miles of the Little River. In the past, dams along two creeks, which flow into the Little River, have broken and flooded portions of suitable habitat. Cracks and leaks have been observed on the dam above DeSoto Falls and a portion of a dam near the Georgia population has deteriorated (Whetstone 1988). Several existing populations are threatened by unstable impoundments that could break and eliminate or degrade populations and suitable habitat (McCartney 1999).

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

At the time of listing, overutilization was not believed to be a threat. We have no new documentation of this threat 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, that are protective of Kral's water plantain and its habitat. Therefore, the only protection afforded to this species in Alabama is on Federal land or on Federal projects under Section 7 of the ESA. 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 Kral's water plantain population is found. State protections are in place for the species in Georgia but do not provide for the protection against habitat destruction. In Georgia, listed plants, or those proposed for listing, are protected by the Wildflower Preservation Act of 1973. This legislation prohibits taking of plants from public lands without a permit and regulates the sale and transport of plants within the State. This statute does not provide protection against habitat destruction, which is the principal threat.

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

Increased recreational use of streambed habitats on Federal land, particularly by off-road vehicles during low-flow periods, is a threat that warrants further study and possible management actions Use of stream channels by recreational off-road vehicles on National Park Service and U.S. Forest Service lands is a growing problem (Mary Shew, NPS, pers. comm. March 2014).

Destruction of habitat from off-road vehicle (ORV) is also likely occurring in streams on public land. Both the Forest Service and National Park Service recognize this as a potential problem and will be attempting to manage ORV usage (Ryan Shurette, USFS, pers. comm., February 2014, Mary Shew, NPS, pers. comm., March 2014).

Siltation, impoundments, and eutrophication due to sewage are threats to this species. Activities that increase stream turbidity or siltation from erosion pose a threat to this species by reducing the amount of light reaching this submersed plant and burying it under silt. Eutrophication may lead to algal growth on the plant and result in degraded water quality.

The Bankhead population of Kral's water plantain is located within the Wild and Scenic River Corridor which is classified as unsuitable for many management activities. Since the population is located at the junction of Caney Creek and Sipsey Fork some silt may be contributed to the Sipsey Fork by activities above and along Caney Creek. However, National Forest Revised Land and Resource Management Plan standards for

riparian corridors should minimize the amount of silt reaching Caney Creek and Sipsey Fork and other creeks and streams on Bankhead where potential habitat is present. On-going Forest Service activities that may cumulatively affect Kral's water plantain or its habitat include thinning of loblolly pine stands and site preparation and planting of shortleaf and longleaf pines through the Forest Health and Restoration Project (FHRP).

D. Synthesis

At its time of listing, Kral's water-plantain was known from only a single population in the Little River system in northeast Alabama (DeKalb and Cherokee Counties) and northwest Georgia (Chattooga County) (55 FR 13907). A historical population from Town Creek (DeKalb County, Alabama) had not been located and was believed to be extirpated from the area. On August 11, 1993, Scott C. Gunn, Alabama Natural Heritage Coordinator, discovered a population of Kral's water-plantain growing in shoals at the confluence of Caney Creek and Sipsey Fork in the Bankhead National Forest, Winston County, Alabama (Johnson & Wehrle, 2006). On July 26, 2001, Kral's water-plantain was found growing with Cahaba lilies in crevices along Hatchet Creek, Coosa County, Alabama (Threlkeld and Soehren, 2003). On April 16, 2005, two clusters of Kral's water-plantain were discovered attached to bedrock at the bottom of Brushy Creek, Winston County, Alabama (Johnson & Wehrle, 2006).

Kral's water-plantain is found in a small number of locations in Alabama and Georgia, with relatively small numbers of plants in each population. Surveys have shown that it is more widely distributed than was once believed; three of the four extant populations are found in streams within federally-managed lands (Little River Canyon National Preserve, and Bankhead National Forest). Although the Bankhead National Forest and the National Park service provide for standards and protective measures for the Kral's water plantain, the species could be threatened by a rise in impoundments, siltation from silviculture, land use practices that can lead to changes in hydrology and/or degradation of water quality, and recreational use of the river corridor.

At this time, the Kral's water plantain 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 limited range.

III. RESULTS

A. Recommended Classification:

No change is needed. Recovery criteria have not been met, and the original threats to the species have not been abated.

B. New Recovery Priority Number _8___

Recovery Priority Number of 8 to reflect "moderate" degree of threat and high recovery potential.

IV. RECOMMENDATIONS FOR FUTURE ACTIONS

1. Gather base-line data on all populations and initiate long-term monitoring on sites, particularly on the secure, protected sites.
2. Develop habitat suitability indices using GIS to predict potential locations of additional populations;
3. Conduct additional field surveys to locate additional populations.
4. Since the discovery of the Hatchet Creek population, new surveys should be conducted in the Piedmont Region
5. Work to obtain protection for sites adjacent to privately-owned lands.
6. Assess the threat of increased off-road vehicle use in stream channels where Kral's water-plantain is found.
7. Implement tasks identified in the recovery plan, except for number 6, related to reintroduction of the plant.
8. Revise recovery plan to address changes in known distribution.
9. Assist ADCNR in implementing State legislation that provides protection of Krals' water plantain.

V. REFERENCES

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U.S. FISH AND WILDLIFE SERVICE
5-year Review of Kral's water-plantain (*Sagittaria secundifolia*)

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 _____ Date 1/25/2014

REGIONAL OFFICE APPROVAL:

The Regional Director or the Assistant Regional Director, if authority has been delegated to the Assistant Regional Director, must sign all 5-year reviews.

for
Lead Regional Director, Fish and Wildlife Service

Approve _____ Date 4-29-14

APPENDIX A
Summary of peer review for the five-year review of Kral's water-plantain (*Sagittaria secundifolia*)

A. Peer Review Method:
A draft copy of the five-year review was emailed to biologists at the Jackson FWS field office. In addition, the document was also sent to four independent peer reviewers including Al Shotz, botanist with the Alabama Natural Heritage Program, Wayne Barger, Botanist/Curator of the Alabama Natural Heritage Section Herbarium (ALNHS) with the Alabama Department of Conservation and Natural Resources, Ryan Shurette, botanist with the National Forests in Alabama, and Jim Godwin, biologist on staff at Auburn University, AL

B. Peer Review Charge:
Reviewers were asked to review and provide comments on the underlying science and overall assessment of the data in the document. Reviewers were not asked to provide recommendations on the legal status of the species.

C. Summary of Peer Review Comments/Report:
We received comments from two of the peer reviewers which were mostly editorial in nature with a few specific comments. One reviewer from the National Forests in Alabama provided updated status survey information as well as conservation measures for the species. This reviewer also provided information on ongoing threats to the populations in Bankhead National Forest.

Comments were considered and incorporated into the final document as appropriate

D. Response to Peer Review:
The primary author was in agreement with all comments and concerns received from the peer reviewers and tried to address every comment as appropriate.