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

5-Year Status Review:
Summary and Evaluation

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

August 2025

5-YEAR STATUS REVIEW
Kral's Water-Plantain (*Sagittaria secundifolia*)

GENERAL INFORMATION

Current Classification: Threatened

Lead Field Office: Alabama Ecological Services Field Office, Daphne, Alabama

Review prepared by: Erin Lentz, Alabama Ecological Services Field Office

Reviewers:

Lead Regional Office: Southeast Region, Carrie Straight

Cooperating Field Office(s): Georgia Ecological Services Field Office, Mincy Moffett

Date of original listing: May 14, 1990 (55 FR 13907; April 13, 1990)

Methodology used to complete the review:

In accordance with section 4(c)(2) of the Endangered Species Act of 1973, as amended (Act), the purpose of a status review is to assess each threatened species or endangered species to determine whether its status has changed and if it should be classified differently or removed from the Lists of Threatened and Endangered Wildlife and Plants (50 CFR 424.11). The U.S. Fish and Wildlife Service (Service) evaluated the best available information about Kral's water-plantain's biology, habitat, and threats of to inform this status review.

We announced initiation of this review in the Federal Register on June 6, 2024 (89 FR 48437) with a 60-day comment period and received no comments. The primary sources of information used in this analysis were the 1990 final listing rule (55 FR 13907), the 1991 recovery plan, 2014 and 2020 5-year reviews, peer-reviewed reports, agency reports, unpublished survey data and reports, and personal communication with recognized experts. This review was completed by the U.S. Fish and Wildlife Service, Alabama Ecological Services Field Office, Daphne, Alabama. All literature and documents used for this review are on file at the Field Office. All recommendations resulting from this review are the result of thoroughly reviewing the best available information on the Kral's water-plantain. A completed draft of this 5-year review was sent to other affected Service offices in the species' range for review and comment. All comments received were evaluated and incorporated into this final document as appropriate.

Federal Register Notice citation announcing the species is under active review:
June 6, 2024 (89 FR 48437)

Species' Recovery Priority Number at start of 5-year review (48 FR 43098):
8, indicating that the listed entity is a species with a moderate degree of threat and high recovery potential.

Review History:
The Service completed two 5-year reviews for this species recommending no change in status, one signed on April 29, 2014, the second signed on August 12, 2020 (Service 2014, 2020, respectively).

REVIEW ANALYSIS

Listed Entity

Taxonomy and nomenclature
We are not aware of any changes to the taxonomy of this entity, and it is still considered valid by the Service.

Distinct Population Segment (DPS) (61 FR 4722)
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 of a DPS to only vertebrate species. Because the species under review is a not a vertebrate, the DPS policy does not apply.

Recovery Criteria

Recovery Plan
Final Recovery Plan for Kral's Water-Plantain (*Sagittaria secundifolia*), August 12, 1991.

Recovery plans are not regulatory documents and intended to provide guidance to the Service, States, and other partners on methods of minimizing threats to listed species and on criteria that may be used to determine when recovery is achieved. If the recovery criteria defined in the plan are still valid, meeting recovery criteria can indicate that the species no longer requires protections under the Act. However, when recommending whether a listed species should be delisted, the Service must apply the factors in section 4(a) of the Act (84 FR 45020).

Based on the 1991 Recovery Plan (Service 1991), the Service will consider Kral's water-plantain for delisting when the species meets the following criteria.

(1) Species will be considered for delisting when viable populations have been documented in three or more river basins within the Cumberland Plateau which lies within the Level IV Ecoregion 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.

This criterion has not been met. The species does occur in three river basins or watersheds; however, one record is from outside of the Cumberland Plateau and within the Southern Inner Piedmont Level IV Ecoregion (Griffith et al. 2001). This meets part of the intent of the criteria, providing spatial distribution of the species across three different watersheds to minimize impacts of a single threat on the species, but redundancy (tributaries within a watershed) has not been met yet. In addition, viability of these populations are still being assessed. The three

watersheds are meta-populations and tributaries within the associated watershed with occurrences are populations. Those populations are:

1. Little River Watershed - Cherokee and DeKalb counties, AL, and Chattooga County, GA, Cumberland Plateau
    1. Little River mainstem
    2. West Fork - tributary
    3. East Fork - tributary

2. Sipsey Fork Watershed - within Bankhead National Forest, Winston County, AL, Cumberland Plateau
    4. Sipsey Fork mainstream
    5. Brushy Creek and its tributary Rush Creek

3. Hatchet Creek Watershed - within the Coosa River watershed (one tributary in Coosa County, AL, Southern Inner Piedmont; Threlkeld and Soehren 2003).
    6. Hatchet Creek

(2) Each population has been found to be viable through periodic monitoring for 15 or more years.

This criterion has not been met. Surveys undertaken by Service and National Park Service (NPS) biologists confirm that specific populations of Kral's water-plantain along the Little River have remained extant for more than 15 years. Despite this longevity, no formal monitoring plan has been established for the Little River populations and only sporadic monitoring have taken place in the Sipsey Fork and the Hatchet Creek watersheds (Coosa River).

(3) 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.

This criterion has not been met. Descriptions for the three river basins (watersheds) are below:

1. The Little River is bordered by publicly owned lands, with the NPS overseeing the Little River Canyon National Preserve and the Alabama Department of Conservation and Natural Resources (ADCNR) managing the Little River Wildlife Management Area.
2. The Brushy Fork and Sipsey Fork populations all lie within the Bankhead National Forest which is managed by the U.S. Forest Service. Within Bankhead National Forest, the Brushy Creek population lies in a multi-use area managed for timber production, and the Sipsey Fork population benefits from enhanced protection under its Wild and Scenic River designation.
3. The Hatchet Creek population is totally, surrounded by private land and lacks any level of institutional oversight.

Biology and Habitat Summary

Detailed reviews of Kral's water-plantain's biology and habitat can be found in pervious 5-year reviews (Service 2014, 2020). A summary of the species current condition is provided below,

along with new information. Kral's water-plantain's range, including counties with known occurrences is depicted by the red circles in Figure 1.

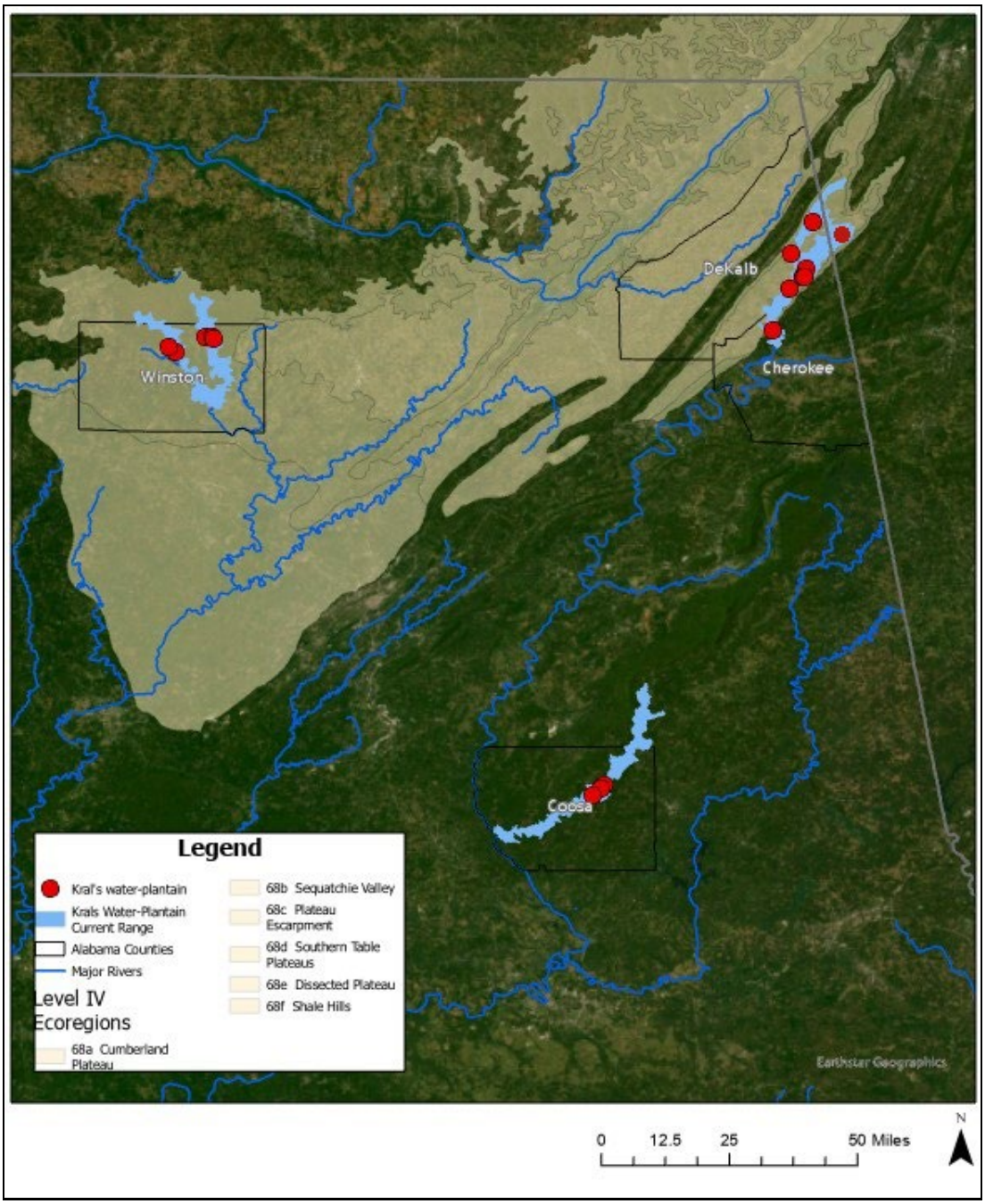

Figure 1: Distribution of Kral's water-plantain (circles denoting occurrences in the Little River watershed populations in northeast Alabama and northwest Georgia, Brushy and Sipsey forks in northwest Alabama, and Hatchet Creek in central Alabama).

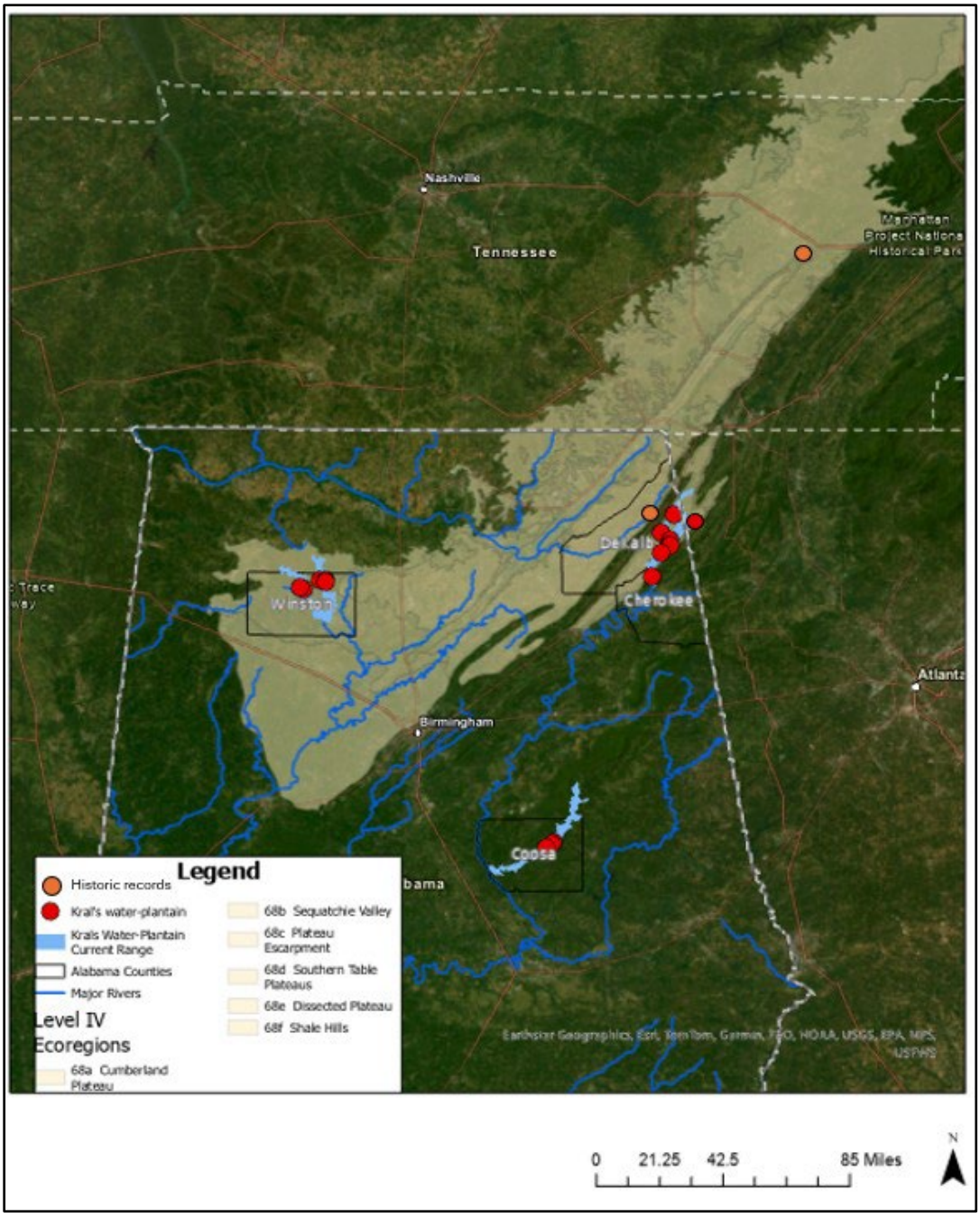

Figure 2: Historic distribution of Kral's water-plantain (orange circles denoting historic occurrences in Town Creek, Alabama and Daddy's Creek, Tennessee).

Range and Distribution

Currently, Kral's water-plantain is comprised of six populations within only three watersheds (metapopulations):

1. Little River Watershed: Little River (Population 1), West Fork (Population 2), and East Fork (Population 3) (Cherokee and DeKalb counties, AL, and Chattooga County, GA).

2. Sipsey Fork Watershed: Sipsey Fork (Population 4) and Brushy Creek and its tributary Rush Creek (Population 5) (Winston County, AL).
3. Hatchet Creek Watershed (Population 6) (Coosa County, AL).

Historically, Kral's water-plantain was documented across the Southwestern Appalachians, with known populations in Town Creek, DeKalb County, Alabama (Godwin and Schotz 2017), and Daddy's Creek, Cumberland County, Tennessee (Keener, pers. comm. 2025), as indicated by the orange circles in Figure 2. Both populations are likely extirpated (Kral 1983).

Little River Watershed: This was the original population at time of listing in northeast Alabama (DeKalb and Cherokee counties) and northwest Georgia (Chattooga County) (Service 1990). A tributary of the Coosa River that includes the Little River (Population 1), the West Fork (Population 2), and the East Fork (Population 3). Publicly owned land surrounds the Little River. NPS manages the Little River Canyon National Preserve and ADCNR manages the Little River Wildlife Management Area.

Sipsey Fork Watershed: There are several populations within the Black Warrior River system, in Winston County, Alabama. One, along the mainstem of the Sipsey Fork, constituting Population 4, a couple along the mainstem of Brushy Creek, including one along its tributary, Rush Creek, which form Population 5. These populations are protected within the Bankhead National Forest, managed by the U.S. Forest Service. The Brushy Creek population is situated in an area designated for timber production and multiple-use management, while the Sipsey Fork population benefits from enhanced protection due to its location within a segment designated as a Wild and Scenic River.

Hatchet Creek Watershed: This population, part of the Coosa River watershed, is the only one located outside the Cumberland Plateau, occurring in the Southern Inner Piedmont of Coosa County, Alabama (Threlkeld and Soehren 2003). Surrounded by private land, this population lacks federal or state protection outside of volunteer actions.

Table 1. Number and location of Kral's water-plantain populations (extant, likely extirpated, and partially protected).

Watershed	Populations	Location	Populations (Extant = E, Likely extirpated = LX)	Level IV Ecoregion	Partially Protected
Little River	Little River West Fork East Fork	DeKalb, Cherokee, AL and Chattooga, GA	E	Cumberland Plateau	Yes
Sipsey Fork	Sipsey Fork Brushy Creek	Winston Co., AL	E	Cumberland Plateau	Yes
Hatchet Creek	Hatchet Creek	Coosa Co., AL	E	Southern Inner Piedmont	No
Town Creek	Last Known Record 1983	Dekalb Co., AL	LX	Southern Table Plateaus	-
Daddy's Creek	Last Known Record 1983	Cumberland Co., TN	LX	Cumberland Plateau	Yes
Total Populations	6		6 E, 2 LX		2

Threats (Five-Factor Analysis) Summary

The status of a species is determined from an assessment of factors specified in section 4 (a)(1) of the Act. A summary of this assessment is detailed below.

Factor A: the present or threatened destruction, modification, or curtailment of its habitat or range.

Habitat modification and alteration within the range of Kral's water-plantain constitute the primary threat to the species' survival, driven predominantly by land-use changes and impoundments. Land-use shifts in watersheds supporting the species pose ongoing risks, as the clearing of riparian zones for silviculture, residential expansion, recreational development, surface mining, or agricultural activities directly impairs its habitat. Notably, intensified private land development near Little River Canyon, increased recreational use of streams, mining operations, and forestry practices without properly implemented protections and best management practices can adversely affect water quality and hydrological conditions critical to the plant's persistence. These disturbances elevate sedimentation levels, compromising habitat suitability by filling rock crevices and interstitial spaces, covering roots, and coating leaves—thereby hindering oxygenation, photosynthesis, and energy production—while also destabilizing stream substrates and eliminating the silt-free, rocky conditions essential for the species, as demonstrated by historical population declines in the now-extirpated population of Town Creek (Kral 1983) and also seen in Little River drainage sites (Rinehart 2008).

Impoundments have likely resulted in the loss of undocumented populations, particularly along the Little River (Service 1991), with four significant impoundments along the West Fork Little River, two downstream of the Georgia locality on the East Fork, and the Weiss Lake impoundment in Cherokee County, Alabama, during the 1960s, inundating viable habitats along Yellow Creek and segments of the Little River. Additional threats to Kral's water plantain include past dams along two creeks, which flow into the Little River, have broken and flooded

portions of suitable habitat. Cracks and leaks observed on the dam above DeSoto Falls and a portion of a dam near the Georgia population continue to deteriorate (Whetstone 1988). Several existing occurrences are threatened by unstable dams that could break and eliminate or degrade populations and suitable habitat (McCartney et al. 1998). Unintentional dam breaks can result in a flush of materials that can bury downstream habitats removing suitable habitat for Kral's water-plantain and potentially burying existing populations.

Factor B: overutilization for commercial, recreational, scientific, or educational purposes. Factor C: disease or predation.

We have no indication that overutilization for commercial, recreational, scientific, or educational purposes (Factor B) or disease and predation (Factor C) poses a significant threat for the species.

Factor D: the inadequacy of existing regulatory mechanisms.

Federal Regulatory Mechanisms

Section 404 of the Clean Water Act regulates the discharge of dredged or fill material into waters of the United States, requiring a permit by the U.S. Army Corps of Engineers. The Corps of Engineers consults with the Service under Section 7 of the Act and the Fish and Wildlife Coordination Act for any projects requesting a permit that affects a federally listed species like Kral's water-plantain, affording federal protections in waters of the U.S. The Endangered Species Act, however, does not protect plants on private lands in the watershed where it occurs or in situations that does not require a U.S. Army Corps permit—where much of this species occurs—unless state laws are violated.

In addition to the Clean Water Act, the Endangered Species Act prohibits removal or malicious damage of listed plants on federal lands, but it offers no safeguard against habitat destruction on non-federal lands absent violation of state or other laws.

There are other regulations and policies that protect plants on U.S. Forest Service property. U.S. Forest Service regulation 36 CFR 261.9 prohibits removing or damaging any plant that is classified as a threatened, endangered, sensitive, rare, or unique species. Additionally, Forest Service Manual 2673 establishes policy that prohibits the removal and collection of any threatened or endangered plants on lands under Federal jurisdiction except when authorized by permits. Although these regulations and policies should protect Kral's water-plantain on U.S. Forest Service property in Alabama lack of resources prevents monitoring of compliance and enforcement. If this species were to be delisted, removal of U.S. Forest Service protections might occur after independent U.S. Forest Service review but would not automatically change with Federal status. Gathering and removing plants or plant parts is currently prohibited in National Park System areas unless specifically authorized by federal statute, treaty rights, or conducted under the limited circumstances authorized by existing codified regulations (36 CFR 2.1).

State and Regional Regulatory Mechanisms

Navigable waters (typically waters which are capable of transporting boats loaded with freight in the regular course of trade either for the whole or part of a year) in Alabama and Georgia are classified as public rights-of-way (Alabama Code section 9-11-80 and Georgia Code section 52-1-31). The land under navigable waters are also considered state lands in both states (Alabama Code section 220-4-0.09 and Georgia Code section 44-8-5) while for non-navigable waters'

(those not classified as public rights-of-way) ownership depends on the riparian landowner (private, state, or federal). Therefore, federal lands like Bankhead National Forest are subject to protections under the Act, and private inholdings lack such protections.

Georgia's Wildflower Preservation Act of 1973 protects listed plants on public lands and regulates their sale and transport but does not address habitat destruction—the primary threat—leaving state protections limited despite federal consultation benefits. Kral's water-plantain is also included in the Georgia State Wildlife Action Plan as a plant species of Highest Conservation Concern. These Plans do not mandate specific conservation actions or guarantee funding of such actions for Kral's water-plantain; however, inclusion within these Plans informs and promotes conservation of Kral's water-plantain by highlighting and focusing attention on the conservation needs of the species and its habitats. Although Kral's water-plantain does not receive any specific legal protections in Alabama, it is included in State Wildlife Action Plan as a Plant of Conservation Concern. In addition, Kral's water-plantain was recently ranked as a species of very high conservation concern in the Southeastern Plants Regional Species of Greatest Conservation Need List (Radcliffe et al. 2023), a regional cooperative effort funded by the Service to identify and assess plant conservation needs, improve conservation of these species, and inform development of State Wildlife Action Plans within the greater southeastern region.

Given limited protections for much of the land within the watersheds for most populations, the populations are still threatened by land use practices described under Factor A and impacts discussed under Factor E. Some protections can be afforded by the Clean Water Act and even with protections under the Endangered Species Act, threats are still of concern for the species. Therefore, we believe that there are still inadequate regulatory mechanisms to protect the species from current and future threats.

Factor E: other natural or manmade factors affecting its continued existence.
Habitat degradation from off-road vehicle use poses a significant threat to Kral's water-plantain populations on public lands, particularly in accessible stream fords that serve as recreational hubs, leading to water quality decline, increased turbidity, and siltation from erosion, as documented in historical studies (Kral 1983, Whetstone 1988). Such impacts are believed to have contributed to the loss of the species and its habitat in the Town Creek watershed (Kral 1982, 1983). With heightened off-road vehicle activity during low-flow periods on federal lands prompting concern from the U.S. Forest Service and National Park Service and warranting further investigation and potential management (Shurette pers. comm. 2020; Shew pers. comm. 2025).

The Little River populations face risks from garbage dumping and sewage leaks, causing eutrophication and elevated coliform bacteria levels (Whetstone 1988), which foster filamentous algae growth that hinders light availability for the plant's growth and flowering, amplifying vulnerability due to the species' limited population size. The Sipsey Fork population, situated within the Wild and Scenic River Corridor, experiences sedimentation from upstream land management and Caney Creek tributary activities, though National Forest management standards aim to mitigate sediment flow into key tributaries; ongoing Forest Service activities, such as pine stand thinning and restoration planting, may also cumulatively impact the species and its habitat.

Although future trends in precipitation are uncertain for Alabama, models do predict increases in extreme rainfall events (Runkle et al. 2022). Extreme rainfall events may cause erosion and sedimentation and increase runoff from land use practices depositing sediments, nutrients, and toxins into the waterways along with scouring bed sediments removing plants and their rocky substrates into inhospitable locations. These impacts could result in loss of individual plants, decline in habitat suitability and hindering oxygenation, photosynthesis, and energy production. Models also note greater drought intensity in both Alabama and Georgia (Runkle et al. 2022 and Frankson et al. 2022, respectively). Increases in drought could result in loss or reduction of habitat from reduced water availability and resultant increases in water temperature. It is currently unknown how these future impacts may play a role in Kral's water-plantain population dynamics.

Synthesis

Kral's water-plantain is a perennial aquatic herb restricted to a limited number of locations within Alabama and Georgia. There are three extant watersheds containing six populations (Little River with populations in the mainstem and two tributaries, Sipsey Fork with populations in two tributaries, and Hatchet Creek containing one population) each comprising relatively small numbers of individuals. Of the six known extant populations, five are situated in streams on federally managed lands: Little River Canyon National Preserve and Bankhead National Forest. Protective measures and management standards implemented by the National Park Service and the U.S. Forest Service provide some safeguards for the species. However, ongoing threats—including siltation, alteration of hydrology or degrading water quality, and recreational pressures along river corridors—continue to challenge its persistence. For all populations, ongoing threats from point and non-point source pollutants—particularly the cumulative impact of sedimentation—remain a concern. Eutrophication from sewage inputs, and impoundments promotes algal growth on plants and compromises water quality. Siltation and increased stream turbidity, often resulting from erosion, reduce light penetration critical for this submerged aquatic plant and may bury individuals under sediment. Additionally, unstable impoundments pose a risk by potentially releasing large volumes of water and sediment during dam failures, which could uproot plants and smother remaining populations. Future expectations of extreme precipitation events and increases in drought intensities could also threaten populations. The limited number of individuals within limited number of populations and the ongoing threats make the species vulnerable to population-level extirpation as has been seen with two populations in the past. Because of these conditions we believe Kral's water-plantain continues to meet the definition of a threatened species under the Act.

RECOMMENDED FUTURE ACTIVITIES

A detailed discussion of recovery actions and criteria are presented in the Recovery Plan (Service 1991). During this status review new and/or targeted potential recovery activities were identified and are included below.

These activities are recommended to support and promote recovery of Kral's water-plantain.

Recovery Activities

- Conduct comprehensive surveys across the species' range to locate additional populations of Kral's water-plantain, with a particular focus on the Southern Inner Piedmont, informed by the known occurrence in Hatchet Creek, to enhance understanding of its distribution.
- Prioritize the protection of presently unprotected populations, especially those near privately owned lands, to mitigate risks from adjacent land-use activities and secure critical habitats.
- Enhance ex situ conservation efforts by expanding seed banking and cultivation initiatives to include a broader range of populations outside of the known range, thereby improving genetic diversity and representation in safeguarded collections.
- Collaborate with ADCNR, GADNR, NPS, USFS, and Alabama Power Company to support the implementation of conservation of Kral's water-plantain.

Monitoring and Research Activities

- Collect baseline data for all known Kral's water-plantain populations and establish long-term monitoring programs, with an emphasis on secure, protected sites to track population health and trends effectively.
- Develop a species distribution model to inform future surveys, pinpoint additional populations, and identify suitable habitats for potential population establishment.
- Define the criteria for a viable population to establish benchmarks for conservation success and management goals.
- Broaden population genetic studies to define population boundaries, assess whether inter-breeding is occurring, and to deepen understanding of genetic diversity and structure, building on ongoing research (Morris 2025, pers. comm.).
- Formulate tailored management plans for individual sites to address specific ecological needs and threats.
- Evaluate the impact of escalating off-road vehicle activity in stream channels hosting Kral's water-plantain to quantify risks and inform mitigation strategies.

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RESULTS / SIGNATURES

U.S. Fish and Wildlife Service
Status Review of Kral's Water-Plantain

Status Recommendation:

On the basis of this review, we recommend the following status for this species (50 CFR § 424.11). A 5-year review presents a recommendation of the species status. Any change to the status requires a separate rulemaking process that includes public review and comment, as defined in the Act.

____ Downlist to Threatened
____ Uplist to Endangered
____ Delist:
____ *The species is extinct*
____ *The species is recovered.*
____ *New information indicates the species does not meet the definition of an endangered or threatened species.*
____ *The listed entity does not meet the statutory definition of a species.*
_X__ No change needed

FIELD OFFICE APPROVAL:

Field Supervisor, Alabama Ecological Services Field Office, Fish and Wildlife Service

Approve WILLIAM PEARSON Digitally signed by WILLIAM PEARSON Date: 2025.08.22 15:05:43 -05'00'