Louisiana Quillwort
(*Isoetes louisianensis*)

5-Year Status Review:
Summary and Evaluation

Photo of Louisiana quillwort by M. Scott Wiggers, U.S. Fish and Wildlife Service.

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

July 2024

5-YEAR STATUS REVIEW
Louisiana Quillwort (*Isoetes louisianensis*)

GENERAL INFORMATION

Current classification: Endangered

Lead Field Office: Mississippi Ecological Services Field Office, Jackson, Mississippi

Review prepared by: M. Scott Wiggers, Mississippi Ecological Services Field Office, (228) 475-0765

Reviewers:

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Date of original listing: November 27, 1992 (57 FR 48741, October 28, 1992)

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 biology, habitat, and threats of Louisiana quillwort to inform this status review.

We announced initiation of this review in the Federal Register on May 11, 2023 (88 FR 30324), with a 60-day comment period and received no comments. The primary sources of information used in this analysis were the 1992 final listing rule (57 FR 48741), the 1996 recovery plan, peer-reviewed reports, agency reports, unpublished survey data and reports, and personal communication with recognized experts.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, Mississippi Ecological Services Field Office, Jackson, Mississippi. All literature and documents used for this review are on file at the Mississippi Ecological Services Field Office. All recommendations resulting from this review are the result of thoroughly reviewing the best available information on Louisiana quillwort.

Federal Register Notice citation announcing the species is under active review: May 11, 2023 (88 FR 30324)

Species' Recovery Priority Number at start of 5-year review (48 FR 43098): 14. Louisiana quillwort is a species with a low degree of threat and a high recovery potential.

Review history: Two previous 5-year reviews recommending no change in status were published on June 20, 2012 (Service 2012), and August 1, 2019 (Service 2019).

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 or Outline

Recovery plan for the Louisiana quillwort (*Isoetes louisianensis* Thieret), September 30, 1996.

Recovery plans are not regulatory documents and are 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).

The Recovery Plan does not include reclassification (to threatened) criteria and only includes delisting (recovery) criteria. Louisiana quillwort's recovery criteria are:

"Louisiana quillwort will be considered for delisting when 10 viable and geographically distinct populations from distinctly separate drainages are protected. A viable population is one which is reproducing and stable or increasing in size as shown by monitoring for at least a 10-year period." (Service 1996, p. 15)

The Service considers these criteria are appropriate and relevant; however, recovery criteria have not been met.

Biology and Habitat Summary

There is limited additional new biology or habitat information available since the most recent species review that impacts the status of the species. The information provided in previous 5-year reviews (Service 2012, 2019) remains valid, except as detailed herein. New and updated information is summarized below. The species' range, including watersheds, subwatersheds, states, and counties with known populations, is listed in Tables 1 and 2 and depicted in Figure 1.

Louisiana quillwort is currently known from 20 populations in 3 states (Alabama, Louisiana, and Mississippi) distributed among 20 watersheds, 45 subwatersheds, and 15 counties (Figure 1, Tables 1 and 2). In 2022, a new occurrence of Louisiana quillwort was discovered in the Bayou Costapia subwatershed in Jackson County, Mississippi (Smith 2022a,b, pers. comms.), expanding the known population of the Tuxachanie Creek – Tchoutacabouffa River watershed.

Louisiana Department of Wildlife and Fisheries (LDWF) staff resurveyed all known Louisiana quillwort sites and five additional sites with potentially suitable habitat during 2021 in southeastern Louisiana. While no new sites were discovered, LDWF determined that all nine known locations are in fair to excellent condition (LDWF 2021). No new information is available for Alabama.

Currently, 16 Louisiana quillwort populations occur entirely (12) or in part (4) on conservation or public lands and, as such, these populations receive enhanced protections and conservation considerations. Of these populations, 15 are found on U.S. Forest Service (De Soto National Forest) or Department of Defense (Camp Shelby Joint Forces Training Center [Camp Shelby]) lands in Mississippi while 1 is found on a preserve owned and managed by The Nature Conservancy (TNC) in Louisiana. Eight populations (1 in Alabama, 2 in Louisiana, 5 in Mississippi) are located entirely (4) or partially (4) on non-conservation lands.

Consistent, detailed monitoring data are not available throughout the species' range. Since completion of the previous 5-year review, these data are only available from Camp Shelby in Mississippi for a limited number of sites. These data suggest mixed trends for the species among monitored sites on the installation, with some sites increasing in abundance and some decreasing since 2019 (Lyman and Lee 2020, 2021, 2022; Lyman 2023), although Louisiana quillwort's overall abundance has increased on the installation since monitoring began in 1999 (Lyman and Lee 2020).

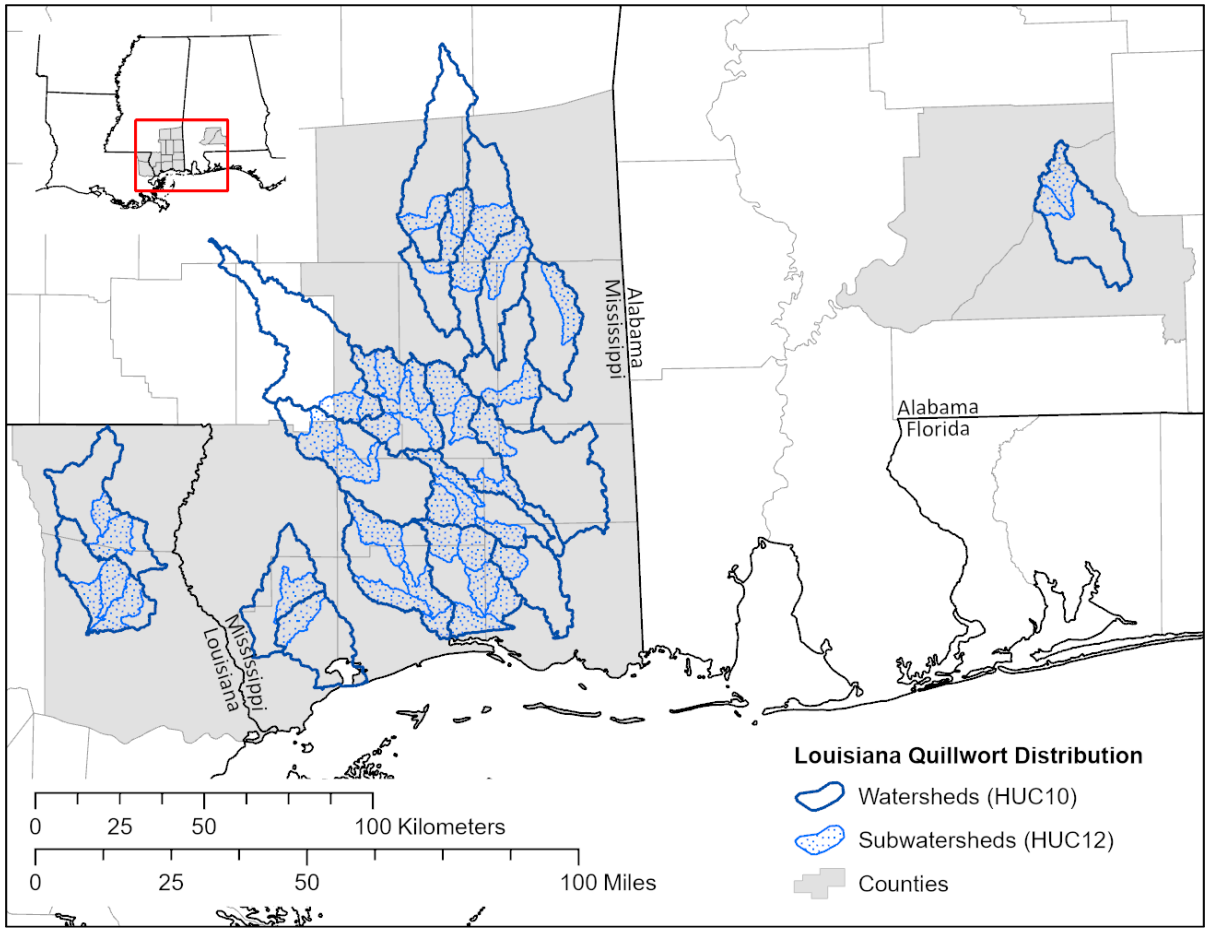

Figure 1. Distribution of Louisiana quillwort.

Table 1. Watershed and subwatershed distribution of known Louisiana quillwort populations.

State	Watershed	Subwatershed
Alabama	Upper Murder Cr.	Harpers Store
		Spring Cr. – Murder Cr.
Louisiana	Bogue Chitto	Berrys Cr. – Bogue Chitto
		Thigpen Cr. – Mill Cr.
	Bogue Falaya R.	Abita R.
		Little Bogue Falaya R.
		Lower Bogue Falaya R.
Mississippi	Atkinson Cr. – Leaf R.	Big Oktibee Cr. – Leaf R.
	Beaverdam Cr. – Black Cr.	Bowens Bay Cr. – Beaverdam Cr.
		Middle Cr. – Black Cr.
		Pearces Cr.[1]
		Poplar Cr. – Chaney Cr.[1]
		Walls Cr.
	Big Cedar Cr. – Pascagoula R.	Whiskey Cr.
	Bluff Cr. – Red Cr.	Clear Cr. – Bluff Cr.
		Cypress Cr. – Red Cr.
		Little Red Cr.
		Old Cr. – Red Cr.
	Buck Cr. – Bogue Homo	East Tiger Cr. – Tiger Cr.
		Tiger Cr. – Bogue Homo
	Flint Cr. – Red Cr.	Hickory Cr. – Red Cr.
		Hurricane Cr. – Red Cr.
	Hickory Cr. – Big Black Cr.	Beaver Cr. – Hickory Cr.
		Joes Cr. – Cypress Cr.
		Long Branch – Black Cr.
	Hickory Cr. – Catahoula Cr.	White Cypress Cr. – Hickory Cr.
	Jourdan R. – Saint Louis Bay	Bayou Bacon
	Little Biloxi R. – Biloxi R.	Fritz Cr. – Biloxi R.
		Horse Cr. – Biloxi R.
		Lower Little Biloxi R.
		Palmer Cr. – Biloxi R.
		Saucier Cr.
	Little Black Cr. – Black Cr.	Granny Cr. – Black Cr.
		Potato Cr. – Big Cr.
	Little Bogue Homo – Bogue Homo	Camp Cr. – Bogue Homo
	Little Thompson Cr. – Thompson Cr.	Hollis Cr. – Thompson Cr.
		West Little Thompson Cr. – Thompson Cr.
	Mason Cr. – Big Cr.	Waterfork Branch – Mason Cr.
	Moungers Cr. – Bluff Cr.	Wolf Branch – Bluff Cr.
	Piney Woods Cr. – Gaines Cr.	Piney Woods Cr.
	Tuxachanie Cr. – Tchoutacabouffa R.	Bayou Billie – Tchoutacabouffa R.
		Bayou Costapia[2]
		Bigfoot Cr. – Tuxachanie Cr.
		Cypress Cr. – Tchoutacabouffa R.
		Hurricane Cr. – Railroad Cr.

[1]Subwatersheds were erroneously included as part of the Bogue Falaya River watershed in the 2019 5-year review.
[2]Subwatershed highlighted in italics are new occurrences that were not included in the 2019 5-year review.

Table 2. County and parish distribution of Louisiana quillwort.

State	County/Parish
Alabama	Conecuh
	Monroe
Louisiana	Saint Tammany
	Washington
Mississippi	Forrest
	George
	Greene
	Hancock
	Harrison
	Jackson
	Jones
	Pearl River
	Perry
	Stone
	Wayne

Conservation Activities

Louisiana quillwort is designated as a Plant of Conservation Concern in Alabama's Wildlife Action Plan (Alabama Department of Conservation and Natural Resources 2016), a Species of Greatest Conservation Need in Louisiana's Wildlife Action Plan (Holcomb et al. 2015), and a Plant Species of Concern in Mississippi's Wildlife Action Plan (Mississippi Museum of Natural Science 2016). More recently, Louisiana quillwort was ranked as a species of 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. While these designations in state wildlife action plans do not carry any legal protections, they do serve to highlight plants in need of conservation within these states and may help focus attention and resources on these species.

Louisiana quillwort is included in the Camp Shelby Integrated Natural Resources Management Plan (INRMP; Mississippi State University et al. 2014) and Mississippi National Forests Land and Resources Management Plan (U.S. Forest Service 2014). Inclusion in these management plans helps reduce threats posed by potentially incompatible land use and management activities while also promoting the species' recovery by increasing awareness and assessment of Louisiana quillwort and its conservation needs, promoting monitoring and management of the species and its habitats, and addressing other issues pertinent to Louisiana quillwort conservation such as integrity of wetlands, streams, and water quality.

Staff at TNC's Camp Shelby office conducted a demographic study that yielded information that may improve future translocation efforts (Lyman 2023).

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, including: Factor A: the present or threatened destruction, modification, or curtailment of its habitat or range; Factor B: overutilization for commercial, recreational, scientific, or educational purposes; Factor C: disease or predation; Factor D: the inadequacy of existing

regulatory mechanisms; Factor E: other natural or manmade factors affecting its continued existence. A summary of this assessment is detailed below.

Development and habitat conversion (Factor A) represent the most persistent threat to Louisiana quillwort, resulting in extirpated populations and range restriction (Leonard 2011; Smith 2011, pers. comm.). In southeastern Louisiana, development represents the primary threat to the species (Louisiana Department of Wildlife and Fisheries 2021). Excessive sedimentation from inadequate sediment abatement in adjacent uplands or during bridge construction and/or replacement may smother Louisiana quillwort plants (Leonard 2011; Smith 2011, pers. comm.); however, following appropriate sediment abatement and mitigation best management practices (BMPs) will prevent these problems. Louisiana quillwort found along a portion of Abita Creek in Louisiana experienced degradation of habitat quality due to failure of a culvert, which increased sedimentation upstream from the structure (Wiggers 2019, pers. obs.), but a replacement of the culvert with a bridge has since improved habitat quality (Wiggers 2022, pers. obs.). Similarly, overstory clearing and lack of adherence to appropriate streamside management zones (SMZs) degrades Louisiana quillwort habitat (Service 1996; Leonard 2011) but adherence to appropriate SMZs and recommended buffer widths in the species' recovery plan (Service 1996) can alleviate such threats. While gravel mining was considered a threat to some Louisiana quillwort populations when the species was listed, the current threat of such activities is unknown. Similarly, off-road vehicle operation and hay production were previously identified as a threat to one colony in Alabama (Leonard 2011), but current information on this threat is limited.

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

Alabama, Louisiana, and Mississippi have no state laws affording specific protections to Louisiana quillwort or its habitat (Factor D), although theft of plants from private lands is illegal in these states (for example, theft of a plant from private land is punishable as a misdemeanor in the state under Mississippi Code §97-17-89 (2020)). On September 8, 2023, a final rule (88 FR 61964) became effective that amended the "Revised Definition of 'Waters of the United States'" to conform key aspects of the regulatory text to the U.S. Supreme Court's May 25, 2023, decision in the case of *Sackett v. EPA*, 598 U.S. ___ (2023). As a result of the amended definition of the "Waters of the United States," some wetland habitats supporting Louisiana quillwort may no longer be considered jurisdictional under the section 404 of Clean Water Act (33 U.S.C. 1344) and may not receive the same level of Federal oversight under the Clean Water Act as prior to the rule change. Regardless of Clean Water Act regulations, both jurisdictional and non-jurisdictional wetlands continue to be protected through such measures as water quality management, avoidance and impact-minimization measures, and wetland acquisition, restoration, enhancement, and creation, which collectively limit potential impacts to recent regulatory changes to implementation of the Clean Water Act. For example, each State in Louisiana quillwort's range has a State Wildlife Action Plan (Holcomb et al. 2015; Alabama Department of Conservation and Natural Resources 2016; Mississippi Museum of Natural Science 2016) that include conservation and management recommendations for habitats supporting Louisiana quillwort. In addition, these states also recommend voluntary forest BMPs that include maintaining vegetated buffers along riparian areas and wetlands to reduce nutrient runoff and sedimentation from adjacent agricultural and forestry practices (Alabama Forestry Commission 2007; Mississippi Forestry Commission 2008; Louisiana Forestry Association 2022). These state BMPs also provide additional guidelines to maintain integrity of riparian areas and wetlands,

including herbicide application and road and firebreak construction. In addition, the U.S. Forest Service has developed similar national BMPs for use on National Forest lands (U.S. Forest Service 2012). Likewise, the Natural Resources Conservation Service (NRCS) has developed national Conservation Practice Standards—such as the *Riparian Forest Buffer (Ac.) (391)* standard (NRCS 2020)—to guide development of state level standards in support of programs carried out by the agency on agricultural lands.

Louisiana quillwort habitats and populations continue to be impacted by other factors (Factor E), such as wild hogs (*Sus scrofa*) and beavers (*Castor canadensis*) and may be vulnerable to future impacts of climate change. Wild hogs continue to damage some Louisiana quillwort populations in Mississippi (Lyman 2022); however, while wild hogs are recognized as a nuisance species throughout the southeastern United States that can cause extensive damage to natural resources and habitats (Animal and Plant Health Inspection Service 2015), the extent of their threat to Louisiana quillwort is poorly understood. Wild hog control efforts have been implemented in Mississippi but are currently inadequate to limit wild hog damage in some Louisiana quillwort habitats (Lyman, pers. comm., 2018). Likewise, beaver dams have inundated colonies of Louisiana quillwort in Mississippi and Alabama (Leonard 2011; Lyman 2023). Some of these colonies have apparently been destroyed, but, while such beaver activity may degrade or eliminate some Louisiana quillwort habitat upstream of the dams, they may enhance habitat downstream (Leonard 2011). Currently, however, while beaver activity may threaten local Louisiana quillwort populations, degrading their habitat, beavers are not considered a major threat to Louisiana quillwort rangewide. Given the localized impacts of beavers, beaver control may be required in some areas if their activities threaten entire populations of Louisiana quillwort, but they are otherwise considered to be a minor concern for the species. Observations of armadillo (*Dasypus novemcinctus*) disturbance within Louisiana quillwort colonies on Camp Shelby were noted in a previous 5-year review (Service 2012) but no recent observations of such disturbance are known. As such, the impacts of armadillos on Louisiana quillwort populations and habitat continues to be considered minimal.

Because Louisiana quillwort requires sufficient rainfall to promote favorable soil moisture and trigger periodic scouring of stream channels and floodplains (Service 1996; Leonard 2011), increased frequency, length, and/or intensity of droughts due to climate change may reduce the availability of suitable habitats or lead to the elimination of populations. Likewise, increased accumulation of wind-throw from more frequent hurricanes caused by climate change may promote excessive sedimentation within stream systems (Leonard 2011), thereby degrading Louisiana quillwort habitat and potentially smothering plants in these areas.

Synthesis

Louisiana quillwort is a small, semi-aquatic, facultatively evergreen, spore-bearing, grass-like plant with spirally arranged leaves (sporophylls) arising from an underground corm that is endemic to certain small stream systems in the southeastern United States (including portions of southeastern Alabama, southern Mississippi, and southwestern Louisiana). Since completion of the last 5-year review, limited new available information on the species' populations and trends indicates that the species likely remains stable overall. However, limited availability of recent monitoring data coupled with lack of consistent monitoring for many populations increases the uncertainty associated with this assessment. Increased monitoring is needed to adequately understand and assess the status, trends, and threats to Louisiana quillwort, particularly for

populations occurring on conservation lands. Overall, recovery progress has been made with Louisiana quillwort, with 16 populations occurring at least in part on conservation or public lands. Louisiana quillwort conservation efforts have been encouraged, engaged in, and/or funded by the Service, Louisiana and Mississippi chapters of The Nature Conservancy, the U.S. Forest Service, State Natural Heritage Programs, universities, and Mississippi Army National Guard. Habitat destruction and degradation from development, particularly in Louisiana continue to threaten the species, while unchecked wild hog damage represents a continued threat to the species. Prolonged inundation from beaver dams may have destroyed some Louisiana quillwort colonies in Mississippi, but the threat of beavers to the species' long-term persistence is likely minor, as beaver activities may also enhance habitat downstream of dams. Finally, as discussed in the 2019 5-year review, recent genetics work indicates that at least some populations considered to be Louisiana quillwort, may be another, as-yet undescribed species of quillwort, suggesting that there may be fewer populations of Louisiana quillwort than currently thought. Because of ongoing threats and the current condition of the species, Louisiana quillwort continues to meet the definition of an endangered species.

RECOMMENDED FUTURE ACTIVITIES

A detailed discussion of recovery criteria and actions are presented in the species' Recovery Plan (Service 1996). During this status review, new and/or targeted potential recovery activities were identified and are included below. These actions are recommended to support and promote recovery of Louisiana quillwort. Use of a numbered list for these recommendations is for convenient reference only and does not necessarily imply prioritization of any activity over others.

Recovery Activities

1. Continue working with Federal and State entities, non-governmental conservation organizations, and private individuals to permanently protect and manage existing habitats and populations.
2. Implement aggressive wild hog control programs.
3. Search for additional populations on private lands, particularly around De Soto National Forest in Mississippi.
4. Preserve additional genetic stock.

Monitoring and Research Activities

1. Perform regular monitoring of populations and their habitats throughout the species' range.
2. Implement expanded demographic and habitat studies to more fully understand underlying drivers of population fluctuations.
3. Continue and expand conservation genetics work to include all watersheds with known occurrences.

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RESULTS / SIGNATURES

U.S. Fish and Wildlife Service
Status Review of Louisiana Quillwort

Status Recommendation:

On the basis of this review, we recommend the following status for this species. 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
- ☐ Delist:
  - ☐ *The species is extinct*
  - ☐ *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*
- ☒ No change needed

FIELD OFFICE APPROVAL:

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

Approve JAMES AUSTIN Digitally signed by JAMES AUSTIN Date: 2024.07.03 16:23:35 -05'00'