Arkansas Fatmucket
(*Lampsilis powellii*)
5-Year Status Review:
Summary and Evaluation

U.S. Fish and Wildlife Service

Southeast Region

Arkansas Ecological Services Field Office

Conway, Arkansas

October 2024

5-YEAR STATUS REVIEW

Arkansas Fatmucket (*Lampsilis powellii*)

GENERAL INFORMATION

Current Classification: Threatened

Lead Field Office: Arkansas Ecological Service Field Office, Chris Davidson

Lead Regional Office: Southeast Region, Carrie Straight

Date of Original Listing: May 7, 1990 (55 FR 12797; April 5, 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 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 Arkansas fatmucket biology, habitat, and threats 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 one public comment from the National Council for Air and Stream Improvement Inc. The comment received refers to best management practices for silviculture practices and their benefit, when implemented, to water quality. Their comments were reviewed and incorporated into the threats discussion below. The primary sources of information used in this analysis were the 1990 final listing rule (55 FR 12797), 1992 recovery plan (Service 1992), peer-reviewed reports, agency reports, unpublished survey data and reports, and personal communication with recognized experts.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, Arkansas Ecological Services Field Office, Conway, Arkansas. 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 Arkansas fatmucket.

FR 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):

5. Arkansas fatmucket is a species with high degree of threat and low degree of recovery potential.

Review History:

Two previous 5-year reviews recommending a change in classification to endangered status were signed in 2013 and 2020 (Service 2013 and 2020).

REVIEW ANALYSIS

Listed Entity

Taxonomy and nomenclature

The Arkansas fatmucket was described as *Unio powelli* by Lea in 1852 from the Saline River, Arkansas (Johnson 1980). It was synonymized under *Actinonaias ligamentina* by Call in 1895 (Harris and Gordon 1988). In 1900, Simpson placed it in the genus *Lampsilis* (Simpson 1914). The 2023 checklist of freshwater bivalves (Mollusca: Bivalvia: Unionida) of the Unted States and Canada, as considered and approved by the Bivalve Names Subcommittee, recognizes the nomenclature as *Lampsilis powellii*, Arkansas fatmucket (FMCS 2023). This nomenclature is supported by the Integrated Taxonomic Information System (ITIS 2024) as valid.

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 DPS policy applies only to vertebrates and because this species is not a vertebrate the Service's 1996 DPS Policy does not apply.

Recovery Criteria

Recovery Plan

Final Recovery Plan for the Arkansas Fatmucket Mussel (*Lampsilis powellii*) February 10, 1992

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).

For the Arkansas fatmucket to be considered as recovered, the following criteria must be met.

1. There are viable populations in the Ouachita and South Fork Ouachita Rivers; in the Alum, Middle, and North Forks of the Saline River; and, in the mainstem Saline River.
2. The habitat for all these populations is fully protected.
3. Viable population levels are maintained for a period of at least 20 years.

The Service believes these criteria are appropriate and relevant; however, no criteria have currently been met.

Biology and Habitat Summary

Detailed information on the species' biology can be found in the previous 5-year reviews (Service 2013 and 2020). There is low genetic diversity within Arkansas fatmucket, which may

reflect small population size due to its geographic isolation and the compounding effects of anthropogenic habitat degradation (Walters et al. 2021).

The Service and the Arkansas Game and Fish Commission have an active propagation and stocking program for Arkansas fatmucket in the upper Saline River basin to counter population declines. However, locating gravid females in the upper Ouachita River basin has proven more challenging and no recent stockings have occurred in the basin since 2019.

The Arkansas fatmucket is endemic to the Ouachita Mountains region of Arkansas. Prior to the Harris and Gordon (1988) status assessment, the species' known range was restricted to 20 locations: 10 localities in the Ouachita River basin; 1 in the upper Ouachita River, 2 in the South Fork Ouachita River, 2 in the Caddo River, and 5 in the Saline River and forks (Gordon and Harris 1985).

The historical range likely included around 421 river miles [rm]:

- Ouachita River from the confluence of the Caddo River upstream to near Mena, AR (approximately 160 rm)
- South Fork Ouachita River (approximately 29 rm)
- Caddo River from Norman, AR, to the Ouachita River (approximately 64 rm)
- South Fork Caddo River (approximately 4 rm)
- Alum Fork Saline River (approximately 53 rm)
- Middle Fork Saline River (approximately 30 rm)
- North Fork Saline River (approximately 22 rm)
- South Fork Saline River (approximately 15 rm)
- Saline River from its formation to U.S. Highway 270 (approximately 44 rm).

Approximately 109 rm of historical habitat was inundated by reservoir construction or lost due to altered dam releases prior to listing (Service, unpublished data). The current range is restricted to approximately 149 rm (Service, unpublished data), with approximately 163 rm of occupied habitat lost since listing, and is now known to be split into two populations which are split below (Walters et al. 2021):

<u>Ouachita River Population</u>

- Ouachita River from Irons Fork confluence to the Pine Ridge public access (26.9 rm)
- South Fork Ouachita River from Montgomery County Road 17 to the inundation pool of Lake Ouachita (14.3 rm)
- Caddo River from the confluence of Collier Creek (between Norman and Caddo Gap, AR) to Arkansas Highway 84 (near Amity, AR; 24.3 rm) and Interstate 30 to its confluence with the Ouachita River (2.4 rm)

<u>Saline River Population</u>

- Middle Fork Saline River from Arkansas Highway 7 to its confluence with the Alum Fork Saline River (30.2 rm)

- Alum Fork Saline River from Love Creek to the inundation pool of Lake Winona (5.6 rm) and from Lake Winona Dam downstream to the North Fork Saline River confluence (34 rm)
- North Fork Saline River from Arkansas Highway 9 to Arkansas Highway 5 (21.7 rm)
- Saline River from its formation downstream to U.S. Highway 270 (43.6 rm).

While the species distribution suffered approximately a 38% reduction in occupied stream reaches since listing, the number of extant sites and abundance is substantially lower range wide. As noted in the previous 5-year reviews (Service 2013, 2020), Arkansas fatmucket numbers found during surveys indicate a decline in the species in previously known, occupied sites.

The Saline River and Alum Fork Saline River contain the largest extant populations, but similar declines have been observed in these rivers as have been seen throughout the range. Gravid females are becoming increasingly more difficult to locate and the population has limited evidence of recruitment indicating potential concerns for the species viability. Recent genetic work indicates low genetic diversity in the species (Walters et al. 2021), which further supports concerns related to decreases in population conditions, population size, and isolation of remaining populations.

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.

In the final listing rule for Arkansas fatmucket it was noted that the species was threatened by impoundments, channel alteration, gravel dredging, sedimentation, and water quality degradation (Service 1990). The destruction, modification, and curtailment of the species' range continues to be a significant threat today.

Saline River Basin – Human activities such as urbanization play an important role in altering the geomorphology of rivers (Shukla et al. 2013). Removal of native vegetation and conversion to urban landscapes diminish soil water retention, increase overland and instream flow, ultimately causing increased riverbed erosion and channel degradation (Chin 2006). Since 1974, developed land use within the Saline River headwaters increased by 208%, with 10% of the upper basin classified as developed in 2012 (Falcone 2015). Most of the basin occurs within Saline County, which is among the fastest growing counties in Arkansas with a 246% population increase (36,766 to 127,357 people) from 1970 – 2022 (U.S. Bureau of Census 1970 – 2022).

The *Upper Saline River Conservation Opportunity Area Conservation Plan* identifies nine threats to aquatic species in the basin and outlines conservation objectives with specific actions for each threat (Arkansas Game and Fish Commission 2023). The highest threat to aquatic habitats and ecosystem function is loss of riparian and floodplain forest cover. Loss of riparian and floodplain forests contributes to six of eight other threats cited and are essential to slow flood

waters, stabilize riverbanks, filter sediment and other pollutants, and buffer water temperature. The remaining two threats cited are water withdrawal and invasive species. Water demand is projected to increase with increasing urbanization and population growth in the upper basin. Reduced water availability is expected to decrease the amount of available habitat for mussels (Strayer and Ralley, 1993), the river's ability to dilute pollutants (Sweeney, 1993), and reduce reproduction (Cushway et al. 2024) (in addition see discussions of Factor E related to climate change). The threat from invasive species is considered low.

Forestry also is a major land use in the upper Saline River basin. Forestry best management practices (BMPs) are voluntary in Arkansas. However, BMPs are required for third party-certified landowners and landowners that supply wood to mills with third party-certified fiber sourcing. The requirement for BMP use by forest certification programs provides certainty that BMPs will be implemented for fiber sourcing from small to large, private forested lands. From 2005–2017, BMP implementation rates in the Ouachita Mountain region of Arkansas ranged from 86–95 percent (Best Management Practices - Water Quality - Arkansas Department of Agriculture). Annual third-party auditing helps ensure BMP compliance. There is a large body of scientific literature supporting conservation benefits provided to aquatic species from BMP implementation on private, working forests (National Council for Air and Stream Improvement, Inc., in public comments submitted to the field office in response to the Notice of Initiation for this status review (89 FR 48437; Service 2024)). These benefits include protecting water quality and riparian forest structure (as reviewed in Cristan et al. 2016; Warrington et al. 2017; Cristan et al. 2018; Schilling et al. 2021).

A recent study indicates landscape-scale alteration in the Saline River headwaters has affected fish communities over multiple decades (Burgad et al. 2019). Substantial declines in Arkansas fatmucket abundance within the Saline River basin was first noted in 2003 (Scott 2004). During the past two decades, Arkansas fatmucket has continued to decline in distribution (number of occupied sites) and in abundance within sites (Service, unpublished data). Although the precise effects of land use changes on Arkansas fatmucket and mussel assemblages in the Saline River headwaters remains poorly understood, declines are surmised to be a result of land use changes leading to mussel displacement from habitats that have become unstable due to sedimentation, altered hydrology, and channel destabilization (Service, unpublished data).

Ouachita River Basin – Recent studies also found shifts in fish community assemblages over time in the Ouachita River headwaters upstream of Lake Ouachita and in the Caddo River (Furr 2018; Burgad et al. 2019). The extirpation of peppered shiner (*Notropis perpallidus*), a small minnow that requires water willow beds with appropriate water depth, in the upper Ouachita River (Miller et al. 2021) coincides with declines of Arkansas fatmucket (Service 2020), which also historically was associated with similar habitat (Service 1992). Changes in land use leading to increased sedimentation is surmised to be the primary threat affecting fish and mussel assemblages in these rivers (Service, unpublished data).

The 2022 303(d) list of impaired waterbodies produced by the Arkansas Department of Environmental Quality includes 27 miles of the Alum Fork Saline River (impairment dissolved oxygen and pH), 22 miles of the North Fork Saline River (impairment dissolved oxygen), 38

miles of the Middle Fork Saline River (impairment dissolved oxygen), 26 miles of the South Fork Ouachita River (impairment dissolved oxygen and total dissolved solids), and 18 miles of the Ouachita River (impairment dissolved oxygen and pH) (Arkansas Department of Environmental Quality 2022). Water pollution through point and nonpoint sources can contribute pollutants that have undesirable effects on species such as Arkansas fatmucket.

Chronic human-induced threats will likely continue to adversely affect Arkansas fatmucket, its habitat, and host fishes in the headwaters of the Ouachita, Saline, and Caddo rivers, possibly making it more vulnerable to extinction.

Factor B. Overutilization for commercial, recreational, scientific, or educational purposes.

Overutilization for commercial, recreational, scientific, or educational purposes is not considered a significant threat to this species. Arkansas Game and Fish Commission regulations (Code 05.27 – Endangered Species Protected) make it unlawful to import, transport, sell, purchase, hunt, harass, or possess any threatened or endangered species of wildlife or parts of species listed under the Act (Arkansas Game and Fish Commission Code Book).

Factor C. Disease or predation.

There is no evidence that shows disease or predation are significant threats to this species. While predation may occur naturally, there is no indication that it poses a population level threat.

Factor D. The inadequacy of existing regulatory mechanisms.

The Clean Water Act (33 U.S.C. §1251 et seq. (1972)) regulates pollutant discharges into the nation's waters by developing water quality standards and protecting aquatic life and habitats through permitting. The Clean Water Act affords Arkansas fatmucket substantial protections by reducing effects from discharge of harmful pollutants and discharge of dredge and fill. However, a lack of specific information on the sensitivity of Arkansas fatmucket to common industrial and municipal pollutants may be limiting the full conservation potential under the Clean Water Act.

The State of Arkansas also has enacted legislation intended to protect water quality that parallel comparable Federal regulations. While the Arkansas Department of Environmental Quality has implemented Regulation 2, a lack of biological and ecological data for Arkansas fatmucket and its ecological thresholds (e.g., level of contaminants that produce adverse effects) make it difficult to determine the positive impacts this may have had on the species. Despite these Federal and State protections, current regulations have been insufficient to fully protect Arkansas fatmucket and its habitat from alteration and water quality degradation.

Factor E. Other natural or manmade factors affecting its continued existence.

Threats from other natural or manmade factors affecting the continued existence of Arkansas fatmucket are unchanged from the previous 5-year review (Service 2020). Geographic isolation and small population size increase the risk of extinction due to the species susceptibility to catastrophic and stochastic events and its ability to recolonize areas. Climate change acts on aquatic ecosystems in concert with other anthropogenic threats, which may compound the effects. Threats occurring within the range of Arkansas fatmucket that interact with climate

change include altered land use, water quality degradation, and flow alterations. For example, the period from 2015 – 2020 was the highest multi-year average annual and summer precipitation (Runkle et al. 2022) in Arkansas. Increased frequency and severity of flood events exacerbate bank erosion, destabilize river channels, and increase sediment input. Climate models also predict future increases in temperature and corresponding increases in droughts, which may further limit Arkansas fatmucket distribution and abundance (Runkle et al. 2022). These threats interact with each other and climate change at multiple scales to transform the physical and biotic environment of aquatic systems (Allan 2004).

Species Status Summary (3 Rs)

To sustain populations over time, a species must have the capacity to withstand:

(1) environmental and demographic stochasticity and disturbances (Resiliency),
(2) catastrophes (Redundancy), and
(3) novel changes in its biological and physical environment (Representation).

Although Arkansas fatmucket does not have a formal species status assessment (SSA), we have briefly assessed resiliency, redundancy, and representation below.

Resiliency is the ability of a species to withstand environmental stochasticity (normal, year-to-year variations in environmental conditions such as temperature, rainfall), periodic disturbances within the normal range of variation (fire, floods, storms), and demographic stochasticity (normal variation in demographic rates such as mortality and fecundity).

Current resiliency of Arkansas fatmucket is low in the Ouachita, South Fork Ouachita, and Caddo rivers. Surveys conducted from 2003 – present document significant declines in abundance and number of occupied sites in these rivers (Scott 2004; Service, unpublished data). We believe the population declines are systemic and associated with watershed-level changes in land uses and the resulting habitat degradation from sedimentation and water quality. The Saline River and Alum Fork Saline River contain the largest populations, but similar declines have been observed in these rivers. Gravid females are becoming increasingly more difficult to locate for propagation efforts in these two rivers. Arkansas fatmucket is on the brink of extirpation from much of its range, including the Ouachita, South Fork Ouachita, Caddo, Middle Fork Saline, and North Fork Saline rivers. Additionally, a recent study shows low genetic diversity within Arkansas fatmucket, which may reflect small population size due to its geographic isolation and the compounding effects of anthropogenic habitat degradation (Walters et al. 2021). Overall, resiliency remains low across the species range and its ability to withstand environmental and demographic stochasticity is greatly reduced from historical periods (pre-2000).

Redundancy is the ability of a species to withstand catastrophes. Catastrophes are stochastic events that are expected to lead to population collapse regardless of population heath and for which adaptation is unlikely.

Based on recent genetic studies, there are two populations of Arkansas fatmucket – Ouachita River and Saline River basins (Walters et al. 2021). The Ouachita River basin contains extant populations in the headwaters of the Ouachita River, South Fork Ouachita River, and Caddo River. The status of the Ouachita River downstream of Interstate 30 extending to the confluence of the Caddo River is unknown. The Ouachita, South Fork Ouachita, and Caddo rivers are all demographically isolated from each other due to reservoir construction. The Saline River basin contains extant populations in the mainstem Saline River and Alum, Middle, and North forks of the Saline River. These rivers are demographically connected (e.g., no barriers limiting dispersal). The South Fork Saline River is extirpated. The naturally small geographic range of both populations and low resiliency of each river and population makes populations more susceptible to extirpation – resulting in low redundancy for Arkansas fatmucket.

Representation is the ability of a species to adapt to both near-term and long-term changes in its physical (climate conditions, habitat conditions, habitat structure, etc.) and biological (pathogens, competitors, predators, etc.) environments.

Arkansas fatmucket has low genetic diversity likely due to small population size and geographic isolation of both populations. There is no morphological, behavioral, or life history differences that exist across its range. There is no dispersal ability among the two populations and no dispersal ability among extant rivers within the Ouachita River basin population. Small population size in the Ouachita River basin population further reduces its adaptive capacity. There is limited recent evidence of natural recruitment in the Saline River population, although gravid females persist widely dispersed in low abundance. Propagation efforts are ongoing to supplement natural recruitment and increase abundance and distribution within the Saline River population. Despite these efforts, Arkansas fatmucket representation is low.

Synthesis

The Arkansas fatmucket (*Lampsilis powellii*) is a freshwater mussel that is native to Arkansas, specifically the Saline, Ouachita, and Caddo river basins. There are two populations (Ouachita River and Saline River basins) that include a total of seven rivers. All three rivers within the Ouachita River basin population are on the brink of extirpation. Within the Saline River basin population, the main stem Saline River and Alum Fork Saline River contain the largest number of individuals dispersed across the greatest number of sites. The North Fork Saline and Middle Fork Saline have very low abundance with a greatly reduced number of sites compared to two decades ago, while the South Fork Saline is extirpated. These extant populations show limited evidence of recruitment and finding reproductive females has been rare. Primary threats are associated with land use change, particularly rapid urbanization in the Saline River headwaters, leading to the degradation of habitat due to channel instability, sedimentation, and degraded water quality. Sedimentation from a variety of land uses and small population size are the primary threats in the Ouachita River basin. Climate change is expected to further compound effects from ongoing threats. Due to ongoing threats and current condition of Arkansas fatmucket, we recommend reclassification to endangered.

RECOMMENDED FUTURE ACTIVITIES

A detailed discussion of recovery actions and criteria are presented in the Recovery Plan (Service 1992). During this status review new and/or targeted potential recovery activities were identified, see below.

Recovery Activities

- Continue propagation and augmentation efforts in the Ouachita and Saline River basins.
- Actively use the U.S. Fish and Wildlife Service's Partners for Fish and Wildlife Program, Arkansas Game and Fish Commission's Private Lands Program, and U.S.D.A. Natural Resources Conservation Service's Farm Bill program to foster working partnerships with landowners to address and minimize threats.
- Implement priority strategic actions outlined by the Upper Saline River Conservation Opportunity Area Conservation Plan (Arkansas Game and Fish Commission 2023).
- Work closely with the Saline River Watershed Alliance to develop conservation partnerships with landowners, municipalities, non-governmental organizations, and industry.

Monitoring and Research Activities

- Conduct surveys concurrent with searches for gravid females, stocking, and post-stocking assessments to better understand population and habitat trends.
- Conduct a genomic analysis of brood stock and subset of offspring to inform future propagation and augmentation efforts.

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RESULTS / SIGNATURES

U.S. Fish and Wildlife Service

Status Review of Arkansas Fatmucket (*Lampsilis powellii*)

Status Recommendation:

Based on 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.
__X__ 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.*

____ No change needed.

FIELD OFFICE APPROVAL:

Jason Hight, Field Supervisor, U.S. Fish and Wildlife Service, Arkansas Ecological Services Field Office

Approve JASON HIGHT Digitally signed by JASON HIGHT Date: 2024.11.14 07:34:29 -06'00' _____

LEAD REGIONAL OFFICE APPROVAL:

Assistant Regional Director – Ecological Services, U.S. Fish and Wildlife Service

Approve Catherine T. Phillips _____