

Draft Recovery Plan for the Southern Combshell
(*Epioblasma penita*)



Female (top) and male (bottom) southern combshell. Photos by Matthew Wagner, U.S. Fish and Wildlife Service.

U.S. Fish and Wildlife Service
Southeast Region
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PURPOSE AND DISCLAIMER

This document presents the U.S. Fish and Wildlife Service's (Service) plan for the conservation of southern combshell. The recovery plan includes the statutorily required elements pursuant to section 4(f) of the Endangered Species Act (Act). We have also prepared a Recovery Implementation Strategy (RIS). The RIS is an easily updateable operational plan that is separate from and complimentary to the recovery plan that details the on-the-ground recovery activities needed to complete the recovery actions contained in the recovery plan.

Recovery plans describe the envisioned recovered state for a listed species (when it should no longer meet the Act's definitions of a threatened species or endangered species) and include a recovery strategy, recovery criteria, recovery actions, and the estimates of time and cost needed to achieve it. Plans are published by the Service and are often prepared with the assistance of recovery teams, contractors, State agencies, and others. Recovery plans do not necessarily represent the views, official positions, or approval of any individuals or agencies involved in plan formulation other than the Service. They represent the official position of the Service only after they have been signed by the Regional Director as approved. Recovery plans are guiding and planning documents only; identification of an action to be implemented by any public or private party does not create a legal obligation beyond existing legal requirements. Nothing in this plan should be construed as a commitment or requirement that any Federal agency obligate or pay funds in any one fiscal year in excess of appropriations made by Congress for that fiscal year in contravention of the Anti-Deficiency Act, 31 U.S.C. 1341, or any other law or regulation. Approved recovery plans are subject to modification as dictated by new findings, changes in species status, and completion of recovery actions.

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Lead Author

Matthew Wagner, U.S. Fish and Wildlife Service, Jackson, Mississippi

RECOMMENDED CITATION AND ELECTRONIC AVAILABILITY

U.S. Fish and Wildlife Service. 2026. Recovery Plan for southern combshell (*Epioblasma penita*). U.S. Fish and Wildlife Service, Southeast Region, Atlanta, GA, USA. 10 pp.

An electronic copy of this Final Recovery Plan will be made available at:

<https://ecos.fws.gov/species/7285>

INTRODUCTION

This recovery plan describes criteria for determining when the southern combshell should be considered for delisting, lists site-specific actions that will be necessary to meet those criteria, and estimates the time and cost to achieve recovery. Additionally, a summary of information on the species' biology and status are included, along with a brief discussion of factors limiting its populations. A detailed discussion of these and other topics pertinent to the recovery of southern combshell can be found in the 2009, 2015, and 2021 5-year reviews (Service 2009, Service 2015, and Service 2021). This recovery plan is a species-specific revision incorporating elements of the 1989 recovery plan (Service 1989), the 2000 Mobile Basin recovery plan (Service 2000), the 2010 Mobile Basin restoration plan (Mobile River Basin Mollusk Restoration Committee 2010), and the 2019 recovery plan amendment (Service 2019). Detailed on-the-ground activities implementing recovery actions can be found in the Recovery Implementation Strategy (Service 2026). These supplemental documents are available at <https://www.fws.gov/species/7285>. The RIS is finalized separately from the Recovery Plan and will be updated on a routine basis.

The southern combshell is a small sexually dimorphic freshwater mussel that reaches a maximum standard length of 2.6 inches (6.7 centimeters) (Jones et al. 2021). The species requires stable gravel riverine habitats to support both the species and its host fish. It historically inhabited river channels of the Mobile River drainage including the Tombigbee River, East Fork Tombigbee River, Buttahatchie River, Noxubee River, Sipsey River, Black Warrior River, Alabama River, Cahaba River, and Coosa River across Georgia, Alabama, and Mississippi (Jones et al. 2021). Physical destruction of habitat via the construction of dams and reservoirs, channelization, and dredging all contributed to modifications of the natural geomorphology and hydrologic regime of the Mobile River drainage. This modification and destruction of habitat caused the extirpation of southern combshell populations from all rivers throughout its historic range except for the Buttahatchie River. The lone surviving population of the species is restricted to a 36.9 mile (59.3 kilometers) reach of the Buttahatchie River in Mississippi (Service 2024).

The southern combshell was listed as an endangered species under the Act on May 7, 1987 (52 FR 11162) as determined from an assessment of factors specified in section 4 (a)(1) of the Act, (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). It has been assigned a recovery priority number of 2, indicating that the species faces a high degree of threat and has a high recovery potential. The degree of threat is considered high because the only known population in the Buttahatchie River has no redundancy in the face of stochastic or catastrophic events. Barring landscape-level catastrophic events, and with appropriate management, we expect the southern combshell can maintain its current condition within the Buttahatchie River.

Although the southern combshell population in the Buttahatchie River has remained stable in Mississippi since its listing under the Act, the species is still vulnerable to persistent threats that degrade riverine habitat. Persistent threats, such as point source and non-point source pollution, sedimentation, and stream bank instability, are present in both the Buttahatchie River and the other habitat appropriate rivers throughout its historic range.

Abatement of these threats will require voluntary conservation management actions (e.g., conservation easements that protect water quality) and implementation of regulatory mechanisms that prevent instream habitat degradation. Although many of the persistent threats can be abated via management, the species is still vulnerable to catastrophic random events (e.g., spills, drought, etc.) that cannot be abated.

RECOVERY STRATEGY

The recovery strategy provides a concise overview of the envisioned recovered state for the southern combshell and describes the Service's chosen approach to achieve it and includes the rationale for why the approach was chosen. Specifically, the recovery strategy articulates how the plan's statutory elements (e.g., recovery criteria, recovery actions, and estimates of time and cost) will work together to achieve recovery of the southern combshell.

The approach of the recovery strategy for the southern combshell is to ensure the long-term viability of the species through reintroducing multiple, independent, viable populations across the range of the species, and securing management of those populations and their riverine habitats for the foreseeable future. More specifically, we describe objectives and actions intended to provide long-term habitat protection, reduce threats to the riverine habitats, and implement a controlled propagation and reintroduction program pursuant to the Service's *Policy Regarding Controlled Propagation of Species Listed Under the Endangered Species Act* (65 FR 56916). Alabama Aquatic Biodiversity Center (AABC) has been implementing controlled propagation and reintroductions since 2012 and developed an updated controlled propagation and reintroduction plan in 2025 that compliant with the Service's policy (Johnson et al. 2025). Implementation of controlled propagation and reintroduction and other conservation activities needed to recover southern combshell efficiently and effectively will require close coordination and collaboration with partners and other interested parties, including municipal, state, and federal agencies, land conservancies, landowners, universities, and industry professionals.

Achieving a recovered state for the southern combshell is founded upon the ecological principles of resilience, representation, and redundancy (the "3 Rs"; Wolf et al. 2015). The southern combshell occupies a narrow geographic range and has only one extant population. Therefore, high resiliency in the Buttahatchie River population, as evidenced by stable distribution and continued recruitment, is a necessary component of recovery for the species. As the species is confined to a single, linear population, the species currently has no redundancy. To increase redundancy for the species, multiple resilient populations (as evidenced by stable distribution and continued recruitment) should be established using controlled propagation and reintroduction within at least two other rivers where the southern combshell historically occurred to decrease the risk of a catastrophic random event causing extinction. As only a single population remains, the genetic variability of the species likely cannot be increased to improve species level representation. However, when reintroducing new populations to reach a recovered state, the use of unique brooders for reintroductions will help create as much genetic diversity as possible in any reestablished populations (Johnson et al. 2025) and reintroducing the species into unique habitats in other watersheds throughout the Mobile River may increase the ecological variability occupied by the species, thereby increasing its representation.

The geographic scope of this recovery plan includes the extant Buttahatchie River population in Mississippi and various other watersheds throughout the Mobile River drainage in Mississippi and Alabama for potential reintroductions. The revised controlled propagation and reintroduction plan for the southern combshell identifies rivers within the historical range of the southern combshell where reintroduction would be appropriate based on habitat quality, presence of other mussels with similar habitat requirements, and presence of host fish required for southern combshell. The rivers for potential reintroduction that were identified in the revised controlled propagation and reintroduction plan focus on parts throughout the Mobile River drainage, to include the Cahaba River, Sipsey River, East Fork Tombigbee River/Bull Mountain Creek, and Locust Fork of the Black Warrior River (Johnson et al. 2025). The controlled propagation and reintroduction plan will be updated as needed to add or remove rivers based on new information supporting successful reintroductions of southern combshell. If the species is successfully established in any of the rivers identified in the reintroduction plan, recovery will require that threats have been reduced in these watersheds to the extent that the species will maintain viability into the foreseeable future. As such, the recovery criteria are designed to protect the existing population of southern combshell and reintroduce the species in two other rivers with protections that will provide for the populations to remain viable into the future.

To achieve recovery for southern combshell as outlined by the recovery criteria, recovery actions must:

- 1) Focus monitoring efforts on the existing population in the Buttahatchie River using a standardized monitoring protocol.
- 2) Protect the existing habitat or improve degraded habitat by actively participating in existing federal and state regulatory processes to avoid, minimize, and mitigate the loss and degradation of habitat and support conservation enhancement and restoration measures.
- 3) Include implementation of the controlled propagation and reintroduction plan to support reintroduction efforts that include monitoring of any reintroduced populations and an assessment of population genetics.

A breakdown of how these actions will be accomplished is described below in tables listing the time, cost, and potential partners needed. The accompanying Recovery Implementation Strategy includes a detailed table of these recovery actions with stepdown activities.

RECOVERY CRITERIA

Recovery criteria are statutorily required objective, measurable descriptions of a recovered state for southern combshell, as described in [4\(f\)\(1\)\(b\)\(ii\)](#) of the Act. Recovery criteria describe the conditions of resiliency, redundancy, representation, and threat abatement that indicate when southern combshell may no longer meet the Act's definitions of an endangered species or threatened species. Recovery criteria present our best estimate of a species' recovered condition at the time of recovery plan development. Changes in available information, technologies, and our understanding of the species over time might mean that the recovered state envisioned by the recovery criteria differs from our assessment in a later status determination.

The following delisting criteria, when met collectively, may indicate that southern combshell no longer meets the Act's definitions of either a threatened species or endangered species, and may be able to be removed from the Federal Lists of Endangered and Threatened Wildlife and Plants based on an assessment of the factors specified in section 4 (a)(1) of the Act, (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; and Factor E: other natural or manmade factors affecting its continued existence).

Recovery Criterion 1:

1. The southern combshell population in the Buttahatchie River remains stable or increases over a 10-year timeframe, occupying at least 30 miles (48 kilometers) of the Buttahatchie River and having the presence of multiple age classes and naturally produced juveniles (Factor A).

Rationale for Criterion 1

The only known surviving southern combshell mussel population occurs within a 36.9 mile (59.3 kilometer) reach of the Buttahatchie River in Mississippi (Service Database 2026). As the primary threats to the species are destruction and modification of habitat, and curtailment of range (Factor A), Criterion 1 secures the surviving population and is measured by persistence and natural recruitment of the species over time. Conservation of the only surviving population is protective of the species remaining genetic and habitat representation. The ten-year time frame was considered adequate as it should allow for the detection of multiple generations of naturally recruited individuals to be detected.

Recovery Criterion 2:

2. In addition to the Buttahatchie River population, two or more independent, self-sustaining populations are reintroduced via propagation into two separate rivers within the historical range. Self-sustaining reintroduced populations must occupy at least 10 miles (16 kilometers) within each river over a 10-year timeframe with evidence of multiple age classes and naturally produced juveniles (Factors A, E).

Rationale for Criterion 2

Expanding the range of the species into historically occupied river drainages increases its resiliency, representation, and redundancy while reducing threats from curtailment of its range (Factor A) and stochastic events (Factor E). The ten-year time frame was considered adequate as it should allow for the reproductive maturation of stocked individuals and the ability of naturally recruited individuals to be detected.

Recovery Criterion 3:

3. For existing or reintroduced populations, active management programs and partnerships are in place with conservation or management assurances and commitments that demonstrate potential to maintain or improve habitats, provide for stability of populations, and allow for species reintroduction within improved reaches with suitable habitat (Factors A, D, E). This includes Federal/state/private partnerships within each watershed that are supported by adequate regulatory and implementation mechanisms and including the flexibility and ability to minimize point and non-point source pollution, sedimentation, erosion, effects of habitat

modification, and habitat destruction that negatively impact the southern combshell or its riverine habitat (Factors A, D, E).

Rationale for Criterion 3

Due to the alteration of habitats throughout the Mobile River drainage, there are only a few remaining watersheds that can support existing or reintroduced populations of southern combshell. As such, southern combshell is expected to remain a conservation reliant species in need of habitat management and other conservation actions into the future (Factor A).

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RECOVERY ACTIONS

Recovery actions are the statutorily required, site-specific management actions needed to achieve recovery criteria, as described in section [4\(f\)\(1\)\(B\)\(i\)](#) of the Act. The Service assigns recovery action priority numbers (1–3) to rank recovery actions. The assignment of priorities does not imply that some recovery actions are of low importance but instead implies that lower priority items may be deferred while higher priority items are being implemented. Recovery action priority numbers are based on the following:

- Priority 1: An action that must be taken to prevent extinction or to prevent the species from declining irreversibly.
- Priority 2: An action that must be taken to prevent a significant decline in species population/habitat quality, or some other significant negative impact short of extinction.
- Priority 3: All other actions necessary to provide for full recovery of the species.

Key Acronyms Used in the RIS

SERVICE U.S. Fish and Wildlife Service

Potential Partners and Their Abbreviations

AABC	Alabama Aquatic Biodiversity Center
ACADEMIA	Academic Institutions
ADEM	Alabama Department of Environmental Quality
ALDOT	Alabama Department of Transportation
EPA	Environmental Protection Agency
MDOT	Mississippi Department of Transportation
MDWFP	Mississippi Department of Wildlife, Fisheries, and Parks
MSDEQ	Mississippi Department of Environmental Quality
PRIVATE	Private landowners
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture

Table 1. Recovery action summary table.

Related Recovery Criterion	Recovery Action Priority Number	Recovery Action ID Number	Recovery Action	Additional Information	Potential Partners	Estimated Costs
1	1	1	Work with partners and stakeholders to develop and implement a survey and monitoring strategy for the Buttahatchie River population.	This action will involve working with federal agencies, state agencies, and academic institutions to develop and implement a standardized survey plan for the Buttahatchie River population to ensure that the population remains stable and meets the recovery criteria.	AABC, ACADEMIA, MDWFP	\$377,000
2	1	2	Develop and maintain a controlled propagation and reintroduction program.	This action will involve implementing a current controlled propagation and reintroduction plan following the Service's <i>Policy Regarding Controlled Propagation of Species Listed Under the Endangered Species Act</i> (65 FR 56916). The program should include implementing a controlled propagation and reintroduction plan with partners (that includes broodstock collection, propagation, and reintroduction), monitoring of reintroduced populations, and assessment of the genetic health of any reintroduced populations.	AABC, ACADEMIA, MDWFP	\$4,395,000
3	1	3	Work with private landowners, municipalities, industries, businesses, state agencies, and federal agencies to protect or improve riverine habitat where the southern combshell occurs or may be reintroduced.	This action will involve working with private landowners, municipalities, industries, businesses, state agencies, and federal agencies to minimize point and non-point source pollution, sedimentation, erosion, effects of habitat modification, and habitat destruction that negatively impact the southern combshell or its riverine habitat.	AABC, ADEM, ALDOT, EPA, MSDEQ, MDOT, MDWFP, PRIVATE, USACE, USDA	\$6,180,000

ESTIMATED TIME AND COSTS TO ACHIEVE RECOVERY

Estimates of time and cost, as defined in section [4\(f\)\(1\)\(B\)\(iii\)](#) of the Act, must reflect, to the maximum extent practicable, the total amount of time and costs it will take to achieve the recovery (delisting) of southern combshell. The cost estimates provided do not account for possible future inflation.

We estimate that the full implementation of the recovery actions would improve the status of southern combshell so that it could be delisted within 30 years following the adoption of this recovery plan and cost \$10,952,000. We note that the recovery program may change over time, or the timeframe estimated to implement the recovery actions to achieve recovery of the species may take longer than expected. The recovery of southern combshell will depend largely on the commitment and ability of the Service and partners to implement the recovery actions necessary to achieve the recovery criteria.

Table 3. Recovery action time and cost table.

Time Frame	Action 1 Cost	Action 2 Cost	Action 3 Cost	Total Cost by Year
Year 1	\$14,500	\$125,000	\$206,000	\$345,500
Year 2–10	\$112,500	\$1,370,000	\$1,854,000	\$3,336,500
Years 11–20	\$125,000	\$1,450,000	\$2,060,000	\$3,635,000
Years 21–30	\$125,000	\$1,450,000	\$2,060,000	\$3,635,000
Total Cost by Recovery Action	\$377,000	\$4,395,000	\$6,180,000	\$10,952,000

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