

OUTLINE OF FEDERAL REGISTER NARRATIVE FOR DELISTING DUE TO EXTINCTION

UPLAND COMBSHELL (*EPIOBLASMA METASRIATA*)

I. Background Information:

The upland combshell, *Epioblasma metastriata*, was listed as endangered on March 17, 1993 (58 FR 14330), primarily due to habitat modification, sedimentation, and water quality degradation. The recovery plan (“Mobile River Basin Aquatic Ecosystem Recovery Plan”) was completed on November 17, 2000. The species’ recovery priority number (RPN) is 5, indicating a high degree of threat and low recovery potential. Critical habitat was initially determined to be not prudent and later not determinable, but in 2001, in response to a challenge to the “not determinable” findings, the U.S. District Court for the Eastern District of Tennessee issued an order requiring the Service to propose and finalize critical habitat for 11 Mobile River Basin-listed mussels, including the Upland combshell. The Service published a final critical habitat rule on July 1, 2004 (see actions outlined in proposed listing rule (56 FR 58339), final listing rule (58 FR 14330), proposed critical habitat rule (68 FR 14752) and final critical habitat rule (69 FR 40084)). Two 5-year reviews published on April 7, 2008 and October 15, 2018 recommending delisting the Upland combshell due to extinction. The Service solicited peer review from eight experts for both 5-year reviews from State, Federal, University, NGO, and Museum biologists with known expertise and interest in Mobile River Basin mussels (Service 2008, pp.36-37; Service 2018, p.15); we received responses from five peer reviewers, who concurred our conclusion that the species is extinct.

The Upland combshell was described in 1838 from the Mulberry Fork of the Black Warrior River near Blount Springs, Alabama (58 FR 14331). Adult Upland combshells were rhomboidal to quadrate in shape and are approximately 2.4 inches in length (58 FR 14330-14331). Johnson (1978) considered the Upland combshell to be a variation of the Southern combshell (= Penitent Mussel, *Epioblasma penita*) and synonymized the two (58 FR 14331). Stansbery (1983) recognized consistent morphological differences between the two and considered both species to be valid taxa; the Upland combshell was distinguished from the Southern combshell by the diagonally straight or gently rounded posterior margin of the latter, which terminates at the post-ventral extreme of the shell (58 FR 14331). The Service recognizes *Unio metastriatus* Conrad and *Unio compactus* Lea as synonyms of *Epioblasma metastriata* (58 FR 14331).

The Upland combshell was historically found in shoals in rivers and large streams in the Black Warrior, Cahaba, and Coosa River systems above the Fall Line in Alabama, Georgia, and Tennessee (Service 2000, p.61). As with many of the freshwater mussels in the Mobile River Basin, it was found in stable sand, gravel, and cobble in moderate to swift currents. The historical range included the Black Warrior River and tributaries (Mulberry Fork and Valley

Creek), Cahaba River and tributaries (Little Cahaba River and Buck Creek), and the Coosa River and tributaries (Choccolocco Creek, Etowah, Conasauga, and Chatooga rivers) (58 FR 14331). At the time of listing in 1993, the species was believed to be restricted to the Conasauga River in Georgia, and possibly portions of the upper Black Warrior and Cahaba River drainages (58 FR 14331; Service 2008, p.19). The Upland combshell was last collected in the Black Warrior River drainage in the early 1900s; in the Coosa River drainage in 1986 from the Conasauga River near the Georgia/Tennessee State line; and the Cahaba River drainage in the early 1970s (58 FR 14331; Service 2000, p.61; Service 2018, p.5).

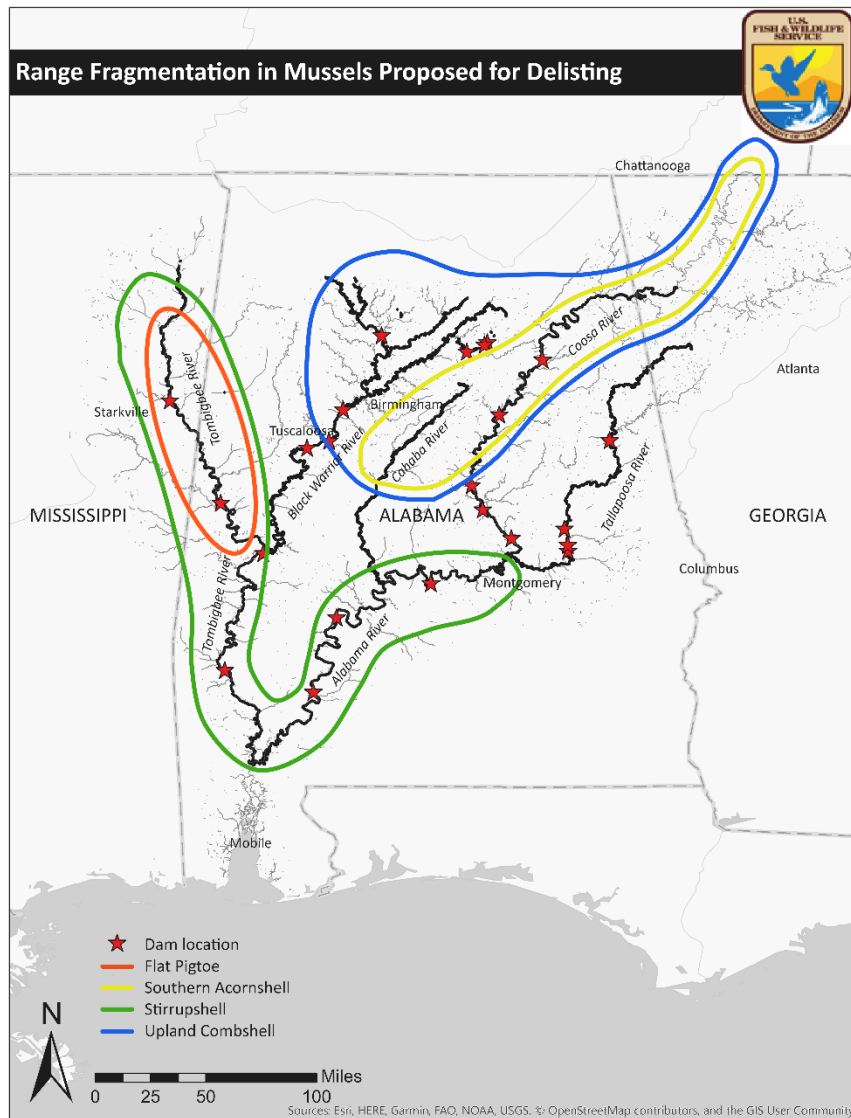


Figure 1 Historical range of the Upland combshell (in blue)

Habitat modification, sedimentation, eutrophication, and other forms of water quality degradation were the primary causes of decline (Service 2000, p.61). The Upland combshell did not tolerate impoundment and was highly sensitive to water quality degradation (Service 2000, p.61). More than 1,000 miles of large and small river habitat in the Mobile River drainage has been impounded for navigation, flood control, water supply, and/or hydroelectric production purposes (58 FR 14335). Habitat within its range has also been impacted by several types of pollution events, including carpet mill and other industrial discharge, sewage treatment plant discharge, urban and agricultural runoff, and surface mine drainage (Service 2000, p.61). Because of extensive habitat degradation and inability to locate the species, experts presumed the species to be extinct as of the 2008 5-year review (Service 2008, p.19; Service 2018, p.7).

II. Information about the Three Criteria and Related Information:

Species detectability – Detection of rare, cryptic, benthic-dwelling animals like freshwater mussels is challenging, and can be affected by a variety of factors, including:

- size of the mussel (smaller mussels, including juvenile mussels, can be more difficult to find in complex substrates than larger mussels, and survey efforts must be thorough enough to try to detect smaller mussels);
- behavior of the mussel (some are found sub-surface, some at the surface, some above the surface, and position can vary seasonally (some are more visible during the reproductive phase when they need to come into contact with host fish, therefore surveys likely need to be conducted during different times of the year to improve detection));
- substrate composition (it can be easier to see/feel mussels in sand and clay than in gravel or cobble, therefore surveys need to include all substrate types because mussels can fall off host fish into a variety of substrates);
- size of river (larger rivers usually have more expansive habitat areas to search and are sometimes deep requiring specialized survey techniques (SCUBA));
- flow conditions (visibility can be affected in very fast flowing, very shallow, or turbid conditions, therefore surveys need to use tactile or excavation methods, or delay until turbidity conditions improve);
- surveyor experience (finding mussels requires a well-developed search image, knowledge of instream habitat dynamics, and an ability to identify and distinguish species); and
- survey methodology and effort (excavation and sifting of stream bottom can detect more mussels than visual or tactile surveys).

All of these challenges are taken into account when developing survey protocols for any species of freshwater mussel, including the Upland combshell. The Upland combshell was medium-sized (but juveniles were very small) and most often found buried in sand, gravel, or cobble in fast flowing runs. However, mussels can be found in sub-optimal conditions, depending on where they drop off their host fish as juveniles. Therefore, all of the above-mentioned

considerations need to be considered when trying to detect this mussel species. Despite detection challenges, many well-planned, comprehensive surveys by experienced State and Federal biologists have not been able to locate extant populations of Upland combshell (Service 2000, p.61; Service 2018, p.7).

Survey effort – Prior to listing, Upland combshell was observed during surveys in the Black Warrior River drainage in the early 1900s; repeated surveys in this drainage in 1974, 1980-1982, 1985, and 1990 did not encounter the species (58 FR 14331). The Upland combshell was observed in the Cahaba River drainage in 1938 and in 1973, but a 1990 survey failed to find the species in the Cahaba River drainage (56 FR 14331). The species was observed in the upper Coosa River drainage in Alabama and Georgia in 1966-1968, but not during 1971-1973 surveys; a single specimen was collected in 1988 from the Conasauga River (58 FR 14331). Both the 2008 and 2018 5-year reviews reference multiple surveys by experienced Federal, State, and private biologists – 18 survey reports from 1993-2006 and 10 survey reports from 2008-2017 – and despite these repeated surveys of historical habitat in the Black Warrior, Cahaba, and Coosa River drainages, no living animals or fresh or weathered shells of the Upland combshell have been located (Service 2008, p.19; Service 2018, p.5).

Time since last detection – The most recent records for the Upland combshell are many decades old: from tributaries of the Black Warrior in early 1900s, from the Cahaba River drainage in the early 1970s, and from the Coosa River drainage in the mid-1980s (58 FR 14331; Service 2008, p.19; Service 2018, p.5). No living populations of the Upland combshell have been located since the time of listing (Service 2000, p.61; Service 2008, p.20; Service 2018, p.7).

Any other overarching considerations – Habitat modification is the major cause of decline of the Upland combshell (Service 2000, p.61). More than 1000 miles of large and small river habitat in the Mobile River drainage has been impounded for navigation, flood control, water supply, and/or hydroelectric production purposes; the Upland combshell cannot tolerate impounded waters. Other threats include channel improvements such as clearing and snagging, sand and gravel mining, diversion of flood flows, and water removal for municipal use; these activities impact mussels by alteration of the river substrate, increasing sedimentation, alteration of water flows, and direct mortality from dredging and snagging (Service 2000, p.6-13). Runoff from fertilizers and pesticides causes algal blooms and excessive growth of other aquatic vegetation, resulting in eutrophication and death of mussels due to lack of oxygen (Service 2000, p.13). The cumulative impacts of habitat degradation likely led to the Upland combshell populations becoming scattered and isolated over time. These small, isolated populations decrease reproductive success as distance between individuals increases which increases the likelihood of extirpation and eventual extinction (Service 2000, p.14).

III. Analysis:

There has been no evidence of the continued existence of the Upland combshell for over three decades; the last known specimens were collected in the late-1980s. When listed, it was thought that the Upland combshell was likely restricted to the Conasauga River in Georgia, and possibly portions of the upper Black Warrior and Cahaba River drainages. Numerous mussel surveys have been completed within these areas, as well as other areas within the historical range of the species since the listing, with no success. Although other federally-listed mussels have been found by mussel experts during these surveys, no live or fresh-dead specimens of the upland combshell have been found (Service 2018, p.7). The species is presumed extinct.

IV. Summary/Conclusion/Determination

We conclude that the Upland combshell is extinct, and therefore should be delisted. This conclusion is based on significant alteration of known historical habitat and lack of detections during numerous surveys conducted throughout the species range.

References

- U.S. Fish and Wildlife Service. 2000. Mobile River Basin Aquatic Ecosystem Recovery Plan. U.S. Fish and Wildlife Service. Atlanta, GA. 128pp.
https://ecos.fws.gov/docs/recovery_plan/001117.pdf
- 2008. Fine-lined Pocketbook (*Hamiota* (= *Lampsilis*) *altilis*), Orange-nacre Mucket (*Hamiota* (= *Lampsilis*) *perovalis*), Alabama Moccasinshell (*Medionidus acutissimus*), Coosa Moccasinshell (*Medionidus parvulus*), Southern Clubshell (*Pleurobema decisum*), Dark Pigtoe (*Pleurobema furvum*), Southern Pigtoe (*Pleurobema georgianum*), Ovate Clubshell (*Pleurobema perovatum*), Triangular Kidneyshell (*Ptychobranhus greenii*), Upland Combshell (*Epioblasma metastriata*), Southern Acornshell (*Epioblasma othcaloogensis*) 5-Year Review. U.S. Fish and Wildlife Service. Jackson, MS. 24pp.
https://ecos.fws.gov/docs/five_year_review/doc2365.pdf
- 2018. Upland Combshell (*Epioblasma metastriata*), Southern Acornshell (*Epioblasma othcaloogensis*) 5-Year Review. U.S. Fish and Wildlife Service. Jackson, MS. 16pp.
https://ecos.fws.gov/docs/five_year_review/doc5963.pdf