

**Ochlockonee Moccasinshell
(*Medionidus simpsonianus*)**

**5-Year Review:
Summary and Evaluation**



Adult Ochlockonee Moccasinshell (*Medionidus simpsonianus*)
collected in the lower Ochlockonee River, Florida. Credit USFWS.

**U.S. Fish and Wildlife Service
Southeast Region
Florida Ecological Services Field Office
Panama City, Florida**

August 2025

5-YEAR STATUS REVIEW

Ochlockonee Moccasinshell (*Medionidus simpsonianus*)

GENERAL INFORMATION

Current Classification: Endangered

Lead Field Office: Florida Ecological Services Field Office.

Author: Sandra Pursifull, Florida Ecological Services Field Office.

Reviewers:

Lead Field Office: Florida Ecological Services Field Office, Emily Bauer.

Lead Regional Office: Southeast Region, Carrie Straight.

Cooperating Field Office: Georgia Ecological Services Field Office, Martha Zapata.

Cooperating Service Programs: Panama City Fish and Wildlife Coordination Office, Channing St. Aubin.

Date of original listing: April 15, 1998 (63 FR 12664; March 16, 1998)

Critical Habitat final rule: November 15, 2007 (72 FR 64286).

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 the Ochlockonee Moccasinshell's 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 public comment discussed silviculture best practices and impacts on water quality, which was evaluated and incorporated into this final document as appropriate. The primary sources of information used in this analysis were the 1998 final listing rule, the 2003 and 2019 recovery plan and amendment (Service 1998, 2003, and 2019, respectively), peer-reviewed reports, agency reports, unpublished survey data and reports, and personal communication with the Florida Fish and Wildlife Conservation Commission (FWC) and recognized experts. This review was completed by the Service's, Florida Ecological Services Field Office. All literature and documents used for this review are on file at the Field Office. 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. All recommendations resulting from this review are the result of thoroughly reviewing the best available information on the Ochlockonee Moccasinshell.

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; Ochlockonee Moccasinshell is a species with a high degree of threat and a low recovery potential.

Review History:

- Two 5-year status reviews recommending no change in status have been published (Service 2007, 2020).

REVIEW ANALYSIS

Listed Entity

Taxonomy and nomenclature

No changes to taxonomic classification or nomenclature have occurred since the Ochlockonee Moccasinshell (*Medionidus simpsonianus*, Walker 1905) was listed. Nomenclature is consistent and follows that in Williams et al. (2017) and Graf and Cummings (2021). 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 not a vertebrate, the DPS policy does not apply.

Recovery Criteria

Recovery Plan or Outline

Final Recovery Plan for the Ochlockonee Moccasinshell (*Medionidus simpsonianus*) [and six additional mussels], September 19, 2003.

Amended Recovery Plan for Ochlockonee Moccasinshell (*Medionidus simpsonianus*), September 26, 2019.

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](#)).

Delisting of Ochlockonee Moccasinshell will be considered when:

Criterion 1: The one (1) Ochlockonee Moccasinshell population in the lower Ochlockonee

River basin exhibits a stable or increasing trend, evidenced by natural recruitment, and multiple age classes.

Criterion 2: At least one (1) Ochlockonee Moccasinshell population is established or discovered in the upper Ochlockonee River basin that exhibits a stable or increasing trend, evidenced by natural recruitment and multiple age classes.

Criterion 3: Spatial distribution of Ochlockonee Moccasinshell populations is sufficient to protect against extinction from catastrophic events and maintain adaptive potential (occupancy of at least 25 km [15.5 mi] of stream channel in the lower basin and 55 km [34.2 mi] of stream channel in the upper basin is needed to maintain each population).

Criterion 4: Threats have been addressed and/or managed to the extent that the species will remain viable into the foreseeable future.

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

Biology and Habitat Conditions Summary

The Ochlockonee Moccasinshell is a small freshwater mussel that rarely exceeds 50 millimeter (mm) (2.0 inches (in)) in length. Its historical range includes the Ochlockonee River mainstem and lower Little River in Florida and Georgia (Fig. 1). The mainstem was impounded by Jackson Bluff Dam in 1927, forming Talquin reservoir near Tallahassee, FL. The structure is a barrier to fish movement and divides the Ochlockonee basin into *lower* and *upper* portions (Pursifull et al. 2021). Habitat in the lower Ochlockonee River, generally downstream of Telogia Creek confluence, is characterized by relatively stable stream channels with good connectivity to the floodplain and undisturbed riparian areas; however, these habitat conditions are degraded in the upper basin. Watershed alterations that may have adversely impacted the species include land use change, impoundment of the mainstem, and the effects of droughts and water use by humans (Holcomb et al. 2015, Pursifull et al. 2021).

Once a fairly common species—museum records sometimes numbered in the dozens of individuals at sites above Talquin reservoir—Ochlockonee Moccasinshell collections decreased in regularity after 1950 (Holcomb et al. 2015). At the time the species was listed in 1998, it was considered extant in the upper basin (Service 1998). Status surveys conducted by FWC, Georgia Department of Natural Resources (GaDNR) and the Service during 2006–2017 found the species extant only in the lower Ochlockonee River (Holcomb et al. 2015, Pursifull et al. 2021). Despite considerable survey effort since 2005 (Fig. 1), the Ochlockonee Moccasinshell was last collected in the upper basin in 1995.

Since our last review, FWC and the Service conducted surveys during 2021–2024 and detected 39 live individuals (shell lengths ranged from 22–47 mm, representing multiple age classes), all within the lower Ochlockonee River:

- FWC conducted surveys at 5 sites in the upper and 10 sites in the lower Ochlockonee River and detected 17 individuals at 3 sites in the lower basin (FWC 2024).
- As part of a study to estimate population size, the Service sampled 10-meter² radial

plots within the lower Ochlockonee River. Out of 84 plots, only 20 individuals were detected, indicating an approximated density of 0.02/meter² (FWS 2024, unpubl. data). These survey efforts increased its current range upstream by approximately 5 kilometers (km) (3.1 miles (mi)).

- The Service used environmental DNA (eDNA) methods to assess the species’ presence at nine upper basin and two lower basin sites, all within its known historical range. No positive detections were recorded at any of the upper basin sites. In contrast, one lower basin site (with confirmed presence of two individuals) yielded a positive detection for Ochlockonee Moccasinshell (J. Roush, 2025 unpubl. master’s thesis).
- In 2024, glochidia from two gravid individuals were extracted streamside for controlled propagation efforts at Warm Springs National Fish Hatchery in Georgia. First year efforts indicate that, like other members of the genus, darters (*Percina* spp.) are its glochidial host.

In summary, the species’ range increased slightly since our last review, however, we attribute this to increased survey effort rather than range expansion. Currently, the Ochlockonee Moccasinshell is extant in a 32 km (20 mi) continuous reach of the lower Ochlockonee River (Fig. 1; Table 1). This is a significant range contraction since its listing and represents about 14 percent of its known historical distribution. Its abundance appears unchanged since our last review, with only 68 live individuals collected since an extant population in the lower Ochlockonee was discovered in 2014 (Table 1). Observations of multiple age classes indicate that recruitment is occurring at some level within the remaining population.

Table 1. Summary of Ochlockonee Moccasinshell historical (pre-2005) and current (2005-2024) occurrences as stream kilometers (km) occupied and number of individuals detected.

Reach	Status	Last live observed	# individuals historical/current¹	Occupied stream historical/current²
Upper Ochlockonee	extirpated	1995	202 / 0	193 / 0 km
Lower Ochlockonee	extant	2024	2 / 68	32 / 32 km
Total			204 / 68	225 / 32 km

¹Number of live individuals collected during the current period (2005-2024), and an estimate of live individuals collected during the historical period (pre-2005). If a museum record or historical survey lacked data on number of individuals collected, we counted it as one individual collected.

²Because only one historical collection exists in the lower basin, we assume the species occupied at least the same stream reach as occupied currently. This likely represents a very conservative estimate of its historical range in the lower basin.

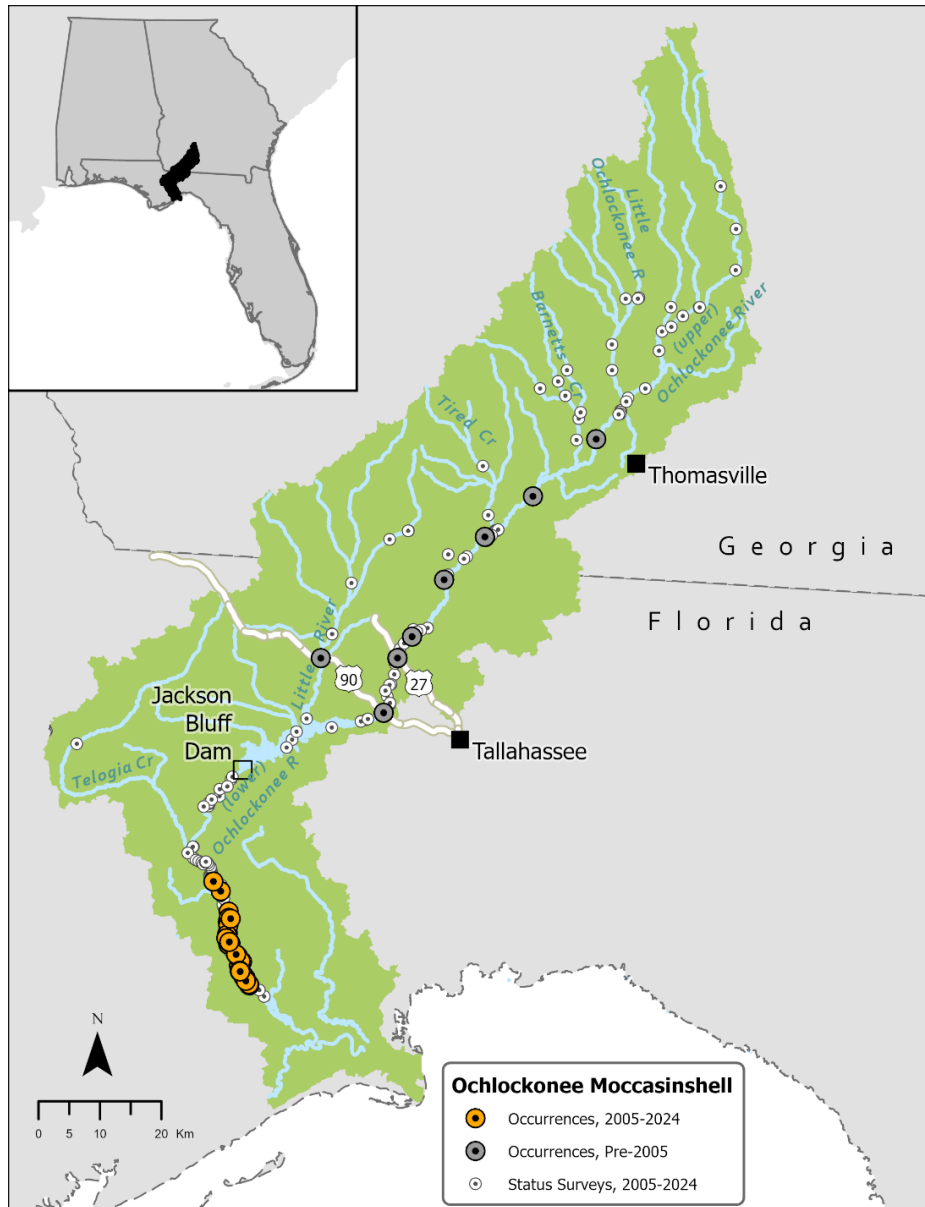


Figure 1. Locations of historical (grey) and current (orange) Ochlockonee Moccasinshell occurrences, and locations of all surveys conducted during the current period (white). Only historical collections with known localities are represented. There is one historical collection in the lower basin described as Wakulla County, Florida from 1897, placing it generally downstream of Telogia Creek confluence.

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 and discussed in more detail in the previous review (Service 2020).

The final listing rule described threats to the Ochlockonee Moccasinshell from habitat degradation or modification (**Factor A**) as a result of excessive sedimentation, siltation and associated habitat instability; water quality degradation and pollution primarily stemming from intensive agricultural activities, urban development, industrial and municipal wastewater discharges, and surface mining; habitat changes and isolation caused by impoundments; and direct habitat disturbance (Service 1998). To address the general topic of the public comment received, the Service doesn't believe silvicultural practices a significant threat to the species. As described in the listing rule (Service 1998), deforestation historically represented a threat to Ochlockonee Moccasinshell, however, current silvicultural activities following best management practices are expected to be compatible with the continued existence of the species. Recent information indicates that the direct and indirect effects of flow reduction and cessation, due to groundwater consumption and reoccurring droughts, are major drivers affecting the ecological health of streams in the upper basin and may have contributed to the loss of mussel populations in this reach (Pursifull et al. 2021). Recent information shows that habitat degradation and modification remain ongoing and severe within its historical range in the upper basin, and we expect these threats to continue in the future.

At the time of listing, the species was not known to occur in the lower Ochlockonee River. Although habitat threats are relatively low in this reach of the river, some threats associated with the mainstem dam exist and include unnatural flow regimes, altered water quality, and channel instability (Hemming et al. 2006, Holcomb et al. 2015, Pursifull et al. 2021). These impacts occur for several kilometers below the dam, and presumably, have extirpated the species from this portion of its range. The dam is also a barrier to upstream dispersal and effectively isolates this lower basin population. Other potential threats to this population include pollution, extreme flood events, and saltwater encroachment (Pursifull et al. 2021). These threats are ongoing, moderate to high in severity, and we expect them to continue in the future.

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

Disease and predation (**Factor C**) were not considered threats to the Ochlockonee Moccasinshell at the time of listing. However, novel densovirus appears to be a threat for some mussel communities in the Southeastern United States (Richard et al. 2020) and could potentially become a threat to this mussel. Also, parasitic trematodes were found in gonadal tissues of a related species (*Medionidus conradicus*), and heavy infestations resulted in the complete disintegration of reproductive tissue (Zale and Neves 1982). We have no indication that disease or native predators presently pose a significant threat to the Ochlockonee Moccasinshell, but they could potentially become a threat to this mussel and should be monitored and studied.

We have identified inadequate regulation (**Factor D**) of consumptive water uses and pollutants loads in basin streams as a new threat to the species. State and Federal regulatory programs intended to manage or protect water resources in the Ochlockonee region, including state permitting programs, are being applied and have helped reduce the negative effects of pollutants since the 1970s. However, these regulations are difficult to implement and regulate and may not provide adequate protection for sensitive aquatic organisms like freshwater

mussels. Despite these protective regulations, recent information indicates that streams within the basin continue to be impacted by consumptive water uses and pollutants discharged by permitted industrial and municipal facilities and mining operations and contained in stormwater runoff and septic tank leachate (Northwest Florida Water Management District 2017, Florida Department of Environmental Protection 2020, Pursifull et al. 2021). Therefore, the species is not adequately protected by existing regulatory mechanisms throughout its range, and we expect this threat to continue in the future.

The final listing rule described other natural or manmade threats (**Factor E**) to the Ochlockonee Moccasinshell as increased vulnerability to stochastic events due to its greatly reduced range and small population size, competition for resources with introduced *Corbicula fluminea* (basket clam), and difficulty in recolonizing extirpated reaches due to limited dispersal ability and complex life history. Stochastic weather events, such as extreme drought and precipitation, are predicted to increase in the Ochlockonee River basin in the future. Modelling for Florida predicts increases in intensity of drought caused by rising temperatures (Runkle et al. 2022). Increasing temperatures and drought may limit water availability causing competition for water resources in the basin. Extreme rainfall events are predicted to increase with landfalling tropical storms (Runkle et al. 2022). These heavy rainfall events are likely to exacerbate run-off from human-modified landscapes increasing sedimentation and associated chemicals into receiving waters, as well as cause channel erosion due to flood scour. Recent information shows that these natural and manmade threats remain ongoing and severe throughout the species range, and we expect these threats to continue in the future. All Ochlockonee Moccasinshell individuals are linearly distributed within an approximately 32 km (20 mi) reach of the lower Ochlockonee River mainstem. Consequently, catastrophic events—including flooding, storm surge, contaminant spill, or dam breach—have the potential to impact the entire population.

Synthesis

The Ochlockonee Moccasinshell is presently extant in approximately 32 km (20 mi) of the lower Ochlockonee River in Florida, where it occurs in relatively low abundance. This small, remaining population is isolated by Jackson Bluff dam, a mainstem impoundment. A total of 68 live individuals have been observed since the population was discovered in 2014. Since its listing in 1998, the species' range has continued to decline and its current distribution represents 14 percent of its known range. The species' distribution and abundance are generally unchanged since our previous review. In the upper basin where the species is extirpated, threats of excessive sedimentation and siltation, channel instability, reduced flows, altered water quality, and pollution are on-going problems. Although threats to habitat are relatively low in the occupied stretch of the lower river, threats associated with the dam and pollution exist, and the population is vulnerable to catastrophic events and saltwater encroachment. Competition from invasive *Corbicula* continues to be a threat throughout its range. The population remaining in the lower basin appears to be moderately healthy and presently stable but highly vulnerable to environmental and demographic stochastic events. Therefore, its viability is deemed low. The degree of threat to its persistence remains high and the potential for recovery remains low. Although critical recovery actions such as threat abatement, securing the extant population, and protecting and restoring habitat are Priority 1 recovery tasks, they are difficult to implement, and little progress has been made on these

tasks. In addition, the recovery criteria for populations and threats are not currently met. Because of ongoing threats and the current condition of the species, the Ochlockonee Moccasinshell continues to meet the definition of an endangered species.

RECOMMENDED FUTURE ACTIVITIES

A detailed discussion of recovery actions and criteria are presented in the Recovery Plan (Service 2003) and its amendment (Service 2019). In the course of this status review, new and/or targeted potential recovery activities were identified and are included below.

Recovery Activities

- Develop and implement a reintroduction, augmentation, and monitoring program for the species in cooperation with agency partners and other stakeholders.
- Prepare a comprehensive threats assessment that identifies and maps existing and potential threats within the Ochlockonee River basin and identifies activities or practices that may affect the species or its habitats.
- Reduce and prevent threats by implementing actions that protect and restore stream habitat, including:
 - Maintain or establish wide riparian buffer areas along basin streams. Buffers of at least 300 feet in width and consisting of native forest are considered the most protective and effective. A greater width may be necessary to effectively buffer storm water runoff from urban and suburban lands, cultivated fields, and timber harvest operations.
 - Protect and restore stream flow levels. Minimize ground and surface water withdrawals or other actions that alter stream hydrology. Encourage the development of criteria for stream flow levels necessary to sustain freshwater mussels and maintain their stream habitats.
 - Protect and improve water quality. Reduce the use of fertilizers and pesticides, especially in recharge areas and near stream channels. Improve treatment of wastewater discharged from permitted facilities and the operation of those facilities.
 - Avoid physical alterations to the stream channel and floodplain and ensure continued connection between the two.
 - Restore and improve in-stream habitat and stream connectivity through removing artificial fish migration barriers, bank stabilization, and channel restoration.
 - Work with the Florida Department of Environmental Protection to inform staff of recovery activities and ensure that flow management operations at Jackson Bluff dam are protective of the population remaining in the lower basin.
- Develop outreach and education products to raise awareness of the species and explain the benefits of protecting stream ecosystems.

- Update the recovery implementation strategy for this species.

Monitoring and Research Activities

- Locate two suitable reintroduction sites in the upper Ochlockonee River.
- Research biological, ecological, genetic, and life-history requisites to direct management and conservation actions.
- Conduct surveys for the species in under-sampled portions of its range to assess status and habitat conditions.
- Conduct quantitative assessments of mussel assemblages to examine relative abundance, catch per unit effort, and population size, density, and age structure.
- Conduct long-term monitoring studies to obtain demographic data, including population size trends, population growth rates, recruitment levels, and age-specific survival.
- Examine the population status of host fishes (e.g., *Percina* spp. and *Etheostoma* spp.) and identify factors potentially inhibiting host-mussel interactions.
- Determine if diseases, parasites, or predators pose a threat to the species.
- Model flow scenarios to assess the vulnerability of the lower mainstem population to saltwater encroachment and storm surge events.

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RESULTS / SIGNATURES

**U.S. Fish and Wildlife Service
Status Review of Ochlockonee Moccasinshell (*Medionidus simpsonianus*)**

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.*
- No change needed.

FIELD OFFICE APPROVAL:

Acting Division Manager, Florida Ecological Services Office, U.S. Fish and Wildlife Service

Approve: _____

** In the Florida Ecological Services Field Office, the Classification and Recovery Division Manager has delegated authority to approve 5-year reviews that do not recommend a status change.*