Recovery Plan for the Gulf Moccasinshell (*Medionidus penicillatus*), Oval Pigtoe (*Pleurobema pyriforme*), Purple Bankclimber (*Elliptoideus sloatianus*), and Shinyrayed Pocketbook (*Hamiota subangulata*). https://ecos.fws.gov/docs/recovery_plan/030930.pdf

Original Approved: September 19, 2003
Original Prepared by: U.S. Fish and Wildlife Service, Asheville and Panama City Field Offices

AMENDMENT 1

We have identified the best available information that indicates the need to amend recovery criteria for the endangered shinyrayed pocketbook, Gulf moccasinshell, oval pigtoe, and the threatened purple bankclimber since the recovery plan was completed. In this proposed modification, we will reference the current criteria, show amended recovery criteria, and describe the rationale supporting the proposed recovery plan modification. The proposed modification is shown as an addendum that supplements the recovery plan by adding delisting criteria, which were not developed at the time this recovery plan was completed. The proposed criteria amendments supersede only pages iv, 77-83 of the recovery plan for the Gulf moccasinshell, oval pigtoe, purple bankclimber, and shinyrayed pocketbook (USFWS 2003). Recovery plans are a non-regulatory document that provide guidance on how best to help recover species.

For
U.S. Fish and Wildlife Service
Atlanta, Georgia

Approved: Larry Williams
Acting **Regional Director, U.S. Fish and Wildlife Service**

Date: September 26, 2019

METHODOLOGY USED TO COMPLETE THE RECOVERY PLAN AMENDMENT

This amendment was developed using the most recent and best available information for the species. The Service gathered information for the Gulf moccasinshell, oval pigtoe, purple bankclimber, and shinyrayed pocketbook including recent survey data, unpublished reports, and publications by the Service, the Georgia Department of Natural Resources (GADNR), and the Florida Fish and Wildlife Conservation Commission (FWC). In addition, we notified species experts of the Service's process to complete this amendment and a meeting among mussel biologists in Region 4 was conducted in order to develop the delisting criteria. Biologists and managers in the Georgia and Panama City Ecological Services Offices reviewed the amended criteria.

ADEQUACY OF RECOVERY CRITERIA

Section 4(f)(1)(B)(ii) of the Endangered Species Act (Act) requires that each recovery plan shall incorporate, to the maximum extent practicable, "objective, measurable criteria which, when met, would result in a determination…that the species be removed from the list." Legal challenges to recovery plans (see Fund for Animals v. Babbitt, 903 F. Supp. 96 (D.D.C. 1995)) and a Government Accountability Audit (GAO 2006) also have affirmed the need to frame recovery criteria in terms of threats assessed under the five listing factors.

Recovery Criteria

The current recovery plan (**https://ecos.fws.gov/docs/recovery_plan/030930.pdf**) only provides downlisting criteria for the federally endangered Gulf moccasinshell, oval pigtoe, and shinyrayed pocketbook and does not provide delisting criteria for the federally threatened purple bankclimber; see pages iv, 77-83.

Synthesis

The Gulf moccasinshell, oval pigtoe, and shinyrayed pocketbook were listed as endangered and the purple bankclimber was listed as threatened on March 16, 1998 (63 FR 12664) due to significant habitat loss, range restriction, and population fragmentation. Critical habitat was designated in 2007 (72 FR 64286). A five-year review was last completed in 2007 (USFWS 2007), however recent Biological Opinions contain the latest status review for shinyrayed pocketbook and purple bankclimber (2016), Gulf moccasinshell (2017) and oval pigtoe (2018). The information presented in this synthesis updates the status of the species in each sub-basin since the 2007 five-year review was completed. All three endangered species historically occurred throughout the Apalachicola-Chattahoochee-Flint (ACF) River basin and Econfina Creek with the shinyrayed pocketbook and oval pigtoe also historically occurring in the Ochlockonee River basin. The oval pigtoe is the only one of the three species that occurs in the Suwannee River basin. The threatened purple bankclimber is endemic to the ACF and Ochlockonee River basins.

Shinyrayed Pocketbook

The shinyrayed pocketbook historically occurred in 12 sub-basins and currently occupies the Upper Flint, Middle Flint, Lower Flint, Kinchafoonee-Muckalee, Ichawaynochaway, Spring, Middle Chattahoochee, Lower Chattahoochee, Chipola and Econfina sub-basins. It is considered likely extirpated in the upper Ochlockonee sub-basin as the species was last collected live in 2002 with no occurrences during extensive surveys from 2006 to 2016 (S. Pursifull et al., in preparation). It is also likely extirpated from the Upper Chattahoochee sub-basin with only historical occurrences (Brim Box and Williams 2000).

The Upper Flint sub-basin had one occurrence record of the shinyrayed pocketbook from Turkey Creek in 2013 (GADNR, unpub. data). In the Middle Flint sub-basin, this species was recorded in 2010 from Mercer Millpond Creek and in seven of the last ten years of surveys in Chokee Creek (GADNR, unpub. data). Within the Lower Flint sub-basin, there are four occurrences on the Flint River main stem (2009, 2010, 2011 and 2017) in Baker, Mitchell and Decatur counties and one in

Coolewahee Creek (2009) (GADNR, unpub. data). The Kinchafoonee-Muckalee sub-basin had one occurrence (2015) in Kinchafoonee Creek (GADNR, unpub. data). Ichawaynochaway sub-basin had one occurrence (2011) in Ichawaynochaway Creek and three occurrences in Chickasawhatchee Creek (2010, 2011, and 2014) (GADNR, unpub. data). The Spring Creek sub-basin harbors the largest number of shinyrayed pocketbooks known to occur in Georgia. They occupy the lower reaches of Spring Creek (Decatur County) near Seminole Lake, up to Harmony Church Road (2010 and 2011) (J. Wisniewski, pers. com. 2018). Service and GADNR personnel have tagged 262 shinyrayed pocketbooks from surveys conducted over a 90 meter (295 ft.) stretch of Spring Creek (Miller County) from 2011-2017 with evidence of recruitment.

The Middle Chattahoochee sub-basin has only one known occurrence of the shinyrayed pocketbook in Uchee Creek, Russell County, Alabama. There were two occurrences in this tributary in 2010 (Stringfellow 2010) and 2015 (J. Garner, pers. comm. 2018). The Lower Chattahoochee sub-basin occurrence of shinyrayed pocketbooks is limited to the Sawhatchee Creek system, Early County, Georgia. They are usually found in small numbers with consistently documented occurrences throughout its main stem and Sheffield's Mill Creek tributary with evidence of recruitment. Service and GADNR biologists have tagged 83 individuals from 2005-2018 in a 150 meter (492 ft.) stretch of Sawhatchee Creek in support of a long term mark-recapture study (GADNR unpub. data).

The Chipola River sub-basin has numerous occurrence records (20 sites) of the shinyrayed pocketbook from 2011-2017 (USFWS, unpub. data; FWC, unpub. data).

In Econfina Creek, a total of five shinyrayed pocketbooks were found in three locations in 2009 and in one location in 2015 on the main stem (USFWS, unpub. data).

Gulf Moccasinshell

The Gulf moccasinshell historically occurred in 11 sub-basins and currently occupies the Upper Flint, Middle Flint, Ichawaynochaway, Lower Chattahoochee, Chipola and Econfina Creek sub-basins. The Gulf moccasinshell is likely extirpated from the Upper and Middle Chattahoochee sub-basins; there have been no records of occurrence since the 1970s (Brim Box and Williams 2000). The Service and GADNR have conducted extensive surveys of the Spring Creek sub-basin since 2000 (USFWS, unpub. data; GADNR, unpub. data); the species was not found during these surveys and it is likely extirpated.

The Upper Flint sub-basin had one occurrence in 2014 from Whitewater Creek (GADNR, unpub. data). Chokee Creek in the Middle Flint sub-basin had yearly occurrences from 2008 to 2018 with evidence of recruitment (GADNR, unpub. data). The Ichawaynochaway sub-basin had one occurrence in 2014 from Chickasawhatchee Creek (GADNR, unpub. data).

In the Lower Chattahoochee sub-basin, the Gulf moccasinshell is limited to the Sawhatchee Creek system, Early County, Georgia. This is the largest known assemblage of this species in Georgia. They are located throughout this system and show evidence of recruitment. Service and GADNR biologists have tagged 412 Gulf moccasinshells from yearly surveys (2005-2018) in a 100 meter (328 ft.) stretch of Sawhatchee Creek (GADNR, unpub. data).

The Chipola sub-basin had several occurrences in three tributaries (Spring, Baker, and Dry Creeks) in 2012 with one additional occurrence in 2014 (Dry Creek) (USFWS, unpub. data; USGS, unpub. data).

Econfina Creek had three occurrences in 2009 and one in 2015 (USFWS, unpub. data).

Oval Pigtoe

The oval pigtoe historically occurred in 14 sub-basins and currently occupies the Upper Flint, Middle Flint, Kinchafoonee-Muckalee, Ichawaynochaway, Spring, Chipola, Lower Chattahoochee, Santa Fe, Lower Suwannee, and Econfina Creek sub-basins. It is considered likely extirpated in the upper Ochlockonee River sub-basin as the species was last collected live in 2005 with no occurrences during extensive surveys from 2006 to 2016 (S. Pursifull et al., in preparation).

In the Upper Flint, GADNR conducted an extensive survey of the northern part of this sub-basin in 2013-2014 resulting in only one occurrence record on the Flint River main stem. The species may be extirpated from previously known locations in Line Creek above and below Lake McIntosh; a 650-acre (263 hectare) reservoir completed in 2012 near Peachtree City, Georgia. There is evidence of recruitment within the last 10 years in Chokee Creek (Middle Flint sub-basin) documented by GADNR recapture surveys. No oval pigtoe were found in surveys of the Lower Flint sub-basin from 2008 to 2017 (GADNR, unpub. data). The last recorded occurrence was in Coolewahee Creek in 1992 (Brim Box and Williams 2000). Collections within the Kinchafoonee-Muckalee sub-basin have been declining however, a new location was documented in Bear Creek in 2009 (GADNR, unpub. data). In the Ichawaynochaway sub-basin, the number of occurrences and individuals collected has also declined. Spring Creek (Spring sub-basin) has the largest number of oval pigtoe in the Flint River system where Service and GADNR biologists have collected over 300 individuals since 2011 in a 90 meter (295 ft.) reach.

Within the Chattahoochee drainage, the Lower Chattahoochee sub-basin is the only one currently occupied, but it represents the largest number of oval pigtoe in Georgia. From 2005-2018, GADNR tagged over 700 individuals in Sawhatchee Creek (GADNR, unpub. data).

There are 46 occurrence records from 2008 to 2018 distributed throughout the Chipola sub-basin, including large collections in 2018 (USFWS, unpub. data). In 2017, FWC documented a new site below the Dead Lakes area. This section of the river did not include any historical accounts of oval pigtoe. The species is currently absent from the Apalachicola sub-basin and was historically only known from archaeological evidence at sites in the upper Apalachicola River (Williams and Fradkin 1999).

The oval pigtoe has occurred consistently in Econfina Creek in varying abundance and distribution (M. Gangloff and USFWS, unpub. data). In the Santa Fe sub-basin, three localities were documented with a few individuals; two sites in the Santa Fe River in 2011 (Williams et al. 2014) and one site in the New River in 2015 (FWC, unpub. data). A notable collection of one live oval pigtoe was made by FWC in 2017 in the Lower Suwannee sub-basin on the Suwannee River main stem. One shell was collected at another location in 2014; other specimens from this river are only known from museum records.

Purple Bankclimber

The purple bankclimber historically occurred in 10 sub-basins and currently occupies the Upper Flint, Middle Flint, Lower Flint, Ichawaynochaway, Apalachicola, Chipola, Upper Ochlockonee, and Lower Ochlockonee sub-basins. It is likely extirpated from the Chattahoochee River with the last documented occurrence in 2001 near Goat Rock Lake, a man-made reservoir. Extensive surveys of the area in 2010 did not find the species. In the Upper Flint sub-basin, purple bankclimber was collected at seven locations (62 individuals) on the main stem Flint River in 2014 between Beaver Creek and Lake Blackshear. Occurrences from the main stem Flint River in the Middle Flint sub-basin were documented in 2010, 2011, and 2014. A 2011 GADNR survey of the Flint River main stem in the Lower Flint sub-basin found purple bankclimber at 19 of 39 sites (105 individuals). Evidence of recruitement was indicated by good size variation and the presence of small individuals. Numerous individuals (1154 live) were found at nine locations in 2010. In 2013, a single individual was found in Ichawaynochaway Creek; a first collection for this area since the species was listed.

This species was found in varying numbers from multiple years (2011-2017) in sections of the Apalachicola River (USFWS 2016). Although the population of purple bankclimber in the upper section was estimated to be relatively large, the species is apparently rare in the rest of the river and may be experiencing poor recruitment (USFWS 2016).

The most recent collections of purple bankclimber in the lower Chipola River (below Dead Lakes and the Chipola River cut-off) were in 2014 (5 live). Minimal numbers (1 per site) of live individuals were found in dive surveys of the northern Dead Lakes region in 2017 and 2018.

In the Upper Ochlockonee sub-basin this species was collected regularly in the main stem from 2009-2017, including in new locations. Surveys of the Lower Ochlockonee sub-basin in 2014 found over 300 live individuals from 22 sites. Smaller numbers were collected at fewer sites in 2015 and 2017. Few small and medium-sized individuals were found, although juveniles and small adults of other species were collected regularly (USFWS, unpub. data).

Summary of Threats

The shinyrayed pocketbook, Gulf moccasinshell and oval pigtoe are restricted in distribution, occur in generally small numbers, and show little evidence of recovering from historical habitat losses without significant positive human intervention (USFWS 2007). The purple bankclimber is found in larger numbers and occurs at more sites but is restricted in its distribution and likely extirpated from the Chattahoochee River. The declining range and abundance of these species is due mostly to changes in the river systems resulting from dams, dredging, mining, channelization, pollution, sedimentation, and water withdrawals resulting in habitat loss, fragmentation and degradation. Severe drought contributes to further fragmentation and loss of habitat. These threats occur throughout all the basins to some degree but is the greatest in the Flint, Apalachicola, and Ochlockonee rivers, which are downstream of major main-stem dams, or in areas of relatively high municipal, industrial, or agricultural water use (USFWS 2007).

AMENDED RECOVERY CRITERIA

Recovery criteria serve as objective, measurable guidelines to assist in determining when an endangered species has recovered to the point that it may be downlisted to threatened, or that the protections afforded by the Act are no longer necessary and the Gulf moccasinshell, oval pigtoe, purple bankclimber, and shinyrayed pocketbook may be delisted. Delisting is the removal of a species from the Federal Lists of Endangered and Threatened Wildlife and Plants. Downlisting is the reclassification of a species from endangered to threatened. The term "endangered species" means any species (species, sub-species, or DPS) which is in danger of extinction throughout all or a significant portion of its range. The term "threatened species" means any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Revisions to the Lists, including delisting or downlisting a species, must reflect determinations made in accordance with sections 4(a)(1) and 4(b) of the Act. Section 4(a)(1) requires that the Secretary determine whether a species is an endangered species or threatened species (or not) because of threats to the species. Section 4(b) of the Act requires that the determination be made "solely on the basis of the best scientific and commercial data available." Thus, while recovery plans provide important guidance to the Service, States, and other partners on methods of minimizing threats to listed species and measurable objectives against which to measure progress towards recovery, they are guidance and not regulatory documents.

Recovery criteria should help indicate when we would anticipate that an analysis of the species' status under section 4(a)(1) would result in a determination that the species is no longer an endangered species or threatened species. A decision to revise the status of or remove a species from the Federal Lists of Endangered and Threatened Wildlife and Plants, however, is ultimately based on an analysis of the best scientific and commercial data then available, regardless of whether that information differs from the recovery plan, which triggers rulemaking. When changing the status of a species, we first propose the action in the *Federal Register* to seek public comment and peer review, followed by a final decision announced in the *Federal Register*.

Delisting Recovery Criteria

We are providing recovery criteria for the Gulf moccasinshell, oval pigtoe, purple bankclimber, and shinyrayed pocketbook recovery plan which will supersede (replace) the existing criteria (USFWS 2003; pages iv, 77-83).

The following recovery criteria 1-3 apply to all four species. Criteria specific to each species are listed separately as criteria 1a and 2a.

The four species will be considered for delisting when:

1. Populations exhibit a stable or increasing trend, evidenced by natural recruitment, and multiple age classes.

Shinyrayed Pocketbook
1a) At least eight (8) populations exhibit a stable or increasing trend, evidenced by natural recruitment, and multiple age classes.

Gulf Moccasinshell
1a) At least seven (7) populations exhibit a stable or increasing trend, evidenced by natural recruitment, and multiple age classes.

Oval Pigtoe
1a) At least nine (9) populations exhibit a stable or increasing trend, evidenced by natural recruitment, and multiple age classes.

Purple Bankclimber
1a) At least seven (7) populations exhibit a stable or increasing trend, evidenced by natural recruitment, and multiple age classes.

2. The spatial distribution of populations (as described in Criterion 1) are sufficient to protect against extinction from catastrophic events and maintain adaptive potential.

Shinyrayed Pocketbook
2a) At least one (1) population in each of the Econfina Creek, Chipola, Chattahoochee, Flint, and Ochlockonee Rivers, and two (2) populations being located within the major tributary sub-basins of the Flint River.

Gulf Moccasinshell
2a) At least one (1) population in each of the Econfina Creek, Chipola, Chattahoochee, and Flint River systems, and two populations being located within the major tributary sub-basins of the Flint River.

Oval Pigtoe
2a) At least one (1) population in each of the Econfina Creek, Chipola, Chattahoochee, Flint, Ochlockonee, Santa Fe, and Suwannee River systems, and two populations being located within the major tributary sub-basins of the Flint River.

Purple Bankclimber
2a) At least one (1) population in each of the Chipola, Flint, Apalachicola, and Ochlockonee River systems.

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

Justification

The recovery criteria were developed for each species by considering its known historical and current distribution and abundance, amount of existing potential habitat, amount of habitat that is irreversibly lost for the foreseeable future, barriers to genetic exchange, and the scientific literature.

Ensuring that populations are distributed throughout the range (e.g. multiple rivers) and within each river (e.g. multiple sites distributed from headwaters to confluence) addresses resiliency and redundancy (as defined in Criteria 1 and 2). A resilient population also consists of some number of mussels in a particular sub-basin that has a stable or increasing trend, demonstrates natural recruitment and contains multiple age classes. The criteria will ensure that resilient populations are distributed to avoid genetic isolation, potential inbreeding depression, and extirpation from one or two successive catastrophic events. The main threat to the four species continues to be habitat loss and degradation. Criterion 3 ensures resilient populations are within the river systems that may support the species through the reduction and/or management of threats (Factors A, D, and E).

Rationale for Recovery Criteria

The Service has adopted the analysis of Resiliency, Redundancy, and Representation (3Rs) as a means for determining species viability to inform listing and other regulatory decisions (Smith et al. 2018). These amended criteria follow that 3R framework.

Resiliency (as defined in Smith et al. 2018) is met through Criterion 1 listed above. The Service believes that with data reflecting a stable or increasing trend in population numbers, and by demonstrating successful recruitment through multiple age classes, the populations will withstand regular stochastic events that may occur into the future.

Redundancy (as defined in Smith et al. 2018) is addressed in Criteria 1 and 2. The requirement of the number of resilient populations for each species across multiple sub-basins, as well as, in multiple stream orders will provide the distribution necessary to avoid extinction following any catastrophic event. Each of the sub-basins possess unique land characteristics, annual climate variations, and stream morphology. These variances should provide the four species protection from a catastrophic event.

Representation (as defined in Smith et al. 2018) will be accomplished when all three criteria listed above is accomplished. The populations will be distributed across multiple states, physiographic provinces, and stream orders. This should allow for preservation of genetic exchange into the future between two or more populations, distribution across multiple natural variances in habitat types, and allow for future adaptations to the changing environmental conditions.

Specifically, the proposed delisting recovery criteria reflect the best available and most up-to-date information for the Gulf moccasinshell, oval pigtoe, purple bankclimber, and shinyrayed pocketbook. The number of resilient populations required for recovery of each species reduces the probability of extinction in the foreseeable future. Aquatic species, and especially freshwater mussels, are subject to habitat degradation from effects throughout their entire catchment. This relationship is reflected in the wide variety of threats mentioned under Factors A and E in the initial listing publication (63 FR 12664). Due to the large number of immitigable threats to each population, the only way to ensure that the species will not become threatened with extinction in the foreseeable future is to create a sufficient number of populations distributed throughout the sub-basins such that the loss of any one population does not limit the continued existence of the species. We suggest the maintenance and improvement of the existing populations along with the establishment of additional populations will have demonstrated that the combination of threats

acknowledged in the initial listing are reduced to a degree that is manageable, and that viable populations can be sustained despite remaining threats.

Additionally, the development of a successful reintroduction strategy (redundancy across tributaries and large river systems) will demonstrate that future threats are likely to be addressed through active management of the species without resort to future re-listing of the species, ensuring they no longer meet the definition of an endangered or threatened species.

LITERATURE CITED

Brim Box, J., and J.D. Williams. 2000. Unionid mollusks of the Apalachicola Basin in Alabama, Florida, and Georgia. Bulletin of the Alabama Museum of Natural History No. 22. 143pp.

Pursifull, S.C., J. Holcomb, J.D. Williams, and J.M. Wisniewski. Manuscript in preparation. Status of Freshwater Mussels of the Ochlockonee River Basin of Georgia and Florida and a Discussion of Potential Threats.

Smith, David R., Nathan L. Allan, Conor P. McGowan, Jennifer A. Szymanski, Susan R. Oetker, and Heather M. Bell. 2018. Development of a Species Status Assessment Process for Decisions under the U.S. Endangered Species Act. Journal of Fish and Wildlife Management. 9(1): 302- 320.

Stringfellow, C. 2010. Mussel Survey for Carson Drive at Uchee Creek, Seale, Alabama. Columbus State University, Columbus, Georgia, unpublished report.

U.S. Fish and Wildlife Service. 1998. Endangered and threatened wildlife and plants; determination of endangered status for five freshwater mussels and threatened status for two freshwater mussels from eastern Gulf slope drainages of Alabama, Florida, and Georgia. Federal Register 63(50): 12664-12687.

U.S. Fish and Wildlife Service. 2003. Recovery plan for the endangered fat threeridge, shinyrayed pocketbook, Gulf moccasinshell, Ochlockonee moccasinshell, oval pigtoe and the threatened Chipola slabshell, and purple bankclimber. U.S. Fish and Wildlife Service, Atlanta, GA, unpublished report.

U.S. Fish and Wildlife Service. 2007. 5-year review of the Fat threeridge (Amblema neislerii), Shinyrayed Pocketbook (Lampsilis subangulata), Gulf Moccasinshell (Medionidus penicillatus), Ochlockonee Moccasinshell (Medionidus simpsonianus), and Oval Pigtoe (Pleurobema pyriforme); and Threatened Chipola Slabshell (Elliptio chipolaensis), and Purple Bankclimber (Elliptoideus sloatianus). 31pp.

U.S. Fish and Wildlife Service. 2016. Biological opinion on the U.S. Army Corps of Engineers, Mobile District, Update of the Water Control Manual for the Apalachicola-Chattahoochee-Flint River Basin in Alabama, Florida, and Georgia and a Water Supply Storage Assessment. Prepared by the USFWS Panama City Field Office, Florida. 305pp.

Williams, J.D., and A. Fradkin. 1999. Fusconaia apalachicola, a new species of freshwater mussel

(Bivalvia: Unionidae) from pre-Columbian archeological sites in the Apalachicola Basin of Alabama, Florida, and Georgia. Tulane Studies in Zoology and Botany 31: 51-62.

Williams, J.D., R.S. Butler, G.L. Warren, and N.A. Johnson. 2014. Freshwater Mussels of Florida. University of Alabama Press, Tuscaloosa.