Green-blossom pearly mussel (*Epioblasma torulosa gubernaculum*)
Tubercled-blossom pearly mussel (*Epioblasma torulosa torulosa*)
Turgid-blossom pearly mussel (*Epioblasma turgidula*)
Yellow-blossom pearly mussel (*Epioblasma florentina florentina*)

5-Year Review:
Summary and Evaluation

Tubercled blossom, USFWS photo

U.S. Fish and Wildlife Service
Southeast Region
Tennessee Ecological Services Field Office
Cookeville, Tennessee

5-YEAR REVIEW
Green-blossom pearly mussel (*Epioblasma torulosa gubernaculum*)
Tubercled-blossom pearly mussel (*Epioblasma torulosa torulosa*)
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Yellow-blossom pearly mussel (*Epioblasma florentina florentina*)

I. GENERAL INFORMATION

A. Methodology used to complete the review –

The Tennessee Ecological Services Field Office conducted this 5-year review. The primary sources of information used in this analysis were the 5-year review completed for three of the blossom species (Service 2007) and the 5-year review completed for the tubercled-blossom (Service 2011).

We published a notice in the Federal Register on March 25, 2014 (79 FR 16366), announcing the initiation of this second 5-year review for the green-blossom, yellow-blossom and tubercled-blossom species and a 60-day comment period was opened. We published a notice in the Federal Register on August 30, 2016 (81 FR 59650), announcing the initiation of this second 5-year review for the turgid-blossom species and a 60-day comment period was opened. We did not receive any public comments. Before finalizing this current 5-year review, we discussed the status of the four mussel species with researchers similar to the ones originally consulted to ensure that no new information is available that would change the recommendation to delist these species because they are presumed to be extinct. In spite of numerous surveys throughout the ranges of these species, no new information is available.

B. Reviewers

Lead Region — Southeast Region: Kelly Bibb: 404/679-7132

Lead Field Office — Tennessee, Ecological Services: Stephanie Chance; 931/525-4981

Cooperating Regions — Northeast Region: Mary Parkin, 617/417-3331
Midwest Region: Laura Ragan, 612/713-5157

Cooperating Field Offices — Southwest Virginia Field Office: Jordan Richard, 276/623-1233; Rock Island, Illinois, FO: Kristen Lundh, 309/757-5800 x215; Bloomington, Indiana, FO: Lori Pruitt, 812/334-4261 x213; Columbus, Ohio, FO: Angela Boyer, 614/416-8993; Elkins, West Virginia, FO: Barbara Douglas, 304/636-6586; Frankfort, Kentucky, FO: Leroy Koch, 502/695-0468; Daphne, Alabama, FO: Anthony Ford, 251/441-5838

C. Background

1. Federal Register Notice citation announcing initiation of this review: 79 FR 16366; March 25, 2014; 81 FR 59650; August 30, 2016

2. Species status:
Green-blossom pearly mussel - Presumed extinct
Yellow-blossom pearly mussel - Presumed extinct
Turgid-blossom pearly mussel - Presumed extinct
Tubercled-blossom pearly mussel – Presumed extinct

3. Recovery achieved
"1" for all 4 mussels; 1=0-25% recovery objectives achieved

4. Listing history
Green-blossom pearly mussel
FR Notice: 41 (FR) 24062
Date Listed: June 14, 1976
Entity Listed: Subspecies
Classification: Endangered

Yellow-blossom pearly mussel
FR Notice: 41 (FR) 24062
Date Listed: June 14, 1976
Entity Listed: Subspecies
Classification: Endangered

Turgid-blossom pearly mussel
FR Notice: 41 (FR) 24062
Date Listed: June 14, 1976
Entity Listed: Species
Classification: Endangered

Tubercled-blossom pearly mussel
FR Notice: 41 (FR) 24062
Date Listed: June 14, 1976
Entity Listed: Species
Classification: Endangered

5. Associated actions
A final rule was published for the establishment of a non-essential experimental population of the yellow-blossom pearly mussel, turgid-blossom pearly mussel and tubercled-blossom pearly mussel in the Tennessee River below Wilson Dam in Alabama on June 14, 2001 (66 FR 32250).

6. Review history

1991: In this review (56 FR 56882), different species were simultaneously evaluated with no species-specific, in-depth assessment of the five factors and threats as they pertained to the different species' recovery. In particular, no changes were proposed for the status of these mussels in the review.

The last 5-year reviews for the green-blossom, turgid-blossom, and yellow-blossom pearlymussels recommended that they be delisted because they were presumed to be extinct (Service 2007). The 2007 review summarizes comments from experts, who indicate that the three species are extinct. The last 5-year review for the tubercled-blossom did not recommend delisting, although it stated that many experts presume it to be extinct (Service 2011).

In an email dated August 8, 2017, Janet Clayton, West Virginia Division of Natural Resources, stated that they had done extensive surveys within the Kanawha Falls area of the Kanawha River since 2005 and have found no evidence that tubercled blossom still occurs there. The species is believed extirpated from West Virginia.

In an email dated August 8, 2017, Steven Ahlstedt, U.S. Geological Survey [retired], informed us of his opinion that all three species are likely extinct.

In an email dated August 7, 2017, Monte McGregor, Kentucky Department of Fish and Wildlife Resources, indicated that four blossoms are extirpated from Kentucky, and that they are likely extinct.

In an email dated August 8, 2017, Jeremy Tiemann, Illinois Natural History Survey, indicated that he had no new collection information for the four blossoms.

In an email dated August 9, 2017, John Navarro, Ohio Division of Wildlife, indicated that he had no no comments to add to this review of the tubercled blossom.

In an email dated August 9, 2017, Jeff Garner, Alabama Department of Conservation and Natural Resources, indicated that he had no information about the four blossoms.

In an email dated August 14, 2017, Don Hubbs, Tennessee Wildlife Resources Agency, indicated that the TWRA has no recent records for any of the four blossoms despite completing or funding surveys in the Cumberland, Tennessee, Clinch, Duck, Elk, Emory, Hiwassee, Little, and Powell rivers. The TWRA considers the four blossoms extirpated from Tennessee.

7. Species' recovery priority number at start of review (48 FR 43098): The green-blossom pearly mussel, tubercled-blossom pearly mussel, and yellow-blossom pearly mussel have a number of 6 (degree of threat is high; potential for recovery is low; taxonomy is subspecies level). The turgid-blossom pearly mussel has a number of 5 (degree of threat is high; potential for recovery is low; taxonomy is species level).

8. Recovery plan

Recovery Plan for the Tubercled-blossom Pearly Mussel Epioblasma =Dysnomia) torulosa torulosa (Rafinesque, 1820), Turgid-blossom Pearly Mussel Epioblasma (=Dysnomia) turgidula (Lea, 1858), Yellow-blossom Pearly Mussel Epioblasma (=Dysnomia) florentina florentina (Lea, 1857)
Date Issued: January 25, 1985

Recovery Plan for the Green-Blossom Pearly Mussel Epioblasma (=Dysnomia) torulosa gubernaculum (Reeve, 1865)

Date Issued: July 9, 1984

II. REVIEW ANALYSIS

A. Application of the 1996 distinct population segment (DPS) policy

Not applicable. The tubercled-blossom pearly mussel, turgid-blossom pearly mussel, yellow-blossom pearly mussel, and green-blossom pearly mussel are invertebrates and are not covered by the DPS policy, and therefore the other DPS questions will not be addressed further in this review.

B. Recovery Criteria

1. Do these species have final, approved recovery plans containing objective, measurable criteria? Yes

Since reproducing populations of the turgid-blossom pearly mussel and yellow-blossom pearly mussel were not known to exist at the time of approval of the recovery plan, the plan indicates that recovery efforts for the two species would be reevaluated if and when reproducing populations of one or both species was found and when each species and its habitat were protected from present and foreseeable events that might interfere with survival of the species. No populations – reproducing or non-reproducing – have been found since approval of the recovery plan.

2. Adequacy of recovery criteria

a. Do the recovery criteria reflect the best available (i.e., most up-to-date) information on the biology of the species and their habitats? Yes

b. **Are all of the 5 listing factors that are relevant to the species addressed in the recovery criteria (and there is no new information to consider regarding existing or new threats)?** Yes

3. **Recovery criteria:**

Yellow-blossom pearly mussel, tubercled-blossom pearly mussel, and turgid-blossom pearly mussel

1. A reproducing population of either *E. t. torulosa, E. turgidula* or *E. f. florentina* is found in any stream or river system.

This criterion has not been met. The last known collection of the turgid-blossom pearly mussel was a fresh-dead specimen found in the Duck River, Tennessee, in 1979 by biologists with the Tennessee Valley Authority. Herbert Athearn, a private malacologist, recorded the last known specimens of the yellow-blossom pearly mussel in the Little Tennessee River and Citico Creek, Tennessee, in the mid-1960's. The last tubercled-blossom pearly mussel individuals were collected live or freshly dead in 1969 in the Kanawha River, West Virginia, below Kanawha Falls.

Individuals or reproducing populations of the three species have not been recorded for approximately 50 years anywhere within the known ranges of the species.

2. Each species and its habitat are protected from present and foreseeable anthropogenic and natural events that may interfere with the survival of the population (Listing Factor A; the present or threatened destruction, modification, or curtailment of its habitat or range).

This criterion has not been met.

Green-blossom pearly mussel

1. A viable population of *E. t. gubernaculum* exists in the Clinch River from the backwaters of Norris Reservoir upstream to approximately CRM 280 and in the Powell River from the backwaters of Norris Reservoir upstream to approximately PRM 130. These two populations are dispersed throughout each river so that it is unlikely that any one event would cause the total loss of either population.

   This criterion has not been met. The last known record for the green-blossom pearly mussel was a live individual collected in

1982, 35 years ago, by Dr. Richard Neves of Virginia Tech in the Clinch River at Pendleton Island, Virginia.

2. Through reestablishments and/or by discoveries of new populations, viable populations exist in two additional rivers. Each of these rivers will contain a viable population that is distributed such that a single event would be unlikely to eliminate E. t. gubernaculum from the river system.

   This recovery criterion has not been met.

3. The species and its habitat are protected from present and foreseeable human-related and natural threats that may interfere with the survival of any of the populations (Listing Factor A).

   This recovery criterion has not been met.

4. Noticeable improvements in coal-related problems and substrate quality have occurred in the Powell River, and no increase in coal-related siltation occurs in the Clinch River (Listing Factor A, the present or threatened destruction, modification, or curtailment of its habitat).

   This recovery criterion has not been met. Both rivers have been and continue to be impacted by coal-related siltation and associated contaminants.

C. Updated Information and Current Species Status

1. Biology and habitat – Neither the yellow-blossom pearlymussel, green-blossom pearlymussel, tubercled-blossom pearlymussel, nor turgid-blossom pearlymussel have been recently found anywhere within their known ranges.

Since the last recorded collections of the pearly mussels, numerous mussel surveys have been done by mussel biologists from the Alabama Department of Conservation and Natural Resources, Kentucky Department of Fish and Wildlife Resources, Tennessee Valley Authority, Virginia Tech, West Virginia Division of Natural Resources, U.S. Geological Survey, and others in rivers historically containing these four species. Biologists conducting those surveys have not reported live or fresh-dead individuals of the green-blossom pearlymussel, turgid-blossom pearlymussel, tubercled-blossom pearlymussel, or yellow-blossom pearlymussel. For example, the WVDNR has conducted numerous

surveys in the Kanawha River, West Virginia since 2005, and has not collected the tubercled blossom (Clayton, pers. com. 2017).

2. Five factor analysis (threats, conservation measures, and regulatory mechanisms)

a. Present or threatened destruction, modification, or curtailment of habitat or range:

No new information is available due to failure to find populations or live individuals.

b. Over utilization for commercial, recreational, scientific, or educational purposes:

No new information is available.

c. Disease or predation:

No new information is available.

d. Inadequacy of existing regulatory mechanisms:

No new information is available.

e. Other natural or manmade factors affecting the species' continued existence:

No new information is available.

D. Synthesis – The last known collection of the green-blossom pearlymussel was 35 years ago, tubercled-blossom pearlymussel was 48 years ago, turgid-blossom pearlymussel was 52 years ago, and the yellow-blossom pearlymussel was 50 years ago. Mussel experts believe that the all four species are likely to be extinct. Numerous mussel surveys have been completed within the known ranges of these species over the past 50 years. Although other federally listed mussels have been found by these experts during these surveys, no live or fresh-dead specimens of the four blossoms have been found. In our 2011 5-year review for the tubercled blossom, we held out some hope that we might find this mussel in the last remaining 50 miles of the Ohio River that appeared to be suitable habitat, but our experts have not reported any new collections.

III. RESULTS

A. Recommended Classification:
Delist

B. If applicable, indicate the Listing and Reclassification Priority Number: 6

IV. RECOMMENDATIONS FOR FUTURE ACTIONS

Since available information indicates that these four species are likely extinct, we would proceed with the proposed rulemaking process at such time as workload for the Tennessee ES Field Office allows. The recent listing and litigation workload for this office has precluded us from initiating this rulemaking process and will for the foreseeable future.

V. REFERENCES

Ahlstedt, Steven A. U.S. Geological Survey (retired). Reviewed notification of status review and provided comments.

Clayton, J. West Virginia Division of Natural Resource. Reviewed notification of status review and provided comments.

Garner, J. Alabama Department of Conservation and Natural Resources. Reviewed notification of status review and provided comments.

Hubbs, D. Tennessee Wildlife Resources Agency. Reviewed notification of status review and provided comments.

McGregor, M. Kentucky Department of Fish and Wildlife Resources. Reviewed notification of status review and provided comments.

Navarro, J. Ohio Division of Wildlife. Reviewed notification of status review and provided comments.

Tiemann, J. Illinois Natural History Survey. Reviewed notification of status review and provided comments.

U.S. Fish and Wildlife Service. 1976. Endangered and threatened wildlife and plants; endangered status for 159 taxa of animals. Federal Register 50 CFR 17, 41(115): 24062-24067.

U.S. Fish and Wildlife Service. 1984. Recovery plan for the green-blossom pearly mussel, Epioblasma (=Dysnomia) torulosa gubernaculum (Reeve, 1865). U.S. Fish and Wildlife Service, Atlanta, GA. 50 pp.

U.S. Fish and Wildlife Service. 1985. Recovery plan for the tuberculed-blossom pearly mussel, Epioblasma (=Dysnomia) torulosa torulosa (Rafinesque, 1820), turgid-

blossom pearly mussel, Epioblasma (=Dysnomia) turgidula (Lea, 1858), and yellow-blossom pearly mussel, Epioblasma (=Dysnomia) florentina florentina (Lea, 1857). U.S. Fish and Wildlife Service, Atlanta, GA. 42 pp.

U.S. Fish and Wildlife Service. 2001. Endangered and threatened wildlife and plants; establishment of nonessential experimental population status for 16 freshwater mussels and 1 freshwater snail (Anthony's riversnail) in the free-flowing reach of the Tennessee River below Wilson Dam, Colbert and Lauderdale counties, Alabama. Federal Register: 32250-32264.

U.S. Fish and Wildlife Service. 2005. Endangered and threatened wildlife and plants; 5-year review of 14 southeastern species. Federal Register. 70: 55157-55158.

U.S. Fish and Wildlife Service. 2007. Green-blossom pearly mussel (*Epioblasma torulosa gubernaculum*), turgid-blosom pearly mussel (*Epioblasma turgidula*), yellow-blossom pearly mussel (*Epioblasma florentina florentina*) 5-Year Review: Summary and Evaluation. Southeast Region. September 21, 2007.

U.S. Fish and Wildlife Service. 2011. Tubercled-blossom pearly mussel (*Epioblasma torulosa torulosa*) 5-Year Review: Summary and Evaluation. Southeast Region. August 12, 2011.

U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW
Green-blossom pearly mussel (*Epioblasma torulosa gubernaculum*)
Tubercled-blossom pearly mussel (*Epioblasma torulosa torulosa*)
Turgid-blossom pearly mussel (*Epioblasma turgidula*)
Yellow-blossom pearly mussel (*Epioblasma florentina florentina*)

Current Classification: Endangered

Recommendation resulting from the 5-Year Review:

____ **Downlist to Threatened**
____ **Uplist to Endangered**
_X_ **Delist**
____ **No change needed**

Review Conducted By: Stephanie Chance, Tennessee Ecological Services Field Office.

FIELD OFFICE APPROVAL:

Lead Field Supervisor, Fish and Wildlife Service

Approve Mary E Jennings Date 8/31/17

REGIONAL OFFICE APPROVAL:

Lead Regional Director, Fish and Wildlife Service

for Assistant

Approve _____ Date 9-1-17
Matthew P. Dekar

The lead Region must ensure that other regions within the range of the species have been provided adequate opportunity to review and comment prior to the review's completion. If a change in classification is recommended, written concurrence from other regions is required.

Assistant

Cooperating Regional Director, Fish and Wildlife Service, Midwest Region

X Concur ___ Do Not Concur

Signature _____ Date 10/13/17

U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW
Green-blossom pearly mussel (*Epioblasma torulosa gubernaculum*)
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Yellow-blossom pearly mussel (*Epioblasma florentina florentina*)

Current Classification: Endangered

Recommendation resulting from the 5-Year Review:

____ **Downlist to Threatened**
____ **Uplist to Endangered**
_X_ **Delist**
____ **No change needed**

Review Conducted By: Stephanie Chance, Tennessee Ecological Services Field Office.

FIELD OFFICE APPROVAL:

Lead Field Supervisor, Fish and Wildlife Service

Approve Mary E Jennings Date 8/31/17

REGIONAL OFFICE APPROVAL:

for Assistant **Lead Regional Director, Fish and Wildlife Service**

Approve _____ Date 9-1-17
Matthew P. Dekar

The lead Region must ensure that other regions within the range of the species have been provided adequate opportunity to review and comment prior to the review's completion. If a change in classification is recommended, written concurrence from other regions is required.

Cooperating Regional Director, Fish and Wildlife Service, Midwest Region

✓ Concur ___ Do Not Concur

Signature Paul d. Ply Date 9/20/17
Acting

APPENDIX A: Summary of peer review for the 5-year review of the Green-blossom pearly mussel (*Epioblasma torulosa gubernaculum*) Tubercled-blossom pearly mussel (*Epioblasma torulosa torulosa*) Turgid-blossom pearly mussel (*Epioblasma turgidula*) Yellow-blossom pearly mussel (*Epioblasma florentina florentina*)

A. Peer Review Method: Emails were sent to Steve Ahlstedt (USGS retired), Janet Clayton (WVDNR), Jeff Garner (ALDCNR), Wendell Haag (USFS), Don Hubbs (TWRA), Monte McGregor (KYDFWR), John Navarro (ODOW), Jeremy Tiemann ILNHS), and Brian Watson (VADGIF) requesting that they peer review the scientific portions of the oyster mussel 5-year review document. Peer reviewers were given 21 days to complete the review.

B. Peer Review Charge: We explained to the peer reviewers that in order to support the Service's interest in making its decision based on the best available science, portions of the draft review need to be subjected to an appropriate level of peer review. They were told that due to their expertise regarding this species, we requesting that they peer review the enclosed portion of the document.

C. Summary of Peer Review Comments/Report: We received comments from seven peer reviewers. None of the peer reviewers provided edits to the document. The peer reviewers either reported that there was no new information on the 4 blossoms, or that they were presumed extirpated and/or extinct from their state.

D. Response to Peer Review: All the peer review comments were incorporated into the 5-year review document.