Ring Pink
***Obovaria retusa* (Lamarck, 1819)**

5-Year Review: Summary and Evaluation

(USFWS photo)

U.S. Fish and Wildlife Service
Southeast Region
Kentucky Ecological Services Field Office
Frankfort, Kentucky

5-YEAR REVIEW
RING PINK (*Obovaria retusa*)

I. GENERAL INFORMATION

A. Methodology used to complete the review: Public notice of this 5-Year Review was provided in the *Federal Register* on June 30, 2017 and a 60-day comment period was opened (82 FR 29916). During this comment period, we obtained information on the status of this species from several species' experts, and additional data was obtained from the recovery plan, peer-reviewed scientific literature, and our state partners. Once all known literature and information was compiled, the review was completed by the species' lead recovery biologist, Leroy Koch, Fish and Wildlife biologist with the Kentucky Ecological Services Field Office. A draft of this document was internally reviewed by Barbara Douglas of the West Virginia Ecological Services Field Office (ESFO), Andrew Ford of the Alabama ESFO, Stephanie Chance of the Tennessee ESFO, Mike Floyd of the Kentucky ESFO, Marissa Reed of the Indiana ESFO, and Angela Boyer of the Ohio ESFO. Comments received were evaluated and incorporated as appropriate.

B. Service Reviewers

Lead Region – Kelly Bibb, Southeast Region, Atlanta, GA, 404-679-7132

Lead Field Office – Kentucky Ecological Services Field Office, Frankfort, KY, 502-695-0468

Cooperating Regions –
Laura Ragan, Midwest Region, Bloomington, MN, 612-713- 5157
Martin Miller, Northeast Region, Hadley, MA, 413-253-8615

Cooperating Field Offices –
Alabama ESFO, Daphne, AL, 251-441-5181
Illinois ESFO, Rock Island, IL, 309-757-5800
Indiana ESFO, Bloomington, IN, 812-334-4261
Ohio ESFO, Columbus, OH, 612-416-8993
Tennessee ESFO, Cookeville, TN, 931-528-6481

C. Background

1. ***Federal Register* Notice Citation Announcing Initiation of This Review:** June 30, 2017, 82 FR 29916.

2. **Species status:** Unknown – This species continues to be extremely rare. In the past 15 years, only two live individuals have been observed, and both were observed in the Green River (Kentucky). The most significant threats identified in the recovery plan (i.e., conversion of free-flowing rivers to impoundments, decreased availability of fish host(s), and sedimentation of habitat from channel dredging and gravel mining) continue to impact the species, and no viable populations of the species are believed to

exist. In addition, the apparent low population size for the species is another significant threat to its existence. Survey efforts by KDFWR and others on the Green River (Green and Hart Counties, Kentucky) have located only one live individual in the last five years. The fish host remains unknown.

3. **Recovery achieved:** 1 (1 = 0% to 25% of species recovery objectives achieved).

4. **Listing history**
   Original Listing
   FR notice: 54 FR 40109
   Date listed: September 29, 1989
   Entity listed: Species
   Classification: Endangered

5. **Associated rulemakings**
   Establishment of Nonessential Experimental Population Status for 15 Freshwater Mussels, 1 Freshwater Snail, and 5 Fishes in the Lower French Broad River and in the Lower Holston River, Tennessee, Final Rule; September 13, 2007 (72 FR 52434).

6. **Review History:**
   Final Recovery Plan – March 1991

   Latest 5-Year Review – The previous 5-Year Review was approved August 2011. In that review, no changes were recommended for the listing status of this mussel (i.e. remain endangered).

   Each year, the Service reviews and updates listed species information for inclusion in the required Recovery Report to Congress. Through 2013, we did a recovery data call that included status recommendations such as "Unknown" for this mussel. We continue to show that species status recommendation as part of our 5-Year Review. The most recent evaluation for this mussel was completed in 2018.

7. **Species' Recovery Priority Number at start of review (48 FR 43098):**
   5: Degree of threat is considered to be high. Recovery potential is estimated as low, and the taxonomic level is species.

8. **Recovery Plan**
   Name of plan: Recovery Plan for Ring Pink Mussel (*Obovaria retusa*)
   Date issued: March 25, 1991

II. REVIEW ANALYSIS

A. Application of the 1996 Distinct Population Segment (DPS) policy

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 DPSs to only vertebrate species of fish and wildlife. Because the species under review is an invertebrate, the DPS policy is not applicable.

B. Recovery Criteria

1. **Does the species have a final, approved recovery plan containing objective, measurable criteria?** Yes.

2. **Adequacy of recovery criteria.**

   a. **Do the recovery criteria reflect the best available and most up-to-date information on the biology of the species and its habitat**? Yes

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

   List the recovery criteria as they appear in the recovery plan, and discuss how each criterion has or has not been met, citing information. *Note: For both the Downlisting Criteria and Delisting Criteria provided below, no aspects have been completed because Ring Pink individuals have not been available to make any progress.*

Downlisting Criteria

The Ring Pink will be considered for downlisting or reclassification from endangered to threatened status upon completion of the following (USFWS 1991):

a. Through protection of existing populations and successful establishment of reintroduced populations or discovery of additional populations, a total of at least six Ohio River system tributaries contain viable populations. These populations will be distributed within the Ohio River system as follows: two populations in the upper Ohio River basin in Pennsylvania, Ohio, West Virginia, Indiana, or Illinois; two populations in Kentucky; and two populations in Tennessee.

   No aspect of this downlisting criterion has been accomplished. Only one population of the Ring Pink is believed extant in the Green River, albeit at very low numbers.

b. Biological and ecological studies have been completed, and the recovery measures developed and implemented from these studies are beginning to be successful, as evidenced by an increase in population density and/or an increase in the population size and length of the river reach inhabited within each of the populations.

   No aspect of this downlisting criterion has been accomplished. Little work on the Ring Pink's biology has been completed due to the difficulty in finding live individuals and populations have not increased.

Delisting Criteria

The Ring Pink will be considered for delisting upon completion of the following (USFWS 1991):

a. Through protection of existing populations and successful establishment of reintroduced populations or discovery of additional populations, a total of at least nine Ohio River system tributaries contain viable populations. These populations will be distributed within the Ohio River system as follows: one population in Pennsylvania, one population in Ohio, one population in West Virginia, one population in Indiana, one population in Illinois, two populations in Kentucky (one in the lower Tennessee or Cumberland River and one in another Ohio River tributary such as the Green River), and two populations in the Tennessee River.

No aspect of this delisting criteria has been accomplished. Only one population of the Ring Pink is believed extant in the Green River, albeit at very low numbers.

b. Studies of the mussel's biological and ecological requirements have been completed, and the recovery measures developed and implemented from these studies have been successful, as evidenced by an increase in population density and/or an increase in the population size and length of the river reach inhabited within each of the nine populations.
No aspect of this delisting criteria has been accomplished. Little work on the Ring Pink's biology has been completed due to the difficulty in finding live individuals, which has limited recovery efforts for the species.

c. No foreseeable threats exist that would likely threaten survival of any of these nine populations.
No aspect of this delisting criteria has been accomplished. The Ring Pink remains threatened by conversion of free-flowing rivers to impoundments, decreased availability of fish host(s), habitat degradation, and low population size.

d. Where habitat had been degraded, noticeable improvements in water and substratum quality have occurred.
Water and habitat quality have improved in some streams where the Rink Pink occurs or historically occurred. However, there has been no resultant increase in Ring Pink populations in the Green River or any streams where the species historically occurred.

Updated Information and Current Species Status

Historically, the Ring Pink mussel was widespread in medium to large rivers in the Ohio River basin. It is now one of the rarest mussels in North America and is considered "endangered" meaning it is in danger of extinction throughout all or a significant portion of its range. At the time the recovery plan was completed in 1991, it was believed that five populations remained; however, even these populations were considered to be relic and likely non-reproducing (USFWS 1991). These populations were located within these river basins: one in Green River in Kentucky, one in the Kanawha River in West Virginia, two in the Tennessee River in Kentucky and Tennessee, and one in the Cumberland River in Tennessee. The record from the Kanawha River in West Virginia has since been confirmed as a misidentification (Tolin 1991), and the species is now considered extirpated from West Virginia.

A population currently is known to exist in the Green River in Kentucky, where a live individual was found as recently as 2015. Elsewhere, populations may still occur in small segments of the Tennessee River downstream of Wilson Dam, Pickwick Landing Dam, and/or Kentucky Dam and in the Cumberland River near Hartsville, Tennessee. However, recent survey efforts in portions of these rivers have not documented presence of the species.

Biology and Habitat:

a. Abundance, population trends (e.g. increasing, decreasing, stable), demographic features (e.g., age structure, sex ratio, family size, birth rate, age at mortality, mortality rate, etc.), or demographic trends:

Tennessee and Cumberland Rivers

All recently observed individuals have been old (e.g., 20+ years old), and there is no evidence this species is offsetting mortality rates through reproduction and recruitment. Encountering specimens in the wild is becoming an increasingly rare occurrence, even though mussel surveys are more quantitative, commonplace, thorough, and intensive. The Ring Pink has not been recorded from the Tennessee River since the early 1990s, and the species may already be functionally extinct in the wild. The most recent record from the Tennessee River downstream of Wilson Dam (in Tennessee) was obtained in the early 1990s as part of a commercial mussel harvest (Richardson 2005). Ring Pink records from the Tennessee River downstream of Pickwick Landing Dam, Tennessee River downstream of Kentucky Dam, and the Cumberland River are from the 1980s or earlier (Leroy Koch 2007; Hubbs 2007). Despite extensive survey efforts by the Tennessee Wildlife Resources Agency since the last 5-Year Review for this species completed, none have been observed, and no live individuals have been collected from either the Tennessee River or Cumberland River (Hubbs 2017). While the Ring Pink's continued persistence is unlikely in these rivers (Hubbs 2017), we believe the species may still occur in the Cumberland and Tennessee rivers. However, the Ring Pink is rare and occurs in such low densities that it is unlikely to be detected during typical mussel surveys, which are often of limited scope and duration and unlikely to result in detecting such a rare species.

Green River

We believe the species still exists in the Green River, but it likely occurs in low numbers that hamper successful survey efforts. We do not know if it is reproducing and/or possibly recruiting in the Green River; however, there have been positive indications of several other mussel species reproducing and/or recruiting in the Green River in recent years, so conditions may also be suitable for the Ring Pink. The Service has provided a limited amount of funding for recent search efforts in the Green River. Only four live individuals have been recorded from the Green River since 1998. One of these, a female, was held at the Kentucky Department of Fish and Wildlife Resources' (KDFWR) Minor Clark Fish Hatchery, near Morehead, Kentucky, until it died in 2004. When captured, this female contained unfertilized eggs at a time when the eggs should have been fertile, indicating that this species is so rare that successful reproduction in the wild is problematic. Two old males were collected in 2005 but have since died in

captivity at KDFWR's Center for Mollusk Conservation (CMC) in Frankfort, Kentucky. The last individual observed in the wild was a female; she was maintained in the Green River (Mammoth Cave National Park) in 2015 but was found dead in the fall of 2016. The cause of death is unknown but was likely due to her advanced age.

Ohio River and Other Tributaries

The species is not believed to currently occur in the Ohio River or other Ohio River tributaries, except potentially the Cumberland, Green, and Tennessee rivers as identified and discussed above.

Life History

Studies of the Rink Pink's biological and ecological requirements have not been completed. Recovery actions such as fish host identification, propagation of juvenile mussels, reintroduction of propagated individuals to selected rivers, etc., can only occur if enough adult Ring Pink mussels are located. If live individuals are found, there are several mussel culture facilities within its historic range that could hold and attempt to propagate this species. Recent progress utilizing in-vitro propagation for mussels at the CMC provides some assurance that, if a gravid female with mature larvae is found, successful propagation could be achieved. This facility has had success propagating the round hickorynut.

The fish host for this species is currently unknown; however, it is suspected that the host may be a sand darter, *Ammocrypta pellucida*, which is a known host for the closely-related round hickorynut, *Obvaria subrotunda*, and/or the western sand darter *Ammocrypta clara*, which is found in the Green River. Based on observations in the Green River by Dr. Monte McGregor (2018) of the KDFWR, both *Obovaria* species have been observed in similar habitat locations, and the western sand darter has also been observed in locations where the round hickorynut is known to be present. We believe this fish has also experienced reductions in its population in the past in the Green River, and, if it is a host for the Ring Pink, then low numbers of the fish may be a contributing factor to Ring Pink declines. However, the current population of the western sand darter in the Green River is thought to be stable (Thomas 2018). It is possible that a more targeted search effort in those locations where sand darter habitat is present may be more likely to locate additional Ring Pink individuals.

Genetics, genetic variation, or trends in genetic variation:

No information is currently known concerning population genetics.

Taxonomic classification or changes in nomenclature:

There has been no change in the classification or nomenclature of this species.

Spatial distribution, trends in spatial distribution, or historic range (e.g. corrections to the historical range, change in distribution of the species' within its historic range, etc.):

The species' historical range is the Ohio River basin including the states of Alabama, Illinois, Indiana, Kentucky, Ohio, Pennsylvania, Tennessee, and West Virginia. In the last 15 years (2003-2018), only two live specimens have been found, and both were found in the Green River, Kentucky. Based on the low number of observed individuals in the Green River, it is likely that this population is not viable. At present, we believe that no viable populations of the species persist anywhere within its historical range.

At the time the recovery plan was completed in 1991, it was believed that five populations remained for the species; however, even these populations were considered to be relic and possibly non-reproducing (USFWS, 1991). These populations were within four river basins: the Green River in Kentucky, the Kanawha River in West Virginia, and the Tennessee and Cumberland rivers in Kentucky and Tennessee. The record from the Kanawha River in West Virginia has since been confirmed as a misidentification (Tolin, 1991), and the species is now considered to be extirpated from West Virginia. In the last 15 years, two live specimens and four shells have been found in the Green River, and only one live individual and one shell since the last 5-Year Review was completed.

Only small portions of the Green River from Greensburg to Mammoth Cave National Park (approximately 50 miles) that historically supported Ring Pink mussels have been sampled recently, with little evidence of this species' occurrence. There have been additional survey efforts in portions of the Green River downstream of Mammoth Cave National Park and extending to Lock and Dam 4 (approximately 35 miles), but the Ring Pink has not been observed. These reaches of the Green River have not been searched extensively, so it is possible that the species is still extant within these sections, especially in areas of high mussel diversity, high mussel densities, and apparent suitable habitat.

Habitat or ecosystem conditions (e.g., amount, distribution, and suitability of the habitat or ecosystem):

This species typically occurs in medium to large rivers and is believed to prefer a mixture of silt, sand, and gravel substrate.

Five-Factor Analysis

Present or threatened destruction, modification or curtailment of its habitat or range:

Threats for this species remain very similar to those present when the recovery plan was developed. Current threats to the Ring Pink are primarily associated with its restricted range, small population size, and low recruitment into the population. In addition, the conversion of free-flowing large rivers to a series of long, linear impoundments has seriously reduced the availability of its preferred riverine gravel and sand habitat and likely affected the distribution and availability of the Ring Pink mussel's fish host.

The recovery plan mentioned threats by oil and gas production in the Green River drainage, but we believe any current threat is likely associated with legacy effects of past oil and gas activities (e.g., 1960s). As a result, oil and gas production are no longer considered a major threat in the Green River watershed (Kessler 2007), but recent interest in gas exploration has resulted in new drilling and land disturbance activities, especially in Green, Metcalf, and Hart counties in the Green River drainage. These activities may, therefore, represent an increasing threat in the future.

Gravel dredging and channel maintenance were also listed as threats in the recovery plan. These activities occur sporadically throughout the historic range of the Ring Pink, but there is no new information that indicates that these activities are affecting Ring Pinks in any portion of its range.

Knowledge of habitat improvements, if any, are either considered negligible and/or have not been studied well enough to document improvements or a reduction of the original habitat degradation that has occurred in streams where Ring Pink occurs or historically occurred. However, the Service and its partners collaborated to remove Green River Lock and Dam 6 in 2017, which is likely to improve habitat conditions in the area previously inundated by that dam.

Overutilization for commercial, recreational, scientific, or educational purposes:
Overutilization for commercial, recreational, scientific or educational purposes was not considered to be a threat in the Recovery Plan, and we have no new information to indicate that this has changed. Although this species is not commercially valuable, incidental take of the species may occasionally occur during commercial mussel harvest operations. In particular, brailing is indiscriminate with regard to the species harvested but is used to collect other, commercially-valuable species. However, it is likely that the potential commercial take of Ring Pinks has declined over the last 20 years because fewer commercial mussel fishermen use brailing methods to harvest mussels and some state wildlife agencies have eliminated commercial harvests of mussels or invoked regulations to better control commercial harvests of mussels with the intent of avoiding impacts to federally listed mussel species. Most commercial mussel harvesters currently employ diving and hand collection of mussels, allowing the collection of only commercially-valuable species.

Disease or predation:
We have little information on disease or predation that would indicate either is a threat to the species. Black carp and zebra mussels have not been observed in the Green River, so, at this point in time, they are not a threat to the species. If the Ring Pink still occurs in the Tennessee River, Cumberland River, or Ohio River, zebra mussels and/or black carp may be a threat to Ring Pinks in those areas. However, we have no new information that would indicate disease or predation is a current threat to the species.

Inadequacy of existing regulatory mechanisms:
We have no new information that would indicate that the inadequacy of existing regulatory mechanisms is a threat to this species.

Other natural or manmade factors affecting its continued existence:
The fish host for this species is currently unknown; however, it is suspected that a host may be a sand darter, *Ammocrypta clara* and/or *A. pellucida*, which is a known host for the closely related *Obovaria subrotunda*, the round hickorynut. We have no new information on any other natural or manmade factors.

Synthesis
It appears that no viable populations remain for this species in the Ohio River basin. At the time the recovery plan was completed in 1991, five populations were known; however, even these populations were considered to be relic and possibly non-reproducing. Threats to the remaining populations identified in the recovery plan included water quality problems due to oil and gas production, gravel dredging, channel maintenance, commercial mussel fishing, and reduced natural reproduction. The record from the Kanawha River in West Virginia has since been determined to be a misidentification (Tolin 1991); therefore, this species is considered extirpated from West Virginia. Records from the Tennessee River are 25 years old or more (Leroy Koch 2007; Don Hubbs 2017). The most-recent record from the Tennessee River downstream of Wilson Dam is from the early 1990s due to a commercial mussel harvest (Richardson 2005). The species likely has been extirpated from all but the following five river reaches: the Green River in Kentucky, the Tennessee River downstream of Wilson Dam in Alabama, the Tennessee River downstream of Pickwick Landing Dam in Tennessee, portions of the Cumberland River, and the Tennessee River downstream of Kentucky Dam in Kentucky.

The most recent records are from the Green River, where four live adults have been found since 1998. We believe the species still exists in the Green River, but in extremely low numbers that hamper detection efforts. It may occur in other river systems, but the likelihood of detecting this species is extremely low. Ring Pink mussels are rare and occur in such low densities that they are unlikely to be detected during typical mussel surveys, which are often of limited scope and duration. They are also a relatively long-lived mussel species, so a population may persist for many decades, which can provide future opportunities to locate individuals. These factors, combined with the recent progress in mussel in-vitro culture methods, suggest that numerous juvenile Ring Pinks could be produced for recovery efforts from only one or a few gravid females, if those females can be found.

All threats identified in the recovery plan likely remain for this species. Natural factors or threats affecting the continued existence of the Ring Pink include its restricted range, small population numbers, and its apparent inability or limited ability to recruit individuals into the population. Habitat improvements, if any, are either considered negligible and/or have not been studied sufficiently to document improvements and/or a reduction of habitat degradation. The Green River population may benefit from the 2017 removal of Green River Lock and Dam 6, but it will likely require many years or decades to determine if the dam removal benefitted the species.

Based on the information presented herein, we believe that the Ring Pink should remain as an endangered species.

III. RESULTS

A. Recommended Classification:

__X__ **No change is needed**

IV. RECOMMENDATIONS FOR FUTURE ACTIONS

Since we have had limited success in finding individuals, we believe the following actions, in priority order, should be our direction for the next 5 years:

1. Conduct thorough surveys of the Green River in areas with suitable habitat from Green River Lake Dam downstream to Green River Lock and Dam 4. Individuals found should be pit tagged and located in areas of suitable habitat, where they can be accessed for life history study and propagation efforts.

2. Conduct thorough surveys for the Ring Pink in the Tennessee and Cumberland Rivers at sites with suitable habitat and mussel assemblages indicating the possible presence of this species.

3. Determine the fish host(s) of the Ring Pink and propagate the species using the fish host and/or in-vitro methods. Any propagated juveniles should be translocated to areas with suitable habitat in the Green River and/or other suitable streams within the species' historic range.

4. Begin studies in the cryopreservation of gametes and glochidia of a surrogate mussel in anticipation of using this technique on the Ring Pink. This work, if successful, will preserve gametes and glochidia for propagation. This is needed because of the difficulty of bringing male and female Ring Pink mussels together for reproduction.

5. Solicit the assistance of commercial mussel fishermen to help find live Ring Pinks and make them available for propagation purposes.

6. Update the recovery plan as new information is obtained with regard to the species' status.

7. Seek funding to continue survey efforts for the Ring Pink. Mussel surveys for this species often require divers, which results in a higher survey costs.

V. REFERENCES

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U.S. FISH AND WILDLIFE SERVICE

5-YEAR REVIEW of Ring Pink (*Obovaria retusa*)

Current classification: Endangered

Recommendation resulting from the 5-Year Review: Retain endangered classification.

Review conducted by: Leroy Koch, Kentucky ESFO, Frankfort, Kentucky

FIELD OFFICE APPROVAL

Field Supervisor, Kentucky ESFO, Southeast Region, Fish and Wildlife Service

Approve VIRGIL ANDREWS Digitally signed by VIRGIL ANDREWS Date: 2019.09.27 16:07:30 -04'00' Date_____

REGIONAL CONCURRENCE

Assistant Regional Director, Region 3, Fish and Wildlife Service

Signature LORI NORDSTROM Digitally signed by LORI NORDSTROM Date: 2019.09.26 16:43:48 -05'00' Date_____

Assistant Regional Director, Region 5, Fish and Wildlife Service

Signature Paul R. Ply Date 9/25/19