

Purple Cat's Paw Pearlymussel
(*Epioblasma obliquata obliquata*)

5-Year Review:
Summary and Evaluation

U.S. Fish and Wildlife Service, Midwest Region
Ecological Services Field Office
Columbus, Ohio

5-YEAR REVIEW

Purple Cat's Paw Pearlymussel/*Epioblasma obliquata obliquata*

1.0 GENERAL INFORMATION

1.1 Reviewers

Lead Regional Office: Carlita Payne, Midwest Regional Office,
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Lead Field Office: Angela Boyer, Ecological Services Field Office,
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Cooperating Regional Office: Kelly Bibb, Southeast Regional Office,
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1.2 Methodology used to complete the review:

Public notice was given in the *Federal Register* (74 FR 11600) requesting new scientific or commercial data and information that may have a bearing on the purple cat's paw pearlymussel (*Epioblasma obliquata obliquata*) classification of endangered status. Pertinent data was obtained from the Recovery Plan and from recent reports of freshwater mussel surveys of Killbuck Creek. This 5-year review was completed by Angela Boyer, Fish and Wildlife Biologist with the Ohio Ecological Services Field Office. The focus of this 5-year review is to summarize the current status of the purple cat's paw pearlymussel. Peer review of this document was determined to be unnecessary because there is a lack of new information about this species and the review resulted in a recommendation to leave the status unchanged.

1.3 Background:

1.3.1 FR Notice citation announcing initiation of this review:
74 FR 11600-11602 (March 18, 2009)

1.3.2 Listing history

Original Listing

FR notice: 55 FR 28209

Date listed: July 10, 1990

Entity listed: Purple Cat's Paw Pearlymussel (*Epioblasma obliquata obliquata*);
Subspecies

Classification: Endangered

1.3.3 Associated rulemakings: A final rule was published for the establishment of a non-essential experimental population of the purple cat's paw pearlymussel in the Tennessee River below Wilson Dam in Alabama on June 14, 2001 (66 FR 32250). A correction to this final rule, amending the table of species information to include the "When Listed" numbers, was published on August 21, 2001 (66 FR 43808).

1.3.4 Review History: Purple cat's paw pearlymussel was included in a cursory review initiated November 6, 1991 (56 FR 56882) for all endangered and threatened species listed before 1991. This review resulted in no change in the listing classification of endangered.

1.3.5 Species' Recovery Priority Number at start of 5-year review: 6. The "6" indicates a high degree of threat and low recovery potential.

1.3.6 Recovery Plan

Name of plan: Purple Cat's Paw Pearlymussel Recovery Plan

Date issued: March 10, 1992

Dates of previous revisions, if applicable: none

2.0 REVIEW ANALYSIS

2.1 Application of the 1996 Distinct Population Segment (DPS) policy

2.1.1 Is the species under review a vertebrate? *No.*

2.2 Recovery Criteria

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

2.2.2 Adequacy of recovery criteria.

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

2.2.2.2 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)? *No.*

2.2.3 List the recovery criteria as they appear in the recovery plan, and discuss how each criterion has or has not been met, citing information:

The purple cat's paw pearl mussel may be considered for reclassification to threatened status when the following criteria are met:

Criterion 1. Through protection of existing populations and successful establishment of reintroduced populations or the discovery of additional populations, a total of at least four 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 Ohio, Indiana, or Illinois; one population in Kentucky; and one population in Tennessee.

In 1992 when the recovery plan was issued, the purple cat's paw was only known to be extant in two river reaches – the Cumberland River in Tennessee and the Green River in Kentucky. However, no living or freshdead purple cat's paw have been collected in these two rivers in over 20 years. In 1994, a small population of the purple cat's paw was discovered in Killbuck Creek in Coshocton County, Ohio.

Killbuck Creek was closed in 2004 to all mussel sampling and collecting except for that required in conjunction with life history research approved by the Ohio Department of Natural Resources (R. Ollis, Ohio Department of Natural Resources, Division of Wildlife, in litt. 2010).

In 2005, the U.S. Fish and Wildlife Service's Columbus, Ohio Ecological Services Field Office (COFO) received a Preventing Extinction grant to conduct surveys in Killbuck Creek to locate and obtain live male and female purple cat's paw for a captive propagation program. Since this survey effort was initiated, only living males have been found, three of which are being held in captivity at the Minor Clark Fish Hatchery in Kentucky. COFO received additional Preventing Extinction grants in 2007 and 2009 to continue the survey efforts.

This criterion addresses listing factor A which is the present or threatened destruction, modification, or curtailment of habitat or range. Since there are only three known populations of purple cat's paw and the status of each is unknown, Criterion 1 has not been met.

Criterion 2. Two naturally reproduced year classes exist within each of the four populations. Both year classes must have been produced within 10 years, and one year

class within 5 years, of the downlisting date. Within 1 year of the downlisting date, gravid females of the subspecies and its fish host must be present in each river.

Since there are only three known populations of purple cat's paw and the status of each is unknown, Criterion 2 has not been initiated.

Criterion 3. 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 the length of the river reach inhabited within each of the populations.

Criterion 3 has not been initiated.

The purple cat's paw pearly mussel will be considered for removal from Endangered Species Act protection when the likelihood of the subspecies becoming threatened in the foreseeable future has been eliminated by the achievement of the following criteria:

Criterion 1. Through protection of existing populations and successful establishment of reintroduced populations or the 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: one population in Ohio, one population in Indiana, one population in Illinois, two populations in Kentucky, and one population in Tennessee.

Criterion 1 has not been initiated.

Criterion 2. Two distinct naturally reproduced year classes exist within each of the six populations. Both year classes must have been produced within 10 years, and one year class within 5 years, of the downlisting date. Within 1 year of the recovery date, gravid females of the subspecies and its fish host must be present in each river.

Criterion 2 has not been initiated.

Criterion 3. Studies of the mussel's biological and ecological requirements have been completed, and 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 the length of the river reach inhabited within each of the six populations.

Criterion 3 has not been initiated.

Criterion 4. No foreseeable threats exist that would likely threaten survival of any of these six populations.

An effort to locate individuals to begin captive propagation has been initiated to begin addressing criterion 4. However, Criterion 4 has not been met.

Criterion 5. Where habitat had been degraded, noticeable improvements in water and substratum quality have occurred.

Criterion 5 has not been initiated.

2.3 Updated Information and Current Species Status

2.3.1 Biology and Habitat

2.3.1.1 New information on the species' biology and life history:

Rock bass, mottled sculpin, stonecat, blackside darter, and logperch have been found to be fish hosts for the purple cat's paw pearlymussel (G.T. Watters, Ohio State University Museum of Biological Diversity, in litt. 1998).

2.3.1.2 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:

In 1994, the purple cat's paw was discovered in Killbuck Creek in Coshocton County, Ohio (Hoggarth et al. 1995). Prior to this discovery, the purple cat's paw was not known from Killbuck Creek. In 1994, 2 live and 4 freshly dead individuals were found at one site and an additional 13 living and 19 freshly dead individuals were found at another site in Killbuck Creek (Hoggarth et al. 1995).

In 1997, Hoggarth and Ross (1997) reported finding a total of 62 living purple cat's paw within the lower Killbuck Creek during the 1995-1996 survey. The results of this study indicated that a reproducing population of purple cat's paw occurred in the lower 13 river miles of Killbuck Creek (Hoggarth 1996; Hoggarth and Ross 1997).

A project was initiated in 2001 to examine the status of the purple cat's paw in Killbuck Creek, expand the centers of distribution of the species in Killbuck Creek, and to establish a Walhonding River population. Gravid females were targeted to inoculate host fish to be released outside the core population area in Killbuck Creek and in the Walhonding River to establish a second population. During the course of the study, several female purple cat's paw were found, but none were gravid with glochidia (Hoggarth 2002).

The COFO received funding in 2005 to initiate a new project in 2006 to locate purple cat's paw for captive propagation. Additional Preventing Extinction funding was received in 2007 and 2009. Since the initiation of the project in 2006, only 12 living purple cat's paw have been found and all were males (Ahlstedt 2007; Ahlstedt 2008; L.M. Koch, U.S. Fish and Wildlife Service, in litt. 2008 and 2009; G.F. Zimmerman, Enviroscience Inc., in litt. 2009). All but one of the males were old individuals. In September 2009, a young, freshly dead female was found (G.F. Zimmerman,

Enviroscience Inc., *in litt.* 2009). The fact that this intensive 4-year survey effort has failed to find any living females, and only one young male (approximately age 3), and one freshly dead female, indicates that the Killbuck Creek population has drastically declined from the original population found in 1994. It appears unlikely that a viable population remains in Killbuck Creek, though reproduction appears to have occurred within the past 3 years based on the finding of a live 3 year old male.

2.3.1.3 Genetics, genetic variation, or trends in genetic variation (e.g., loss of genetic variation, genetic drift, inbreeding, etc.):

There is no information about the species' genetics due to the lack of individuals available for genetic research.

2.3.1.4 Taxonomic classification or changes in nomenclature:

There is no new taxonomic information.

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

In 1994, a population of purple cat's paw was discovered in Killbuck Creek in the Muskingum River watershed in Coshocton County, Ohio (Hoggarth et al. 1995). Historically, this species was not known from this creek, but it was known to occur in the Muskingum River. A 1995-1996 survey of Killbuck Creek determined that a viable population of the purple cat's paw occurred in the lower 13 miles of the creek. However, based on the survey efforts in 2006-2009, the population in Killbuck Creek no longer appears to be viable (see 2.3.1.2).

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

The Killbuck Creek watershed is predominantly agricultural with numerous oil and gas wells (Ahlstedt 2007). In 1997, Hoggarth and Ross reported that Killbuck Creek "provides high quality habitat and sufficient water quality" to support the purple cat's paw and 24 other mussel species. However, just a decade later, Ahlstedt (2007) reported that mussel habitat in Killbuck Creek is "severely degraded" with the creek entrenched among steep eroding banks. Deadfalls and debris piles are common in the creek and point bar formations are evidence of massive bed-load movement during high surface flows. Furthermore, Ahlstedt (2007) reports that sampling for purple cat's paw in the creek is difficult due to the high sediment load causing very poor visibility, except during rare low-flow conditions.

2.3.1.7 Other:

N/A

2.3.2 Five-Factor Analysis (threats, conservation measures, and regulatory mechanisms)

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

The purple cat's paw pearl mussel was historically distributed in the Ohio, Cumberland, and Tennessee River systems in Ohio, Illinois, Indiana, Kentucky, Tennessee, and Alabama (Bogan and Parmalee 1983; Isom et al. 1979; Kentucky State Nature Preserves Commission 1980; Parmalee et al. 1980; Stansbery 1970; Watters 1986). Currently, the subspecies may survive in only 3 river reaches – Killbuck Creek in Ohio, the Cumberland River in Tennessee, and the Green River in Kentucky (USFWS 1992; Hoggarth et al. 1995). Continued existence of the purple cat's paw in the Cumberland and Green Rivers is questionable as live individuals have not been reported from these rivers for over 20 years. Many of the historic populations of purple cat's paw were apparently lost when the river sections they inhabited were impounded. These impoundments seriously reduced the availability of riverine habitat and likely affected the distribution and availability of the mussel's fish hosts (USFWS 1992). The Green River in Kentucky has also experienced water quality problems related to the impacts from oil and gas production in the watershed (USFWS 1992).

Ahlstedt (2007) reported that mussel habitat in Killbuck Creek is “severely degraded.” The substrate is severely imbedded and relatively hard packed which doesn't allow for mussel colonization. The riparian zone is impacted by timber removal, field crops, and cattle accessing the stream. Ahlstedt (2007) also noted that “fish are noticeably absent and Asian clams were abundant” in Killbuck Creek. The Killbuck watershed also contains many operating oil and gas wells, though it is unknown if these wells are impacting the creek.

2.3.2.2 Overutilization for commercial, recreational, scientific, or educational purposes:

Any individuals that do still survive in the Cumberland River are threatened by commercial mussel fishing. Although the subspecies is not commercially valuable, incidental take of the species has occurred in the Cumberland River during commercial mussel fishing for other species (USFWS 1992).

2.3.2.3 Disease or predation:

The Recovery Plan does not discuss disease or predation as limiting factors for this species. We have no new information on disease or predation that would indicate either is a limiting factor.

2.3.2.4 Inadequacy of existing regulatory mechanisms:

We have no new information regarding inadequacy of existing regulatory mechanisms for protecting this species.

2.3.2.5 Other natural or manmade factors affecting its continued existence:

Climate change likely constitutes a threat for the species. Current climate change predictions in the Northern Hemisphere indicate warmer air temperatures and more intense precipitation events are likely to occur in the future (IPCC 2007). The predicted impacts on streams include changes in the distribution of algae, plankton, and fish, as well as changes in water temperatures and oxygen levels. Warming of waters in rivers and streams may make these habitats less able to support their current fish and mussel fauna (IPCC 2007). Highly specialized species, such as freshwater mussels, are likely to be most susceptible to the additional stresses of a changing climate.

The most recent literature on climate change includes predictions of hydrological changes, higher temperatures, and expansion of drought areas, resulting in a northward and/or upward elevation shift in range for many species (IPCC 2007). Although the specific effects of climate change on the purple cat's paw pearl mussel are unknown, altered hydrology in rivers, increased frequency of extreme weather events, and a changing abundance and distribution of fish species have the potential to adversely affect this species. The magnitude of the climate change threat to the purple cat's paw pearl mussel is unknown.

2.4 Synthesis

The purple cat's paw pearl mussel is a federally listed endangered subspecies that is currently known to exist in only three streams, though no individuals have been documented in two of the three streams in over 20 years. The Killbuck Creek, Ohio population, first discovered in 1994, was thought to be viable in the first few years following discovery based on sampling efforts. However, recent search efforts aimed at collecting adult purple cat's paw for captive propagation have found that the species is now quite rare in the creek, and that the habitat conditions have declined dramatically since the 1990s.

The biology of the purple cat's paw pearl mussel is similar to other bivalved mollusks belonging to the family Unionidae. However, due in large part to its rarity, relatively little is known about its specific life history requirements.

Survey work in Killbuck Creek for the purple cat's paw has occurred in 1994, 1995-1996, 1997, 2001, and 2006-2009 (Hoggarth et al. 1995; Hoggarth 1996; Hoggarth and Ross 1997; Ahlstedt 2007; Ahlstedt 2008; G.F. Zimmerman, Enviroscience Inc., *in litt.* 2009). A total of 62 live purple cat's paw, both males and females, were collected during the 2-year study in 1995-1996 compared to only 12 live males found in the 2006-2009 survey, a 4-year survey effort. Based on the size and condition of the shells, all but one of these males were old individuals, indicating an aging population with very little recruitment. One freshdead female, estimated to be about 3

years old, was found in 2009, indicating that reproduction occurred in Killbuck Creek around 2006. The 2006-2009 survey work was funded by grants received by the Columbus Ohio Ecological Services Field Office in 2005, 2007, and 2009 to fund a search for any remaining live individuals to initiate a propagation program for augmentation and reintroduction. This survey work will continue through 2010, under the 2009 grant.

Since 1991 when the last 5-year review was conducted on the purple cat's paw pearl mussel, there has been little new information on the species' biology, life history, or genetics. New information is limited to the determination of suitable fish hosts. There has been no change in the species' spatial distribution or historic range, with the exception of a new population that was discovered in Killbuck Creek in Ohio in 1994.

The purple cat's paw pearl mussel should remain listed as *endangered* because the species has continued to decline, threats have not been ameliorated, and the criteria for downlisting to threatened status have not been met. Threats persist for the remaining purple cat's paw pearl mussel populations, including habitat degradation and climate change. The life history and environmental sensitivity of the subspecies is poorly known, increasing the probability that previously unidentified activities could cause a precipitous decline of the only remaining populations. These unknowns also make it unlikely that the subspecies can be downlisted in the near future. In sum, our current understanding of the purple cat's paw pearl mussel's status leads us to conclude that this species continues to face a probability of extinction throughout all or a significant portion its range, thereby meeting the definition of endangered under the Endangered Species Act.

3.0 RESULTS

3.1 Recommended Classification:

- Downlist to Threatened**
- Uplist to Endangered**
- Delist** (*Indicate reasons for delisting per 50 CFR 424.11*):
 - Extinction*
 - Recovery*
 - Original data for classification in error*
- No change is needed**

RECOMMENDATIONS FOR FUTURE ACTIONS

Prevent extinction by continuing surveys to locate individuals to initiate a captive propagation program.

Update recovery criteria to address all of the listing factors that are relevant to the species.

5.0 REFERENCES

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U.S. FISH AND WILDLIFE SERVICE

5-YEAR REVIEW of Purple Cat's Paw Pearlymussel

Current Classification: Endangered

Recommendation resulting from the 5-Year Review:

- Downlist to Threatened
- Uplist to Endangered
- Delist
- No change needed

Appropriate Listing/Reclassification Priority Number, if applicable: NA

Review Conducted By: Angela Boyer, Fish and Wildlife Biologist

FIELD OFFICE APPROVAL:

Lead Field Supervisor, U.S. Fish and Wildlife Service

Approve Mary M. Knapp Date 8-17-10
Mary M. Knapp, Ph.D., Field Supervisor

REGIONAL OFFICE APPROVAL:

Lead Assistant Regional Director, Ecological Services, U.S. Fish and Wildlife Service, Midwest Region

Approve Stephen M. Lewis Date 9/2/10

Cooperating Assistant Regional Director, Ecological Services, U.S. Fish and Wildlife Service, Southeast Region

Approve Franklin J. ... ^{FRD} Acting Date 9/24/2010