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

5-Year Review:
Summary and Evaluation

Juvenile Purple Cat's Paw Pearlymussels, Photo by Keith Lott, USFWS

U.S. Fish and Wildlife Service, Region 3
Ohio Ecological Services Field Office
Columbus, Ohio
September 25, 2025

5-YEAR REVIEW

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

1.0 GENERAL INFORMATION

1.1 Reviewers

Lead Regional Office: Region 3, Laura Ragan

Lead Field Office: Ohio Ecological Services Field Office, Keith Lott

Cooperating Field Offices:
Kentucky Ecological Services Field Office, Taylor Fagin
Tennessee Ecological Services Field Office, Anthony Ford
West Virginia Ecological Services Field Office, Curtis Roth

Cooperating Regional Offices:
Southeast Regional Office, Atlanta GA, Carrie Straight
Northeast Regional Office, Hadley, MA, Sarah Furtak

1.2 Methodology used to complete the review:

In accordance with section 4(c)(2) of the Endangered Species Act of 1973, as amended (Act), the purpose of a status review is to assess each threatened species or endangered species to determine whether its status has changed and if it should be classified differently or removed from the Lists of Threatened and Endangered Wildlife and Plants. The U.S. Fish and Wildlife Service (Service) evaluated the biology and status of the purple cat's paw pearlymussel (*Epioblasma obliquata*) to inform this status review. Public notice was given in the *Federal Register* (89 FR 804) requesting new scientific or commercial data and information that may have a bearing on the purple cat's paw pearlymussel classification of endangered status. Pertinent data were obtained from the Recovery Plan and from recent propagation, augmentation, and reintroduction efforts in Kentucky, Ohio, Tennessee, and West Virginia. This 5-year review was completed by Angela Boyer, Fish and Wildlife Biologist with the Ohio Ecological Services Field Office.

1.3 Background:

1.3.1 FR Notice citation announcing initiation of this review:

89 FR 890 (January 5, 2024) – Endangered and Threatened Wildlife and Plants; Initiation of a 5-Year Status Reviews of 16 Listed Animal and Plant Species.

1.3.2 Listing history

Original Listing
FR notice: 55 FR 28209
Date listed: August 9, 1990
Entity listed: Purple Cat's Paw Pearlymussel (*Epioblasma obliquata obliquata*); Subspecies
Classification: Endangered

Direct Final Rule (updating species entity to reflect new taxonomy)
FR notice: 87 FR 15143
Date listed: June 15, 2022
Entity listed: Purple Cat's Paw Pearlymussel (*Epioblasma obliquata*); Species
Classification: Endangered

1.3.3 Associated rulemakings: A final rule was published for the establishment of a non-essential experimental population for the purple cat's paw pearlymussel in the Tennessee River below Wilson Dam in Alabama on June 14, 2001 (66 FR 32250). The ''When Listed'' numbers in the table of species information was inadvertently omitted in this final rule. 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. Five-year reviews were initiated on March 18, 2009 (74 FR 11600); July 8, 2014 (79 FR 38560); and April 26, 2019 (84 FR 17420) and completed on September 24, 2010; April 21, 2015; and April 21, 2020. These reviews resulted in no change in the listing classification of endangered.

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

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. The DPS policy does not apply.

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)?

All the relevant listing factors are addressed in the recovery criteria and there is no new information to consider regarding existing or new threats.

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 pearlymussel 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.

Since the completion of the last 5-year review in 2020, in-vitro captive propagation at the Kentucky Center for Mollusk Conservation facility has continued annually using broodstock maintained at the facility. In 2022 and 2023, the Tennessee Wildlife Resources Agency (TWRA), Cumberland River Aquatic Center (CRAC) propagated juveniles from broodstock taken from the previously released animals in the Duck River (Hua 2023, Hua 2024; TWRA CRAC 2023). CRAC successfully propagated the juveniles using the mottled sculpin (*Cottus bairdii*) as the host fish (Hua 2023, Hua 2024).

In 2020 and 2021, few juvenile cat's paw were produced at the Kentucky facility due to a staff shortage during the COVID-19 pandemic. No augmentations occurred in 2020 and a total of 420 juveniles were released into the Green River at two locations in 2021. In 2022, a total of 2,393 juvenile cat's paw were stocked into five streams (Duck River (TN), Green River (KY), Killbuck Creek (OH), Licking River (KY), and Walhonding River (OH)). All the 2022 releases occurred at previous release locations. In 2023, a total of 4,990 juvenile cat's paw were released into six streams (Duck River, Green River, Killbuck Creek, Licking River, Ohio River (WV), and Walhonding River). Release locations were the same as in previous years with the addition of four new sites in the Green River. In 2024, 2,200 juvenile cat's paw were released into five

streams (Duck River, Green River, Killbuck Creek, Licking River, and Walhonding River). There were no new release locations in 2024.

Captive propagation at the Kentucky facility is ongoing. Juveniles produced from these efforts will continue to be used for augmentations and reintroductions in the species current and historical range. Additionally, the TWRA CRAC captively propagated purple cat's paw and released juveniles in 2022 and 2023 at one of the Duck River sites in 2024. Broodstock was taken from the previously released animals in the Duck River (Hua 2023, Hua 2024, TWRA CRAC 2023).

This criterion addresses listing factor A, which is the present or threatened destruction, modification, or curtailment of habitat or range. Some progress has been made to address the threats under listing factor A, including the removal of two Green River dams, Lock and Dam #6 in 2017, and Lock and Dam #5 in 2024. Removal of the dilapidated and partially collapsed Green River Lock and Dam #4 is anticipated for the summer of 2025 (Fagin 2024, pers. comm.). Additionally, the Barren River Lock and Dam #1, a major tributary of the Green River, was removed in 2022 (Fagin 2024, pers. comm.). In 2020, the Six Mile Dam on the Walhonding River was removed. Currently there is one small reproducing population of cat's paw in Killbuck Creek and the five reintroduced populations (Duck River, Green River, Licking River, Ohio River, and Walhonding River). Recruitment has not yet been documented in any of these five reintroduced populations. However, monitoring of the release locations has documented survival and growth of the released individuals and gravid females were found in the Duck River (TWRA CRAC 2023). Criterion 1 has not been met because recruitment in the reintroduced populations has not yet been documented, though the recent additional release efforts are focused on addressing this criterion. Purple cat's paw reach sexual maturity around age three to four. Therefore, it is possible that recruitment has occurred, but juveniles have not yet been observed.

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[1] and its fish host must be present in each river.

There is currently one reproducing population (Killbuck Creek) and five reintroduced populations (Duck River, Green River, Licking River, Ohio River, and Walhonding River). Long-term viability of the Killbuck Creek population is questionable due to the low density, though some recent recruitment has occurred, and the population was augmented with captively propagated juveniles in 2018, 2022, 2023, and 2024.

The five reintroduced populations contain many individuals that have reached sexual maturity and TWRA was able to use reintroduced and sexually mature females that were fertilized in the Duck River to produce juveniles at the CRAC. However, evidence of recruitment has not yet been documented at any of the reintroduction sites. Due to the small size and restricted range of the Killbuck Creek population and the current non-reproductive status of the five reintroduced populations, Criterion 2 has not been met.

[1] The species was classified as a subspecies when the Recovery Plan was completed.

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.

Monitoring efforts of reintroduced populations are underway to meet the recovery goals of the species. However, currently Criterion 3 has not been met because recruitment has not yet been documented at any of the reintroduction sites.

The purple cat's paw pearlymussel will be considered for removal from Endangered Species Act protection when the likelihood of the species 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.

Captive propagation is ongoing, and reintroductions are continuing in five streams - one in Ohio, one in West Virginia, two in Kentucky, and one in Tennessee. Many of the individuals released into the species' historical range may have reached sexual maturity, though no recruitment has been documented yet in any of the reintroduced populations. Annual monitoring is ongoing to document recruitment.

This criterion has not been met. See explanation above in status of downlisting Criterion #1. Currently, there are no reintroduced populations in Illinois or Indiana.

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[1] and its fish host must be present in each river.

This criterion has not been met. See explanation above in status of downlisting Criterion #2.

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.

This criterion has not been met. See explanation above in status of downlisting Criterion #3.

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

Criterion 4 has not been met. Threats to the extant population in Killbuck Creek include habitat degradation from agricultural activities in the watershed, contaminants, and oil and gas extraction wells and pipelines. While foreseeable threats to the five reintroduced populations are minimal, stochastic events, such as spills and the potential for climate change effects (e.g., flooding, droughts, increased water temperatures), cannot be ruled out.

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

Criterion 5 has not been met. However, three dam removals have occurred on two the streams where cat's paw has been reintroduced, one on the Walhonding River in Ohio and two on the Green River in Kentucky. These dam removals restored sections of these streams to free-flowing systems and will increase the amount of available habitat for the species and its host fish.

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:

There is no new information on the species' biology and life history.

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:

There is currently one reproducing population (Killbuck Creek) and five reintroduced populations (Duck River, Green River, Licking River, Ohio River, and Walhonding River). Although recruitment has occurred within the past several years based on the finding of young individuals, long-term viability of the Killbuck Creek population is questionable due to the very small population size that appears to be concentrated in one riffle. The species is likely extirpated from the Cumberland River as no individuals have been observed there in over 30 years. To date, recruitment of the reintroduced populations in the Duck River, Green River, Licking River, Ohio River, and Walhonding River has not been documented. Release numbers of juveniles in each stream are summarized in Table 1.

Table 1. Populations and release data for juvenile purple cat's paw. The natural population that has been augmented is indicated by an asterisk (*) and all other populations are reintroductions.

Population	State	Evidence of Recruitment	Number of Reintroduction Sites	Total # Juveniles Released 2017-2024
Duck River	TN	N	2	2,708
Green River	KY	N	6	4,100
Licking River	KY	N	3	4,103
Ohio River	WV	N	1	1009
Walhonding River	OH	N	1	993
Killbuck Creek*	OH	Y	1	148
Total # Juveniles Released				**13,078**

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 new information on the species' genetics.

2.3.1.4 Taxonomic classification or changes in nomenclature:

The purple cat's paw pearlymussel (*Epioblasma* (=*Dysnomia*) *obliquata obliquata* (=*E. sulcata sulcata*)) was described by Rafinesque (1820). Williams et al. (2017) used Turgeon et al. (1998), Serb et al. (2003), Sproules et al. (2006), their own unpublished research, and discussions with other experts on mussel systematics to develop a revised taxonomic classification and comprehensive list of the freshwater mussels of the United States and Canada that reflected recent refinement of mussel systematics. Due to the distinctive shell morphology and distinctive geographical range of the subspecies, they reassigned the purple cat's paw name to "catspaw" and reassigned the subspecies to the species *Epioblasma obliquata*. The Service published a direct final rule (87 FR 15143) on March 17, 2022, recognizing the change in nomenclature.

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 subspecies[1] within its historic range, etc.):

The purple cat's paw 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 species occurs in the Ohio River and four of its tributaries (Green River (KY), Licking

River (KY), Ohio River (WV), Walhonding River (OH), and Killbuck Creek (OH)) and one Tennessee River tributary (Duck River (TN)) (Figure 1). Except for the Killbuck Creek population, all of these populations were reintroduced into these streams starting in 2017.

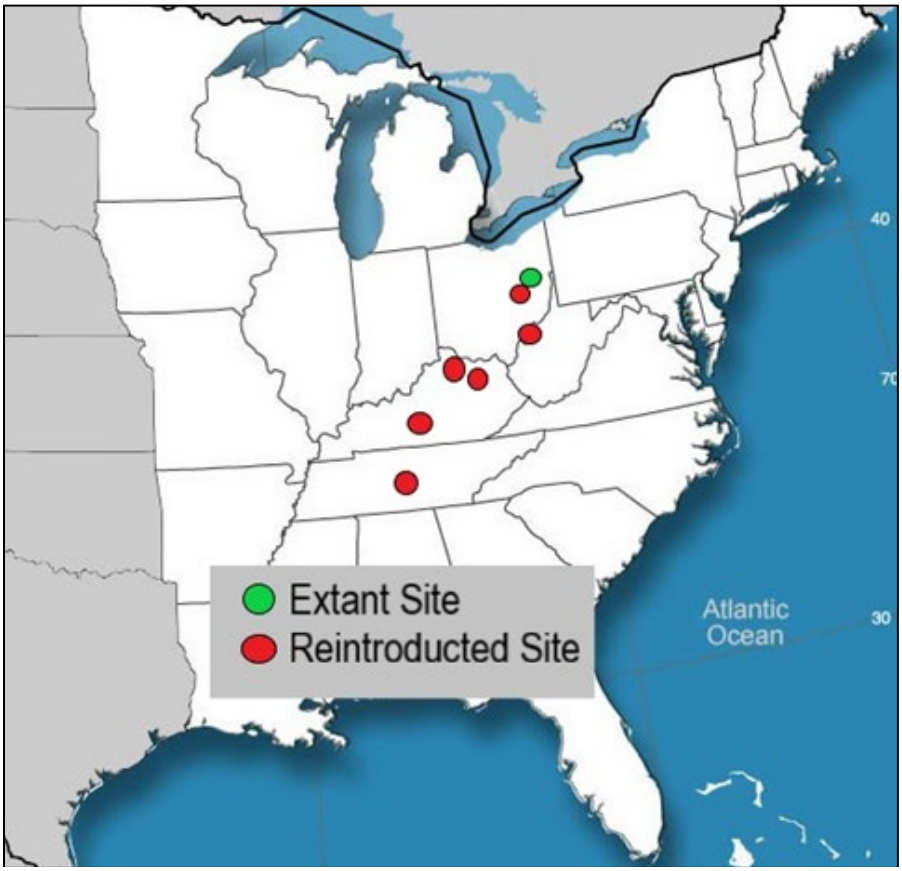
2.3.1.6 Habitat or ecosystem conditions (e.g., amount, distribution, and suitability of the habitat or ecosystem):

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 was "severely degraded" with the creek entrenched among steep eroding banks. Deadfalls and debris piles were common in the creek and point bar formations are evidence of massive bed-load movement during high surface flows. Furthermore, Ahlstedt (2007) reported that sampling for purple cat's paw in the creek was difficult due to high sediment load causing very poor visibility, except during rare low-flow conditions. In 2012, a drought provided excellent sampling conditions that allowed biologists to locate living females and initiate captive propagation.

Two dam removal efforts on the Green River in Kentucky have occurred, removing Lock and Dam #6 in 2017 and Lock and Dam #5 in 2024. These dams created areas of unsuitable habitat for the purple catspaw. Removing these dams potentially restored a total of 38 miles (61 kilometers (km)) of river to free-flowing condition downstream of the reintroduction locations.

The Six Mile Dam on the Walhonding River in Ohio was removed in the fall of 2020. The removal of this dam restored the entire 23.5 miles (37.8 km) of the Walhonding River to a free-flowing system from where the Kokosing and Mohican Rivers join to form the river downstream to the mouth where the Walhonding River flows into the Muskingum River. One dam, the Mohawk Dam, remains on the river just downstream of the convergence of the Kokosing and Mohican River where they form the Walhonding River. The Mohawk Dam is a dry dam, holding back water only during a flood and releasing it slowly downstream. This dam removal provides an additional 23.5 miles to the X miles of current accessible range for potential range expansion if reproduction and recruitment is successful at the introduction site.

Figure 1. Current Range of the Purple Cat's Paw Pearly Mussel



The Service and its partners collaborated to remove Green River Lock and Dam 6 in 2017, Barren River Lock and Dam 1 in 2022, and Green River Lock and Dam 5 in 2024.

2.3.2 Threats Analysis (threats, conservation measures, and regulatory mechanisms)

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

We have no new information regarding the destruction, modification, or curtailment of the purple cat's paw habitat or range since the 2020 5-year review was completed. However, one dam removal on the Green River in Kentucky occurred in 2022 with another dam removal planned on the river in 2025. The Six Mile Dam on the Walhonding River in Ohio was removed in the fall of 2020. These dam removal projects helped restore sections of these rivers to habitat suitable for the purple cat's paw.

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

We have no new information regarding overutilization of the purple cat's paw since the

2020 5-year review was completed.

2.3.2.3 Disease or predation:

The recovery plan does not discuss disease or predation as limiting factors for this species. Muskrat predation was found to be relatively high, especially in 2022, at one of the Duck River reintroduction sites (Hua 2023). Predation may be a limiting factor at certain sites, but it is not considered to be a limiting factor for the species throughout its range.

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:

A changing climate likely constitutes a threat for the species. Current predictions in the Northern Hemisphere indicate warmer air temperatures and more intense precipitation events are likely to occur in the future (Hoegh-Guldberg et al. 2018). 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 suitable for their current fish and mussel fauna (IPCC 2023). Highly specialized species, such as freshwater mussels, are likely to be most susceptible to these additional stresses of a changing climate.

The most recent literature related to climate 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 2023). Although the specific effects of a changing climate on the purple cat's paw pearlymussel 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 a changing climate threat to the purple cat's paw pearlymussel is unknown.

Other threats to the species also exist in Killbuck Creek, where the substrate is severely embedded and largely comprised of hard pan, which doesn't allow for mussel colonization outside of the currently occupied riffles. The riparian zone is also 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. Ahlstedt (2014) reported that Asian clams (*Corbicula fluminea*) appeared to have a massive die-off in 2011 but have appeared to rebound and are currently relatively common in the stream. It is interesting to note that the 2011 die-off correlates with the timing of the recent recruitment of purple cat's paw in Killbuck Creek. When Asian clam numbers were very low the purple cat's paw had successful recruitment. It is not known if these two events are related, however, it has been suggested that Asian clams may

adversely impact native mussels by consuming a significant portion of their sperm (USFWS 1992) and that they may compete with native mussels for food and space (Sea Grant Pennsylvania, no date). The Killbuck watershed also contains many operating oil and gas wells, though it is unknown if these wells are impacting the creek.

2.4 Synthesis

The purple cat's paw pearlymussel is a federally listed endangered species that is currently known to occur in six streams. At the time of listing, the species was thought to be extant in the Cumberland River in Tennessee. However, no individuals have been documented in the Cumberland River in over 30 years and that population is likely extirpated. The Killbuck Creek 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 habitat conditions have declined dramatically since the 1990s.

The biology of the purple cat's paw pearlymussel 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. Since the last 5-year review was conducted, there has been no new information on the species' biology or life history.

Currently, the species occurs in the Ohio River and four of its tributaries (Killbuck Creek (OH), Walhonding River (OH), Green River (KY), Licking River (KY)) and one Tennessee River tributary (Duck River (TN)). Except for the Killbuck Creek population, all of these populations were reintroduced into these streams in 2017 as juveniles and augmented with additional juveniles in 2021, 2022, 2023, and 2024. While many of the reintroduced individuals should be sexually mature, and naturally fertilized females have been documented at one of the release sites, no recruitment (i.e., young individuals) has been documented yet.

After reviewing the best available scientific information, we conclude that the purple cat's paw pearlymussel should remain listed as endangered because 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 pearlymussel populations, including habitat degradation and impacts from climate change. In summary, our current understanding of the purple cat's paw pearlymussel's status leads us to conclude that this species continues to be in danger of extinction throughout all or a significant portion of its range, thereby meeting the definition of endangered under the Endangered Species Act.

3.0 RESULTS

U.S. FISH AND WILDLIFE SERVICE
STATUS REVIEW of Purple Cat's Paw Pearlymussel

Current Classification: Endangered

Status Recommendation resulting from Status Review:

____ Downlist to Threatened
____ Uplist to Endangered
____ Delist (Indicate reasons for delisting per 50 CFR 424.11):
____ The species is extinct
____ The species does not meet the definition of an endangered or threatened species
____ The listed entity does not meet the statutory definition of a species
_X_ No change needed

Lead Field Supervisor, Fish and Wildlife Service

Approve ERIN KNOLL Digitally signed by ERIN KNOLL Date: 2025.09.25 09:12:19 -04'00' Date _____

RECOMMENDATIONS FOR FUTURE ACTIVITIES

- Prevent extinction by continuing surveys to locate individuals to continue the captive propagation efforts.

- Continue to rear juveniles in captivity for future augmentation, reintroductions, and to serve as broodstock for captive propagation.

- Investigate potential sites for future augmentation or reintroduction of captivity reared juveniles and/or adults.

- Continue efforts to remove dams to improve/restore stream habitat for the purple cat's paw and its host fish.

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