

**Draft Recovery Plan for the Missouri Distinct
Population Segment of the Eastern Hellbender**
(Cryptobranchus alleganiensis alleganiensis)



December 2023

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Prepared by the
Eastern Hellbender Missouri DPS Recovery Planning Team

for

Region 3
U.S. Fish and Wildlife Service
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Actions identified in this recovery plan are based largely on the Hellbender Conservation Strategy: an Action Plan for the Recovery of the Ozark and Eastern Hellbender in the Ozark Highlands of Missouri and Arkansas (Briggler et al. 2010). The strategy was developed by the Ozark Hellbender Working Group, a collaborative partnership among individuals from State and Federal agencies, academia, zoos, nonprofit organizations, and other individuals interested in the conservation of the species. The Service gratefully acknowledges the members of the Ozark Hellbender Working Group for their commitment and efforts, which have played a significant role in identifying information needs and guiding conservation efforts for eastern hellbenders in Missouri. Because much of this recovery plan was based on that of the Ozark hellbender (USFWS 2021c), we also sincerely appreciate contributions of the Ozark Hellbender Recovery Planning Team.

DISCLAIMER

Recovery plans delineate actions that are determined to be necessary to recover federally-listed species. Plans are published by the U.S. Fish and Wildlife Service (Service) and are often prepared with the assistance of recovery teams, contractors, State agencies, Tribes, and others. Recovery plans do not necessarily represent the views, official positions, or approval of any individuals or agencies involved in plan formulation, other than the Service. They represent the official position of the Service only after they have been signed by the Regional Director as approved. Recovery plans are guiding and planning documents only; identification of an action to be implemented by any public or private party does not create a legal obligation beyond existing legal requirements. Nothing in this plan should be construed as a commitment or requirement that any Federal agency obligate or pay funds in any one fiscal year in excess of appropriations made by Congress for that fiscal year in contravention of the Anti-Deficiency Act, 31 U.S.C. 1341, or any other law or regulation. Approved recovery plans are subject to modification as dictated by new findings, changes in species' status, and completion of recovery actions.

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An electronic copy of this Recovery Plan is available at:

<http://www.fws.gov/endangered/species/recovery-plans.html>

Cover image courtesy Jeffrey Briggler, Missouri Department of Conservation.

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INTRODUCTION

This recovery plan describes criteria for determining when the Missouri Distinct Population Segment (DPS) of the eastern hellbender (*Cryptobranchus alleganiensis alleganiensis*) should be considered for delisting as well as the actions necessary to meet those criteria and time and cost estimates for implementing recovery actions. This recovery plan is based on the Species Status Assessment for the Eastern Hellbender (*Cryptobranchus alleganiensis alleganiensis*) (USFWS 2018) and the Recovery Outline for the Missouri Distinct Population Segment of the Eastern Hellbender (USFWS 2021b). These documents describe the life history and biology of the species, the current status of the species, and the threats that impact the species. A Recovery Implementation Strategy describing the stepped-down activities to implement the recovery actions will be developed in coordination with recovery partners. The Recovery Implementation Strategy and Species Status Assessment are developed separately from the Recovery Plan and will be updated as needed.

Due to severe population declines and reduced recruitment observed in the wild, eastern hellbender populations in Missouri were federally listed as endangered under the Endangered Species Act in 2021 (USFWS 2021a). The Service determined designating critical habitat for the species was not prudent given the threat of illegal collection (USFWS 2021a).

Within Missouri, the eastern hellbender occurs in the northern portion of the Ozark Highlands in the Niangua River, Gasconade River, Osage Fork of the Gasconade River, Big Piney River, Meramec River, Huzzah Creek, Courtois Creek, and Big River (Fig. 1). We consider the DPS to consist of 3 populations, with each population defined as all of the occupied rivers within a watershed flowing into either the Missouri or Mississippi rivers (Fig. 1). Thus, the Niangua River population consists of individuals in the Niangua River; the Gasconade River population consists of individuals from the Gasconade River, Osage Fork of the Gasconade River, and Big Piney River; and the Meramec River population consists of individuals from the Meramec River, Huzzah Creek, Courtois Creek, and Big River (**Figure 1**).

The primary reason for eastern hellbender population declines in Missouri remains unclear. However, several potential factors have been identified and include degraded water quality, habitat loss resulting from impoundments and sedimentation, disease, illegal and/or scientific collection, and potential increased predation from some native and non-native species of stocked fish (USFWS 2021b). Population declines have necessitated the use of captive propagation efforts to ensure the long-term survival of the species until threats are better understood and abated.

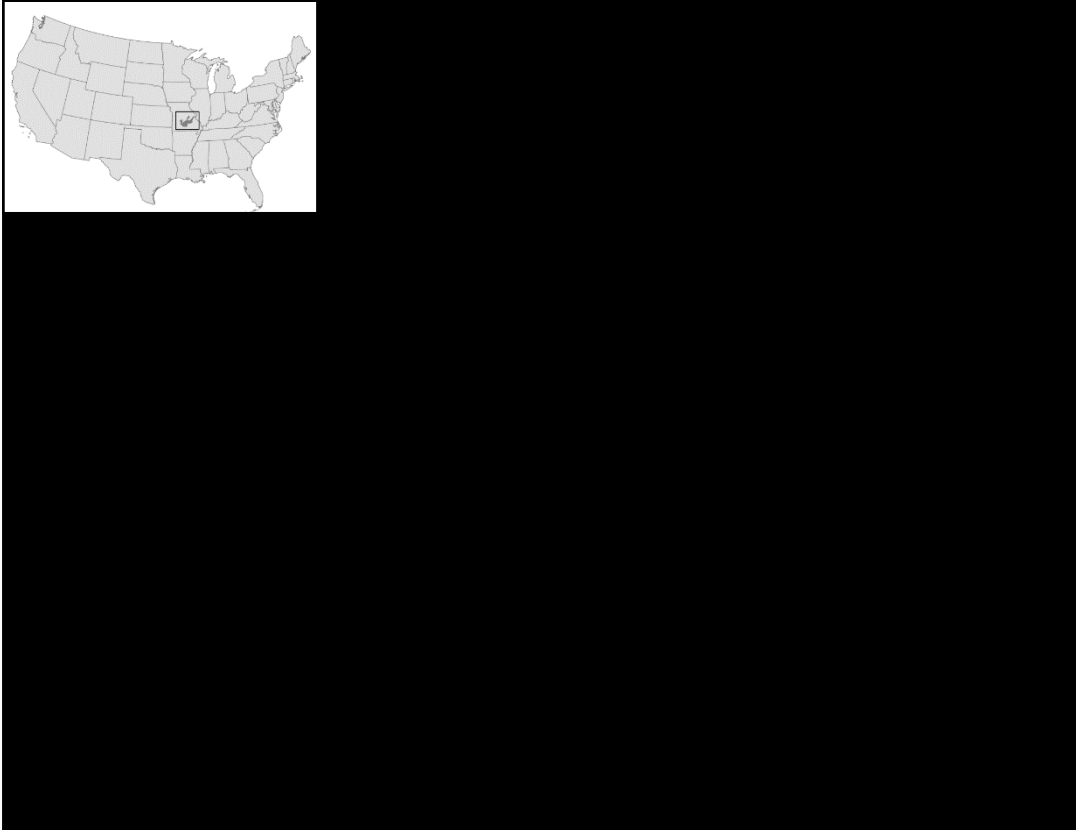


Figure 1. Range-wide distribution of the eastern hellbender in Missouri and public lands within the species' range. Rivers in which the eastern hellbender DPS is thought to occur include the Niangua River, Gasconade River, Osage Fork of the Gasconade River, Big Piney River, Meramec River, Huzzah Creek, Courtois Creek, and the Big River.

RECOVERY STRATEGY

The ultimate goal of this recovery program is to arrest the decline and enhance Missouri populations of the eastern hellbender so that Endangered Species Act protection is no longer necessary. To achieve this goal, it will be necessary to establish naturally sustaining populations, that possess healthy long-term demographic traits and trends. There are two primary objectives for achieving recovery of the Missouri DPS of the eastern hellbender: 1) restore and maintain suitable habitat to support viable populations within the Niangua River, Gasconade River, and Meramec River watersheds (including occupied tributaries); and 2) establish and maintain viable populations in each of these watersheds.

Because the life history and threats of eastern hellbenders in Missouri are very similar to those of the federally-listed Ozark hellbender, recovery efforts will be similar to those for the Ozark hellbender (USFWS 2021c). Thus, efforts for the eastern hellbender Missouri DPS will focus on further investigating and addressing potential causes of population declines while continuing to

stabilize populations using the captive propagation and head-starting program. An additional focus in this plan is to increase the resiliency of occupied streams to flood events by protecting the riparian habitat. Since development of the Ozark hellbender recovery plan, the severity and frequency of flood events has increased and is projected to continue to increase due to climate change. Severe flood events, especially in areas with limited riparian corridors, can drastically impact hellbender habitat and injure or kill individuals when large rocks are mobilized.

To investigate and address potential causes for declines, recovery efforts will focus on addressing diseases¹, reducing sediment input, improving water quality, conducting outreach to increase support for the species, enhancing protection to prevent illegal collection and other impacts to the species, and addressing other threats found to contribute to declines. Those recovery efforts will aim to ameliorate threats that could: 1) result in mortality or injury to eastern hellbenders, 2) reduce reproduction or recruitment of young into populations, 3) increase stress to remaining individuals in the wild, or 4) alter habitat such that survival or reproduction is reduced. Particularly important is the protection of eastern hellbender sites where reproduction is known to still occur or that contain large numbers of hellbenders.

Lastly, implementing an adaptive management approach will be important given the uncertainty regarding the exact reason(s) for population declines.

RECOVERY CRITERIA

An endangered species is defined in the Act as a species that is in danger of extinction throughout all or a significant portion of its range. A threatened species is one that is likely to become endangered within the foreseeable future throughout all or a significant portion of its range. When we evaluate whether a species warrants downlisting or delisting, we consider whether the species meets either of these definitions. A recovered species is one that no longer meets the Act's definitions of threatened or endangered. Determining whether a species should be downlisted or delisted requires consideration of the same five categories of threats (that is, the five threat factors, A-E) that were considered when the species was listed and are specified in section 4(a)(1) of the Act.

The Service may consider reclassifying (downlisting or delisting) the eastern hellbender Missouri DPS when the criteria outlined below are met. Recovery criteria are conditions that, when met, are likely to indicate that a species may warrant downlisting or delisting. Thus, recovery criteria are benchmarks that measure progress toward recovery. These recovery criteria are our best assessment at this time of what needs to be achieved to downlist or delist the eastern

¹ Eastern hellbenders in Missouri do not exhibit the type and severity of physical abnormalities observed in Ozark hellbenders.

hellbender Missouri DPS. These criteria describe the demographic characteristics of a recovered population and threat alleviation needed to maintain those recovered populations, both of which are necessary to ensure that the species is no longer in danger of extinction.

Although several potential threats have been identified (USFWS 2021b), the primary cause(s) of the population declines and the vulnerability of the eastern hellbender Missouri DPS to these threats remains unclear. Therefore, it is difficult to predict the exact course that recovery may take. Thus, it is possible that a future status review may indicate that downlisting or delisting is warranted although not all of these recovery criteria are met. Conversely, it is possible that the recovery criteria could be met, but a future status review may indicate that downlisting or delisting is not warranted (for example, a new threat may emerge that is not addressed by the recovery criteria below and that causes the species to remain threatened or endangered).

Downlisting Criteria

Due to genetic differences among the three eastern hellbender Missouri DPS populations, we consider all three populations necessary to maximize the evolutionary potential of the species. Given the small range of each population, the persistence of all three populations is also necessary to guard against extinction from catastrophic events such as extreme flooding, drought, and chemical spills. Therefore, the eastern hellbender Missouri DPS may be considered for downlisting to threatened when the following criteria are achieved for each of three populations (the Niangua River, Gasconade River, and Meramec River):

1. There is a positive population trend for a 30-year period¹ that is not contingent on continued augmentation of populations.
2. There is evidence of successful recruitment to maintain a sustaining population, with recruitment defined as attainment of sexual maturity by young that are reproductively viable.
3. Watershed health, such as riparian protection, sediment inputs, and water quality, is sufficient to provide habitat quantity and quality to support all life stages.
4. Within each watershed the number and distribution of occupied habitat patches and abundance of individuals within these patches is such that 1) the population is resilient to stochastic and catastrophic events and 2) connectivity and gene flow is sufficient to maintain genetic diversity and provide for natural re-establishment if a patch is extirpated.
5. Causes of population declines have been identified, it is clear what actions are needed to address these threats, and these actions are being implemented.

¹ Because hellbenders are a long-lived species, population trends take a longer amount of time to be realized. In addition, population surveys are only conducted every 10 years. Thus, a longer period of time is necessary to monitor population trends.

Delisting Criteria

The eastern hellbender Missouri DPS may be considered for delisting when the following criteria are achieved for each of three populations (the Niangua River, Gasconade River, and Meramec River):

1. Downlisting criteria have been met.
2. Threats and causes of decline have been reduced or eliminated such that downlisting criteria will continue to be met into the foreseeable future.

RECOVERY ACTIONS

The actions below are those that, based on the best available science, the Service believes are necessary to move towards recovery, and ultimately delist the eastern hellbender Missouri DPS.

1. Propagate eastern hellbenders in captivity to augment declining, wild populations.
2. Monitor populations to assess long-term trends.
3. Using a watershed approach, protect and improve habitat and water quality, which may include land acquisition, conservation easements, and conservation actions and practices on private and public land.
4. Monitor and address emerging diseases and other stressors that affect the health of individuals.
5. Identify, prioritize, and conduct other research to enhance the conservation and recovery of eastern hellbenders in Missouri.
6. Initiate educational and public outreach actions to heighten awareness of the hellbender as an endangered species and solicit help with recovery actions.
7. Enhance the level of protection through policy, regulation, and enforcement.

ESTIMATED TIME AND COST OF RECOVERY ACTIONS

It is difficult to estimate the time it will take to accomplish recovery actions such that the delisting criteria have been met because, although several potential threats have been identified (USFWS 2021b), the primary cause(s) of population declines remains unclear. Assuming that the primary cause(s) could be identified within the next 15 years, it would likely take at least another 15 years to address the cause(s), followed by an additional 15 years to monitor the response of populations (that is, population trends). Thus, we estimate that recovery could be accomplished in 45 years, assuming effective coordination with necessary partners and stakeholders. However, we recognize that it may take longer than this estimate to delist the species.

The estimated cost of the first 15 years of recovery actions for the eastern hellbender Missouri DPS is \$32,073,000 (**Table 1**). However, as noted above, we expect that full recovery could take 45 years. If we assume that many research projects and other recovery actions are completed in the first 15 years, we estimate that the following 15 years of recovery actions (years 16-30) will be 50% of the costs of the first 15 years, or \$16,036,500. If all of the anticipated recovery actions are completed within 30 years and monitoring populations is the only action to be completed in the next 15 years (years 31-45), we estimate costs of the third 15-year period to be \$649,000. Thus, we estimate that the cost of completing the recovery actions such that the criteria have been met and the eastern hellbender Missouri DPS may be considered for delisting is at least \$48,758,500 (**Table 2**).

Because we cannot currently estimate the costs of protecting and improving habitat and water quality, the total cost of completing recovery actions is likely higher than our estimates. However, many of the recovery actions overlap with those for the Ozark hellbender. Thus, the actual cost of recovery may be substantially less when considering the cost per species.

Table 1. Actions the Service believes are necessary to move towards recovery of the eastern hellbender Missouri DPS and estimated costs of the first 15 years of implementation¹.

Recovery Action	Estimated Cost for the 1 st 15 Years
1. Propagate eastern hellbenders in captivity to augment declining, wild populations	\$3,737,000
2. Monitor populations to assess long-term trends	\$649,000
3. Using a watershed approach, protect and improve habitat and water quality, which may include land acquisition, conservation easements, and conservation actions and practices on private and public land	\$24,706,000
4. Monitor and address emerging diseases and other stressors that affect the health of individuals	\$386,000
5. Identify, prioritize, and conduct other research to enhance the conservation and recovery of eastern hellbenders	\$1,312,000
6. Initiate educational and public outreach actions to heighten awareness of the hellbender as an endangered species and solicit help with recovery actions	\$55,000

¹ The estimated cost of recovery actions is greater than those estimated for the Ozark hellbender because cost of several actions was estimated, rather than noted as to be determined (TBD).

Recovery Action	Estimated Cost for the 1 st 15 Years
7. Enhance the level of protection through policy, regulation, and enforcement	\$1,228,000
Total estimated cost of recovery actions for the first 15 years	\$32,073,000

Table 2. Estimated costs for different time intervals of actions the Service believes are necessary to move towards recovery of the eastern hellbender Missouri DPS.

Years	Estimated Cost
1-15	\$32,073,000
16-30	\$16,036,500
31-45	\$649,000
Total	\$48,758,500

REFERENCES

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