

Recovery Plan for the Ozark Hellbender
(*Cryptobranchus alleganiensis bishopi*)



June 2021

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for the
Ozark Hellbender
(Cryptobranchus alleganiensis bishopi)

Prepared by the
Ozark Hellbender Recovery Planning Team

for

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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 Ozark hellbenders.

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, 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 of the Missouri Department of Conservation.

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INTRODUCTION

The U.S. Fish and Wildlife Service (Service) recovery planning process entails developing a recovery plan and a recovery implementation strategy (<https://www.fws.gov/endangered/esa-library/pdf/RPI-Feb2017.pdf>). This document presents the Service's plan for the conservation and recovery of Ozark hellbender (*Cryptobranchus alleganiensis bishopi*). Pursuant to section 4(f) of the Endangered Species Act (Act), a recovery plan must, to the maximum extent practicable, include (1) a description of site-specific management actions as may be necessary to achieve the plan's goals for the conservation and survival of the species; (2) objective, measurable criteria which, when met, would support a determination under section 4(a)(1) that the species should be removed from the List of Endangered and Threatened Species; and (3) estimates of the time and costs required to carry out those measures needed to achieve the plan's goal and to achieve intermediate steps toward that goal. This recovery plan is based on the Biological Report for the Ozark Hellbender (*Cryptobranchus alleganiensis bishopi*) (USFWS 2020), which describes the life history and biology of the species, the current status of the species, and the threats that impact the species. The recovery implementation strategy is a separate document that is developed in close cooperation with partners. It is used as a coordination document among the various partners for stepping down the higher-level recovery actions into more specific activities and may include more details, such as where, when, and by who those activities are planned to be implemented. The specifics of the recovery implementation strategy are updated as new information becomes available through recovery implementation. Both the biological report and the recovery implementation strategy are available at <https://ecos.fws.gov> and will be updated as necessary.

The Ozark hellbender (*Cryptobranchus alleganiensis bishopi*) (Fig. 1) was federally-listed as endangered under the Act in 2011. The Service determined designating critical habitat for the species was not prudent given the threat of illegal collection (USFWS 2011). The Ozark hellbender is endemic to the White River drainage in northern Arkansas and southern Missouri (Johnson 2000), historically occurring in portions of the Spring, White, Black, Eleven Point, and Current Rivers and some of their tributaries (Bryant Creek, the North Fork White River, and Jacks Fork) (LaClaire 1993). In 2019, populations of Ozark hellbenders were known to occur in Bryant Creek, the North Fork White River, the Eleven Point River, and the Current River with some individuals possibly still present in the main stem of the White River, Spring River, and Jacks Fork (Fig. 2) (Briggler, Missouri Department of Conservation, 2013, pers. comm.; Irwin, Arkansas Game and Fish Commission, 2013; pers. comm.).

The primary reason for Ozark hellbender population declines 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 2011).

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. An adult Ozark hellbender. Photo credit: Jeffrey Briggler.

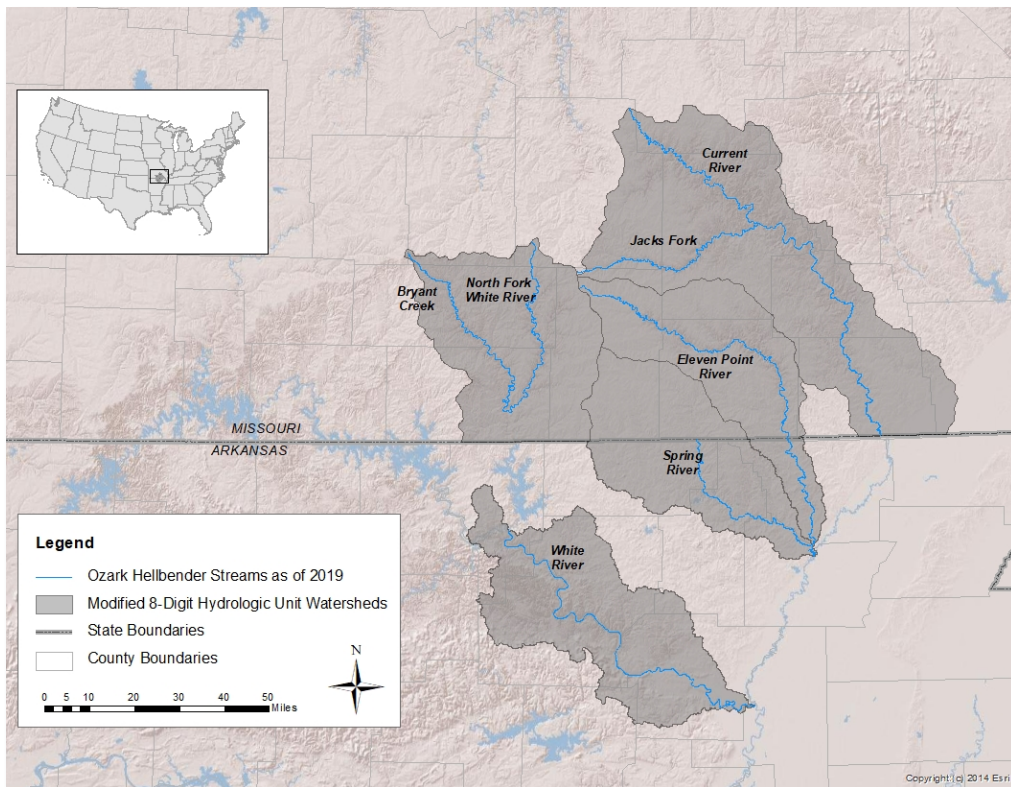


Figure 2. Streams in which the Ozark hellbender was presumed to occur (the species only occurs in portions of each stream) as of 2019.

RECOVERY STRATEGY

The ultimate goal of this recovery program is to arrest the decline and enhance Ozark hellbender populations so that Endangered Species Act protection is no longer necessary. To achieve this goal it will be necessary to establish naturally sustaining populations, which possess healthy long-term demographic traits and trends. There are two primary objectives for achieving recovery of the Ozark hellbender: (1) restore and maintain suitable habitat to support viable populations within the North Fork White River, Eleven Point River, and Current River watersheds¹; and to the extent practicable, the Spring River; and (2) establish and maintain viable populations in each of these watersheds.

Recovery efforts for the Ozark hellbender 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. To investigate and address potential causes for declines, recovery efforts will focus on addressing diseases and physical abnormalities, reducing sediment input, improving water quality, conducting outreach to increase support for the species, enhance 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 Ozark 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 Ozark 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 or not 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.

¹ In the North Fork White River watershed, the majority of the population will likely occur in the North Fork White River with some individuals occupying Bryant Creek. In the Current River watershed, the majority of the population will likely occur in the Current River with some individuals occupying the Jacks Fork.

The Service may consider reclassifying (downlisting or delisting) the Ozark hellbender 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 Ozark hellbender. 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 2020), the primary cause(s) of the population declines and the vulnerability of the Ozark hellbender 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

Because each of the three extant Ozark hellbender populations is genetically unique, all three populations are 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, to downlist the Ozark hellbender, the following criteria should be achieved for each of three Ozark hellbender populations (the North Fork White River, Eleven Point River, and Current River):

1. There is a positive population trend for a 20 year period¹.
2. There is evidence of successful recruitment to maintain a sustaining population, with recruitment defined as attainment of sexual maturity by young.
3. Habitat quantity and quality are sufficient 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

¹ Because the Ozark hellbender is a long-lived species, population trends take a longer amount of time to be realized. Thus, a longer period of time is needed to monitor population trends.

maintain genetic diversity and provide for natural re-establishment if a patch is extirpated.

5. Causes of population declines have been identified, and it is clear what actions are needed to address these threats.

Delisting Criteria

To delist the Ozark hellbender, the following criteria should be achieved for each of three Ozark hellbender populations (the North Fork White River, Eleven Point River, and Current River):

1. Downlisting criteria have been met.
2. Threats and causes of decline have been reduced or eliminated such that delisting 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 Ozark hellbender.

1. Propagate Ozark hellbenders in captivity to augment declining, wild populations or to restore extirpated populations
2. Monitor populations to assess long-term trends.
3. Protect and improve habitat and water quality, which may include land acquisition
4. Minimize impacts of diseases to Ozark hellbenders via research efforts
5. Investigate causes of abnormalities
6. Identify, prioritize, and conduct other research to enhance the conservation and recovery of Ozark hellbenders
7. Initiate educational and public outreach actions to heighten awareness of the hellbender as an endangered species and solicit help with recovery actions
8. 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 2011, USFWS 2020) 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 Ozark hellbender is \$7,150,000 (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 \$3,575,000. 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 \$638,000. Thus, we estimate that the cost of completing the recovery actions such that the criteria have been met and the Ozark hellbender may be considered for delisting is at least \$11,363,000 (Table 2). However, because we cannot currently estimate the costs of protecting and improving habitat and water quality, the actual cost of completing recovery actions is likely higher.

Table 1. Actions the Service believes are necessary to move towards recovery of the Ozark hellbender and estimated costs of the first 15 years of implementation.

Recovery Action	Estimated Cost for the First 15 Years
1. Propagate Ozark hellbenders in captivity to augment declining, wild populations or to restore extirpated populations	\$3,737,000
2. Monitor populations to assess long-term trends.	\$753,000
3. Protect and improve habitat and water quality, which may include land acquisition	\$1,238,000 (plus TBD costs ¹)
4. Minimize impacts of diseases to Ozark hellbenders via research efforts	\$351,000
5. Investigate causes of abnormalities	\$45,000
6. Identify, prioritize, and conduct other research to enhance the conservation and recovery of Ozark hellbenders	\$830,000
7. Initiate educational and public outreach actions to heighten awareness of the hellbender as an endangered species and solicit help with recovery actions	\$196,000
8. Enhance the level of protection through policy, regulation, and enforcement	TBD ²
Total estimated cost of recovery actions for the first 15 years	\$7,150,000

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

Years	Estimated Cost
1-15	\$7,150,000
16-30	\$3,575,000
31-45	\$638,000
Total	\$11,363,000

¹ Costs will depend on other actions (for example, completion of a comprehensive threats analysis for each watershed, which will identify the location and extent of the primary sources of sediment and other water quality degradation).

² Costs will depend on which issues are found to affect Ozark hellbenders.

REFERENCES

- Briggler, J.T., T. Crabill, K. J. Irwin, C. Davidson, J. Utrup, and A. Salveter (editors). 2010. Hellbender Conservation Strategy: An action plan for the recovery of the Ozark and Eastern Hellbender in the Ozark Highlands of Missouri and Arkansas. Ozark Hellbender Working Group, Jefferson City, Missouri. 59 pp.
- Johnson, T.R. 2000. The amphibians and reptiles of Missouri. Missouri Department of Conservation, Jefferson City, Missouri. 400 pp.
- LaClaire, L. V. 1993. Status review of Ozark hellbender (*Cryptobranchus bishopi*). U.S. Fish and Wildlife Service status review. Jackson, Mississippi. 8 pp.
- [USFWS] U.S. Fish and Wildlife Service. 2011. Endangered and threatened wildlife and plants; endangered status for the Ozark hellbender salamander. Federal Register 76: 61956.
- [USFWS] U.S. Fish and Wildlife Service. 2020. Biological Report for the Ozark hellbender (*Cryptobranchus alleganiensis bishop*). U.S. Fish and Wildlife Service, Midwest Region, Bloomington, MN. 81 pp.