**U.S. Fish and Wildlife Service**

# Ozark Hellbender
## (*Cryptobranchus alleganiensis bishopi*)

## 5-Year Review

Photo credit: Jeffrey Briggler, Missouri Department of Conservation

U.S. Fish and Wildlife Service
Midwest Region

Missouri Ecological Services Field Office
Columbia, Missouri

September 2025

## PURPOSE

The U.S. Fish and Wildlife Service (Service) is required by section 4(c)(2) of the Endangered Species Act (Act) to conduct a status review of each listed species at least once every 5 years. Based on the outcome of the 5-year review, we recommend whether the species should: 1) be removed from the list of endangered and threatened species; 2) be changed in status from endangered to threatened; 3) be changed in status from Threatened to Endangered; or 4) remain unchanged in its current status. If we recommend a change in listing status based on the results of the 5-year review, a separate rulemaking process must be conducted to implement the recommendation.

## GENERAL INFORMATION

| | |
|---|---|
| Species: | Ozark hellbender (*Cryptobranchus alleganiensis bishopi*) |
| Classification: | Endangered |
| Listing History: | 76 FR 61956; November 7, 2011 |
| Critical Habitat: | None Designated |
| Other Associated Rules: | Inclusion in Appendix III of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (76 FR 61978; April 3, 2012) |
| Recovery Planning: | Recovery Plan for the Ozark Hellbender (*Cryptobranchus alleganiensis bishopi*) (USFWS 2021b); Recovery Implementation Strategy for the Ozark Hellbender (*Cryptobranchus alleganiensis bishopi*) (USFWS 2021a) |
| Recovery Priority Number: | 3 |
| Lead Region: | Midwest Region |
| Lead Field Office: | Missouri Ecological Services Field Office (Columbia, MO) |
| Contact Information: | Trisha Crabill; 573-530-7534; Trisha_Crabill@fws.gov |
| Cooperating Field Offices: | Arkansas Ecological Services Field Office (Conway, AR) |
| Cooperating Regions: | Southeast Region |

## REVIEW ANALYSIS

We must use the best scientific and commercial information available when we conduct a 5-year review. Therefore, we solicited information for the review through a Federal Register notice published on January 5, 2024 (89 FR 804806). We received information from the Missouri Department of Conservation (MDC), Arkansas Game and Fish Commission (AGFC), and the Saint Louis Zoo. This review was conducted by the Missouri Ecological Services Field Office with contributions and review by the cooperating field and regional offices and members of the Ozark Hellbender Recovery Planning Team. The primary sources of information used in this analysis include reports to the Service, published literature, data collected by the Service, and information provided by the MDC, AGFC, and the Saint Louis Zoo.

## REVIEW HISTORY

A previous 5-year review for the Ozark hellbender was published on May 8, 2020 (USFWS 2020b) and recommended no change to the species' classification and recovery priority number.

## NEW INFORMATION SINCE THE LAST REVIEW

Below is a summary of the Ozark hellbender's current status and new information since the 2020 5-year review. For a complete review of the species' biology, status, threats, and recovery actions, please refer to the Biological Report for the Ozark Hellbender (*Cryptobranchus alleganiensis bishopi*) (USFWS 2020a).

### Life History

We are aware of no new information that changes our general understanding of the ecology or physiology of adult hellbenders. However, recent information on habitat characteristics of larval eastern hellbenders (*Cryptobranchus alleganiensis alleganiensis*) may provide insight about those of larval Ozark hellbenders. Gilled eastern hellbender larvae, estimated to be 5–8 months in age, were captured from a stream in North Carolina and subjected to in situ and ex situ experiments to assess habitat selection (Unger et al. 2020). The larvae exhibited a strong preference for small cobble with an average length of 137 millimeters (mm) (range 129–150 mm) over gravel with an average length of 41 mm (range 30–56 mm) (Unger et al. 2020). Unger et al. (2020) also found that the larvae were unable to burrow under small cobble when the cobble was embedded 50% in gravel substrate.

A subsequent study in North Carolina found that occurrence of larval eastern hellbenders was positively correlated with the percentage of cobble within a site and the percentage of forested land cover within 1 kilometer (km) of a site and was negatively correlated with the extent of substrate embeddedness (Unger et al. 2021). Rocks under which larvae were found had an average: length of 23 ± 2.4 centimeters (cm), width of 15 ± 1.4 cm, and height of 4 ± 0.4 cm (Unger et al. 2021). The average water depth where larvae were captured was 34 ± 2.3 cm, and most occupied rocks were less than 20% embedded (Unger et al. 2021).

### Taxonomy

No new information is available on Ozark hellbender taxonomy, and we continue to consider the Ozark hellbender to consist of 3 genetic lineages: 1) individuals in the North Fork White River, Bryant Creek, and White River mainstem, 2) individuals in the Spring River, and 3) individuals in the Eleven Point, Current, and Jacks Fork rivers.

### Distribution

Environmental DNA (eDNA) sampling was conducted in 2019 in Missouri in the Black River, part of the Ozark hellbender's presumed historic range, and in the Warm Fork, a tributary to the Spring River. No Ozark hellbender DNA was detected in samples (Crabill 2020, unpublished data). Therefore, at the time of this 5-year review, we consider the species' current range to be the same as it was at the time of listing and the 2020 5-year review (**Figure 1**). Occupied or potentially occupied streams include: North Fork White River, Bryant Creek, the lower portion of the White River mainstem, Spring River, Eleven Point River, Current River, and Jacks Fork River.

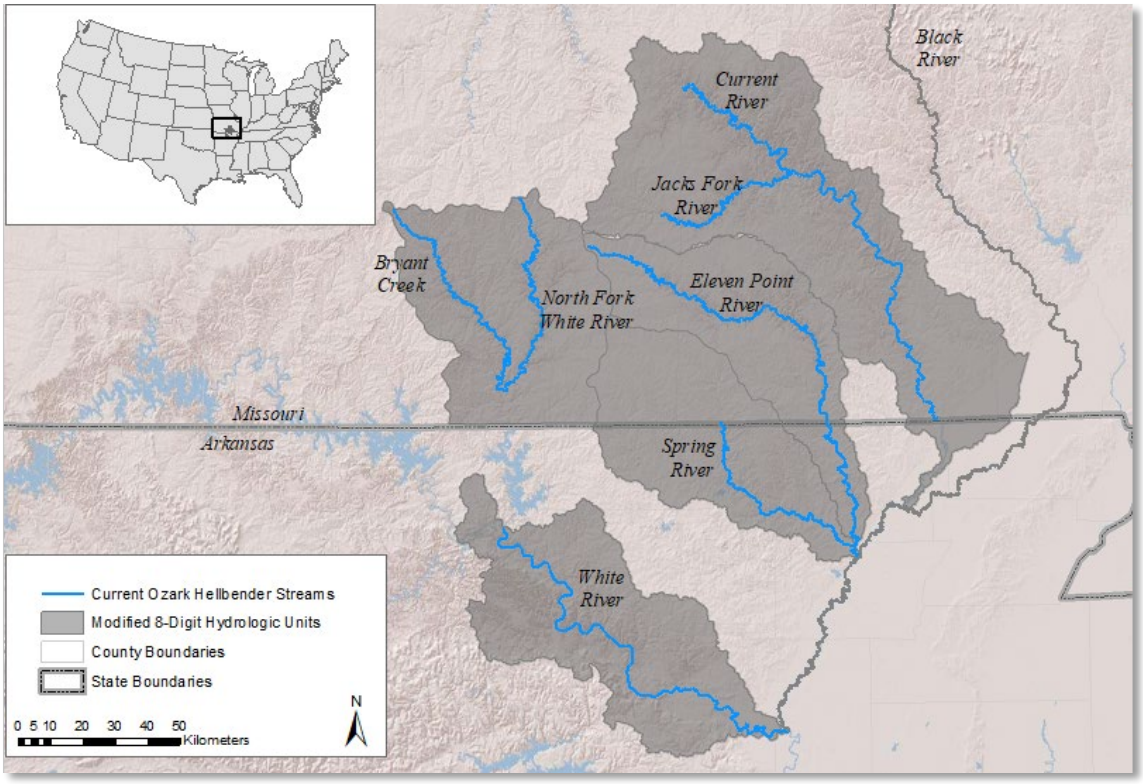


**Figure 1. Streams occupied or potentially occupied by the Ozark hellbender. Individuals occur in discrete habitat patches, rather than throughout the entirety of streams.**

## Status of Populations

New information on Ozark hellbender occupancy and abundance within each river, the health of individuals, and evidence of reproduction and recruitment is described below.

### Occupancy and Abundance

*White River (Mainstem)*

There are no new records of Ozark hellbenders from the White River mainstem, although there have been tentative detections of eDNA from the river (Irwin 2019, pers. comm.).Whether any individuals remain in this river is unknown.

*North Fork White River*

As noted in the 2020 review, extreme flooding occurred in the spring of 2017, resulting in record flooding that significantly impacted Ozark hellbender habitat in the North Fork White River (Briggler 2018). Due to the severity of impacts, the MDC estimated that the number of Ozark hellbenders in the river may have been reduced by over 50% (Briggler 2018).

Results of standardized surveys conducted by the MDC in 2021 in the North Fork White River also support the previous assumption that the population was impacted substantially by the flood. The proportion of surveyed habitat patches in which hellbenders were detected decreased from 65% in 2012 (20 of 31 patches) to 45% in 2021 (14 of 31 patches), representing a 19% decrease in occupancy (Briggler 2024, pers. comm.). The total time to detect a hellbender (at sites with

detections) increased from 103 person hours in 2012 to 177 person hours in 2021 (Briggler 2024, pers. comm.), with the 72% increase indicating abundance also decreased substantially. Results from non-standardized surveys conducted since 2021 also indicate a lower abundance, with less hellbenders observed, including within bedrock crevices that were consistently occupied prior to the 2017 flood (Briggler 2024, pers. comm.). However, detectability of hellbenders was less in 2021 than in 2012 (Briggler 2024, pers. comm.) and environmental DNA (eDNA) sampling in 2022 resulted in positive hellbender detections at several sites in which no hellbenders were observed during the 2021 occupancy surveys (Crabill 2023, unpublished data). Thus, the actual occupancy rate is likely higher than that indicated by the 2021 surveys, with detectability likely reduced due to the substantial changes to the substrate from the 2017 flood.

Although the 2017 flood appears to have reduced Ozark hellbender abundance and the extent of occupancy within the river, the number of egg nests found each year has been slowly increasing since the flood, indicating hellbender breeding is rebounding (Briggler 2024, pers. comm.). However, extreme flooding occurred again in the North Fork White River in November 2024, and the extent of impacts to hellbenders and their habitat is unknown.

The number of adult Ozark hellbenders estimated to currently occur in the North Fork White River is 225 individuals (**Table 1**) ( Briggler 2024, pers. comm).

*Bryant Creek*

During standardized surveys in 2021 by the MDC, Ozark hellbenders were observed in Bryant Creek in 11% of surveyed habitat patches (4 of 35) (Briggler 2024, pers. comm), a decrease from the 20% occupancy rate in 2012 (hellbenders were detected in 7 of 35 patches) (Bodinof Jachowski et al. 2012). The proportion of habitat patches with hellbender detections in 2021 is low given the number of head-started juveniles released in Bryant Creek. However, detectability of hellbenders was less in 2021 than in 2012 (Bodinof Jachowski et al. 2012; Briggler 2024, pers. comm.), and results of eDNA sampling indicate hellbenders may be present at additional sites (Crabill 2023, unpublished data).

Extreme flooding occurred in Bryant Creek in November 2024, but the extent of impacts to hellbenders and their habitat is unknown. The number of adult Ozark hellbenders estimated to currently occur in Bryant Creek is 25 individuals (**Table 1**) ( Briggler 2024, pers. comm.).

*Spring River*

There are no new records of Ozark hellbenders in the Spring River, whether any individuals remain in this river is unknown.

*Eleven Point River*

During standardized surveys conducted by the MDC in 2022, Ozark hellbenders were observed in the Eleven Point River in 46% of surveyed habitat patches (15 of 33) in Missouri (Briggler 2024, pers. comm.), an increase from the 33% (11 of 33 patches) occupancy rate in 2013 (Kelly et al. 2013; Briggler 2024, pers. comm.). Five of the 15 individuals observed in 2022 were juveniles, including one that was 28 grams (Briggler 2024, pers. comm.). Of the 5 juveniles, 3 were likely released, head-started individuals, and 2 were likely a result of natural reproduction (Briggler 2024, pers. comm.). Individuals were also detected at upstream monitoring sites with

no observations since the late 1990s, indicating that head-started individuals released at the sites are persisting.

Since the last 5-year review, efforts by the AGFC in Arkansas have focused on locating egg clutches for head-starting instead of monitoring occupancy and abundance. However, 3-4 adult hellbenders are typically found during annual maintenance and monitoring of artificial nest boxes (Moles and Irwin 2021). The number of individuals observed in nest boxes since the last 5-year review include: 0 in 2021, 3 in 2023, and 2 in 2024 (nest boxes were not surveyed in 2022) (Moles and Irwin 2021, 2022, 2023, 2024). Because no hellbenders were observed in nest boxes in 2021, AGFC and Service biologists non-invasively scanned in 2021 for PIT tags at all 4 sites at which head-started individuals were released in 2017 (Moles and Irwin 2021). An abbreviated survey of suitable habitat was also conducted at 12 sites (Moles and Irwin 2021). During the survey and scanning, only 3 individuals were detected, with 1 being a head-started and released individual (Moles and Irwin 2021). In 2024, surveys were conducted in all areas with previous occurrence records. Despite searching for 87.5 hours, no hellbenders were observed beyond the two individuals located in nest boxes (Bryant 2024, pers. comm.). Information provided by the AGFC indicates that the suitability of hellbender habitat in Arkansas continues to degrade, particularly in downstream sites (Bryant 2024, pers. comm.).

Extreme flooding occurred in the Eleven Point River in November 2024, but the extent of impacts to hellbenders and their habitat is unknown. The number of adult Ozark hellbenders estimated to currently occur in the Eleven Point River in Missouri is 170 individuals (**Table 1**) (Briggler 2024, pers. comm.).

*Current River*

During standardized surveys conducted by the MDC in 2023, Ozark hellbenders were observed in the Current River in 33% of surveyed habitat patches (21 of 63) (Briggler 2024, pers. comm.), a slight decrease from the 35% (22 of 63 patches) occupancy rate in 2014 (Kelly et al. 2014). Of the 21 individuals observed in 2023, 3 were juveniles and 18 were adults (Briggler 2024, pers. comm.). Because none of the juveniles were captured, it is unknown if they represent head-started and released individuals or natural reproduction.

During searches for egg clutches in 2022, a head-started and released male was found in an artificial nest box in the Current River (MDC 2023). The male was reared from eggs collected in 2013 and released in 2019 (MDC 2023). A subsequent assessment of the nest revealed the eggs were in the process of hatching (MDC 2023), indicating that head-started individuals can successfully breed and produce fertilized eggs.

Extreme flooding occurred again in the Current River in Missouri in November 2024. However, impacts to hellbenders and their habitat have not yet been fully assessed. The number of adult Ozark hellbenders estimated to currently occur in the Current River is 350 individuals (**Table 1**) ( Briggler 2024, pers. comm.).

*Jacks Fork River*

Ozark hellbenders have not been captured or observed in the Jacks Fork River since 2007, and eDNA sampling at two sites in 2019 did not result in any positive detections (Crabill 2020, unpublished data). However, given the difficulty in finding hellbenders when few individuals are

present, we presume that there may be a small number of Ozark hellbenders remaining in the Jacks Fork River (**Table 1**).

**Table 1. Ozark hellbender population size estimates from 2006 (Briggler et al. 2007), 2014 (Briggler 2014, pers. comm.), 2019 (Briggler 2019, pers. comm.; Irwin 2020, pers. comm.), and 2024 (Briggler 2024, pers. comm.). Estimates for 2006 do not include individuals less than 1 year in age, and subsequent estimates do not include individuals too small to detect during surveys.**

| River | 2006 | 2014 | 2019 | 2024 |
|---|---|---|---|---|
| White River mainstem | Not estimated | Not estimated | Not estimated | Not estimated |
| North Fork White River | 200 | 550 | 275 | 225 |
| Bryant Creek | | ≤ 30 | ≤ 30 | ≤ 25 |
| Spring River | 10 | Not estimated | Not estimated | Not estimated |
| Eleven Point River in Missouri | 300 | 180 | 150 | 170 |
| Eleven Point River in Arkansas | | Not estimated | 100 | Not estimated |
| Current River | 80 | 350 | 350 | 350 |
| Jacks Fork River | | ≤ 10 | ≤ 10 | ≤ 10 |
| **Total** | **590** | **1,120** | **915** | **780** |

Health of Individuals

Within Missouri, there has been no discernible increase in the prevalence of physical abnormalities or amphibian chytrid fungus on Ozark hellbenders since the 2020 review (Briggler 2024, pers. comm.). To minimize negative effects from stress, the AGFC has reduced the extent to which hellbenders are handled (Moles and Irwin 2024). Therefore, we are unable to determine if the prevalence of physical abnormalities or amphibian chytrid fungus in Ozark hellbenders in Arkansas has changed since the last review.

Reproduction and Recruitment

Ozark hellbender egg clutches continue to be found consistently in Missouri, both in artificial nest boxes or natural habitat (Briggler 2024, pers. comm.). The majority of eggs are usually fertilized (Briggler 2024, pers. comm.), indicating successful breeding and fertilization. The number of egg clutches found in the North Fork White River is substantially lower than before the 2017 flood, but the number is slowly increasing (Briggler 2024, pers. comm.).

Of the 54 Ozark hellbenders detected or captured during MDC standardized surveys in 2021-2023, all but 8 were adults (Briggler 2024, pers. comm.). Three juveniles were observed in the Current River, and 5 juveniles were observed in the Eleven Point River, including one that was 28 grams (Briggler 2024, pers. comm.). Of the 5 juveniles observed in the Eleven Point River, 3 were likely head-started and released individuals, and 2 were likely a result of natural reproduction (Briggler 2024, pers. comm.).

Although egg clutches are consistently found in Missouri and some juveniles were observed during MDC surveys in 2021-2023, the proportion of juveniles observed continues to be much less than during historical surveys. Detectability of juveniles may have been somewhat lower during recent surveys since where possible, MDC uses dive lights during occupancy surveys to minimize habitat disturbance. However, even with that consideration, survey results indicate that recruitment in the wild continues to be limited.

Augmentation Efforts

The MDC and Saint Louis Zoo continue to augment populations with captive-reared individuals and have released close to 2,500 Ozark hellbenders since the last 5-year review (**Table 2**). The total number of individuals released to date is over 9,500. Although the long-term success of the augmentation efforts has yet to be determined, propagated individuals have successfully bred at the Saint Louis Zoo and in the wild (Briggler 2019c, pers. comm.; MDC 2023), indicating propagated individuals are able to successfully reproduce. Results of a telemetry study indicate that subadult head-started Ozark hellbenders also have annual survivorship comparable to that of hellbenders born in the wild (Bodinof et al. 2012). However, survivorship of smaller juveniles and larvae released into the wild remains unknown, and the percentage of the 9,500 released individuals that have persisted is unknown.

**Table 2. The number of head-started Ozark hellbenders released by the MDC into each river since the last 5-year review (Briggler 2021, 2022, 2023, 2024, 2025).**

| Year | North Fork White River | Bryant Creek | Eleven Point River | Current River |
|---|---|---|---|---|
| 2020 | 11 | 283 | 108 | 496 |
| 2021 | 175 | - | 168 | 279 |
| 2022 | 235 | - | 73 | 129 |
| 2023 | - | - | 188 | 335 |
| 2024 | - | - | - | 2 |
| **Total** | **421** | **283** | **537** | **1,241** |

## Threats Affecting the Species

Described below is new information on threats affecting the Ozark hellbender, accompanied by a brief summary of threats.

The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range (Factor A)

The creation of a series of impoundments in the upper White River in the mid-1900s eliminated Ozark hellbender habitat within large sections of the river and degraded habitat in the impoundment tail waters. The impoundments and associated dams also impede hellbender movement and gene flow, as do multiple dams on the lower White River and Spring River.

Ozark hellbender habitat is also affected by sedimentation, which continues to be one of the primary factors affecting populations particularly in the Eleven Point River in Arkansas where sedimentation appears to be increasing (Bryant 2024, pers. comm.). Deposition of excessive

sediment degrades hellbender habitat by reducing the interstitial spaces in substrate used by larvae and subadults as refugia and for foraging the availability of suitable habitat for all life stages. This is supported by new information that indicates larval hellbenders are unable to burrow under embedded cobble and prefer substrate with low embeddedness (Unger et al. 2020, Unger et al. 2021) (see **Life History**).

Overutilization for Commercial, Recreational, Scientific, or Educational Purposes (Factor B)

Information gathered by MDC and Service law enforcement indicates Ozark hellbenders continue to be sought after for the pet trade and medicinal purposes. Thus, unauthorized collection of Ozark hellbenders for commercial sale in the pet trade continues to be a threat.

Disease or Predation (Factor C)

Amphibian chytrid fungus (*Batrachochytrium dendrobatidis*; *Bd*), which can cause a fungal disease that is lethal to amphibians, continues to be present in Ozark hellbender populations. However, prevalence of the fungus does not appear to be increasing (Briggler 2024, pers. comm.). The specific effects of *Bd* infection on Ozark hellbenders remains unclear, but the belief among species experts remains the same as it was at the time of listing and of the last 5-year review - that the *Bd* pathogen may cause some hellbenders to be more susceptible to other infections, including those responsible for lesions and appendage loss, but that there may be additional unknown factors underlying the increased vulnerability.

Ranaviruses are another group of pathogens that infect amphibians, and as noted in the last review, a strain of Ranavirus may be present on some Ozark hellbenders in Arkansas (Miller et al. 2016). However, there is some uncertainty regarding the results given the number of times samples needed to be amplified before Ranavirus DNA could be detected (Crabill 2017, pers. comm.). Hellbenders captured in Missouri continue to be swabbed for Ranaviruses, with no detections to date (Briggler 2024, pers. comm.). To date, *Batrachochytrium salamandrivorans* (*Bsal*), an emerging pathogen capable of causing significant morbidity and mortality in salamanders, has also not been detected on hellbenders in Missouri (Briggler 2024, pers. comm.).

There is no new information regarding predation of Ozark hellbenders by native or non-native predators. However, we expect that Ozark hellbenders within the North Fork White River continue to be exposed to increased predation pressure from large predatory fish stocked in Norfork Reservoir.

The Inadequacy of Existing Regulatory Mechanisms (Factor D)

Some existing regulatory mechanisms provide protection for the Ozark hellbender and its habitat, such as the Lacey Act, inclusion of the species in Appendix III of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), and Federal and State laws to protect water quality. However, sources of sedimentation, such as gravel roads and eroding streambanks, are not regulated and continue to degrade hellbender habitat (see above). In addition, penalties under the Endangered Species Act, Lacey Act, and Missouri Wildlife Code are not effective in deterring illegal collection attempts.

Other Natural or Manmade Factors Affecting Its Continued Existence (Factor E)

At the time of listing, flooding was not considered a major threat to the Ozark hellbender. However, as noted in the last review, a record flood in 2017 substantially impacted hellbenders

and their habitat in the North Fork White River, reducing the number of individuals by an estimated 50% (Briggler 2019, pers. comm.). Though the impacts have not been determined, extreme flooding also occurred in November 2024 in Ozark hellbender rivers in Missouri. The frequency and intensity of extreme precipitation events, such as the ones in 2017 and 2024, are predicted to increase in both Missouri and Arkansas (NOAA 2022a, 2022b). Therefore, we expect there will be an increase in impacts to Ozark hellbender populations from extreme flooding. Impacts may include: 1) increased predation risk from reduced availability of suitable habitat, 2) reduced fitness due to changes in the prey base, 3) disruption of breeding activities, 4) mortality of individuals entombed under deposited gravel or cobble, and 5) injury or mortality of displaced hellbenders.

**Recovery Efforts**

Recovery efforts implemented since the last review or that are ongoing include:

- Population monitoring by the AGFC and MDC in coordination with other partners (the National Park Service's Ozark National Scenic Riverways, the U.S.D.A. Forest Service's Mark Twain National Forest, and the Service).
- Captive propagation by the MDC and Saint Louis Zoo (see **Status of Populations** - Augmentation Efforts).
- Use of artificial nest boxes by the AGFC and MDC to provide nesting habitat for hellbenders in the wild and to also provide an efficient way to collect eggs for captive rearing.
- Conducting eDNA surveys on the North Fork White River and Bryant Creek to complement MDC's standardized surveys. Surveys were a collaborative effort among the Saint Louis Zoo, Service, and MDC.
- Reducing impacts from electrofishing activities used to collect information on fish populations. Since the late 2000s, the MDC has refrained from electrofishing within eastern and Ozark hellbender sites that either have an abundance of individuals or have had evidence of reproduction (such as eggs, larvae, or juveniles). In 2020, the MDC increased the number of hellbender sites at which electrofishing is avoided and began implementing several measures to minimize exposure and impacts.
- Protecting populations by reviewing projects potentially affecting Ozark hellbenders and make recommendations to minimize or mitigate for adverse effects.
- Conducting research that aids Ozark hellbender or eastern hellbender recovery. Additional recent efforts not already discussed in this review include: investigating the effectiveness of eastern hellbender skin peptides and skin mucosome in inhibiting *Bd*, Ranaviruses, and *Bsal* (Cusaac et al. 2021, Pereira et al. 2021), evaluating if inoculation of head-started eastern hellbenders with a diverse skin microbial community increases survival after release into the wild (Kenison et al. 2020), assessing factors influencing production and development of Ozark hellbender eggs (Macklem et al. 2024a), and assessing growth of captive-reared Ozark hellbenders (Macklem et al. 2024b).

**Synthesis**

The Ozark hellbender, one of two hellbender subspecies, occurs in the White River drainage in southern Missouri and northern Arkansas. The main streams in which Ozark hellbenders are found include the North Fork White River, Bryant Creek, Eleven Point River, and Current River, with the species' presence unknown in the White River mainstem and the Jacks Fork River.

Ongoing population monitoring indicates that since the last 5-year review, the extent of sites occupied by Ozark hellbenders is roughly the same in the Current River and has increased in the Eleven Point River in Missouri. However, in the Eleven Point River in Arkansas, hellbender occupancy and abundance continue to decrease, likely from the ongoing degradation of habitat. Population monitoring also indicates the North Fork White River population, once a stronghold for the Ozark hellbender, is still recovering from the extreme flood event in 2017. In all populations, recruitment in the wild appears to still be limited and a large percentage of captured individuals continue to exhibit severe physical abnormalities.

To address the limited recruitment in the wild and population declines, Ozark hellbender populations continue to be augmented with captive-reared young, with almost 2,500 larvae and juveniles released since the last 5-year review. Nests are consistently found in the wild, allowing for the removal of eggs for head-starting, and brood stock consistently breed in captivity at the Saint Louis Zoo. However, the number of released individuals that are recaptured is small and the success of augmentation efforts remains unknown.

While the exact cause of population declines continues to be unclear, the primary threats believed to currently contribute to population declines are habitat degradation and disease, with amphibian chytrid fungus (*Bd*) present in all Ozark hellbender populations. Extreme flooding is now also considered a major threat, with the severity and intensity of extreme precipitation events predicted to increase in both Missouri and Arkansas.

After reviewing the best available scientific information, we conclude that the Ozark hellbender remains an endangered species. The evaluation of threats affecting the species under the factors in section 4(a)(1) of the Act and analysis of the status of the species in our 2020 status review remains an accurate reflection of the species' status.

## ACHIEVEMENT OF RECOVERY CRITERIA

Recovery plans are not regulatory documents and are intended to provide guidance to the Service, States, and other partners on methods of minimizing threats to listed species and on criteria that may be used to determine when recovery is achieved. If the recovery criteria defined in the plan are still valid, meeting recovery criteria can indicate that the species no longer requires protections under the Act. However, when recommending whether a listed species should be delisted, the Service must apply the factors in section 4(a) of the Act (84 FR 45020).

The criteria for down-listing the Ozark hellbender are listed below, and the extent to which each criterion has been achieved is described. The criteria pertain to each of the three Ozark hellbender populations: North Fork White River (which includes Bryant Creek), Eleven Point River, and Current River (which includes the Jacks Fork River).

1. **There is a positive population trend for a 15 year period**.

   The estimated number of adult Ozark hellbenders in the Current River population in 2024 is the same as in 2019 and 2014, and the estimated number in the Eleven Point River in Missouri is higher than in 2014. However, the estimated number in the North Fork White River and Bryant Creek population in 2024 is 18% less than in 2019 and 57% less than in 2014. Thus, this criterion has not been met for each of the 3 populations.

2. **There is evidence of successful recruitment to maintain a sustaining population, with recruitment defined as attainment of sexual maturity by young**.

   A small number of juveniles were observed in Missouri during surveys in 2021-2023. However, the juvenile to adult ratio continues to be much smaller than it was historically, indicating recruitment continues to be limited. This criterion has not been met for any of the 3 populations.

3. **Habitat quantity and quality are sufficient to support all life stages**.

   Sedimentation is continuing to degrade the quality of hellbender habitat, particularly in the Eleven Point River in Arkansas. This criterion has not been met for any of the 3 populations.

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**.

   While the rate of occupancy increased slightly in the Eleven Point River in Missouri between 2013 and 2022, occupancy decreased slightly in the Current River/Jacks Fork River population between 2013 and 2022 and substantially in the North Fork White River/Bryant Creek population between 2012 and 2021. Thus, this criterion has not been met for each of the 3 populations.

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

   The exact cause of population declines continues to be unclear. Thus, this criterion has not been met.

## RECOMMENDATIONS FOR FUTURE ACTIONS

Below are the recommended future actions for the next 5 years:

- Evaluate larval survivorship to determine if low larval survivorship is contributing to the limited recruitment observed since the 1970s.
- To stabilize populations until factor(s) causing the declines can be better understood, continue to augment populations with head-started individuals from captive breeding and from eggs collected from the wild.
- Continue to augment nesting habitat with artificial nest boxes.

- Continue to monitor populations while minimizing disturbance to habitat and individuals. This includes evaluations of abundance, size class distributions (to determine if populations are continuing to senesce), health (extent and severity of physical abnormalities), and number of captured individuals that were head-started.
- Conduct eDNA sampling to identify additional areas of occupancy and assess persistence of head-started and released individuals. The U.S.D.A. Forest Service has provided substantial funds to the Service to conduct the sampling, which is scheduled for the fall of 2025.
- Continue to test for amphibian chytrid fungus, Ranaviruses, and any other emerging pathogens.
- Conduct another population viability analysis.
- Initiate a study to further investigate amphibian chytrid fungus. This may include inoculation of head-started young before being released, additional treatment options, and/or an evaluation of what life stages are most vulnerable to the fungus (to determine if the fungus is one of the primary factors contributing to population declines).
- Continue to reduce sedimentation entering streams by working with Federal agencies through the section 7 consultation process and with private landowners through existing landowner incentive programs.
- Pursue funding for one or more watershed assessments to identify areas contributing the highest amount of sediment (eroding streambanks, gravel roads, etc.).
- Continue to investigate potential factors contributing to declines by 1) determining if amphibian chytrid fungus causes high mortality during early life stages, 2) investigating depth of substrate mobilized during flood events to determine if larvae may be injured during these events, 3) investigating any other potential factors that may be discovered.

## RESULTS OF STATUS REVIEW FOR THE OZARK HELLBENDER (*CRYPTOBRANCHUS ALLEGANIENSIS BISHOPI*)

Current Classification: Endangered

Status Recommendation:

____ 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

Approve JOHN WEBER Digitally signed by JOHN WEBER Date: 2025.09.09 11:06:01 -05'00' _____

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

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