Ozark cavefish
(*Amblyopsis rosae*)

5-Year Status Review:
Summary and Evaluation

U.S. Fish and Wildlife Service
Southeast Region
Arkansas Ecological Services Field Office
Conway, AR

July 2024

5-YEAR STATUS REVIEW
Ozark cavefish (*Amblyopsis rosae*)

GENERAL INFORMATION

Current Classification: Threatened

Lead Field Office: Arkansas Ecological Services Field Office, Pedro Ardapple (501) 513-4470

Lead Regional Office: Southeast Region, Carrie Straight, (404) 679-7226

Cooperating Field Office(s):
Kris Budd, Missouri Field Office, 573-507-8924
Kevin Stubbs, Oklahoma Field Office, 918-382-4501

Cooperating Regional Office(s):
Midwest Region, Bloomington Minnesota, Laura Ragan, 612-713-5157
Southwest Region, Albuquerque New Mexico, Angela Anders 505-248-7953

Date of original listing: December 3, 1984 (49 FR 43965; November 1, 1984)

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 (50 CFR 424.11). The U.S. Fish and Wildlife Service (Service) evaluated the best available information about the Ozark cavefish biology, habitat, and threats to inform this status review.

We announced initiation of this review in the Federal Register on May 11, 2023 (88 FR 30324) with a 60-day comment period and received no comments. The primary sources of information used in this analysis were the 1984 final listing rule (49 FR 43965), the 1989 recovery plan, peer-reviewed reports, agency reports, unpublished survey data and reports, and personal communication with recognized experts. This review was completed by the U.S. Fish and Wildlife Service, Arkansas Ecological Services Field Office, Conway, Arkansas. All literature and documents used for this review are on file at the Arkansas Field Office. All recommendations resulting from this review are the result of thoroughly reviewing the best available information on Ozark cavefish.

FR Notice citation announcing the species is under active review:
May 11, 2023, (88 FR 30324)

Species' Recovery Priority Number at start of 5-year review (48 FR 43098):
5C. Ozark cavefish is a species with a high degree of threat and low recovery potential. The "C" indicates that the recovery of the species "are, or may be, in conflict with construction or other development projects or other forms of economic activity."

Review History:

Two previous 5-year reviews recommending no change in status were signed on September 19, 2011 (Service 2011) and August 09, 2019 (Service 2019).

REVIEW ANALYSIS

Listed Entity

Taxonomy and nomenclature

Niemiller (2011) suggested resurrection of the genus *Troglichthys* for the Ozark cavefish based on eye histology, phylogenetic analyses, and rhodopsin evolution. This taxonomic update was further supported by a peer reviewed publication Niemiller et al. (2013) and the American Fisheries Society's Common and Scientific Names of Fishes from the United States, Canada, and Mexico (Page et al. 2023). This updated nomenclature (i.e., the genus change from *Amblyopsis* to *Troglichthys*) does not impact our assessment of the listed entity (e.g., does not change its distribution, biology, life history, or threats), and it is still considered a valid entity by the Service. Until we finalize a technical correction of the name, we will continue to reference the species using the name as it was listed.

Distinct Population Segment (DPS) (61 FR 4722)

The Act defines species as including any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate wildlife. This species was not listed as a DPS, and we have no new information that would indicate the species should be listed as a DPS under the Service's 1996 DPS Policy.

Recovery Criteria

Recovery Plan

Ozark Cavefish Recovery Plan, November 14, 1989

Recovery plans are not regulatory documents. They 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 Ozark Cavefish Recovery Plan states: recovery will be achieved when:

(1) nine caves and important components of their recharge areas are protected, including Cave Springs Cave, Arkansas, and

(2) the cavefish population in each of these caves remains stable or increasing as evidenced by systematic observations over at least a 10-year period.

Recovery Criterion 1 has been partially met. The entrance and some portion of the recharge areas of four Oklahoma sites, ten Missouri sites and four Arkansas sites are owned by conservation

organizations, including Cave Springs Cave. However, important contributing portions of Cave Springs Cave are not protected. Recovery Criterion 2 has not been met as survey results at Cave Springs Cave and one other site (Logan Cave) are indicative of declining population and the very limited number of fish observed at all other sites make trend analysis inconclusive at those sites.

Biology and Habitat Summary

Ozark Cavefish distribution is restricted to karst groundwater habitats of the Springfield Plateau geologic province of Arkansas, Missouri, and Oklahoma (Figure 1). The Springfield Plateau encompasses approximately 21,000 km^2 and drains the White, Neosho, and Osage rivers.

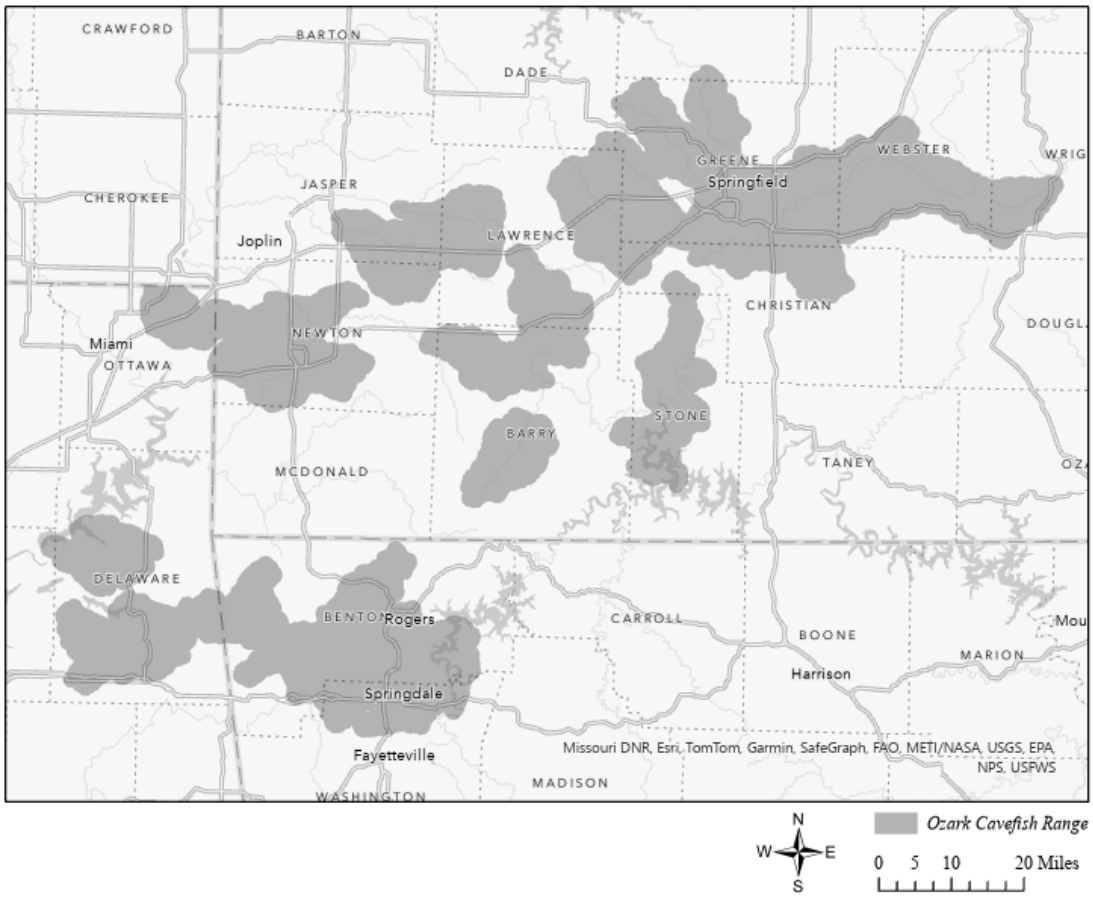

Figure 1. Species range map of Ozark cavefish in northwest Arkansas, northeast Oklahoma and southwest Missouri.

Ozark cavefish are small fish reaching a maximum total length of about 75 mm (3 inches). Ozark cavefish lack pigment and appear pinkish-white because their translucent skin reveals blood and organs. Their eyes are vestigial and there is no remnant of the optic nerve in adults. The lower jaw slightly protrudes, and the head is flattened. Dorsal and anal fins are located further forward than other fishes and there are no pelvic fins. The caudal fin is rounded and has two to three rows of sensory pits (papillae) on the lower and upper halves. They can be differentiated from non-cave adapted surface fish in the field by the absence of pelvic fins, pigment, and eyes. It is difficult to distinguish the Ozark cavefish from other cavefish species in the field. Separation of cavefish species is based on differing degrees of cave adaptation and genetics. Ozark cavefish differ from the Southern cavefish (*Typhlichthys subterraneus*) and Northern cavefish (*Amblyopsis spelaeus*) in the

absence of a postcleithrum bone, and in the arrangement of cutaneous sense organs, and number of dorsal, anal, and caudal rays (Poulson 1961; Service 1989; Romero 1998).

Specific breeding habits of Ozark cavefish are unknown, including the number of eggs produced and whether they mouth brood or not. While reproductive season is not documented, young-of-year (based on size) were captured in July and January (Boyd 1997; Service 2019). Efforts to record general size categories of individuals have been made at Logan Cave and Cave Springs Cave. These data are indicative of ongoing recruitment at both sites (Figures 2 and 3). Recruitment has not been evaluated at other sites due to low rates of detection.

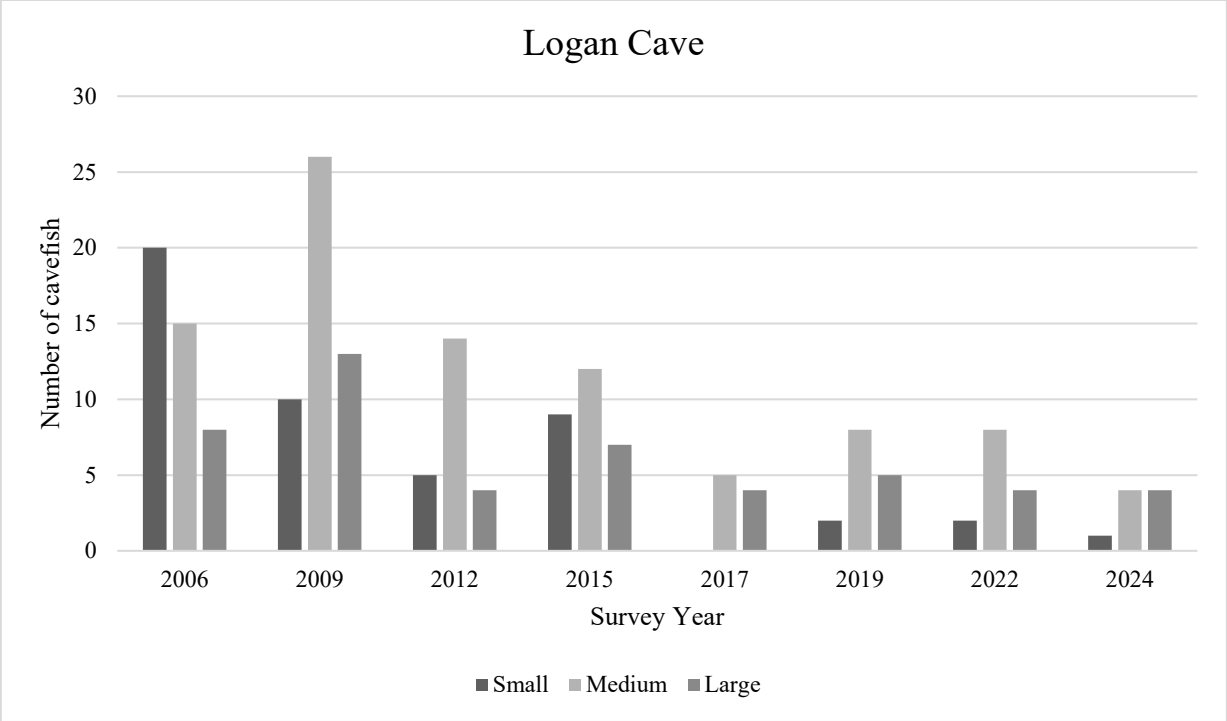

Figure 2. Number of Ozark cavefish at Logan Cave by size class from 2006 to 2024. Small represents Ozark cavefish under 1 inch in length, medium represents individuals between 1 and 2 inches and large represents individuals over 2 inches.

Ozark cavefish are easily observed in the cave streams at Cave Springs and Logan Caves, but access to most of the other known locations is limited or not possible due to the inability of humans to access most karst groundwater habitats. Limited accessible habitat coupled with low prevalence of individuals at most sites means that surveys provide little to no indication of population trends. Surveys at Cave Springs and Logan Caves result in the detection of more Ozark cavefish than all other locations combined and provide an indication of population trends within the accessible portions of those sites. Surveys at Logan Cave and Cave Springs Cave are conducted biennially but were not historically standardized. Surveys are believed to have been standardized by 2013 and are indicative of a decreasing population at Cave Springs Cave and Logan Cave post standardization but additional years of data are needed (Figures 2 and 3).

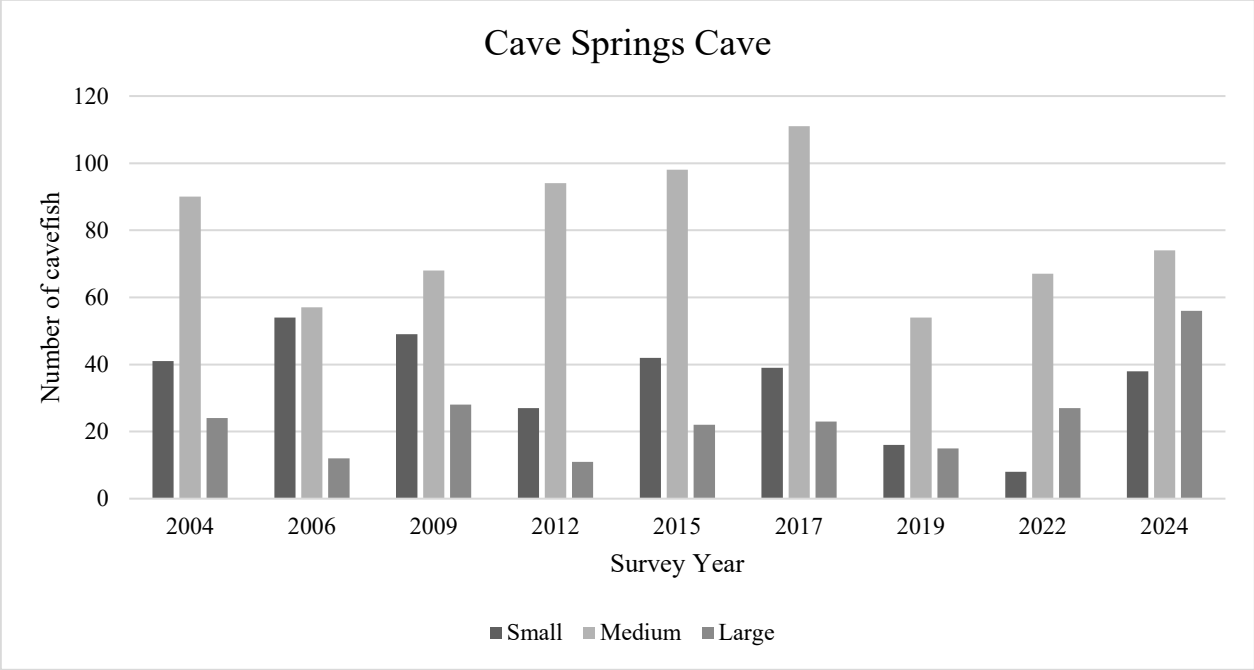

Figure 3. Number of Ozark cavefish at Cave Springs Cave by size class from 2004 to 2024. Small represents Ozark cavefish under 1 inch in length, medium represents individuals between 1 and 2 inches and large represents individuals over 2 inches.

The number of locations with current detections may provide a better indication of species persistence than counts at individual locations. For the purposes of this five-year review, current Ozark cavefish locations are defined as sites where Ozark cavefish have been observed or detected via eDNA (environmental DNA) within the past 10 years. The Service currently has records of 74 Ozark cavefish locations. About 51% of those known locations (38 of 74) are locations where the species has been seen since 2015. Of those 38 locations, 7 are in Arkansas, 3 are in Oklahoma and 28 are in Missouri (Table 1). Since the last five-year review, 4 new locations have been discovered in Arkansas and 12 have been discovered in Missouri (denoted in Table 1 with an asterisk). No new locations have been identified in Oklahoma. Due to the limited ability of Ozark cavefish to disperse into new habitats, all new locations are believed to be previously overlooked. In addition, once an entire population is extirpated, they are typically not expected to recolonize those sites.

Thirty six of 74 known Ozark cavefish locations do not have current detections. Whether some or all of those 36 sites are extirpated is undetermined. Survey feasibility and effort varies widely between sites. Some of those sites are readily surveyed via walkable stream passage while at other sites detection is dependent on high flow events to flush fish into areas where they can be seen. Many sites are completely inaccessible to humans and at least Ben Lassiter Cave, Mule Hole Sink and Monte Ne Sink have been intentionally filled by landowners so that access cannot be obtained.

Table 1. Ozark cavefish survey data from sites with positive eDNA or visual counts from 2015 to 2024. Blank cells represent years when a survey was not conducted for the respective site. Positive eDNA survey results are represented by the + symbol. This table does not include an additional 36 locations where we have historical records but no current records of Ozark cavefish. New sites found from 2019-2024 are denoted with an asterisk. Caves with a "^" indicates that the cave's recharge area is known.

State	Cave Name	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
AR	Cave Springs	162		173		85			102		168
AR	Logan	28		9		14			14		9
AR	Civil War			1							
AR	Elm Springs Upwelling*						1				
AR	Sewer Line Excavation*^						9				
AR	PBA01082020b Spring Box*^						2				
AR	PBA20211210b Shores Well*^							1			
OK	Jail			1							
OK	Mitchell				1						
OK	Star				1						
MO	Brown Spring*^					+	+	+			
MO	Buddy Well^		2	1							
MO	Capps Creek Well 1		6			+	+	+		0	
MO	Capps Creek Well 2		1			+		1		2	
MO	Cave Spring							+			
MO	Fitzpatrick Cave	1					0	0			
MO	Baynham Branch Population, Forbes Spring*					+					
MO	Baynham Branch Population, Gary Well*					+		+			
MO	Gentry Cave^										
MO	Baynham Branch Population, Glen Brown Spring*					+	+	+			
MO	Harris Spring*^									+	
MO	Harrison aka Faye Valley		7				12				
MO	Hayes Spring Cave					+		1		+	
MO	Baynham Branch Population, Hensen Spring*					+		+			
MO	Higgins Well*^							+			
MO	Hilldale Cave*^					+		+			
MO	Johnson's Well	9		0				1			
MO	Kellhofer's Cave						1				
MO	Kenny Cave					+		6			
MO	Lewis Well*^							+			
MO	Low Water Bridge Cave*^										2
MO	McHahan Spring Box*^					+				+	
MO	Natural Bridge Cave*^							1			
MO	Poor Well		4	1				0			
MO	Sarcoxie		8				0				
MO	Turnback Creek									2	
MO	Walbridge Spring		1				3				
MO	Wilsons					0		+			

Threats (Five-Factor Analysis) Summary

The status of a species is determined from an assessment of factors specified in section 4 (a)(1) of the Act. A summary of this assessment by factor is detailed below.

Factor A. The present or threatened destruction, modification, or curtailment of its habitat or range.

Because Ozark cavefish occur in underground environments that are typically inaccessible to humans it is difficult to assess Factor A. Due to the fact that the species has evolved to exist in relatively stable karst groundwater (Service 1989), and karst landscapes are characterized by rapid contribution of water from the surface to groundwater systems (Greene et al. 2006, De Waele et al. 2011), the best indicator of destruction, modification or curtailment of its habitat are activities occurring on the landscape above known populations that are likely to impact water quality. A natural forested landscape reduces contribution of contaminants to karst groundwaters via reduced uptake of contaminants and increased filtration of water prior to entering karst systems. Land conversion from natural forested landscapes to urban or agricultural uses typically increases the risk of contamination of karst water resources from sedimentation, chemicals and nutrification resulting in reductions in viability of the species in those areas. Therefore, we provide an assessment of land conversion by five year interval using the National Land Cover Database for all populations with delineated recharge areas. Due to the large number of populations with delineated recharge areas and the significant difference in land use between areas in Arkansas, Oklahoma and Missouri, we conduct this assessment at the state level. Due to the presence of over 60% of all documented Ozark cavefish records occurring in Cave Springs and Logan Caves we also conducted a site level assessment of threats at Logan Cave and Cave Springs Caves. Overall, across the range of Ozark cavefish, a portion of the habitat in the recharge areas continues to be converted from forested to developed or other habitat types increasing the risk of contamination of karst water resources from sedimentation, chemicals and nutrification resulting in reductions in viability of the species in those areas.

Ozark Cavefish Recharge Areas in Arkansas

Land in Arkansas Ozark cavefish recharge areas (31,421 acres) is primarily hay/pasture (44%), with a lower percentage being developed lands (33%) and a significantly smaller portion consisting of forest, scrub or herbaceous lands (23%). Forested area in the Arkansas Ozark cavefish recharge areas decreased a total of 15% from 2001-2021 (Table 2a, National Land Cover Database 2021). Over the same time interval developed land in the recharge areas in Arkansas increased a total of 85% (Table 2b; National Land Cover Database 2021).

Table 2a. Percent changes in forested area in recharge areas of Ozark cavefish (National Land Cover Database 2021).

Area	Changes in Forest from 2001-2006	Changes in Forest from 2006-2011	Changes in Forest from 2011-2016	Changes in Forest from 2016-2021	Total Forest Change from 2001-2021
Arkansas	-6%	-2%	-1%	-7%	-15%
Oklahoma	-2%	-2%	1%	-3%	-6%
Missouri	-2%	0%	1%	-1%	-2%

Table 2b. Percent change in developed area within Ozark cavefish recharge areas (National Land Cover Database 2021).

Area	Changes in Developed Land from 2001-2006	Changes in Developed Land from 2006-2011	Changes in Developed Land from 2011-2016	Changes in Developed Land from 2016-2021	Total Forest Developed Land from 2001-2021
Arkansas	39%	9%	4%	18%	85%
Oklahoma	3%	1%	1%	13%	19%
Missouri	2%	4%	1%	14%	22%

Ozark Cavefish Recharge Areas in Oklahoma

Land in Oklahoma Ozark cavefish recharge areas (39,714 acres) is primarily forest, scrub or herbaceous (57%), with a lower percentage being hay/pasture (37%) and a significantly smaller portion being developed (6%). Overall, forested area in Oklahoma Ozark cavefish recharge areas has decreased 6% from 2001-2021 (Table 2a; National Land Cover Database 2021). Over the same time intervals developed land in recharge areas in Oklahoma increased 19% (Table 2b; National Land Cover Database 2021).

Ozark Cavefish Recharge Areas in Missouri

Land in Missouri Ozark cavefish recharge areas (293,475 acres) is primarily hay/pasture (50%), with a lower percentage being forest, scrub, or herbaceous (34%) and a smaller portion being developed (15%). Forested area in Missouri Ozark cavefish recharge areas declined 2% between 2001 and 2021 (Table 2a, National Land Cover Database 2021). Developed area in Missouri Ozark cavefish recharge areas increased 22% over the same time interval (Table 2b; National Land Cover Database 2021).

Cave Springs Cave

Cave Springs Cave has the highest counts of any surveyed Ozark cavefish population. Approximately 57 acres of the Cave Springs Cave recharge area (0.4% of the total 12,424 acres) is owned by Arkansas Natural Heritage Commission (ANHC) and the fenced entrance is owned by the Illinois River Watershed Partnership. Aley and Goers 2023 defined vulnerability classes for recharge areas based on soil treatment capabilities, slope, proximity and other factors. All 57 acres owned by ANHC are contained in the extremely high vulnerability area, but protected property represents only 2.6% of the extremely high vulnerability area and 0% of the high, moderate and low vulnerability areas.

From 2010 to 2022, the human population in Benton County increased 36.1% (USA Facts 2022) and urban development is occurring throughout the recharge area. Historical confined animal feeding operations in the recharge area have been completely removed due to the rapid urban development (Aley and Goers 2023). Typically, new subdivisions built in the recharge area are serviced by public sewer systems, but some new homes and many older homes are serviced by onsite septic systems. Contamination of groundwater from malfunctioning septic drain fields, failure of public sewer system lift stations and lines, and toxic pollutants associated with urban development and urban stormwater runoff continue to pose a threat within the Cave Springs Cave recharge area (Aley and Goers 2023).

Logan Cave

Logan Cave has the second highest count of any surveyed Ozark cavefish population. Approximately 124 acres of the Logan Cave recharge area including the gated and fenced cave entrances are owned by the Service and the Nature Conservancy, but protected property represents less than 0.5% of the extremely high vulnerability area and 0% of the high, moderate and low vulnerability areas as defined in Aley and Goers 2023. The total protected area is 1.6% of the 7,507 acre recharge area. Aley and Goers (2023) of Ozark Underground Laboratory conducted a review of hazards at biologically significant springs and caves in Arkansas and identified the following hazards within the Logan Cave recharge area:

1) agricultural uses, including 36 confined animal feeding buildings and spreading of animal waste on fields,
2) onsite sewage disposal (septic),
3) subdivision of lots for housing development that will be serviced by septic,
4) one transportation/transmission route.

The number of confined animal feeding operations in the recharge area decreased since last assessed in 1985 (Aley and Goers 2023), but are still present in the moderate, high and extremely high vulnerability areas. Houses with septic systems are located in all vulnerability areas and risk contamination of groundwater from leaky septic drain fields and toxic pollutants from human activities. As previously noted, from 2010 to 2022 the population in Benton County increased 36.1% (USA Facts 2022). Subdivision of land is occurring throughout the Logan Cave recharge area. Subdivision is most prevalent in the northwestern portion of the Logan cave recharge area which is located in the high vulnerability area.

Factor B. Overutilization for commercial, recreational, scientific, or educational purposes

Overutilization for commercial, recreational scientific or educational purposes is not considered a significant threat at this time. This is due to a naturally occurring lack of or limited accessibility to many of the populations, gates or fences that control access on 21 Ozark cavefish sites and ownership of access points to 19 Ozark cavefish locations by conservation organizations.

Factor C. Disease or predation

Disease or predation is not considered a significant threat. Cave species' endemicity suggests that the potential exists for transport of unknown parasites or diseases from cave to cave by researchers or recreational cavers, but this has not been documented for Ozark cavefish and it is a standard protocol that all cave gear be cleaned and decontaminated before biennial surveys. We have no evidence of predation on Ozark cavefish, although numerous surface crayfish, fish, and small mammals enter caves making predation likely. Regardless, predation is likely minimal and not believed to be a threat to the continued existence of the species.

Factor D. The inadequacy of existing regulatory mechanisms.

Inadequacy of existing regulatory mechanisms is still a significant threat to Ozark cavefish. While surface streams have water quality standards that are monitored and enforced, existing regulatory mechanisms regarding the protection of groundwater resources are limited. State agencies conduct groundwater quality monitoring throughout the species range, but Ozark cavefish sites are not currently included in their scheduled sampling. Similarly, the U.S. Environmental Protection Agency (EPA) has regulations and standards outlining water quality conditions for groundwater based on human health standards. However, EPA regulations and management guidance necessary to protect groundwater from nonpoint source pollution do not exist. "States report that nonpoint

source pollution is the leading current cause of water quality problems. The effects of nonpoint source pollutants on specific waters vary and may not always be fully assessed. However, we know that these pollutants have harmful effects on drinking water supplies, recreation, fisheries and wildlife" (EPA 2023).

The objective of the Federal Water Pollution Control Act, commonly referred to as the Clean Water Act (CWA; 33 U.S.C. 1251 et seq.), is to restore and maintain the chemical, physical, and biological integrity of the nation's waters by preventing point and nonpoint pollution sources and a stated goal that "…wherever attainable, an interim goal of water quality which provides for the protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water be achieved by July 1, 1983." States are responsible for setting and implementing water quality standards that align with the requirements of the CWA. Overall, implementation of the CWA could benefit Ozark cavefish through conservation efforts to minimize point and nonpoint pollution.

Sources of nonpoint source pollution within the recharge areas occupied by Ozark cavefish include timber harvest, use of chemicals, clearing of riparian vegetation, urbanization, road construction, and other practices that allow bare earth to enter streams, sinkholes, and other conduits that transport surface waters, additional organic materials, and pollutants to groundwater systems. Currently, the CWA may not adequately protect Ozark cavefish habitat from nonpoint source pollution. Because there is very little information known about water quality parameters necessary to fully protect cavefish and general water quality conditions at these sites, it is difficult to determine whether the CWA is adequately addressing nonpoint and point-source threats to this species. Given that a goal of the CWA is to establish water quality standards that protect aquatic life, we take a conservative approach in favor of the species and conclude that the CWA regulations are insufficient to provide adequate protection and significantly reduce or remove threats from point-source or nonpoint source pollution.

Factor E. Other natural or manmade factors affecting its continued existence.
Changes in recharge of the Springfield Plateau Aquifer System can lead to substantial changes in water levels within the system, both seasonally and across longer time spans. Research suggests that climate change will impact availability of ground and surface water, but the impacts to specific areas are hard to predict (Kumar 2012). Clark et al. (2019) modeled water levels in the Ozark Plateaus Aquifer system and determined that between 1900 and 2060 water levels in the aquifer will decline between 0 and 24 feet on average. Additionally, climate models in Arkansas, Missouri, and Oklahoma predict increases in extreme heat and increases in intensity of naturally occurring droughts and increases in extreme precipitation events, which could negatively impact ground water availability and create pulses of nonpoint pollution (Runkle et al. 2022, Frankson et al. 2022a, and Frankson et al. 2022b, respectively). If climate change negatively impacts ground and surface water availability in the area or depletion of the aquifer for anthropogenic purposes continues, it may threaten species persistence. In addition, the species' limited range and low genetic diversity are likely to inhibit the ability of Ozark cavefish to adapt to changing habitat conditions.

Synthesis

The Ozark cavefish is a fish species known from cave systems of the Springfield Plateau of the Ozark Highlands in northwest Arkansas, southwest Missouri, and northeast Oklahoma. At the time of listing as threatened in 1984, the Ozark cavefish had disappeared from over 40 percent of its historical locations. The species is now known to be more broadly distributed but has not been detected at 49% of historical locations for at least ten years. The density of individuals observed

during species surveys is low at all sites except Cave Springs Cave, Arkansas. However, the extreme difficulty of conducting surveys and accessing much of the habitat make population estimates and identification of species trends challenging. Populations in the accessible portions of Cave Springs Cave and Logan Cave in Arkansas are indicative of declining numbers. Analysis of all species locations are also indicative of a range-wide long-term decline as evidenced by the lack of detections at 36 of 74 historical locations. Assessment of land use within all Ozark cavefish recharge areas shows loss of forest and a large shift towards developed areas with greater threats. Primary threats to the species include point and nonpoint source contaminants from onsite sewage disposal (septic fields and sewage lagoons), failure of sewage lift stations and lines, agricultural land practices, urban land practices, discharge of urban storm water and climate change. Because of ongoing threats and current condition of the species, this species continues to meet the definition of a threatened species.

RECOMMENDED FUTURE ACTIVITIES

A detailed discussion of recovery actions and criteria are presented in the Recovery Plan (Service 1989). In the course of this status review new and/or targeted potential recovery activities were identified and are included below.

- Delineation of recharge areas for caves/springs not previously delineated (see Table 1) should be conducted, we recommend prioritizing PBA01082020b, PBA20211210b and the Bentonville sewer line excavation.
- Additional work should be focused on perpetual protection of lands in the recharge areas via a conservation easement or fee-simple purchase. Prioritization should be on buffers of sinking streams and other karst features that contribute surface waters to Ozark cavefish populations.
- Best Management Practices (BMPs) for construction projects in the species range should be updated.
- Genetic research to determine variation between populations.
- Research to assess the impacts of contamination within aquifers within the range of Ozark cavefish.

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RESULTS / SIGNATURES

U.S. Fish and Wildlife Service
Status Review of the Ozark Cavefish (*Amblyopsis rosae*)

Status Recommendation:

On the basis of this review, we recommend the following status for this species. A 5-year review presents a recommendation of the species status. Any change to the status requires a separate rulemaking process that includes public review and comment, as defined in the Act.

____ Downlist to Threatened
____ Uplist to Endangered
____ Delist:
____ *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

Field Office Approval:

Field Supervisor, Arkansas Ecological Services Field Office, Fish and Wildlife Service

Approve JASON HIGHT Digitally signed by JASON HIGHT Date: 2024.08.06 16:59:53 -05'00' _____

COOPERATING REGIONAL OFFICE APPROVAL:
We emailed this 5-year review to regional offices in Regions 2 and 3 for their concurrence prior to finalizing the document. We will retain any comments that we received, as well as verification of concurrence from other regions, in the administrative record for this 5-year review.