

# OZARK CAVEFISH (*AMBLYOPSIS ROSAE*) CONSERVATION IN MISSOURI: A PROACTIVE APPROACH TO RECOVERY

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## Abstract

Missouri Department of Conservation personnel are conducting a three-year project using recharge area delineations for known Ozark cavefish (*Amblyopsis rosae*) sites to reach landowners and implement groundwater protection efforts in Southwest Missouri. A U.S. Fish and Wildlife Service Landowner Incentive Program grant is being used to support these efforts and to protect and recover this species of special concern.

The recharge areas encompassed by this project are variable in both size and degree of development and human disturbance. Various methods are being used to reach people living in these recharge areas. Targeted mailings, special-invitation meetings, telephone contacts, and on-site visits are among the approaches used. Outreach and education efforts are designed to reach highly urbanized populations in some recharge areas and include informational meetings, booths and displays at special events, cooperation with local watershed groups, distribution of promotional materials, newsletter articles, and information distributed through local media outlets.

This project differs from most Missouri Department of Conservation incentive programs in that selected landowners are actively contacted, rather than waiting for landowners to initiate contact. With a unique environment and an unusual and often-misunderstood fish as the focus, the best information and management practices available are used to match the characteristics, problems and limitations at each site.

Landowners in seven recharge areas have received mailings, efforts are underway to secure easements, and Missouri Department of Conservation staff is working closely with partners to promote non-traditional "best management practices" at selected locations. Summaries, examples and case histories are discussed.

Key words: *Amblyopsis rosae*, cavefish, Ozarks, karst land management, Missouri

## Introduction

The Ozark cavefish, *Amblyopsis rosae* (Figure 1), is a stygobite, an aquatic, subterranean organism. Its range is exclusively in the Springfield Plateau region of the Ozarks, which includes parts of southwestern Missouri (Figure 2), northeastern

Oklahoma, and northwestern Arkansas (Pflieger 1975). The small size of the Ozark cavefish, which is not known to exceed 56 mm (2.2 in.), allows it to move about in small cracks in limestone bedrock. *A. rosae* is observed in solution cave streams, springs and wells within karst groundwater of its range. It



**Figure 1** Ozark cavefish, *Amblyopsis rosae*. Photo by Jim Rathert, Missouri Department of Conservation.

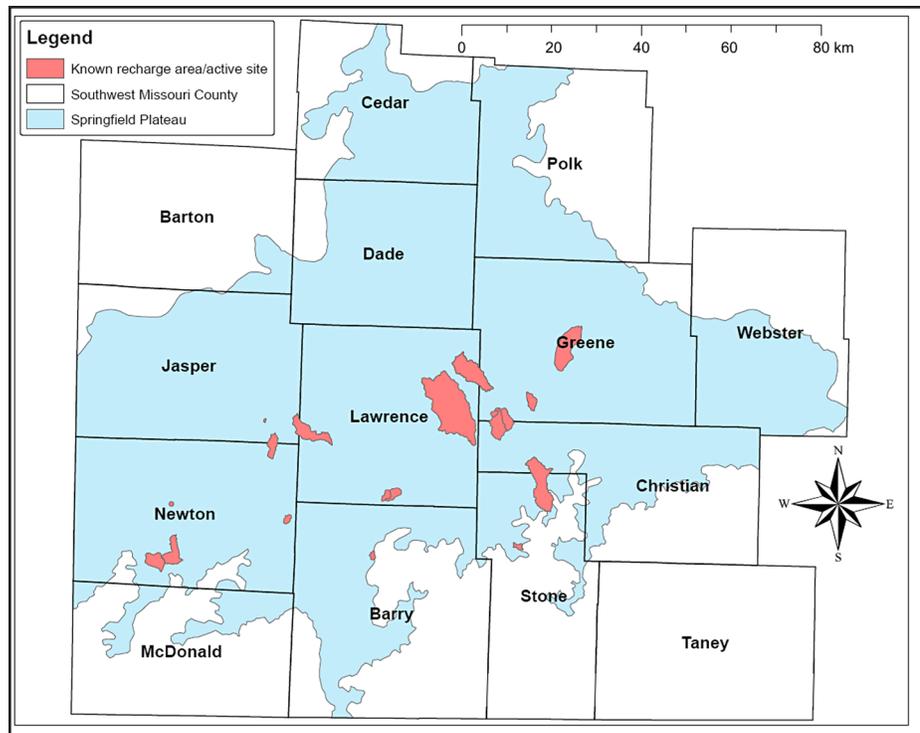
is well-adapted to life in total darkness with no body pigment or eyes, but with sensory papillae located throughout its body that aid in finding food. It is inferred that as few as 20% of females breed and have mature ova in a given year (Poulson 1961, 1963).

The Ozark cavefish is listed as a federally threatened species by the U.S. Department of the Interior (Willis and Stewart 1984), and the Missouri Department of Conservation (Missouri Department of Conservation) lists *A. rosae* as endangered in the state of Missouri (1999). Southwest Missouri contains the majority of the documented active sites for the Ozark cavefish. A site is considered active, not historic, if it is currently accessible and Ozark cavefish have been documented at the location after 1970 (Missouri Department of Conservation 1999).

Missouri Department of Conservation has taken a leadership role in recovery of this species in southwest Missouri. In 1999, Missouri Department of Conservation created "An Action Plan for the Ozark Cavefish (*Amblyopsis rosae*)." This plan

set up a long-range strategy for protecting *A. rosae* in Missouri that centered on identifying and minimizing threats to current populations. The major threats to Ozark cavefish outlined in the Missouri action plan were declining water quality related to groundwater pollution in karst environments, habitat disturbance of cave ecosystems, and loss of stream flows by declining groundwater levels. Since establishment of this action plan, Missouri Department of Conservation has started a water-quality and population-monitoring program, constructed protective structures around active sites, and contracted recharge delineation studies in known, active-site geographies of Ozark cavefish to identify sensitive areas for groundwater and Ozark cavefish protection.

Because of growing threats to these sensitive karst ecosystems in southwest Missouri, Missouri Department of Conservation applied for and received a three-year Landowner Incentive Program (Landowner Incentive Program) Tier 2 Grant from the U.S. Fish and Wildlife Service. The purpose of the grant is to work specifically with private land-



**Figure 2** Range of the Ozark cavefish in Missouri, 2008.

owners within these Ozark cavefish recharge areas to protect the karst groundwater they inhabit from degradation. The federal share of this Landowner Incentive Program grant is \$240,900. This grant allows a unique opportunity for Missouri Department of Conservation to take a more proactive approach to contacting and educating landowners and implementing conservation. As of the start of this Landowner Incentive Program grant, Ozark cavefish were known from 15 specific cave or well locations in southwest Missouri. Thirteen recharge areas have been delineated for known active sites (one recharge area contains two active sites).

## Materials and Methods

As a conservation agency, Missouri Department of Conservation has consistently worked to provide genuine assistance to public and private land managers to preserve fish, forest and wildlife resources for the state of Missouri. One of the most important means by which Missouri Department of Conservation has done this is by offering technical assistance and cost sharing with landowners on conservation-friendly land practices. Most of the day-to-day, private-landowner work that Missouri Department of Conservation coordinates is reac-

tive in nature. A landowner requests assistance, and Missouri Department of Conservation responds promptly and courteously. Even in endangered-species management and recovery, generally an interested or concerned landowner initiates first contact.

Since the Ozark cavefish is unknown and unseen by most of the general public, this reactive approach is not the preferred method. An effective outreach to specific landowners in recharge areas is essential to make these landowners aware of technical, and cost-share assistance available to them. A more proactive approach is needed to ensure better results. The strategy implemented through the Landowner Incentive Program grant utilizes this proactive strategy.

The 13 targeted recharge areas vary in size, shape and land use, but the determining factor deemed most important to planning appropriate landowner outreach to these recharge areas was degree of development. Nine of the recharge areas are rural with the majority of these areas located outside any municipality. The land use in these areas is currently dominated by agricultural practices. The other four recharge areas are considered urban with most of these recharge areas encompassed within the city limits of a growing community. Different

outreach strategies were used for rural and urban recharge areas.

The main method used to accomplish initial outreach in rural recharge areas was sending targeted, direct mailings to area landowners. Names and addresses of property owners within the delineated recharge areas were collected from county courthouse records and used to address postcards sent to the landowners. These postcards invited the landowners to an evening meeting in their community explaining special technical and financial assistance made available through the grant for practices that protect groundwater quality. At the meetings, landowners learned about the relationship between Ozark cavefish and groundwater quality and how specific conservation practices benefit groundwater for both cavefish and people. If landowners were interested, individual site visits/appointments were set up to address groundwater quality protection on their land and develop an individualized plan of action using available cost-share options. A follow-up mailing was sent to those unable to attend within two weeks after the landowner meeting. This was done to ensure that all landowners within the recharge area had ample opportunity to learn about the cost share available. Interested landowners could then contact Missouri Department of Conservation via telephone or e-mail.

This direct mailing approach was not plausible or cost-effective in reaching landowners in the urban recharge areas. Also, since the property owners associated with these urban recharge areas generally owned lots smaller than 2 ha (5 ac.) in size, it was less likely that these urban landowners would require a detailed, cost-shared conservation agreement. As a result, general education on groundwater quality protection practices, not establishment of larger, cost-shared conservation practices, was the main outreach goal to these urban landowners.

To accomplish this education, Missouri Department of Conservation cooperated with local urban watershed committees, and utilized such outreach opportunities as fair booths, youth programs, and newspaper/newsletter articles. A new Ozark cavefish brochure was created that outlined the importance of protecting Ozark cavefish, and promotional items such as magnets, stickers, rain gauges, and coffee mugs are routinely given away at community events. Also, a variation of the special invitation meeting has been planned for the public

at a local nature center.

One other method employed to reach these urban landowners was the creation of an Ozark cavefish placemat as an outreach tool. The placemat highlights drinking water quality and contains pictures, kids' activities, trivia and useful facts on groundwater protection. It will be made available to restaurants within the urban recharge areas.

## **Results**

To date there have been targeted landowner meetings for seven of the 13 delineated recharge areas in Missouri, with three remaining meetings projected. A total of 43 landowner contacts were made at these meetings. Fifteen people attended the public meeting on Ozark cavefish intended for urban landowners at the Springfield Conservation Nature Center. Follow-up landowner visits have been made to 27 different, individual landowners, and currently seven landowner contracts are pending payment/completion in three Ozark cavefish recharge areas. Nearly 500 targeted landowners have been contacted about the Landowner Incentive Program grant through initial and follow-up mailings. Also, over 7,800 landowners received information on Landowner Incentive Program grant opportunities through published articles in local Soil & Water Conservation District and Farm Service Agency (SWCD/FSA) newsletters. The Ozark cavefish placemat intended for area restaurants is currently under development.

This grant is currently providing opportunities for landowner assistance through a number of nontraditional best management practices including assistance on installation of an advanced septic system, removal of trash from a sinkhole, establishment of two light equipment crossings, and installation of lockable lids for viewable well openings.

Other accomplishments include discovery of two new Ozark cavefish locations. Landowner Incentive Program funding is paying for a recharge delineation of one of these new sites, while alternative funding is currently being sought for the other new site. Landowner Incentive Program is also currently funding a recharge delineation study on a once-historic, newly-active Ozark cavefish site. This site was classified as historic until an old well cap was removed and Ozark cavefish were seen there in May 2006. The current number of active

sites in Missouri is now 18.

Two grant proposals for additional funding were drafted during the first year and a half of this Landowner Incentive Program grant. A recovery land acquisition grant proposal was sent to the U.S. Fish and Wildlife Service for acquisition of an Ozark cavefish site currently on the open market. This grant proposal was unsuccessful. A grant proposal also was drafted for a karst-conservation-easement project through the U.S. Fish and Wildlife Service, which did receive funding of \$400,000. Additional efforts to secure easements are pending.

### **Discussion**

A major benefit realized from working with a proactive, flexible project is the opportunity for Missouri Department of Conservation to cooperate with landowners on projects that are not normally available for cost-share assistance. Federal government programs offered through the United States Department of Agriculture, such as the Conservation Reserve Program (CRP), Conservation Reserve Enhancement Program, Environmental Quality Incentives Program, and Wildlife Habitat Incentives Program, already provide important cost-share assistance to landowners on a variety of conservation practices. The Landowner Incentive Program grant has ultimately been used to fill in the gaps where these other land management assistance programs have no program available to assist landowners. Conventional best management practices have been utilized and promoted through the Landowner Incentive Program grant and will continue to be, but other specific, alternative groundwater protection projects are being funded through this grant as well. Two examples follow of how this grant has assisted landowners with management goals when other programs cannot.

### **Mary Turton Project**

Mary Turton was first invited, by mail, to a landowner meeting in her area. Miss Turton attended the meeting, and made plans for a future site visit on her property in eastern Lawrence County with an Missouri Department of Conservation biologist. At the meeting, plans were agreed upon between Miss Turton and Missouri Department of Conservation to partner with Landowner

Incentive Program funds to restrict livestock access from five sinkholes on her property. One of the sinkholes has been used as a place to dump trash, including scrap metal and old tires, by the previous landowner. Part of Miss Turton's project plan with Missouri Department of Conservation is to remove the trash from the sinkhole and properly dispose of it in an effort to protect groundwater quality.

### **Charles Johnson Project**

Prior to receiving funding through the Landowner Incentive Program grant, Missouri Department of Conservation initiated direct contact with Mr. Charles Johnson after determining that an historic Ozark cavefish site was located on his property. Efforts were successful in confirming the presence of *A. rosae* and constructing a viewable entrance to the site, while maintaining protection from direct disturbance. As dye tracing was being done to determine the recharge delineation for the new active site in southern Lawrence County, Missouri, a dye-trace from Mr. Johnson's toilet proved that his nearby failing septic system is hydrologically linked to the Ozark cavefish site. Landowner Incentive Program funds are currently being used to remove the old system and install a new, advanced, waste-treatment system to eliminate direct groundwater contamination caused by the old system. The efficiency of the new system will be quantified through additional dye-tracing analyses.

These unconventional practices for groundwater protection in Ozark cavefish recharge areas would not be eligible for cost-share assistance under any other program, but the benefits of these practices should not be overlooked. Cleaning and protecting a sinkhole which provides a direct conduit to karst groundwater and fixing a failing septic system directly minimize pollution into the karst environment associated with these recharge areas. In the case of the advanced septic system installation, the pre- and post-project dye tracing analyses provide a rare opportunity to measure the amount of contamination that is being prevented from entering the Ozark cavefish active site. The installation of this advanced septic system is the first of its kind to be installed within the county and it will serve to demonstrate the effectiveness of advanced septic treatment within sensitive karst areas. These projects, along with implementation of more conventional conservation practices, should have a

direct, positive impact on Ozark cavefish and other karst fauna.

One challenge to installing a major septic-system renovation is the cost. Cost sharing on projects like this takes up a substantial percentage of the Landowner Incentive Program money available for other cost share projects. One question is, "Should money be used on these larger projects?" Smaller projects allow for a larger volume of projects to be implemented in many different recharge areas, allowing a larger number of individuals to participate in a cost-share conservation practice. Conversely, large projects have the capacity to provide solutions to large groundwater pollution problems. Large projects that help fulfill the goals of the grant should not be overlooked simply because they require more funds than smaller projects. With this Landowner Incentive Program grant, if a significant groundwater threat could be neutralized, funds were utilized to minimize the threat. This is another benefit of administering a flexible Landowner Incentive Program grant.

As noted in the results, two new Ozark cavefish locations have been discovered since the start of the grant. This has been an unexpected, positive benefit of the proactive outreach approach. To find a new site location, first a cave, spring or well opening to the groundwater must be found within the Ozark cavefish's range. Not knowing the location of caves, springs and wells containing adequate habitat on private property makes an already state-endangered species even harder to find. Actively contacting and communicating with area landowners has opened lines of communication between Missouri Department of Conservation personnel and landowners who own or have knowledge of features with direct access to the groundwater. Through investigation of leads from informed landowners, not only have

new active sites been documented, but successful landowner partnerships have been forged.

Progress will continue with this grant, utilizing this proactive outreach approach until the grant's scheduled end date of March 31, 2009. Grant objectives and goals are currently being met and a complete final report will detail all accomplishments mentioned in this paper and those yet to be attained.

## Acknowledgments

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