

**Title: Targeting and facilitating conservation efforts for two Arkansas darters: *Etheostoma cragini* and *E. microperca*.**

**Summary:** This project will seek to establish a mechanism to target and implement conservation easements and land acquisitions to benefit two of the rarest darter species in the state, the Arkansas darter (*E. cragini*) and least darter (*E. microperca*). In order to accomplish effective targeting, the status of historic least darter populations must be assessed and monitoring efforts for Arkansas darters must be implemented. Due to potential genetic diversity among Arkansas darter populations, baseline genetic data is needed to determine the most effect geographic scale for conservation efforts.

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**SWG Funds Requested:** \$35,698

**Amount and Source of Matching Funds:** \$37,493 (50%+) from Saint Louis University, The Nature Conservancy, and Arkansas Game and Fish Commission.

**Total Project Cost:** \$73,191

**Date Submitted:** January 9, 2008

**Need:**

*Etheostoma cragini* is one of the rarest fishes in Arkansas and has been designated as a candidate for listing under the Endangered Species Act. It was first found in the state in 1979 in Wilson Spring near Fayetteville. Harris and Smith (1985) found the species at five locations, three of which persisted more recently (Hargrave and Johnson 2003). Surveys in 2004-2005 (Wagner and Kottmyer 2006) confirmed persistence at these three locations and identified additional nearby locations, while failing to discover new populations outside the general area of the historic sites. A survey in Oklahoma (Echelle and Fisher 1996) found *E. cragini* at fourteen localities and failed to find them at nine of eleven historically known sites. A recent Missouri study (Combes and Winston, in press) found *E. cragini* at 43 sites. The Arkansas State Wildlife Action Plan calls for monitoring of this species biannually and of its habitats annually.

*Etheostoma microperca* is another of the rarest fishes in Arkansas, but is widely distributed outside the state. Harris and Smith (1985) found the species at five locations, two of which persisted more recently (Hargrave and Johnson 2003). Surveys for *E. cragini* in 2004-2005 (Wagner and Kottmyer 2006) confirmed persistence in one of these areas, expanding its distribution to several nearby spring runs, and discovered an additional population near one of the historic sites, but failed to discover new populations outside the general area of the historic sites.

These two species, which coexist in some of their best habitats in Arkansas, are very restricted within the state and vulnerable to extirpation from the Arkansas fauna. Rapid population growth and development in Benton and Washington Counties make the need to document and conserve populations of these rare darters even more urgent.

**Funding Priorities Addressed:**

This project will lay the necessary groundwork to accomplish address funding priority four (to acquire land or easements to protect *Etheostoma cragini* and *E. microperca*, Arkansas and least darters) identified by the Fish Taxa Team and included in the 2008 Request for Preproposals. The project will also address critical data gaps identified in the Arkansas State Wildlife Action Plan and by the Steering Committee in order to most effectively accomplish this funding priority and provide necessary information for on-the-ground conservation by making new information available to biologists and land managers with Arkansas Game and Fish Commission, U.S. Forest Service, and other agencies.

**Location of Work:**

Work will be conducted within portions of the Ozark Highlands ecoregion, within the Ozark Highlands - Arkansas River eco-basin.

**Conservation Priorities Addressed:**

This project will lay the groundwork for accomplishing funding priority four determined by the State Wildlife Action Plan Steering Committee for 2008, namely to acquire land or easements to protect *Etheostoma cragini* and *E. microperca*, Arkansas and least darters. In addition, the project will address following data gaps that impede accomplishing this priority:

1. Status and distribution update for least darter, *Etheostoma microperca*.
2. Establish protocols and conduct monitoring at Arkansas darter habitats.
3. Establish genetic status of Arkansas darter, *E. cragini*, between populations and relative to other species.
4. Determine threats associated with Arkansas and least darter habitats.

**Goal:**

The goal of this project is to establish a mechanism to target and implement conservation easements and land acquisitions to benefit the Arkansas darter (*E. cragini*) and least darter (*E. microperca*). To accomplish this goal, we will assess the status of historic least darter populations, initiate monitoring for Arkansas darters, and examine genetic structuring of Arkansas darter populations.

**Methods:**

GIS software will be used to map the location of known populations of *E. microperca*. Based on previous studies (Harris and Smith 1985; Hargrave and Johnson 2003; Wagner and Kottmyer 2006), the search area will be limited to the Illinois River watershed, specifically springs/tributaries within 2 mile radius of historic least darter locations. Stream habitats within the search area will be sampled to attempt to detect presence and abundance of *E. microperca* and characterize the associated fish community. Voucher specimens will be preserved and identifications verified by Dr. Tom Buchanan at University of Arkansas – Fort Smith. No more than 5 specimens of *E. microperca* will be preserved from new locations and no specimens of *E. microperca* will be taken from historically documented sites.

Recently occupied Arkansas darter sites (Wagner and Kottmyer 2006) will be revisited to establish monitoring protocols. Delineation of occupied habitats will be accomplished as minimum monitoring. In addition, we will evaluate the practicality of more quantified population assessments while minimizing impacts on the species.

For genetic analyses, specimens from all known Arkansas populations of *E. cragini*, representative populations of *E. cragini* range wide, and representatives of closely related species will be analyzed for variation at the cytochrome *b* gene and genotyped at 8 nuclear microsatellite loci.

Sub-basins where the darters occur will be assessed for potential threats to stream habitats. These threats are described in the Arkansas State Wildlife Action Plan. The current statuses of these indicators are unknown, and are recognized as data gaps within the plan. Threat indices will be derived through GIS analyses and field reconnaissance, and include the percent of the sub-basin in urban, impervious, agricultural and forested land-use, density of pollution point sources, paved and unpaved road density, and riparian habitat stability.

Based on threats analyses, landowner tracts where darter habitat occurs will be prioritized for conservation actions. We will then facilitate contact with respective landowners to promote protection and restoration concepts. Where opportunities for land acquisition or conservation easement occur, we will provide information on available programs and assist with landowner negotiations to secure protection of darter habitats.

**Expected Outcomes:**

Data collected will be used to assess the conservation status of *E. microperca*, establish monitoring protocols for *E. cragini*, determine baseline genetic structure of *E. cragini* populations, assess threats relative to these darters, set priorities for habitat restoration and protection, and facilitate the protection, through acquisition or conservation easement, of habitats where these species are found. Papers will be written concerning these species and published in state, regional, or national scientific journals. Data collected will also significantly enhance our understanding of fish distributions in Arkansas and will be incorporated into databases maintained by the Arkansas Game and Fish Commission and the Arkansas Natural Heritage Commission.

**Existing Resources Utilized:**

As reflected in the matching funds portion of the budget below, this project takes advantage of past cooperation between Saint Louis University, The Nature Conservancy, and Arkansas Game and Fish

Commission and builds on recent Arkansas fish studies by the cooperators jointly and independently. All three cooperators contribute expertise in field collection/sampling, threats assessment, land acquisition, and genetic areas of this project. Utilizing lab equipment and personnel resources as contributions by the cooperators directly enhances the project. Necessary reference samples of darter species for comparison to Arkansas populations of *E. cragini* are in Wood's frozen tissue collection at Saint Louis University.

**Proposed Budget:**

<b>Requested SWG Funds:</b>	<b>SLU</b>	<b>TNC</b>	<b>AGFC</b>
Personnel & Fringe:		\$ 9,000.00	\$ 4,000.00
Operating Expenses			
Travel		\$ 1,500.00	\$ 1,000.00
Supplies	\$ 12,225.00	\$ 2,500.00	\$ 1,000.00
Overhead	\$ 1,223.00	\$ 3,250.00	
<i>Subtotal</i>	\$ 13,448.00	\$ 16,250.00	\$ 6,000.00
<b>TOTAL</b>		<b>\$ 35,698.00</b>	

<b>Matching Funds:</b>	<b>SLU</b>	<b>TNC</b>	<b>AGFC</b>
Personnel & Fringe:	\$ 24,693.00	\$ 2,000.00	\$ 8,000.00
Operating Expenses			
Travel			\$ 1,000.00
Supplies			
PCR/Sequencing Equipment (prorated)	\$ 1,800.00		
Overhead			
<i>Subtotal</i>	\$ 26,493.00	\$ 2,000.00	\$ 9,000.00
<b>TOTAL</b>		<b>\$ 37,493.00</b>	

**Brian Wagner** is Nongame Aquatics Biologist with the Arkansas Game and Fish Commission. He has a Masters Degree in Fisheries from Virginia Tech, and has been involved in aquatic conservation and research with the Commission for 18 years. For the past 9 years, he has been the Commission's Nongame Aquatics Biologist. Brian coordinates the Commission's Nongame Aquatics Program and has specific oversight of nongame fish and crayfish efforts. He is a Certified Fisheries Scientist and has authored or co-authored peer-reviewed publications on sport fish, nongame fish, crayfish, reptiles, and amphibians. Brian led the State Wildlife Grants Crayfish Taxa Team, and was also active on the Fish, Cave, and Invertebrate Taxa Teams.

**Dr. Robert Wood** is an Associate Professor at Saint Louis University. He received his Ph. D. from the University of Alabama, and teaches several courses including Evolution, Phylogenetic Systematics, and Aquatic Ecology. The research in his lab focuses on reconstructing phylogenetic/evolutionary relationships among North American freshwater fishes using molecular (i.e. DNA sequence), morphological and allozyme data sets. His primary focus is on two groups of stream dwelling fishes, darters and minnows, though he has also collaborated with AGFC on crayfish investigations. He has published numerous articles on these topics, and has a manuscript in-preparation on molecular systematics of the darter subgenus *Ozarka*, which includes the Arkansas darter.

**Michael Slay** has been working in karst conservation for eight years in the five states that contain the caves and springs of the Ozark Highlands Ecoregion. Before joining The Nature Conservancy as the Ozark Karst Program Director, Mike coordinated karst research during positions held at the University of Arkansas, Buffalo National River NPS, Illinois Natural History Survey, and Missouri Department of Conservation. Since joining The Nature Conservancy, Mike has worked with multiple partners such as US Fish & Wildlife Service, US Forest Service, Arkansas Game & Fish Commission, Missouri Department of Conservation, Oklahoma Biological Survey, and Illinois Natural History Survey to conserve and protect karst species and habitats, including species found in spring habitats. Mike has coordinated the exploration, species monitoring, and habitat analysis in several hundred caves and springs, and he has assisted with the discovery of over 15 karst species new to science. Mike received his undergraduate degree and M.S. in Biology at the University of Arkansas. In addition to conducting karst research and implementing karst conservation actions, Mike has authored and co-authored 10 peer-reviewed journal articles related to the discovery and conservation of karst species.

**Ethan Inlander** has been applying geospatial technologies and physical sciences to conservation issues for over 12 years. He received his undergraduate and master's degrees from the Department of Geography at University of California Santa Barbara. Before joining The Nature Conservancy as the Ozark Rivers Program Director, Ethan applied geographical information systems technology to address multiple scale conservation problems in riparian and coastal habitats of California. Since joining The Nature Conservancy, Ethan has applied these same techniques to identify and reduce impacts and habitat degradation to freshwater stream ecosystems, conduct local, watershed, and regional threat assessments of subterranean environments, and prioritize and implement karst and riverine conservation actions at multiple scales.