

State Wildlife Grant Pre-Proposal

Project Title:

Distribution and Abundance of the Strawberry Darter (*Etheostoma fragi*) in the Main Stem and Tributaries of the Strawberry River.

Project Summary:

The goal of this project is to fill a data gap regarding the distribution and abundance of the Strawberry Darter (*E. fragi*). The Strawberry Darter is a relatively newly described species from the Orangethroat Darter (*E. spectabile*) group. This darter is endemic to the Strawberry River and its tributaries in north central Arkansas. Robison (1998) completed a survey of *E. fragi* in the Strawberry in 1998. The objectives of the current study include (a) resampling of the sites found to be occupied during Robison's survey, in order to determine whether distribution and abundance are stable; (b) sample new tributary sites to determine if the distribution is larger than historical data indicate; and (c) employ multistate occupancy models to determine which habitat variables are associated with sites occupied by *E. fragi*.

Project Leader:

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Project Partners:

Brian Wagner, Nongame Aquatics Biologist, Arkansas Game and Fish Commission - Nongame Aquatics Program, 915 E. Sevier Street, Benton, AR 72015, bkwagner@agfc.state.ar.us, (877) 847-2690

Chris Davidson, Endangered Species Biologist – US Fish and Wildlife Service, Arkansas Field Office, 110 S. Amity Road, Suite 300, Conway, AR 72032, Chris_Davidson@fws.gov, (501) 513-4481

Project Budget:

Item	Yr 1	Yr 2	Yr 3	Total
Total Project Request	26018	27328	12514	65860
Match				
State Non-game Biologist Match (25 h/yr x \$50/h)	1250	1250	1250	3750
UAPB (Unrecovered indirect cost 59.4% of salaries and wages)	10573	11167	5584	27324
Out of state tuition remission (\$221/credit hour)	3094	3094	1547	7735

Project Statement:

a. Need –

The Strawberry Darter is specifically listed in Section 2, page 19 of the Arkansas Wildlife Action Plan as a “species of greatest conservation need.” This project addresses a data gap/research need outlined on page 444 of the Species Reports section of the Arkansas Wildlife Action Plan. Specifically the plan identifies the need to, “determine abundance” of the Strawberry Darter. The 2014 State Wildlife Grants Request for Proposals specifically calls for distribution and abundance surveys, including tributaries.” The project addresses a specific need outlined in the 2014 State Wildlife Grant RFP. This RFP identifies a need for, “distribution and abundance surveys, including tributaries” (pg. 4). A survey of the distribution of the Strawberry Darter was last undertaken in 1998 (Robison 1998).

The Strawberry River has been classified as a river with flow that is not consistent, and is flashy when rain fills the main stem and its tributaries. Variable flow conditions have been aggravated by recent drought and flood conditions. The effect of drought on this riffle species is unclear. Conditions related to climate change and more episodic, but severe floods are likely to change the character and volume of available habitat for this species.

b. Purpose and Objectives –

The major outcome of this project will be a more current and complete understanding of the distribution and abundance of *E. fragi* in the Strawberry River and its tributaries. This project will also include a comparison of the current abundance of *E. fragi* with the abundances at the same sites, previously sampled by Robison (1998). An understanding of the trends in abundance between the two studies will be useful for conservation and management decisions. Another outcome is an increased understanding of the microhabitat characteristics associated with the presence of *E. fragi* in reaches of the main stem and tributaries of the Strawberry River. Identifying the most important stream characteristics for occurrence of Strawberry Darter will allow managers to determine the prevalence of such habitat and the management actions necessary to conserve and expand such areas.

The objectives of this project include:

- Objective 1. During the spring and summer of 2015 and 2016, sites previously sampled by Robison (1998) will be re-sampled using similar sampling strategies such that comparison of occurrence and abundance will be possible.
- Objective 2. During the spring and summer of 2015 and 2016, sites on tributaries of the Strawberry River (South Big Creek, Piney Fork, Mill Creek, North Big Creek, and Bray Branch) will be sampled using the same sampling strategies as those from objective 1. This will allow the determination of distribution with a greater degree of completeness.
- Objective 3. All *E. fragi* will be measured and a swab of mucus will be collected and stored in an ultracold freezer for future DNA work.
- Objective 4. A subsample of *E. fragi* will be fixed in buffered formalin and preserved in ethanol for a morphological comparison with the diagnostic characteristics identified by Ceas and Page (1997).
- Objective 5. If any *E. spectabile* or *E. uniporum* are encountered, they will be collected and preserved, so that evidence of hybridization can be examined.

- Objective 6. We will identify and sample possible zones of introgression in the Black River and its tributaries to determine whether expansion of the *E. fragi* distribution might have brought them in contact with conspecifics.
- Objective 7. We will collect habitat characteristics at a subsample of sites randomly chosen from sites visited in objectives 1 & 2. These sites will be sampled on two different days, so that multistate occupancy models can be used to determine which habitat variables are associated with occupancy of the site by *E. fragi*.

c. Location-

The location for this study will be the Strawberry River Watershed (Figure 1). Seventy-one sample sites are listed in Table 1 from Robison (1998). These sites are located in Izard, Fulton, Sharp, and Lawrence counties in north central Arkansas. Robison (1998) noted the Strawberry Darter was mainly a tributary species found mostly in the upper two thirds of the Strawberry River System. Sampling will take place mostly in, “shallow gravel and rubble riffles of slow to moderate current” (Robison 1998).

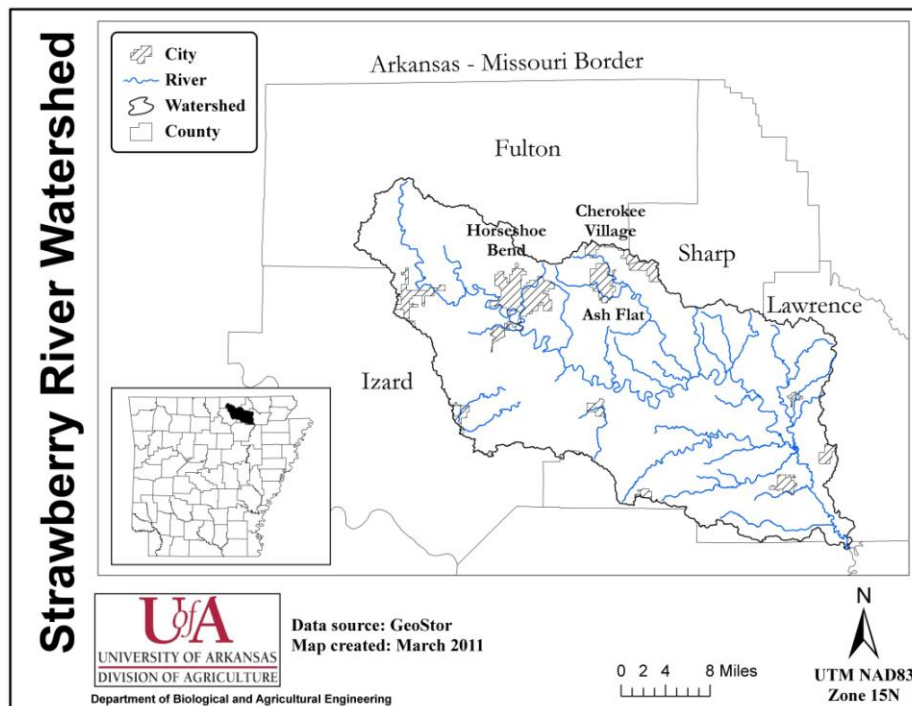


Figure 1. Strawberry River Watershed in north central Arkansas.

d. Approach –

The Project Leader, a graduate student, an undergraduate student, and the two Project Partners will be responsible for sampling and collecting stream characteristics. We will loosely follow the sampling protocols outlined in Robison (1998) to ensure a valid comparison between results of this study, results from Robison (1998) and results from Robison (1975) and Hilburn (1987) which are also presented in Robison (1998). We note the gap between this project and Robison (1998) is a period of ~15 years, while the gaps between Robison and the previously mentioned studies are eleven and twelve years, respectively. This will provide four data points and a good

indication of the trend in abundance for *E. fragi* over the entire period. In addition, we are also likely to attempt kick seining as the Project Leader and Project Partners have prior experience with this method. We will measure a suite of stream characteristics including bottom temperature, dissolved oxygen, conductivity, pH, turbidity, current velocity, stream wetted width, depth, vegetation, and bottom composition. Other stream characteristics may be included. We will use a multistate occupancy modeling approach outlined in MacKenzie *et al.* (2002, 2006) to determine which of the stream characteristics are associated with a high probability of a site being occupied by *E. fragi*.

e. Expected Results and Benefits –

The expected result of this study will be a clearer picture of the distribution of *E. fragi* in the Strawberry River and its tributaries. By attempting to replicate earlier sampling methods for part of this project, Arkansas will also benefit by the comparison of current abundances to historical abundances. Conservation of important habitat within the tributaries of the Strawberry River seems to be a key to the long-term health of this species. This project will clearly identify the most critical habitat characteristics for this darter, and provide a clear picture of the trends in abundance over an almost 40-year time period. Species of greatest conservation need that inhabit the Ozark Highlands – White River ecobasin, and inhabit natural pools, riffles, or runs include *Ammocrypta clara*, *Crystallaria asprella*, *Cyprinella camura*, *Erimystax harryi*, *E. uniporum*, *Lampetra aepyptera*, *L. appendix*, *Moxostoma anisurum*, and *M. macrolepidotum*. The USFWS has been asked to list *Erimystax harryi*. We could conceivably encounter these species while sampling for *E. fragi*.

f. Detailed Budget –

Budget category	Year 1	Year 2	Year 3	Total
a. Salaries & Benefits				
Graduate Research Assistant	17800	18800	9400	46000
Benefits	5518	5828	2914	14260
Total Salary and Benefits	23318	24628	12314	60260
c. Travel	2000	2000	0	4000
d. Equipment (seines, buckets, jars)	500	500	0	1000
e. Supplies (preservative, office supplies)	200	200	200	600
Total Project Request	26018	27328	12514	65860
Match				
a. State Non-game Biologist Match (25 h/yr x \$50/h)	1250	1250	1250	3750
b. Unrecovered Indirect Cost	10573	11167	5584	27324
c. Out of state tuition remission (\$221/credit hour)	3094	3094	1547	7735
Total Match	13667	14261	7131	35059

Steve Lochmann is an Associate Professor in the Aquaculture/Fisheries Department at the University of Arkansas at Pine Bluff. Dr. Lochmann teaches Ichthyology and is responsible for the UAPB teaching collection. Dr. Lochmann has been conducting fisheries research for more than 25 years. He has collected larval and adult fish in marine, estuarine and freshwater habitats. He has worked with darters for more than five years, including captive spawning of Yellowcheek Darter (*E. moorei*), culture of larval and juvenile Yellowcheek Darter, and has been part of one effort to restock Yellowcheek Darter into a portion of the Middle Fork of the Little Red River from which it was extirpated. Dr. Lochmann has a permit from the USFWS to work with Threatened and Endangered Species. He has supervised the research of more than a dozen master's students during his 20 years at the University of Arkansas at Pine Bluff.

Brian Wagner is the Nongame Aquatics Biologist with the Arkansas Game and Fish Commission. He has a Master's Degree in Fisheries from Virginia Tech, and has been involved in aquatic conservation and research with the Commission for 25 years. For the past 16 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 leads the State Wildlife Grants Crayfish Taxa Team, and is also active on the Fish, Cave, and Invertebrate Taxa Teams.

Chris Davidson is an endangered species biologist with the United States Fish and Wildlife Service. He has lead on recovery of federally threatened and endangered aquatic species and at-risk aquatic species, including several darter species. Prior to his current position, he worked as a stream ecologist for ADEQ. He has 17 years of experience working with aquatic species of conservation concern. He has a Master's Degree in Aquatic Biology from Arkansas State University.