

PROJECT TITLE: Mussel Survey of Cadron Creek, Point Remove Creek and Big Piney Creek and Major Tributaries with Population Assessments for Two Species of Concern

PROJECT SUMMARY: The purpose of this project is to survey under-sampled drainages to locate individuals and populations of freshwater mussels, a necessary first step in any conservation effort. Neither Cadron Creek nor Point Remove Creek, major southward draining basins on the north slope of the Arkansas River in central Arkansas, have been systematically surveyed for freshwater mussels. Big Piney Creek has been systematically surveyed within the Ozark St. Francis National Forest; however, downstream reaches of the creek within the Arkansas Valley have not been examined. Two species, *Cyprogenia aberti* and *Lampsilis* sp. A, will be specifically targeted for distribution and population assessments to determine their status within these drainages. The objective of this study is to fill data gaps with regards to major drainages of the Arkansas Valley and Boston Mountains and obtain data on the distribution and population dynamics freshwater mussels (Unionidae, Margaritiferidae) of greatest conservation concern from Arkansas.

PROJECT LEADER:

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PROJECT BUDGET:

SWG AMOUNT REQUESTED - \$49,929

MATCH AMOUNT (35%) - \$27,184

TOTAL AMOUNT - \$77,113

PROJECT STATEMENT:

Need - Freshwater mussels represent some of the most imperiled species in North America. Locating individuals and populations is a necessary first step in any conservation effort. In order to manage freshwater mussel resources, it is imperative to know the present distributions and population status of species of greatest conservation need (SGCN). Harris *et al.* (2010) summarized the status of Arkansas mussels and noted the mussel faunas of many southward draining Arkansas River tributaries have been inventoried; however, large segments of Cadron Creek and Point Remove Creek remain unstudied. Big Piney Creek was systematically surveyed within the boundaries of the Ozark National Forest (Stoeckel and Davidson 2000); however, a substantial portion of the creek downstream of the Forest remains unstudied. Substantial natural gas exploration and infrastructure development has occurred within the Arkansas Valley and Boston Mountains within the last decade. Much of this activity has occurred within the drainage basins of Big Piney, Cadron, and Point Remove creeks, and the affect to streams and freshwater mussels is unknown.

Purpose and Objectives - The purpose of this project is to fill data gaps for freshwater mussel SGCN distribution and population status in under studied drainages in the Arkansas Valley and Boston Mountains ecoregions. Objectives are to determine the distributional limits (upstream to downstream) and assess population status for freshwater mussel SGCN within the drainages of Big Piney, Cadron, and Point Remove creeks.

Location - The proposed project is located within the Arkansas Valley and Boston Mountains ecoregions of each target drainage. Proposed survey limits for each drainage are as follows:

Big Piney Creek. From the County Road 311 (spur) crossing (approximately 0.34 stream kilometer downstream of the confluence of Curtis Creek) to Arkansas Highway 359 (near the confluence with Lake Dardanelle), a distance of approximately 75.5 stream kms (46.9 stream miles) in Johnson, Pope, and Newton counties. Major tributaries that will be cursorily examined include Indian Creek and Little Piney Creek.

Cadron Creek. Mainstem from Arkansas Highway 225 downstream to the confluence with the Arkansas River (82.1 stream km, 51.0 stream mi); East Fork Cadron Creek from Arkansas Highway 36 in Rosebud downstream to the confluence with the mainstem approximately 13.1 stream km from mouth (79.0 stream km, 49.1 stream mi); North Fork Cadron Creek from Arkansas Highway 16 downstream to the confluence with the mainstem near Arkansas Highway 124 (42.4 stream km, 26.3 stream mi). Total stream km are 203.5 (126.5 stream mi) in Cleburne, Conway, Faulkner, Van Buren, and White counties. Major tributaries that will be cursorily examined include Cover Creek, Cypress Creek, Greenbrier Creek, Black Fork Cadron Creek, and Muddy Bayou.

Point Remove Creek. Mainstem from the confluence of West Fork Point Remove and East Fork Point Remove to the confluence with Arkansas River at the Point Remove Public Use Area (28.8 stream km, 17.9 stream mi); East Fork Point Remove Creek from Conway County Road 39 downstream to the confluence with West Fork Point Remove Creek (40.4 stream km, 25.1 stream mi); West Fork Point Remove Creek from Conway County Road 34 downstream to confluence with East Fork Point Remove Creek (56.5 stream km, 35.1 stream mi). Total stream

km are 125.6 (78.0 stream mi) in Conway and Pope counties. Major tributaries that will be cursorily examined include Gum Log Creek, Hackers Creek, Isabel Creek, and Kuhn Bayou.

Approach - Due to the small size of headwaters reaches of target streams, a variety of access methods will be necessary. Each stream segment will be navigated by boat, canoe, kayak or pedestrian means. Locations presenting suitable mussel habitat with evidence of mussel assemblages (live or dead shell visible) will be surveyed by wading (water <0.5 meter deep), snorkeling (water >0.5 meter deep), diving (water >1.5 meter deep) or a combination thereof. In addition, depositional areas (gravel bars, overflow secondary channels, vegetated channels) will be searched for fresh-dead shells. Overall, the qualitative timed-search approach with limited excavation may be the best for detecting mussel presence or demonstrating a reasonable probability of mussel absence (EPA 2013); therefore, our initial survey method will be qualitative timed searches. For specimens of *Lampsilis* sp. A, *Cyprogenia aberti*, and any federally listed threatened or endangered species length, height, and width dimensions will be measured to the nearest 0.1 mm with calipers, and the sex determined when possible. All mussels encountered will be identified to species, recorded on site specific data sheets that include GPS site coordinates, and the mussels replaced in the substrate. Coordinates will be obtained with a Garmin Venture HC GPS receiver. Voucher specimens will be collected for all non-listed species, live animals will be fixed and preserved in absolute ethanol, and subsequently deposited in the Mollusk Collection, Museum of Zoology, Arkansas State University. Swabs to collect DNA will be taken from federally listed species to confirm identification and for use in future eDNA and population genetics studies.

Following an initial pass through each targeted drainage to define locations and estimate size (area) of mussel assemblages, a maximum of 5 assemblages from each target drainage will be quantitatively assessed using the appropriate sampling protocol (Strayer and Smith 2003, Smith 2006). Specimens obtained during quantitative sampling will be handled and data recorded as previously discussed for qualitative timed searches. Additionally, major tributaries of the target streams will be examined at road crossings using timed searches.

Expected Results and Benefits:

Seventeen mussel species of greatest conservation need (SGCN) are known from southward draining tributaries to the Arkansas River or the mainstem Arkansas River including Elktoe (*Alasmidonta marginata*), Flat Floater (*Anodonta suborbiculata*), Rock Pocketbook (*Arcidens confragosus*), Spectaclecase (*Cumberlandia monodonta*), Western Fanshell (*Cyprogenia aberti*), Louisiana Fatmucket (*Lampsilis hydiana*), Undescribed Species A (*Lampsilis* sp. A), Flutedshell (*Lasmigona costata*), Black Sandshell (*Ligumia recta*), Southern Hickorynut (formerly *Obovaria jacksoniana*, now *O. arkansasensis*), Pyramid Pigtoe (*Pleurobema rubrum*), Round Pigtoe (*Pleurobema sintoxia*), Ouachita Kidneyshell (*Ptychobranhus occidentalis*), Southern Mapleleaf (*Quadrula apiculata*), Purple lilliput (*Toxolasma lividum*), and Little Spectaclecase (*Villosa lienosa*) (AGFC 2006, Bouldin *et al.* 2013). Additionally, 2 species are known from Arkansas River tributaries on the south side of the river, Butterfly (*Ellipsaria lineolata*) and Scaleshell (*Leptodea leptodon*). The Western Fanshell is known from 2 sites in the Arkansas River Drainage within Arkansas, and its taxonomic status across its entire range is under review (Roe and Chong 2014). Undescribed Species A is currently being described; however the eastern extent of its geographic distribution is poorly known (Harris *et al.* 2004). Data to clarify

the taxonomic and conservation status of these two taxa will be provided by this project. The proposed project will provide data to bridge distribution and population status data gaps for SGCN in each of the targeted drainages.

BUDGET BREAKDOWN (35% Match)

Proposed start date: June 30, 2015

Completion date: June 30, 2017

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Principal Investigator: Jennifer Bouldin

Cost Category	Federal	Non-Federal	Total
1. Salaries and wages	\$20,254		\$20,254
2. Fringe benefits	\$2,800		\$2,800
3. Supplies	\$1,000		\$1,000
4. Equipment		\$11,310	\$11,310
5. Travel	\$21,336		\$21,336
6. Total direct costs	\$45,390	\$11,310	\$56,700
7. Indirect costs on Federal Request	\$4,539		\$4,539
8. Indirect costs on Non-Federal Match		\$15,874	\$15,874
9. Total estimated costs	\$49,929	\$27,184	\$77,113

Budget Justification: Salary and wages totaling \$18,334 (90 person-days, mean rate of \$25.46/hr) are requested for the P.I. and two project collaborators to administer the project, conduct field surveys, curate museum specimens and produce the project report. A total of \$1,920 is requested for a student worker (M.S. level) to assist with field work and museum curation of voucher specimens calculated at \$12/hr for 40 hours for 4 weeks. A total of \$21,336 is requested for travel for field surveys (70 field days, 2 vehicles per day, minimum of two people per day). Equipment Non-Federal match is based on comparable rental rates for dive boat (16 ft jon-boat with 30-hp outboard motor), one canoe, two kayaks, small dive compressor

(floatable, 2 divers, no communication gear), large dive compressor (boat mounted, single diver with underwater communication gear) and the estimated field days that various combinations would be required based on stream size and survey conditions.

Literature Cited

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- Bouldin, J., W. R. Posey II, and J. L. Harris. 2013. Status assessment survey for *Leptodea leptodon* (Rafinesque 1820), the Scaleshell, in Arkansas. Department of Biological Sciences, Arkansas State University, Jonesboro, AR. Final Report to Arkansas Game and Fish Commission, Little Rock. 19 pp + Appendix A.
- Environmental Protection Agency (EPA). 2013. Technical support document for conducting and reviewing freshwater mussel occurrence surveys for the development of site-specific water quality criteria for ammonia. U. S. Environmental Protection Agency, Office of Water, Washington, DC. EPA 800-R-13-003. 59 p.
- Harris, J. L., W. R. Hoeh, A. D. Christian, J. L. Walker, J. L. Farris, R. L. Johnson, and M. E. Gordon. 2004. Species limits and phylogeography of Lampsilinae (Bivalvia; Unionoida) in Arkansas with emphasis on species of *Lampsilis*. Final report to Arkansas Game and Fish Commission, Little Rock. 72 p.
- Harris, J. L., W. R. Posey II, C. L. Davidson, J. L. Farris, S. Rogers Oetker, J. N. Stoeckel, B. G. Crump, M. Scott Barnett, H. C. Martin, M. W. Matthews, J. H. Seagraves, N. J. Wentz, R. Winterringer, C. Osborne, and A. D. Christian. 2010. Unionoida (Mollusca: Margaritiferidae, Unionidae) in Arkansas, third status review. Journal of the Arkansas Academy of Science 63 (2009):50-86.
- Roe, K. J. and Chong, J. P. 2014. Species delineation and estimation of genetic diversity in the freshwater mussel genus *Cyprogenia* (Bivalvia: Unionidae). Final report to U. S. Fish and Wildlife Service, Conway, AR. Department of Natural Resource Ecology and Management, Iowa State University, Ames, IA. 27 p.
- Smith, D. R. 2006. Survey design for detecting rare freshwater mussels. J. N. Am. Benthol. Soc. 25(3):701-711.
- Stoeckel, J. N and C. L. Davidson. 2000. Location and notes on freshwater mussels (Bivalvia: Unionacea) inhabiting Big Piney Creek, and East and Middle forks Illinois Bayou within the Ozark-St. Francis National Forest, Arkansas. Final report to Ozark-St. Francis National Forest, Russellville, AR. Dept. Biological Sciences, Arkansas Tech University, Russellville, AR.
- Strayer, D. L., and D. R. Smith. 2003. A guide to sampling freshwater mussel populations. American Fisheries Society, Monograph 8, Bethesda, Maryland.

QUALIFICATIONS:

Jennifer L. Bouldin, PhD: Is Director of the Ecotoxicology Research Facility and Associate Professor of Environmental Biology. Her research has included surveys and ecological studies on freshwater mussels in Arkansas since 2002.

Brook L. Fluker: Received Ph.D. in Biology from the University of Alabama in 2011 with an emphasis in phylogenetics, population genetics, and conservation of freshwater fishes. Has 11 years of experience sampling, handling, and collecting tissues from freshwater fishes in North America,

including experience assisting with surveys of freshwater mussels and snails and seasonal abundance surveys for several federally protected fishes. This work has resulted in six publications, 10 technical reports, and 30+ presentations at professional conferences and meetings.

John L. Harris: Received Ph.D. in Zoology from University of Tennessee in 1986 with emphasis in taxonomy and systematics of aquatic fauna concentrating on fish and mussels. Has 30+ years experience in performing mussel surveys and impact analyses resulting in numerous peer-reviewed publications and/or agency reports. Has co-directed or been a committee member for 15 graduate students researching distribution and/or life history aspects of freshwater mussels in Arkansas.