

2013 Arkansas State Wildlife Grant Pre-proposal

Status assessment of mussel populations and host fish in the Buffalo National River, Arkansas.

Project Summary

The National Park Service has established twelve long-term monitoring stations (LTMS) along the Buffalo River for native mussel beds based on research by Harris (1996) and Matthews et al. (2009). Of the approximately 29 species of mussels found in the Buffalo River, the Arkansas Wildlife Action Plan lists 16 as species of Greatest Conservation Need. Data collected over the past 10 years indicate a decline in diversity and number of mussel beds in the Buffalo River. We will quantitatively resample the LTMS beds originally identified by Harris (1996) and Matthews et al. (2009), as well as provide data on habitat associations for the mussel species present. In addition, we will sample the host fish community adjacent to each bed and provide data on the status of the Ozark Shiner (*Notropis ozarcanus*), which is listed as a species of Greatest Conservation Need in the Arkansas Wildlife Action Plan and in need of a status survey. Data will be used by the National Park Service to determine action plans for the mussels.

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	35% Match	50% Match
Total amount of project cost:	\$91,163	\$113,055
Total amount of SWG money requested:	\$56,837	\$56,837
Amount and source of matching funds or in-kind services:	\$34,326	\$56,218

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Need:

Freshwater mussels exhibit their greatest diversity in North America (approximately 300 species) and are primarily associated with lotic systems. They play a significant role in ecosystem function, including nutrient cycling (Vaughn et al. 2004, Vaughn et al. 2008). However, they are also the most endangered aquatic organisms in North America (Williams et al. 1993, Lydeard et al. 2004, Strayer 2008) and mussel declines have been dramatic in the past 50 years. Decline in native mussels has been attributed to a wide variety of anthropogenic factors that are further exacerbated by their unique life history (requiring a fish host) as well as their limited mobility and filter-feeding behavior (Vaughn et al. 2008).

Few long-term datasets are available; however, data on freshwater mussels in the Buffalo River exist from as early as 1910 (Meek and Clark 1912). Current data collected on the Buffalo River suggest a recent decline in diversity and abundance of mussels at twelve long-term monitoring stations (LTMS) delineated by Harris (1996) and Matthews et al. (2009). Previous research on the Buffalo River has recommended continued monitoring of the LTMS stations as well as sampling of the fish community to assess availability of suitable host fish (Matthews et al. 2009).

Location:

The Buffalo River flows through the heartland of the Ozarks in northwestern Arkansas and is considered one of the region's finest natural rivers (Figure 1). The Buffalo is one of only a few entirely free flowing rivers in the country. According to the Nationwide Rivers Inventory, only 42 high quality free-flowing rivers (no major dams) greater than 200 km remain in the 48 contiguous states (Benke 1990). The Buffalo National River encompasses 150 square miles (95,730 acres) and includes 135 miles of the 150-mile-long Buffalo from the Boston Mountains to the White River. The first 16 miles of the headwaters are within the Ozark National Forest and were recently designated as part of the National Wild and Scenic Rivers system. Overall, 11% of the 1,338 square mile watershed lies within National Park Service (NPS) administration and 28% is in other federal or state ownership (Figures 2 and 3). The remaining and majority (61%) of the watershed is in private ownership (NPS, 1998).

Twelve LTMS were established in 2006, and are intermittently dispersed along the corridor of Buffalo National River. The LTMS were selected from nearly 90 mussel beds or aggregates that formed 4 species domains along the river's gradient. Three stations were randomly selected from each species domain and were quantitatively sampled during the summer of 2006. Generally, mussel beds are located in riffle/run habitats and water depths and flow intensity varies between sites. Depths can vary between a couple of centimeters up to two meters in depth, but in general, most depths are about a meter. Flows can vary between 0.05 m/s up to 0.1 m/s, with some velocity always present, and mussels are seldom found in stagnant water. Substrates can also vary between a boulder/cobble mixture down to coarse gravel, and sand is typically a subcomponent at every site. However, only at sites where mussels are in decline are fine sands and organics found as a component of the substrate. Access to sites can be difficult, as most sites are found between river access points and hard to get to by boat during low water. Several sites are located in wilderness or reaches of the river that flow through designated Wilderness areas.

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Objectives:

1. Provide monitoring data for twelve mussel beds located in the Buffalo River at a five-year interval (last sampled in 2009).
2. Examine the host fish population in the Buffalo River and provide data on the Ozark Shiner (*Notropis ozarcanus*), which is listed as a species of Greatest Conservation Need in the Arkansas Wildlife Action Plan and in need of current status and inventory data.
3. Correlate habitat and water quality data with the mussel communities to provide a better understanding of the factors that influence distribution, abundance and size class structure of freshwater mussels in the Buffalo River.

Approach:

The twelve LTMS for freshwater mussels on the Buffalo River will be quantitatively sampled in summer 2014. We will follow a stratified random quadrat sampling design (Christian and Harris 2005) to keep data collection consistent with previous methods. Within each sampled bed we will calculate bed area, diversity, richness, density, and individual species density. Three of the project partners for this research (Usrey, Hodges and Harris) were present during previous samples and will provide continuity and standardization of sampling protocols. These data will be compared to previous samples on the LTMS beds. Habitat data will also be collected along transects at each site and will include stream width, average water depth, substrate size, canopy cover, and water velocity. Water quality parameters taken will include dissolved oxygen, pH, conductivity, water temperature and turbidity. Habitat data will be analyzed using NMS (non-metric multidimensional scaling) and composite axes will be correlated with mussel data.

Fish will be sampled using a combination of backpack electrofishing with effort divided among the available habitat types (riffle, run, pool). One person shocking and two dipnetters will be kept standard, and runs will be standardized with time. Samples will be located at least 150 meters downstream of the mussel bed to avoid disturbance to the freshwater mussels. Fish will be placed into an aerated bucket during sampling. Fish collected will be identified and length and weight collected prior to being released. Voucher specimens will be collected from each site as well as individuals to small to identify in the field.

Expected Results and Benefits:

Buffalo National River has information on native mussels going back more than one hundred years (Meek and Clark 1912), but knowledge of the present condition is incomplete. Results from 2009 sampling indicated that many native mussel communities within Buffalo River are in decline and some aggregates are no longer present at locations where they have been for over hundred years. Buffalo National River needs information on the status and trends of these fragile and diminishing resources. Future management decisions must be science based and consider cumulative impacts upon mussel communities in order to go forward, and without a definitive status and trends assessment many management issues cannot be finalized.

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In addition, data collected during this project will provide more information of a suite of species that have been petitioned for candidacy under the Endangered Species Act including purple lilliput, western fanshell, American eel, Ozark shiner, and Ozark chub.

Literature Cited:

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Budget:

Budget Category	State Wildlife Grant Funds (Federal)	Cash Match (35%/50%)	In-Kind Match (35%/50%)	Total Project Costs (35%/50%)
Salaries	39,170	8,332/24,554		47,502/63,724
Contract Services	6,500		16,250/22,500	22,750/29,000
Supplies and Materials	2,000			2000
Travel	4,000			4000
Indirect Costs	5,167		9,744/9,744	14,911
Total				91,163/113,055

Budget justification: The primary budget need on the project is salary for graduate students and consultants to conduct the field research. Sampling will involve a minimum of 30 (10-12 hours/day) days in the field. Travel to the sites and a minimum amount to defray costs of students to attend and present data at a scientific meeting is included.

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Qualifications of assembled research group:

Ginny Adams research has focused on the conservation of sensitive and endangered species in relation to anthropogenic disturbance. She is an expert in morphology, physiology, life history, genetics, and ecology of invertebrates and fishes on which she has published. Her responsibilities on this project will include mentoring of undergraduate and graduate students in fish and mussel sampling and identification. She worked on mussels at Waterways Experiment Station in Vicksburg, Mississippi.

Reid Adams research has focused on physiology and ecology of freshwater fishes and invertebrates in large river systems and has several papers relevant papers on these subjects. He will contribute his broad experience on the ecology of streams and rivers in this region. His responsibilities on this project will include mentoring of undergraduate and graduate students in fish collection and identification.

John 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. Have 30 years experience in performing mussel surveys and impact analyses resulting in numerous peer reviewed publications and/or agency reports. Have co-directed or been a committee member for 15 graduate students researching distribution and/or life history aspects of freshwater mussels in Arkansas.

Bill Posey is a malacologist for the Arkansas Game and Fish Commission. He was trained as a malacologist and has many years of experience in the sampling, identification and conservation of native freshwater mussels. He will assist in the field with identification and logistics.

Chris Davidson is an endangered species biologist with the United States Fish and Wildlife Service. He has national lead on recovery of the federally endangered speckled pocketbook and monitors the activity of natural gas activities in the Little Red River watershed, including authorizing BMPs. He will act in an advisory role to find study sites, gain access to private lands, and disseminate our research results.

Shawn Hodges completed his M.S. in Biology at the University of Arkansas – Arkansas Cooperative Fish and Wildlife Research Unit. Having worked in Ozark streams for over 15 years, eight of which while with the NPS, he has become very familiar with the fish and mussel fauna of the Buffalo River.

Faron Usery received a Master of Science Degree from University of Central Arkansas in 2001, and has worked as an Aquatic Ecologist for the National Park Service for nearly a decade. Specializing in the area of water quality and effects on aquatic biota, Faron has worked extensively with native mussels on the Buffalo River and in surrounding river systems. The National Park Service started working with native mussels in Buffalo River the mid 1990s, and in 2004-2006 an intensive search organized by Faron lead to many new discoveries and condition assessments.