

PROJECT TITLE: *Improving Water Quality in High Priority Karst and Aquatic Habitats in the Illinois River Watershed, Arkansas*

PROJECT SUMMARY: The goal of this project is to reduce water quality and aquatic passage impacts to Arkansas and least darter in Benton and Washington Counties. This would be accomplished following several objectives. The project would focus on confirmed habitat sites that were identified through previous SWG-funded efforts. The project would identify the highest priority specific conservation actions at these sites through GIS and field assessments of roads and other land use. On the highest priority road segments and crossings, construction designs would be developed, and implementation of at least one design would be completed. A road maintenance workshop would be held to provide training of best management practices to road maintenance professionals in the area to gain further water quality improvements into the future.

PROJECT LEAD:

Ethan Inlander, Ozark Rivers Program Director, The Nature Conservancy in Arkansas
 38 W. Trenton Blvd. Suite 201, Fayetteville AR, 72701
 479-973-9110, einlander@tnc.org

PROJECT PARTNERS:

Mike Slay, Ozark Karst Program Director, The Nature Conservancy in Arkansas
 479-973-9110, mslay@tnc.org
 Brian Wagner, Non-Game Aquatics Biologist, Arkansas Game and Fish Commission
 877-847-2690, bkwagner@agfc.state.ar.us

BUDGET SUMMARY:

Match Scenario	SWG Request	Match Required	Total Amount
50% Match Required	\$34,615.50	\$34,615.50	\$69,231.00
35% Match Required	\$45,000.00	\$24,231.00	\$69,231.00

BUDGET DETAIL:

	50% Match Scenario			35% Match Scenario		
	SWG	Match	Total	SWG	Match	Total
Personnel / Fringe	\$ 20,335	\$ 20,335	\$ 40,670	\$ 28,136	\$ 12,535	\$ 40,671
Travel	\$ 1,000	\$ 1,000	\$ 2,000	\$ 2,000		\$ 2,000
Supplies	\$ 8,000		\$ 8,000	\$ 8,000		\$ 8,000
Contracts		\$ 8,000	\$ 8,000		\$ 8,000	\$ 8,000
Subtotal	\$ 29,335	\$ 29,335	\$ 58,670	\$ 38,136	\$ 20,535	\$ 58,671
Indirects (18%)	\$ 5,281	\$ 5,281	\$ 10,561	\$ 6,864	\$ 3,696	\$ 10,560
Total	\$ 34,616	\$ 34,616	\$ 69,231	\$ 45,000	\$ 24,231	\$ 69,231

Match sources include TNC and donation or discount supplies and contracts (rental equipment).

PROJECT NEED: Recent Arkansas State Wildlife Grant projects have identified specific karst and aquatic habitats within the Illinois River watershed as high priority locations for conservation and protection activities. Inlander et al (2011, T20-9) assessed water quality threats from spatially available data for a suite of 32 Arkansas karst species of greatest conservation need (SGCNs), several of which occur in caves and springs in the Illinois River watershed. For example, subterranean habitat within the Logan Cave recharge area is habitat for eight SGCNs, while Cave Springs Cave is home to seven SGCNs. Sediment, nutrients, pollutants, and hydrologic alteration all contributed to threat scores assigned to these species.

Wagner et al (2011, T27-11) surveyed the Illinois River watershed for the presence of two rare darters, Arkansas Darter and Least Darter, and they confirmed the existence of these species at known locations, the extirpation of populations at some sites, and documented new populations. In nearly all situations, these darters were found in springs and spring runs entirely fed by groundwater. In addition, Wagner et al (2011) reported on potential impacts at these sites, prioritized darter locations for conservation activities, and made site-specific recommendations for implementation of habitat protection and restoration projects. In general, water quality improvements and elimination of fish passage barriers were suggested for these habitats. The report delineated the darter sites into nine distinct landscape areas. These nine areas were prioritized generally for further conservation actions. One of the priority landscapes was within the Logan Cave recharge area, making this site unique because it provides habitat for both surface and subsurface SGCNs. Conservation actions and implementation projects within the Logan Cave recharge area have the potential to provide maximum benefit to all SGCNs found there.

Sedimentation is a common threat to aquatic species in Arkansas' rivers and groundwater-fed cave and spring habitats. Significant sources of sediment in the Illinois watershed include eroding stream banks, poorly maintained unpaved roads, and urban construction sites. Sedimentation in spring-run habitats for Arkansas and least darters can degrade or even eliminate those reaches as viable habitat.

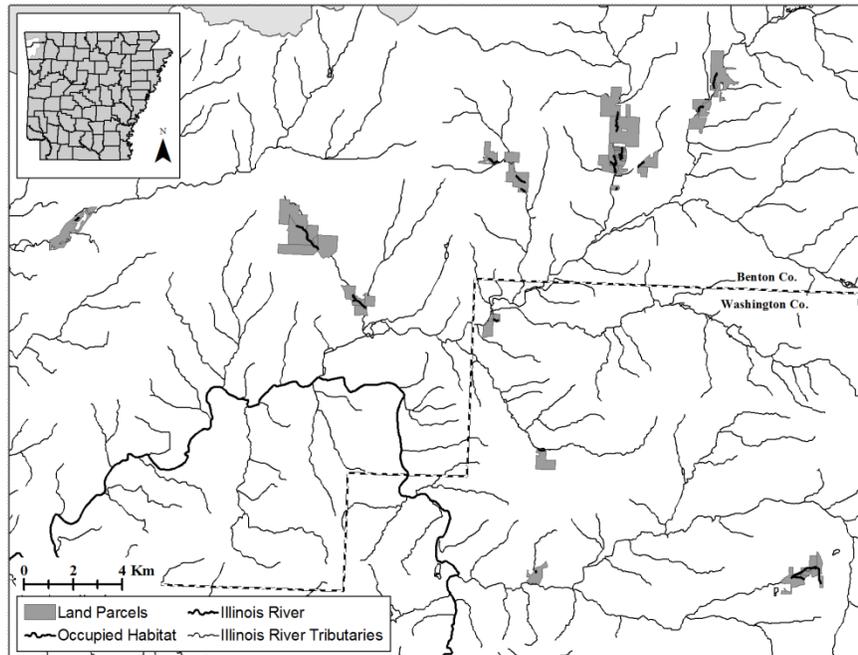
Barriers to the migration of the darters were a common threat found along spring-runs sampled by Wagner et al. Removal or retrofit of stream road-crossings, or other infrastructure that act as barriers to migration, could greatly expand occupied habitat for these darter species.

The proposed project would address several **AWAP 2011-2012 priorities**, including:

- Restoring habitat for the Arkansas darter and least darter.
- Identifying and mitigating barriers to migration for Arkansas darter and least darter.
- Restoring native terrestrial habitat in karst recharge areas.
- Implementing road BMP projects and workshops to improve stream water quality.
- Adaptive Management: Phase 2 Conservation Actions, building upon knowledge gained in previous SWG projects.

LOCATION: The project will be conducted in portions of the upper Illinois River watershed in Washington and Benton counties. It will focus on occupied habitats and upstream contributing watersheds for Arkansas and least darter. These include darter spring-run habitats within Logan Cave recharge area and other recharge areas that support additional karst SGCNs. See Figure 1.

Figure 1: This map shows the general study area, and parcels containing occupied habitat. The map was produced by Wagner et al for the final report for State Wildlife Grant T27-11.



OBJECTIVES: The goals of this project include:

- Refine the prioritization of threats to the SGCN darters, including sediment sources and passage barriers.
- Develop construction designs for high priority road segments and barriers to migration.
- Implement a demonstration project that reduces the threat of sediment to darter habitat.
- Host an unpaved roads best management practices (BMP) workshop to promote future implementation of additional sediment reduction and barrier removal projects.

APPROACH: The proposed project would build on the findings and recommendations of Wagner et al (2011) to:

- Develop a **GIS-based threat assessment** for darter sites within the nine priority landscapes. The assessment would characterize threats that had not been documented in the earlier report, especially threats related to water quality. These would include land use characteristics, riparian buffer condition, impervious surfaces, and unpaved roads.
- Within the landscapes determined to have the most significant threat to water quality, conduct a **field-based assessment of unpaved road segments** that are likely to negatively impact water quality at occupied sites.
- **Develop road improvement construction designs** using best management practices (BMPs) that would reduce erosion and sedimentation on at least three priority road segments.
- Work with private landowners, city, county and/or other road maintenance personnel to **implement road improvement design** on at least one priority road segment.
- Further characterize and **prioritize barriers to passage** by the darter species. The 2011 report identified several barriers to passage. This effort would characterize the barriers in more detail and **develop designs for their removal** or retrofit. Develop designs on at least two barriers.

- Provide **classroom and field training on best management practices for unpaved roads** to private landowners, city, county and other road maintenance personnel. Use the implementation project as a demonstration site for the training. Present barrier removal designs and seek future partnerships to implement the barrier removal designs.

EXPECTED RESULTS AND BENEFITS

- List and maps of prioritized road segments for BMP implementation.
- Road improvement designs on at least three priority road segments.
- Barrier removal designs on at least two migration barriers.
- Implementation of road improvement project.
- Unpaved road BMP workshop and demonstration.

Expected benefits include direct habitat improvement for at least one high-priority darter site, and a prioritized ‘short list’ and designs for future road and crossing BMP projects. The road maintenance workshop will have direct and lasting effect on roads throughout the watershed. Improved water quality will benefit the darters, subterranean karst species within recharge area of the demonstration project, and SGCNs within the Illinois River and its tributaries. Queries of TNC’s Aquatic Gap and Karst databases shows that water quality improvement from the proposed project could benefit the following SGCNs:

Taxa Association	Scientific Name	Common Name	Priority Score
Fish	<i>Etheostoma cragini</i>	Arkansas darter	43
	<i>Amblyopsis rosae</i>	Ozark cavefish	34
	<i>Etheostoma microperca</i>	least darter	29
	<i>Nocomis asper</i>	redspot chub	23
	<i>Cyprinella spiloptera</i>	spotfin shiner	23
	<i>Percina phoxocephala</i>	slenderhead darter	19
Mussel	<i>Lampsilis rafinesqueana</i>	Neosho mucket	62
	<i>Toxolasma lividus</i>	Purple liliput	57
	<i>Quadrula cylindrica</i>	Rabbitsfoot	38
	<i>Venustaconcha ellipsiformis</i>	Ellipse	30
	<i>Fusconaia ozarkensis</i>	Ozark pigtoe	27
	<i>Ptychobranchnus occidentalis</i>	Ouachita kidneyshell	23
	<i>Alasmidonta marginata</i>	Elktoe	19
	<i>Lampsilis siliquoidea</i>	Fatmucket	15
	<i>Lasmigona costata</i>	Flutedshell	15
	<i>Strophitus undulatus</i>	Creeper	15
	<i>Villosa lienosa</i>	Little spectaclecase	15
Crayfish	<i>Cambarus aculabrum</i>	Cave crayfish	80
	<i>Orconectes meeki brevis</i>	crayfish	34
	<i>Orconectes nana</i>	crayfish	30
Amphibian	<i>Eurycea spelaea</i>	Grotto salamander	19
Invertebrate - other	<i>Caecidotea stiladactyla</i>	cave isopod	30
	<i>Stygobromus ozarkensis</i>	Ozark cave amphipod	27

BUDGET: See proposal **Page 1** for budget details.

Ethan Inlander has been applying geospatial technologies and physical sciences to conservation issues for over 16 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 costal 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.

Over the past seven years at TNC, Ethan has led efforts to map and prioritize over 2000 miles of unpaved roads in for priority Ozark river watersheds. He has worked with landowners and public partners to implement unpaved road BMPs on eight separate projects in five counties. He has also organized and led road maintenance BMP workshops over the past three that have been attended by over 150 road maintenance professionals from cities, counties, state and federal agencies, timber and energy industries. Ethan authored the unpaved roads best management practices chapter of the Illinois River Watershed Plan.

Michael Slay has been working in karst conservation for 10 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 15 peer-reviewed journal articles related to the discovery and conservation of karst species.

Brian Wagner is 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 23 years. For the past 10 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.