Assessing the success of stream restoration projects for Species of Greatest Conservation Need in the Kings River, Archey Fork Little Red River, Middle Fork Saline River, and Big Fork Creek watersheds.

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Summary: Three stream restoration sites have been implemented within the past six years by The Nature Conservancy Arkansas Chapter. Each restoration used natural channel design techniques as taught by Dave Rosgen. The Nature Conservancy sees the benefits of natural channel design in reduced bank erosion, increased sediment routing efficiency, improved aesthetics and recreation potential, and decreased maintenance compared to traditional hardening methods of restoration; however, these few restoration projects have not been tested for their effectiveness in habitat improvement or aquatic community analysis. This project will monitor the success of stream restoration projects at Kings River, Archey Fork Little Red River, Middle Fork Saline River, and Big Fork Creek by assessing the fish and macroinvertebrate communities and sampling habitat parameters with Bank Erosion Hazard Index, Near-Bank Stress, Pfankuch, cross-section, and longitudinal profile assessments. These sites contain 10 aquatic Species of Greatest Conservation Need (SGCN) with many more located within the watersheds. This project would collect population status and abundance of these SGCN and help determine integrity of their habitats. Stream restoration projects typically have aquatic life and habitat as the primary focus, but actually tracking the effectiveness is difficult due to budget constraints. This will help determine what is and what is not working for these streams and offer management recommendations for future restoration projects.

Project Budget: SWG amount $129,500; match amount $70,911 (35%); total amount $200,411

Need: The Nature Conservancy (TNC) has implemented three natural channel design restoration projects within the past six years at Middle Fork Saline (completed 2009; partially SWG funded), Kings River (Phase I of 3 completed 2012), and Archey Fork Little Red River (Phase I (2013) & 2 (2014) of 3 completed). Cut banks, erosion, lack of riparian vegetation, flooding, Species of Greatest Conservation Need (SGCN) protection, and habitat enhancement are several reasons these stream reaches were chosen for restoration. Biological and physical habitat monitoring are ways that progress is tracked pre- and post-treatment. Aside from assessing TNC restoration success, the project will also address four of the State Wildlife Grant funding priorities within the fish, insect, and habitat categories:
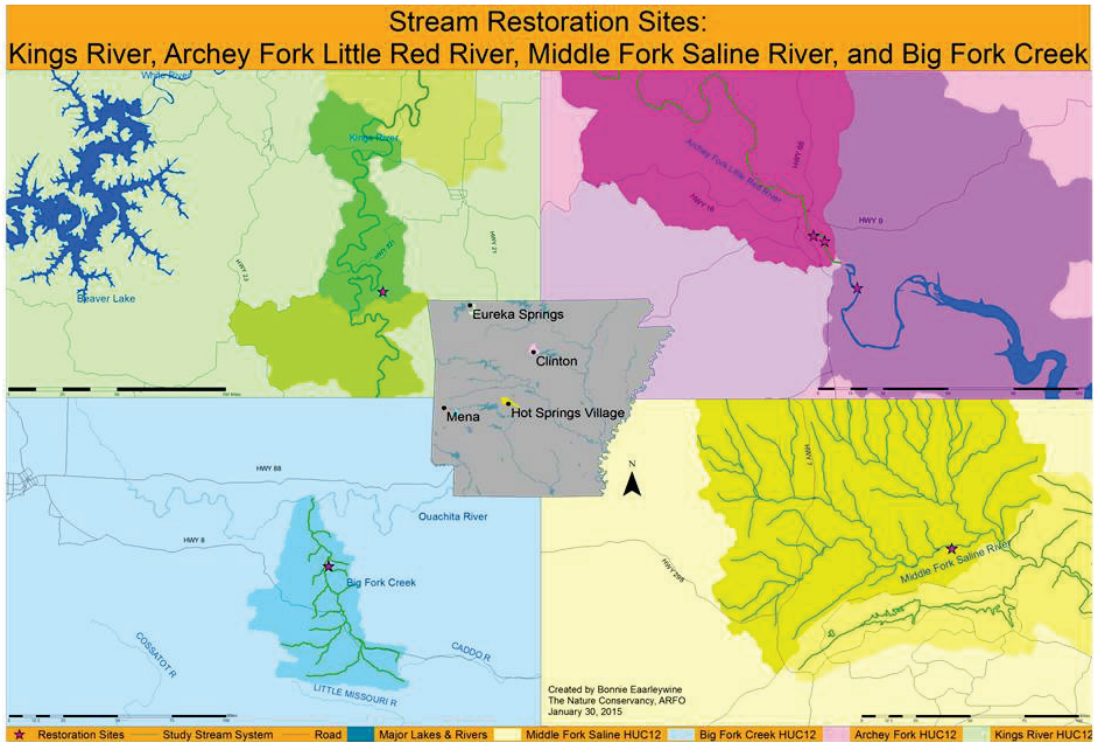
- Fish – distribution and abundance surveys
- Fish – maintain, protect, and restore habitat with monitoring requirement
- Insect – obtain baseline distribution and population status for multiple species
- Habitat – restore, enhance, and/or maintain the integrity of aquatic habitats.

Purpose & Objective: Improving habitat conditions is often times the first step in protecting sensitive species populations. This project will provide data on fish and macroinvertebrate communities and channel stability analysis on four restoration sites. With these funding priority issues addressed, we will be able to make management recommendations for these SGCN habitat sites and our own stream restoration projects. The specific objectives of this project are to:

1) Perform community assessments on fishes and macroinvertebrates within Kings River, Archey Fork Little Red River, Middle Fork Saline River, and Big Fork Creek restoration sites;
2) Perform Pfankuch, Near-Bank Stress (NBS), and Bank Erosion Hazard Index (BEHI) assessments along with longitudinal profile and cross-section analysis within the four restoration sites;
3) Analyze biological and physical data for pre- and post-restoration changes; and
4) Share data and results in a report to Arkansas Game & Fish Commission and partners.

Location: The Kings River restoration site is in the Ozark Mountains ecoregion, outside of Eureka Springs, AR in Carroll County (Figure 1). Archey Fork Little Red River restoration site is located Van Buren County, in the city of Clinton, AR and within the Boston Mountains ecoregion. Middle Fork Saline River site is located in Jessieville, AR within Garland County and part of the Ouachita Mountains ecoregion. The restoration site on Big Fork Creek is in the Ouachita Mountains ecoregion in Polk County and outside of Opal, AR.

Figure 1. Map of Kings River, Archey Fork Little Red River, Middle Fork Saline River, and Big Fork Creek restoration sites.

Approach:

Objective 1 - Perform community assessments on fishes and macroinvertebrates within Kings River, Archey Fork Little Red River, Middle Fork Saline River, and Big Fork Creek restoration sites. Contract an accredited partner (i.e. college or university, contractor, state or federal agency) and assist in biological monitoring of four restoration sites to sample the fish and macroinvertebrate communities.

Objective 2 - Perform Pfankuch, NBS, and BEHI assessments along with longitudinal profile and cross-section analysis within the four restoration sites. TNC will perform habitat assessments within the restoration sites using Pfankuch (1975), NBS (Rosgen 2009), and BEHI (Rosgen 1996) protocols. Longitudinal profiles will outline the habitat (riffle, pool, run, glide) units along the stream reach using pre- and post-restoration to show changes in morphological features such as slope and depth of pools and riffles. Cross-sections will be taken at riffle and pool sections to show changes in channel dimensions as a result of the restoration. These stability metrics will show whether suitable habitat (i.e. desired pool depths) for SGCN was increased and whether the channel has shown a decrease in bank erosion as a product of the restoration.

Objective 3 - Analyze biological and physical data for pre- and post-restoration changes. TNC will analyze data to determine the success of these stream restoration sites based upon biological analysis of catch per unit effort and/or total number of individuals collected, species

abundance and richness, and SGCN abundance and richness. BEHI, NBS, and Pfankuch are used to assess overall stability of stream banks and the stream bed, designating scores based upon multiple physical parameters which are weighted according to their importance. The sum of these parameters scores gives an overall scoring, reflecting the more stable (or less unstable) sites with lower overall scorings. The final score indicates the capacity of a stream reach to resist erosion and to recover from potential disturbances such as changes in hydraulics or sediment supply. Since Phase III of Archey Fork and Kings River may not be implemented within the grant period, Kings River Phase I & II, Archey Fork Phase I & II, and Big Fork Creek will be used in this comparison. There is pre-implementation data on the biology and habitat for these sites.

Objective 4 - Share data and results in a report to Arkansas Game & Fish Commission and partners. Partners and AGFC will receive a final report and Excel spreadsheet of species collections.

Expected timeline:

	Season				
Work	fall–winter 2015	spring-summer 2016	fall–winter 2016	spring-summer 2017	fall 2017
Field - sampling inverts	xxxx		xxxx		
Field - sampling fishes		xxxx		xxxx	
Field - sampling habitat	xxxxxx		xxxxxx		
Lab - id species	xxxxx	xxx	xxxx	xxx	
Lab - analyzing data		x	x	x xx	xx
Lab - writing report				xxxxxxxx	xx

Expected Results and Benefits: The watersheds among these study sites contain critical habitat for over 10 SGCN. Performing these assessments will not only monitor the habitat in these streams to create a more robust dataset for general conservation use but also help update population distributions and status reports of the listed SGCN. Monitoring habitat using these select assessments will give data concerning the bank stability which relates to sedimentation and embededness, a major threat to many SGCN, and establishes a baseline that can be repeated in the future. With these priority issues addressed, we will be able to suggest management recommendations for these SGCN as well as our own stream restoration projects.

Species of Great Conservation Need (by site):

Kings River - *Allocapnia jeanae, A. ozarkana, Orconectes neglectus, Erimystax harryi,* and
     Notropis ozarcanus;

Archey Fork Little Red River - *Etheostoma moorei* and *Percina nasuta;*
Middle Fork Saline River - *Noturus lachneri*;
Big Fork Creek - *Etheostoma pallididorsum* and *Plethodon caddoensis.*

Budget:

Category	Funds Requested	TNC Match	Other Match	Total
Salaries and Benefits*	$31,716	$26,500	$0	58215.6832
Operating Expenses	$74,650	$1,500	$36,821	$112,971
Captial Expenses	$0	$0	$0	$0
Subtotal	$106,366	$28,000	$36,821	$171,187
Indirect Cost (21.75% NICRA)	$23,135	$6,090	$0	$29,224.54
TOTAL	**$129,500**	**$34,090**	**$36,821**	**$200,411**

*TNC currently has a 21.75% Negotiated Indirect Cost Rate that is accepted by USFWS.

References:

Pfankuch, D. J. 1975. Stream reach inventory and channel stability evaluation. USDA Forest   Service, R1-75-002. Government Printing Office #696-260/200, Washington D.C.: 26.

Rosgen, D.L. 1996. Applied River Morphology, Second Edition. Wildland Hydrology, Pagosa Springs, CO. 350pp.

Rosgen, D.L. 2009. Watershed Assessment of River Stability and Sediment Supply (WARSSS). Wildland Hydrology, Fort Collins, CO. 598pp.

Qualifications:

Bonnie Earleywine has thirteen years of experience sampling biological communities and water chemistry. She received a B.S. in environmental science from University of Central Arkansas and a M.S. in fisheries from Mississippi State University**.** She has been a Stream Restoration Technician at TNC for two years and completed two courses in fluvial geomorphology through Rosgen training.

Joy DeClerk is a 2002 graduate of Hendrix College, majoring in Economic & Business and Environmental Studies. DeClerk has worked for TNC since April 2005. Her current work as the River Restoration Program Director focuses on assessing sedimentation from various land uses and applying natural channel design restoration techniques to reduce sedimentation and restore habitat. She has completed all four trainings in fluvial geomorphology and natural channel design led by instructor Dr. Dave Rosgen.

Mitchell Allen has a B.S. in Environment Science/Biology from the University of Central Arkansas. While working on his degree, he was able to gain 3 years of experience with non-native plant removal and restoration ecology with the UCA Department of Biology and the National Park Service. Since graduating, he has worked with U.S. Fish & Wildlife Service on the Upper Colorado River Endangered Fish Program, helping restore habitat for four endangered fishes and removing non-native fishes. He began working at TNC in August 2012 where he continues to help surveying, planning, and constructing river restoration projects.

Melissa Jenks is the Ouachita Stream Coordinator at TNC Arkansas. She graduated with a BS in geology from Arkansas Tech University. She specializes in Geographic Information Systems modeling and has worked with the rivers crew at TNC for eight years. She has attended four Rosgen training courses and will serve as project lead and designer at the Big Fork Creek restoration site.