



## Shoal Creek Watershed Restoration Plan October 2021



Prepared by:  
**US Fish and Wildlife  
Service**  
and  
**Missouri  
Department of  
Natural Resources**



## 1.0 INTRODUCTION

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The Missouri Trustee Council (Trustees) is comprised of the State of Missouri, represented by the Missouri Department of Natural Resources (MDNR), and the U.S. Department of the Interior, represented by the U.S. Fish and Wildlife Service (USFWS). In May 2012, the Trustees finalized the Springfield Plateau Regional Restoration Plan and Environmental Assessment (SPRRP), a comprehensive plan that describes the process by which the Trustees will use recovered funds to restore natural resources injured by the release of hazardous substances within the Springfield Plateau.

In accordance with the Natural Resource Damage Assessment and Restoration (NRDAR) process as outlined in the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and its implementing regulations, in addition to the goals and objectives of the SPRRP, this Restoration Plan (RP) identifies and evaluates restoration alternatives considered for achieving the restoration objectives, and identifies the selected alternative that the Trustees will implement in order to compensate the public for injuries to natural resources and their services in Shoal Creek, Newton County, an area within the Springfield Plateau.

### 1.1 Background of Injury

Commercial mining began about 1848 in Newton County, Missouri and moved westward into Kansas and southward into Oklahoma. At first, lead was of primary interest; however, the ore was rich in zinc deposits and zinc production became increasingly important over time. The Tri-State Mining District (Tri-State) spans portions of the states of Kansas, Missouri and Oklahoma. The Missouri portion includes Barry, Christian, Greene, Lawrence, Jasper, and Newton Counties. Tri-State is the fourth largest historic producer of lead and the number one historic producer of zinc within the United States.

As a result of these mining and related activities, large amounts of hazardous substances, including cadmium, lead, and zinc, were released into Missouri's environment, and these metals continue to be released in certain areas of Tri-State. Cadmium, lead, and zinc associated with mining are toxic to a wide variety of plants and animals. After nearly 150 years of mining and smelting, chat piles, tailings sites, waste rock piles, and subsidence ponds remain as features of the landscape. Although the natural resource injury assessment is ongoing in Tri-State of Missouri outside of Newton County, the Trustees have decided to initiate restoration now for several reasons:

1. the Trustees determined that the injury assessment completed to date has sufficiently demonstrated the types of injury and service losses to enable the identification of appropriate types of restoration actions;
2. the Trustees have recovered damages for the Newton County Site from all of the viable Potentially Responsible Parties (PRPs) (Eagle-Picher Holdings, Peabody Energy Corp., ASARCO, and Blue Tee, Brown Strauss) through various settlements, including bankruptcy;
3. The scope of anticipated United States Environmental Protection Agency's (EPA) remedial action is relatively limited due to the relatively minor and defined scope of contamination in Shoal Creek.

The Trustees are required to use these recovered funds to restore, replace, or acquire the equivalent of injured natural resources and associated lost services resulting from exposure to hazardous substances. Remedial activities are still ongoing at the site, as EPA caps and removes contaminated soils in the watershed, and plans to address contamination within perennial streams. The Trustees believe it is

possible to proceed with restoration, if planned and implemented in careful coordination with the ongoing remedial cleanup. The Trustees have regular coordination calls with EPA to review remedial and restoration activities to determine whether there are any conflicts or benefits to joint actions. The restoration work described in Section 2.4 below will take place in areas below EPA action levels/preliminary remediation goals (SLERA 2009, CH2MHill 2021). In other words, restoration will be carried out in areas that are less contaminated than areas that EPA is likely to clean-up. The EPA remedial cleanup is expected to improve the water quality of Shoal Creek by excavating and capping and removing surficial mine waste that can be carried into the stream.

The selected restoration projects take place within the Shoal Creek watershed, tributary to the Spring River, within Newton County, Missouri. Past mineral processing operations have caused injuries to natural resources, triggering clean up actions by the EPA under CERCLA. Specifically, the Newton County Mine Tailings Site is approximately 300 square miles and has been grouped into five subdistricts. The Granby subdistrict is located within the area the Trustees have prioritized for restoration. American Zinc, Lead and Smelting Company, a predecessor of Blue Tee Corporation, conducted mining operations in the Granby, Diamond, and Spurgeon Subdistricts from 1917 to 1935. Federal Mining & Smelting Company, a predecessor of ASARCO LLC, conducted mining activities in the Granby Subdistrict from approximately 1916 to 1953. The intent of restoration is to compensate the public for harm to natural resources and lost use of these natural resources.

## **1.2 Purpose and Need for Restoration**

As described in §2 of the SPRRP, the Trustees developed the SPRRP to identify a preferred alternative to restore injured natural resources and to establish criteria for selecting projects to implement such restoration alternatives. This RP incorporates by reference the information and analysis contained within the SPRRP. The SPRRP can be accessed at: [FWS Tri State Missouri website](#). The Trustee-selected alternative in the SPRRP included a combination of restoration activities and projects to accomplish restoration goals at or near the site of injury.

The purpose and need of this RP, in accordance with the analysis contained in the SPRRP, is to propose and analyze a primary restoration project to restore injured natural resources as part of the on-going restoration process. This RP presents a range of alternatives to meet the Trustees' goal of restoring and/or enhancing natural resources affected by historical mining activities and to compensate the public for injuries to natural resources and ecological services lost over time until clean-up or restoration improves ecological function to baseline.

## **1.3 Authorities and Legal Requirements**

This RP was prepared by the Trustees pursuant to their respective authority and responsibilities as natural resource trustees under CERCLA (42 U.S.C. § 9601, *et seq.*) and its implementing regulations applicable to the NRDAR process. In addition, federal trustees must comply with NEPA, 42 U.S.C. § 4321 *et seq.*, and its regulations, 40 C.F.R. § 1500 *et seq.*, when planning and implementing restoration projects.

## **1.4 Public Participation**

Public participation and input are important parts of the restoration planning process. To comply with the statutory and regulatory processes, the Trustees solicited comments on a draft RP for 30 days, ending on September 28, 2021. The public was notified by posting in a local newspaper, as well as publishing the

open comment period on the Trustees' websites. The Trustees received no comments. No significant revisions to the draft RP were made.

## **2.0 BACKGROUND**

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### **2.1 Natural History**

Shoal Creek is a tributary of the Spring River which flows into Empire Lake in Southeast Kansas. The entire Shoal Creek watershed drains an area of approximately 450 square miles, located in Barry, Newton and Lawrence counties in southwest Missouri, and Cherokee County in Kansas. The Missouri portion of Shoal Creek is about 66 miles long, and flows in a northwesterly direction from its headwaters in Barry County until entering the state of Kansas southwest of Joplin. Largely spring-fed, upper Shoal Creek in its entirety is approximately 141 square miles located primarily in northwestern Barry County. Bedrock outcrops are common along the banks of Shoal Creek, including chert glades that are unique to this stream. According to the Missouri Department of Conservation (MDC), the Shoal Creek watershed is home to several species of conservation concern (SOCC) such as the Bristly Cave Crayfish (*Cambarus setosus*) and Arkansas Darter (*Etheostoma cragini*), as well as the federally listed Ozark cavefish (*Troglichthys rosae*), Rabbitsfoot Mussel (*Quadrula cylindrical*) and Neosho Mucket (*Lampsilis rafinesqueana*). Shoal Creek is an important source of drinking water supply for the cities of Joplin and Neosho, Missouri. (Holt WMP)

The presence of diverse and reproducing populations of mussels indicate a healthy aquatic system, which means good fishing and good water quality for other wildlife species. Unfortunately, it is estimated that 70 percent of U.S. freshwater mussels are extinct, endangered, or in need of special protection (USFWS 2015). The Neosho Mucket has been selected by the Trustees as a focal species for the restoration efforts in Shoal Creek. Many of mussel species' problems stem from how they live and the changes that have occurred to their river habitats. Neosho Mucket are found in river bottoms with gravel and sand. Because adult mussels rarely move, they are vulnerable to erosion and sedimentation of gravel bars. Larval stage mussels, called glochidia, must attach themselves to a host fish to disperse throughout the watershed. The Neosho Mucket only use black basses, such as smallmouth, largemouth, and spotted bass for its host. The requirements of clean water, stable sediment, and a healthy fish population makes the species an ideal barometer of water quality.

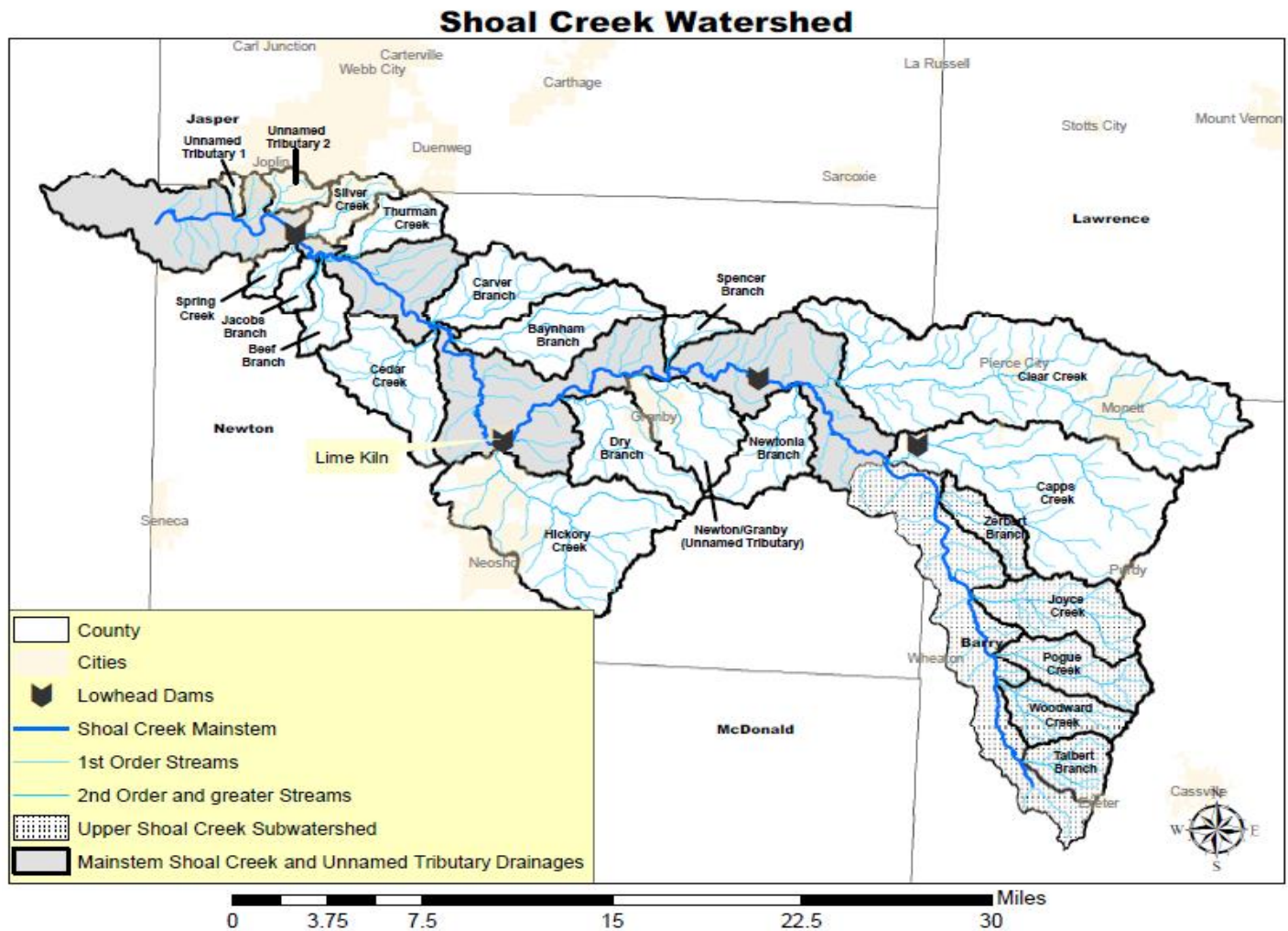


Figure 1 Shoal Creek watershed. Produced by Missouri Department of Conservation (MDC)

## 2.2 Watershed Issues

An interagency workgroup<sup>1</sup> on Shoal Creek, composed of resource agencies and non-profit organizations, identified the issues below that may be negatively impacting the Shoal Creek watershed. Based on this input from the workgroup, the Trustees will fund restoration projects that will address these issues and improve the health of the Shoal Creek watershed.

- *Mussel richness has declined.*

Mussels are sensitive to both metals and ammonia, two contaminants that are present in this watershed. Shoal Creek is on the most recent (2018) EPA-approved 303(d) list of impaired waters for zinc, though recent data from Shoal Creek indicates metal concentrations in sediment are below proposed EPA action levels in areas where restoration will occur. Angelo et al. (2007) determined low species richness and abundance of mussels appeared to be correlated with higher levels of

<sup>1</sup> Workgroup includes Missouri Dept of Conservation (Streams, Private Lands Units), Missouri Dept. of Natural Resources (NRDA, Soil and Water Conservation, Regional Office), The Nature Conservancy, US Fish & Wildlife Service (NRDA, Fisheries, Hatcheries, Partners Programs)

cadmium, lead, and zinc, throughout the Spring River basin. EcoAnalyst, Inc. (2018) found lower density and catch per unit effort of mussels in and below mining areas compared to non-mining areas. This report also stated that the decline in species richness and sediment quality had little correspondence with physical habitat scores and implied pollution is the primary factor limiting mussel diversity. EcoAnalyst, Inc. (2018) also found stable substrate was generally lacking in Shoal Creek and determined that habitat had changed at sites where mussel communities had historically been located. The two highest-quality sites on Shoal Creek were upstream of the Newton County Designated Waste Area, with similar longitudinal patterns throughout the Spring River basin, suggesting that sediment metal concentrations have negatively impacted the mussel community. MDC (McMurray and Faiman 2020 ) surveyed eight sites between 2010 and 2015, and found four sites with a mussel community. In 2016 these sites were re-surveyed and live mussels were only found at one site. Based on mussel survey data since the 1960s, the current community appears to be declining. There is no data on the mussel community prior to mining. Based on these findings, the Trustees are proposing a restoration project that focuses on implementing restoration that improves water quality and mussel habitat in areas not effected by expected EPA action levels.

- *Heavy metals are in the water and sediment, EPA may remediate portions of Shoal Creek and tributaries by excavating sediment.*

Streams throughout the Spring River watershed, including Shoal Creek have been impacted by heavy metals due to historic mining. The EPA is currently conducting response actions to contaminated soils and stream sediments. A Record of Decision (ROD) was released and remedial actions begun to address terrestrial mine and mill wastes, contaminated soils, and sediments in intermittent tributary streams. A remedial investigation (RI) is currently being developed for perennial streams and surface waters, with a ROD for that operable unit expected to be issued in 2025. Possible remedial actions include excavation of contaminated sediments or the creation of artificial sediment traps to collect contaminated sediments in areas with the highest concentrations of heavy metals. In addition to the ecological stresses caused by the metals themselves, future remedial actions are likely to have localized impacts while they are occurring. For this reason, future restoration work will be concentrated on stream reaches where metal concentrations are below potential remedial action thresholds, and all work will be coordinated with EPA remedial project managers. EPA Region 7 has utilized the T20 (a level of contamination that causes a 20% reduction in biomass of test organisms) as an action level in Jasper County and Newton Counties. Recently, in a Draft Preliminary Remediation Goal Memorandum, EPA indicated it may clean up sediment that exceeds the T10 within the Tri-State area. The Trustees have identified areas less than the T10 (a level of contamination that causes a 10% reduction in biomass of test organisms) as focal points for current restoration, which are the areas depicted on the map below in blue. Based on metals concentrations, planned restoration in these areas is anticipated to be outside the scope of future EPA remedial action in the watershed. Furthermore, a source of Shoal Creek contamination, the Granby tributary, has been cleaned of contaminated mine waste by EPA within the last 2 years.

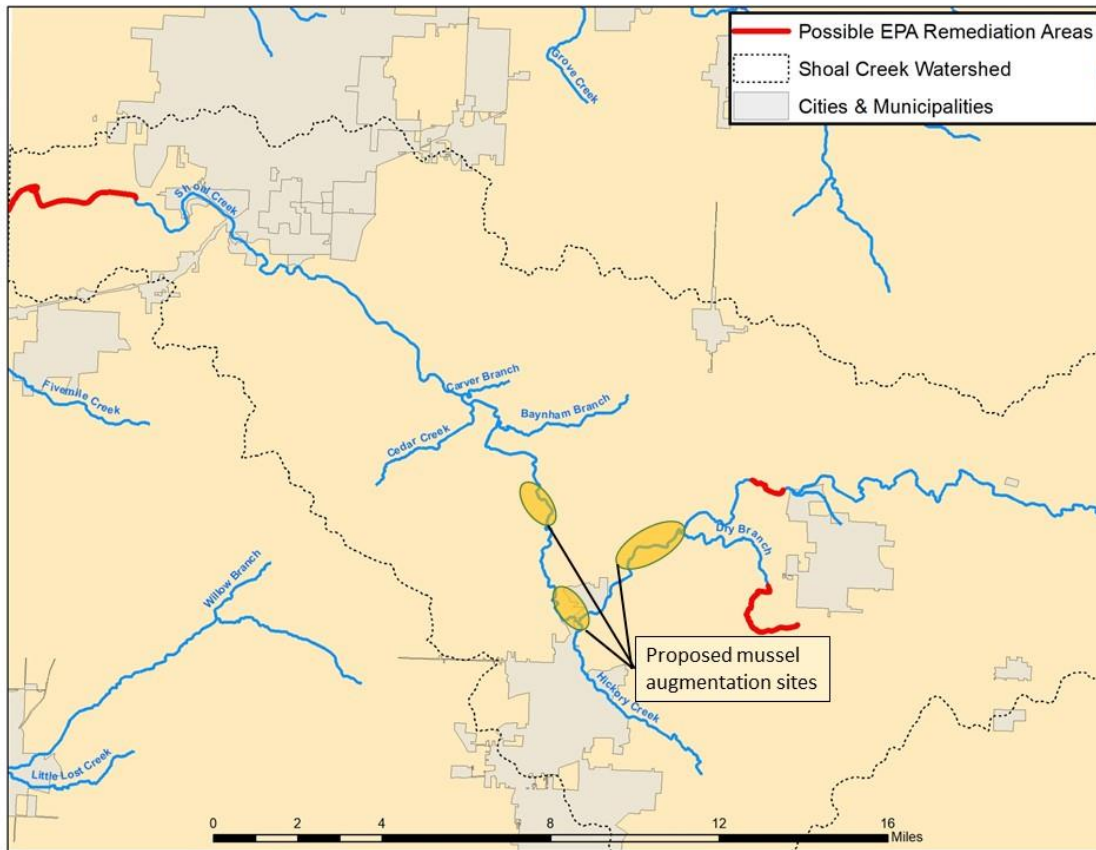


Figure 2 Areas of Shoal Creek (red) in which EPA may conduct remedial actions.

- *Some streambanks are unstable*

A virtual reconnaissance of Shoal Creek was completed that compared the 1963 channel to the World Imagery basemap to determine unstable reaches in the Creek. The World Imagery basemap aerial parcels ranged from 2018 to 2020 for the Shoal Creek reach. This analysis determined the main channel of Shoal Creek has moved at least one channel width in approximately 9.5 miles. Also using the World Imagery basemap, the riparian corridor of the 72.5 miles of Shoal Creek designated as perennial and the major tributaries were analyzed. This analysis determined the streams are currently lacking a riparian corridor of at least 100 feet along much of their reach (table and figure below).

Stream	Overall Length (mi)	Length Lacking Riparian Corridor (mi)
Shoal Creek	72.5	33.8
Silver Creek	4.6	1.6
Beef Branch	3.8	1.5
Thurman Branch	2.4	1.5
Carver Branch	3.2	1.6
Cedar Creek	3.8	1.4
Baynham Branch	4.2	1.6
Hickory Creek	4.9	3.4
Dry Branch	4.9	1.9
Newtonia Branch	1.4	1.2
Clear Creek	11.1	6.3
Capps Creek	5.0	3.6
Pogue Creek	2.6	1.4

Table 1. Tributaries of Shoal Creek and intact riparian corridor.

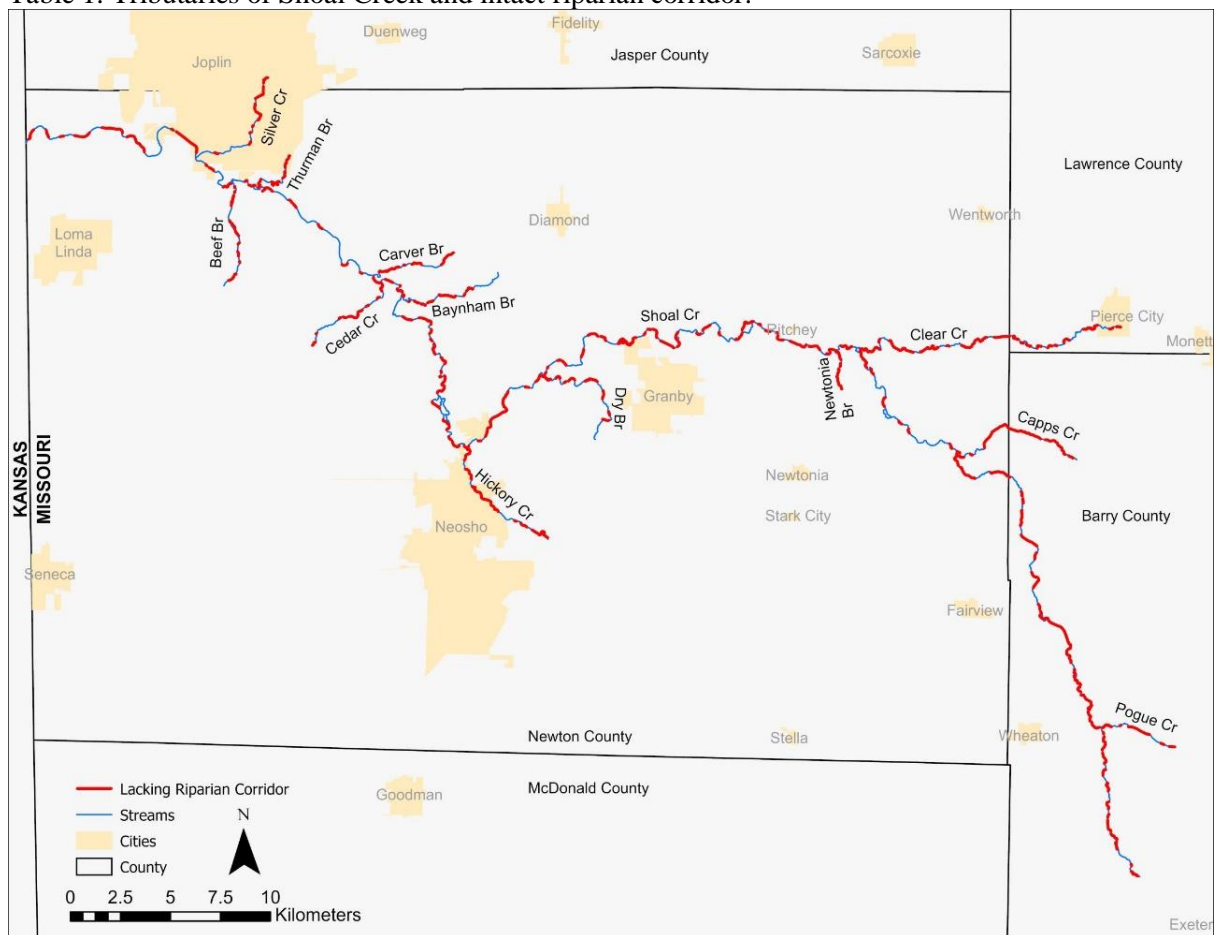


Figure 3 Areas lacking 100' riparian corridors within the Shoal Creek watershed.



- *There are numerous barriers to aquatic organism passage*

Many barriers to aquatic organism passage exist throughout the Shoal Creek watershed, ranging from culvert crossings on small tributaries, to dams on the mainstem of Shoal Creek, to the largest instream falls in Missouri. Though adult mussels do not move much on their own, in their juvenile stage, glochidia “hitch” a ride on various fish species, and then drop off after using the fish to disperse to other parts of the stream. Thus, the ability of mussels to colonize new habitat is tied to the ability of fish to swim to new habitat. MDC compiled an inventory of barriers based on how difficult it would be for a fish to pass through the structure. According to MDC, more than 1100 stream crossings are present within the Shoal Creek watershed, and 463 were considered barriers to aquatic organisms. There are three lowhead dams present on the mainstem. Some barriers are more significant to the ecosystem than others, based on the area that they isolate (both upstream and downstream), the ecological integrity of the system they impact, the size of the stream, and the configuration of the particular barrier.

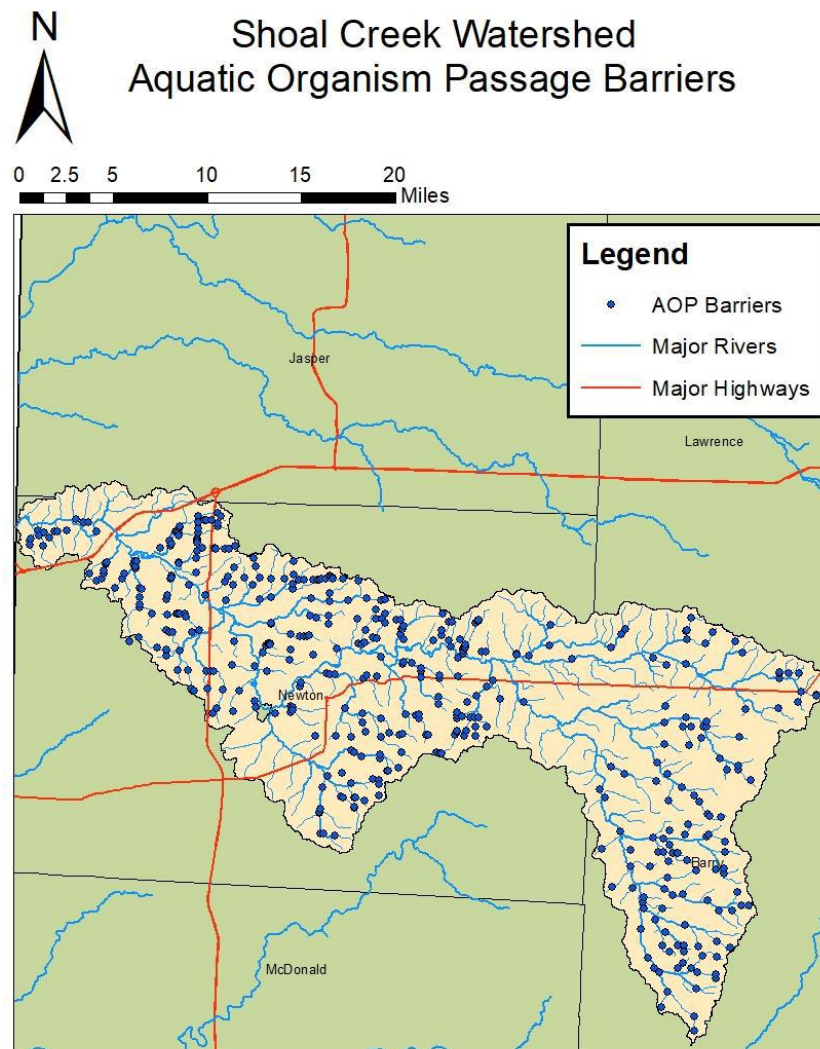


Figure 4 Aquatic organism passage barriers within the Shoal Creek watershed. Produced by MDC

- *Ammonia effects on mussels*

Mussels are particularly sensitive to ammonia, and recent studies in Missouri and elsewhere have found that the current criteria, EPA's 1999 chronic water quality criteria for total ammonia, do not adequately protect certain juvenile mussel species (Wang et al. 2007). The EPA criteria was derived from a database that did not include data for freshwater mussels, and studies indicate that glochidia and juvenile mussels are more sensitive to some chemicals when compared to commonly tested aquatic organisms. Elevated concentrations of ammonia can be derived from inadequately treated municipal wastewater and agricultural runoff.

- *Poultry Confined Animal Feeding Operations (CAFOs) and cattle pollute the stream via run-off; and cattle with stream access pollute the stream directly*

Upper Shoal Creek watershed is primarily rural farmland and woodland, with approximately 89 percent grassland, 11 percent wooded, and less than one percent row crop and urban land use. (Shoal Creek Watershed Improvement Group. 2012) According to the Total Maximum Daily Load (TMDL), studies performed prior to 1980 indicated excellent water quality in Shoal Creek. Studies conducted between 1992 and 1999, indicated that concentrations of fecal coliform bacteria in upper Shoal Creek averaged more than 5,000 colonies per 100 mL. *E. coli* is a type of bacteria that are present in the digestive tract of all warm blooded animals, the higher the level of bacteria in water, the greater the level of fecal contamination from livestock, humans, or wildlife. Nutrients such as phosphorous and nitrogen, which co-occur with fecal contamination, are used as surrogates for bacteria for monitoring purposes. Excess nutrients create a proliferation of algae and the subsequent decomposition depletes available dissolved oxygen in the water profile. Nutrients in Shoal Creek, specifically total nitrite plus nitrate as nitrogen at base-flow concentrations, were significantly higher compared to other Missouri streams. Nitrogen compounds can transform into ammonia in aquatic environments. A 13.5 mile segment of upper Shoal Creek was placed on the 1998 303 (d) list of impaired waters, and the subsequent 2003 TMDL's goal was to restore Upper Shoal Creek to the water quality standard of 200 col/100mL of fecal coliform. Since that time, the major tributaries of upper Shoal Creek (in Lawrence and Barry counties) remain impaired for *E. coli*. Results from a study on the origin of bacterial contamination in the Shoal Creek watershed (circa 2012) are below (Shoal Creek Watershed Improvement Group. 2012).

<i>E. coli</i>	Sources/Causes	Summer	Winter	Appropriate BMPs
Cattle	Cattle standing in streams and manure from pastures reaching streams during storm events	45%	27%	Off-stream watering systems/limiting stream access; riparian corridor restoration; grassy swales; vegetative filter strips; intensive grazing
Poultry	Land-applied poultry litter from pastures reaching streams during storm events	19%	17%	Adherence to setback requirements during litter application; riparian corridor restoration; grassy swales; vegetative filter strips
Human	Failing onsite wastewater treatment systems (OWTS)	11%	21%	Regular maintenance (pumping) of septic tanks; repair/replacement of failing OWTSs
Domestic animals	Horses, goats, sheep, hogs, dogs, etc. manure reaching streams during storm events	19%	11%	Off-stream watering systems; riparian corridor restoration; grassy swales; vegetative filter strips
Wildlife	Wildlife droppings reaching streams during storm events and/or directly deposited in streams	6%	25%	Riparian corridor restoration; grassy swales; vegetative filter strips

Table 2 Sources of *E. coli* within the Shoal Creek watershed. Produced by Shoal Creek Watershed Improvement Group.

- *Sedimentation from gravel roads and other sources*

Interstitial spaces (areas between gravel and cobble) provide crucial habitat for aquatic insects, such as mayflies and caddisflies, and juvenile fish and mussels. When these spaces are clogged with excessive sediment, from roads or other sources, it changes the flow of water and these spaces often are reduced. This can lead to lower feeding and respiratory efficiency from clogged gills, abrasion to body and gills, reduced growth rates, and complete physical smothering. The physical effects of sediment on aquatic habitats appear to be numerous, and include changes in suspended and bed material load, loss of fish spawning areas, stream channel changes in stability, changes in light penetration and flow regime, and changes in water quality. While there is limited data on sedimentation in Shoal Creek specifically, the issue of excessive sedimentation in similar Midwestern streams has been studied extensively. Nearby, the Arkansas Unpaved Roads Program was formed to promote utilization of best management practices on rural, unpaved roads to minimize erosion. In an index used for the Species Status Assessment of the Western Fanshell mussel, a road density of less than 0.5 km/km<sup>2</sup> is considered good, 0.5-1 is ok, >1 is considered bad. The unpaved road density for the watershed of Shoal Creek is 1.93 km/km<sup>2</sup> (USFWS 2020)

- *Baynham Branch Impoundment/artificial flow*

There is a reservoir planned by Missouri American Water “Site C” that would dam up approximately 1,100 acres of land within Baynham Branch, and will hold approximately 12 billion gallons of water. Missouri American Water is beginning the permit process with the U.S. Army Corps of Engineers (USACE). The entire project is expected to be completed within five to six years. (MAW website). Many details are lacking on this project, such as whether water would be diverted from Shoal Creek, when this would occur, and how water would be conveyed

downstream to water users in Joplin. Baynam Branch is downstream of restoration focus areas, and restoration projects are not planned within this tributary.

## 2.3 Project Objectives

The Trustees developed restoration objectives and a request for proposal process (RFP) in the SPRRP (see, Section 6 of the SPRRP for a discussion of the RFP Process). In August 2020, the Trustees released an RFP to seek restoration projects that address one or more of the following resource objectives.

- Increase the diversity and size of native mussel populations.
- Stabilize streambanks within the Shoal Creek watershed.
- Remove barriers to aquatic organism passage.
- Reduce run-off/contamination of streams by CAFOs, cattle, and other sources.
- Reduce the amount of ammonia entering Shoal Creek streams from wastewater treatment plants and other sources.

There were three successful applications, two involving riparian and upland restoration with willing landowners, and one involving mussel monitoring. These are discussed in detail in Section 2.5 Alternatives.

## 2.4 Restoration Criteria

To ensure the appropriateness and acceptability of restoration options addressing ecological losses, the Trustees evaluated each option against restoration evaluation criteria in the NRDAR regulations. Below are the criteria used to evaluate the potential restoration projects described in this RP as a part of the NRDAR process. The criteria reflect the “factors to consider when selecting the alternative to pursue” (NRDAR factors) as described in 43 C.F.R. § 11.82(d)(1-10). The Trustees have considered the following factors as part of their evaluation of the Selected Alternative in this RP, and believe this RP and the Selected Alternative complies with the regulations, as follows:

### *Technical Feasibility (43 CFR 11.82(d)(1):*

The selected restoration alternative must be technically sound. The Trustees considered the level of risk or uncertainty involved in implementing a project. A proven record of accomplishment demonstrating the success of projects utilizing similar or identical restoration techniques can be used to satisfy this evaluation criterion.

### *Cost Effectiveness (43 CFR 11.82(d)(3):*

The Selected restoration alternative must be cost effective, including planning, implementation, and long-term operation, maintenance, and monitoring.

### *The results of any actual or planned response actions. (43 CFR 11.82(d)(4):*

The Selected alternative considered likely future remedial activities. The Trustees have planned restoration actions in areas that are either not contaminated or are below risk-based criteria or preliminary remedial goals.

### *Compliance with Laws, Regulations, and Policies (43 CFR 11.82(d)(9-10):*

Development of this RP requires consideration of a variety of legal authorities and their potential applicability to the Selected Alternative(s). As a part of restoration planning process, the Trustees have initiated steps to ensure compliance with applicable laws, regulations, and policies. Implementation of the Selected Alternative(s) would remain subject to meeting all permitting and other environmental compliance requirements to ensure the project is implemented in accordance with all applicable laws and regulations.

*Consistency with the Trustees Restoration Goals:*

The Selected Alternative(s) should meet the Trustee's intent to restore the injured resources or the services those resources provide. The Trustees considered the potential for success (meeting restoration goals) and the level of expected return of resources and resource services.

*Public Health and Safety (43 CFR 11.82(d)(8):*

The Trustees considered whether the Selected Alternative(s) posed a threat to the health and safety of the public.

*Avoidance of Further Injury (43 CFR 11.82(d)(5):*

The Selected Alternative(s) should avoid or minimize adverse impacts to the environment and the associated natural resources. The Trustees considered the future short- and long-term injuries, as well as mitigation of past injuries, when evaluating projects.

*Time to Provide Benefits:*

The Trustees considered the time expected for the project to begin providing benefits to the target ecosystem and/or public. A more rapid time to delivery of benefits is favorable.

*Duration of Benefits:*

The Trustees considered the expected duration of benefits from the restoration alternatives. Projects expected to provide longer-term benefits were regarded more favorably.

## **2.5 Restoration Alternatives**

In August 2020, the Trustees advertised a Request for Proposal seeking applicants that can “implement successful environmental restoration programs and projects” within the Shoal Creek watershed. The Trustees considered the following restoration alternatives, based on applicants’ proposals, in developing this plan:

### **2.5.1 Alternative 1 – No Action**

Alternative 1, the “No Action” alternative, considers the environmental consequences of conducting no restoration and is included in this RP as a basis for comparison of the other alternatives to the status quo. If the “No Action” alternative is selected, there would be no funds expended for the restoration of Shoal Creek and therefore no ecological uplift would occur. No mussels would be re-introduced. The “No Action” alternative is not expected to provide additional compensation to the public for interim ecological and human use losses for the impairment of surface water due to mining actions. The Trustees concluded that the No Action Alternative would not meet the purpose and need for restoration under this RP, would not meet the restoration objectives, and would meet only some of the restoration criteria, such as where inaction would avoid future injury, and safety would remain at status quo.

## **2.5.2 Alternative 2 Riparian Corridor, Stream Bank, and Wetland Restoration**

This alternative will implement stream and wetland restoration projects in the central and upper reaches of Shoal Creek and protect these areas through conservation easements. One restoration site is located at the confluence of Hickory Creek and Shoal Creek. This 34-acre property is presently a cattle operation, which includes approximately 0.25 mile along Shoal Creek, and 0.5 mile along both banks of Hickory Creek. There are other possible bank stabilization/riparian planting projects amounting to approximately half a mile on Upper Shoal Creek. If selected, a conservation easement will be placed on the known 34 acre site, and similar easements or landowner agreements will protect other restoration properties. Restoration will only occur on land held by willing landowners, and no land will be purchased by the Trustees. A sample easement is included as Appendix A to this plan.

Riparian buffers of 50-100 feet along Upper Shoal Creek and its tributaries will be established to filter pollutants, before entering streams from runoff, to control erosion, stabilize streambanks, and to improve terrestrial and aquatic habitats for the long term. This alternative will only be implemented on property where land-owners are willing to implement projects and agree to contracts that preserve the restoration for some period of years or permanent easements. Several nature-based streambank stabilization projects will incorporate native trees, shrubs, and grass plantings adapted to floodplain conditions adjacent to streams and extending outward for 50-100 feet. This initiative will follow Natural Resource Conservation Service and Soil and Water Conservation District specifications for streambank stabilization and riparian corridor establishment practices, such as stream protection (WQ10), native grass and forb restoration and establishment, alternative watering, cattle exclusion fencing, spring protection, and woodland restoration. Erosion and vegetation monitoring components will be used to evaluate the success of the projects. Re-vegetation will be deemed successful if over 90% of the area is covered by native vegetation as determined by quantitative surveys at 1, 2, and 4 years after initial revegetation. Soil erosion rates will not be monitored directly. However, studies indicate that native grass, shrub, and tree cover reduces erosion rates by 75 to 90% (Sweeney and Newbold, 2014). It is estimated that 12 miles (non-contiguous) of riparian corridor will be restored/enhanced, and 850 acres will be restored/enhanced. The cost to implement this alternative would be \$1,500,000, and would be augmented by approximately \$1,000,000 of outside matching contributions.

This alternative would achieve the restoration objectives of stabilizing streambanks within the Shoal Creek watershed and reducing nutrient/ammonia run-off/contamination of streams by CAFOs, cattle, and other sources, as well as meeting all of the restoration evaluation criteria in Section 2.3 above. This alternative is technically feasible because it uses well-known methods of improving watershed health. It is cost effective because many of the measures to be used (riparian tree-planting, exclusion fencing, creating alternative water sources for cattle) are low maintenance and will be cost-shared from matching funds from other sources. This restoration has a minimum of land disturbance and will be implemented in areas that do not have contaminated soils, which will minimize additional injuries, and avoid areas in which remedial clean up would occur. The time to provide benefits would be relatively rapid (one to two years) as vegetation becomes established, and the duration would be insured in the long-term through conservation easements or contracts.

## **2.5.3 Alternative 3 Mussel Monitoring**

This alternative is the assessment of water quality in Shoal Creek using the non-endangered Plain Pocketbook mussel, *Lampsilis cardium*. Conditions in Shoal Creek would be assessed by placing sub-

adult Plain Pocketbook in mussel silos for a period of six months to monitor growth and survival. In addition, the Trustees or partners will conduct four rounds of seasonal water quality sampling that will include, at a minimum, ammonia and chloride. One of the water quality sampling events will occur prior to placement of mussel silos. The Plain Pocketbook is being used as a surrogate for the Neosho Mucket, *Lampsilis rafinesqueana*, to ascertain if water quality is sufficient for mussel recruitment. If the results from the silos identifies sites as supportive of mussel growth, the Trustees will consider restocking Plain Pocketbook mussels in the substrate, using a cage to facilitate recovery. If growth and survival of sub-adult mussels continues in the substrate, the site will be deemed supportive of young mussels. If there is >70% survival of the sub-adults, the area will be considered a possibility for future mussel augmentation. If >70% survival is not achieved or the monitoring phase suggests poor mussel growth, more time will be allowed for other restoration projects to positively impact water quality before resuming any mussel monitoring. Comparisons of mussel response between sites, water quality, and sediment quality data will instruct future restoration efforts. Any augmentation of the Neosho Mucket would be considered under a separate RP/EA. This project will cost approximately \$13,500 for mussel production, \$2500 for mussel silos, and \$15,000 for field monitoring and report preparation, totaling \$31,000. This project will produce 500 Plain Pocketbook mussels over 2 years.

This alternative, by design, would only address some of the restoration objectives of Section 2.2, particularly those related to mussel restoration, due to its limited scope. Mussel monitoring via silos is a well-used, technically feasible activity. This alternative is cost effective because it provides necessary monitoring/feedback for planned restoration projects at a minimal cost. The time to provide benefits would be relatively rapid (two years), and the duration of benefits lasts as long as the projects are monitored. Minimal site disturbance would occur, thus no further injury to resources is anticipated.

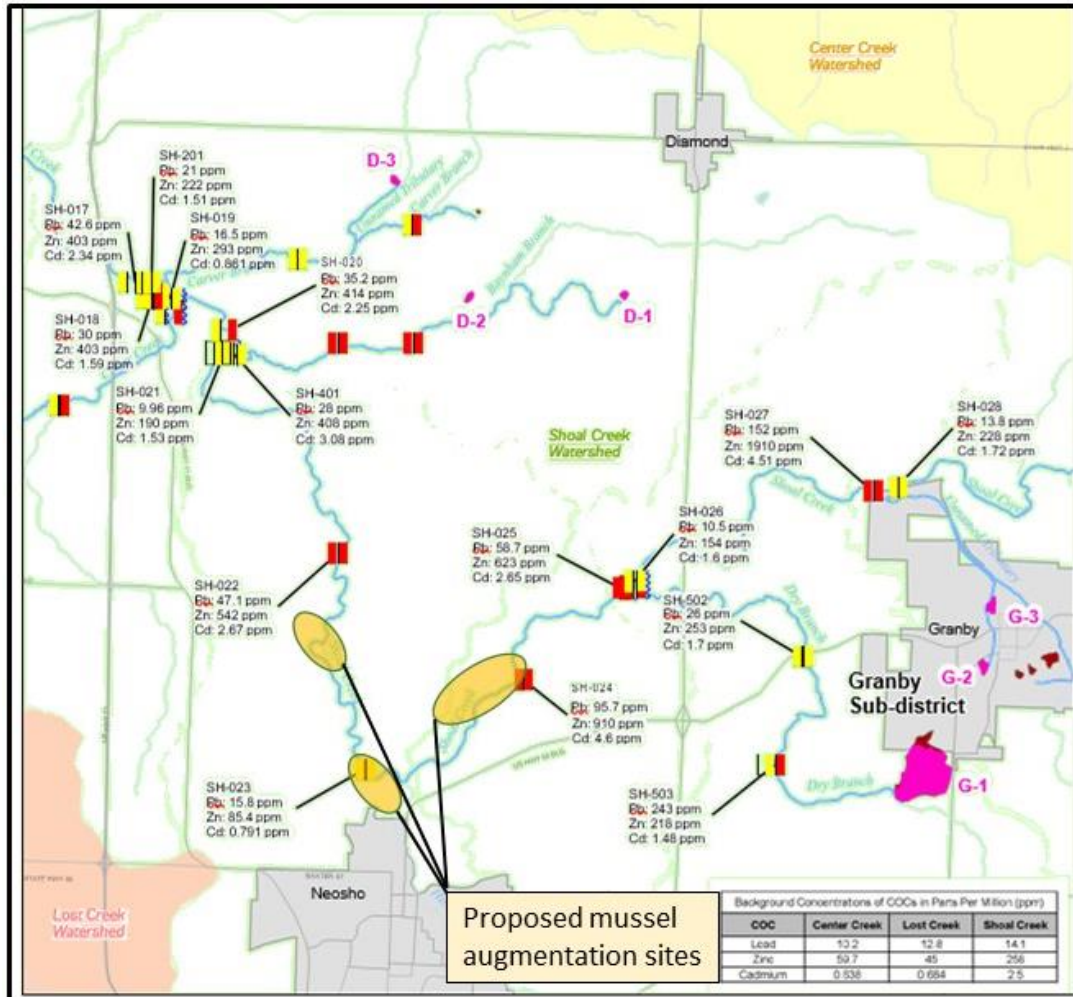


Figure 5 Proposed mussel monitoring sites overlaid on sediment contamination map from EPA's Remedial Investigation document. Source map produced by Black & Veach

### 2.5.4 Alternative 4 Combined Restoration Activities (Selected Alternative)

This selected alternative will fund both alternatives 2 and 3, resulting in multiple types of restoration within priority areas to occur simultaneously. It is anticipated that the implementation of multiple restoration projects will shorten the time for ecological uplift to occur. This alternative will achieve a majority of the restoration objectives of Section 2.3, and would meet all of the restoration criteria of Section 2.4, above. It is estimated that 12 miles of riparian corridor will be restored/enhanced, and 850 acres will be restored/enhanced. Approximately 500 sub-adult Plain Pocketbooks mussels will be produced. The cost of funding both alternatives is approximately \$1,531,000, and matching funds from other sources would total approximately \$1,020,000. These activities would take place within 5 years of being funded.

The selected alternative is technically feasible because it uses well-known methods of improving watershed health and monitoring. It is cost effective because many of the measures to be used (riparian tree-planting, exclusion fencing, creating alternative water sources for cattle) are low maintenance and will be cost-shared from matching funds from other sources. This selected restoration and mussel monitoring alternative minimally disturbs land and will be implemented in areas that do not have



contaminated soils, which will minimize additional injuries, and avoid areas in which remedial clean up would occur. The time to provide benefits is anticipated to be relatively rapid (one to two years) as vegetation becomes established and monitoring occurs, and the duration would be insured in the long-term through conservation easements or contracts.

### **3.0 ENVIRONMENTAL COMPLIANCE**

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General information regarding the location of the selected restoration projects, and affected resources, including the physical resources, biological setting, and socioeconomic resources, is provided in the SPRRP at Section 4, Affected Resources, (Springfield Plateau Regional Restoration Plan) and is incorporated by reference herein.

Actions undertaken by a federal trustee to restore natural resources or services under CERCLA are subject to the National Environmental Policy Act (NEPA) (42 U.S.C. § 4321 *et seq.*) and other federal laws. NEPA requires an assessment of any federal action that may impact the human environment. The Trustees believe this plan meets the criteria for a categorical exclusion under 516 DM 8.5 (A)(4) and (B)(1-6). A completed NEPA Compliance Checklist(s) will be included with the Final Restoration Plan.

Any additional environmental compliance required, including compliance with Endangered Species Act (ESA) consultation and National Historic Preservation Act (NHPA), as appropriate, will occur prior to implementation of restoration. Necessary permits, such as a 404 USACE permit and floodplain no-rise certificate, are the responsibility of the entities implementing those activities.

### **4.0 AGENCIES, ORGANIZATIONS, AND PARTIES CONSULTED FOR INFORMATION**

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Environmental Protection Agency, Region 7  
11201 Renner Blvd,  
Lenexa, KS 66219

Land Learning Foundation  
704 W Jackson  
P.O. Box 55  
Keytesville. MO 65261

Missouri Department of Conservation  
2901 W. Truman Blvd.  
Jefferson City, MO 65109  
573 751-4115

Neosho National Fish Hatchery  
520 Park Street Neosho, MO 64850

Partners for Fish and Wildlife Program  
101 Park DeVille Dr, Suite A  
Columbia, MO 65203

## 5.0 CITATIONS

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- Angelo, R.T., M.S. Cringan, D. L. Chamberlain, A. J. Stahl, S. G. Haslouer & C. A. Goodrich. 2007. Residual effects of lead and zinc mining on freshwater mussels in the Spring River basin (Kansas, Missouri, and Oklahoma, USA). *Science of the Total Environment* 384: 467-496.
- Black & Veatch Special Projects Corp. 2008. Final Newton County Mine Tailings Site Remedial Investigation Report. Prepared for U.S. Environmental Protection Agency Region 7
- CH2MHill. 2021. Technical Memorandum- Development of Human Health Risk-Based Preliminary remediation Goals for Operable Unit 5. Prepared for USEPA Region 6
- EcoAnalysts, Inc. 2018. Final report: Tri-state mining district unionid assessment, Missouri, Kansas, and Oklahoma, 2016 – 2018. Unpubl. report prepared for U.S. Fish and Wildlife Service, Columbia, Missouri. 101 pp.
- MacDonald Environmental Sciences Ltd. 2009. Advanced Screening-Level Ecological Risk Assessment (SLERA) for Aquatic Habitats within the Tri-State Mining District, Oklahoma, Kansas, and Missouri. Prepared for U.S. Environmental Protection Agency
- McMurray, S.E. and J.S. Faiman. 2020. Freshwater mussel survey of the Spring River basin in Southwest Missouri. Missouri Department of Conservation, Jefferson City.
- Obermeyer, B.K., D.R. Edds, C.W. Prophet, and E.J. Miller. 1997. Freshwater mussels (Bivalvia: Unionidae) in the Verdigris, Neosho, and Spring River basins in Kansas and Missouri, with emphasis on species of concern. *American Malacological Bulletin* 14(1):41-55.
- Shoal Creek Watershed Improvement Group. 2012. Upper Shoal Creek Watershed Non-Point Source (NPS) Watershed Management Plan Unpubl. report prepared for Missouri Dept of Natural Resources 32 pp
- Sweeney, B.W. and J.D. Newbold. 2014. Streamside forest buffer width needed to protect stream water quality, habitat, and organisms: A literature review. *Journal of American Water Resources Association*. Vo. 50, No.3.
- U.S. Fish and Wildlife Service. 2015. Online article: 2MusselsFactsApril2015.pdf  
[https://www.fws.gov/southwest/es/oklahoma/Documents/TE\\_Species/Mussels/2MusselsFactsApril2015.pdf](https://www.fws.gov/southwest/es/oklahoma/Documents/TE_Species/Mussels/2MusselsFactsApril2015.pdf)
- U.S. Fish and Wildlife Service. 2020. Species status assessment report for Western Fanshell (*Cyprogenia aberti*) and “Ouachita” Fanshell (*Cyprogenia cf.aberti*). December 2020 (Version 1.1). Columbia, Missouri.
- U.S. Fish and Wildlife Service. 2020. Online article “Improving Unpaved Roads for Nature and Arkansans”. <https://www.fws.gov/ecological-services/highlights/04242017.html>

U.S. Fish and Wildlife Service and Missouri Department of Natural Resources. 2012. Springfield Plateau Regional Restoration Plan and Environmental Assessment (Amended 2018).

<https://dnr.mo.gov/env/hwp/sfund/docs/sprrp2018.pdf>

Wang, Ning, Christopher G. Ingersoll, Douglas K. Hardesty, Christopher D. Ivey, James L. Kunz, Thomas W. May, F. James Dwyer, Andy D. Roberts, Tom Augspurger, Cynthia M. Kane, Richard J. Neves, and M. Chris Barnhart. 2007 Acute Toxicity of Copper, Ammonia, and Chlorine to Glochidia and Juveniles of Freshwater Mussels (Unionidae)

**APPENDIX A**  
**SAMPLE CONSERVATION EASEMENT**

**DECLARATION OF CONSERVATION EASEMENT DEED**

This Declaration of Conservation Easement Deed (“Conservation Easement”) is made this \_\_\_\_ day of \_\_\_\_\_, 20\_\_, by and between the Grantor, \_\_\_\_\_ (“Grantor”), in favor of the Grantee, \_\_\_\_\_ (“Grantee”), for the benefit of the Grantee and the United States Department of the Interior, U.S. Fish and Wildlife Service (“FWS”).

**RECITALS**

A. This Declaration is made pursuant and according to the common law of the State of Missouri, and the Missouri Private Landowner Protection Act, Rev. Mo. Stat. § 442.014 (2011).

B. Grantor is the fee owner of certain real properties located in the County of \_\_\_\_\_, State of Missouri, that are legally described in Exhibit A attached hereto and made a part of this Conservation Easement by reference (“Property”). The Property is further depicted for reference purposes only on the Site Diagram attached hereto as Exhibit B.

C. Grantor is willing to grant this Conservation Easement over the Property for a period of \_\_\_\_ years from the date of execution, thereby restricting and limiting the use of the Property as hereinafter provided in this Conservation Easement for the purposes hereinafter set forth.

## DECLARATION

NOW THEREFORE, in consideration of the mutual covenants of the parties and other valuable consideration, receipt of which is hereby acknowledged, Grantor and Grantee agree as follows:

1. The natural characteristics and physical conditions of the Property as of the date of this Conservation Easement, including a map that accurately identifies the ecological habitat(s) of the Property and potential future ecological habitats(s) after management (“Natural State”) are further documented in the attached Baseline Report and signed and acknowledged by representatives of the Grantor and the Grantee, establishing the Natural State of the Property as of the date of this Conservation Easement, including reports, maps, photographs and other documentation as set forth in Exhibit C and incorporated by reference herein. Grantor, on behalf of itself and its heirs, successors, and assigns, and pursuant to the laws of the United States and the State of Missouri, hereby grants, bargains, sells, and conveys to the Grantee, its agents, contractors, successors, and assigns, this Conservation Easement in the Property, described above and in Exhibits A and B hereto, subject to the covenants, conditions, and restrictions declared herein, all of which are declared and agreed to be equitable servitudes in furtherance of the conservation in perpetuity of the Natural State of the Property, including the conservation of the natural resources contained and natural resources services provided therein. The Property, the natural resources contained therein, and natural resources services provided therein, shall be conserved in their Natural State for the purposes stated in Section 5, below.

2. Any use of or activity on the Property that would impinge upon or interfere with their conservation in their Natural State, for the purposes set forth in Section 5, below, is prohibited. Such prohibited uses shall include but not be limited to the following:

- a. Alteration of the surface topography, other than that caused by forces of nature;
- b. Creation of roads except as needed for service roads and roads necessary for public access and parking.;
- c. The placement of fill material as defined in Part 303 of the NREPA, MCL 324.30301 et seq., as amended, except as needed to create or maintain service roads;
- d. Dredging, removal or excavation of any soil or minerals;
- e. Drainage of surface or groundwater;
- f. Construction or placement of any structure except the construction of fences for cattle exclusion, and the construction of hiking trails and parking lot or lots that allow for public use of the Property, is specifically permitted pending Trustee approval;
- g. Plowing, tilling, or cultivating the soils or vegetation;
- h. Ranching, grazing, farming, or horticulture;
- i. Silviculture or lumbering, unless completed pursuant to a resource management plan (including an approved Missouri Department of Conservation forest inventory/prescription plan) and approved by Trustees;
- j. Use of chemical herbicides, pesticides, fungicides, fertilizers, spraying with biocides, larvicides or any other agent or chemical treatments, and oil, gas, or mineral exploration and extraction, except: 1) when required to treat invasive or undesirable species; and 2) as needed to complete timber stand improvement pursuant to a resource management plan (including an approved Missouri Department of Conservation forest inventory/prescription plan).;
- k. Construction of utility or petroleum lines, nor shall any other interest be granted in the Property for this purpose. However, the Grantor reserves the right to maintain and repair telephone, electric, wells, water, or other utility lines or mains needed to provide for the needs of the Grantor, successor or assigns. The area affected by the repair work shall be the minimum necessary to accomplish the task. Upon completion of all construction for such utilities, the area shall be restored to its previous state;;
- l. Storage or disposal or accumulation of ash (except ash created as a result of controlled burns conducted pursuant to an approved Missouri Department of Conservation forestry inventory/prescription plan), garbage, trash, debris, abandoned equipment or accumulation of machinery, bio-solids or other waste materials, including accumulated vegetative debris, such as grass clippings, leaves, yard waste or other material collected and deposited from areas outside the Property;
- m. Use or storage of automobiles, trucks or off-road vehicles including, but not limited to, snowmobiles, dune buggies, all-terrain vehicles, and motorcycles, except vehicles required for resource maintenance activities (including those conducted pursuant to an approved Missouri Department of Conservation forest inventory/prescription plan), public user vehicles for access and parking, and vehicles necessary to provide reasonable

accommodation pursuant to the American Disabilities Act (ADA) to individuals having disabilities as defined by the ADA;

- n. Placement of billboards or signs;
- o. Actions or uses detrimental or adverse to water conservation and purity, and fish, wildlife or habitat conservation;
- p. All industrial, residential, and commercial activity except for de minimis commercial recreational activity.

3. The covenants, conditions, and restrictions set forth herein shall run with the Property and each part of them, and shall be binding upon, and for the benefit of the Grantor, Grantee, and to each owner of fee title to all or any portion of the Property and their successors in ownership of fee title.

4. This Conservation Easement, when filed by Grantor with the Recorder of Deeds for \_\_\_\_\_ County, Missouri, shall serve as notice that the Property, the natural resources contained therein, and natural resources services provided therein, shall be conserved for a period of \_\_\_ years, for the purposes set forth in Section 5, below, and subject to the covenants, conditions, and restrictions set forth herein, and further that any use or activity within the Property which impinges upon or interferes with the covenants, conditions, and restrictions set forth herein is prohibited.

5. The Property, the natural resources contained therein, and natural resources services provided therein, shall be conserved in their Natural State, pursuant to and consistent with the Shoal Creek Watershed Restoration Plan, dated \_\_, \_\_, 20\_\_ (“the Restoration Plan”), for the purposes of conserving, protecting, and enhancing the natural resources on and in the Property, including native flora and fauna on the Property; and conserving, protecting, and enhancing natural resource services provided by native flora and fauna, including but not limited habitat for migratory birds, song birds, and other native species.

6. Authorized representatives of FWS shall have the right to enter the Property after coordination with the Grantee, for the purposes of monitoring the conditions of the Property pursuant to enforcement of this Conservation Easement.

7. This Conservation Easement may not be modified or amended except by a writing signed by Owners and representatives of FWS.

8. Unless the parties expressly state that they intend a merger of estates or interests to occur, no merger shall be deemed to have occurred hereunder or under any document executed in the future affecting this Conservation Easement.

9. Every person who now or hereafter owns or acquires any right, title, or interest in any portion or all of the Property is and shall be conclusively deemed to have consented and agreed to every covenant, condition, restriction, and provision contained in this Conservation Easement.

10. This Conservation Easement grants third-party rights of enforcement to the United States Department of the Interior, FWS, for the enforcement of this Conservation Easement's terms, which may be enforced under either or both common law and Rev. Mo. Stat. § 442.014 (2011).

11. This Conservation Easement shall be governed by the laws of the United States and the State of Missouri, including the common law of property in the State of Missouri and the Missouri Private Landowner Protection Act, Rev. Mo. Stat. § 442.014 (2011).

12. This Conservation Easement may be executed in a number of identical counterparts. Each of the counterparts will be deemed an original for all purposes and all counterparts will collectively constitute one Agreement.



13. The sole remedy for breach of this Conservation Easement shall be specific performance, and damages shall not be recoverable against Grantor or any successor in ownership of the Property.

14. If any covenant, condition, provision, term or agreement of this Conservation Easement is to any extent held invalid or unenforceable, the remaining portion thereof and all other covenants, conditions, terms, and agreements of this Declaration will not be affected by such holding, and will remain valid and in force to the fullest extent permitted by law.

15. Grantor, and each subsequent owner of fee title to all or any portion of the Property, and their successors in ownership of fee title, agree to notify Grantee and FWS prior to undertaking any activity that may be inconsistent with the terms of this Conservation Easement. The purpose of this provision is to afford Grantee and FWS an adequate opportunity to monitor the activities in question to insure that they are designed and carried out in a manner that is consistent with the purposes of this Conservation Easement. In such circumstances, Grantor or any subsequent owner shall notify Grantee and FWS in writing not less than forty-five (45) days prior to the date Grantor or any subsequent owner intends to undertake the activity in question. The notice shall describe the nature, scope, design, location, timetable, and any other material aspect of the proposed activity in sufficient detail to permit the Grantee and FWS to make informed judgments as to the consistency with the purposes of this Conservation Easement, and to take any action they may deem necessary to preserve their rights under this Conservation Easement.

16. Grantor, and each subsequent owner of fee title to all or any portion of the Property, and their successors in ownership of fee title, agree to notify Grantee and FWS prior to undertaking any conveyance of any portion of the Property to any other party. Grantor or any

subsequent owner shall provide such notice to Grantee and FWS in writing not less than forty-five (45) days prior to the date of the conveyance. Said notice shall provide a general description as well as a legal description of the property to be conveyed.

17. Grantor, and each subsequent owner of fee title to all or any portion of the Property and their successors in ownership of fee title, agrees to incorporate into the terms of this Conservation Easement by reference in any deed or other legal instrument by which it divests itself of any interest in all or a portion of the Property, including, without limitation, a leasehold interest, and shall indicate said rights and restrictions are binding upon all successor in interest in the Property in perpetuity. Grantor and said owners shall also notify the Grantee and FWS of the name(s) and address(es) of their successors in interest; notice shall not impair the effectiveness thereof nor the effectiveness of this Conservation Easement as to the successor(s) in interest or their assigns.

18. Any document or other item required by this Conservation Easement to be given to another party shall be sent to:

If to any owner of the Property:

If to the Grantee:

If to Third Party with Right of Enforcement:

U.S. Fish and Wildlife Service  
101 Park De Ville Drive, Suite A  
Columbia, Missouri 65203

19. Nothing in this Conservation Easement shall be construed to give any right or ability of the Grantee or FWS to exercise physical or managerial control over the day-to-day

operations of the Property, or any activities of any owner of any or all portions of the Property, or otherwise to become an “operator” with respect to the Property within the meaning of CERCLA.

20. Grantor hereby releases and agrees to hold harmless, indemnify, and defend both the Grantee and FWS and their respective employees, agents, and contractors, and the heirs, personal representatives, successors, and assigns of each of them (collectively, the “Indemnified Parties”) from and against any and all liabilities, penalties, fines, charges, costs, losses, damages, expenses, causes of action, claims, demands, orders, judgments, or administrative actions, including, without limitation, reasonable attorneys’ fees, arising from: (1) the violation or alleged violation of, or other failure to comply with, any state, federal, or local environmental law, regulation, or requirement, including, without limitation, CERCLA, by the Grantor relating to the Property, or (2) the presence or release on the Property of any substance defined, listed, or otherwise classified pursuant to any federal, state, or local law, regulation, or requirement as hazardous, toxic, polluting, or otherwise contaminating to the air, water, or soil in violation of applicable laws, ordinances, or regulations, unless caused solely by any of the Indemnified Parties. Nothing in this Conservation Easement waives the Grantee’s or the FWS’s claims of sovereign immunity or similar defenses available to either the Grantee or FWS, or the respective employees, agents, and contractors and their heirs, personal representatives, successors, and assigns.

FOR GRANTOR:

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FOR GRANTEE:

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