

RedHorse Environmental PO Box 148 Tionesta, PA 16353 814-806-6073 www.redhorseenvironmental.com

## Three Rivers Quest Water Quality Monitoring Project: Northern Allegheny River Watershed

RedHorse Environmental is managing the Three Rivers Quest (3RQ) Water Quality Monitoring Program in the Northern Allegheny River watershed. The 3RQ project monitors rivers, tributaries and headwater steams that drain an area of over 25,000 square miles in five states. Water quality information and data are available on the 3RQ website to provide the public, researchers, federal and state agencies, and industry with timely and accurate information as it pertains to the overall health of our local rivers and streams.

Redhorse Environmental has collected water quality grab samples at approximately 90 locations in the Northern Allegheny watershed from Coudersport to Emlenton since 2013. Many sites are located on the Allegheny River mainstem; others are on significant tributaries to the Allegheny River including Tionesta Creek, Oil Creek, Kinzua Creek, and the Clarion River. The project is ongoing and is funded by ColCom. Additional partners include WVU and Duquesne University. The project is funded by the ColCom Foundation.

RedHorse Environmental has completed targeted watershed studies on Oswayo Creek, the Allegheny River Headwaters, and Pithole Creek.



Allegheny Monongahela Ohio





Pithole Creek @ Stone Arch Bridge

Allegheny River @ Coudersport



Allegheny River @ Kinzua Dam



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## Channel Unit Modification and Fish Community Response Associated with Long Wall Mining Subsidence in Robinson Fork, Greene County, Pennsylvania

The assessment of the physical characteristics of channel units and fish communities of two reaches of Robinson Fork was conducted in 2001 for Pennsylvania DEP and the US Fish and Wildlife Service. The watershed has been extensively mined (long wall method) and has significant surface subsidence. This study examined both the physical and biological components of a subsided (mined) and reference (unmined) reach individually and in association with one another to determine the effects of subsidence from long wall mining on a lowgradient, third order warm water stream on the Appalachian Plateau in Southwestern Pennsylvania. Robinson Fork is a low order, warm water stream originating near Claysville, Washington County, Pennsylvania that empties into the Enlow Fork of Wheeling Creek near the PA-WV Experimental design, State line. field surveys, and data management/statistical analysis, and reporting completed by Dr. Bruce Dickson.

Habitat measurements and fishery sampling were made when Robinson Fork was at base flow. CUs were mapped with sub-meter GPS and mean current velocity (m/s) and depth (m) was calculated by averaging readings at 3 to 7 randomly selected transects in each CU. Riparian areas were also characterized.



Photo left shows gate traversing Robinson Fork creating an abnormal, elongated pool common to streams in this region where subsidence from long wall mining is prevalent; At right is an example of a cluster dendogram of Froude numbers for channel units in the mined reach as developed for the CU based methodology for impact analysis.

#### **Study Findings:**

- The quantity and physical dimensions of channel units in the mined reach differed from those in the unmined reach (altered geomorpholy). Channel units in the mined reach were abnormal being longer, deeper, and wider than those in the unmined reach and had greater surface area and volume.
- Race CUs have contracted in the mined reach and pool CUs have expanded, the latter finding concurring with the results of Sidle et. al. (2000) on Burnout Creek, Utah.
- More than 78 percent of the volume of the mined reach is contained within pool channel units whereas 46 percent was found for unmined pools.
- Bank stability ratings show that bank erosion/failure are more severe in the unmined reach but is consistent with differences in longitudinal position and because the upstream, unmined reach, is located on alluvial deposits with less occurrence of bedrock and greater sinuosity.
- Total fish species richness in the mined reach (19) exceeded species richness in the unmined reach (14).
- The cumulative impact of the various environmental stressors has produced a fish community in Robinson Fork that is composed of primarily tolerant habitat generalists.
- This applied research demonstrated that a habitat based system utilizing channel units (CUs) is applicable to Southwestern Pennsylvania and can serve as a valid, reliable impact assessment tool. Our CU based assessment methodology accurately characterized and quantified changes resulting from anthropogenic activities and was a more sensitive, and considerably less expensive, methodology when compared to Rosgen's classification system.

For additional information contact Dr. Bruce Dickson at 814-806-6073 or bdickson@redhorseenvironmental.com



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# Scrubgrass Creek Comprehensive Watershed Assessment Venango County, Pennsylvania

A detailed assessment of the 25,000 acre Scrubgrass Creek watershed relating to environmental, recreational, cultural, and economic activities and issues was completed in 2003. Historical data were collected from available sources and new data were developed from extensive interpretation and mapping of natural resources and land uses from low altitude aerial photography. New data layers were developed and analyzed using geographic information system software.

The initial assessment directed the development of a second study designed to collect new data from a comprehensive physical, hydrological, and biological assessment of the watershed. This new data was used to characterize physical and biological conditions in the watershed, identify pollution sources and quantify their environmental impact, assess cumulative impacts, and provide the necessary information to develop and implement a watershed restoration plan. Watershed data was developed over an eighteen-month period across a monitoring network of thirty water quality stations and twenty-two corresponding locations where fisheries and habitat data were collected. Stream habitat was assessed following the Qualitative Habitat Evaluation Index (QHEI) protocol developed by Ohio EPA and compared where appropriate. Fish were collected following EPA methods for electro-fishing in wadeable streams and rivers. Field surveys were conducted to ground truth known pollution sources and identify and plot new locations with global positioning systems technology.

Approximately 60 well locations and 2 major AMD seeps were confirmed and mapped. On-site inspections and water quality/quantity evaluations were used to design treatment options, provide basic data for engineering planning and cost estimates, and allow the research team to prioritize and group pollution sources for subsequent restoration.

Plans were presented to local stakeholders, community leaders, and partners to facilitate restoration efforts. A passive treatment system was completed By Hedin Environmental in 2015 and has significantly improved water quality in the headwaters area of Scrubgrass Creek and downstream.



**Abandoned Mine Location** 



Mine Drainage on Scrubgrass Creek



Lower Reach of Scrubgrass Creek

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### **Forest School District Conservation Camp**

RedHorse Environmental conducts a 2-day conservation camp for the fith grade class at East and West Forest Schools in Forest County, PA. The camp allows hands-on learning by allowing students to participate in sampling water, macroinvertebrates, fish, and amphibians and reptiles to develop a better understanding of their local watersheds and the biological communities therein.

The program is conducted at the Kellettville Campground along Tionesta Creek. The students learn about current environmental concerns and how environmental quality can be measured by examining water quality and the biological communities in streams and wetlands near the campground. An emphasis on hands-on activities includes macro invertebrate sampling and identification, handling fish captured from Salmon Creek and Tionesta Creek, and participating in a herp hunt at the campground.

The project is coordinated with Forest School District teachers, the US Army Corps of Engineers, and Tamarack Wildlife Center.



Great Horned Owl from Tamarack Wildlife Center

