

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 low-gradient, 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 State line. Experimental design, 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.

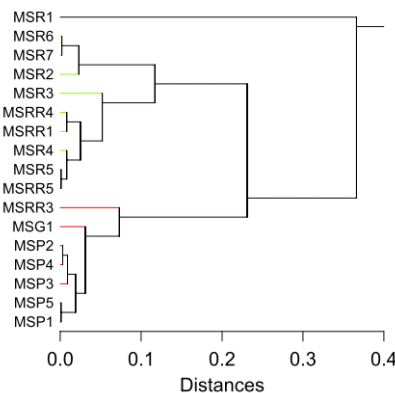


Photo left shows gate traversing Robinson Fork creating an abnormal, elongated pool common to streams in this region where subsidence from long wall mining is prevalent; At right is an example of a cluster dendrogram of Froude numbers for channel units in the mined reach as developed for the CU based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