

# STREAM RESTORATION: A REASSESSMENT OF LONG TERM PERFORMANCE<sup>1</sup>

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**ABSTRACT:** Prior to permit review and approval, Illinois streams affected by mining require pre-disturbance biologic and hydrogeomorphic assessments and submittal of stream restoration designs identifying relocation and restoration practices. Post-disturbance monitoring of physical, chemical, and biological components of the stream community was required for 5 years. The Cooperative Wildlife Research Laboratory of Southern Illinois University Carbondale (CWRL) initiated stream restoration research in the 1980's. CWRL, IDNR, and private biologists assessed ~ 16 miles of restorations during ~ 1981-1994. These early pre- and post-construction investigations provided a valuable benchmark to evaluate the long-term geomorphologic and biologic stream recovery processes. To evaluate stream restoration processes and recovery of functions and values, the OSM Applied Science Program is supporting a 2 year reassessment of three 15-20 year old southern Illinois stream reconstructions (AMAX Pipestone ~ 4.6 mi. CONSOL Galum 4.3 mi. & Bonnie 3.7 mi., and unmined upstream and downstream stations). The role of riparian buffer areas, wetland development, riffle and pool habitats, and deep water connectivity on water quality and the aquatic macro-invertebrate and fish community is being assessed. Extensive spring and fall assessments of water quality, benthic and aquatic communities, and riparian vegetation is being conducted for the 3 stream reconstructions. USGS staff are conducting topographic stream channel surveys and bed material sampling to facilitate hydraulic and sediment modeling for the selected reaches utilizing the Hydrologic Engineering Centers, River Analysis System model (HEC-RAS). HEC-RAS models will be used to summarize velocity, stream power, shear stress, and size of bed materials moved for various flood magnitudes throughout the stream reaches. The modeled effect of incline lakes on flow will also be assessed. The hydrologic, hydraulic, and sediment variables combined with biologic and water quality variables will identify short term and long term recovery processes of streams previously restored by surface mining. Previous baseline data (pre- and post construction data from the 1980's-90s ) and current 2011 – 2013 stream reassessment data are being compiled for archival storage with the OSM Technology Transfer / Technical Library for enhanced public access by state and federal regulatory and natural resource agency staff. This documentation and reassessment of Illinois stream reconstructions that have undergone 10-20+ years of geomorphological adjustment and biological recovery can provide valuable guidance for future stream restoration practices.

**Additional Key Words:** geomorphic design, riparian buffer, stream diversion, hydraulic engineering

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