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Quantifying the Functional Value of Stream and Wetland Mitigation Structures on Reclaimed Surface Mines in West Virginia

Project No. WV-240

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Project Description: The over-riding objective of this project was to provide a comprehensive assessment of ecological functions of aquatic habitats on reclaimed surface mines in southern West Virginia. The specific objectives were to 1) compare and contrast the functional value of reference headwater streams and of post-reclamation aquatic features, 2) determine whether ecological functions are adequately replaced after mining and reclamation, and 3) develop recommendations for surface mine reclamation and direction for future studies.

We studied aquatic ecosystem functions at five reclaimed mine perimeter channel sites and five paired native headwater channel sites in southern West Virginia. Both ecosystem structure and function measures were taken at study locations. All parameters were measured seasonally from May 2006-April 2008. Reclaimed mine sites varied in age from 3 years post mining up to approximately 20 years post mining. We used a variety of statistical approaches to test for structural and functional differences between reclaimed mine and native stream channels.

This represents the first comprehensive study to quantify ecological structures and functions associated with aquatic habitats on reclaimed mines. Our results clearly show that elevated conductivity and TDS concentrations are the dominant factor limiting ecological functions on reclaimed mines and must be the target of progressive reclamation and mitigation practices. Finally, our results were used to produce a table of "functional ratios" that allow objective comparison of ecological functions on reclaimed mines with native catchments.

Project Significance: The results from our research can be used to identify strengths and short-comings of current surface mine reclamation processes as they relate to aquatic ecosystem functions. This information can then be used to determine which ecological functions can be effectively recovered through improved reclamation processes and which functions need to be recovered through off-site mitigation actions. Finally, this information can be used to determine which functions can only be maintained through protection of undisturbed headwater catchments. The specific results of our study are directly applicable to large scale surface mine reclamation in the central Appalachian region. Nevertheless, we believe that the general approach we have used may be applicable nationwide.