



## WATER RESOURCES RESEARCH GRANT PROPOSAL

**Project ID:** 2002WV6B

**Title:** WRI47-Establishing Biological and Water Quality Criteria for Water Resource Management in Mining Impacted Watersheds

**Project Type:** Research

**Focus Categories:** None

**Keywords:** None

**Start Date:** 03/01/2002

**End Date:** 02/28/2004

**Federal Funds:** \$36,746

**Non-Federal Matching Funds:** \$110,531

**Congressional District:** 1

**Principal Investigator:**

J. Todd Petty

### **Abstract**

Nature, Scope, & Objectives:

Watersheds throughout the Appalachian region have been severely impacted by mining activities. Hence, it is critical that state and federal regulatory agencies develop effective means for managing and restoring aquatic ecosystem function. Effective water resource management in this region, however, is currently limited by two critical information needs. First, an ecologically relevant, operational definition of biotic degradation does not currently exist. Second, we cannot predict the amount of biotic degradation that will result from a specific level of water quality impairment. The principal objective of this application is to establish appropriate biological criteria (based on benthic macroinvertebrates) for water resource management in the Cheat River watershed and determine specific water quality standards needed to restore and maintain aquatic ecosystem integrity in acid impacted watersheds. To meet the principal objective of this application, I will address the following specific aims:

\* Develop a stream classification scheme for the Cheat river watershed based on natural variation in landscape and instream features.

\* Quantify biological degradation in streams across a range of water quality impairment, and link biological degradation to specific water quality parameters.

## Approach

My basic approach will combine benthic macroinvertebrate community surveys, water quality assessments, and Geographical Information System (GIS) based analyses of watershed conditions in the upper and lower Cheat River basin. The overall design will enable me to develop a watershed scale reference condition, against which deviations from the expected pattern can be used to quantify the direct and cumulative impacts of mining activities. My approach also will provide information needed to build statistical models that can be used to predict the response of invertebrate communities to specific changes in water quality.

## Expected Results and Benefits:

The primary expected benefit of my proposed research is a significantly improved ability to assess environmental impacts associated with mining activities and an improved ability to implement TMDL budgets in acid impacted watersheds. Specifically, my research is expected to produce the following benefits:

- \* The research will quantify the direct and cumulative effects of mining on invertebrate communities at a watershed scale.
- \* The research will produce predictive models that can be used to direct watershed management actions in the Cheat River Basin and other mining impacted watersheds. The models will incorporate the effects of specific water quality conditions on invertebrate communities and make it possible to predict the consequences of a permitted impact or a particular stream remediation plan to the overall biological "health" of the watershed.
- \* Models produced by my research can be used to facilitate discussions of "pollutant trading" in the Cheat River basin and throughout the Appalachian region. Predictive models with biological endpoints will enable water resource managers to evaluate trades on the basis of water quality standards and according to whether or not they improve the overall biological health of the watershed.