



WATER RESOURCES RESEARCH GRANT PROPOSAL

Project ID: 2002WV5B

Title: WRI48-Impact of Longwall Mining on Headwater Streams in Northern West Virginia

Project Type: Research

Focus Categories: Conservation, Ecology, Water Quantity

Keywords: headwater streams, stream ecology, aquatic insect, biological criteria, dewatering, perennial, intermittent, ephemeral

Start Date: 05/01/2002

End Date: 12/31/2003

Federal Funds: \$19866.00

Matching Funds: \$41085.00

Congressional District: 1

Principal Investigators: Stout, Ben (Wheeling Jesuit Univ.)

Abstract: The purpose of this research is to measure potential impacts of longwall mining to streams in northern West Virginia, and to evaluate a relatively new method of assessing damage to headwater streams based on the biological community. This will be accomplished by the principle investigator and three undergraduate researchers during the summer 2002. The four-person team will conduct biological assessments of headwater streams in Marshall and Monongalia Counties, West Virginia. Within each mining region, undermined streams will be paired with nearby reference streams that are similar geographically but are either un-mined or have been room and pillar mined. In the field, two streams (mined, un-mined) will be sampled each day by a four-person team consisting of the principle investigator and three undergraduate researchers. Each stream will be followed to the source and the source location recorded using Global Positioning Systems. The source (spring, or seep) will be sampled for pH, conductivity, dissolved oxygen, and temperature using standardized field meters. Three investigators will collect aquatic macroinvertebrates from a ten meter reach using any means practical (hand-picking, nets, pans, forceps) for a total of 10 minutes (timed). The resulting 30-minute composite sample will be stored in a pre-labeled 250 ml plastic container, preserved in ethanol, and returned to the laboratory. The team will measure fifty meters downstream with a tape, GPS the location, and repeat the

chemical and biological sampling. Sampling will continue at 100 meter intervals for a total of eight samples per stream. The paired (disturbed, or reference) watershed will be sampled the same day. Sampling will be conducted in May and June, 2002, laboratory work will be done in July and August, and analysis will be done from August to December, 2002. In the laboratory (210b Donahue Hall, WJU, Wheeling), macroinvertebrates from stream samples will be sorted and identified to the lowest practical taxonomic level (usually genus). Chemical and biological data will be compiled in spreadsheets. Spreadsheets will be analyzed for community-level metrics including taxa richness (number of kinds) as a measure of diversity, and number of EPT (mayfly, stonefly and caddisfly) taxa as an indication of the purely aquatic, relatively long-lived taxa. The database will also be queried to determine the number of taxa with life cycles greater than one-year in length as a biological measure of the duration of surface water at a site (i.e. intermittent versus perennial). The percent abundance of each of four functional feeding groups (leaf shredders, fine particle collectors, algal grazers, predators) will be calculated in order to compare the trophic status (energy balance) of communities at each site. Basin geomorphology including watershed area, stream elevation, slope, and aspect will be measured. In analysis, eight samples collected along the longitudinal stream gradient will represent each stream. Samples site locations will be predetermined randomly based on distance measurement from the source, and samples collected at regular (50, 100 meter) intervals will be representative of the entire headwater stream watershed-ecosystem. Mined and reference streams will be compared using two-way analysis of variance of streams within regions. These data will also be pooled with previously-collected databases to provide a broader regional analysis. Analysis of spatially continuous replicate samples will identify points on the landscape where biological communities originate within streams and points where streams become perennial (versus intermittent) based on discrete biological criteria (eg: longevity of the aquatic phase of each of the taxa represented). Existing topographic data will then be analyzed (regression analysis) to find metrics (eg: watershed area, elevation, stream order) that best explain the locations of point-of-origin, and point of perennial stream origin.

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