**EESC 491 Continuing Acid Mine Drainage Impacts on the Environmental Health of the Soils, Streams, and Macroinvertebrates in a Virginia Ecosystem**

Marianne Mannix and Miña Recta

Department of Earth and Environmental Sciences

Faculty Advisor: Dr. Melanie Szulczewski

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The goal of the proposed research was to continue to evaluate the recovery of the Contrary Creek ecosystem and assess the current contamination levels and its effects on the creek through the analysis of soil, water, and sediment samples. Contrary Creek, located in Louisa Country Virginia, has been affected by acid mine drainage (AMD) from old sulfur and pyrite mines for close to a century. This research investigates several different aspects of the effects of AMD on a creek ecosystem and the surrounding environment.

There are currently 4 new sites that were established this semester, located along the length of the creek and adjacent to a nearby pond where soil, sediment, and water samples were collected. Composite soil, sediment, and water samples were collected from the creek and pond at each site. The water, sediment, and soil samples were brought back to campus to be prepared for analysis for pH, organic matter content, and metal concentrations. In September of 2011, dried soil and sediment samples were collected from storage and acid digested in order to prepare the samples for analysis of metal concentrations using the University of Mary Washington’s inductively-coupled plasma atomic emission spectrometer (ICP-AES) Thermo Scientific iCAP 6000 Series with CETAC ASX-520 Autosampler.

We focused our research methods on filling in data gaps relating to metal concentrations in soil, rather than macroinvertebrate research. Chemical analysis of the stream water, sediment, and surrounding soil samples has demonstrated the adverse impact acid mine drainage continues to have on Contrary Creek. We discovered that all of the sites contain very high concentrations of total iron, arsenic, copper, magnesium, lead, zinc, aluminum, and iron. The general trend of the soil samples was that the metal concentrations were highest in soil samples taken from further upstream and decreased somewhat gradually as sampling sites become further downstream from the old mine site. Soil pH was less than 5 for all sites, which enables Al and Mn to become readily available such that toxicity may occur. Stream water concentrations of iron and aluminum surpassed concentration levels considered normal in a non-AMD affected creek in the samples analyzed so far. The less affected tributary had a higher pH in soil, sediments, and stream water and exhibited significantly lower concentrations of total iron, arsenic, and lead in the soil. However, even the tributary exceeded standard toxicity thresholds for lead, aluminum, and arsenic concentrations in the soil. Future study will verify whether some parts are recovering more rapidly and whether the soil contamination extends along a perpendicular transect away from the stream and to the opposite, northwestern side of the stream.

The results of this research were presented at the Soil Science Society of America International Conference in San Antonio, Texas, from October 16-19, 2011. Our poster received a positive response and solicited advice and suggestions for expanding and developing our research methods and scope. The students who attended (Marianne and Miña) were also able to meet with graduate school representatives, current graduate school students, career counselors, and to gain crucial insight into the graduate school application process.

Our research and presentation was allotted a budget of $1800 for the fall semester of 2011. This budget covered expenditures for the conference presentation, including poster supplies, conference registration fees, airfare, food, and hotel costs. EESC department funds amounting to $598 were used to cover any costs associated with the poster presentation and conference attendance that were not covered in the budget. We did not purchase any new laboratory supplies in the Fall 2011 semester.

Overall, the study yielded some interesting results regarding the continual questionable health of this ecosystem. Further analysis will illuminate more specific contamination trends. We look forward to continuing and expanding the investigation in the spring by studying the amount of trace metals in the plants surrounding Contrary Creek. We hope that this will help give a better understanding of how AMD has affected the Contrary Creek ecosystem.