

ORAL PRESENTATION

DIATOM SUCCESSION IN ACID MINE DRAINAGE IMPACTED STREAMS: IMPLICATIONS FOR BIOFILM STRUCTURE AND FUNCTION

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Acid mine drainage (AMD) with high metal concentrations and acidic pH is a devastating legacy of coal mining that impairs the biology and habitat of thousands of stream kilometers in the USA. To improve assessments and restoration efforts, this research focused on how AMD impacts the structure and function of lotic biofilms. We documented algal diversity, biomass, bacterial abundance, and extracellular enzyme activity (EEA) during succession on tiles for 5 weeks in 8 streams (3 AMD, 3 downstream of an AMD discharge with aluminum actively precipitating at pH 5.3, 1 control recovered from AMD, and 1 control with no AMD). Succession was investigated in addition to AMD impacts because it is an important process in streams with frequent high flow events that can scour the benthos. The rate of algal biomass accrual was greatest in the non-AMD control, least in sites downstream of the discharge with metal precipitates, and intermediate in AMD sites. Diatom diversity and evenness were lowest in the worst AMD site, intermediate in sites downstream of the discharge, and greatest in control sites throughout succession, with distinct communities forming in the various stream types. *Eunotia exigua* dominated at pH 3.1, *Surirella roba* and *E. exigua* were abundant at pH 4.9, and *Achnanthydium minutissimum* had increased relative abundances downstream of the discharge. Phosphatase activity was greatest in AMD sites, indicating a response to P limitation likely due to P adsorbing to metals. Leucine-amino peptidase, a measure of N uptake, and β -glucosidase (GLU) were greatest in control streams. GLU was related to algal biomass, likely because algal exudates are an important source of biofilm polysaccharides for bacteria. β -xylosidase was consistent among streams, indicating similar roles of allochthonous carbon. Chlorophyll *a* to P ratios and EEAs indicated inefficient nutrient uptake in AMD streams, which has potential implications for nutrient dynamics downstream. AMD severely impaired biofilm structure and function, along with diatom assemblages and diversity.