

Reproducibility of a Groundwater Microbial Community in Replicate Bioreactors

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One of the most difficult aspects of studying microbial ecology is determining and understanding the fundamental ties between microbial community structure and observed functions. Although microorganisms are important in controlling contaminant fate in the subsurface, knowledge of how/why microbial communities respond to contaminants is lacking. Hence, it is important to characterize microbial communities, establish linkages between biodiversity and function, and study interactions between different species. We have developed a bioreactor system for manipulating and temporally monitoring the microbial community without disturbing the community structure *in-situ*. Three above ground, in-field reactors were fed groundwater from well FW305 at the Oak Ridge Field Research Center, Oak Ridge, TN for 11 weeks. Each bioreactor contained 8 replicate biofilm coupons filled with sterilized sediment obtained from the FRC. The microbial communities from the planktonic and biofilm portions of the reactors were compared to the groundwater community for structure and function. Community structure was measured through sequencing, PCR and qPCR for selected genes, cell counts and total protein before and after the cells entered the bioreactor system. Temporal community function was qualified by alterations in the concentration of 53 metals, 9 organic acids, 7 anions and 3 sugars, pre- and post-bioreactor exposure. The findings of this initial experiment will directly impact the number of biological replicates that will be required going forward with future reactor studies at this site.