Abstract

Thesis: Microbial response to nitrogen availability: *Preferential and adaptive community uptake*

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Date: May, 2010

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This project was designed to assess the ability of natural sediment microbial communities and single species microbial populations to preferentially utilize inorganic forms of nitrogen (ammonium, NH_4-N, and nitrate, NO_3-N, specifically). The first chapter addressed two primary questions: 1) Do sediment microbial communities preferentially assimilate NH_4-N or NO_3-N?; and, 2) Does preferential uptake of nitrogen change with increased NH_4-N or NO_3-N availability? The second chapter furthered these analyses by assessing shifts in microbial nitrogen assimilation in response to sustained nitrogen enrichments. Primary questions addressed were: 1) Are microbial communities able to adapt to nitrogen enrichment and preferentially utilize a more available source?; and, 2) Are initial microbial responses to nitrogen enrichment different from sustained responses? Questions were addressed with *in vitro* laboratory experiments quantifying microbial activity. Overall, microbial community activity changed in response to the form of nitrogen available, enrichment type, and duration of exposure. Data demonstrate sediment microbial communities in the Midwestern US may prefer NO_3-N over other forms of nitrogen. However, microbial communities became saturated with NO_3-N with increases in concentrations >0.75 mg NO_3-N/L. Microbial communities were able to adapt to higher nitrogen concentration and increase rates of assimilation for both NH_4-N and NO_3-N. Thus, microbial communities are robust in response to nitrogen increases in an ecosystem, even in high nitrogen environments like the Midwestern US.