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Microbial ecoenzymatic stoichiometry as an indicator of nutrient limitation in US streams and rivers

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Abstract. We compared microbial ecoenzymatic activity at 2122 randomly-selected stream and river sites across the conterminous United States. The sites were evenly distributed between wadeable and non-wadeable streams and rivers. Sites were aggregated into nine larger physiographic provinces for statistical analyses and reporting. We also sampled 233 least-disturbed (reference) sites in order to set ecoenzymatic activity expectations for C, N and P acquisition. Microbial biomass stoichiometry is expected to be 60C:7N:1P, and this ratio should be reflected in the ratios of glycosidase, peptidase, and phosphatase activities. We demonstrate relative N-limitation in 7-33% of the total assessed stream and river length; P-limitation in 35-59% of stream and river length; and no limitation in 26-47% of stream and river length. Ecoenzymatic stoichiometry indicated that the majority of streams (56-70% of total stream length) are not balanced in their C, N, and P acquisition, further suggesting relative nutrient limitation. The ratio of phenol oxidase to glycosidase activity indicated a prevalence of recalcitrant C in 14-34% of stream and river length. There were no differences between streams and rivers in nutrient limitation and stoichiometric balance.

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Body of abstract: 180/180 words