Report as of FY2007 for 2006MD139B: "2006 Summer Research Fellow"

Publications

Project 2006MD139B has resulted in no reported publications as of FY2007.

Report Follows

Summer 2006 Graduate Summer Fellowship Project Summary for NIWR Annual Report

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Introduction

In 2006, I received a fellowship from the Maryland Water Resources Research Center for summer support. For my summer work, I asked whether geomorphic restoration projects facilitated nutrient reduction in streams and why they were or were not effective at reducing nutrient loads. I worked on 10 streams, all located in Anne Arundel County, Maryland. The streams included 6 restored streams, 3 urbanized non-restored streams (control streams), and 1 forested stream (reference stream).

To investigate the potential for restored streams to reduce nutrient loads, I measured the concentration of nitrate (NO_3^-) and ammonium (NH_4^+) upstream and downstream of each restoration reach and over similar distances on control and reference streams. I also attempted to explain any reductions in nutrient concentrations or lack thereof by measuring community metabolism and channel complexity in each stream. If community metabolism is low, there may be a lack of biological activity to reduce nutrient concentrations substantially. If complexity is low, this indicates that water moves through the stream rapidly, leaving insufficient time for biotic nutrient uptake.

Summary of Results

Although streams differed substantially in N concentration, metabolism, and complexity, there was no consistent trend of decreased N concentrations from upstream to downstream at any stream. Thus, community metabolism and channel complexity did not appear to influence N concentrations. It is possible that at some streams, N concentrations were so high that they overwhelmed the ability of biota to uptake nutrients by a detectable amount. However, it is more likely that concentration data taken at two points was not a good measure of the N uptake capability of each stream. Groundwater inputs of N were not accounted for, and substantial inputs could mask reductions through uptake. More sophisticated procedures, such as a budgeting approach would better characterize N removal potential in each stream.

Variation in N concentration, metabolism, and complexity was as great between restored streams as between restored streams and control and reference streams. Thus, restoration does not seem to have altered stream environments substantially. However, the high variation observed suggests that even within a small geographic area, differences between streams can be great. With such a large range of natural variability, quick, general assessments of stream restoration projects are unlikely to uncover effects of restoration unless the effects are dramatic.

Future Research

For my future PhD work, I will examine how geomprphic restoration projects change channel complexity of river channels and how these changes affect the ability of algal communities to recover from floods. The work performed this summer provides important data that will help frame future work. Most importantly, I have shown that the study streams differ widely in complexity and nutrient concentrations, which are both likely to constrain algal community growth and composition.