# Are we in Hot Water?:
# Comparing Macroinvertebrate Communities and Water Quality over Time

Student name: Shannon Cook
Project advisor: Renae Brodie

Freshwater systems are vital natural resources that support a significant portion of the world's biodiversity.[1] However, freshwater ecosystems are often plagued by pollution, particularly excess nitrogen and phosphorus from agricultural run-off.[2] Additionally, freshwater ecosystems are strongly impacted by climate change.[3] Monitoring and measuring characteristics of freshwater ecosystems allow scientists to assess the health of those systems and how forces such as pollution and climate change are affecting them. One way to measure this impact is by sampling benthic macroinvertebrates and calculating biotic indices which indicate the approximate water quality.[4] Two such studies were conducted on Mount Holyoke College's waterways in 2003 and found results ranging from very good to poor.[5,6] This project repeats the macroinvertebrate surveys on campus with three additional sites as well as most of the original sites to compare and analyze how the macroinvertebrate communities and abiotic factors of the freshwater ecosystems have changed over time.

Macroinvertebrates were sampled using the kick seine method and the dip net method at four stream sites and two lake sites, respectively. After collection, the specimens were identified as specifically as possible, often down to family level, and counted. Abiotic water quality data including temperature, pH, dissolved oxygen, chlorophyll levels, algae concentration, and nitrogen and phosphorus concentrations has been collected every two weeks since 1996 using probes. Diversity and biotic indices were calculated from the macroinvertebrate samples and the changes in abiotic factors over time were examined. According to the general decrease in the biotic indices, the water quality has improved across all sites since 2003. The species richness was generally higher in the stream sites compared to the lake sites plus Project Stream. Since 1996, the average annual temperature and pH have both increased significantly. Although the health of the freshwater ecosystems on campus seem to be improving, there is some discrepancy between the different sites and the abiotic effects of climate change are alarmingly evident.

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[1] Dudgeon D, Arthington AH, Gessner MO, Kawabata ZI, Knowler DJ, Lévêque C, Naiman RJ, Prieur-Richard AH, Soto D, Stiassny ML, Sullivan CA. 2006. Freshwater biodiversity: importance, threats, status and conservation challenges. Biological Reviews 81(2):163-182.

[2] Harmon SM. 2008. Effects of pollution on freshwater organisms. Water Environ Res 80(10):892-917.

[3] Chessman BC. 2009. Climatic changes and 13-year trends in stream macroinvertebrate assemblages in New South Wales, Australia. Global Change Biol 15(11):2791-802.

[4] Dates G and Byrne J. 1997. Living Waters: Using Benthic Macroinvertebrates and Habitat to Assess Your River's Health. River Watch Network.

[5] Cooper J and Baker K. 2003. Stony Brook's macroinvertebrates.

[6] Moss S and Baker A. 2003. Under a rock, in a hard place: Stony Brook's macroinvertebrates.