# PEBBLE: Preservation and Evaluation for Benthic Barcode Life Elements

Michaluk, Sonja (School: Hopewell Valley Central High School)

Biomonitoring programs provide valuable information about trends in ecosystem health. However they rely on manual identification of biological samples, which can be both time consuming and subject to human error. Molecular methods, such as DNA Barcoding from a region of the mitochondrial gene COI (cytochrome c oxidase subunit 1), have begun to enhance biomonitoring programs. Current methods of preserving samples include preservation in ethanol, and freezing, both have shortcomings especially for remote areas on a global scale. Ethanol is flammable and depending on concentration may cause degradation of DNA. Freezing requires a consistent power source. This study explored CO2 as an alternative to ethanol for macroinvertebrate sample preservation, investigated the sensitivity of DNA resolution, and compared DNA Barcoding with traditional manual taxonomic identification under magnification in a waterway habitat under study. The Preservation and Evaluation for Benthic Barcode Life Elements (PEBBLE) device is constructed from a PET and LDPE barrier bag and uses a standard CO2 cartridge to purge the oxygen the sample chamber. The monitoring functionality is provided by a low cost oxygen sensor coupled with a Raspberry Pi, integrated circuits, recycled electronic components, and open source software. It measures the oxygen level in the sample chamber and indicates whether the sample is at risk of deteriorating due to the presence of oxygen. The PEBBLE device with CO2 preservation compared favorably to sample preservation in ethanol, indicating that it could be a viable option for preserving benthic macroinvertebrate samples for environmental monitoring at remote locations around the globe.

**Awards Won:**