

Protocol	Sampling Protocol	Method of Analysis	Results Generated	Necessary Training	Level of Identification	Time Investment	Accessibility of Results	Additional Notes
NYSDEC Stream Bio-monitoring Unit	5 meter transect, 5 minute kick sample with 18" 800-900 micron net	Identify and count the first 100 organisms encountered in a random scoop to genus/species level	Reliable prediction of overall water quality as "non-impacted," "slightly impacted," "moderately impacted," or "severely impacted." Additionally, with genus/species level identification, results may point to a type of pollution responsible for causing an impact.	Genus/species level identification of organisms requires professional taxonomic skills. In order for results to be entered into the NYSDEC database, sampling too must be performed by professionals from the NYSDEC staff or PEERS (Professional External Evaluation of Rivers and Streams) certified individuals.	Generally to genus/species level	Relatively quick analysis time per site (just 100 organisms and just one sample) but DEC professionals must travel throughout the state to sample streams (conducting BMI monitoring at ~75 sites per drainage basin every 5 years - our drainage basin includes most of the Finger Lakes and Oswego River drainage).	Available upon request from the NYSDEC	<p>The NYSDEC Stream Bio-monitoring Unit has been in existence since 1972.</p> <p>100 organism sub-sample size does not give the full picture of biodiversity in streams</p> <p>Random "scoop" method for selecting a sub-sample does not allow for accurate extrapolation to organism density</p> <p>NYSDEC has only limited time/resources to monitor the huge number of NYS streams (only a small fraction have been sampled to date)</p> <p>Results not currently accessible by the general public except by specific request</p>
CSI-modified Hudson Basin River Watch	Same	Identify and count ¼ of sample and at least 100 organisms to family level for two replicate samples	Reliable prediction of overall water quality as "non-impacted," "slightly impacted," "moderately impacted," or "severely impacted." Additionally, organism density might indicate sites with high nutrient loads.	Anyone can participate in guided sampling events and/or attend open bio-monitoring lab hours at the CSI lab to get involved. Volunteers are supported by two staff members at CSI who can offer training, guidance and verification of organism identification. Trained volunteers are able to collect and analyze samples independently following quality assurance protocols and with verification of ID by CSI staff.	Generally to family level	Sampling and physical survey take about 2 hours. Sorting and analysis can take between 3 and 12 hours per sample. Efficiency increases as volunteers gain more experience, especially with sorting and analysis.	Results available on CSI website and most results will be incorporated into the CSI searchable, public, online database in the near future (data going back to 2002).	<p>Grid method for selecting a ¼ sample sub-sample allows for extrapolation to overall sample density of organisms (which may help indicate sites where high nutrient levels might be an issue.</p> <p>Collecting two replicate samples gives a way to do quality control as well as have a back-up if something were to happen to one of the samples (of the 3, only this protocol involves 2 replicate samples).</p> <p>Can be relatively time consuming to process an entire set of replicate samples, but new models are emerging where individual volunteers attend open lab hours to work collaboratively or a stream group splits responsibilities between different members so that individuals can refine skills for their particular task, such as identification.</p> <p>Protocols must be followed exactly for reliable results</p>
WAVE (NYSDEC volunteer monitoring protocols)	Same, though less rigorously following a strict transect	Identify one of each family of organisms encountered in entire sample to family level	Reliable prediction of overall water quality as "No Known Impact" (which translates to "non-impacted" OR "slightly impacted" by NYSDEC standards). Other possible outcomes are "Flagged for Further Study" or "No Conclusion."	Anyone can get involved by attending a NYSDEC training or receiving training from a local WAVE coordinator. CSI has one staff member and a few volunteers who are trained as WAVE coordinators.	Generally to family level, but it's only necessary to pull out one of each "kind" of organism in a sample, with identification of those organisms optional	Usually takes only a few hours per site.	Maps showing results and organisms found at each site are publicly accessible through a link on the NYSDEC website	<p>Protocols allow for a certain margin of error in sampling and analysis</p> <p>Does not accurately predict degree of impact to a stream (is only relatively accurate at saying that a stream has what the DEC calls "No Known Impact" which translates to something like "if sampled professionally by the NYSDEC would most likely generate a water quality rating of 'Non-impacted' or 'Slightly Impacted'").</p> <p>Does not provide any information regarding organism density in a sample (organism density may help indicate sites with high nutrient loads)</p>

Comparison of bio-monitoring protocols. A chart comparing stream benthic macroinvertebrate bio-monitoring protocols used by the New York State Department of Environmental Conservation (NYSDEC) Stream Biomonitoring Unit, Community Science Institute (CSI) and NYSDEC Watershed Assessment by Volunteer Evaluators (WAVE)