Can community-based monitoring data be used to improve stream restoration science?

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Citizen science could greatly increase the data on ecological recovery following stream restoration. Current understanding is limited by the resources of professionals to collect the required volume of data, yet the many volunteers who carry out restoration projects are capable of monitoring the ecological results. However, volunteer data are rarely used, mainly because of the perception that volunteer data are unreliable. To test this perception, we assessed the agreement between volunteer (community group) and local government ("regional council") data at nine stream sites across New Zealand. The regional councils used their standard protocols for State of Environment monitoring, while the volunteers used a simple, low-cost kit based on NIWA's Stream Health Monitoring and Assessment Kit (SHMAK). Over 18 months, community groups and regional councils monitored 'in parallel' (near-simultaneously) a common set of water quality variables and benthic algae each month. Benthic macroinvertebrates and physical habitat were assessed 6-monthly. Community groups achieved close agreement (correlations ≥0.89, bias <1%) with regional councils for temperature, electrical conductivity, visual water clarity, and Escherichia coli. For dissolved oxygen and pH, lower correlations reflected, in part, the narrow range of values encountered. Volunteers accurately assessed streambed cover of thick algal growths (correlation=0.93, bias 0.1%), and a macroinvertebrate pollution index (correlation 0.88, bias <5%), while volunteer assessments of physical habitat appeared as consistent over time as those of councils. Our study suggests that, given adequate support, community-based water monitoring can provide data that is sufficiently reliable to augment professionally-collected data for applications such as understanding ecological recovery after stream restoration, determining optimal riparian buffer design, and State of Environment reporting.