

## SAN JUAN WATERSHED MONITORING PROGRAM

# BENTHIC MACROINVERTEBRATES

### WHY DO WE CONDUCT BENTHIC MACROINVERTEBRATE ASSESSMENTS?<sup>1</sup>

Benthic (or “bottom-dwelling”) macroinvertebrates are small aquatic animals and larvae, including mayfly, caddis, and stonefly larvae, as well as snails, worms, and beetles. They can be seen without a microscope and are often found attached to rocks, vegetation, logs, and sticks or burrowed into sand and sediments. The diversity and assemblage of benthic macroinvertebrate communities can be an important indicator of health in aquatic communities, and the health of macroinvertebrate communities is strongly correlated to water quality, water chemistry, and more. Macroinvertebrate assessments can also help identify important environmental stressors and trends in ecosystems. Macroinvertebrates tolerate certain stressors better than others. Therefore, the make-up of the benthic community (that is, the presence or absence of certain species) can provide valuable clues about pollutants in the water. Macroinvertebrate orders including Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies) are especially sensitive to pollutants and can be important indicators of water quality.

### MACROINVERTEBRATE COMMUNITY STRESSORS

Biological condition is the most comprehensive indicator of waterbody health. Human activity or natural events can compromise waterbody health. Generally, healthy waterbodies can support a wide variety and high number of macroinvertebrates, including many that cannot tolerate pollution. When the biology of a waterbody is healthy, the chemical and physical components of the waterbody are also usually in good condition. However, if samples show only pollution-tolerant species, or little diversity or abundance, that may be an indicator of a less healthy waterbody. This information can be used similarly to fish populations in understanding of the biological condition of a waterbody.

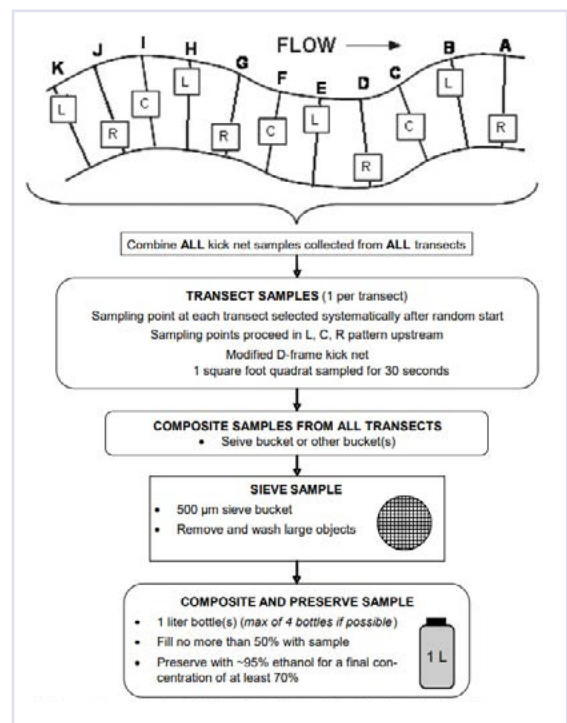


Figure 1. Transect sample design for collecting benthic macroinvertebrates at wadeable sites.

## COLLECTING SAMPLES<sup>2</sup>

Because macroinvertebrates typically live on the bottom of a river, we must first disturb them, usually by “kicking” the substrate surface upstream of our collection net. The current of the water then pushes the macroinvertebrates into the net. Under this approach, we place the mouth of the net in the same area that we disturb with the “kicking” technique. Disturbing a defined area (1 meter<sup>2</sup>) for a pre-defined period of time allows us to estimate the population of macroinvertebrates in that area.

To create a composite sample, we combine samples at each transect (see Figure 1). We sample the first transect at a randomly selected left, right, or center point, then alternate the positions for the remainder of the transects. Samples are combined in a 1-liter bottle and preserved with 95 percent ethanol, which euthanizes the macroinvertebrates. This eliminates the potential for larger, predatory macroinvertebrates to eat the smaller ones and affect the sample composition.

## SAMPLING EQUIPMENT

<b>Collecting Samples</b>	<ul style="list-style-type: none"><li>• Modified kick net (D-frame with 500 µm mesh) and 52” handle</li><li>• Watch with timer or stopwatch</li><li>• Sieve bucket with 500 µm mesh openings (U.S. std No. 35)</li><li>• 5-gallon bucket</li><li>• Watchmakers’ forceps</li><li>• Wash bottle, 1L capacity labeled “STREAM WATER”</li><li>• Funnel with large bore spout</li></ul>	<ul style="list-style-type: none"><li>• Small spatula, spoon, or scoop to transfer sample</li><li>• Sample jars, 1L HDPE plastic suitable for use with ethanol</li><li>• 95% ethanol, in a proper container</li><li>• Cooler (with absorbent material) for transporting ethanol and samples</li><li>• Electrical tape</li><li>• Scissors</li><li>• Field Operations Manual or laminated Quick Reference Guide</li></ul>
<b>Recording Measurements</b>	<ul style="list-style-type: none"><li>• Composite benthic sample labels with and without preprinted sample ID numbers</li><li>• Blank labels on waterproof paper for inside of jars</li></ul>	<ul style="list-style-type: none"><li>• Soft (#2) lead pencils</li><li>• Fine-tip indelible markers</li><li>• Clear tape strips</li><li>• Sample collection form</li></ul>

To learn more about benthic macroinvertebrate sampling, visit <https://www.epa.gov/national-aquatic-resource-surveys/indicators-benthic-macroinvertebrates>.

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<sup>1</sup> U.S. EPA. National Aquatic Resource Surveys. Indicators: Benthic Macroinvertebrates. Available at <https://www.epa.gov/national-aquatic-resource-surveys/indicators-benthic-macroinvertebrates>; Mountain Studies Institute. December 2017. Animas River 2017 Macroinvertebrate Assessment. Available at [https://static1.squarespace.com/static/53bc5871e4b095b6a42949b4/t/5ad4e5598a922de1fc5939dc/1523902062738/MSI\\_AnimasBMI\\_Report\\_20180417.pdf](https://static1.squarespace.com/static/53bc5871e4b095b6a42949b4/t/5ad4e5598a922de1fc5939dc/1523902062738/MSI_AnimasBMI_Report_20180417.pdf).

<sup>2</sup> U.S. EPA. May 2019. National Rivers and Streams Assessment 2018/19: Field Operations Manual Wadeable, Version 1.2. Available at [https://www.epa.gov/sites/production/files/2019-05/documents/nrsa\\_1819\\_fom\\_wadeable\\_version\\_1.2\\_0.pdf](https://www.epa.gov/sites/production/files/2019-05/documents/nrsa_1819_fom_wadeable_version_1.2_0.pdf).