Ipswich River Watershed Association –

Standard Operating Procedure (SOP) for Macroinvertebrate Sampling

Adapted from the River Watch Network: Benthic Macroinvertebrate Monitoring Manual

2021-2023 Version 4



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<u>Overview</u>

This document provides detailed descriptions on how to collect benthic macroinvertebrate samples.

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1.0 Information on River Habitats

River habitat can be of three different types: riffles, runs and pools. We will be collecting our macroinvertebrate samples from riffle sites.

<u>Riffles</u>: Riffles are an important feature of coldwater streams and rivers. They provide aquatic animals with a food source and shelter from predators as well as increase the oxygen content of streams and rivers. Riffles generally occur in shallow sections of streams and rivers, in areas where fast moving currents move over rocks causing turbulence on the water surface. This turbulence mixes oxygen into the river water.

<u>Runs:</u> Runs are fairly deep sections of the river that have fast moving currents with little to no turbulence visible on the river surface.

Pools: Pools are deep sections of the river with slow moving water.

Example of river habitat types: the figure exhibits both a birds eye view of the river and cross sections of each habitat type.



Figure from: http://www.duluthstreams.org

$2.0~{\rm sampling}~{\rm Safety}$

The following are some basic safety rules that you should follow when collecting macroinvertebrate samples. <u>Remember, if you feel unsafe about something, don't do it.</u>

- Always collect samples with a partner.
- If you are unsure if you can safely collect a sample, then don't do it. Be aware of your physical limitations and the difficulty of collecting samples under certain conditions.
- Let someone know where you are going and when you expect to return.
- Be careful pulling off to the side of the road and leaving your car, don't leave it somewhere that will endanger yourself.
- Watch out for poison ivy!
- High flows are a danger. Don't attempt to collect a sample if you feel unsafe.
- Wear waders and bring a towel and a dry, warm change of clothing, if you or someone in your group isn't a strong swimmer, use a life jacket.
- If the stream bed is soft and mucky, test it with a pole or stick before putting your full weight on it.
- Wear rubber gloves when sampling to keep hands from being cut and scraped.
- No sampling shall occur when personal safety is thought to be compromised.
- The Monitoring Coordinator will determine before each sampling event whether conditions pose a safety threat and will cancel/postpone sampling when necessary.
- Wear life vests when wading in waters under difficult conditions.
- Wear proper clothing to protect against the elements as applicable, especially footwear and raingear.
- When sampling in rivers, avoid sampling when water depth is greater than 1.5 ft. or if the current feels too strong.

3.0 Collection of macroinvertebrate samples

The procedure outlined below explains how to collect and preserve a benthic macroinvertebrate sample collected at a wadeable riffle area using a kick net. We are using the simple collection method based on the River Watch Network Benthic Macroinvertebrate Monitoring Manual. In this method, one composite sample is collected from each sampling site. The composite sample consists of samples collected from four locations within your sampling area; two from fast moving areas and two from slow moving areas within the riffle area of the river. Using this method approximately 0.55 square meters of the stream bottom are sampled. The sample is placed in a Nalgene bottle or double bagged with Ziplock bags, labeled and preserved with 90% denatured alcohol.

Please note that a blank sampling data sheet and an example of a completed sampling data sheet are provided after the step by step instructions.

Step by step instructions:

1. Collect equipment and supplies

Equipment:

Equipment	Equipment Use		
 Directions to the collection site 			
 Site identification number 	Allows you to label the plastic bag the sample goes into.		
Sampling Data Sheets	All field data must be recorded on these forms.		
 Collection net (kick net) 	This will be used to collect the samples and the mesh size must be no smaller than 500 microns (0.5mm) and no larger than 600 microns (0.6mm).		
Arm length gloves	Protection for your hands during sampling.		
Sieve Bucket	Helps you to collect and transfer samples (30 mesh).		
Soft, Nylon bristle brush	Used to scrub macroinvertebrates off rocks.		
	Used to pick macroinvertebrates out of net and the sieve bucket.		

Equipment		Equipment Use		
	1qt ziplock bags or Nalgene bottles (at least 2 per site)	Used to hold preserved samples.		
	90% denatured ethyl alcohol	Used for preserving samples.		
	Sharpie	Used to label sample bags.		
	Waders or high boots	To keep your feet dry while sampling.		
	Clipboard	To hold sample data sheets.		
	Life jackets	Wear a life jacket if sampling in deep waters.		

- 2. Follow the driving directions to your sampling site and find the riffle section of the river.
 - a. The riffle section is the area that contains rocks, gravel and boulders, where there is turbulence on the water's surface.
 - b. Fill in the basic information on your sampling data sheet (site ID, location, sampler(s) names, date, time and tide (if applicable).
 - c. Circle the weather description that best describes the weather at the time you are collecting your sample (clear, partly cloudy, cloudy, etc.). Then circle the description of the amount of rain we have experienced in the last 48 hours (heavy, light, none).
 - d. Note the Site ID on each page of the sampling data sheet. On the bottom of each page there is a location to write in the site ID.
- 3. Label your sample bottle or bags using the sharpie. Labels should include Date, Station ID, Preservative (90% Denatured alcohol) and Sampler name(s).
- 4. Estimate a ~50 ft. section of the river that contains the riffle habitat where you will collect the sample. Some sites may not have 50 ft of riffle to sample from. If the riffle at your site is less than 50 ft, estimate the approximate length of the riffle on the Data Sheet.

- 5. While standing on the bank of the river, pick four locations in the river where you will collect your samples. The four locations should be within the 50 ft. section of the river you just measured. (If your site does not have 50 ft. of riffle habitat, measure length of riffle habitat and note on data sheet).
 - a. Two of the sites should have low velocities (approximately 0.5 to 1.5 feet per second) and two should have high velocities (1.5 to 2.5 feet per second). The sites should be predominantly rubble (rocks 2-10 inches).
 - b. If there doesn't seem to be any difference in velocity across the river, then note this on the sample sheet in the observations section and pick four locations representative of the river conditions.
- 6. On your field data collection sheet draw a site sketch of the river as viewed from above (bird's eye view).
 - a. This map should be of a 200 ft. section of the river, the 50 ft. section where you collect your macroinvertebrate sample should be in the middle of the map.
 - b. This map should also show the sample collection spots, riffles, runs, pools, dams, tributaries, roads, wetlands, pipes, vegetation and any other features that will help someone find the spot again using this map.
- 7. Wade to the most downstream collection spot you chose to collect a sample.
 - a. This is a two-person job. One person should have the net and the other person should have put on the arm length gloves. The sampler (person with the gloves) should also bring the brush and the sieve bucket.
 - b. Wade to the most downstream sampling location first, approach from the downstream side, avoiding walking on the area you are going to collect your sample from.
 - c. Pick a good spot to place the net. The area should be at least as wide as the net, have a predominantly rubble bottom and be fairly level so the bottom of the net is flat on the bottom. This will keep organisms from drifting underneath the net. <u>IT IS ESSENTIAL THAT THIS SPOT ALLOW</u> <u>WATER TO FLOW FREELY THROUGH THE NET.</u> Avoid eddies behind large objects or placing the net on large rocks.
 - d. Get into position, with one person holding the net immediately downstream from the collection spot. The person with the gloves should stand to the side of the area they will be collecting so they are not in the way of the net, allowing water to flow from the collection area directly into the net.

- 8. When both people are ready start sampling:
 - a. The person with the gloves should dislodge organisms from a rectangular area of stream bottom as wide as the net and 1 foot back from the opening so the organisms are carried into the net.
 - b. Pick up and rub or brush off the rocks in the sample area to dislodge organisms clinging to the surface. Then place these rocks into the sieve bucket.
 - c. Dig into the river bottom once you have rubbed off all the rocks. Dig down as far as possible into the river bottom to dislodge burrowing organisms. If you find more rocks rub them off into the net and put them into the sieve bucket.
- 9. Once you are finished with this spot you can carefully lift the net off the bottom.
 - a. At this point you can either move to the next spot or if you have many rocks in the sieve bucket you can process these rocks before moving on.
- 10. To process the rocks in the bucket, carefully pick up each rock and using the scrub brush dislodge any remaining organisms on the rocks into the water in the sieve bucket. Inspect each rock, if it is clean, remove it from the bucket and put it back into the river. Clean all the rocks in the bucket this way.
- 11. Move to the next site, which should be upstream of your current location.
- 12. Repeat steps 7 through 10 at each site until you have sampled the four sampling locations.
- 13. Once you have sampled all four sites bring the net and sieve bucket to an area of shallow quiet water.
- 14. If you haven't cleaned off the rocks in the sieve bucket yet, clean the rocks (see step 10 for instruction on cleaning the rocks).
- 15. Then, transfer the contents of the net into the sieve bucket by gathering the sample material into one corner of the net, then grab that corner from the bottom, holding the sample material in a clump, turn the net inside out into the sieve bucket. Try to knock any sample remaining on the net into the bucket or back flush the net into the sieve bucket using a small amount of water.

- 16. Transfer the contents of the sieve bucket into a Nalgene bottle or Zip-lock sample bag. This is accomplished by:
 - a. Placing the sieve bucket in shallow water so that the water comes up through the bottom screen and moves the sample around.
 - b. Move or shake the bucket to get the sample into the bottom of the bucket below the spout.
 - c. Move the sample to the bucket spout and position the sample bag or bottle under it.
 - d. Place the net under the sample bag to catch any organisms that miss the bag.
 - e. Scrape the sample into the bag or bottle. Keep the container a little less than half full with macroinvertebrates. If you find that there are too many organisms for one bag, then use more than one bag for the sample. Just make sure to label the second bag and indicate on the field data sheet that you filled more than one bag with sample.
 - f. Use the forceps to pick off any remaining organisms off the net and sieve bucket and place them in the sample bag.
 - g. The sample bag or bottle should already be labeled with date, station ID, sampler names and preservative (90% denatured alcohol).
 - h. If using bags, place the bag containing the sample into another Zip-lock bag just in case there are any leaks in the first bag (i.e., double-bag it).
 - i. Preserve the sample by pouring enough 90% denatured alcohol to cover the sample. Bring the level of the alcohol to 1 inch above the top of the sample.
 - j. Denatured alcohol is a chemical and as such should be treated with respect. Avoid contact with your skin and eyes. Do not dump down the drain, keep all waste and return it to IRWA. A material safety data sheet (MSDS) is provided at the end of this document. A MSDS provides information on the hazards associated with a chemical.
- 17. On the field sampling data sheet, circle YES for "Macroinvertebrate sample collected" and insert the number of containers you filled with samples next to "Number of sample containers".
- 18. Next, complete the Water Quality section of the Sampling Data Sheet.
- NOTE: One sampling site will be determined to be the duplicate site by the Monitoring Coordinator before sampling of sites begins. This site will be chosen randomly by the Monitoring Coordinator. At the duplicate site, two independent macroinvertebrate collections/samplings will be completed.

4.0 water quality

Measure water quality at each site after collection of macroinvertebrates is complete.

Step by step instructions:

- 1. <u>Weather:</u> If you haven't previously indicated the current weather during sampling, circle the description that best represents the current weather.
- 2. <u>Rain in last 48 hours</u>: If you haven't already indicated the amount of rain in the last 48 hours, circle the description that best represents the weather in the previous 48 hours.
- 3. <u>Observations</u>: Indicate any features that are out of the ordinary such as a strange smell, the water color being strange, algae blooms, if river isn't flowing or there is no water.
- 4. <u>Water quality measurements</u>: A hand-held water quality meter will be provided to measure dissolved oxygen, water temperature and conductivity. The meter will be pre-calibrated and set-up for ease of use following the procedure below:
 - a. Press the Power Button (beneath the f1 button) to turn the meter on. The display should show "Cond" for conductivity and "RDO" for dissolved oxygen on the same screen. If this is not the case, keep pressing the **Channel** button (f3) until you see the two readings together.
 - b. Replace the white plastic sleeve of the RDO probe with the metal guard by twisting the sleeve off and the guard on. Keep the white sleeve in a safe place so it does not get lost.
 - c. Immerse both probes completely in the water. Wait until each "Ready" appears above each reading. This is rapid for conductivity, but may take a minute or two for dissolved oxygen. Use the temperature reading from the DO probe for water temperature. Record these value on the sampling data sheet.
 - d. Remove the metal guard from the DO probe and replace the white sleeve (this is important).
 - e. Turn the meter off, although it will shut off by itself after 10 minutes.

Example of a completed sampling data sheet



IRWA Macroinvertebrate Sampling Data Sheet

Required* LOCATION: Fish Brook, Lockwood Lane, SITE ID # FB-LL Boxford Sampler(s) Names: Sarah Jane, Bob Jane and Lorraine Kerry Date: October 15, 2022 Time: 1:00 pm Macroinvertebrate Sample Collected (circle one) (YES) NO Number of sample containers Observations: River water color and odor were normal. Quite a bit of wood debris along the river bank (broken trees, sticks and logs washed to site from upstream). Weather* (circle one) Partly cloudy Clear Cloudy Overcast Drizzle Rain Snow Sleet Other Fog Rain in Last 48 Hours* (circle one) Heavy Light None Water Quality* Dissolved oxygen Conductivity 5.4 Temperature (°C) 15 300 (mg/L)(µS/cm)

Site ID: FB-LL

Site Sketch (Required) (Include a sketch of the monitoring site. This should be a "bird's eye" view of the 200 ft segment of the river you are sampling in including the macroinvertebrate sampling locations. Note the places where you measured current velocity and depth. Also note riffles, runs, pools, dams, tributaries, roads, wetlands, dams, riprap, pipes, ditches, landscape features and any land or water marks that will help someone else find your site.





IRWA Macroinvertebrate Sampling Data Sheet

Required*

SITE ID #	L	LOCATION:				
Sampler(s) Names	:					
Date:	1	ïme:				
Macroinvertebrate Sample Collected (circle one) YES NO						
Observations:						
Weather* (circle one)						
Clear	Partly cloudy	Cloudy	Overcast	Drizzle		
Rain	Snow	Fog	Sleet	Other		
Rain in Last 48 Hours* (circle one) Heavy Light None						

Water Quality*					
Dissolved oxygen (mg/L)		Temperature (°C)		Conductivity (µS/cm)	

Please return to: IRWA, PO Box 576, Ipswich , MA 01938 Email: irwainfo@ipswichriver.org Site Sketch (Include a sketch of the monitoring site. This should be a "bird's eye" view of the 200 ft segment of the river you are sampling in including the macroinvertebrate sampling locations. Note the places where you measured current velocity and depth. Also note riffles, runs, pools, dams, tributaries, roads, wetlands, dams, riprap, pipes, ditches, landscape features and any land or water marks that will help someone else find your site.