Benthic Collection Procedure Record

This form is for recording the particular sampling protocols that you use when you collect your sample. Such information is useful when analyzing your results. It is also valuable if you want to compare your results to data collected at your site by others before you got involved, or to data from other locations collected by other groups. The sampling method (eg, kick net, surber sampler), the location in the stream, and other variables listed in the Benthic Collection Procedure Record can all impact your results. By keeping track of these procedures, you can factor them into your analysis.

Sample Collection Guidelines

Sampling Materials and Equipment
The following equipment is recommended for collecting benthic macroinvertebrates:

- Kick seine or kick net (or other sampler) - for collecting sample.
- Metal screw driver (or similar device) - for stirring the sample substrate.
- Large white sheet of plastic - to lay out all equipment, keeping it clean and in one place.
- Large buckets - for washing sample out of net and/or for transporting for later identification.
- Plastic scooping devices (large measuring cups or modified plastic milk jugs) - to rinse insects off net (using river water) into collecting bucket or pans.
- White enamel or shallow plastic pans - for dividing the sample for multiple groups; for picking and sorting from.
- Ice cube trays, white preferable - for sorting the organisms by major group.
- Small jars or vials - can be used for sorting and are especially helpful if you want plan to save and transport your sorted sample.
- Seventy-percent alcohol solution - if you plan to save your sample.
- Forceps/tweezers, spoons, small paint brushes - for picking organisms and sorting organisms into major groups.
- Hand-held magnifiers - to aid in identification.
- Vegetable brushes - to gently remove attached organisms from rocks.
- Rubber boots or hip waders and rubber gloves - to keep you dry and warm during collection.
- Meter stick - for making depth measurements.
- Thermometer - for recording water and air temperatures at time of collection.
- Data sheets, pencils, and clipboard - for recording sampling results.
- Field guides - to aid in identification of organisms (can be plastic coated for wet weather).

Survey Design
If you are interested in how your river changes from the headwaters to the mouth, sampling sites should be dispersed along the length of your river so that changes in water quality and the resulting shifts in the aquatic community can be noted.

When the object of sampling is to evaluate the impact of a particular source of pollution or disturbance, at least three sampling sites should be tested. One site should be located just above the source to serve as a control site. Another should be located immediately below the source, and the third should be further downstream to serve as a recovery station.

If sampling can only be done once or twice a year it is preferable in temperate regions to do it in March or April, and in late September or October.

Procedures for Collecting Samples

Depending on the monitoring program you are associated with, you will have guidelines for how to collect your sample. If you are on your own, or associated with GREEN, we suggest the following procedures, see below. Earth Force has further information on resources and equipment to aid you.

The methods described here generally follow a qualitative or semi-quantitative approach. They have been used successfully by non-biologists to monitor water quality and identify trouble spots.

1. Choose a 3-foot by 3-foot area in a riffle typical of the stream. A riffle good for sampling will have cobble-sized rocks, fast moving water, and a depth of 3 to 12 inches.
2. Use the kick seine method to collect the sample. Enter the water downstream of your sampling location. Have one person hold the poles on the net upright in the sampling area and push the poles firmly into the substrate. No water should wash under or over the net. Place small rocks on the bottom edge, if needed, to hold it down.
3. As the net is held, a second person brushes all organisms off the cobbles and rocks. Completely brush rocks and set them outside the sampling area. Next, stir the substrate to a depth of several inches to dislodge any burrowing macroinvertebrates. You can use a metal tool, such as a long screw driver, or use your feet in a shuffling motion to kick the substrate toward the net. Stir for at least one minute.
4. Lift the kick seine out of the water with a forward scooping action to avoid losing macroinvertebrates off the end of the screen.
5. After carrying the seine to the stream bank, wash the contents into a large bucket filled with stream water. Washing from behind the screen helps to dislodge the animals. Use only stream water for rinsing organisms off the net into the bucket. If you plan to sort back at your lab or school, you can transport the sample in the large bucket, preferable with a lid, with plenty of stream water.
6. You can begin sorting directly from the bucket into ice cube trays or other sorting containers filled with stream water. However, it is often easier to scoop parts of the sample into shallow pans from which to sort. Keep scooping and sorting until you've identified the entire sample (or reached whatever maximum number of organisms your program prescribes). Sort the different taxa (types of specimens) into separate containers or sections of the ice trays.
7. Once you have sorted the organisms, they can be identified in the field or lab using identification keys and guides. *The Field Manual for Water Quality Monitoring* has pictures and identifying information in hard copy. An excellent on-line resource is the Save Our Streams Macroinvertebrate Identification Key.
8. Record the results of your assessment using the Benthic Field Data Sheet. Also record your collection and identification procedures in the Benthic Collection Procedure Record (located in My Page).
9. Back in the lab or school, enter your data and collection procedure information into the GREEN web site. The site will help you analyze your sample and take the next steps toward improving conditions on your stream or river. See Biological Analysis Instructions for information on how the database will automatically calculate Taxa Richness, EPT Richness, and Pollution Tolerance Indices for you.

Benthic Field Data Sheet

General Information	
Date:	
Name of Stream or River (or other water body):	
Site Name or Number:	
Site Location (be specific):	
Latitude and Longitude:	
Stream Order of Site:	
Watershed:	
Nearest Town:	
Country:	
State, Region or Province:	
Monitors: Organization: School: Names:	
Time:	
Weather: Today: Previous 2 days: Date of Last Precipitation:	
Air Temperature (^{0}C):	
Water Temperature (^{0}C):	
Estimated Elevation:	

ref: www.earthforce.org/section/programs/green/

Recording Macroinvertebrate Data

The calculations for Total Taxa Richness, EPT Taxa Richness, and either a 3-part or 4-part Pollution Tolerance Index will be automatically generated when you enter your data into the GREEN database. Directions will be provided on-line. Additional information is available in the resource "Biological Analysis Instructions".

Directions: Use hash marks to tally the number of individuals in major groups. Use a different Taxon column any time you encounter a different type of organism *within* a major group. For example: if you find one each of three different types of mayflies, then you will record a hash mark under three taxon columns. If you find another organism just like the one you "named" *Taxon 1*, then put another hash mark in the *Taxon 1* column.

Note: If you do not want richness numbers calculated for you and plan only to analyze using a 3- or 4- part Pollution Tolerance Index, you may opt for recording totals for each major group in just the Taxon 1 column. The computer will take it from there to calculate your PTI.

Major Groups	Taxon 1	Taxon 2	Taxon 3	Taxon 4	Taxon 5	Taxon 6	Total Number of Taxa	Total Number of Individuals
mayfly nymphs *(Ephemeroptera)*								
stonefly nymphs *(Plecoptera)*								
caddisfly larvae *(Trichoptera)*								
gilled/right-handed snails								
riffle beetle adult								
hellgrammite/dobsonflies								
water penny larvae								
beetle larvae								
Clams								
cranefly larvae								
Crayfish								
damselfly nymphs								
dragonfly nymphs								
Scuds								
Sowbugs								
fishfly larvae								
alderfly larvae								
watersnipe fly larvae								
aquatic worms								
blackfly larvae								
Leeches								
midge larvae								
pouch/left-handed & other snails								
filtering caddisfly								
Mosquitoes								
Bivalves								

Benthic Analysis Instructions

The calculations for Total Taxa Richness, EPT Taxa Richness, and either a 3-part or 4-part Pollution Tolerance Index will be automatically generated when you enter your data into the GREEN database. Directions will be provided on-line.

Using the GREEN database, you will have the ability to:

1. Select a 3- or 4-part Pollution Tolerance Index for automatic calculation. You will be asked to select a preference when you create a project. If you do not select, the default setting is the 4-part PTI. (Total Taxa Richness and EPT Taxa Richness will be calculated regardless of PTI choice.)

2. Customize the organisms listed in the 3-part PTI. Only the 3-part PTI can be modified to suit the geographic region where you live. When you create a project, you will be asked if you wish to customize the list and then given a menu of organisms to choose from for placement in the table.

3. Record benthic collection procedures (such information is important for interpreting and comparing monitoring results). This option is accessed when you create or edit your project information and click on enter data link.

4. Auto-calculate. To get automatically calculated results, you will enter a number representing your hash marks for each taxon from your Benthic Field Data Sheet into the identical Macroinvertebrate Data Entry Form (sample below). Both Total Number columns will be automatically calculated, as will Total Taxa Richness and EPT Richness. In addition, your selected PTI will be calculated. *To see these calculations, you will need to go back to View Data and select your particular monitoring event.*

5. Omit richness calculations. If you do not want richness numbers calculated for you and plan to analyze only using a 3- or 4-part Pollution Tolerance Index, you may opt for recording totals for each major group in just the Taxon 1 column. The computer will take it from there to calculate your PTI.

Sample Richness and Pollution Tolerance tables

Total Taxa Richness & EPT Taxa Richness
The computer will automatically calculate the two richness values using the lines below. Good water quality is indicated by high richness.

Line	Description	Totals
A	Taxa Richness (total number of taxa)	
B	Number of Mayfly taxa	
C	Number of Stonefly taxa	
D	Number of Caddisfly taxa	
E	EPT Taxa Richness (total number of EPT taxa [B+C+D])	

4-part Pollution Tolerance Index (PTI)

The computer will automatically calculate the Pollution Tolerance Index number for you using the standard directions: Use letter codes (A=1-9, B=10-49, C=50-99, D=100 or more) to estimate the numbers of organisms found. To calculate the PTI, add up the number of types of letters in each tolerance level column and multiply by the indicated index value. The columns correspond to the organisms' tolerance to pollution. Reference: See Mitchell & Stapp, *Field Manual for Water Quality Monitoring, 12th Edition*, for further information on using the 4-part PTI. www.earthforce.org/green/catalog.

4-part Pollution Tolerance Index

Group 1 - most intolerant	**Group 2 - moderately intolerant**	**Group 3 - moderately tolerant**	**Group 4 - most tolerant**
____ gilled snails ____ stonefly nymph ____ mayfly nymph ____ rifle beetle adult ____ caddisfly larvae ____ dobsonfly larvae (hellgrammite) ____ water penny beetle larvae	____ sowbug ____ scud ____ dragonfly larvae ____ damselfly nymph ____ crane fly larvae ____ clams	____ leech ____ midge (excluding blood midges) ____ flat worm ____ black fly larvae ____ water mite	____ pouch (& other) snails ____ maggot ____ tubifex worm ____ blood midge larvae
____ # of letters x 4 = ____ index value	____ # of letters x 3 = ____ index value	____ # of letters x 2 =____ index value	____ # of letters x 1 =____ index value

Total Index Value = _____ (add together the 4 index values, one from each column)

Compare Total Index Value to Water Quality Rating numbers below to determine an estimate of the water quality of your stream.

Water Quality Rating

_____ Excellent (>22) _____ Good (17-22) _____ Fair (11-16) _____ Poor (<11)