



Bugs in the Mud: PROTOCOL



Welcome to the Bugs in the Mud protocol! Follow these steps to begin monitoring benthic invertebrates in your very own lake.

Equipment List

- Net (ideally a D-net) with fine netting
- Large plastic container
- Ice-cube tray
- Magnifying Glass
- Benthic invertebrate dichotomous key
- Large, plastic tweezers
- Waders or water shoes
- Lifejacket
- Stopwatch
- Polarized sunglasses
- Thermometer
- Sun Hat
- Sunscreen
- Bug Spray
- Towel

- 1.** Print these sheets to record data or download iNaturalist on your smartphone to join The Land Between Bioblitz group. Collect your equipment and head down to the lake to an accessible area. Find a sampling site that has a gradual incline (no steep drops in water). Make note of any potential hazards and apply the appropriate safety measures.
- 2.** Fill out details about your sampling site at the top of the data sheet. Use your thermometer to measure the water and air temperature, and record the results on your field sheet.
- 3.** Wear the proper attire (ideally with shoes for protection, lifejacket if necessary and polarized sunglasses) and begin by standing near the water's edge with your net.
- 4.** Start the timer, enter the water and slowly walk perpendicular to the shoreline until water is 1 meter deep. While walking, kick lake substrate to ~5 cm deep and collect dislodged benthic macroinvertebrates by sweeping the net back and forth and up and down.

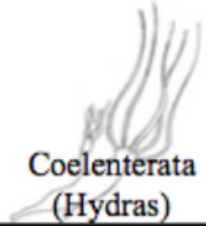
- 5.** When water depth of 1 meter is met from the shoreline, take a step backwards (about 1 meter) parallel to your shoreline, ensuring that you are not in the same path that you just created. Continue your transect back to the shoreline while kicking and collecting your sample.
- 6.** Repeat this method until 5 minutes of sampling is completed. If you're in the middle of a transect (sampling distance from shore to 1m depth), finish the transect before stopping the stopwatch and record the time.
- 7.** Take the net out of the water, and without letting the opening of the net be submerged, swish the net around in the water to remove as much fine sediment as possible.
- 8.** Dump the remaining contents of the net into a bucket and remove as many rocks and plant pieces as possible while checking to make sure there are no bugs clinging to them. Without looking, scoop one spoonful out of the bucket onto a sample tray. Use the ice cube tray to isolate specimens for closer inspection with a magnifying glass. Use a dichotomous key to identify benthics. **NOTE:** Any invertebrates picked, identified, and recorded can be returned to the lake. Be gentle when handling invertebrates as they are delicate and should be shown the respect you'd give any other animal.

TIPS FOR KICKING LAKE SUBSTRATE:

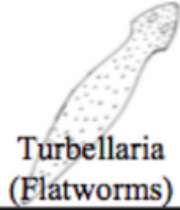
- To kick the substrate, shift and rub your feet into the lake substrate to about 5 cm in depth. Use a 'scraping' motion on the lake floor with your foot to disturb the substrate. While doing so, continue to slowly move perpendicular to the shoreline.
- Try to keep your net close to the bottom of the lake when kicking, as this is where most of the dislodged benthic macroinvertebrates will be.
- Use your net to sweep through substrate that has been 'kicked' up by your feet. Sweep the net around to catch as much floating and dislodged substrate as possible, as that is where you will catch the macroinvertebrates!



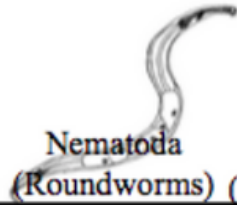
Bugs in the Mud: DATA SHEET



Coelenterata
(Hydras)



Turbellaria
(Flatworms)



Nematoda
(Roundworms)



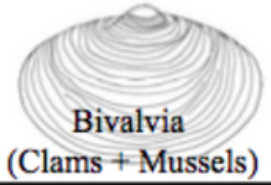
Oligochaeta
(Aquatic Earthworms)



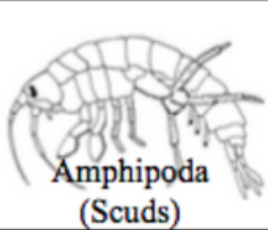
Hirudinea
(Leeches)



Isopoda
(Sow Bugs)



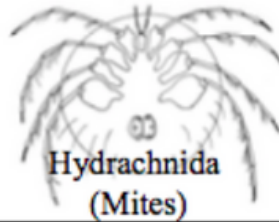
Bivalvia
(Clams + Mussels)



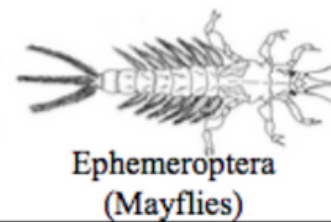
Amphipoda
(Scuds)



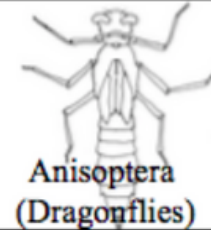
Decapoda
(Crayfish)



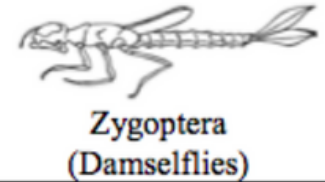
Hydrachnida
(Mites)



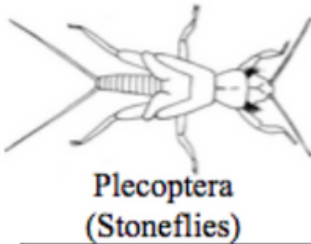
Ephemeroptera
(Mayflies)



Anisoptera
(Dragonflies)



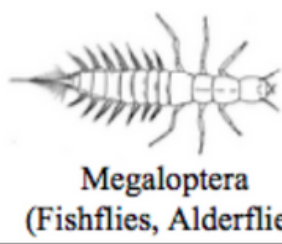
Zygoptera
(Damselflies)



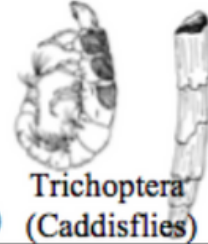
Plecoptera
(Stoneflies)



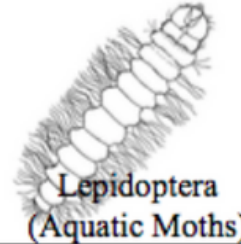
Hemiptera
(True Bugs)



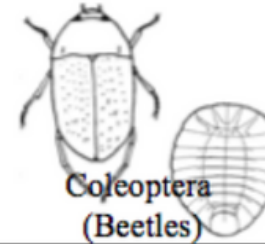
Megaloptera
(Fishflies, Alderflies)



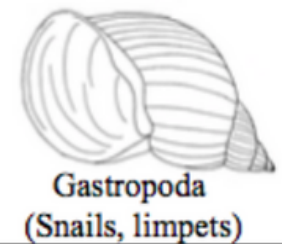
Trichoptera
(Caddisflies)



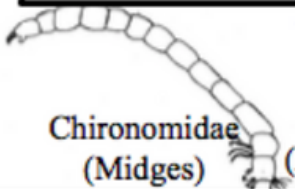
Lepidoptera
(Aquatic Moths)



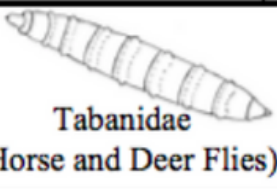
Coleoptera
(Beetles)



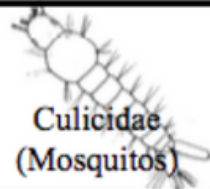
Gastropoda
(Snails, limpets)



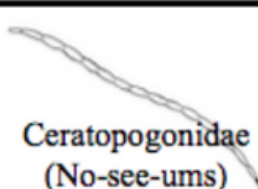
Chironomidae
(Midges)



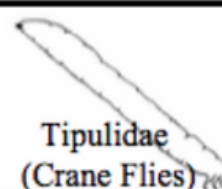
Tabanidae
(Horse and Deer Flies)



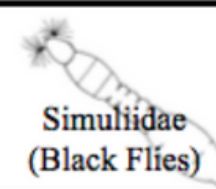
Culicidae
(Mosquitos)



Ceratopogonidae
(No-see-ums)



Tipulidae
(Crane Flies)



Simuliidae
(Black Flies)



Misc. Diptera
(Misc. True Flies)