

Macroinvertebrate and Physical Habitat Sampling Notes

Determining your sampling area:

Biological and physical habitat measurements can't just be measured in a single spot like water chemistry. How big your sampling area is, or how far you walk in the stream, is determined by the width of the stream. Larger streams require you walk further on your survey.

To determine the length of your sampling reach do the following.

- From your sampling point, look upstream for five locations with “typical” widths of the stream. Measure these 5 widths and take an average rounding to the nearest whole meter.
- If the average width is 13 feet or more (big stream), multiply the width by 40 to get the total length of the reach to be sampled. If the average width is less than 13 feet (small stream), use 500 feet as the length.
- Proceed upstream from the water monitoring station unless an obstacle requires you to slide the transect down below the sampling point. Therefore, if the reach length is 500 feet but you reach an obstacle at 300 feet, then you should complete the survey going 200 feet below the water sampling point and note the change on the field sheet. Obstacles that would require that you go below the water sampling site include private property restrictions, lakes/reservoirs, incoming streams that effect stream order, or impassable barrier (waterfall or cliff, not a big log jam). If an incoming stream does not change the stream order (generally if it is not a relatively large one) then you may proceed beyond the confluence. Stream order is determined on 1:100,000 scale maps that should be reviewed prior to doing the field work.

Macroinvertebrate sampling

- Based Benthic Macroinvertebrate Protocol for Wadeable Rivers and Streams, Chapter 3 of the DEQ Water Monitoring and Assessment Mode of Operations Manual available at: <http://www.deq.state.or.us/lab/techrpts/docs/DEQ03LAB0036SOP.pdf> .
- Needed supplies: Net, boots, brush on a string, jars, labels, tape, 95-100% ETOH or Isopropyl alcohol, pencils, squirt bottle.
- How to collect- “random” samples from riffles spread out over whole reach
 1. Determine reach length
 2. Guess how many riffles you will have in the area and try to spread it out
 3. The grid approach BL, BC, BR, ML, MC, MR, ML, and MC.
 4. Actually getting the critters: setting the net, 1X1 area, cleaning bigger than a golf ball, agitating to 4 inches, scooping net, cleaning out big stuff dumping in bucket, at the end clean net thoroughly.
 5. Empty bucket into jars and clean thoroughly. Label in and out.

Hardcopy References

- Adams, Jeff and Mace Vaughan. 2003. *Macroinvertebrates of the Pacific Northwest: A Field Guide*. Portland, Oregon: Xerces Society. This field guide is intended for use as a companion to the CD-ROM: *Stream Bugs as Biomotors: A Guide to Pacific Northwest Macroinvertebrate Monitoring*, also published by The Xerces Society.
(<http://www.xerces.org/publications/identification-guides/macroinvert-pnw/>)
- Edwards, Patrick. 2008. *Stream Insects of the Pacific Northwest: Field Guide*. Published by Center for Science Education, Portland State University, Portland Oregon.

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McCafferty, Patrick W. and Arwin Provonsha. 1981. *Aquatic Entomology: The Fishermen's and Ecologists' Illustrated Guide to Insects and Their Relatives*. Boston, MA: Science Books International.

Hafele, Rick and Steve Hinton. *Guide to Pacific Northwest Aquatic Invertebrates*. Oregon Trout. Portland, Oregon. (503) 222-9091.

Online Guides: See <http://www.nwnature.net/macros/index.html>

[Guide to Freshwater Invertebrates](#) - basic guide to freshwater macroinvertebrates developed by Leska S. Fore for Pacific Northwest water quality volunteers (<http://www.nwnature.net/macros/index.html>)

[Guide to Freshwater MacroInvertebrates from Streams in Western Washington & Western Oregon](#) - sorted collection of macro images by Michael Clapp - nwnature.net (<http://www.seanet.com/~leska/Online/Guide.html>)

[Key to Aquatic Macroinvertebrates in Utah](#) - Utah State University Cooperative Extension (<https://extension.usu.edu/waterquality/htm/macrokey>)

[Key to Aquatic Macroinvertebrates](#) - New York State Department of Environmental Conservation (<http://www.dec.ny.gov/animals/35772.html>)

[North Dakota Digital Key to Aquatic Insects](#) - VCSU Macro-Invertebrate Lab's Digital Key to Aquatic Insects of North Dakota (<http://www.waterbugkey.vcsu.edu/>)

Physical Habitat

- Based on the wadeable protocols from EPA's National Rivers and Streams Assessment field methods protocol
http://water.epa.gov/type/rsl/monitoring/riverssurvey/upload/NRSA_Field_Manual_4_21_09.pdf
- Relative Bed Stability- relationship between supply and transport, a stable stream is transporting as much as is being supplied. When under stress streams can accumulate finer sediment particles or sometimes get an armoring of the bed (removal of fine particles) by streams with too much energy. Stream energy is a function of gradient (most sensitive), size (thalweg depth, bankfull width and height) and the presence of large wood. RBS calculates the expected particle size for a stream and the Wolman Pebble count measures the observed particle size.
- What equipment you need: field sheets, pencils, Stadia rods, ski pole, densitometer and clinometer or Abney level.
- What you measure (see table below). Transect parameters and thalweg/LWD parameters.
- May want to walk upstream and put flags at each transect, then measure gradient on your way back down. The only disadvantage to this is that slope is the most important (sensitive) parameter for RBS calculation and the end of the day can be rushed.

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What it is called	What it is	Where you measure it.	
		Small Stream (average wetted width less than 13 feet)	Large stream (average wetted width 13 feet or more)
Reach Length (ft)	<i>The distance of the stream you get to survey</i>	500 feet	40 x average wetted width
Total number of transects	How many places you stop for all cross channel measurements	11 (referred to as A thru K)	11 (referred to as A thru K)
Distance between transects (ft)		50 feet	4 x average wetted width
Pebble count transects	Classifying stream sediment into size classes	21 total (at each transect and mid way between each transect)	21 total (at each transect and mid way between each transect)
Pebble count locations in transect		5 total (left and right wetted edges, the mid point, and half way between mid point and each of the wetted edges)	5 total (left and right wetted edges, the mid point, and half way between mid point and each of the wetted edges)
Wetted width	Wet edge to wet edge, including bars (record bar widths in comments)	21 total (at each pebble count)	21 total (at each pebble count)
Bankfull Depth and Width	Bankfull is the active channel where the high flows occur every 1 or 2 years. Can be determined based preponderance of evidence from slope breaks, transition between terrestrial plants and exposed stream sediment, presence of drift material, transition from flood/scour tolerant veg to intolerant veg., and changes in moss growth on rocks.	11 (at each transect A – K)	11 (at each transect A – K)
Gradient	Slope of the stream, often close to 0 but never equal to 0 if water is visibly flowing.	11 (one measurement looking from one transect to the next, if line of site is obstructed use multiple slopes and record the proportion of distance to the next transect covered)	11 (one measurement looking from one transect to the next, if line of site is obstructed use multiple slopes and record the proportion of distance to the next transect covered)
Canopy cover	Shade producing plants and structures.	6 at each of 11 transects (Once on each wetted edge towards the bank; and 4 times at the midpoint-towards upstream, downstream, left and right)	6 at each of 11 transects (Once on each wetted edge towards the bank, and 4 times at the midpoint towards upstream, downstream, left and right)
Thalweg depth measurements	<i>Flow path of the deepest water in stream channel</i>	150 (at each transect and every 3 feet as you walk up the stream)	100 (at 0.4 x the average wetted width)
Large Woody Debris	Any large wood that would get wet under bankfull flow conditions.	Tallied for each size class as you walk entire reach length.	Tallied for each size class as you walk entire reach length.

Based section 6.2 of: http://water.epa.gov/type/rs/monitoring/riverssurvey/upload/NRSA_Field_Manual_4_21_09.pdf