

## FIELD PROCEDURE: PEBBLE COUNT

(From Kondolf 1997, Wolman 1954, and Schuett-Hames et al. 1994)

### EQUIPMENT NEEDED:

- Rulers marked in “half-phi” classes (see below), with 1/8” welding rods projecting 8” beyond the end of the ruler
- latex disposable gloves, to protect against sharp objects in the water
- marked boot tips
- data sheet, clipboard, pencil

In this procedure, you will measure the particle size distribution of the surface sediment of your stream, which provides valuable information about its habitat and hydrology.

It is best for two people to perform this procedure: one to pick and measure rocks exclusively; and the other to record. A second counter cuts the time in half, but the counters must coordinate their crossings (see below).

1. If possible, do your sampling in the area of your cross-section transect. However, the site needs to be a channel-spanning riffle or run<sup>1</sup>, at a point where the flow and stream-bottom appear relatively homogeneous (e.g., no eddies or backwaters). If the cross-section transect is not appropriate, find a place that is. You may go outside your reach to find the best place possible if there is no appropriate area within it. (If you see broken glass or other dangerous trash in this area, take precautions, remove the trash, or find another area.) On your data sheet, indicate your sampling location.
2. The counter(s) will be walking back and forth within this riffle/run across the entire channel bottom where the stream runs during normal flows, from the foot (a.k.a. “toe”) of one bank to the foot of the other. Often there is a non-woody vegetation line

at this toe. Part of this area will probably be dry when you do your sampling; that just makes it easier to count!

3. Walk heel-to-toe straight across this channel. With each step, insert the welding-rod straight down to the stream-bottom along the line drawn at the tip of your boots.
4. Don’t count bedrock, garbage, construction debris, or organic materials. If you come to an area of the channel that is bedrock only, skip over that area and move to an area with sediment (see #1 above).
5. Otherwise, measure whatever you **first touch** with the welding rod, be it silt, gravel, or a boulder.
6. If you hit fine sediment that covers a rock completely (not sporadically), count the fines, not the rock. You can tell if you’ve hit fines, because the rod will make a “scrunch” (sand/silt) or “squish” (mud) sound rather than a “thunk” (rock) or “thud” (rock covered by algae). You can confirm this fact in a couple of ways:
  - a) Look for a plume of dirt that flows downstream after you lift up the rod.
  - b) If you’re not sure whether what covers the rock is silt or algae, jiggle the rock, and if the covering easily washes away, it is fine sediment, not algae.
7. If you’ve hit fine sediment, you don’t need to pick it up. Just call out “fines,” and the recorder will enter a tally in the “<4 mm” row.

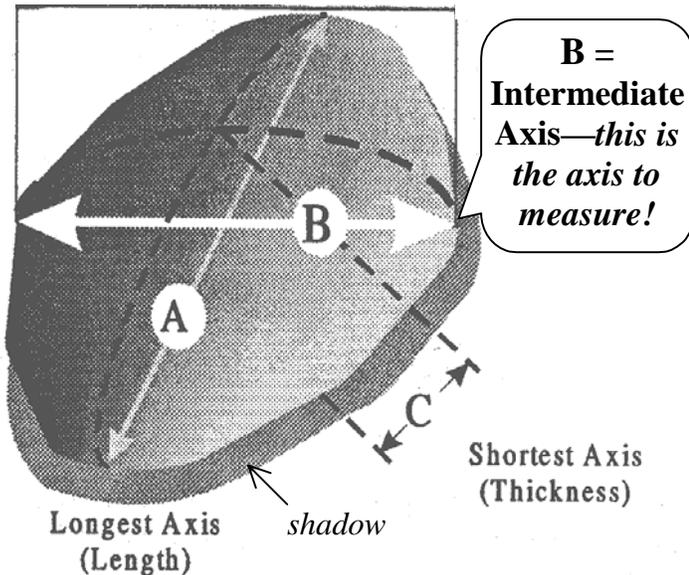
*(please see next page)*

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<sup>1</sup> Riffle = shallow area where water flows swiftly over gravel and rock, creating surface turbulence; run = area with little surface turbulence but relatively high velocity. Don’t sample at pools or “glides” (places of deep, uniform-depth, slow-moving water).

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Otherwise, pick up the first piece you hit, and measure its diameter along its **intermediate axis**, which is perpendicular to the other two. To find this, first find the longest axis; then find the smallest axis that is perpendicular to the longest axis. There is now one more axis that is perpendicular to both the longest and shortest axes--that is the intermediate axis. See diagram below.



(From Schuett-Hames et al., 1994)

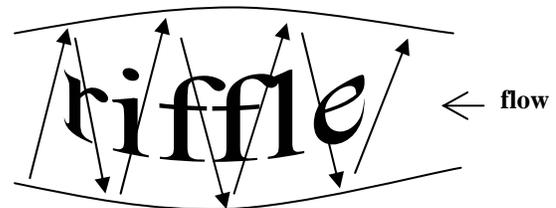
8. If you can't easily remove the rock from the bed, excavate around it and measure it in place. (You may have to "let the dust clear" for a few seconds.) The intermediate axis will be the smaller of the two exposed axes. (If it's a big rock, don't give yourself a hernia! Estimate whether it's embedded or not—i.e., does it look like just the "tip of the iceberg"?) You will tally these pieces in the "Embedded" column on your data sheet (see below).
9. For each piece of sediment measured, make **two tallies** on your data sheet:
  - a) one in the appropriate row for the piece's size class, in **either** the "Loose" or "Embedded" column (not both!). The classes are: < 4 mm; 4-5.7 mm; 5.7-8 mm; 8-11.3 mm; 11.3-16 mm; 16-22.6 mm; 22.6-32 mm; 32-45.3 mm; 45.3-64 mm; 64-90.5 mm; 90.5-128 mm; 128-181 mm; 181-256 mm; 256-362 mm; 362-512 mm; >512 mm. (These increments are called "half-phi" classes;

they increase by the square root of two and mimic data collected by putting sediment through successively finer sieves.)

- b) one in the "Total tally" row, to keep track of how many pieces you've counted.

The recorder should verbally repeat each measurement back to the caller for error checking before placing the tally mark.

10. Repeat this procedure, walking heel-to-toe and crossing back and forth across the riffle. (It will go fast once you get into the rhythm!) Don't walk back along the same line you've walked before! (See diagram below.)



General transect scheme for pebble count

11. If you are on a big boulder and the next step is still on the same rock, tally that rock again.
12. If your foot falls on a rock that you can't stand on, put your foot on top of it and keep your weight on the other foot while you reach down with the rod. If you have to move your forward foot for whatever reason, try to make your next step start from wherever your forward foot would have been.
13. **When 100 tallies are reached, all samplers must complete their crossing to the other side of the channel.** So if you have a 100-ft. channel and two counters, one should start on each side, and they should meet in the middle!
14. In the "Sampler's Initials" box to the right of the data boxes, put all the initials of one sampler taking responsibility for the data. If more than one person worked on this data, put the initials of the person with the most experience or knowledge.