

FIELD PROCEDURE: CROSS SECTION SURVEY

EQUIPMENT NEEDED:

- string
- line level
- flexible measuring tape marked in tenths of a foot
- spring clamp(s)
- stadia rod
- compass
- hand pruner
- “Photos—Summer” protocol
- directions to the cross-section monuments (hand-drawn reach map, verbal directions, someone who knows)
- data sheet, clipboard, pencil

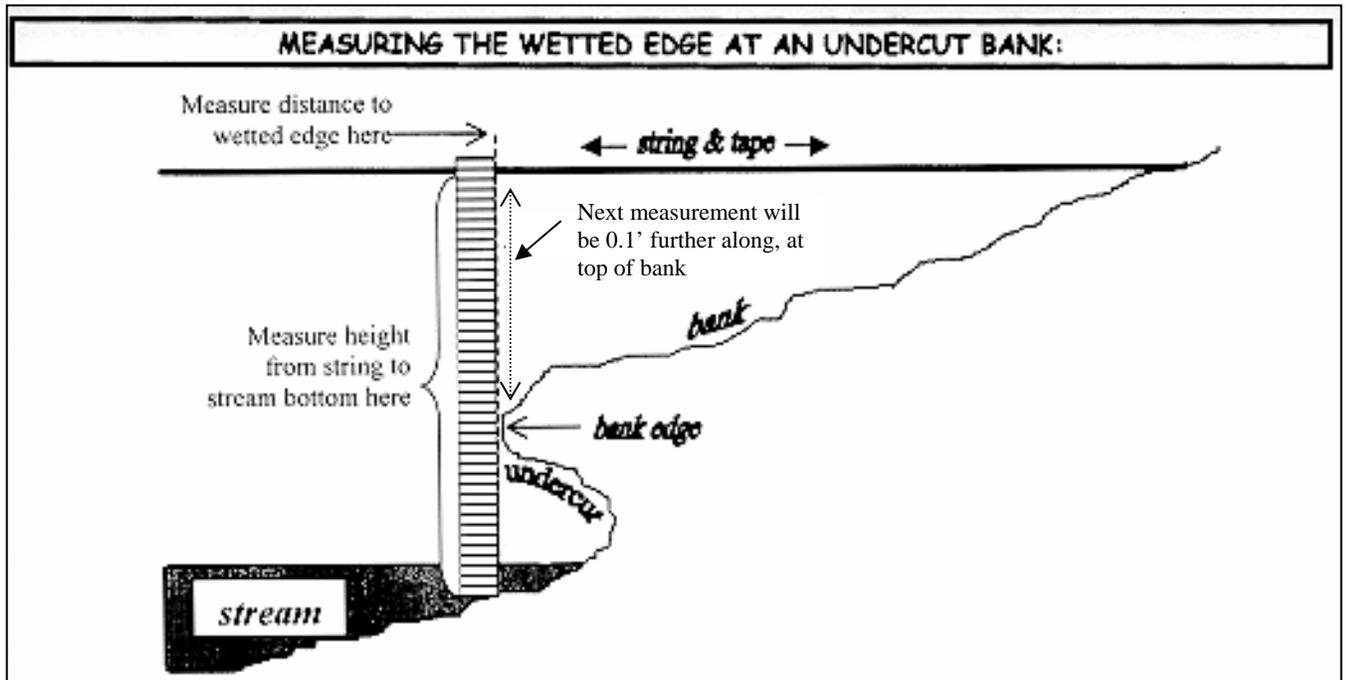
In this procedure, you will survey the stream channel cross section with a series of measurements along a permanently-established line. The data you gather will be entered into a computer database that can generate a graph of the cross section and calculate the degree of change in the cross-section “footprint” over time.

Survey the cross section at the place in your reach where permanent monuments have been established. Generally there will be one set of two monuments in each reach. The location of these monuments should be indicated on your reach map. See the “Establishing Cross Section Monuments” procedure for further details.

1. Avoid trampling down the banks, or your own team will be the cause of changes in the cross section!
2. Locate and verify your monuments, and complete the lines on your data sheet describing your monuments and any changes to the site.
3. Tie a string tightly between the attachment points on the two permanent monuments. For a nail in a tree, the attachment point is directly next to the head of the nail. For a piece of rebar in the ground, the attachment point is the scored line in the rebar just below the rebar cap (or just below where the rebar cap would be if the cap is missing). When in doubt, use the line level to make sure your attachment points are at the same elevation. Tie the string in such a way that you can easily untie it without cutting it. It is crucial that the string not touch anything in between the monuments. If necessary, pull or prune away any brush that interferes. Hang a line level at mid-point on the string to confirm that the string is horizontal, but take it off before proceeding.
4. Starting at either bank, stretch a measuring tape marked in tenths of a foot across the stream between the two monuments. Keep the tape away from the string by attaching it as closely as possible to the tree (if the monument is a nail) or the ground (if the monument is rebar). You can use the piece of wire at the end of the tape to secure the end-hook such that the tape’s zero point is at the head of the nail or the bottom of the rebar cap, or you can wrap the tape around the monument and then clamp it to itself using the spring clamp. (The tape doesn’t have to start at zero.) The tape should be fairly tight, but it will sag below the string, which can be stretched more tightly. Make sure that the tape does not touch the string at any point.
5. Begin readings from either monument (lbn or rbm). You don’t have to begin at zero, and you can start at either end of the tape—the database will make all necessary conversions. One person records on the data sheet while the other measures with the stadia rod.
6. Assure that the rod is straight up by holding it loosely and finding the point at which it balances itself. Read from the side of the rod that is actually touching the ground (the up-bank side). Be sure to have your eye on level with the string.

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7. At the starting point, on your data sheet:
 - In the “Descr” column, circle whether you’re starting at the lbm or rbm.
 - In the “d” column, record the reading on the tape (which won’t necessarily be zero), to the nearest tenth of a foot (DO NOT GIVE MEASUREMENTS IN INCHES).
 - In the “ht” column, record the height on the stadia rod from the ground to the string’s attachment point to the monument—to the nearest tenth of a foot.
8. You do not have to measure at uniform horizontal intervals; in fact, you should not use uniform intervals. Instead, use longer intervals where the slope or terrain is regular, and shorter intervals where it is irregular (such as at the steep drop-off at the edge of the bank). In general, intervals should be 0.2 – 2 ft. when measuring above bankfull (see definition below) and 0.2 – 1.5 ft. when measuring below that line. The person with the stadia rod moves along the cross-section line, measuring from the ground to the string. Two numbers are given at each point: the horizontal reading on the tape measure, and the vertical distance from the ground to the string, both in tenths of a foot.
9. Be sure to stop and measure at the bankfull points (lbfull & rbfull). (See separate “Bankfull” chapter for how to determine these points). Flag these points for the photo-taker, by either a flagged stake or flagging hanging from the tape.
10. Also stop at the left- and right-bank wetted edges (lbwe & rbwe). If the water level is fairly uniform across your line (which it should be if the monuments were well-placed), these two vertical measurements should be equal and should reflect the level of the water across the channel.
11. Once you get into the water, ignore any rocks or wood sitting in the bankfull channel that look like they could be moved in a “two-year flood”—the sort of high-flow event that you’d expect to see every couple of years. Generally, if you can kick the rock out of the way, do so, or just skip over the rock if it’s too big for you (but not the water!) to move. However, if the boulder or tree looks like it wouldn’t move during a bankfull flood, count it as part of the channel bed.
12. **Undercut bank:** If the wetted edge is beneath an undercut bank (or protruding log), act as if the wetted edge were at the edge of the overhang. (*See diagram on next page.*) When your stadia rod butts up against the overhang, record that distance as your wetted edge. Your vertical measurement should be from the stream bottom to the string, as usual. On your data sheet, record “undercut” next to your wetted-edge designation. You can also record the water depth at that point. (*See sample field sheet on next page.*) Make measurements 0.1’ on either side of the undercut edge.
13. If you wish to provide a double-check on the water level, you can measure the water depth at mid-channel, or at more frequent points if the water-level is not uniform across the channel due to small pools or cascades. Enter these measurements in the “wtr” column.
14. Proceed as described above all the way to the monument on the other side.
15. In the space provided on your data sheet, calculate the bankfull width, which you will need to perform the Erosion/Revetment and Pools monitoring protocols.
16. **Before taking the tape and string down**, perform the “Photos—Summer” protocol. You may also be able to perform the Flow protocol using this tape, if it is not too high for the flow meter’s staff and is at a good point to measure flow (see “Where to Measure” in the Flow protocol).



SAMPLE CROSS-SECTION FIELD SHEET:

Cross Section Survey:					Sampler's Initials: JLTB				
Abbreviations:									
l bm , r bm left & right-bank monuments									
d horizontal distance from l bm (in tenths of a foot)									
ht stadia rod reading from ground to string (in tenths of a foot)									
wtr height of water from streambed (in tenths of a foot)									
l bfull , r bfull left/right bankfull level; top of bank over which water would flood									
l bwe , r bwe left/right bank wetted edge									
Descr	d	ht	wtr	(cont.->)	Descr	d	ht	wtr	
l bm	0	1.05		(cont.->)		21.3	4.9	0.3	
	2.0	1.1				22.0	4.9	0.3	
	4.0	1.4				23.1	5.0	0.3	
l bfull	4.8	1.5				24.0	5.0	0.3	
	6.3	1.9				r bwe	24.6	4.8	0.4 — undercut
	6.8	2.5					24.7	2.9 — overhang	
	7.4	2.9					25.2	2.6	
	7.7	4.0				r bfull	26.6	2.4	
	9.6	4.1					28.6	2.3	
	11.0	4.1					30.5	1.9	
	12.5	4.1					32.0	1.7	
	14.0	4.2					33.3	1.4	
	15.5	4.2					34.3	1.2	
l bwe	17.0	4.4	0				35.3	1.0	
	19.9	4.9	0.2			r bm	36.4	0.8	
Bankfull width = (d @ r bfull) - (d @ l bfull) =					21.8' (Needed for Erosion/Revetment & Pools protocols)				

5.1
26.6
- 4.8

21.8

Cross-sections, Bear 5.1, 2000-2003

