In-Stream Habitat Measurements

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Instream and Riparian Habitat Sampling - Day 3

Instream Sampling

1. Break up into two teams
2. Each team should set up a transect line within your stream reach from shoreline to shoreline to measure instream and riparian habitat
3. Place the zero station of the transect tape at the water edge along the left descending bank
4. Record the station of your transect line along the long-pro tape and record on data sheet
5. Measure the wetted stream width at your transect location and record on the data sheet
6. Place observation points systematically along each transect line at 25%, 50%, and 75% of the wetted stream width (Figure 1)

Figure 1: Spacing of the observation points along the transect lines.
7. At each observation point, record water depth, substrate (using the Bunte sampler), and mesohabitat type (riffle, run, pool type, glide) on the data sheet provided (Figure 2 and see Appendix 1). Normally you also would collect data on water velocity at each observation point, but you will be measuring velocity at this same location with Gary on

![Figure 2: The Bundt sampler positioned along the transect line to measure substrate. The 4 strings should be adjusted such that the center opening matches the size of the D₉₀ of the sample reach. Once the strings are adjusted, substrate measurements are taken at each of the four string intersect points.](image)

8. If there is time, each team can complete a second transect at another location along their reach. If you do have time to complete additional transects, they should be spaced two mean wetted stream widths apart.

9. When all measurements have been completed, do not remove the transect lines. These transect lines will be used in the Riparian Sampling Section below.

**Note:** This exercise is designed to provide you with practice with this technique, however, common protocols involve setting systematic transects (with a random start) throughout the reach spaced two mean wetted stream widths apart (shore to shore). A minimum of 11 transects or a minimum of 20 transects are often used; observation points are systematically placed along each transect, often at certain percentages of the width.
10. Use the same transect lines to measure the density of instream cover including wood, aquatic plants, boulders (>256 mm), and undercut banks.

11. Following the transect line, use a transect line-intercept method to estimate instream cover as described below;
   a. Begin at one end of the transect line and count the number of surfaces in one (1) foot increments encountering a plane that extends from the transect line to the stream bottom (Figures 3 and 4).
   b. Exclude substrate except boulders from the counts of the number of surfaces
   c. Follow these rules for counting surfaces:
      i. cover objects with a diameter > 10 cm are counted as 2 surfaces;
      ii. cover objects with a diameter < 10 cm are counted as 1 surface;
      iii. cover objects located closer than 3 cm to each other are counted as 1 surface;
      iv. portions of a cover object that are geometrically separate (such as branches on a tree) are counted separately;
      v. undercut banks are considered to be cover objects, and are therefore counted;
   d. Compute results and record on the datasheet:
      i. count all surfaces and divide by transect length;
      ii. record on the datasheet as # surfaces per 10 feet;

Figure 3: Example of counting cover surfaces along a plane extending down from the transect line
Figure 4: Transect line with arrows to indicate surfaces that intersect the plane that extends down from transect line to the stream bottom.
12. Use the same transect lines to measure bank angle
13. Locate observation points at end of the transect line on both the left ascending and right ascending banks (Figure 3).

14. Place stadia rod or meter stick with the base sitting at the bankfull elevation
15. Lean the top of the stadia rod back toward the top of the banks to capture the bank angle (Figure 4).
16. Place a clinometer flat against the stadia rod and read the sloping bank angle directly in degrees and record on your datasheet (Figure 5).
Figure 4: The yellow pin flag indicates the location of the bankfull elevation. The base of the stadia rod is sitting on the bankfull elevation and then the stadia rod is leaned back to capture the bank angle with a clinometer.

Figure 5: Suunto clinometers showing readouts of 0 degrees (left) and 15 degrees (right), respectively.
17. If the bank is undercut, place the base of the stadia rod at furthest extent of undercut and lift the top of the rod up until it comes in contact with the overhang (Figure 6). Read the angle with a clinometer (as with a sloping bank above) subtract the clinometer reading from 180 degrees (Figure 7).

*Figure 6 (top): The stadia rod is placed at the furthest extent of the undercut bank and then lifted until it touches the top of the undercut bank. Figure 7 (bottom): The clinometers is placed flat on the stadia rod to measure degrees and then subtracted from 180.*
Riparian Sampling

18. Setup to measure riparian canopy closure, nearshore vegetation, and riparian area basal area
19. Using the same transect line and wetted stream width, place 10 equally spaced observation points along each transect line. (Figure 8)

Figure 8: Set up for Riparian Sampling. Set up for canopy closure, nearshore vegetation overhang, nearshore stem density, and basal area measurements are all included in this figure.
20. Measure canopy closure at each of the 10 equally-spaced locations along the instream transect line with a tube densitometer (Figure 9).
   a. For each point, level the densitometer using the bubble levels inside the viewing area and record presence or absence of canopy cover (record presence if the center crosshair intersects with overhead foliage).
   b. The extent of canopy cover is obtained by dividing the # of presence readings by the number of observations (10).

*Figure 9: Tube densiometer. Left photo: Proper technique for holding and looking through the densiometer. Right photo: The inside viewing area of the densiometer showing the bubble levels and center crosshair.*
21. Measure nearshore vegetation overhang on both the left ascending and right ascending bank with a concave spherical densiometer (Figure 10).
   a. The observation point should be positioned 1 foot from each wetted shoreline and 1 foot above the water surface.
   b. Hold the densitometer level by hand, rod, or tripod (using the bubble level) and 12 – 18 inches in front for your body at elbow height so the operator’s head is just outside the grid area.
   c. In the grid area there are 17 line intersections.
   d. At each line intersection, record presence or absence of vegetation.
   e. The extent of nearshore vegetation overhang is obtained by dividing the # of presence readings by the total number of observations (17). Record in your datasheet.
22. Measure nearshore stem density.
   a. Mark off a 6’ x 3’ quadrat using pin flags (Figures 8 and 11). The edge of the quadrat closest to the stream should be set at the bankfull elevation.
   b. Count all live woody stems (no minimum diameter) inside the quadrat.
   c. Express nearshore stem density as # of stems per 10 square feet (remember your quadrat is 18 square feet).

*Figure 11. Nearshore stem density quadrat.*
23. Measure basal area of riparian area.
   a. Extend instream transect line 15’ from each shore to find the observation point
   b. Place pin flag at the observation point
   c. Hold cruise prism (Factor 10) over pin flag and a comfortable distance from your eye.
   d. Pivot 360 degrees around the pin flag assessing “In”, “Out”, and “Borderline” trees
      (Figure 12). Note: As you pivot, your body should move while the cruise prism remains
      in the same position above the pin flag.
   e. Add together the number of “In” trees and every other “Borderline” tree
   f. Multiply count by prism factor (10)
   g. Express as square feet of basal area per acre

Figure 12: Basal area measurements with cruise prism. Top photo: Tree image
in the prism (yellow) is offset from the tree in the background, but there is still
overlap. This tree is “In”.

Middle photo: Tree image in the prism is offset from the tree in the background, but the edges are barely touching.
This tree is “Borderline”.

Bottom photo: Tree image in the prism is completely offset from the tree in the background. There is no overlap. This tree is “Out”. 

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<thead>
<tr>
<th>Station</th>
<th>Waded Width (ft)</th>
<th>Wetted Width (ft)</th>
<th>Velocity (ft/s)</th>
<th>Depth (in)</th>
<th>Substrate Type</th>
<th>Glide (riffle)</th>
<th>Run, Pool, Glide</th>
<th>Instream Cover</th>
<th>Riparian Cover</th>
<th>Canopy</th>
<th>Bank Angle</th>
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Stream Habitat Data Sheet
| Station | Wetted Width (ft) | Velocity (ft/s) | Depth (in) | Substrate | Mesohabitat Type (riffle, run, pool, glide) | Instream Cover | Riparian Canopy Cover | Bank Angle L | Bank Angle R | Canopy Cover L | Canopy Cover R | Bank Density L | Bank Density R | Riparian Density L | Riparian Density R | Bank Stem Density L | Bank Stem Density R | Bank basal area/acre | 25% | 50% | 75% | 25% | 50% | 75% | 25% | 50% | 75% | 25% | 50% | 75% | 25% | 50% | 75% |
|---------|------------------|-----------------|----------|----------|--------------------------------------------|----------------|----------------------|-------------|-------------|----------------|----------------|----------------|----------------|------------------|------------------|----------------|----------------|---------------- |-------|-------|------- |-------|-------|------- |-------|-------|------- |-------|-------|------- |-------|-------|------- |-------|-------|------- |
Equipment

- (2 pair) Silvey stakes
- (2) 100’ steel measuring tapes
- (2) 50’ measuring tapes
- (2) Top-set wading rods (with Gary)
- (2) Velocity meters/sensors (with Gary)
- (2) Meter sticks
- (2) Tape-marked meter sticks (substrate)
- (2) Bunte Sampler for Substrate
- (2) Rulers or gravelometers or calipers
- (2) Stadia rods
- (2) Clinometers
- (All) Tube densiometers
- (All) Spherical densitometers
- (2) Tripod or staff to hold spherical densiometers
- (Bundle) Pin flags (or use chaining rods and a fiberglass tape to outline stem density quadrat)
- (All) Cruise prisms (10 factor)
Appendix 1

Mesohabitat Types

Mesohabitats or channel geomorphic units important habitats for aquatic biota.

In meandering streams, there are four main types: riffle, run, pool, and glide. Pools are further divided into 8 subtypes (see figure 13). Riffles have the steepest slope, pools the flattest, and runs and glides are transitional between riffles and pools. The sequence is:

riffle → run → pool → glide → riffle etc.

Steeper streams may have a step-pool, “rapids” dominated bed morphology. “Steps” are short, sharp drop transitions between pools. High gradient fast, turbulent water areas are sometimes termed “rapids” and even steeper, faster waters are called “cascades”. Steep bedrock morphology is described as “chutes” or “sheets”.
Figure 13. Pool Types