

Standard Operating Procedure 11: Habitat Sampling, version 1.0

Overview

Habitat sampling includes a combination of actual measurements (stream width, site length, depth, and gradient) and visual estimates (% riparian cover and type, stream substrates and pool to riffle ratio). Habitat measurements are typically taken either between or following electrofishing passes. The timing with respect to other tasks will be largely determined by the number of crew available and the complexity of individual sites. At times, crew sizes are sufficient such that a habitat crew of three can follow behind the electrofishing crew on their third electrofishing pass. Habitat measurements always start at the downstream habitat break that comprises the start point for electrofishing at each site. Readings are always taken from left to right while facing upstream. A crew of three to four including a data recorder, a measurer, and one or two people to hold each end of the 30 m tape is optimal and the steps below will assume three to four individuals are involved. Required equipment includes two spooled measuring tapes (30 m and 100 m), a depth staff, a clinometer, a clipboard, and a habitat data form (SOP 1 and SOP 18).

General sampling scheme

The start and end of each sampling reach will be at obvious breaks in stream habitat that are sufficient to stop or slow fish passage. Due to this, the reach may be shorter or longer than 100 m. The 100 m measuring tape should be extended longitudinally between the lower and upper boundaries of the site. This does not need to be done immediately, you may pull the tape in 10 m intervals as you proceed from transect to transect. As the tape is run, it should be placed along the middle of the stream, following the general linear shape of the channel as much as possible. Habitat measurements are made at 10 m intervals along each 100 m stream site. If a site is longer than 100 m, the 30 m tape should be run for each additional segment. The overall scheme for habitat measurements is illustrated for a representative stream site in Figure 1. Note that transects T0 through T10 demarcate segments S1 through S10, respectively. Width, depth, riparian vegetation type, riparian vegetation % cover, and substratum are measured at each transect. Pool-riffle ratio, and % slope (gradient) are measured throughout each segment.

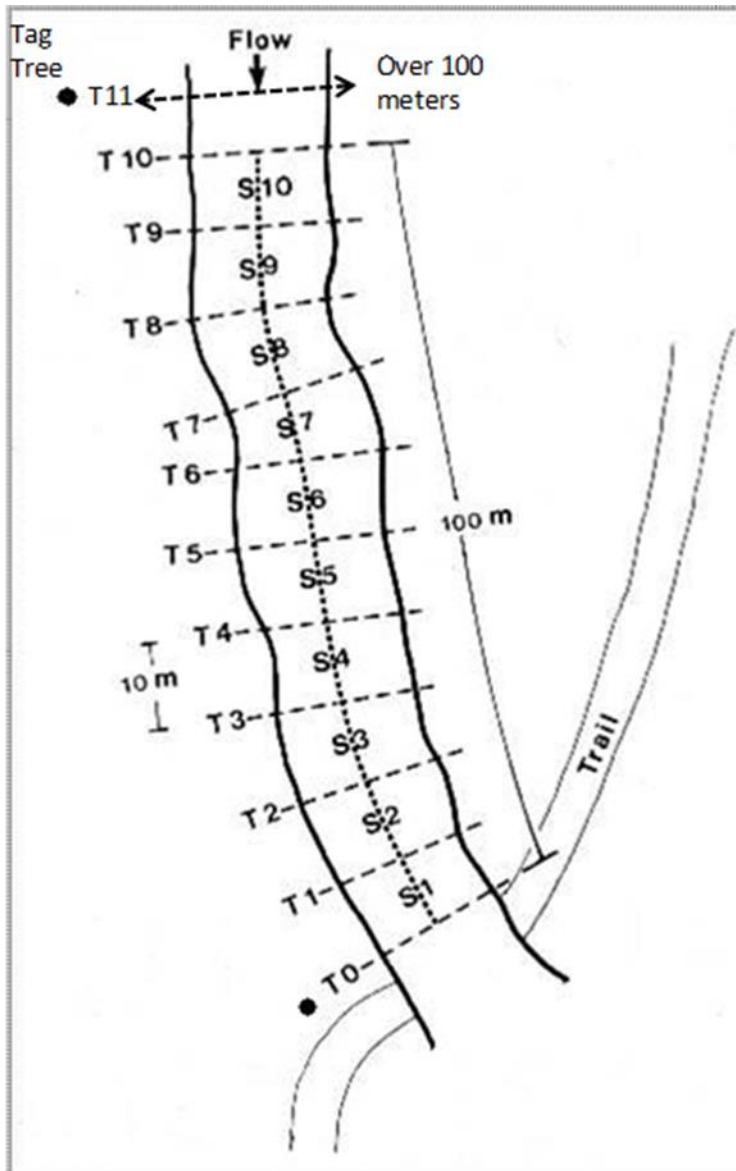


Figure 1. Diagram of stream reach. Width, depth, riparian vegetation, and substratum are measured at each transect. Pool-riffle ratio, and % slope (gradient) are measured throughout each segment.

Collecting Data

- 1) **Clinometer Use.** Prior to collecting habitat information, the technician should be familiar with the use of clinometers (see SOP 10 for details)
- 2) **Establishing the first transect and recording width.** To begin habitat data collection, stretch the 30 m tape from **left to right (as you look upstream)** across the stream channel, perpendicular to the direction of flow at the downstream start of the sample reach. Pull any slack out of the tape and measure the waterline to waterline width (wetted width). **Wetted width will always define the left and right bounds of a transect.** Record width to the nearest 0.1 m on the habitat data form in the first row that

corresponds to “zero meters” (0) in the “Distance” column. Stream widths will be recorded at each 10 m interval up to and including the habitat break at the upstream end of the monitoring site. See below for procedures for measuring habitat features when encountering an island.

- 3) **Recording water depth and substrate.** Using the tape as a guide, water depths are measured and substrate types are estimated at $\frac{1}{4}$, $\frac{1}{2}$ and $\frac{3}{4}$ distance across the channel from **left to right (as you look upstream)**. At each point ($\frac{1}{4}$, $\frac{1}{2}$ and $\frac{3}{4}$), water depth is measured to the nearest 0.01 m directly below the transect (i.e. tape) using the depth staff. The dominant substrate immediately impacted by the depth staff is also visually estimated according to the substrate classification chart as follows (O = organics, L = silt (<0.06 mm), S = sand (0.06-2 mm), P = pebble/gravel (2.0 mm-10.0 cm), C = cobble (10.0-30.0 cm), B = boulder (>30 cm), R = bedrock). Surface substrates, not underlying substrates, are recorded (e.g. if the streambed and associated cobble (C), boulder (B), or bedrock (BR) substrates are covered with a heavy layer of silt at the point of contact between the staff and the streambed, then silt or “L” is entered as the substrate value for that point. If a layer of moss, leaf debris, sticks or woody debris, or a thick layer of algae exists at the point of contact, then organic or “O” is entered as the substrate value for that point.) In this manner, mid-stream wood jams that are not submersed in water would be recorded as having a zero depth and a substrate of organics. Stream depths and substrates are recorded across transects at each 10m interval up to and including the habitat break at the upstream end of the monitoring site.
- 4) **Recording riparian vegetation type and % cover (Rip. Cov.).** Riparian vegetation data can be collected efficiently by the data recorder. From the center of the transect, the data recorder should determine the type and estimate the percent of vegetative cover directly over the transect. The estimate includes all vegetation that extends over the wetted width of the stream above the transect. Vegetation is differentiated between trees (T), shrubs (S), grasses/forbs (GF), or none (0N). Percent cover is estimated at >66% (coded as “3” on data sheet), 33-66% (coded as “2”), <33% (coded as “1”) or 0% (coded as “0”). When vegetation type is recorded as “none” (0N), it should always be accompanied by a 0% (0) determination, or vice-versa. Riparian cover will be recorded at each 10 m transect up to and including the habitat break at the upstream end of the monitoring site.
- 5) **Recording gradient (% Grad; see SOP 10 for additional details).** After wetted width, substrate, depth, and riparian vegetation have been recorded for the first transect, the 100 m tape should be secured at the site start point in the center of the channel. With the endpoint securely anchored, the 100 m tape should now be extended upstream at mid-channel. Each 10 m interval on the tape is marked with a strip of red electrical tape so that it can be readily distinguished at a distance. At 10 m, any slack should be pulled out of the tape from the upstream end. When multiple channels are encountered, run the tape up the center of the “island” (for discussion of islands, see step #9). Using a clinometer, gradient should be measured (in %) within the segment (e.g. for the first segment, between the 0 and 10 m transect, see SOP 10 for details). **It is important to note that the gradient value measured from the 0 meter transect of the monitoring site must be recorded in the 10 m distance row on the data form.** The space for gradient on the

“0” distance row is already crossed out for this purpose. Gradient measurements will be recorded in each segment up to the habitat break at the upstream end of the monitoring site. The 10 m offset on the data form will provide a gradient value that corresponds to the last recorded distance measured at the upstream end of the monitoring site. To be clear, gradient is always measured between two adjacent transects.

- 6) **Recording pool habitat.** Following gradient estimation, the data recorder walks upstream through the first 10 m section and conducts a visual estimate of the relative amount of pool versus riffle habitat. Pool habitat is defined as wetted habitat with an apparent water velocity of zero. Riffle habitat would constitute all other portions of the channel. Pool and riffle habitat are estimated as a percent of the total wetted channel, but are recorded as integers between 0-10. As such, the relative amounts of pools versus riffles for each 10 m section should always be two numbers that add up to ten. **Note that pool and riffle habitat data also have a 10 m offset on the data form.** Therefore, the first recorded values for these habitats must be recorded in the “10” distance row on the data form. The spaces for “pool” and “riffle” on the “0” distance row are crossed out for this purpose. As for gradient, the 10 m offset on the data form will provide a set of habitat values that corresponds to each 10 m section including the last measured section at the upstream end of the monitoring site.
- 7) **Establishing the next transect.** At this point, the entire habitat crew should be assembled at the 10 m distance point along the monitoring site. Begin another transect by stretching the 30 m tape across the stream channel, making sure it intersects the 100 m tape at the appropriate 10 m interval. Again, all transects are perpendicular to stream flow. The same sequence for measuring or estimating stream channel width, depths, substrates, riparian cover type, percent riparian cover, gradient and habitats must be followed at each subsequent 10 m distance interval as described above.
- 8) **Ending the sample reach.** Monitoring sites rarely end right at a 10 m distance interval. It is important to record the total length of the site to the nearest 0.1 m in the distance column following the last full 10 m section measured. For example, if the last full 10 m section was at the “100” distance point and there are still several meters remaining between that point and the actual upstream habitat break (endpoint where electrofishing sampling ended), measure to the endpoint and record the total length (e.g. 104.7) in the “110” distance cell. Be sure to cross out the “110” and record the actual distance just above it in the remaining space within that cell (in this case, “104.7”). Gradient and habitat measurements are continued up to the endpoint and channel width, depths, substrates and riparian cover are measured at the endpoint transect as described above.
- 9) **Encountering Islands.** An additional important consideration at some of the monitoring sites is the procedure for defining and measuring habitat parameters around islands. Islands are rock or land structures greater than 30 cm high and 30 cm wide that support perennial vegetation. When proceeding upstream past an island, the 100m tape should always be extended up the center of the island. At a transect that intersects an island, the width of wetted channel on each side of the island is summed for a total wetted channel width. When measuring wetted width, a chart at the bottom of the habitat data form

contains a special set of columns and rows to assist in recording information from multiple wetted channels (see Habitat Form, SOP 19). Make sure to note the specific distance point(s) where islands are present in the “Dist.” column of the island chart. The clip or endpoint of the tape should be positioned on the left-hand stream bank and the tape should be extended to the right as noted above. The left-hand channel will be “channel A” and the right hand channel will be “channel B”. The data recorder should traverse the tightly stretched tape and record the waterline to waterline width of each channel as well as the width of the island. Individual widths for Channel A and Channel B and the island, as well as the total wetted width (i.e. sum of Channel A and Channel B widths) are recorded in the island chart on the habitat form. The total width is then also recorded in the main table for the corresponding transect.

Depth and substrate measurements will be taken in the same order across the stream from left to right but will be split between the dominant and subdominant channels. The dominant channel will be determined by a visual judgment of discharge. Two depth and two substrate measurements will be recorded in the dominant channel regardless of whether it is channel A or B and the remaining one set of depth and substrate measurements will be recorded in the least dominant channel. For recording single values in side channels, take measurements from the center of that channel. The dominant channel should be visually split into thirds with measurements recorded at 1/3 and 2/3 width intervals. **The resulting data are recorded in the main table under the 1/4, 1/2, and 3/4 columns as at single channel sites.** All measurements are still taken from left to right facing upstream. At the time of data entry into the main fisheries database, individual channel widths and the island width can be referenced in the “notes” field for each associated distance point.

SOP Revision History

All protocols, regardless of how sound they are originally, require modification as new and different information becomes available. SOP version numbers increase incrementally by tenths (e.g. version 1.1, version 1.2...etc.) for minor changes. Major revisions should be designated with the next whole number (e.g., version 2.0, 3.0, 4.0 ...). Small changes or additions to existing methods will be reviewed in-house by Shenandoah or Mid-Atlantic Network staff. However, if a complete change in methods is sought, an outside review is required.

Revision History Log:

Prev. Version #	Revision Date	Author	Changes Made	Reason for Change	New Version #