

## Locating Start and Endpoints

A Geographic Information System (GIS) incorporating a 1:24k or 1:100,000 digital stream network of coho rearing distribution is used to insure an unbiased and spatially balanced selection of sample sites across each monitoring area. The GIS site selection process provides the geographic coordinates of each of the candidate sites. Using these coordinates, we produce topographic maps showing the location of each sample point. Field crews use a hand held Geographic Positioning System (GPS) to find the approximate location of the EMAP selected sample point, and then establish 1000 meter long survey reaches that encompass this point. ***The survey must encompass the EMAP point.***

The downstream end of red line on the site contour map is the approximate start point of the survey. Try to start at an obvious physical landmark such as a tributary junction, confluence, or bridge or road crossing. Whenever possible start the survey at a point that will ensure that the 1K reach will not cross a spawning survey segment break. Only cross a spawning survey segment break if there is no other way to set up a 1K survey reach. Mark the start point as a waypoint in the GPS and record these coordinates in the PDA/datasheet. Also give a brief description of the start point (where the sign was hung and any physical landmarks) that will aid future crew in finding the site. At the start, take your best guess at the visibility of the entire survey. This guess should be educated by information from your crew leader, past surveyors and surveys in the drainage, and the surrounding environment. If you determine that the visibility will be a 2 or better, proceed with a snorkel survey. If you believe that the visibility will be less, or you have health concerns, conduct a presence/absence (electrofishing) survey (see below). Also see this section for sites with mixed visibility.

Survey upstream, approximately 1000 meters to the endpoint. Snorkel each pool that has a maximum depth  $\geq 40\text{cm}$  and area  $\geq 6\text{m}^2$ . The length of the survey is to be measured at all survey sites by range finder. If the 1000 meter end point occurs within a pool that you are sampling, finish the unit and end the survey at the head (upstream end) of this pool. Mark the endpoint as a waypoint in the GPS and record these coordinates in the PDA/datasheet. Write a brief description of the endpoint that includes the location of the end sign.

If a barrier to the upstream migration of adult coho is discovered, the start and/or end point of the survey needs to be reestablished to insure that 1000 meters of stream accessible to coho are surveyed. This usually involves reestablishing the start point at a location sufficiently downstream of the original start point to ensure a 1000 meter survey that encompasses the EMAP point. *If the barrier is downstream of the EMAP point, the survey is above coho and steelhead distribution and you do not have to complete this survey.* If you have surveyed up to the point of the barrier, save your data and snorkel 3 - 4 pools

above the barrier to determine if it is a complete barrier. If you see juvenile coho in these pools, keep going, it is not a complete barrier.

**Mark any barrier you encounter as a waypoint in the GPS** and record the coordinates in the PDA/datasheet. Write a description of the barrier and take photos of the barrier, using a crew member or the depth staff for height reference. Record any information that helps you access or exit the survey in the Site Access Section in the PDA.

## **General Survey Methodology**

### Pool Size and Depth

To reduce problems associated with snorkeling in shallow or fast water habitat, only pools > 6 m<sup>2</sup> in surface area and > 40 cm deep are snorkeled or electrofished. We measure the maximum pool depth (to nearest cm) with a staff and estimate the length and average width of all snorkeled pools (a hip chain may be used to measure the length off all pools) and record it in the appropriate place on the PDA/datasheet. Record Max Depth in centimeters (no decimals, round to the nearest cm) and record pool length and width data in meters, to the nearest 0.5 meter.

### Pool Type

Record the pool number (starting with the first downstream pool sampled) and the pool type (See appendix II for definitions/descriptions of each pool type) in the appropriate place on the PDA/datasheet. Use the follow codes:

PP	Plunge Pool
SP	Straight scour Pool
LP	Lateral scour Pool
TP	Trench Pool
DP	Dammed Pool
BP	Beaver dam Pool
AL	Alcove
BW	Backwater Pool
IP	Isolated Pool

### Side Channels and Braids

If a side channel (defined as a stream channel having less than 50% of the streams flow and separated from the main channel by an island with permanent vegetation) enters or exits the main channel within the survey reach, we will sample all pools meeting our pool size criteria within that side channel. If the side channel extends beyond the start or end of the main channel survey, we will end the side channel survey at a point perpendicular to the start or end point in the main channel (see figure 4). Data collected from side channels must be

identified with an “S” in the SC column of the data sheet. Pools in channels that split from the main channel that are not separated by an island with permanent vegetation should be identified by a “B” in the SC column of the data sheet.

### Beaver Activity

Record a “Y” or an “N” on the data sheet to indicate the presence or absence of beaver activity.

### **Snorkel Methodology**

The snorkeler makes a single upstream pass through each pool, counting the number of juvenile coho, cutthroat, steelhead, and chinook. Trout less than 90mm in length, dace, and shiner are not counted but noted as either present or absent from the unit. These data are then recorded in the appropriate place on the PDA/datasheet. Do not make approximate counts of salmonids or mark them as present or absent, you must make a hard count of all juvenile salmonids.

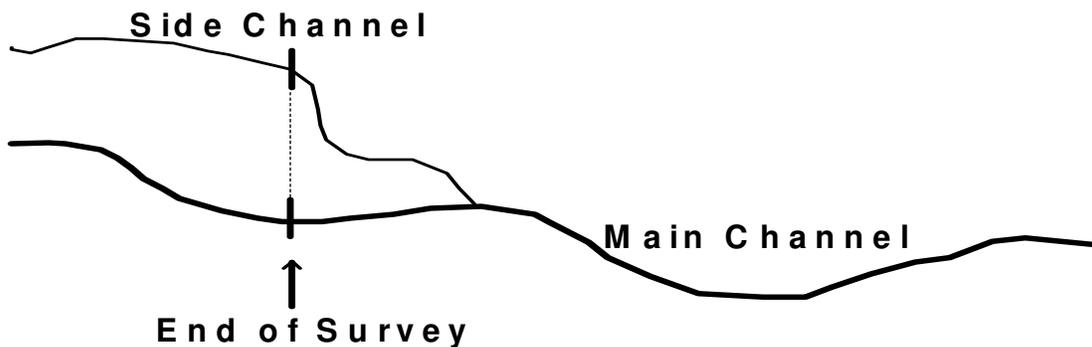


Figure 1. Example of where to end surveys in side channels.

### Visibility

After snorkeling, the underwater visibility of each pool during the snorkel count is recorded on the data sheet. Visibility is ranked on a scale of 0 to 3 where:

- 0 = not snorkelable due to an extreme amount of hiding cover or zero water visibility
- 1 = high amount of hiding cover or poor water clarity
- 2 = moderate amount of hiding cover or moderate water clarity neither of which were thought to impede accurate fish counts.

3 = little hiding cover and good water clarity.

### Resurveys

To quality check the snorkel data, and to provide information on temporal changes in abundance during the course of the sampling season, a random sample of 10 to 20 percent of the sites surveyed in each MA is resurveyed by supervisory staff. We hope to limit between diver error to 20% or less with intensive presurvey training of field crews and regular random resurveys. In order for resurveys to function, each pool number of the original survey must match each pool number in the resurvey. To facilitate this, use a soapstone marker to number each snorkel pool in every survey. Clearly mark the start and end of each pool (i.e., "1S" and "1E") that is not clearly defined. Take notes of any landmarks (trib junctions, debris jams, road crossings, etc.) to help the resurveyor navigate through the site and ensure that the resurveyed pools match with each pool in the original survey. Record these notes in the datasheet.

### **Electrofishing Methodology**

#### Presence/Absence Surveys

For those sites for which visibility is less than 2 or that cannot be snorkeled due to health hazards, we will perform single-pass electrofishing to determine the presence/absence of juvenile salmonids. **All** pools in these poor water quality study reaches that meet our pool size criteria of  $\geq 40$  cm in depth and  $\geq 6$  m<sup>2</sup> in area will be sampled. **Do not** sample pools that do not meet this criteria unless the entire 1000 meter reach is void of pools that meet these standards. If this is the case one or two pools may be electrofished to determine presence/absence for the reach.

Some sites may have **mixed visibility** (pools of poor clarity mixed with pools of good clarity) or health hazards that are patchy (for example if a stream moves into and then out of a cow pasture). In these cases, make an effort to snorkel the pools that are safe and with adequate visibility and electrofish those that are not. The more pools where we can make hard counts of fish, the better, but do not attempt to count fish if the visibility is inadequate or if it is a health risk. If you think that a site will be of mixed visibility (based on previous surveys, site history, and site maps), bring both sets of gear. Scout the site if the access permits you to do so. The Status of such sites (whether it was electrofished or snorkeled) will be determined by supervisory staff. Record any information about the mixed visibility conditions of the site in the comments section of the data sheet.

#### Presence/Absence Electrofishing Protocols

1. Choose "Electrofished" for the site status in the PDA on the site description screen.
2. Measure the water conductivity and water temperature and record in the PDA as part of the site description. Do not electrofish if Water Temperature is above 18 degrees C. If possible, seine this site or return at a time when temperatures may be lower (early mornings late in the field season).
3. Do not electrofish when adult salmonids are present.
4. Use the minimum settings needed to capture fish. Start with a setting of I5 and 200 volts if in shallow pools, and I5 and 300 volts if in deeper pools. Reduce to I4 or H5 or H4 and 200 volts if necessary to minimize mortalities. Make sure to record shocker settings on the form.
5. Beginning at the downstream end of the first pool in the survey that meet our pool size ( $\geq 6m^2$ ) and depth ( $\geq 40cm$ ) criteria, begin shocking. The best way to get fish within an effective radius of the anode probe is to "surprise" them. Position the probe in a new area while it turned off, turn it on only after it is in place. Sweeping a live probe about the stream merely introduces the weak border of the electrical field to new areas and fish will easily escape. Start in areas where you are most likely to capture fish – in wood, under cut banks, around boulders, and in deep pockets with cover. Cover the pool systematically, moving the anode in a herringbone pattern through the water. **Do not** electrofish one area for an extended period. Continue shocking the pool until the first pass is completed OR until at least one juvenile coho , at least one  $\geq 90$  mm steelhead, AND at least one cutthroat have been captured
6. Record the **actual number** of all salmonid species observed in the PDA. **This is important for out permit reporting**, so we know how many fish are being subjected to electrofishing and handling during the course of our field season.
7. Record any mortalities in the PDA.
8. Proceed to the next pool.

The following codes are used for pools with a visibility less than 2:

**If Snorkeled:**

- 1 Species not observed for all species except coho
- 2 Species is present, but no hard count was made
- 3 Coho not observed

**If Electrofished:**

- 1 No information recorded
- 3 Species is Present
- 4 Species is Absent