

**Survey Plan for Adult Fish Counting and Coho Prespawn Mortality in  
Miller and Walker Creeks  
Community Salmon Investigation for Highline 2013**

Version October 3, 2013

NOAA, Wild Fish Conservancy, the City of Seattle, King County and others have conducted a number of assessments concerning coho salmon in Seattle area creeks (Collier et al. 2003, Scholz et al. 2004, and McCarthy et al. 2008). Findings of these efforts indicate that while salmon were successfully returning to many urban streams, a high proportion of sexually mature female coho carcasses showed large numbers of retained eggs. Investigators documented highly erratic swimming behavior and prespawn mortality among both male and female coho. Affected fish from different urban streams displayed a common suite of symptoms, including surface swimming and gaping, fin splaying, spasming, disorientation, and loss of equilibrium. The coho usually died within a few minutes to a few hours after becoming overtly symptomatic. Visual inspections generally indicated that the affected coho spawners were in good condition, with the silver coloration typical of salmonids that have recently transitioned to freshwater from the ocean (McCarthy et al. 2008). This phenomenon has been termed coho prespawn mortality (PSM).

In Miller and Walker Creeks, PSM has been documented and is probably a serious concern for the recovery of coho populations in the basin. However, the information gathered in the Miller/Walker creek basin has been largely anecdotal, as systematic surveys of PSM only began in 2010. Yearly systematic surveys of PSM in the basin of a data quality sufficient to determine percent survival and percent PSM of adult coho returning to spawn will provide information for several purposes. The most important information will be to determine to what extent PSM occurs in the Miller/Walker basin. Severity and variability from year to year can provide clues as to causal factors. Because PSM is an ongoing phenomenon in Miller and Walker Creeks, monitoring every year for an extended timeframe could give us an indication if changes designed to improve the aquatic ecology of these creeks are having their intended effects. It may also be possible to see the degree of change of a given basin improvement based on PSM data. Collecting yearly PSM data could therefore be an important indicator of the effectiveness of our efforts to improve basin hydrology and water quality over time.

Currently, systematic surveys have only been done on Longfellow Creek in Seattle. PSM data on Miller/Walker will provide important regional data that is currently lacking and may also attract other research on the phenomena as part of a synergism of study.

In addition to gathering data on PSM, the Miller and Walker Creeks survey will systematically survey selected locations to generate the minimum estimate of adult coho and chum adult returns to the streams. A better understanding the range of adult fish returning to the streams was one of the top recommendations the community identified as part of coordinated monitoring of the streams (<http://www.kingcounty.gov/environment/watersheds/central-puget-sound/miller-walker-creeks/monitoring.aspx>).

PSM studies and adult fish counts will be carried out by basin volunteers and organized by the basin steward for the third year in 2012. Surveys will be conducted daily during spawning season (mid-October – mid-January, or whenever the chum run ends) to collect information on the number of returning coho and chum, including the number of returning fish, the number of PSM fish, and the number that appeared to die due to predation. Survey volunteers will collect the following measurements for each dead adult salmon encountered: species, fork length, girth, and postorbital to hypural length. In addition, information will be recorded concerning adipose fin presence, sex, percent egg retention, and spawning status.

The survey reaches on Miller and Walker Creeks are a combination of the area of potential spawning and the area that a survey crew can survey in about three hours each day. During 2013, there are two survey areas on Walker Creek and two survey areas on Miller Creek.

Daily stream surveys will begin on October 10, 2013. They will conclude at the end of January, or one week after the last live chum salmon is seen, whichever comes first.

## Methods

Objective: Collect as much information as possible on living adult salmon and dead coho and chum within the stream or found on land. Spawning status is more important and easier to determine for females than males. Record male status as unknown.

## Equipment

Be sure to take each of the items below to the field:

### **Sampling kits**

- data sheets, site maps and clipboard (you provide clipboard)
- pencils for recording data
- Permanent marker for marking “flags” and writing the FISH ID# on plastic bags for heads/snouts collected
- folding knife or tin snips
- orange Zak knife for gutting fish
- tape measure
- flagging tape
- gloves (work gloves for handling fish)
- paper towels
- Zip lock bags for coho snouts
- garbage bags (to carry out all trash)

**Video Camera (optional)** – can use video on digital camera if necessary (for documenting symptomatic fish,)

**Rain gear, waders, safety vest, walking stick, snacks, first aid kit, drinking water**

## **Stream Sampling Instructions**

If it has rained and the creek is cloudy or if the water level is high you will probably not be able to see fish or redds. It may also be too deep to walk in the stream, and dangerous due to potential debris floating downstream. **Do not attempt to walk the stream.** Wait until visibility is better (this may require cancelling the survey in part or totally for a given day).

If the creek is clear, walk the stream to see if there are live symptomatic fish and/or mortalities (videotape symptomatic fish if equipped to do so). Walk on banks rather than in the stream as much as possible.

Watch for redds, mark the redds (see “Flagging Redds” below) and don’t step on the redds!

Further information on how to walk the streams safely and observe fish are found in the separate document titled “How to Survey for Adult Salmon.”

## **Recording Data on the Daily Survey Sheet**

The Daily Survey Sheets handed out at the training are on special Rite-in-Rain paper – pens do not work on this paper, but pencils do, and you can write even if it’s wet! The most up-to-date version of the Daily Survey Sheet survey form always will be posted at the “CSI: Highline” web page:

<http://www.kingcounty.gov/environment/watersheds/central-puget-sound/miller-walker-creeks/salmon-monitoring.aspx>



**IMPORTANT**

### **The Daily Survey Sheet: TOP**

- Fill in **DATE**. This means there is a new worksheet for every day of sampling.
- **TEAM MEMBERS:** First and last names of all surveyors.
- Fill in **START TIME** and **END TIME**.
- Fill in **WEATHER**. Check the predominant one.
- **WATER LEVEL AT COVE:** At the stream gage near the beach and Miller Creek, record the water height if it is at the gage.

Important Point: PSM investigation is for **ADULT** fish only. If you encounter dead juvenile fish, describe them on your form but do not conduct necropsy.

### **The Daily Survey Sheet: Dead Adult Fish**

- **FISH ID#** is the label you will assign to each fish recorded -

it is the date, the sequential number of fish for that day, and the reach name (see below for details) – e.g., 10-15-13\_01LowerWalker – **For coho with no adipose fin, collect the head/snout, and write this number and reach location on the plastic bag.**

- **SPECIES:** Identify species: **coho, chum, pink, or unknown**
- **FORK LENGTH:** measure in centimeters. This is the measure from the tip of the nose to the **indent (fork) of the tail.**
- **GIRTH:** distance around largest section of fish (typically in front of dorsal fin)
- **POH:** distance from PostOrbital (behind eye) to Hypural plate (point in tail where it will not bend, last vertebrae are fused to support caudal rays)
- **ADIPOSE FIN PRESENT?** Fin on back, behind dorsal fin -Y = Yes, N = No, Unk = Unknown (if back is missing or too decomposed to tell)
- **SEX:** M = Male, F = Female, UNK = Unknown
- **% EGG RETENTION:** Choose from 0-50 or 50-100%.
- **SPAWNING CONDITION/PREDATION:** Mark either:
  - Pre-spawn (PSM) for females full of eggs w/ no sign of predation.
  - Post-spawn (POST) for females that are spawned out and have no sign of predation.
  - Unknown (UNK) for fish where pre- or post- spawning condition is undeterminable for females, and all males.
- **Predated?** Check yes if they have signs of being bitten or eaten. If only the eyes are missing, check no. Y = Yes, N = No.
- **NOTES:**
  - Write notes on anything you observe about the fish that is unusual. For example, if there is evidence of predation, how much of the fish has been eaten? Were parts missing?



**Only Count Bodies with Tails:** Only count bodies that have the tail to avoid double counting fish. If you find only a tail, do not count it as a dead fish found that day. Cut off the tail of any carcass you find with a tail after you process it.



**Collect & Mark Coho Heads:** If the carcass you found is a coho, cut off the snout at the back of the jaw and put it in a Ziploc bag or two, **label the bag with the Fish ID# and location (e.g., Upper Miller)**, and store it in your freezer. Call Elissa to come pick it up – (206) 477-4792. About 5% of coho raised in hatcheries have a very small “Coded Wire Tag” inserted into the head that has a tiny number that indicates where the fish came from. We will give these heads to USFWS so they can see whether a tag is present.



### **FISH ID#**

Each fish mortality will receive a Fish ID#. The Fish ID # follows the formula:

Date+ sequential number for that survey day + reach location.



EXAMPLE 1: 10-15-13\_01, *Lower Walker* is the first dead adult salmon found on Oct 15<sup>th</sup>, in Lower Walker.

EXAMPLE 2: 10-22-13\_05, *Upper Miller* is the fifth dead adult salmon found on Oct 22<sup>nd</sup>, in the Upper Miller Creek reach. Write the site name on the bag so we know where it came from.

### **Marking Dead Fish Bodies to Avoid Double-Counting**

Cut the tail off of any dead fish that you count so that following groups will not count the same fish again. Do not mark it with flagging (to avoid polluting Puget Sound). Return fish to where you found it in the wetted area of the stream, or wedge it behind a log or root wad in the water.

**Do not count fish that are missing a tail.**

### **Sexing Fish**

Determine the sex of fish by making an incision using the orange Zak knife on the ventral surface of the body from a point immediately anterior to the anus toward the head to a point immediately posterior to the pelvic fins. If necessary, a second incision should be made on the other side of the fish from the initial point of the first incision toward the dorsal fin. The resulting flap can be folded back to observe the gonads. Ovaries have a *granular* texture and depending on the species can range from orange/red to dark green/blue or even whitish in color. Testes appear creamy off-white and have a *smooth* texture. Record the sex of each fish on the Processing Bench Sheet using M for male, F for female, U for unknown. Add a question mark (?) after M or F for unsure. Fish will be categorized in one of the following 3 categories:

**Pre-spawn mortality (PSM)** = fish that are dead and have not spawned completely. We will collect the following information from pre-spawn mortalities:

- Assign a FISH ID# (see “FISH ID#” above).
- Fork Length
- Girth
- Post-orbital to hypural length (behind the eyeball to the “flex” in the tail)
- Percent egg retention for females
- Presence/absence of adipose fin

**Post-spawn mortality (POST)** = fish that are dead and have spawned completely. Collect the same information from post-spawners as from PSM fish.

**Unknown (UNK)** = fish for which pre- or post-spawn status can't be determined (that is, if predation or damage is too severe). Collect as much information as possible.

### **The Daily Survey Sheet: Live Adult Fish**

Record the number of live adult fish seen in each survey area. Record as “coho” or “chum” those fish that you are confident you have identified correctly. You should be able to see at least two distinctive features of each species to be able to ID the fish as a given species. If in doubt about the species, DO NOT GUESS. Instead, record it as an “Other Adult Fish.”

Use the “Notes” section for each survey area to record anything of interest including:

- Adult symptomatic fish = adults opening and closing mouth rapidly (gaping), loss of equilibrium, fins splayed, and spasming. These behaviors are correlated with pre-spawn mortality.
- Juvenile fish observed
- Wildlife observed
- Stream conditions including clarity of water, flow volume, presence/absence of foam, odors

← IMPORTANT

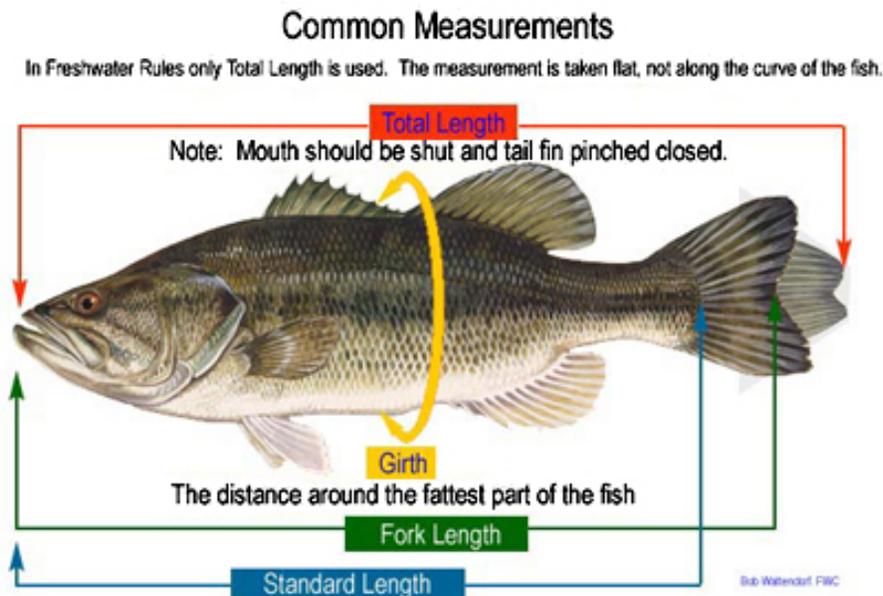
### **The Daily Survey Sheet: Suspected Redds**

Use this line to note any redds identified as new and marked for the first time.

#### **Flagging Redds**

Flag any new redds with flagging tape. Write “REDD PSM STUDY + the date + species” (if the species is known) on the flagging tape and tie it on a branch above the redd so that samplers will not walk in the redd on future surveys. If there is no convenient branch overhead, find a large rock to tie flagging to and place in the pit of the redd, not on the mound. (All flagging from both carcasses and redds will be removed after the redds are located with a GPS for a map.)

### **How to Measure Freshwater Fish** (from Florida Fish and Wildlife website)



## Fork Length Measurement

The **fork length** is the length of the fish to the fork (indent) in the tail, with the mouth closed.

1. Lay fish flat



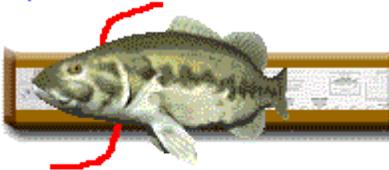
2. Pinch mouth shut and align with front of tape



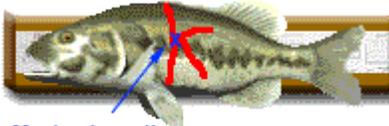
## Girth Measurement

"**Girth**" is best measured with a fabric ruler, such as tailors use. It can also be determined by drawing a string around the fish at its widest point marking where the string overlaps and then measuring the distance between the overlapping points on a conventional ruler. The measurement should be taken perpendicular to the length of the fish. This measurement is analogous to measuring the circumference of someone's waist. Knowing the girth is important when trying to certify a fish for a record, and provides useful information to biologists about the relative condition of a fish.

1. Gently lift fish up and slide a piece of fishing line or a flexible tape measure under fish.

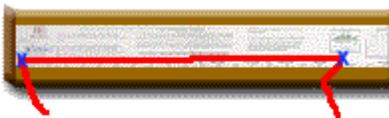


2. Lay fish flat with line or tape under deepest part of fish. Wrap it around, fold fins down if needed, line should be perpendicular.



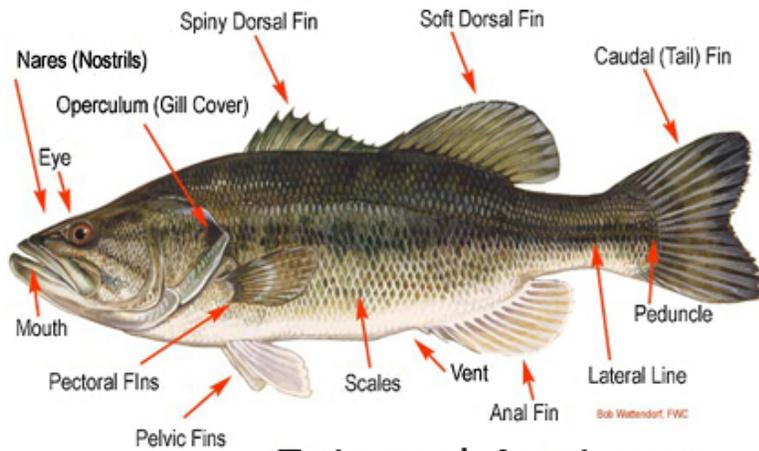
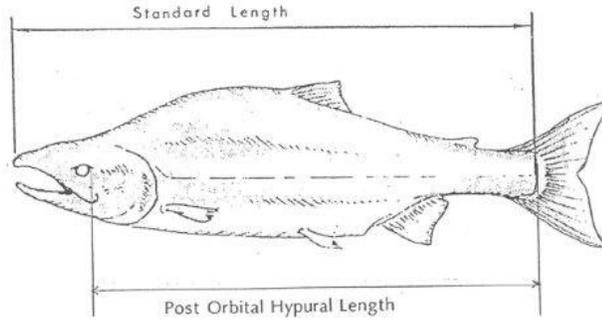
Mark where line crosses.

3. Gently release fish. Remember minimize the fish's time out of water. Lay marked line on tape measure, pull tight, and read girth.



## POH Length Measurement

The **POH length** is the distance from the Post-orbital plate (behind the eye) and the joint at which the tail bends.



## External Anatomy

## Internal Fish Anatomy

The following illustration of a largemouth bass shows some of the common internal features that are used to describe the differences between fish that are described in more detail below.

