Community Salmon Investigation for Highline - 2014 Results

1. Purpose of Community Salmon Investigation: Highline

2. How CSI: Highline works
   • Stream surveys
   • Necropsies
   • Survey locations

3. Results of October – January surveys
   • Summary data
   • Analysis
   • Weather and Wildlife
   • Thank you to volunteers

4. Plans for 2015

5. Factors affecting stream and salmon health

6. Your role!
1) Purpose of CSI

Coho “jack”
(immature male)

November 11, 2011

Photo courtesy of David Bobanick
Basin Boundaries for Miller and Walker Creeks

Legend
An on-going basin monitoring program should be started that will allow for trend analysis of:

- Stream flow (volume)
- Water quality
- Habitat data
Monitoring Information:
How Are Miller and Walker Creeks Doing?

This page provides information on:
- Current and Past Monitoring
- Community Salmon Investigation for Highline
- Monitoring Sampling and Analysis Plan
- Final Monitoring Coordination Recommendations
- Background Information on Monitoring Coordination Workshops in 2008

Current and Past Monitoring

General flow, water quality and other stream condition monitoring in 2012-2013 (Adobe PDF, 2MB)

Water Quantity (Hydrology or Flow)

Stream Gage Information
There are five active gages and additional inactive gages that record flow in Miller and Walker Creeks. At the King County website, type in the number "42" to list all gages on Miller and Walker Creeks. This Web site will allow you to display information in graph form to illustrate the dramatic peaks of stormwater runoff.

Hydrologic Modeling
While not a source of current data from the stream, this page provides background on how land uses affect flow in the streams by influencing the volume of stormwater runoff.

Water Quality

2012 Miller Creek Water Quality analysis for Prespawn Mortality - King County (Adobe PDF)

2012 Walker Creek Water Quality Information - Department of Ecology

Habitat Quality

Miller and Walker Creeks Basin Plan - Appendix C: Habitat Characteristics and Identified Problems of Miller and Walker Creeks
Why do CSI: Highline?

• Count adult salmon – indicators of the health of the ecosystem
• Document rate of coho “pre-spawn mortality” to see how pollution prevention helps
• Raise the awareness about the streams in the community
Survey Plan for Adult Fish Counting and Coho Prespawn Mortality in Miller and Walker Creeks

Community Salmon Investigation for Highline 2014

Version October 2, 2014

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).
Stormwater is not treated
Testing highway runoff on adult coho

Photo courtesy of Tiffany Royal, Northwest Indian Fisheries Commission
2) How CSI Works

Half of “Team Saturday” Lisa and Alex brave the elements

October, 2013
CSI “Cast”

- 32 regular volunteers from Burien, Normandy Park, and Seattle (plus friends and family – 37 total)
- Seven daily teams – one team for each day of the week
- Teams had 2-6 people – some surveyed weekly, some every other week
- Backups filled in

“Team Monday” - Joy, Roger and Michael
CSI Training

Steve Damm from U.S. Fish & Wildlife Service teaches necropsies

October 7, 2010
CSI Style

“Team Thursday” Kay modeling survey attire on Miller Creek
Photo courtesy of Pam Silimperi

Polarized sunglasses for fish spotting
Back pack for supplies
Rain gear and layered clothing
Safety vest for visibility and identification as CSI
Clipboard
Trekking pole for stability and flushing fish
Chest waders for extra warmth and deep water
Male and female coho on Upper Miller Creek
October 14, 2011
Photo Courtesy of Ed Nugent
CSI in Action

“Team Wednesday” Lee measuring a salmon carcass
CSI in Action

“Team Thursday” Pam cutting open the carcass to look for eggs

Photo courtesy of Pam Silimperi/Kay Larsen
CSI in Action

Investigating egg retention – this female spawned!

Photo by L. Moyer
CSI in Action

Investigating pre-spawn mortality – this is a male coho – note white milt sacs
Each carcass was “marked” by cutting off the tail.
CSI in Action

“Team Tuesday” Christine – snouts are collected from hatchery coho carcasses to check for tags
CSI in Action

“Team Sunday”
Drew, Jeremy and Nick - it takes teamwork
Fall 2014
Photo courtesy of Robin Hoefer
Property Owner Permission
Graciously Provided by:

• Clint Adams
• Ann and Stephen Backstrom
• Linda and Thomas Beffa
• Brett Fish
• Glen and Karen Gabrielson
• Mark and Sherri Henry
• Chris Longridge
• Susan Klein
• Steve Dubois
• Normandy Park Community Club
• Normandy Park Swim Club
• Southwest Suburban Sewer District
CSI Survey Locations
Topographic Map of the Miller and Walker Creek Drainages

Image courtesy of GeoEngineers and Washington State Department of Transportation
Survey Locations

• Four locations
  – Two on Miller Creek
    • Lower Miller – Longridge, The Cove, and Adams property
    • Upper Miller – Sewer District and Fish property
    • (Above 1st Ave S. not surveyed – not many fish and difficult access)
  – Two on Walker Creek
    • Upper Walker – Beffa, Backstrom, Gabrielson, Henry properties
    • Lower Walker – The Cove, Swim Club
CSI Survey Locations
Topographic Map of the Miller and Walker Creek Drainages

Image courtesy of GeoEngineers and Washington State Department of Transportation
Walker Creek Stream Restoration

Removing invasive weeds and planting native trees and shrubs at Walker Preserve

January 10, 2015
Upper Miller Creek Survey Area - CSI: Highline

Not surveyed Oct. 27-Nov. 10

Sw And St

(C) 2008 King County

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Date: 10/1/2012 Source: King County IMAP - Property Information (http://www.metrokc.gov/GIS/IMAP)
2010’s “Team Tuesday” Christine & Kerry at Sewer Plant on Upper Miller Creek
November 9, 2010

“Test plot” native plant revegetation area
CSI in Action

Lee and Jim planting willows at Sewer Plant on Upper Miller Creek
November 22, 2011

“Test plot” native plant revegetation area
CSI in Action

2013 - Test Plot at Sewer Plant on Upper Miller Creek
October 13, 2013
3) 2014 CSI Results

Coho carcass
October 23, 2012
Coho: 3-year Life History

- October-Nov 2011: Spawned
- Early 2012: Hatched
- Early 2012 – early 2013: Rearing in stream
- Early 2013: Migration to salt water
- Early 2013 – October 2014: Rearing in Puget Sound and Pacific Ocean
- October – December 2014: Migration upstream, spawning, death
- Early 2015: New fish hatch
## Chum: 4-year Life History

<table>
<thead>
<tr>
<th>Time Period</th>
<th>Event Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nov. – December 2010</td>
<td>Spawned</td>
</tr>
<tr>
<td>Early 2011</td>
<td>Hatched and migrated to salt water</td>
</tr>
<tr>
<td>Early 2011 – Nov. 2014</td>
<td>Rearing in Puget Sound and Pacific Ocean</td>
</tr>
<tr>
<td>Nov. – December 2014</td>
<td>Migration upstream, spawning, death</td>
</tr>
<tr>
<td>Early 2015</td>
<td>Eggs hatch &amp; migrate to Puget Sound</td>
</tr>
</tbody>
</table>
CSI Weather

- Average survey time = 2 hours, 31 minutes
- Weather conditions (81 survey days):
  - Sunny: 35%
  - Cloudy: 42%
  - Rainy: 23%
# Results: Live Fish Observations Summary

<table>
<thead>
<tr>
<th>Species</th>
<th>Coho</th>
<th>Chum</th>
<th>Unidentified Adults</th>
</tr>
</thead>
<tbody>
<tr>
<td>Miller Creek</td>
<td>52</td>
<td>40</td>
<td>14</td>
</tr>
<tr>
<td>Walker Creek</td>
<td>26</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>78</strong></td>
<td><strong>48</strong></td>
<td><strong>20</strong></td>
</tr>
</tbody>
</table>

**GRAND TOTAL: 146 live fish seen**

Unidentified adults were 14% of total fish observed.
Results: 2010-2014

- **Coho**
  - 2010: 10
  - 2011: 400
  - 2012: 400
  - 2013: 100
  - 2014: 10

- **Chum**
  - 2010: 50
  - 2011: 500
  - 2012: 100
  - 2013: 50
  - 2014: 50
Results: 78 Coho Seen

Peak observation on November 5: 11 fish
Results: 48 Chum Observations

Peak observation on November 26 & 27: 7 fish

Last fish seen: December 26
There is something fascinating about science. One gets such wholesale returns of conjecture out of such a trifling investment of fact.

Mark Twain
Species by Stream

Coho
N = 78

Chum
N = 48
Species by Stream

Coho
N = 78

Chum
N = 48

Unidentified
N = 20
Rainfall and live fish - 2014

- Precipitation (inches)
- Coho Miller-Walker
- Chum Miller-Walker
Estimated *Population*

<table>
<thead>
<tr>
<th>Species</th>
<th>Coho</th>
<th>Chum</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Miller Creek</td>
<td>56</td>
<td>24</td>
<td>80</td>
</tr>
<tr>
<td>Walker Creek</td>
<td>24</td>
<td>5</td>
<td>29</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>80</strong></td>
<td><strong>29</strong></td>
<td><strong>109</strong></td>
</tr>
</tbody>
</table>

Assumptions:
- Using the area under the curve (AUC) over the survey period corrects for probable double-counting of fish – salmon spend several days in the stream.

The estimated population is the “escapement estimate” – the actual number of fish that are likely to have spawned.
Escapement Estimates

- **Coho**
- **Chum**

<table>
<thead>
<tr>
<th>Year</th>
<th>Coho</th>
<th>Chum</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td></td>
<td>250</td>
</tr>
<tr>
<td>2011</td>
<td>115</td>
<td>125</td>
</tr>
<tr>
<td>2012</td>
<td>300</td>
<td>65</td>
</tr>
<tr>
<td>2013</td>
<td>35</td>
<td>50</td>
</tr>
<tr>
<td>2014</td>
<td>75</td>
<td>20</td>
</tr>
</tbody>
</table>
## Carcasses Summary

<table>
<thead>
<tr>
<th>Species</th>
<th>Coho</th>
<th>Chum</th>
<th>Unidentified Adults</th>
</tr>
</thead>
<tbody>
<tr>
<td>Miller Creek</td>
<td>56</td>
<td>23</td>
<td>3</td>
</tr>
<tr>
<td>Walker Creek</td>
<td>14</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>70</strong></td>
<td><strong>26</strong></td>
<td><strong>4</strong></td>
</tr>
</tbody>
</table>
Chum Carcasses: Location

N = 26
Chum Carcasses: Sex

- Unknown: 69%
- Males: 16%
- Females: 15%

N = 26
Predation by wildlife

Predated chum carcass
Photo by Gary Wagner
November 7, 2014
Chum Carcasses: Predation

N = 26

- Not Predated: 15%
- Predated: 85%
## Chum Carcasses: Size

<table>
<thead>
<tr>
<th></th>
<th>Fork length (cm)</th>
<th>POH (cm)</th>
<th>Girth (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male average</td>
<td>70.0</td>
<td>48.0</td>
<td>32.5</td>
</tr>
<tr>
<td>Female average</td>
<td>70.3</td>
<td>54.9</td>
<td>33.8</td>
</tr>
</tbody>
</table>

POH: postorbital to hypural plate

![Fish diagram with measurements labeled: Fork length, POH, and Girth.](chart)
Chum: Hatchery Origin Unknown

Adipose fin
Prespawn Mortality

Coho experiencing “prespawn” mortality at Upper Miller survey location
October 23, 2009
Prespawn Mortality (PSM)

Coho female, full of eggs
October 25, 2012
Photo courtesy of Pam Silimperi
Chum: Success in Spawning

Miller and Walker Creeks – 0 of 1 female = 0% Pre-spawn Mortality

N = 1

Spawned 100%

Pre-spawn mortalities 0%
Coho Carcasses: Sex

N = 70

- Males: 33%
- Females: 58%
- Unknown: 9%
Coho Carcasses: Predation

- Not Predated: 79%
- Predated: 21%
Coho Carcasses: Location

- Lower Miller: 15 carcasses
- Upper Miller: 40 carcasses
- Lower Walker: 10 carcasses
- Upper Walker: 10 carcasses

N = 70
## Coho Carcasses: Size

<table>
<thead>
<tr>
<th></th>
<th>Fork length (cm)</th>
<th>POH (cm)</th>
<th>Girth (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male average</td>
<td>55.5</td>
<td>42.5</td>
<td>27.6</td>
</tr>
<tr>
<td>Female average</td>
<td>58.3</td>
<td>46.2</td>
<td>28.8</td>
</tr>
</tbody>
</table>

POH: postorbital to hypural plate

Fork length

Girth
Coho: Success in Spawning

Miller Creek
- 90% PSM
- 29 females
  - Spawned 10%
  - Pre-spawn mortalities 90%

Walker Creek
- 57% PSM
- 7 females
  - Spawned 43%
  - Pre-spawn mortalities 57%

Overall coho pre-spawn mortality:
Coho: Success in Spawning

Miller and Walker Creeks – 30/36 females = 83% Pre-spawn Mortality

N = 36
Coho: Spawning Success in 2012: Miller/Walker and Nearby

**Miller Creek - 95% PSM**
- 94 females
- Spawning: 5%
- Pre-spawn Mortalities: 95%

**Walker Creek - 57% PSM**
- 21 females
- Spawning: 43%
- Pre-spawn Mortalities: 57%

**Longfellow Creek - 86% PSM**
- 86 females
- Spawning: 14%
- Pre-spawn Mortalities: 86%

**Des Moines - 100% PSM**
- 34 females
- Spawning: 0%
- Pre-spawn Mortalities: 100%
Coho: Hatchery Origin

15 fish were either “wild-origin” or TU outplanted fish

51 fish originated from hatcheries outside of the basin and “strayed” into the streams to spawn

4 fish were too far gone to tell

Unmarked 21%

Hatchery 73%

N = 70

Adipose fin
Coho: Success in Spawning and Origin

Pre-spawn Mortalities
- Unmarked 20%

Spawned Fish
- Unmarked 17%
- Hatchery Origin 83%

N = 30

N = 6
Collecting Coho Heads for Coded Wire Tags

Image from Alaska Department of Fish and Game
2013 Coho with Coded Wire Tags: 3

- Coho from Elliot Bay – Muckleshoot Indian Tribes Net Pen
- From Keta Creek Hatchery (Green River) in 2010
- Released in 2012 into Puget Sound
- 3 females: 2 spawned, 1 PSM
- 2014 – 3 tags/46 snouts – origin not yet known
Wildlife

- Rabbits
- Raccoon
- Bald eagles
- Red-winged blackbirds
- Mallards
- American wigeons
- Belted kingfisher

Coyote near Miller Creek
December 23, 2012
Photo by Robin Hoefer
Beautiful

Down trees and sun
Pollution?

Foam on Miller Creek
December 9, 2013
Photo by Joy Neubauer
Bonus
Shared Funding for Stewardship

Thank you Miller-Walker basin partners, who support King County basin stewardship:

Burien

City of Normandy Park, Washington

City of SeaTac

King County

Port of Seattle
Thank You Volunteers!

“Team Sunday”
Drew and Nick cutting open carcasses on Miller Creek
October 19, 2014
Thank You 2014 Volunteers!

- Joy and Roger Neubauer
- Michael and Carlyn Roedell
- Kristine Feldman
- Liesl Sallquist
- Christine Terry
- John Mozieka
- Lee Moyer
- Margy Wallace
- Steve Hanley
- Pam Silimperi
- Kay Larsen
- Scott Newcombe
- Brenda Sullivan
- Jim Burrows
- Gary Wagner
- Peter Naval
- Tracy Madole
- John McKindley
- Merry Ann Peterson
- Ed Nugent
- Ryan Rhodes
- Lisa Cowden
- Alex Ankuta
- Echo Allen
- Michael Lubrano
- Robin Hoefer
- Drew Hoefer
- Nick and Jeremy Hoefer
- Shelby Vander Molen
- Meghan Schuster
- Craig Knutson
- Dahli Strayer
- Nick Rhodes
- Tyler Feldman
Amazing 2014 Volunteers

Most Days Surveyed:
• Merry Ann Peterson (11)
• Ed Nugent (10)
• Joy Neubauer (10)
• Lee Moyer (10)
• Michael Roedell (9)
• Roger Neubauer (9)

Most Hours Spent Surveying:
• Joy Neubauer (28)
• Kristine Feldman (25)
• Liesl Sallquist (25)
• Lee Moyer (24)
4) Plans for 2015 CSI

Ethan documents a carcass
December 5, 2010
Photo courtesy of David Bobanick
Plans for 2015 CSI Survey Season

• Continue the excellent work of the last 5 years by surveying again at four locations in Normandy Park
• Monitor through end of chum spawning season
• Maintain between 25 & 32 volunteers
• Training in early October, 2015
• Sign in with your email address to stay informed
5) Factors Driving Stream and Salmon Health

St. Francis Elementary students mark storm drains by Lake Burien
October 5, 2010
Photo courtesy of Michael Stein-Ross
Coho salmon fry in Miller Creek in Normandy Park

June 30, 2008
How Urban Lands Affect Streams

• Hydrology – stream flow
  – Faster, higher flowing water more often
  – Less and warmer water in summer

• Water quality
  – Warmer, low dissolved oxygen, altered pH, more turbid
  – More pollution - bacteria, metals, pesticides, oil, salt, etc.

• Physical habitat conditions
  – Substrate: hardened, more silt/sand, less gravel
  – Salmon nests in gravel are smothered
  – Streamside vegetation: native, invasive, absent
  – Reaches inaccessible to resident and anadromous fish
Miller-Walker
Stormwater Retrofit Analysis

• Goal: identify where stormwater management will make the biggest difference and be successful
• Grant funded by Dept. of Ecology and supported by Miller-Walker basin partners
• Hydrologic and soil, geology, steep slope analysis of Miller-Walker basin for good locations
• 80 sites selected and prioritized
• Top 4 selected for pre-design
  – Moshier Park and adjacent Moshier Community Art Center
  – 6th Ave SW from SW 146th St to SW 153rd St
  – King County District Court – 6th Ave & SW 149th St.
Locations for infiltrating stormwater

- Infiltration potential
- Impervious surface
- Hydrology
- Slope
- Risk to surrounding environment
- Available area
- Utility, Transportation, Capital project coordination
Moshier: Top-ranked project

- Burien submitted grant proposal to Ecology in November 2014
- Made first cut
- Grant would provide $447,000 for field and parking lot stormwater improvements
Miller and Walker Creeks Stormwater

Miller and Walker Creeks Stormwater: Retrofit Planning for Improving Streams

When it rains in the Miller and Walker Creeks basin, streams flow high and fast, and the water is polluted. This is because much of the area was built with the idea of getting water into the creeks as quickly as possible. Now, we realize that this washes pollution (oil, gas, fertilizers, pesticides, metals used to waterproof wood, etc.) into the streams and causes high flows that damage habitat.

The Miller Walker Basin Partners (the cities of Burien, Normandy Park, and SeaTac; King County; and the Port of Seattle) conducted a stormwater retrofit analysis that identified potential strategies and projects to help reduce runoff into Miller and Walker Creeks.

Maps and Reports

Reports, maps and other Miller-Walker stormwater retrofit products will be posted to this page as they become available.

- Level I Stormwater Retrofit Site Evaluation Map (Adobe PDF)
- Level I Stormwater Retrofit Site Evaluation Criteria (Adobe PDF)
- Level I Stormwater Retrofit Site Evaluations - Matrix (Adobe PDF)
- Level II Stormwater Retrofit Site Evaluation Map (Adobe PDF - 7 MB)
- Level II Stormwater Retrofit Site Evaluation Matrix (Adobe PDF)
- Miller-Walker Infiltration Feasibility Assessment (Large PDF file - 20 MB)
- Public Comments and Answers, May 2014 (Adobe PDF)
- Draft Pre-Design Report for King County Courthouse in Burien - Project KC-47 (Adobe PDF)
- Draft Pre-Design Report for 6th Ave SW in Burien - Project B-20 (Adobe PDF)
- Hydrologic Assessment of Stormwater Retrofit Need in the Miller-Walker Basin (Adobe PDF)
Restoration of Walker Creek at Walker Preserve
August 24, 2009

With funding support from:

King Conservation District
Stewards of the Cove at work since 2003

Normandy Park Community Club
Cove volunteers installing log in Miller Creek
August 9, 2008
Photo courtesy of Al Miller
Homeowner Stewardship

Before
November 16, 2007

After
January 11, 2008

Photo on right courtesy of Kevin Alexander
Ivy in trees along Walker Creek in Normandy Park

August 25, 2011
6) Your Role

THIS STREAM IS IN YOUR CARE
Clean up runoff:
Fix oil leaks in your car
• Check for leaks
• Contain leaks until you can get the car fixed

Don’t Drip & Drive
Fix That Leak!

www.fixcarleaks.org
Clean up runoff:

• Wash your car at a carwash (avoids wasting up to 80 gallons!) or on the lawn rather than in the street (keeps soap and oil out of the storm sewer and out of the creek)
Clean up runoff: pick up after your pet

Rocksie
Things You Can Do

Clean up runoff: build a rain garden

Rain garden at Burien Town Square
January 25, 2011

Photo courtesy of Ken Srilofung, City of Burien
Volunteer to mark storm drains

Lindsay/Andolina family marked storm drains in their Burien neighborhood
August 25, 2010
Things You Can Do

Before

Save your trees – remove the ivy

After

Trees ARE the view
Things You Can Do

Leave down logs in the stream

Great

Not so great

Leave down logs and branches for wildlife
Things You Can Do: Volunteer

Upcoming volunteer events:
Ivy removal at Walker Preserve on March 22 and April 19, 2014

Photo taken February 18, 2012
Things You Can Do: Volunteer

Volunteer for the Community Salmon Investigation for 2015!

“Team Wednesday”
Margy taking statistics
October 23, 2012
Photo courtesy of Margy Wallace
The End

Photo courtesy of Barb and Darrell Williams