

Community Salmon Investigation for Highline 2013 Findings



**Presented by Elissa Ostergaard
Miller/Walker Creeks Basin Steward
March 20 and April 8, 2014**

Community Salmon Investigation for Highline 2013 Results

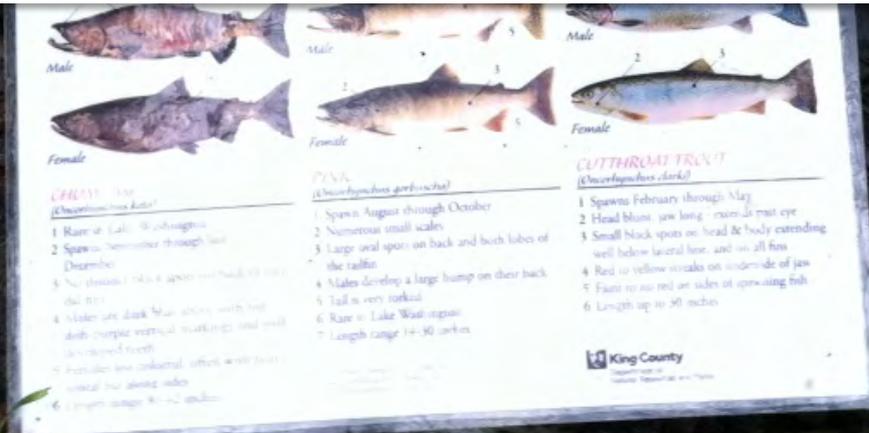
1. Purpose of *Community Salmon Investigation: Highline*
2. How *CSI: Highline* works
 - Stream surveys
 - Necropsies
 - Survey locations
3. Results of October – January surveys
 - Summary data
 - Analysis
 - Weather and Wildlife

Volunteer Recognition

4. Plans for 2014
5. Factors affecting stream and salmon health
6. Your role!

Puget Sound 
Starts Here

1) Purpose of CSI

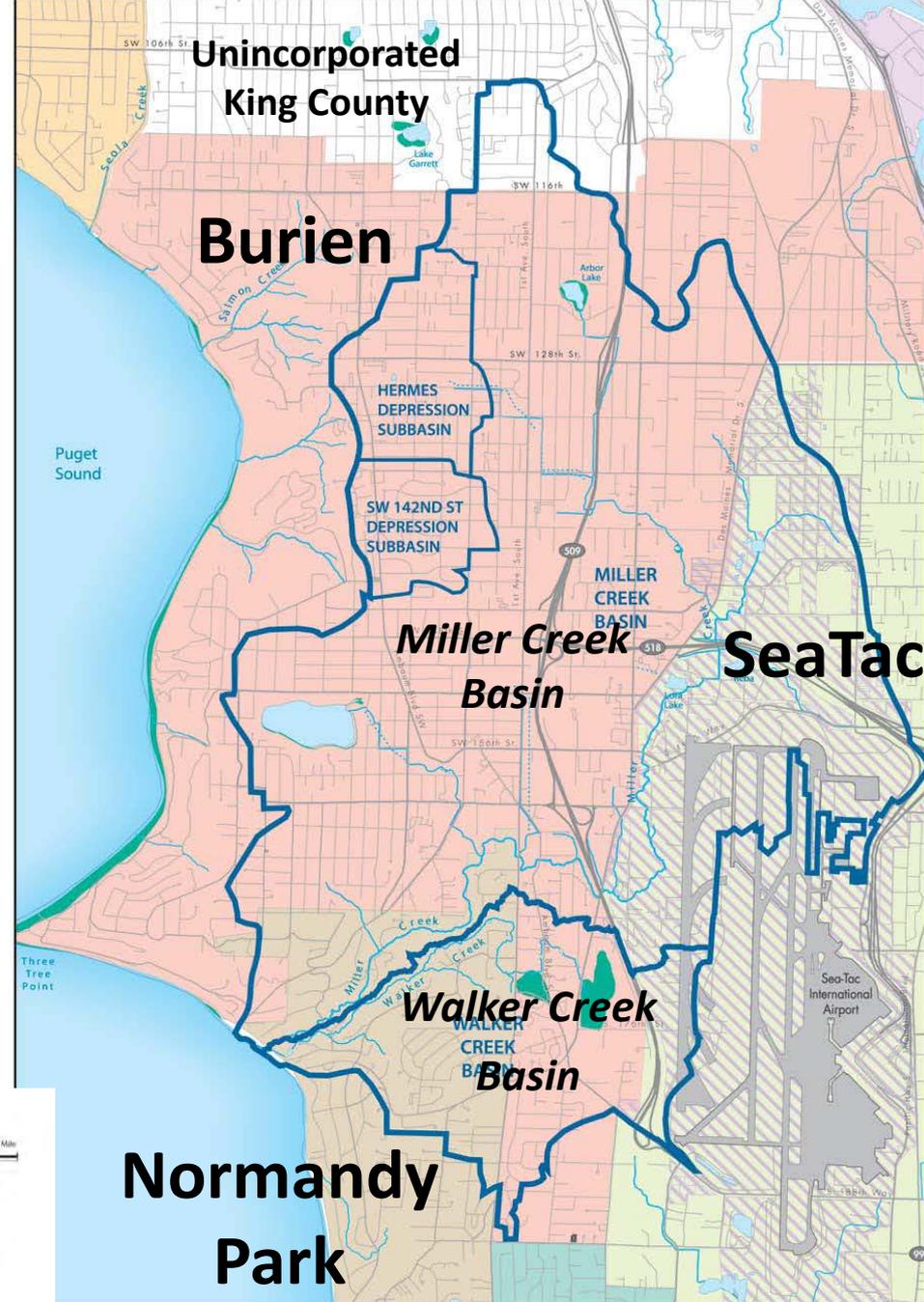


**Coho "jack"
(immature male)**

November 11, 2011

Photo courtesy of David Bobanick

Basin Boundaries for Miller and Walker Creeks



- ### Legend
- | | | |
|---------------|------------------------------|-------------------------------------|
| Burien | King County (unincorporated) | Freeways & Arterials |
| Normandy Park | Port of Seattle Property | Local Roads |
| Seattle | Basin Boundary | Railroads |
| SeaTac | Subbasin Boundary | Pipes |
| Tukwila | SAO Wetlands | Other Significant Man-made Features |
| Des Moines | Streams & Waterline | |



Base Map Notes:
 All symbols legend is USGS NLS.
 Modified to USGS Mount High Water.

Data Sources:
 Miller Creek Basin & Stream (Port of Seattle, 1998)
 Other Streams (Seattle King County "SUTRIS"), 1/98
 Roads King County "TRANS", 1/98
 Wetlands From Environmental Division, 1994

Compiled April, 1994, updated June 2010
 100, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200

King County
 Department of Natural Resources and Parks
 Water and Land Resources Division

Miller and Walker Basins

Draft 2006 Basin Plan

Recommendation on Monitoring

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

- Stream flow (volume)
- Water quality
- Habitat data



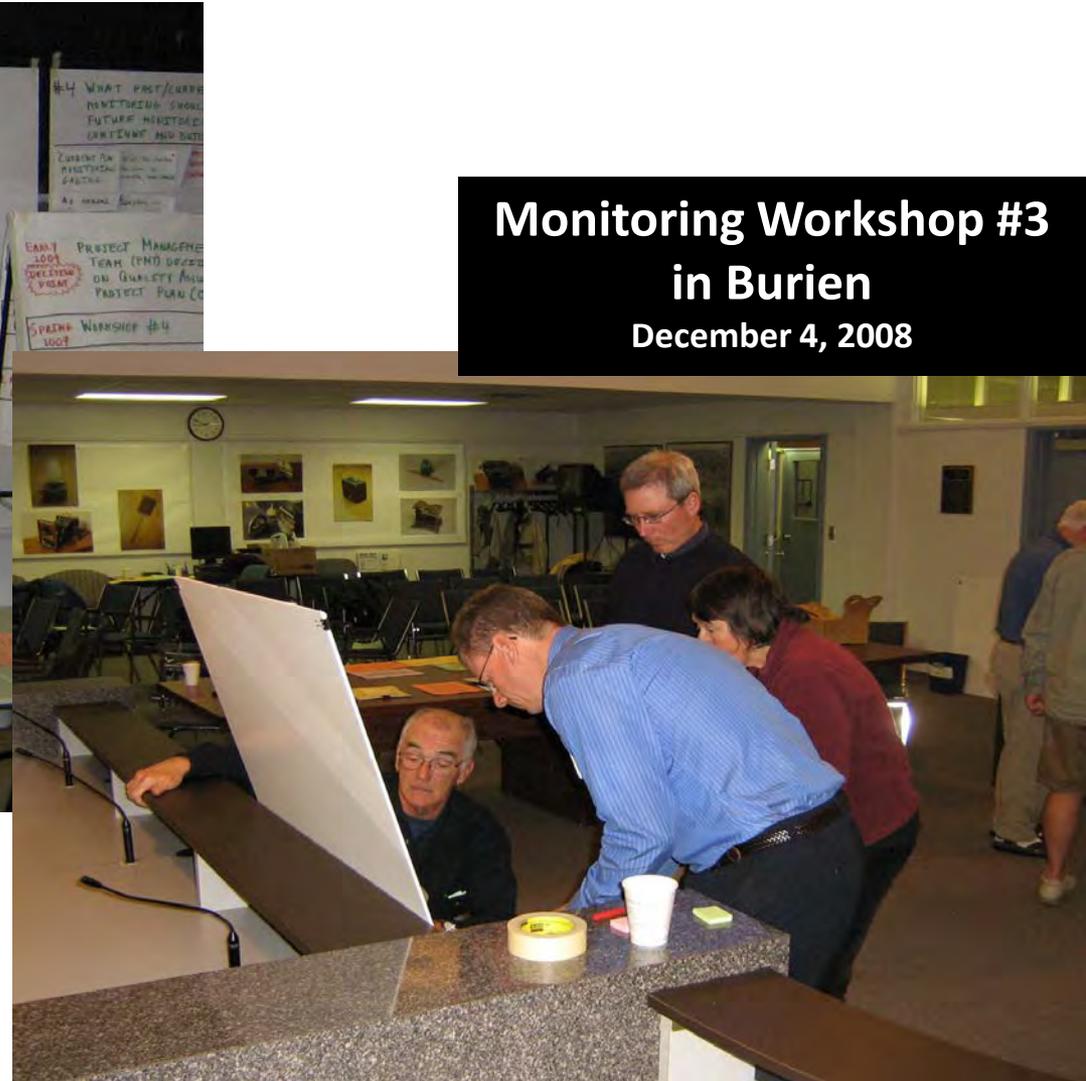
**Port of Seattle water
quality sampling station
at Walker wetlands**

October 16, 2007

Basin Monitoring Coordination Workshops with Dennis Clark, Fall 2008



**Monitoring Workshop #1 at
Burien Community Center
September 24, 2008**



**Monitoring Workshop #3
in Burien
December 4, 2008**



King County
Always at your service

Watersheds, rivers and streams

Central Puget Sound

You're in: Central Puget Sound Watershed » Miller and Walker Creeks Stewardship Page » Monitoring Information

SHARE PRINT S

- Central Puget Sound Watershed
- Vashon - Maury Island
- Miller and Walker Creeks Stewardship Page
- Stewardship Tips
- Volunteer Calendar
- Stream Blog - 2010
- Miller Creek Photo Tour
- Walker Creek Photo Tour
- Basin Plan



Monitoring Information: How Are Miller and Walker Creeks Doing?

This page provides information on:

- [Final Monitoring Coordination Recommendations](#)
- [Background Information on Monitoring Coordination Workshops in 2008](#)
- [Current and Past Monitoring](#)

[Learn about the Community Salmon Investigation \(CSI\) of adult salmon returns in fall 2010.](#)

Final Monitoring Coordination Recommendations

Three workshops occurred in fall 2008 where interested citizens and staff discussed coordination of monitoring of water flow, water quality, and habitat conditions on Miller and Walker Creeks. Basin Steward Dennis Clark drafted recommendations based on input from these workshops. These recommendations were posted for public review in June 2009 before being finalized. The final versions include:

- [Recommendations including Table 2 and Appendices A and B \(Adobe Acrobat\)](#)
- [Table 1: Miller and Walker Creeks Recommended Monitoring Locations for](#)

- Monitoring Information
- Salmon Monitoring Program 2010 - "CSI: Highline"
- Contacts
- Hydrologic Modeling
- Nearshore Environments
- Puget Sound Shoreline Stewardship Guidebook
- Related organizations
- News archive
- Site Map

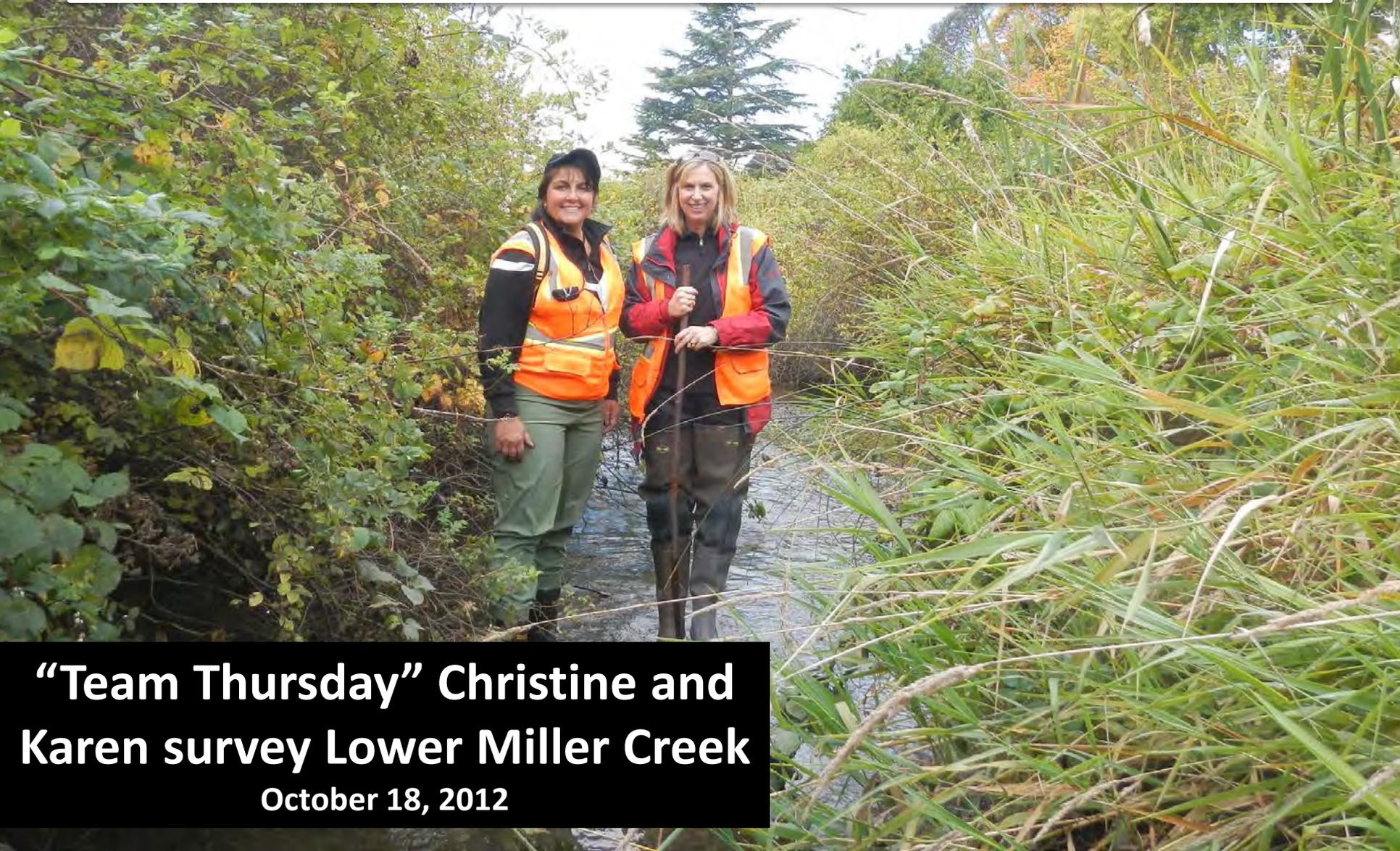


Activities and Purpose of *CSI: Highline*



- 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

2) How CSI Works



**“Team Thursday” Christine and
Karen survey Lower Miller Creek**

October 18, 2012

CSI “Cast”

- 27 regular volunteers from Burien, Normandy Park, and Seattle (plus friends and family)
- Seven daily teams – one team for each day of the week
- Teams had 2-4 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*

Polarized sunglasses for fish spotting

Back pack for supplies

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

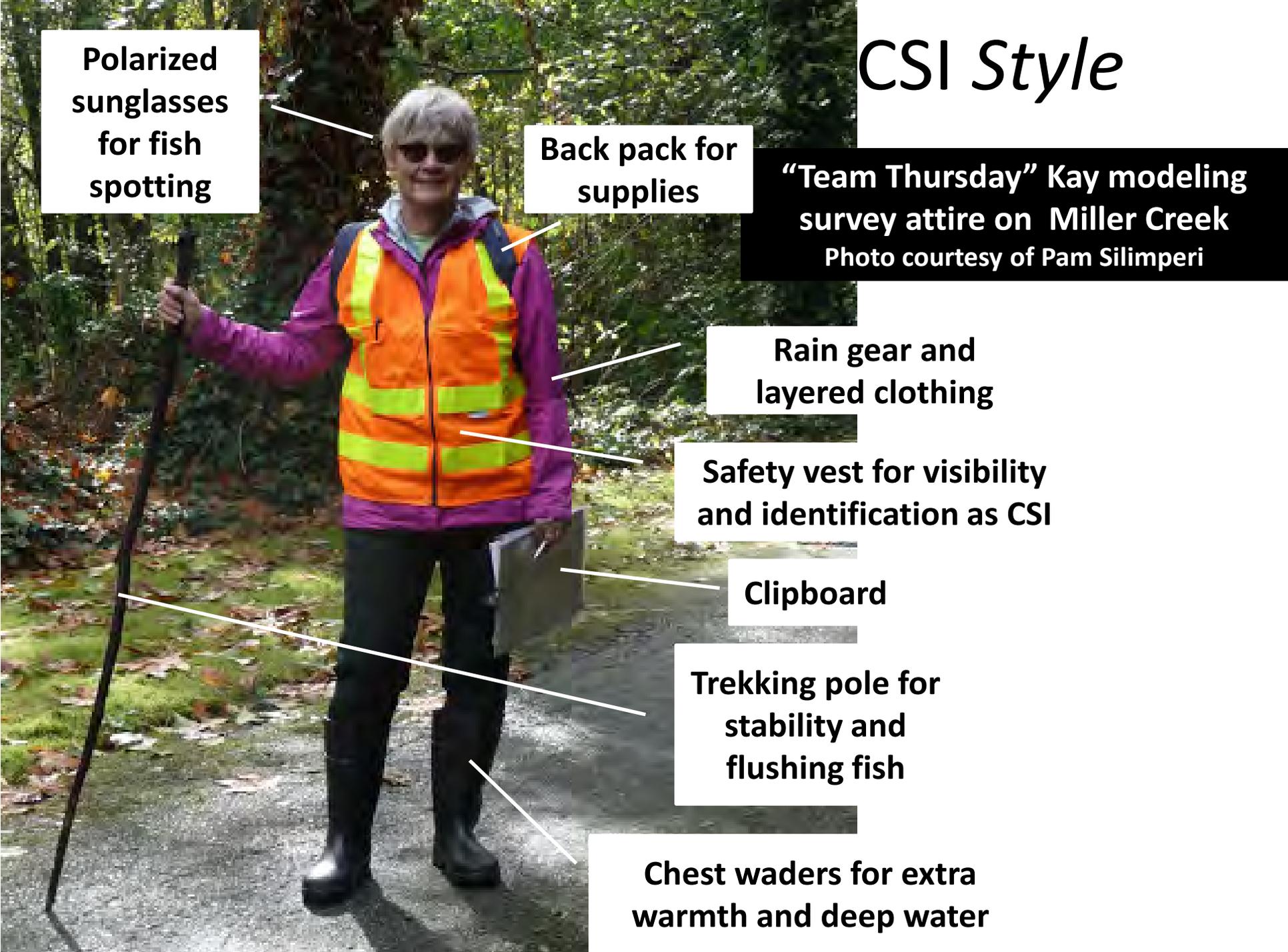
Rain gear and layered clothing

Safety vest for visibility and identification as CSI

Clipboard

Trekking pole for stability and flushing fish

Chest waders for extra warmth and deep water



CSI in Action



**“Team Tuesday”
Kristine and Rony
looking for salmon
along Miller Creek**

CSI in Action

**Half of “Team Sunday”
Lisa and Alex brave the
elements**



CSI in Action

**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 Tuesday” 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

Each carcass was
“marked” by cutting off
the tail



CSI in Action



**“Team Thursday”
Christine – snouts
are collected from
hatchery coho
carcasses to check
for tags**

CSI in Action



**“Team Monday” Joy,
Roger & Michael – it
takes teamwork**

October 15, 2012

CSI in Action

Chum building a redd

November 7, 2010



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

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, Hansen properties
 - Lower Walker – The Cove, Swim Club

CSI Survey Locations Topographic Map of the Miller and Walker Creek Drainages

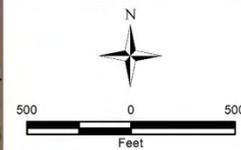
**Upper Miller
Survey Location**

**Lower Miller
Survey Location**

**Upper Walker
Survey Location**

**Lower Walker
Survey Location**

First Ave South



GEOENGINEERS

Reference: LIDAR DEM and Hillshade provided by the Puget Sound LIDAR Consortium
Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes.

Walker Creek Stream Restoration



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

Monthly, fall 2012

CSI in Action

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



CSI in Action



**Today - Test Plot at Sewer
Plant on Upper Miller Creek**
October 13, 2013

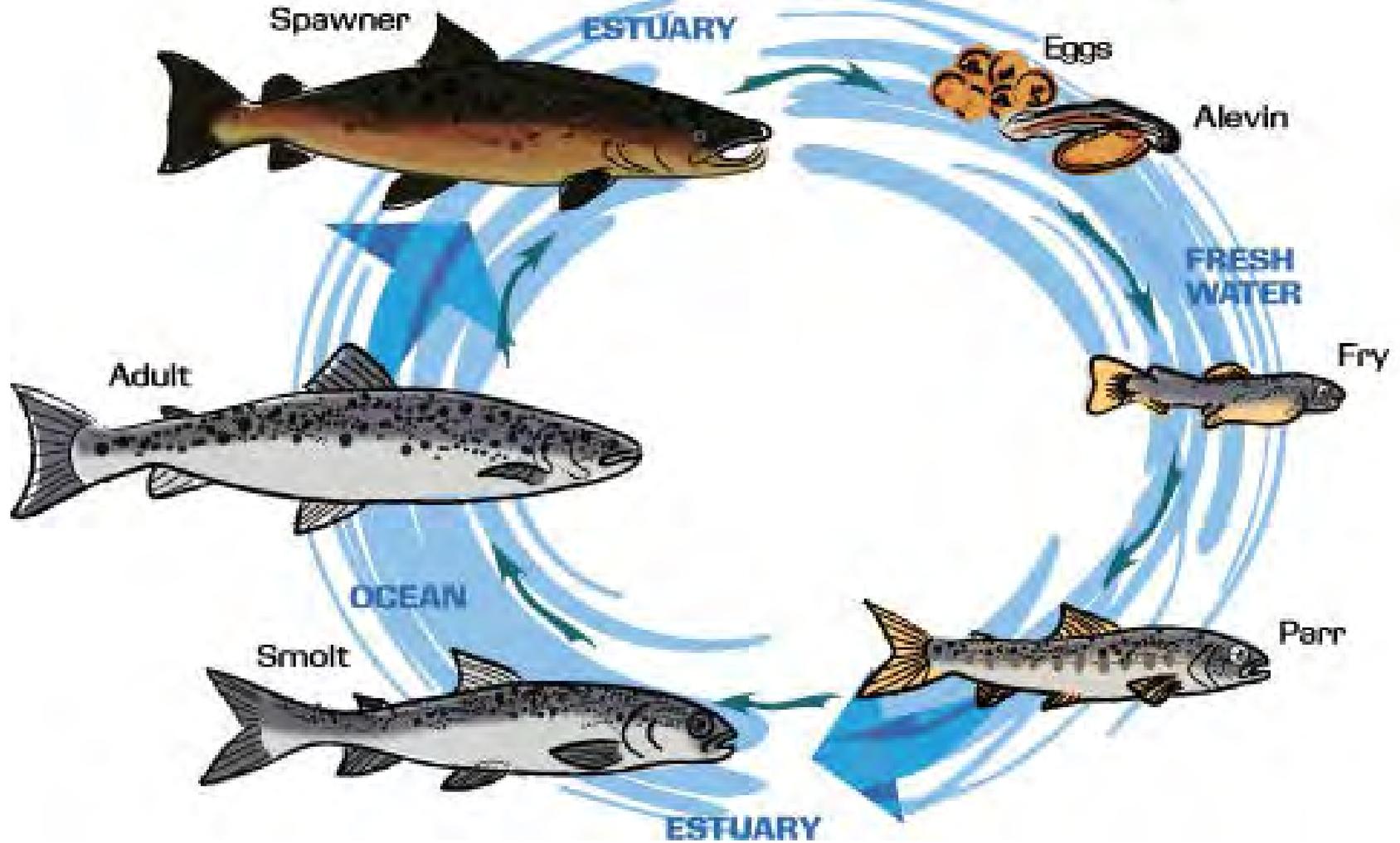
3) 2013 CSI Results



Coho carcass

October 23, 2012

Life Cycle of the Salmon





Coho: Life History

- October-Nov 2010 Spawned
- Early 2011 Hatched
- Early 2011 – early 2012 Rearing in stream
- Early 2012 Migration to salt water
- Early 2012 – October 2013 Rearing in Puget Sound and Pacific Ocean
- October – December 2013 Migration upstream, spawning, death
- Early 2014 New fish hatch

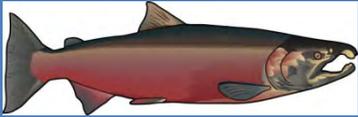


Chum: Life History

- Nov. – December 2009 Spawned
- Early 2010 Hatched and migrated to salt water
- Early 2010 – Nov. 2013 Rearing in Puget Sound and Pacific Ocean
- Nov. – December 2013 Migration upstream, spawning, death
- Early 2014 Offspring hatch

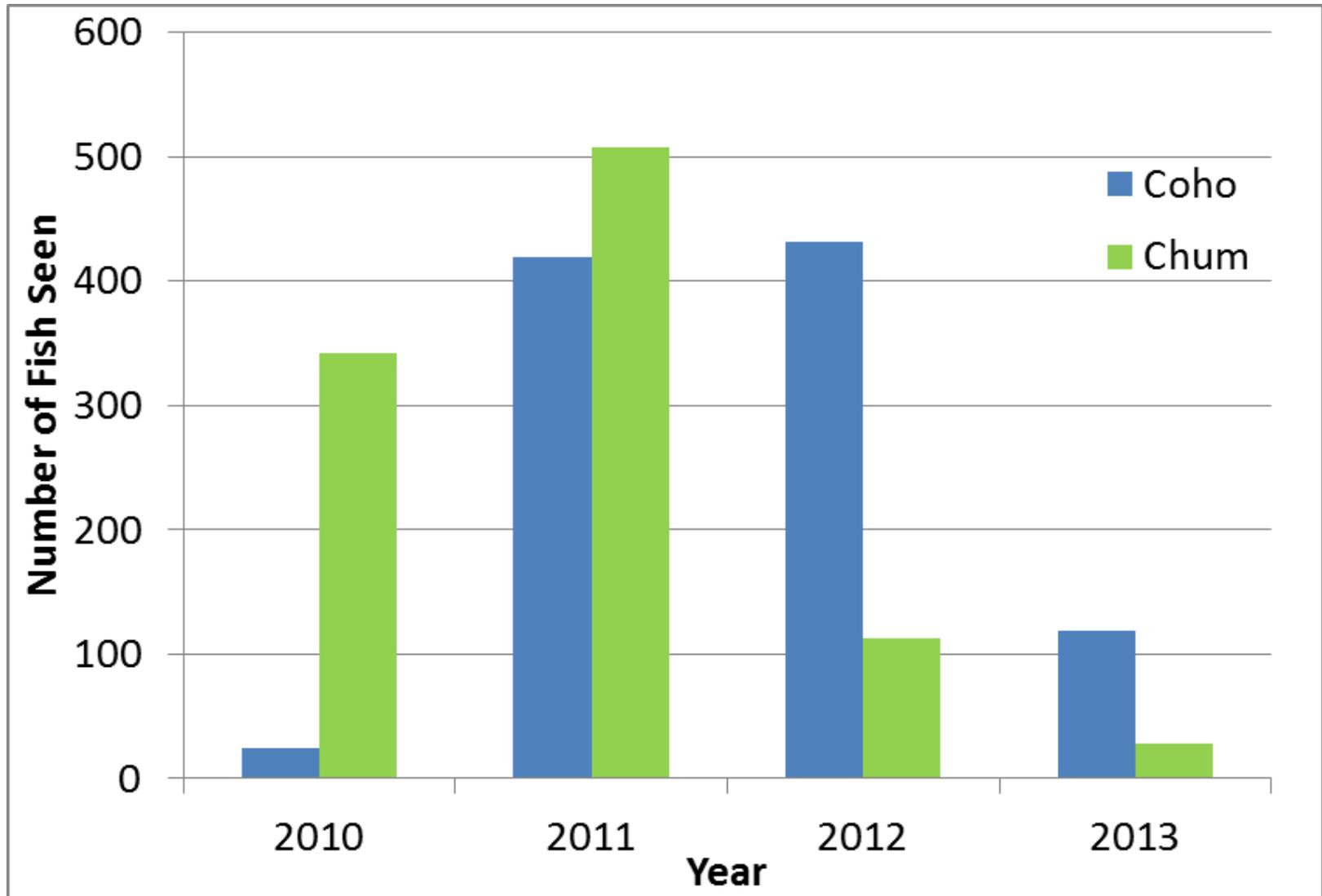


Results: Live Fish Observations Summary

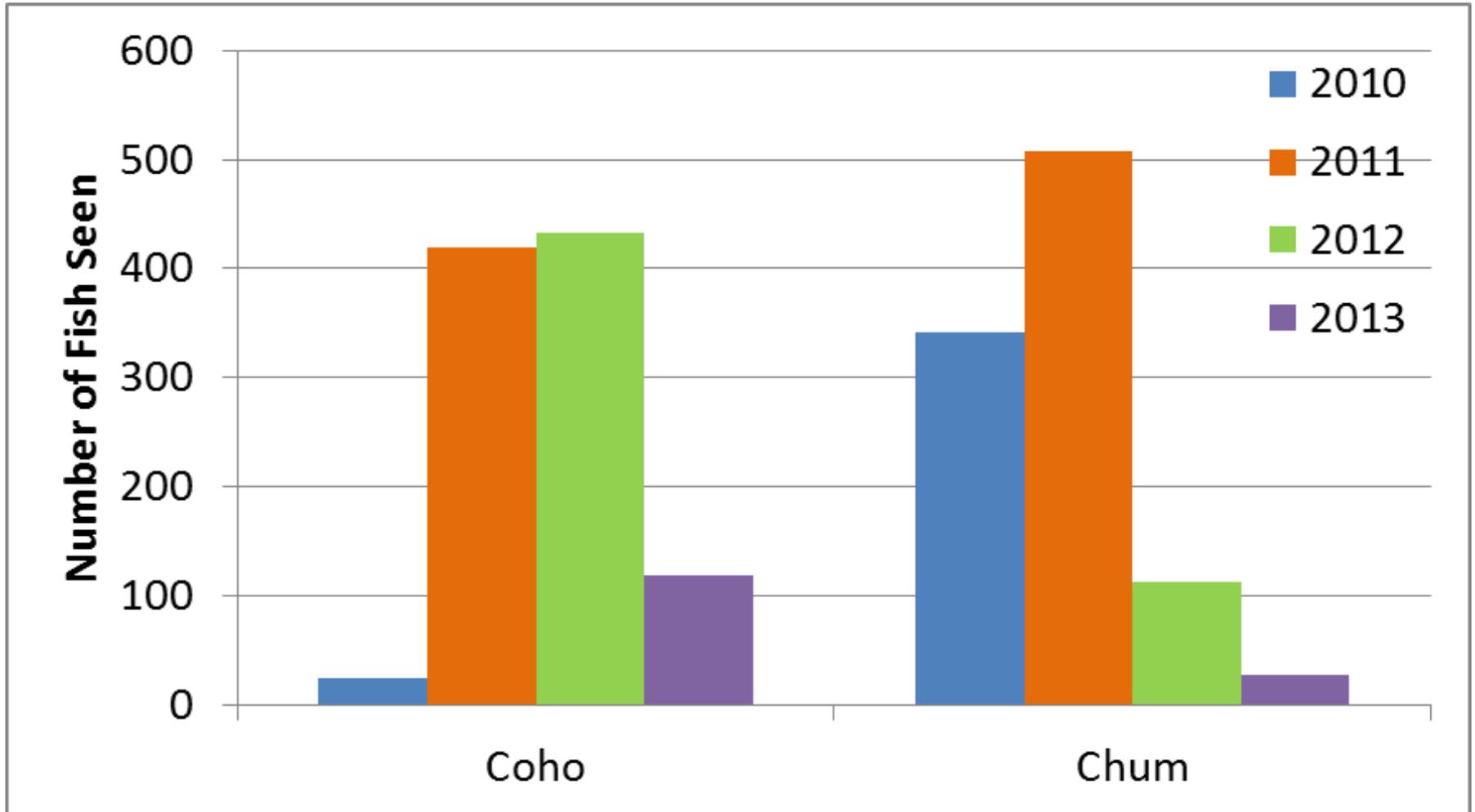
Species	Coho 	Chum 	Unidentified Adults
Miller Creek	78	17	37
Walker Creek	41	11	8
Total	119	28	45

Unidentified adults were 24% of total fish observed.

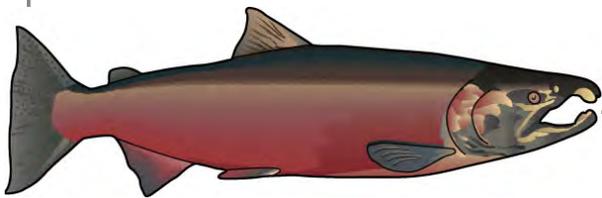
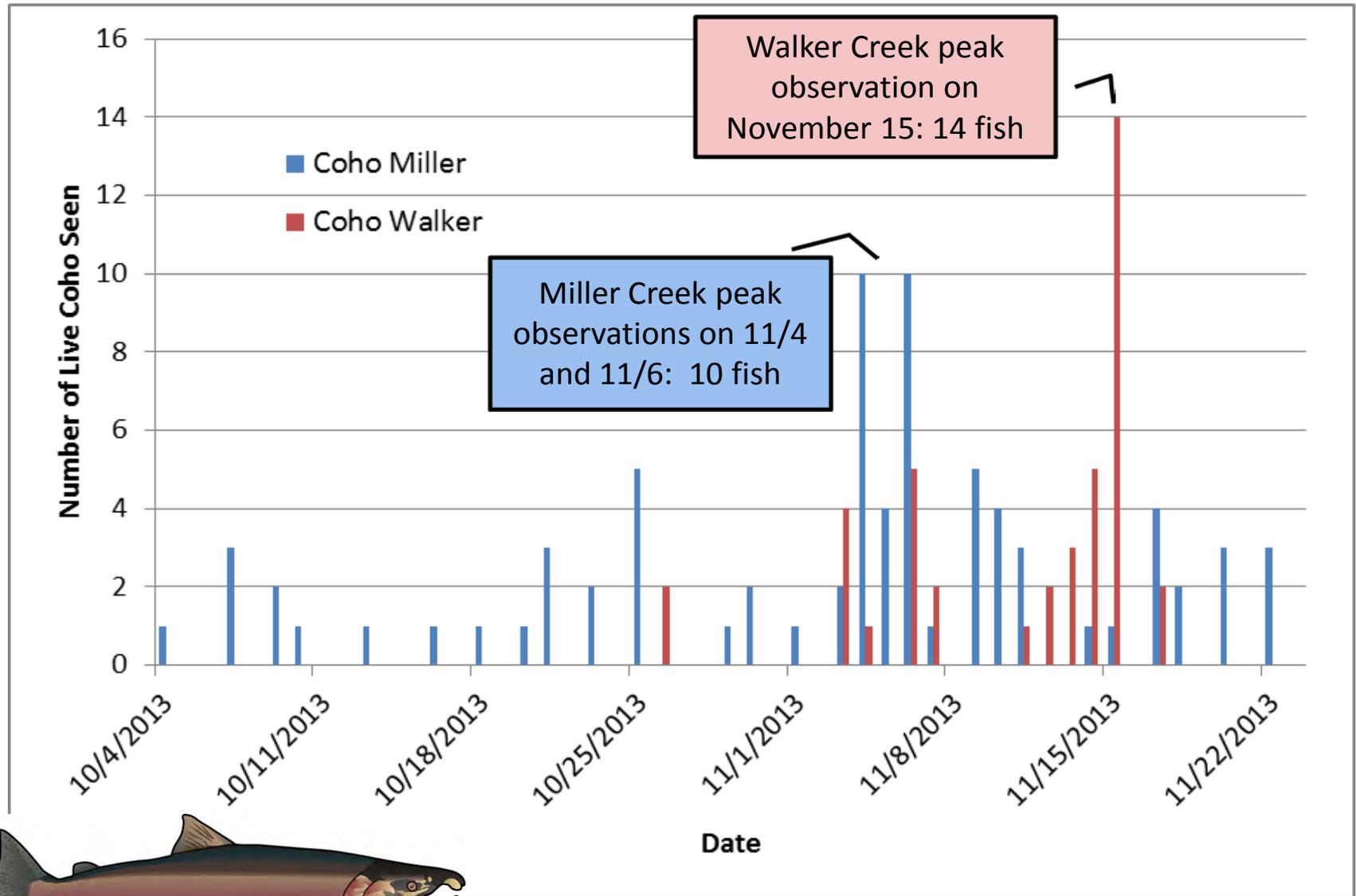
Results: 2010-2013



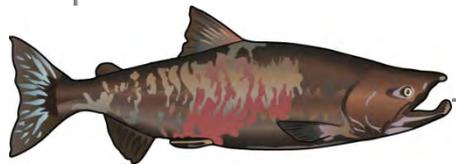
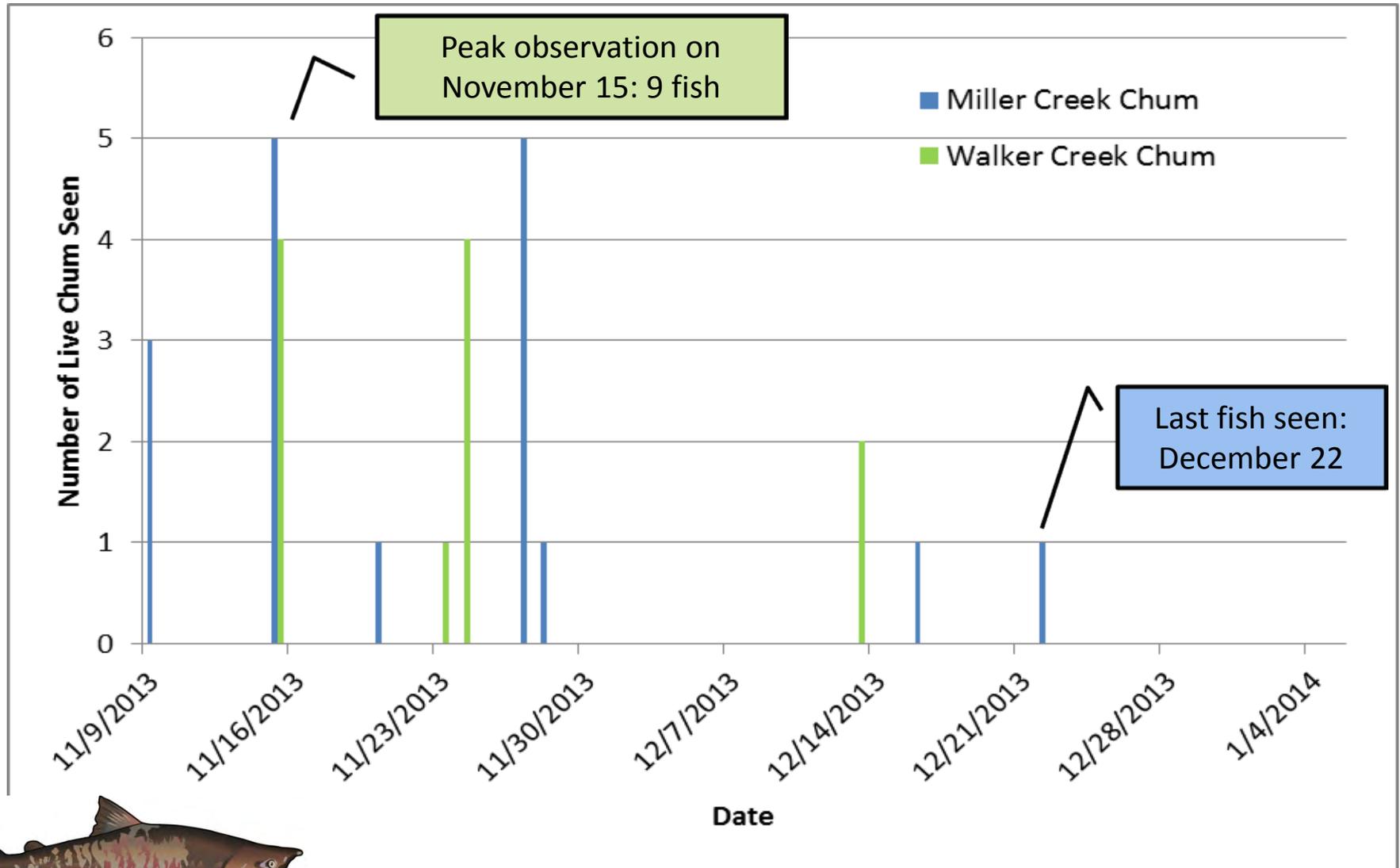
Results: 2010-2013



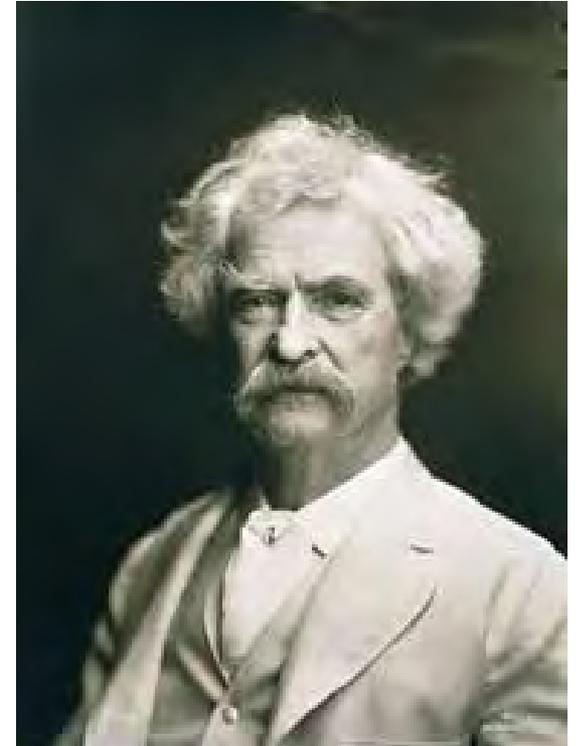
Results: 119 Coho Seen



Results: 28 Chum Observations

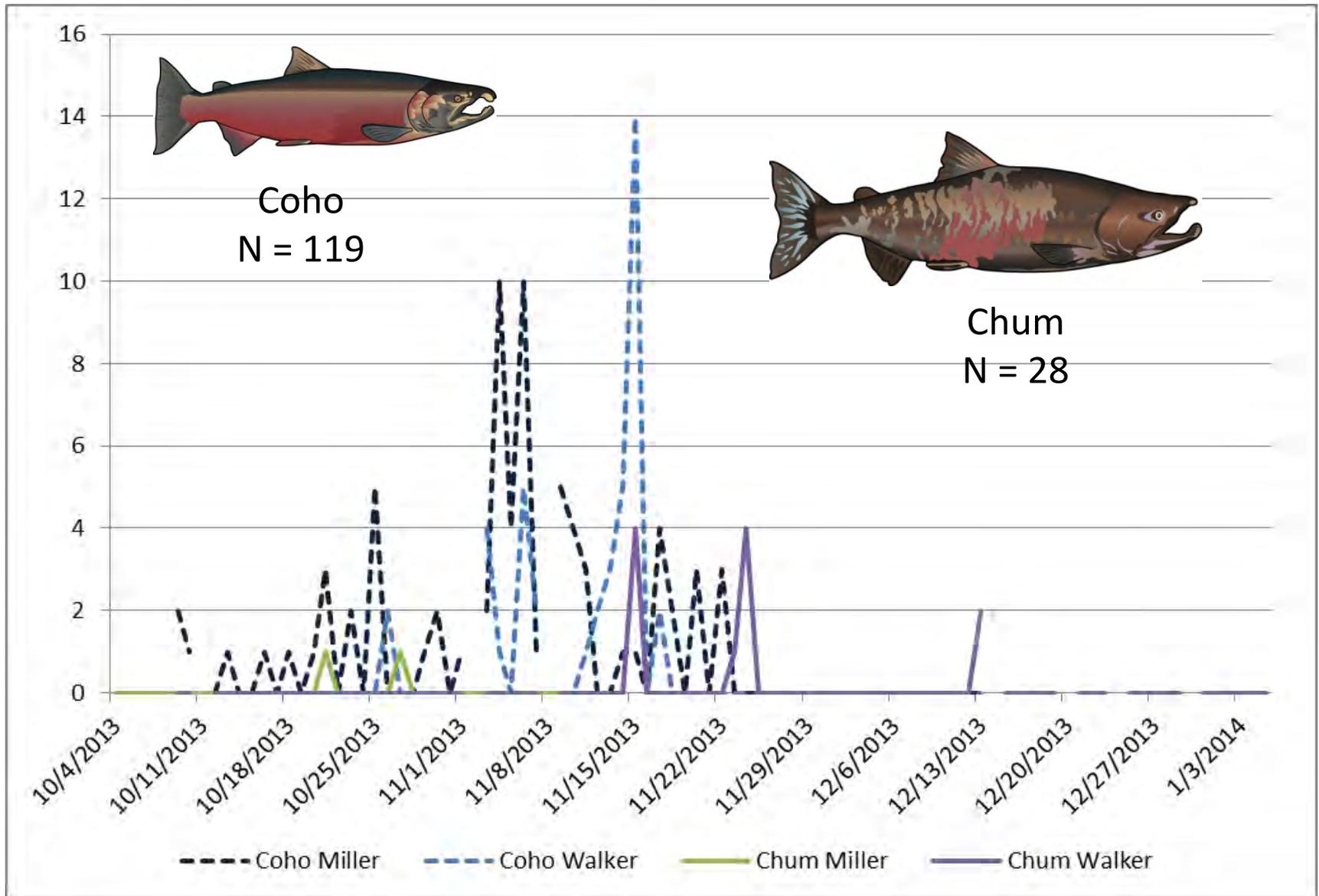


There is something
fascinating
about science.
One gets such
wholesale returns of
conjecture out of
such a trifling
investment of fact.

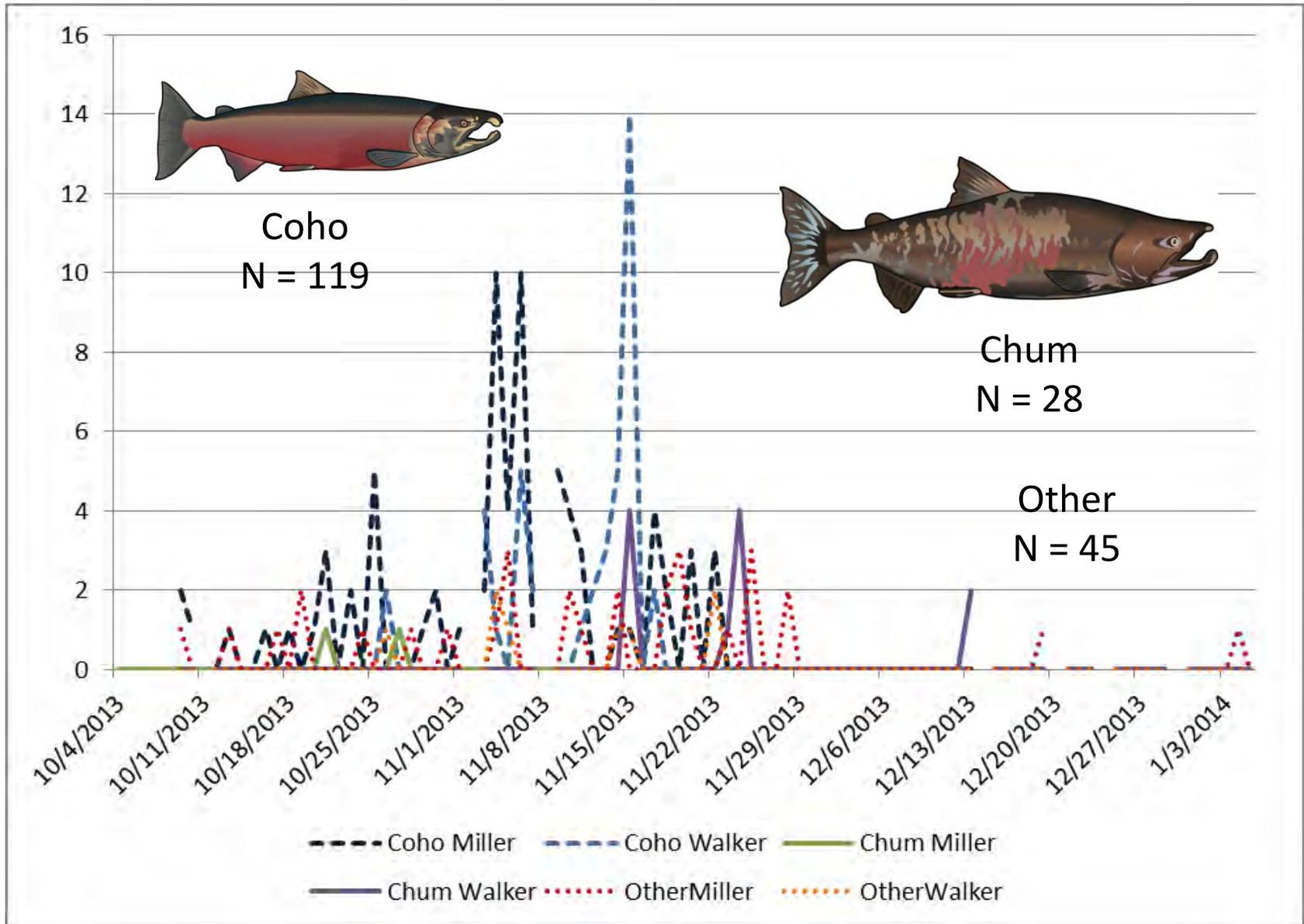


Mark Twain

Species by Stream

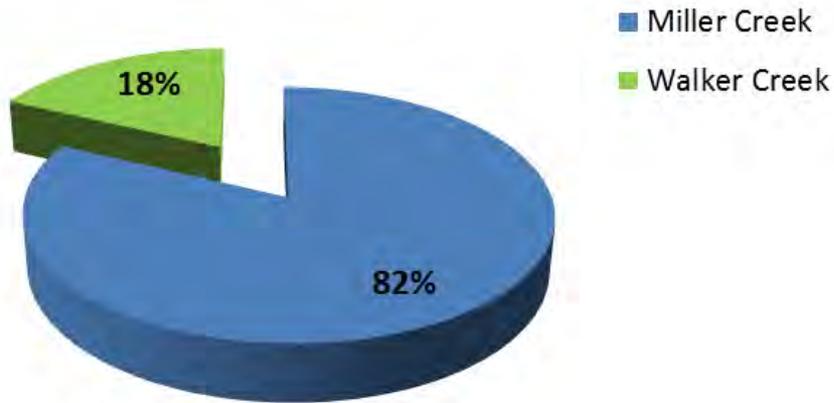


Species by Stream

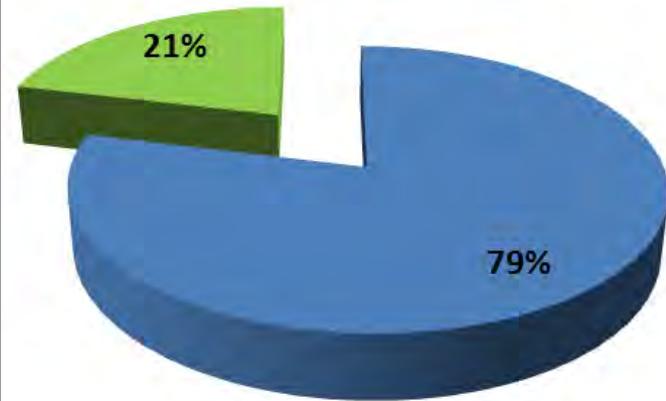


Species by Stream

Coho



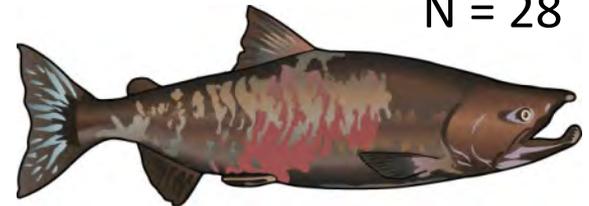
Chum



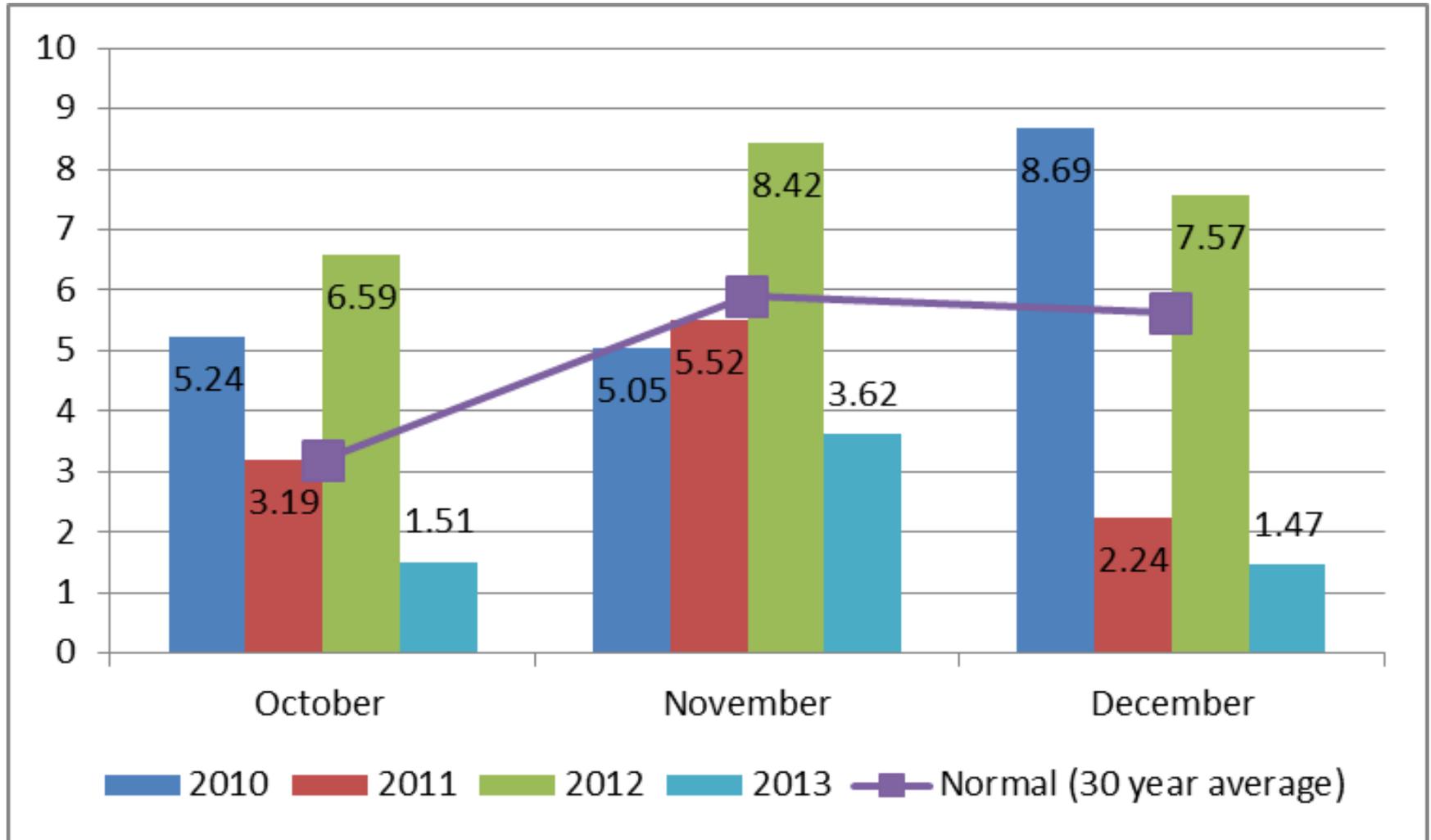
N = 119



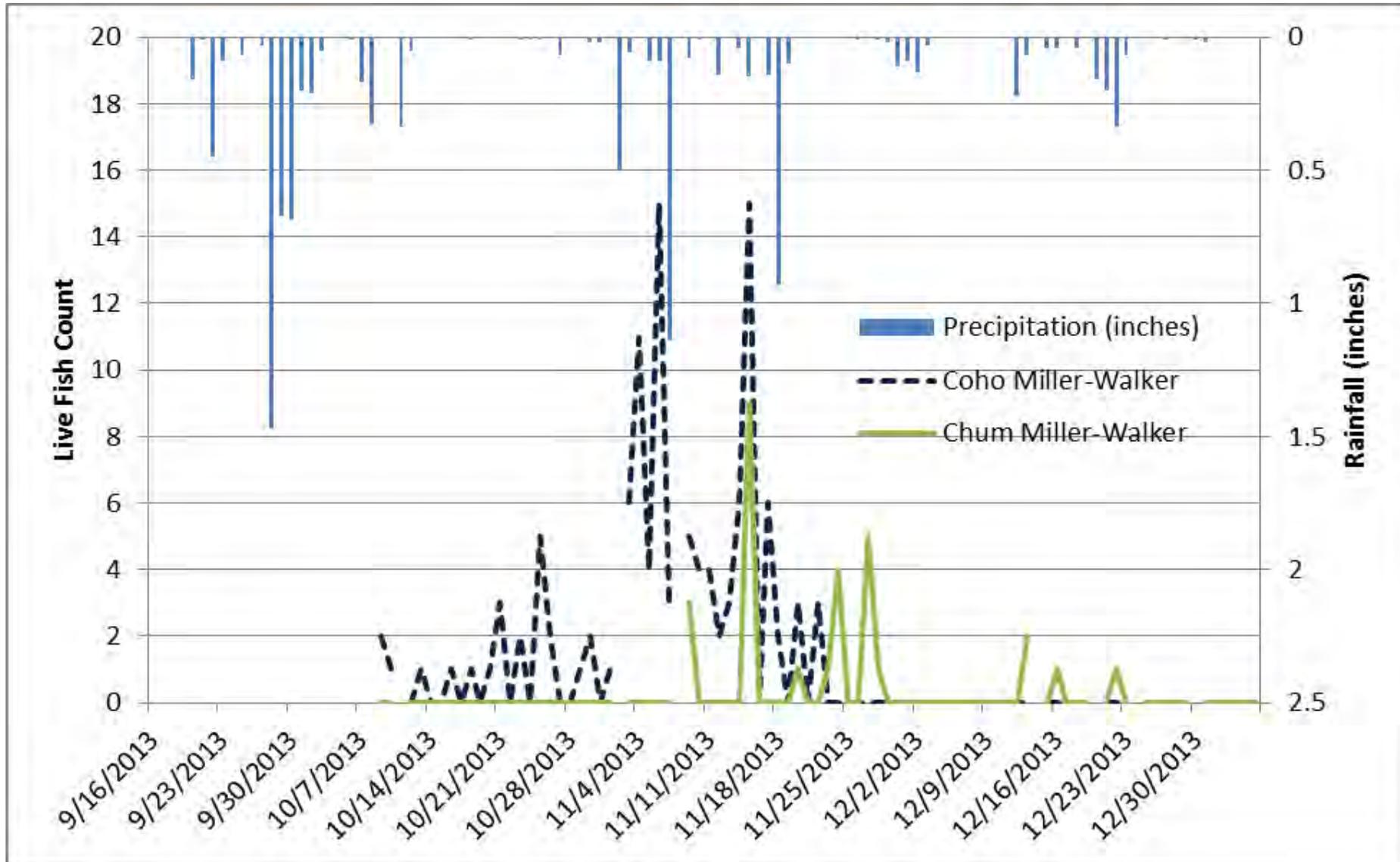
N = 28



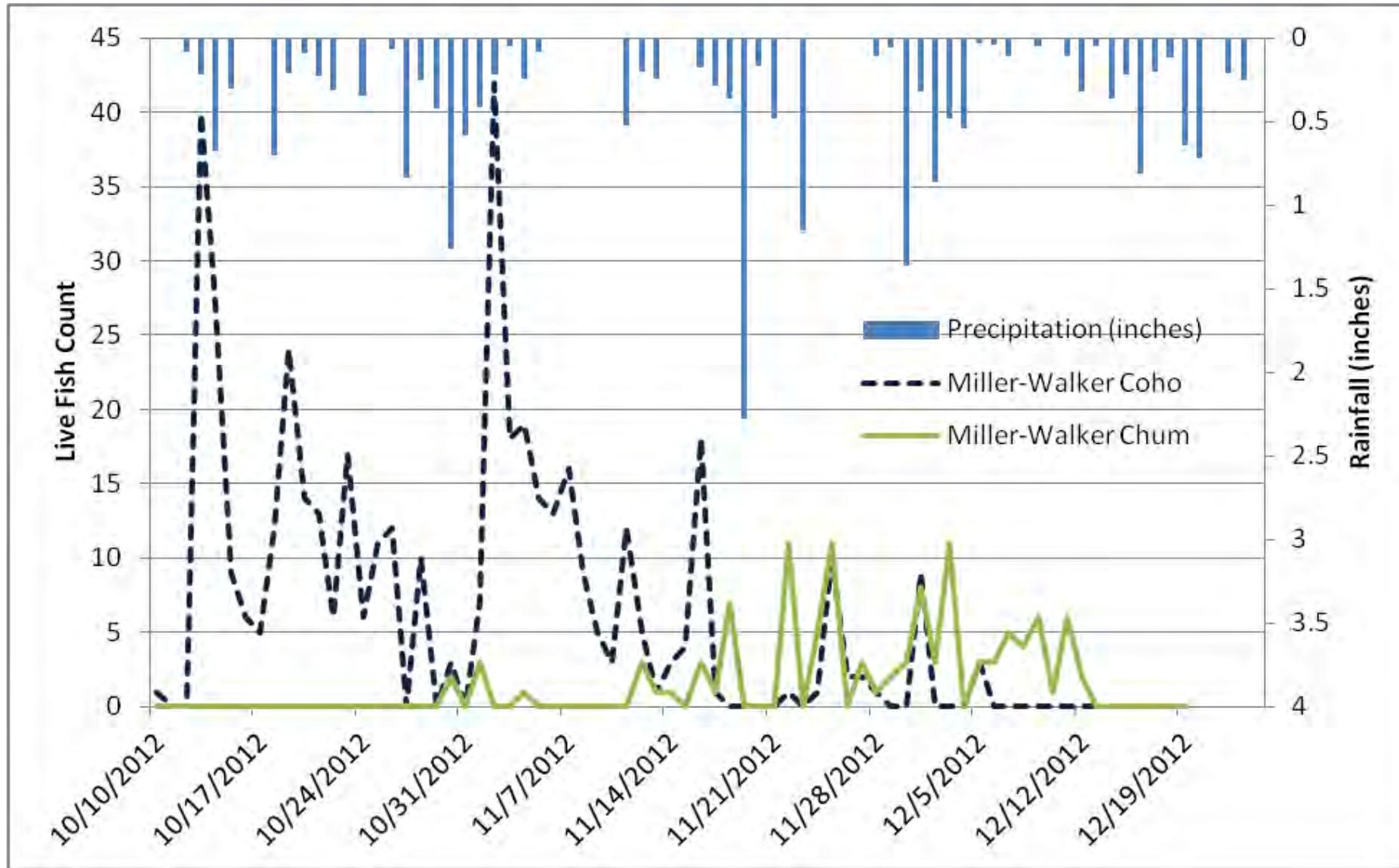
CSI Weather – Monthly Rainfall (inches)



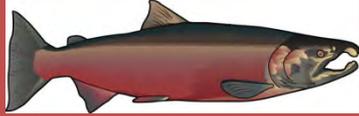
Rainfall and live fish - 2013



Rainfall and live fish - 2012



Estimated *Population*

Species	Coho 	Chum 	Total
Miller Creek	78	17	95
Walker Creek	41	11	52
Total	119	28	147

Assumptions:

- Using several peak counts 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.

Estimated *Population*

Species	Coho 	Chum 	Total
Miller Creek	56**	33*	89
Walker Creek	16*	12*	28
Total	72	45	117

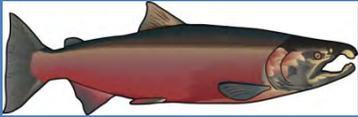
Assumptions:

*Using several peak counts over the survey period corrects for probable double-counting of fish – salmon spend several days in the stream.

**The number of coho carcasses was greater than the population estimate using peak counts on Miller Creek, so we will use number of carcasses for Miller Creek coho – carcasses were marked to prevent counting more than once.

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

Carcasses Summary

Species	Coho 	Chum 	Unidentified Adults
Miller Creek	56	25	
Walker Creek	8	1	
Total	64	26	17

Prespawn Mortality

**Coho experiencing
“prespawn” mortality at
Upper Miller survey location**

October 23, 2009



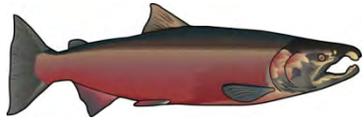
Prespawn Mortality (PSM)



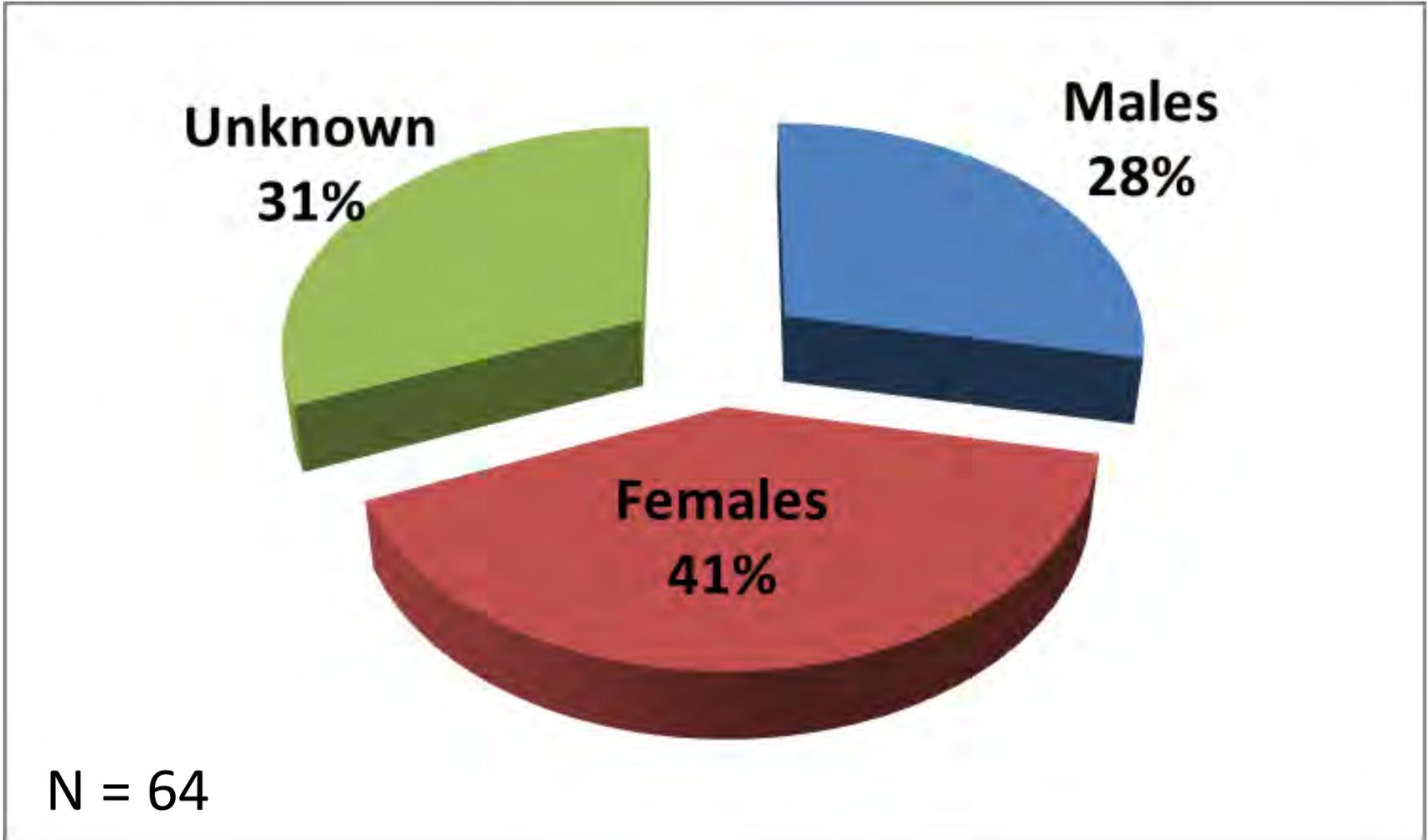
Coho female, full of eggs

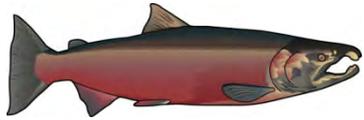
October 25, 2012

Photo courtesy of Pam Silimperi

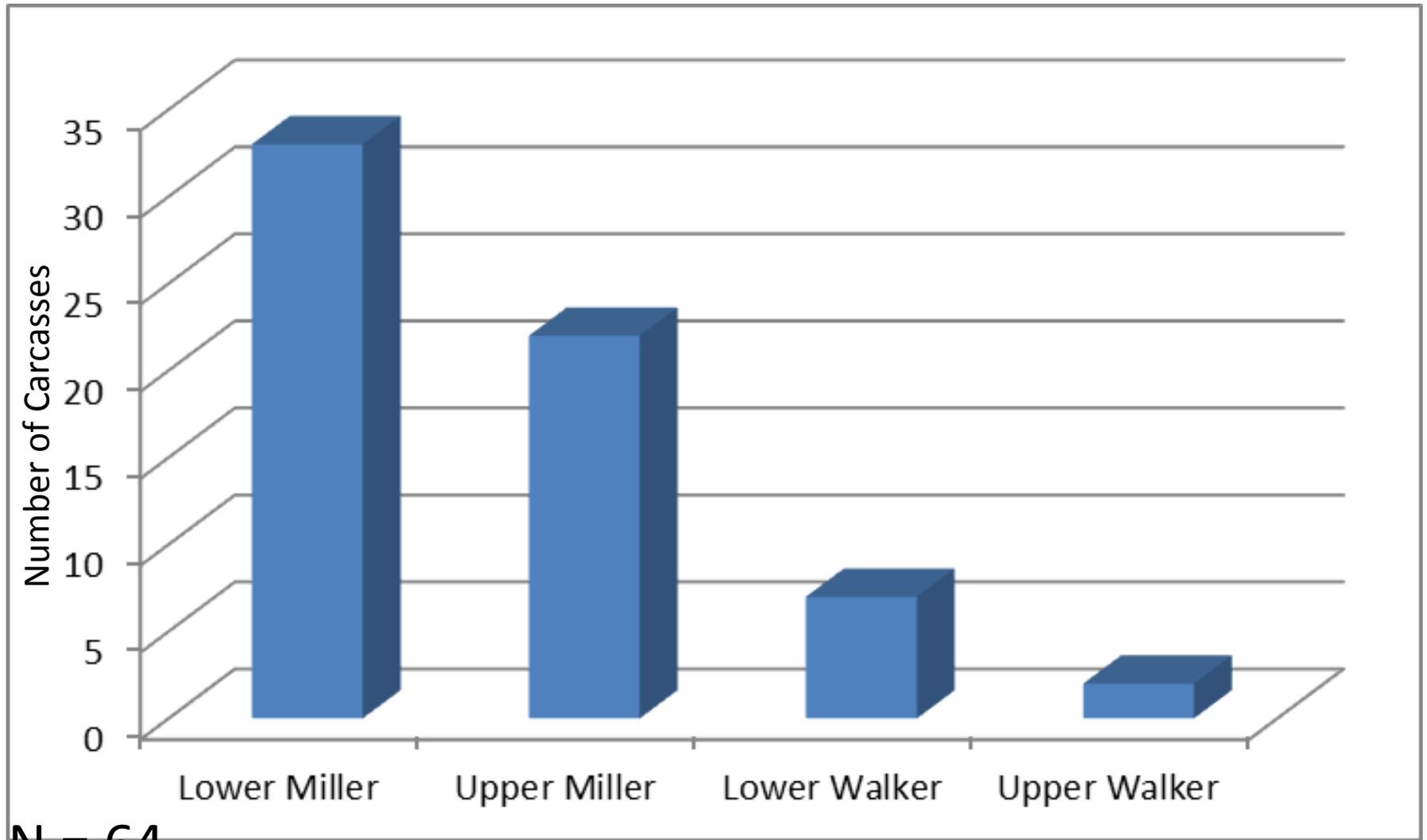


Coho Carcasses: Sex





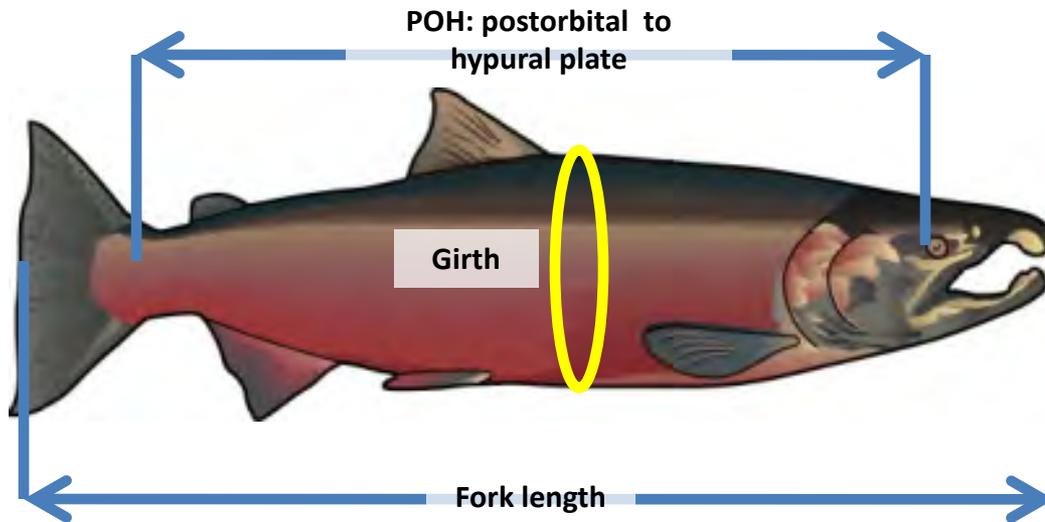
Coho Carcasses: Location

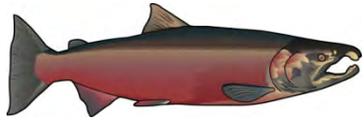


N = 64

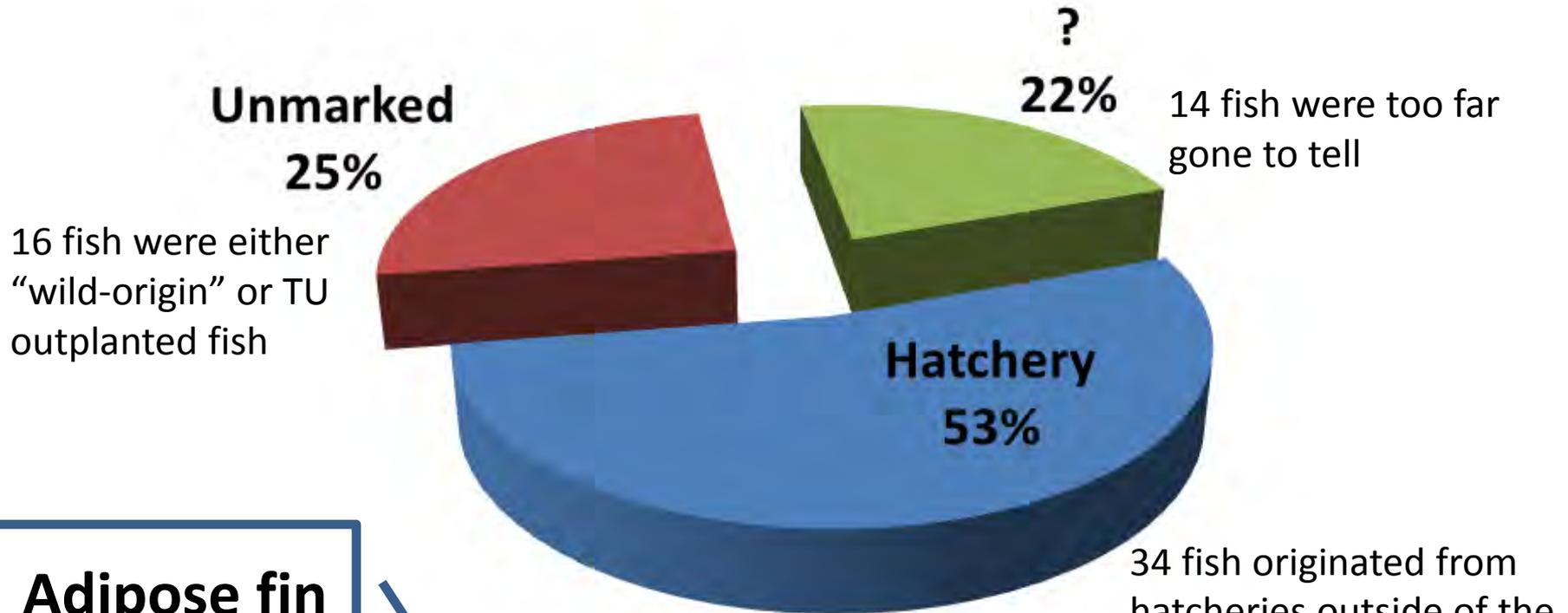
Coho Carcasses: Size

	Fork length (cm)	POH (cm)	Girth (cm)
Male average (n=18)	49.6	38.6	23.9
Female average (n=26)	58.3	46.2	27.6





Coho: Hatchery Origin



Adipose fin



N = 64

Collecting Coho Heads for Coded Wire Tags

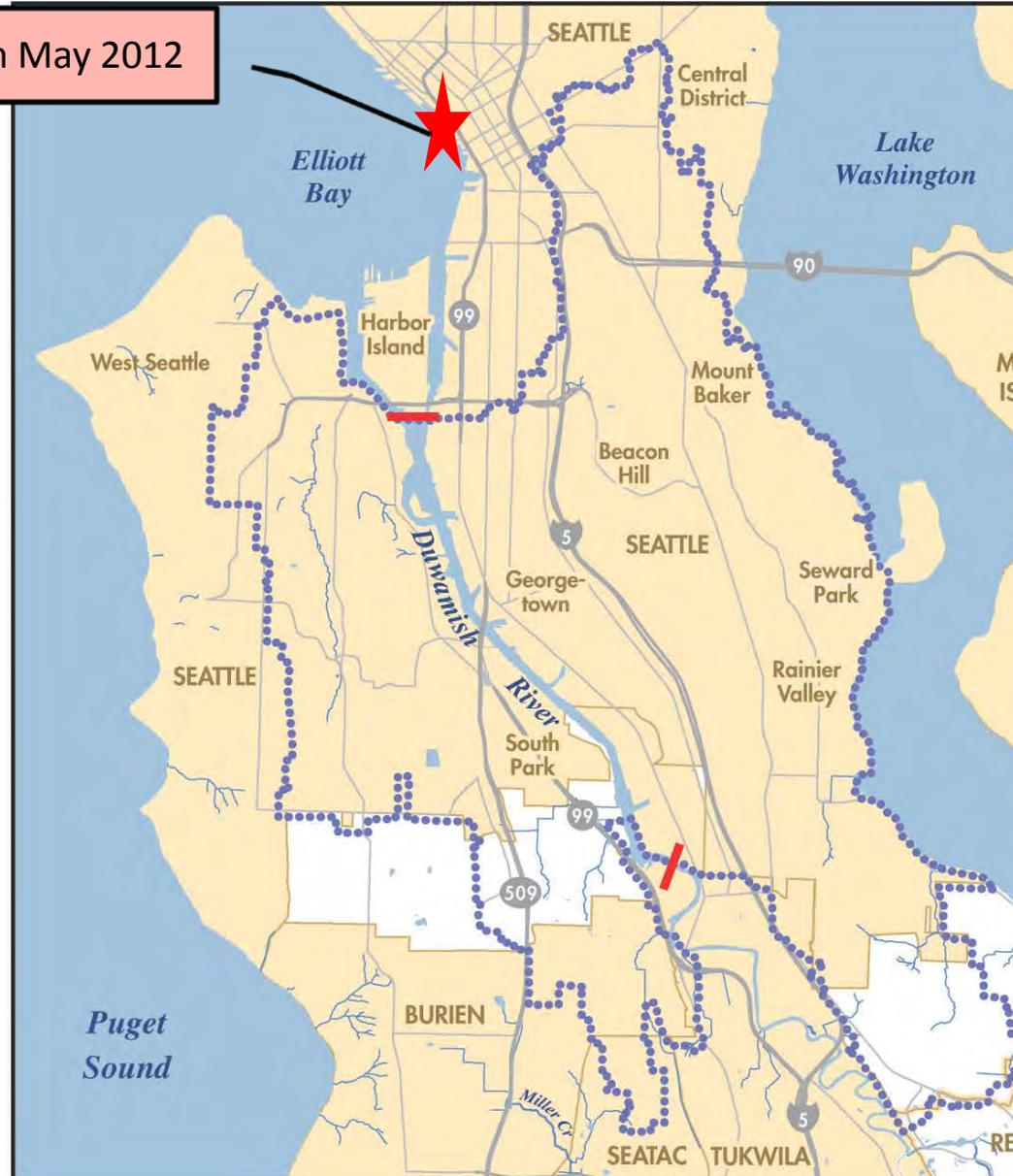


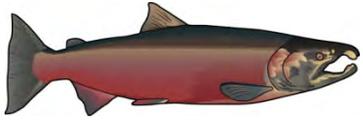
Image from Alaska Department of Fish and Game

Coho with Coded Wire Tags: 3

Coho released here in May 2012

- 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
- Miller Creek



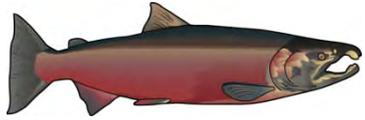


Coho: Success in Spawning

Miller and Walker Creeks – 10/22 females =
45% Pre-spawn Mortality

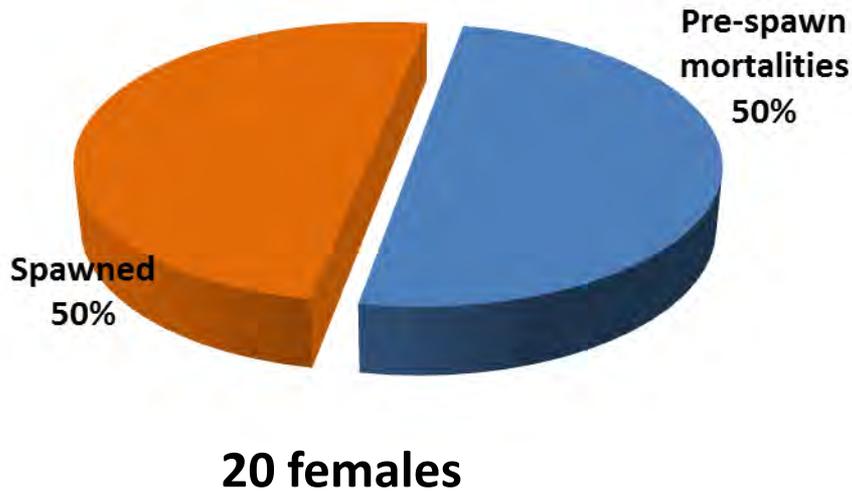


N = 22

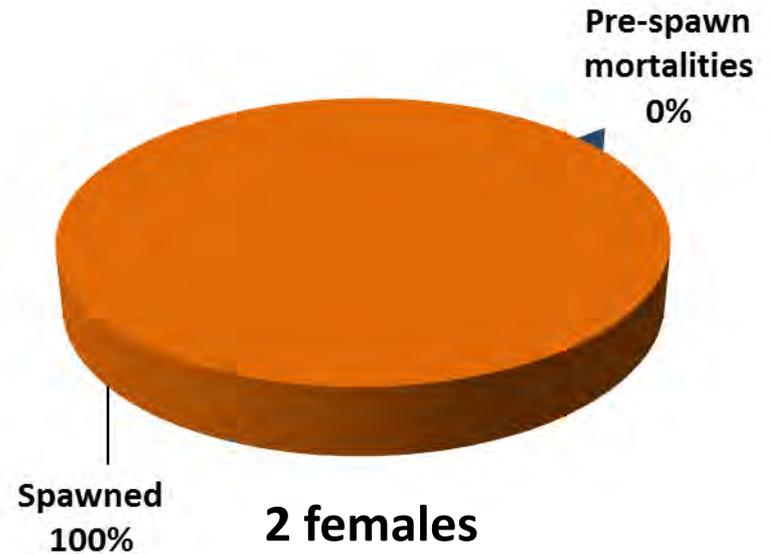


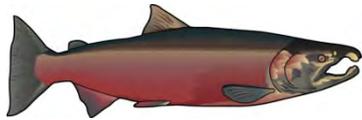
Coho: Success in Spawning

Miller Creek
50% PSM



Walker Creek
0% PSM

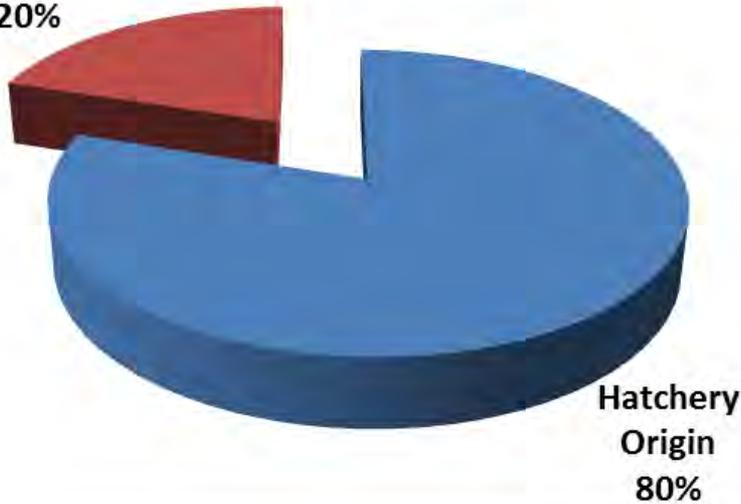




Coho: Success in Spawning and Origin

Pre-spawn Mortalities

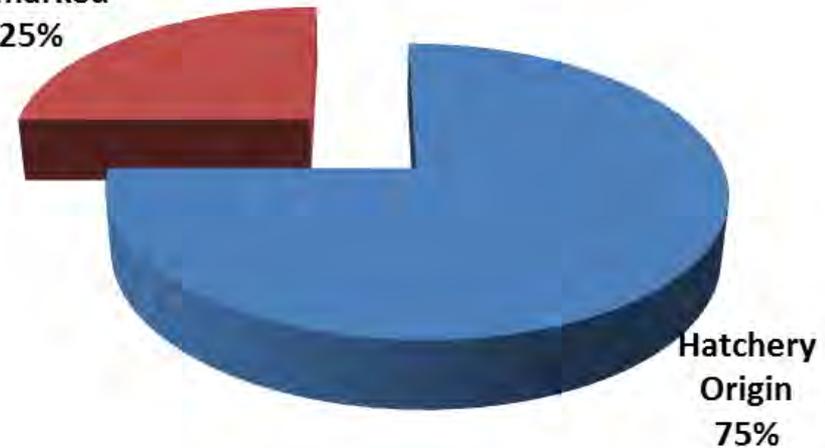
Unmarked
20%



N = 10

Spawned Fish

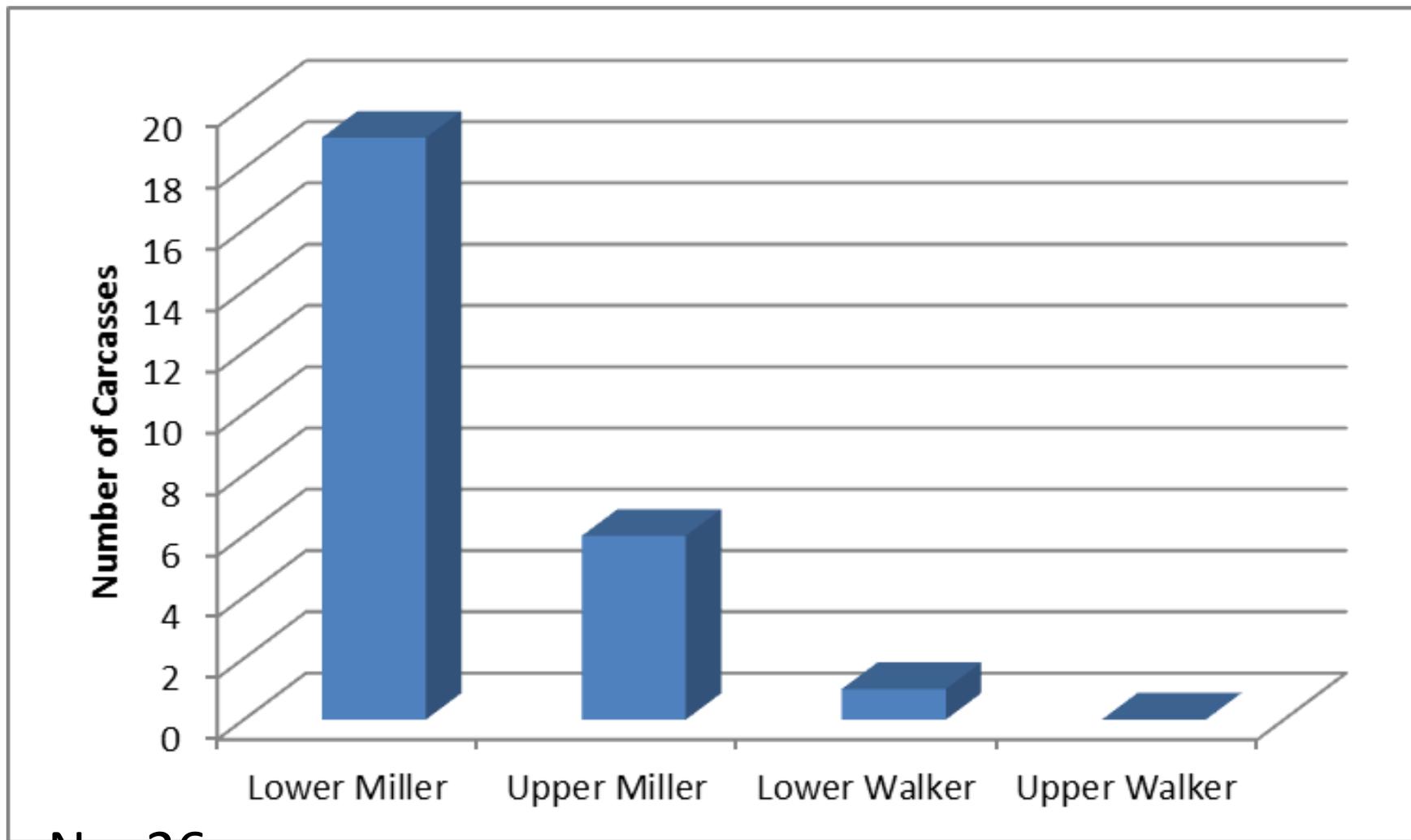
Unmarked
25%



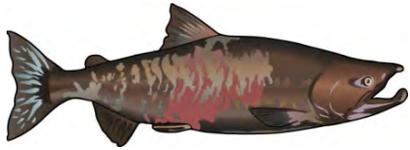
N = 12



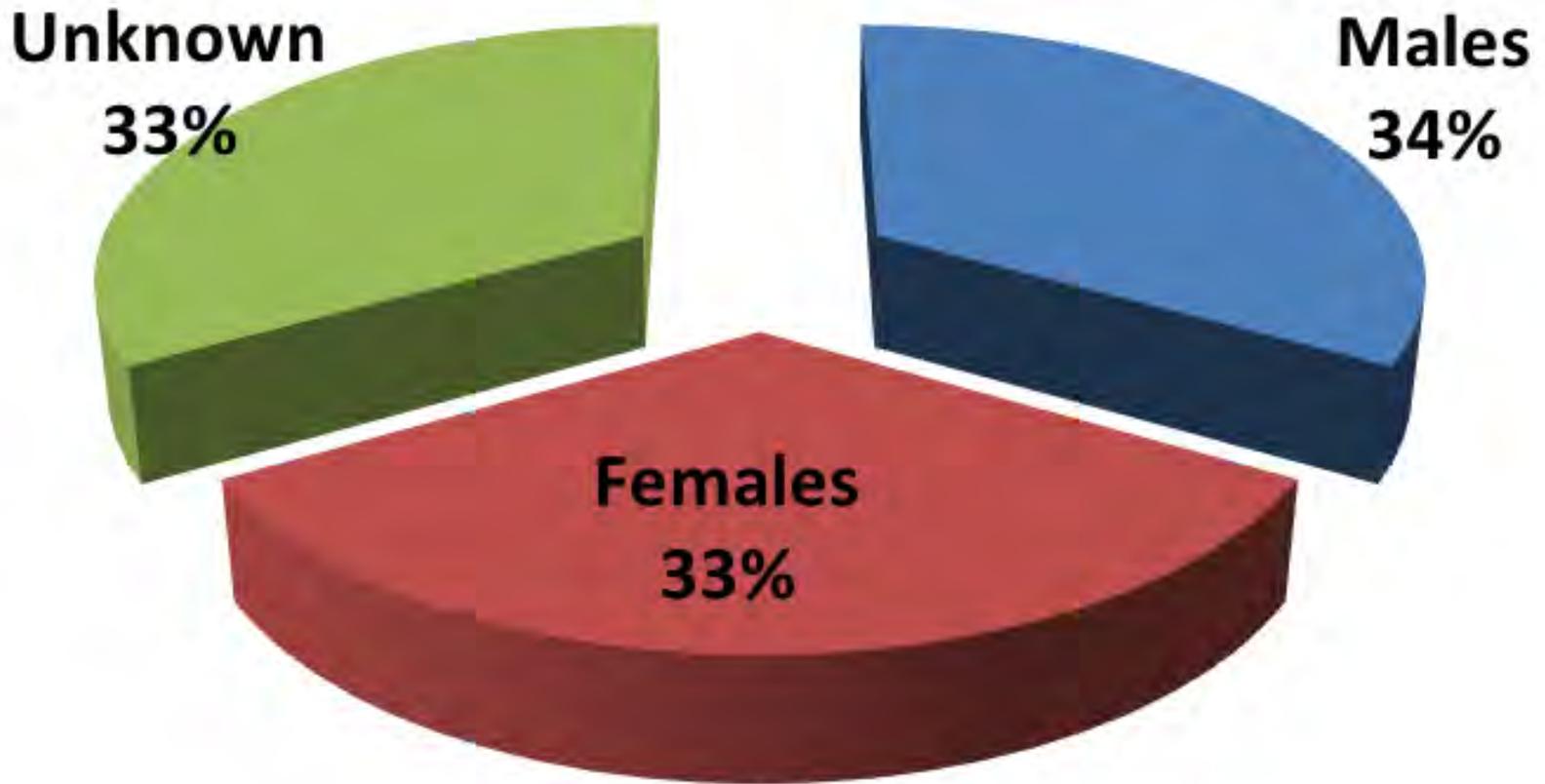
Chum Carcasses: Location



N = 26



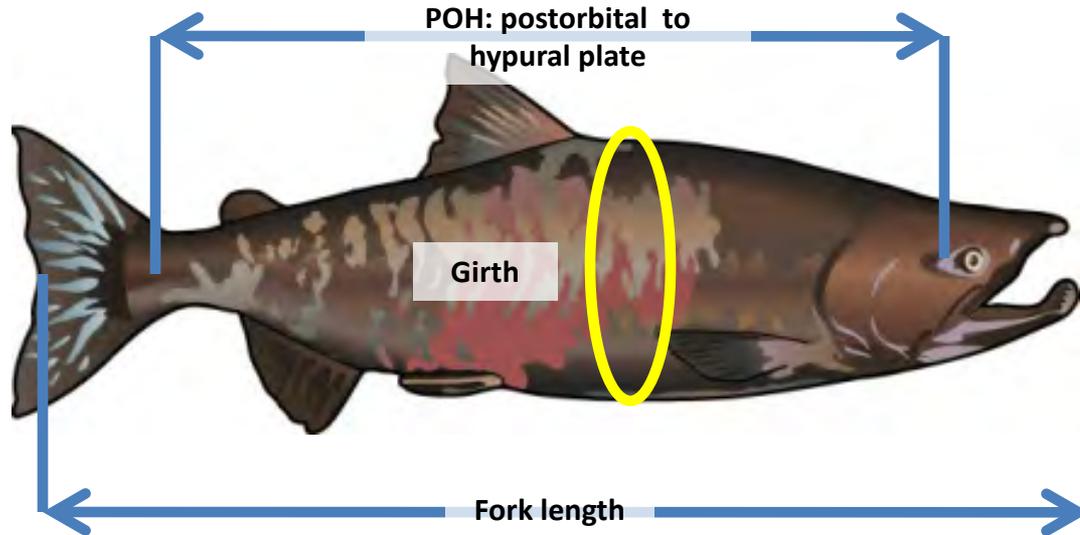
Chum Carcasses: Sex



N = 27

Chum Carcasses: Size

	Fork length (cm)	POH (cm)	Girth (cm)
Male average (n=9)	70.6	53.6	35.4
Female average (n=9)	62.6	48.7	28.3



Chum: Hatchery Origin Unknown



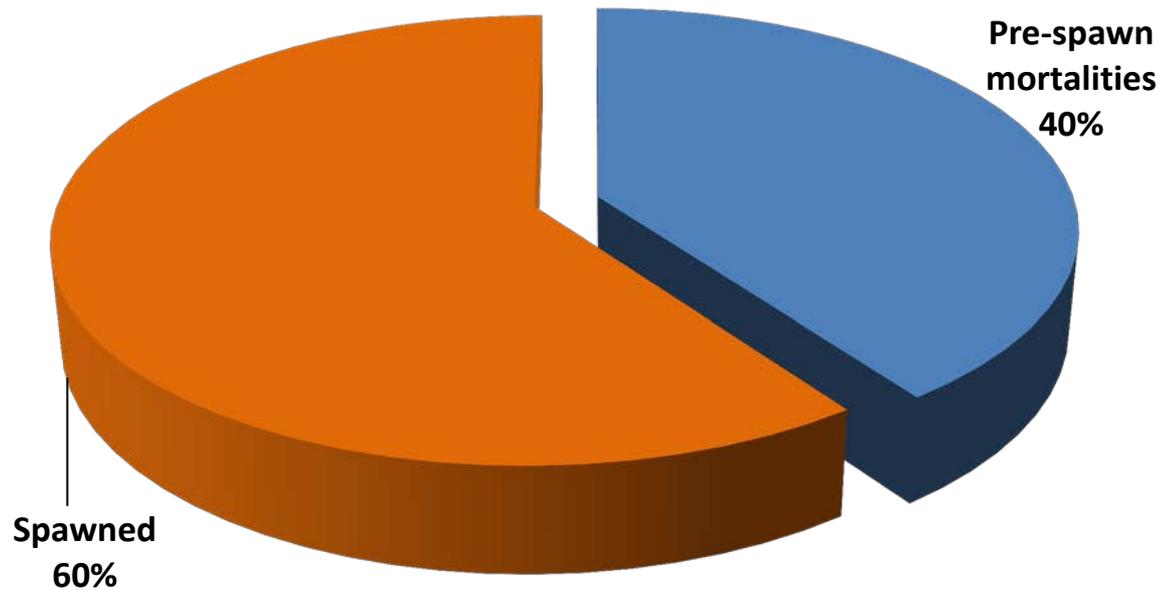
Adipose fin



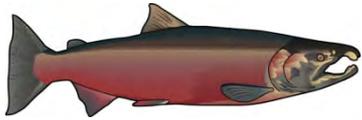
Chum: Success in Spawning

Miller and Walker Creeks – 2 of 5 females =

40% Pre-spawn Mortality

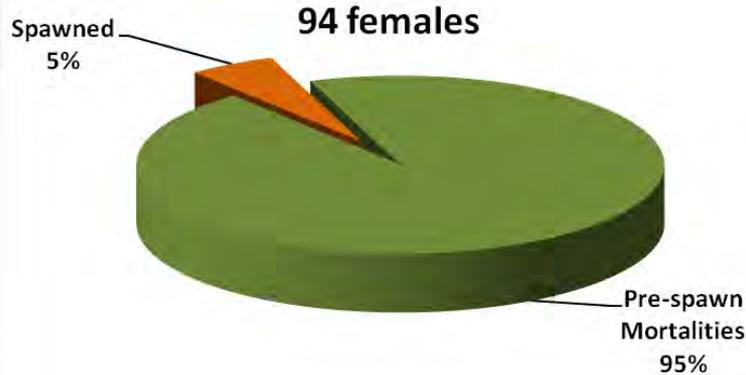


N = 5

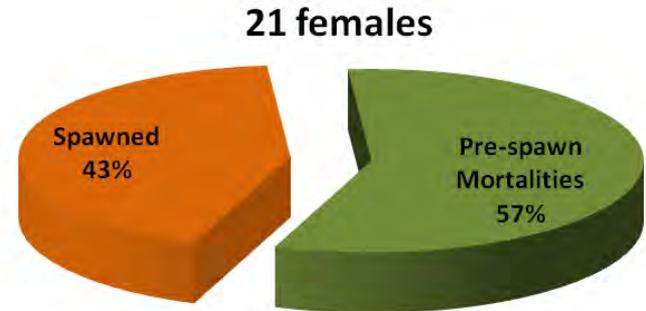


Coho: Spawning Success in 2012: Miller/Walker and Nearby

Miller Creek- 95% PSM

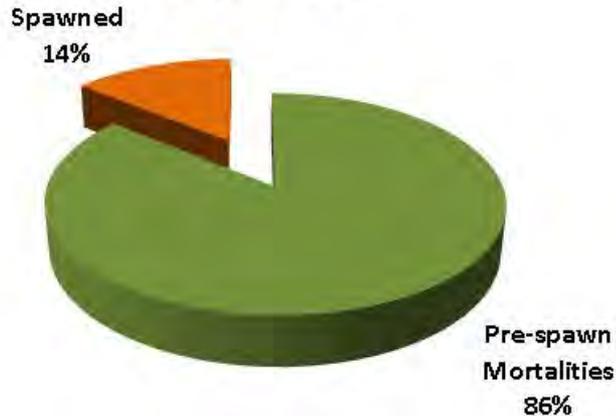


Walker Creek – 57% PSM



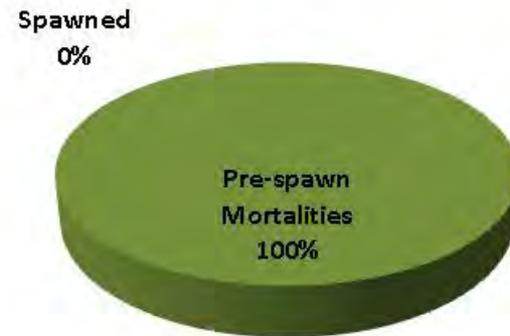
Longfellow Creek – 86% PSM

86 females



Des Moines – 100% PSM

34 females



Evidence of Predators

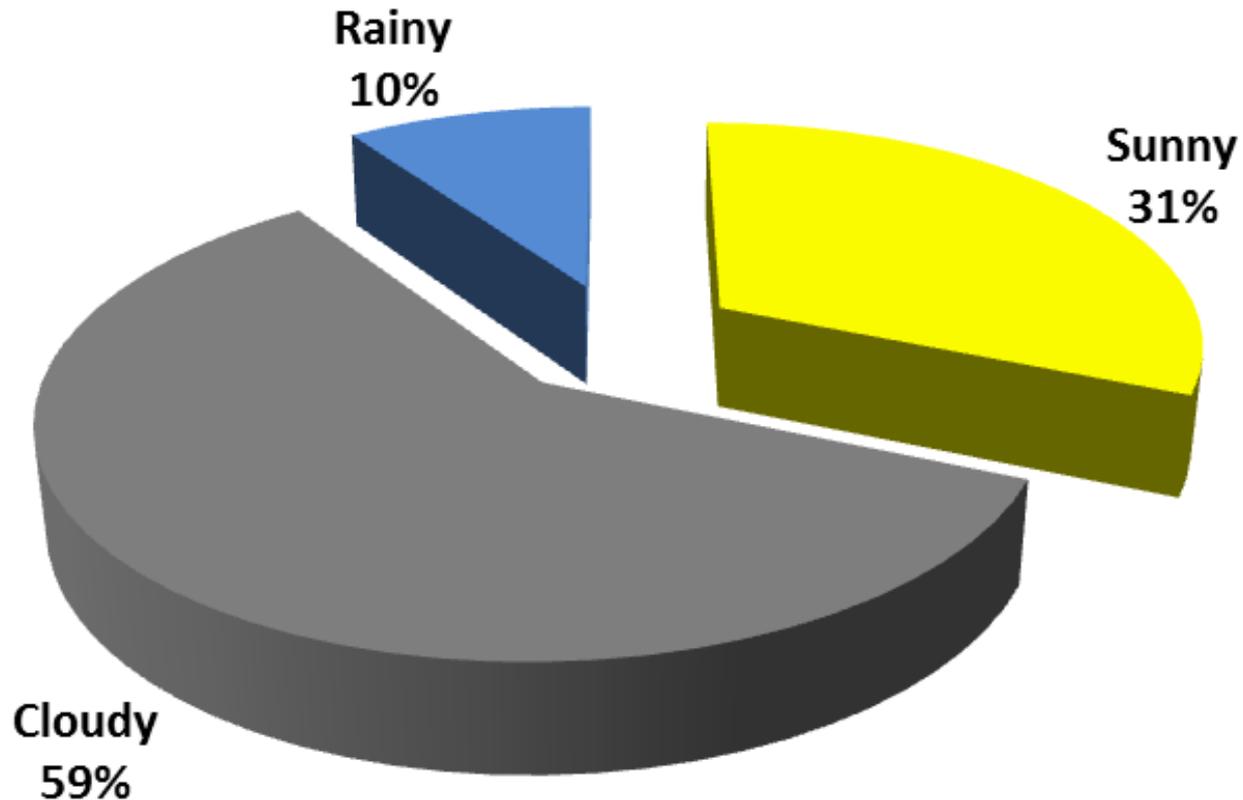


**Predated coho carcass and
raccoon tracks**

October 16, 2012

CSI Weather

- Average survey time = 2 hours, 38 minutes
- Weather conditions (84 survey days):



Wildlife

- Great blue heron
- Raccoon
- Coyote
- Bald eagle
- Red tailed hawks
- Green-backed heron



Coyote near Miller Creek

December 23, 2012

Photo by Robin Hoefer

Great blue heron

Beaver pond at The Cove

December 2, 2011



River otter

**Miller Creek at B.
Fish property
November 7, 2010**



Remarkable

Iron Bacteria on Miller Creek at the Cove

October 23, 2013

**Photo by Kristine
Feldman**



Beautiful

Ice

Photo by Joy Neubauer



Pollution?



Foam on Miller Creek

December 9, 2013

Photo by Joy Neubauer

Shared Funding for Stewardship

King County basin stewardship is jointly funded by five governments:



King County



Thank You Volunteers!

**“Team Saturday”
Jim, Matt and Tom walk
Miller Creek on a training
survey
October 13, 2012**



4) Plans for 2014 CSI

**Ethan documents a
carcass**

**December 5, 2010
Photo courtesy of
David Bobanick**



Plans for 2014 CSI Survey Season

- Continue the excellent work of the last 4 years by surveying again at four locations in Normandy Park
- Monitor through end of chum spawning season
- Maintain volunteer pool at between 25 & 32 persons
- Training (mark your calendars): October 2, 2014

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



Ways Streams Are Affected

- 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

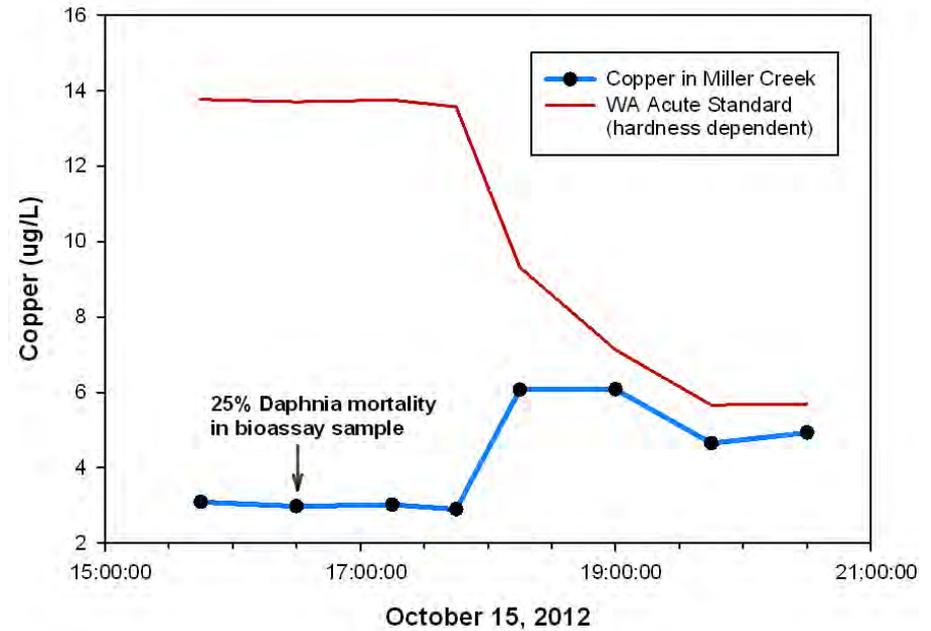
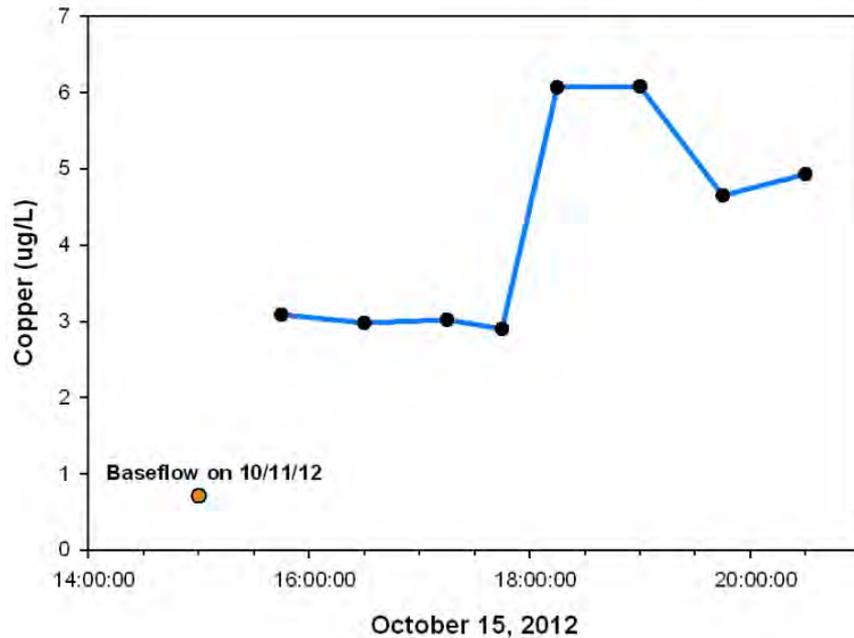


Testing highway runoff on adult coho

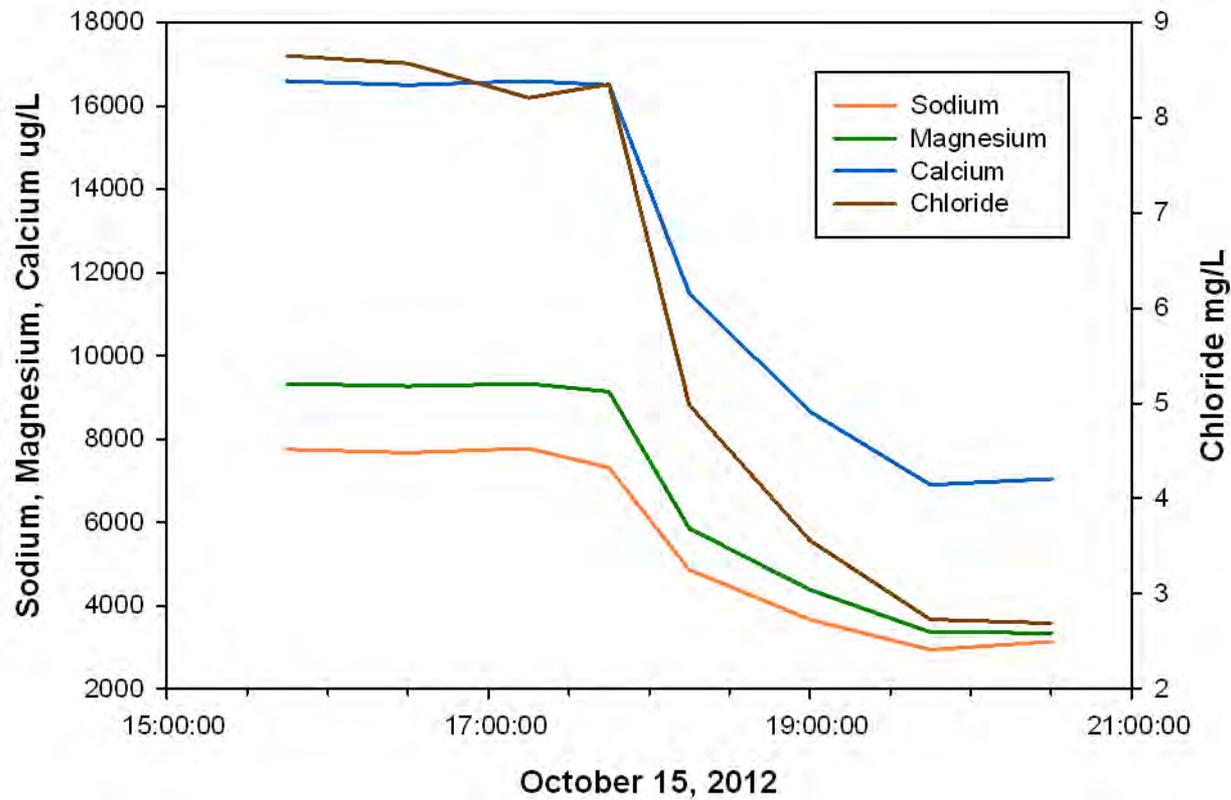


Photo courtesy of Tiffany Royal, Northwest Indian Fisheries Commission

Water Quality in Miller Creek – Copper



Water Quality in Miller Creek - Minerals





Expanded Ambaum stormwater detention pond in Burien

December 3, 2007



With funding
support from:



Washington State
Department of Transportation



Restoration of Walker Creek at Walker Preserve

August 24, 2009



With funding
support from:  **K&D**
King Conservation District

Stewards of the Cove at work since 2003



**Normandy Park
Community Club**

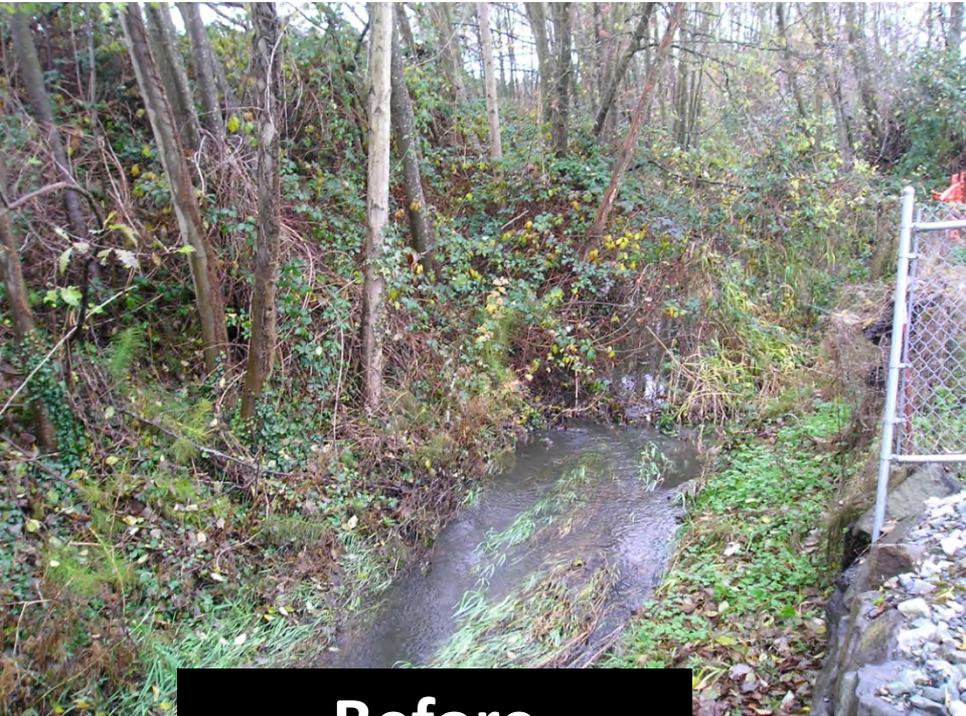


Cove volunteers installing log in Miller Creek

August 9, 2008

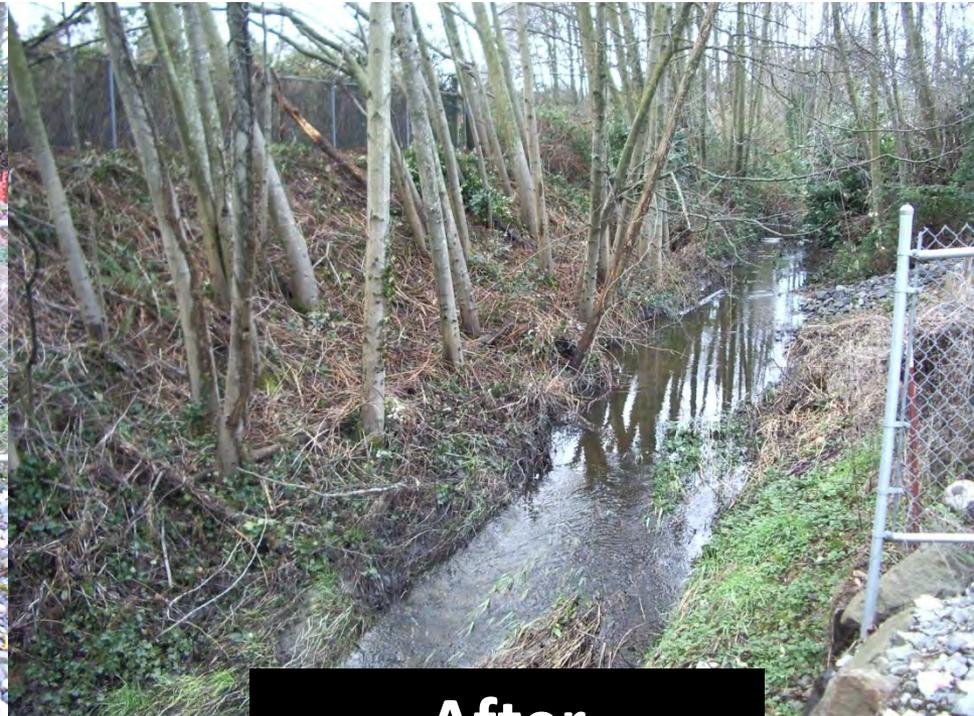
Photo courtesy of Al Miller

Homeowner Stewardship



Before

November 16, 2007

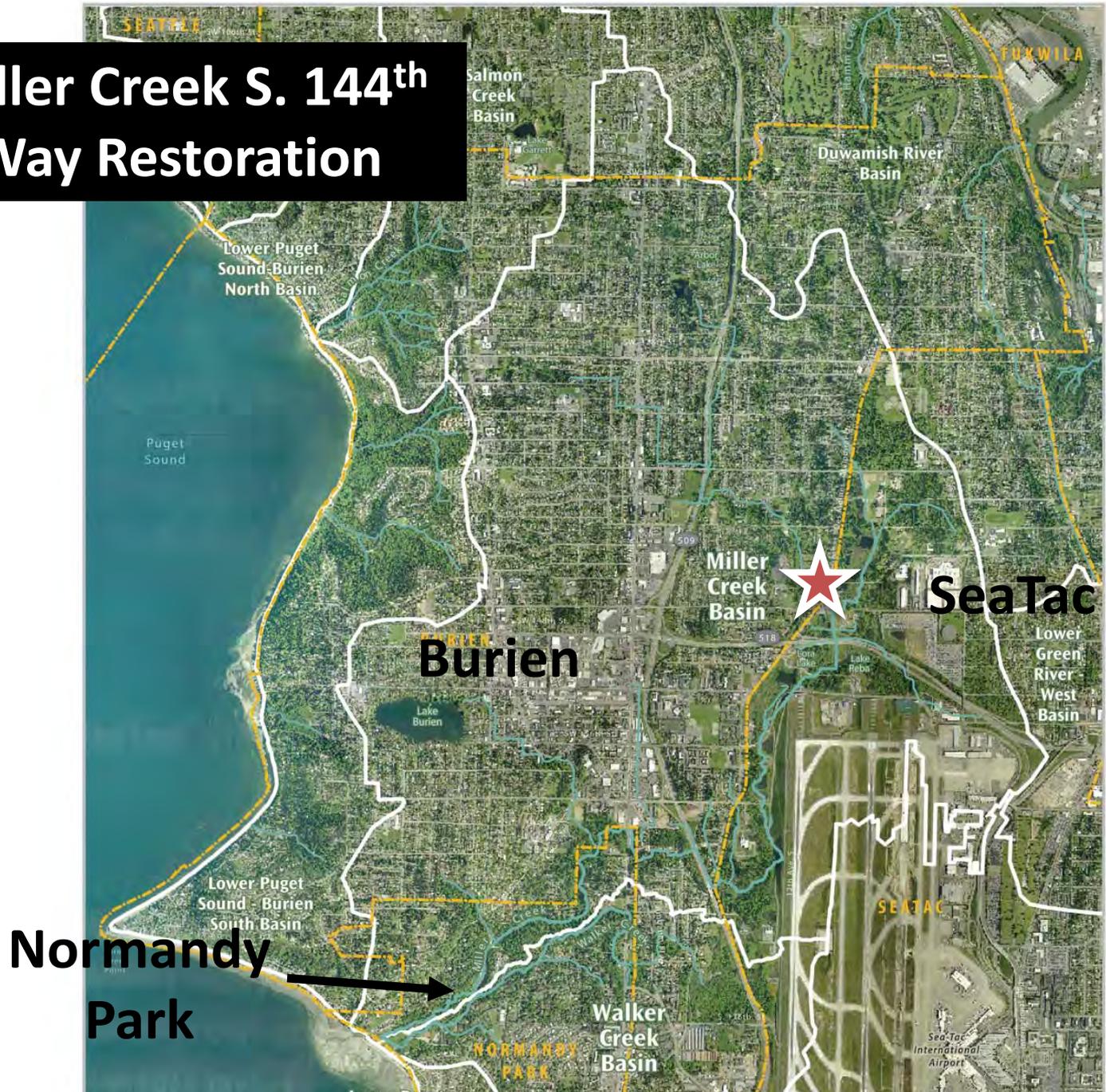


After

January 11, 2008

Photo on right courtesy of Kevin Alexander

Miller Creek S. 144th Way Restoration



**“Before” restoration at S. 144th
Way on Miller Creek in Burien**

October 11, 2007



**“Before” restoration at S. 144th
Way on Miller Creek in Burien**

October 11, 2007



**Invasive Himalayan blackberry;
no small native trees**

Community tree-planting

October 27, 2007

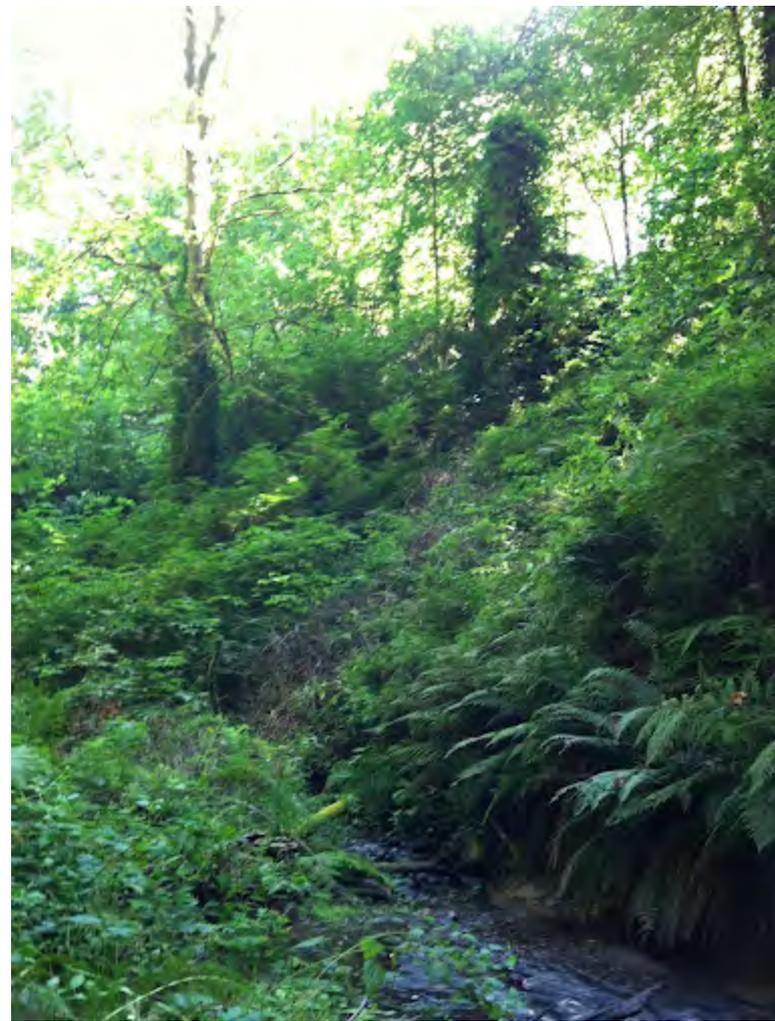




**“After” restoration at S. 144th Way
on Miller Creek in Burien**

October 26, 2007

**Himalayan blackberry removed;
over 150 native trees planted**



**Ivy in trees along Walker Creek in
Normandy Park**

August 25, 2011

**Normandy Park (former)
Mayor Clarke Brant
removes ivy along
Walker Creek in
Normandy Park**

March 22, 2008



Knotweed control on Walker Creek in Burien

October 16, 2007

Control by



King County

Funded by

Port 
of Seattle



6) Your Role





Things *You* Can Do

Clean up runoff:

Fix oil leaks in your car

- Check for leaks
- Contain leaks until you can get the car fixed



www.fixcarleaks.org



Things You Can Do

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)



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



Things *You* Can Do

- Support and contribute to Miller-Walker Stormwater Retrofit Planning
- Watch for upcoming open houses this spring and summer
- Attend to learn more and provide input on best locations and designs

Puget Sound 
Starts Here



Things *You* Can Do

Volunteer to mark storm drains



**Lindsay/Andolina family
marked storm drains in
their Burien neighborhood**

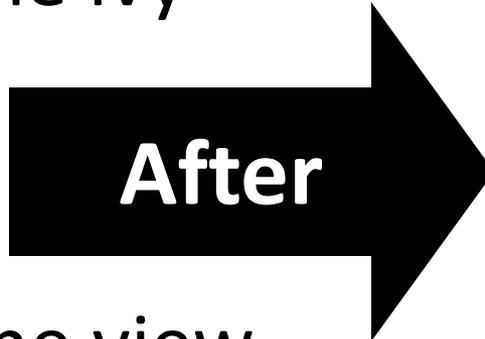
August 25, 2010



Things *You* Can Do



Save your trees –
remove the ivy



Trees ARE the view





Things *You* Can Do



Leave down logs in the stream

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 2014!



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

Community Salmon Investigation for Highline 2013 Presentation

1. Purpose of *CSI: Highline*
2. How *CSI: Highline* works
3. Results of October 2013 – January 2014 surveys
4. Thanked volunteers and property owners
4. Plans for *CSI: Highline* 2014
5. Factors affecting stream and salmon health
6. Your role!



The End

Photo courtesy of Barb and Darrell Williams