



Western Washington University
Western CEDAR

Salish Sea Ecosystem Conference

2014 Salish Sea Ecosystem Conference
(Seattle, Wash.)

May 1st, 1:30 PM - 3:00 PM

An overview of the Salish Sea Marine Survival Project: U.S.- Canada integration

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Pacific Salmon Foundation

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Schmidt, Michael W. and Riddell, Brian E., "An overview of the Salish Sea Marine Survival Project: U.S.-
Canada integration" (2014). *Salish Sea Ecosystem Conference*. 2014.
<https://cedar.wwu.edu/ssec/2014ssec/Day2/201>

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SALISH SEA

MARINE SURVIVAL PROJECT

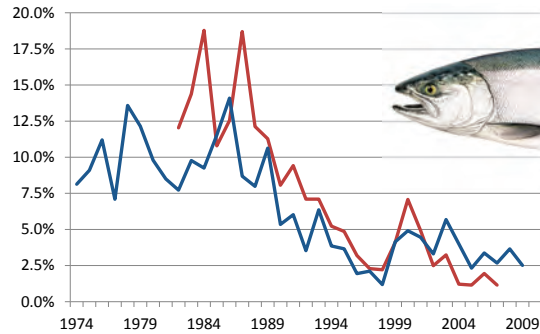


A Salish Sea-wide anomaly

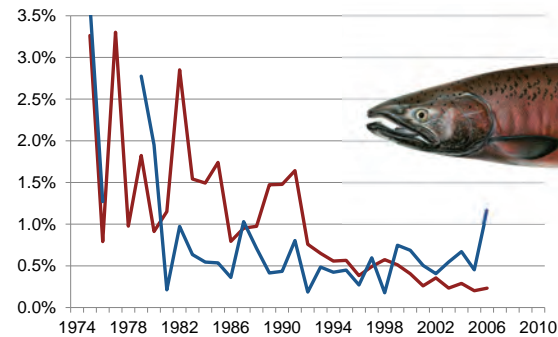
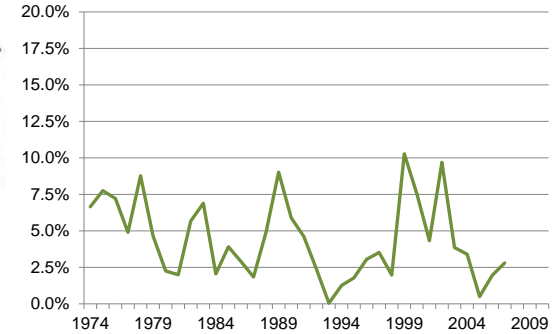


A Salish Sea Anomaly: Decline in Marine Survival

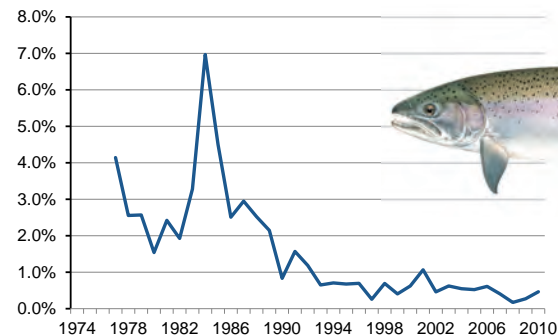
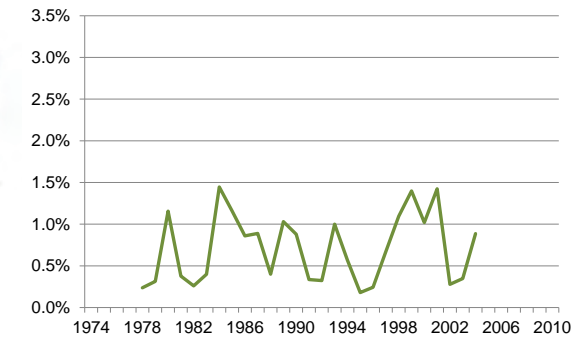
● Puget Sound
● Strait of Georgia
VS
● Washington / B.C. Coast



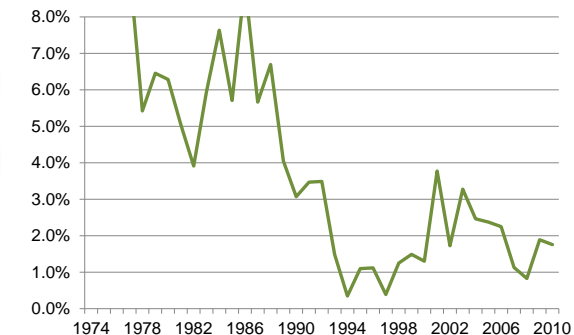
Coho



Chinook

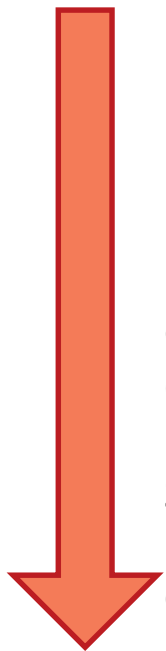


Steelhead





... and changes have not only been observed in Coho, Chinook & steelhead



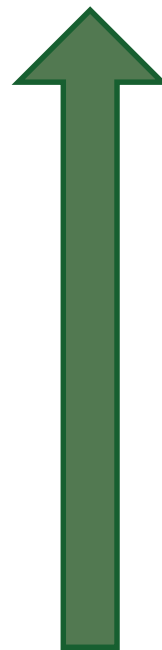
Fraser sockeye salmon (+/-)

Herring spawning locations

Forage fishes (bait fishes);
e.g. Fraser River eulachon,
Ch. Pt. herring

Some marine fishes

Giant kelp and sea grasses



Harbour seals, white-sided
dolphin, and harbor porpoise

Pink salmon (odd-year)

Strait waters, up 1°C over the
past 30 years

Human population &
developments

Issues to address

1. Major changes observed widely. Much uncertainty about why.
2. Little integration of research efforts (fragmented efforts on singular topics/times/locations).
3. Widely dispersed funding limiting scale of efforts.

2012 Workshop: determined there was sufficient merit to a collaborative, US-CA program



... builds on efforts of

- PSF's Strait of Georgia proposal (2009)
- PSC's Fraser Sockeye workshop (June 2010)
- Salish Sea Ecosystem Conference (2011)
- Strait of Georgia Data Centre development (PSF/UBC/Sitka Foundation, 2012)
- Puget Sound marine survival research planning (LLTK, 2012)
- Salish Sea Marine Survival Workshop (LLTK/PSF, Nov. 2012)

A fully integrated, multi-disciplinary program to determine the primary factors affecting early marine survival of salmon and steelhead in the Salish Sea.

Expected Outcomes

- Identify & prioritize management actions to **increase the survival** of Salish Sea wild and hatchery salmon and steelhead;
- Improve the accuracy of **adult return forecasting** for natural spawning, harvest, and hatchery management; and
- More accurately evaluate the success of freshwater habitat restoration activities by **reducing uncertainty around the role of the marine environment** in overall productivity.

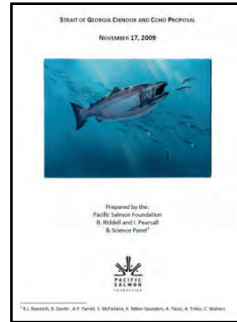


Process

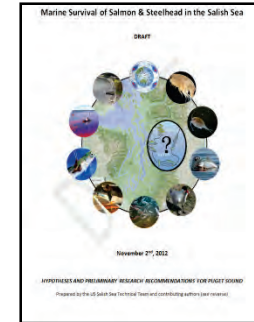
Canada

US

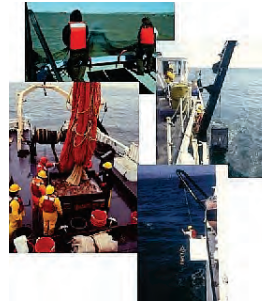
Comprehensive research planning
(initial round through 2014)



Workshops +
New Information



Coordinated, systematic research
(2014-2017)



Dissemination and application of the research results to management
(2018)



How are we implementing this work?

Operational Structure

Nonprofit Support

- Project management, coordination and facilitation
- Fundraising and Communications
- Support integration with other programs

Management Team

(Managers and Funders)

- Program guidance
- Fundraising
- Respond to research outcomes

Science Teams

- Plan and implement research
- Data standards and methodology
- Data management and analyses

Supporting Experts

- Info systems and websites
- Assist w/ research planning and implementation



Partners and Funders



Coordination

- U.S. – Canada workgroups targeting high level integration.
- Proposals and study protocol shared/reviewed transboundary to ensure alignment.
- Workgroup and research team support via conference calls, Web Ex, Basecamp, email.
- Annual workgroup retreats, larger conferences at halfway point and end.
- US-CA project coordinators weekly communications.
- Communications/Development team (media dev., press, fundraising, etc.)
- Joint Project website- under development.

Collaboration and Data Sharing

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PS Bottom-up Program Salish Sea Marine Survival


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Most active discussions

Nisqually Sample Processing Questions and Sample Transfer
 [Latest comment yesterday](#) by Julie Keister
7 comments posted

Status Request - Juvenile Chinook and coho collection
 [Latest comment Mon, 7 Apr](#) by Russel Barsh
7 comments posted

Urgent - review zooplankton sampling sites and respond
 [Latest comment 30 Mar](#) by Russel Barsh
2 comments posted

 **Jed Moore** posted this message on Thu, 10 Apr:
Nisqually Sample Processing Questions and Sample Transfer
Hello Sample Processing Project Partners,

I have a few questions regarding sample processing, and I think it's about time to set up a sample transfer meet-up.


Regarding sample processing, I recently received genetic sampling vials, labels from WDFW and I am uncertain of who should ultimately take custody of these vials and process the genetic samples. From our discussions about the division of sampling labor my impression was the following:

For Estuary & Nearshore Chinook and Coho:


Nisqually will:

<https://nwsalmonprojects.basecamhq.com/projects/11832848-ps-bottom-up-program/c...>

STRAIT OF GEORGIA DATA CENTRE



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SEARCH DATA

Hypotheses

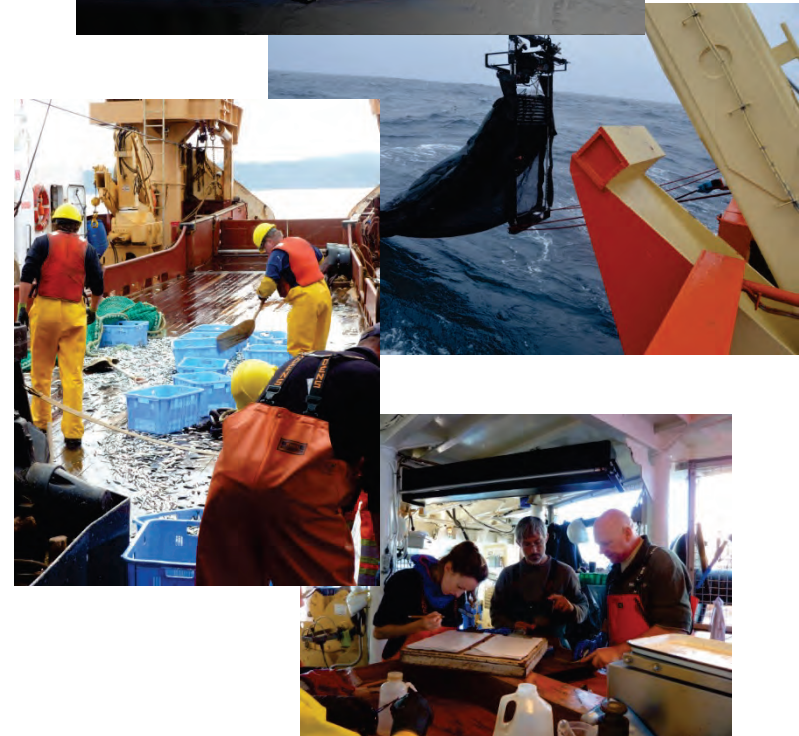
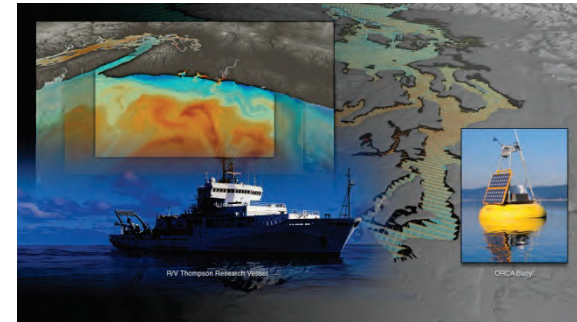
- A. Bottom-up processes** that drive Chinook, coho and forage fish prey availability have changed, and salmon aren't able to compensate - What are time and space scales of effects?
- B. Top-down processes contributing** – Primarily more predators make situation worse. Eating larger juvenile steelhead, resident salmon and baitfish. - If survival is determined in the initial few months, what are the proximate causes of mortality?
- C. Other factors may compound the problem:**
- Microbes & disease
 - Toxics
 - Habitat degradation (role of estuaries?)



Ultimately, is this caused by local, human influence or regional or global impacts (climate change, natural ocean and temperature cycles)?

Research Approach

- Examine condition of salmon and steelhead as they out-migrate to determine what story the fish tell us.
- Simultaneously analyze the physical and biological (plankton) characteristics – cornerstone of Salish Sea ecosystem.
- Identify critical growth periods for salmon and understand mechanisms affecting growth.
- Perform targeted studies of contributing factors such as predation, disease, toxic chemicals, etc.
- Use existing and new data to analyze and model relationships between salmon and their ecosystem, to evaluate the interaction of multiple factors and build back to factors ultimately driving survival.



Research Categories

Trend Analyses and Modeling - Establishes the platform for integrated data analyses for the entire project. Includes survival trends, ecosystem indicators development and ecosystem modeling.

Highly integrated between U.S. and Canada.

Core, Bottom-Up Sampling Program – Examines fish, zooplankton & physical characteristics of the Salish Sea.

Highly integrated between U.S. and Canada

Top down studies and other work – Targeted studies of potential contributing factors (disease, predation, toxics, aquaculture impacts , etc). Process studies to compliment sampling program and build out to fundamental drivers of survival.

Distributed approach among U.S. and Canada scientists to address unique issues and cover more ground

2014-15 Chinook and Coho Research

Iterative research approach

Trend Analyses and Modeling

- Salish Sea-wide survival trends analyses.
- Correlative Analyses: Life-history, and biological/physical char. of environment
- Life-cycle modeling, ecosystem indicators development and ecosystem modeling (NPZ and full food web)

Core, Bottom-Up Sampling Program

- SOG - Cowichan (2015-Campbell River, Baynes Sound, Fraser, Powell River/Sechelt)
- PS – Offshore of Nooksack, Skagit, Snohomish, Nisqually and San Juan Islands
 - Physical & Zooplankton (2014 Puget Sound wide. 2015 SOG wide).
 - Fish: Lower river to Deep Marine - Relationship bet. prey availability and critical growth periods.
- Tools - Buoy upgrades, CTD, gliders, arrays, traps, nets, small vessels, seiners, citizen science.

Top down studies and other work

- PS - Toxic chemicals in outmigrating Chinook
- SOG - Disease and predation studies: Cowichan prototype 2013-2014
- SOG – 2015 seal predation & PIT-tag study
- SOG – 2015 Contaminants and ocean acidification

2014-2015 Steelhead – Puget Sound

- **5 studies use existing data** to evaluate patterns and trends in steelhead marine survival and behavior compared to a range of factors that may be contributing to their mortality.
- **4 field studies** to identify the locations, rate and timing of mortality and evaluate disease, toxic contaminants, genetics, and predator-prey interactions to reveal the direct and underlying causes of steelhead mortality in Puget Sound.
- **1 genetics study** to determine whether there are inherent differences between steelhead that die or survive in Puget Sound,
- (future) **ecosystem modeling** will be used to look at the combined effects of the multiple factors that may be contributing to mortality.

Funding Status

- \$20 million dollars (new money) over 5 years: \$10 million U.S / \$10 million Canada
- Raised approximately \$10.25 million to date: \$3.5 million U.S. / \$6.5 million Canada (+\$500k pending)
- Anchored by \$5 million/ 5 year grant from the Pacific Salmon Commission, Southern Endowment Fund



Partners and Funders





SALISH SEA

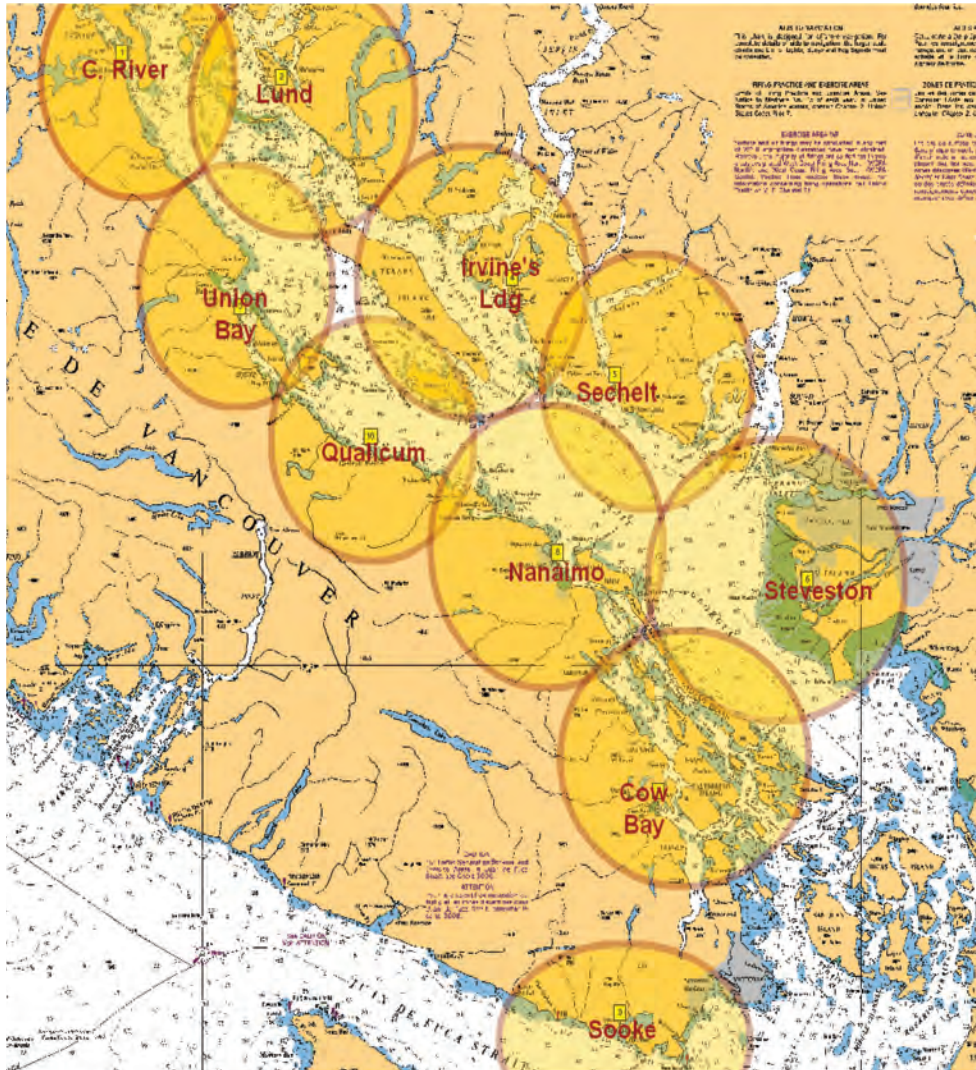
MARINE SURVIVAL PROJECT

www.marinesurvivalproject.com

**LONG LIVE
THE KINGS**



Citizen Science in the Strait of Georgia



- 2014 development: Cowichan Bay, & Campbell River, Victoria, Deep Bay.
- Define time/space scales for sampling
- Involves Ocean Networks Canada, IOS staff, SSMSP technicians

Collaborative Puget Sound Sampling

- Over 80 biologists in the field and labs
- 18 entities involved
- Federal, state, tribal, nonprofit and academic participants

Puget Sound

- Buoy
- Zooplankton
- Juv. Salmon and Steelhead

