THE SALISH SEA MARINE SURVIVAL PROJECT: 2023 UPDATE

Liz Duffy (LLTK) & Isobel Pearsall (PSF)

Salish Sea Science Roundtable
5 December 2023

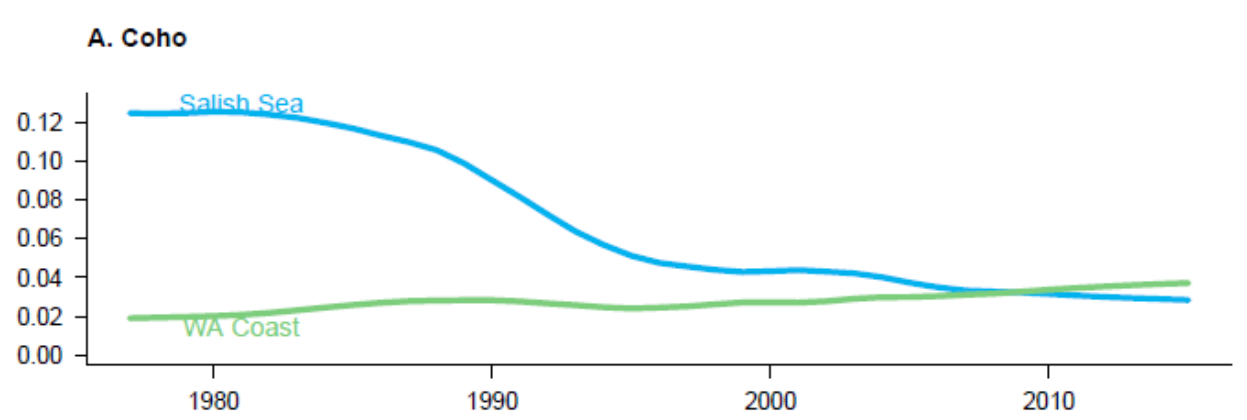
SSMSP Overview

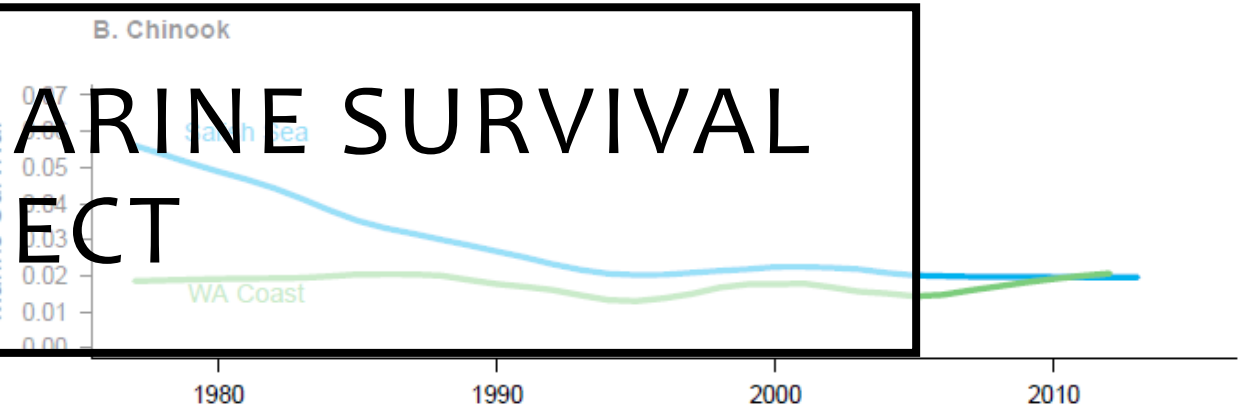
Findings & Recommendations

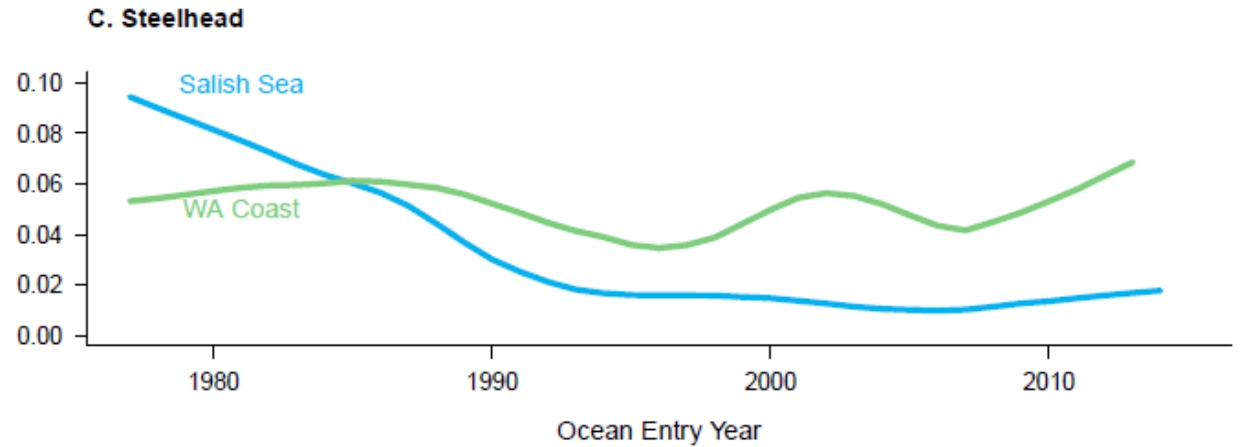
2023 Workshop

Outcomes & Next Steps

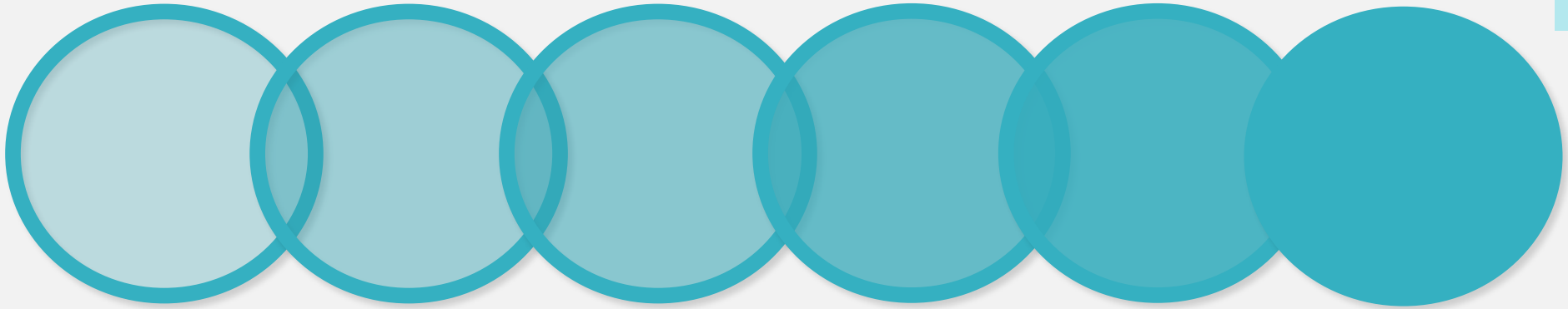
THE SALISH SEA MARINE SURVIVAL PROJECT







2014-2020



200+ participants

60+ entities

$40 million

7 years

2 countries

1 question

What affects the survival of young Chinook, Coho & steelhead in the Salish Sea?

SALISH SEA
MARINE SURVIVAL PROJECT

LONG LIVE THE KINGS

PACIFIC SALMON FOUNDATION

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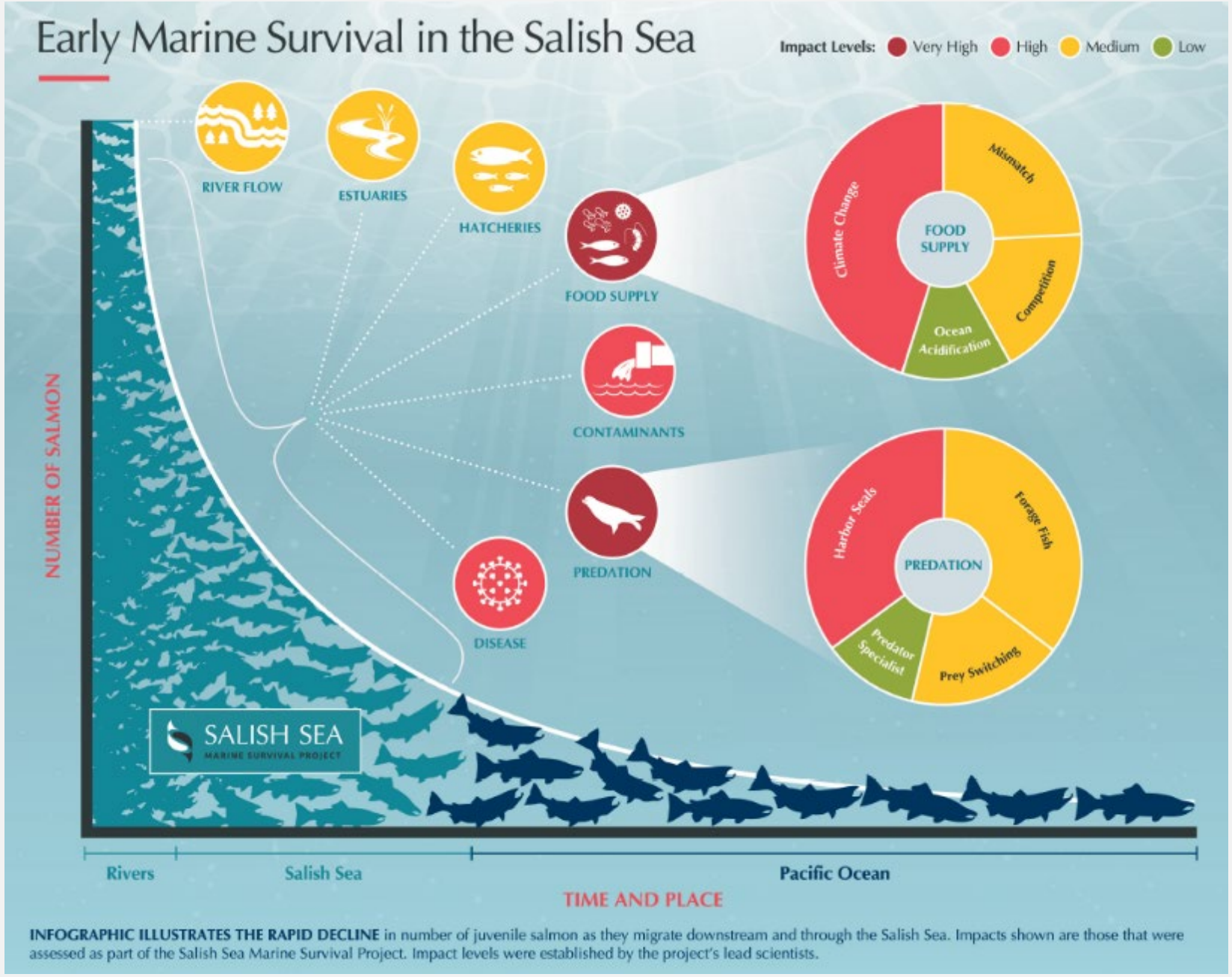
KEY FINDINGS

- Changes in food supply
- Impacts of predation
- But no simple “smoking gun”



SUMMARY OF RECOMMENDATIONS

APPLIED ACTIONS

- Protect & manage **river flows**
- Recover **herring** populations
- Assess strategies to **reduce seal predation**
- Restore and protect estuary & nearshore **habitat**
- Support **salmon resilience** by protecting and promoting life history variability
- Optimize the **health** and survival of hatchery-reared salmon
- Assess **disease impacts** in the face of climate change
- Identify **toxic hotspots** and sources & work to reduce them

SUMMARY OF RECOMMENDATIONS

SCIENCE AND MONITORING

- Continue critical science
- Maintain and **improve monitoring**
- Continue to test **innovative** research techniques and strategies
- Make data **openly available**

SUMMARY OF RECOMMENDATIONS

PLANNING & ADAPTIVE MANAGEMENT

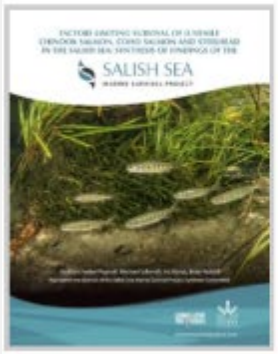
- Improve **forecasting** and planning with new data from monitoring networks and improved **models**
- Incorporate the role and **impact of climate change** in recovery plans and management actions

SUMMARY OF RECOMMENDATIONS

OUTREACH & EDUCATION

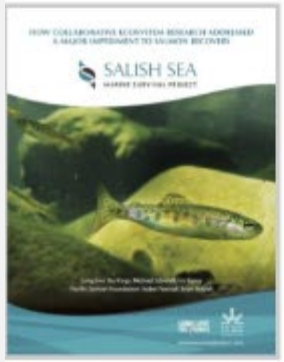
- Improve **education** and **communication**
- Strengthen and support the international community of researchers
- Establish and support a **formal transboundary ecosystem science support structure** (potentially at Salish Sea Institute)

2021



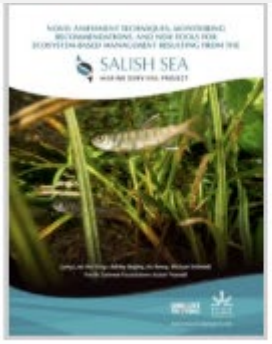
Full Synthesis Report (142 pages)

Factors Limiting Survival of Juvenile Chinook Salmon, Coho Salmon and Steelhead in the Salish Sea: Synthesis of Findings of the Salish Sea Marine Survival Project



A Collaborative Ecosystem Research Approach (11 pages)

How Collaborative Ecosystem Research Addressed a Major Impediment to Salmon Recovery



Monitoring and Novel Research Techniques (15 pages)

Novel Assessment Techniques, Monitoring Recommendations, and New Tools for Ecosystem-Based Management Resulting from the Salish Sea Marine Survival Project

marinesurvivalproject.com

PACIFIC SALMON FOUNDATION

MARINE SCIENCE PROGRAM

marinescience.ca

Pacific salmon face many **challenges in the marine environment** and some populations have experienced steep **declines** as a result.

ADDRESS PRESSURES

- HATCHERY INFLUENCES
- PREDATION PRESSURE
- NEARSHORE DEGRADATION
- DIVERSITY & RESILIENCY LOSS
- CLIMATE CHANGE
- FOOD AVAILABILITY
- DISEASE

GOALS

To ensure a **healthy future** for salmon, we aim to:

- **UNDERSTAND** — Understand bottlenecks to Pacific salmon survival
- **GUIDE** — Guide habitat restoration
- **BUFFER** — Build resilience in a changing climate
- **INFORM** — Translate and share knowledge
- **INFLUENCE** — Influence applied action through partnerships and collaboration

Building on the **results** and **recommendations** of the **Salish Sea Marine Survival Project**, here are some of the

INITIATIVES THAT MAKE UP THE PSF MARINE SCIENCE PROGRAM:

RESILIENT COASTS FOR SALMON

To support communities and nearshore ecosystems in adapting to climate change, this collaborative project is:

- **Raising awareness** on the impacts of climate change and nature-based solutions through educational materials and outreach
- **Building capacity** for applying nature-based solutions through Green Shores® training
- **Demonstrating** nature-based solutions at three Green Shores restoration sites
- **Mapping** the extent of shoreline hardening along the east coast of Vancouver Island

HATCHERY EFFECTIVENESS REVIEW

Aimed at understanding hatchery impacts on wild salmon, improving management, and optimizing practices, this comprehensive project:

- Reviewed **hatchery release strategies**
- Created an applied **genomic technologies** handbook
- Reviewed literature concerning **hatchery-wild interactions**
- Analyzed Chinook **bio-trait trends,**
- Captured practices and challenges of **community hatcheries**
- Analyzed whether **enhancement is effectively** meeting its objectives

CITIZEN SCIENCE PROJECTS

Citizen Science is a cost-effective way to study the entire Strait of Georgia. It is the foundation for three initiatives looking at the salmon food web from the bottom up:

- The **Citizen Science Oceanography Program** monitors conditions at a broad spatial and temporal scale
- The **Forage Fish Monitoring Program** searches for evidence of beach spawning
- The **Adult Salmon Diet Study** analyzes Chinook and coho guts submitted by anglers to assess ecosystem change

STRAIT OF GEORGIA DATA CENTRE

The Strait of Georgia Data Centre brings together marine ecosystem data from many sources to make it accessible to anyone through:

- The **Marine Reference Guide** (MRG), an interactive map of ecological and anthropogenic data
- **StoryMaps**, which merge engaging media, text, and maps on topics of interest
- The **data portal,** a library to connect anyone to thousands of datasets, some of which are not available anywhere else

NEARSHORE & ESTUARY PROJECTS

Supporting restoration and research to ensure a long-term future for vital salmon habitats facing pressures. Projects include:

- Kelp research on **resiliency cryopreservation methods** and **restoration strategies**
- Restoring eelgrass and marsh **habitat** and anthropogenic **debris mapping and removal**
- Creating a **hub of knowledge and tools** to support practitioners for successful habitat restoration
- An invasive European **green crab surveillance** and awareness campaign

BOTTLENECKS TO SURVIVAL

A major effort on the east coast of Vancouver Island to provide new information on where salmon face critical bottlenecks to survival. Activities include:

- Establishment of a **network of monitoring arrays** and **PIT tagging** of Chinook and coho in key river systems
- **Winter ecology** studies to understand the implications of this stressful phase
- **Steelhead** studies exploring mortality and release strategies
- A **modernized fishery monitoring** pilot using cleaning tables outfitted with PIT infrastructure and video surveillance

SALMON AND HERRING INTERACTIONS

Changes in Pacific herring spawn timing and distribution, and their migration dynamics raise questions we are seeking to address about this critical food source for Pacific salmon. Activities include:

- Determine **age-0 herring availability to salmon** using existing data collected by DFO and a new summer sampling program of juvenile salmon diet surveys
- Develop techniques for **biomass assessment and otolith-based detection** of adult non-migratory herring in the Strait of Georgia
- Conduct a **herring spawn habitat gap analysis** to characterize factors affecting the spawn
- Compilation of **Herring Traditional Ecological Knowledge** from First Nations in the Strait of

LLTK's 2025 Strategic Roadmap: Recovery Goals

LOWER MORTALITY IN THE SALISH SEA

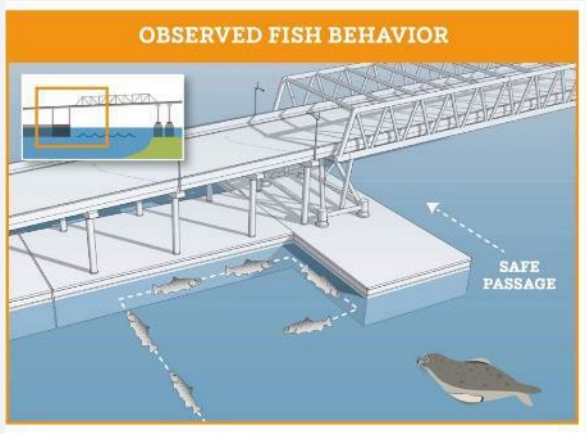
Support salmon ecosystems top to bottom: from whales to zooplankton.

INCREASE CHINOOK DIVERSITY

Restore diversity in salmon populations, their habitats, and food sources.

REMOVE BARRIERS TO MIGRATION

Improve or remove human-made migration obstacles in Puget Sound.



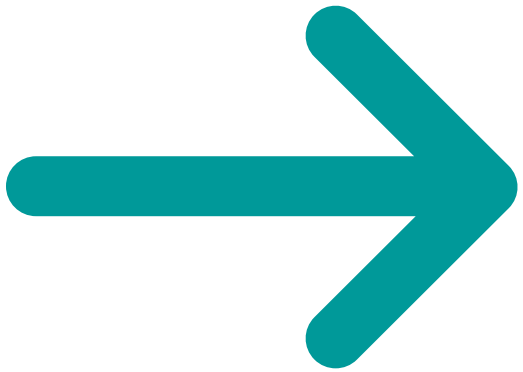
INSPIRE ACTION THROUGH SALMON EDUCATION

Engage and educate to grow the community of vocal salmon advocates.

SURVIVE the SOUND
Ready, Set, Migrate!

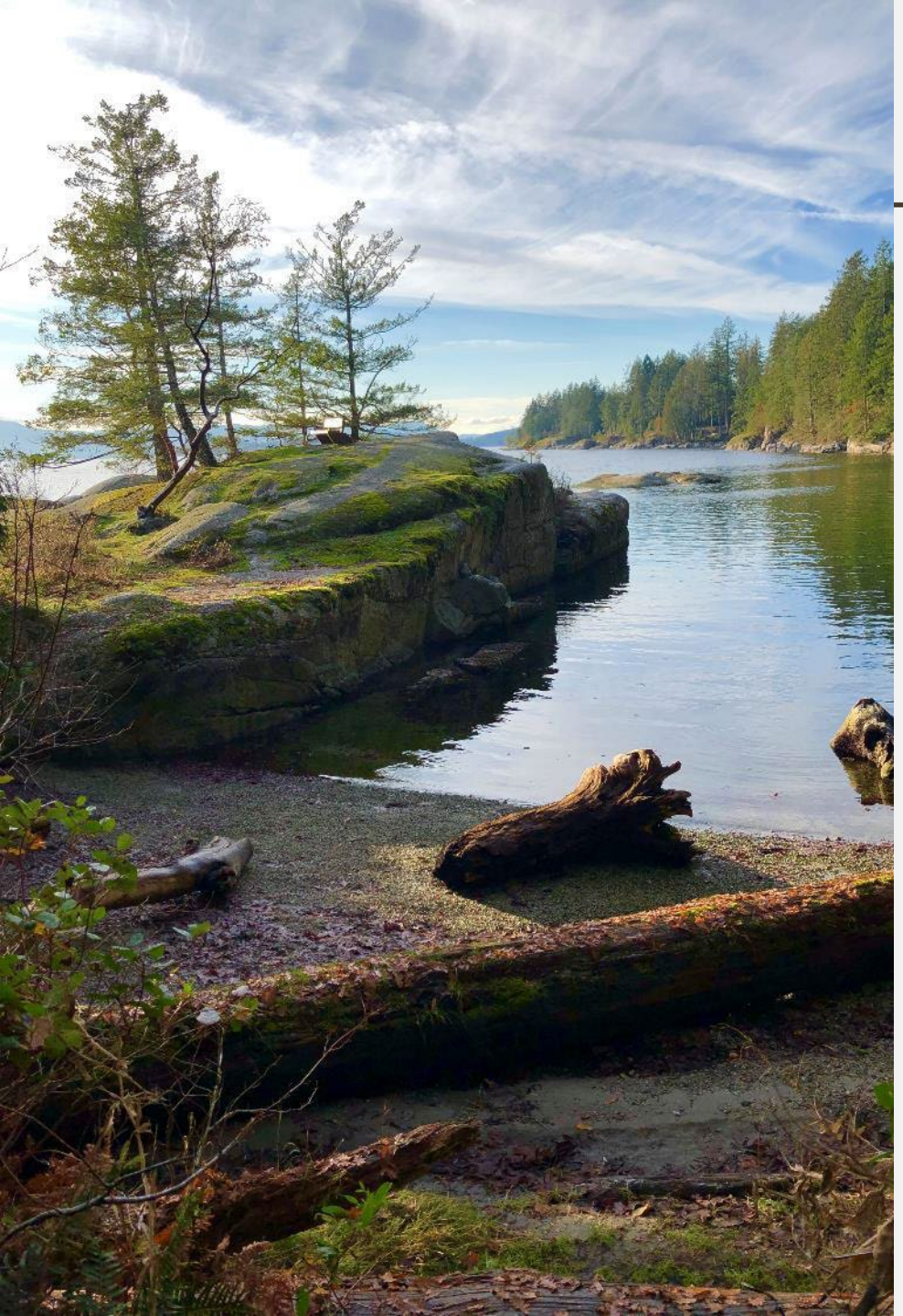
SSMSP Overview

Findings & Recommendations



2023 Workshop

Outcomes & Next Steps



2023 Transboundary Workshop

Goals:

(1) Identify how science and findings from the SSMSP are being advanced and implemented within WA & BC

(2) Identify priorities for research, action, and opportunities for transboundary collaboration

Details:

When: May 16-17, 2023

Funding: Puget Sound Partnership, PSF, LLTK

PUGET SOUND PARTNERSHIP

LONG LIVE THE KINGS

PACIFIC SALMON FOUNDATION

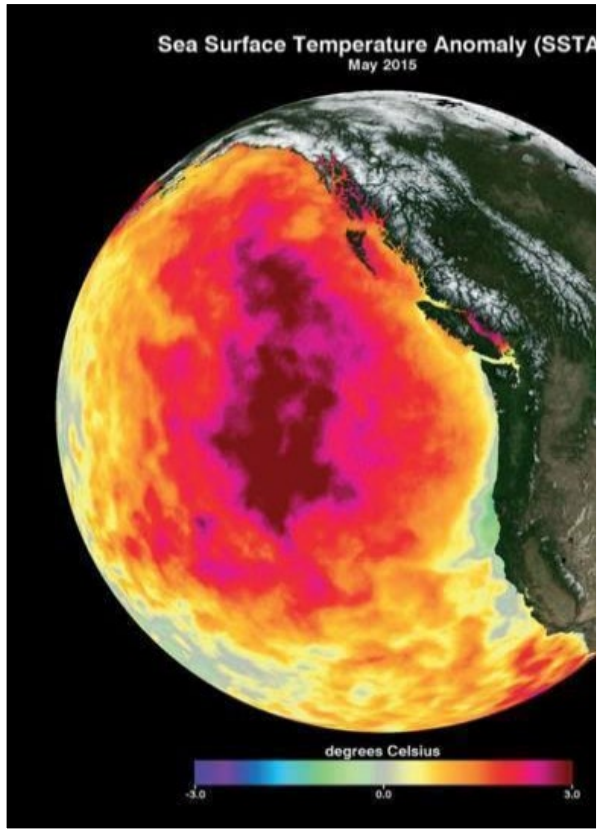
SCIENCE ADVANCEMENTS

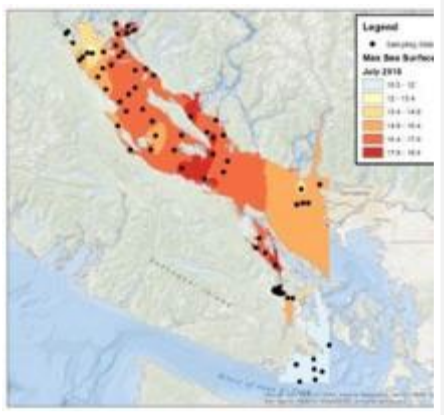
- Additional research is helping to refine our understanding.
- Long-term monitoring programs are essential to untangling impacts of climate and the physical environment on food webs.
- **Citizen Science networks make great contributions to long-term monitoring.**

FOOD SUPPLY: MONITORING USING COMMUNITY SCIENCE

BC

- Understanding bottom-up changes due to climate change and marine heat waves
- Very cost-effective
- High spatial and temporal coverage





PACIFIC SALMON FOUNDATION

SCIENCE ADVANCEMENTS

- Additional research is helping to refine our understanding.
- Long-term monitoring programs are essential to untangling impacts of climate and the physical environment on food webs.
- Citizen Science networks make great contributions to long-term monitoring.
- **Incorporation of indigenous knowledge into research and solutions.**

FOOD SUPPLY: ASSESSING NOVEL TECHNIQUES FOR PUGET SOUND HERRING RECOVERY

WA

LONG LIVE THE KINGS

Nisqually Indian Tribe

nəxʷqíyt nəxʷsƛ̓áýəm̓
PORT GAMBLE S'KLALLAM TRIBE

Implementation of Findings

- Improving models to guide adaptive management.
- Promising new tools and technologies are helping with advances
- **Innovative and collaborative approaches.**

BC

NEARSHORE & ESTUARY HABITAT

RESTORATION, PROTECTION AND RESILIENCY OF CRITICAL NEARSHORE HABITATS FOR SALMON AND THEIR PREY IN THE FACE OF CLIMATE CHANGE

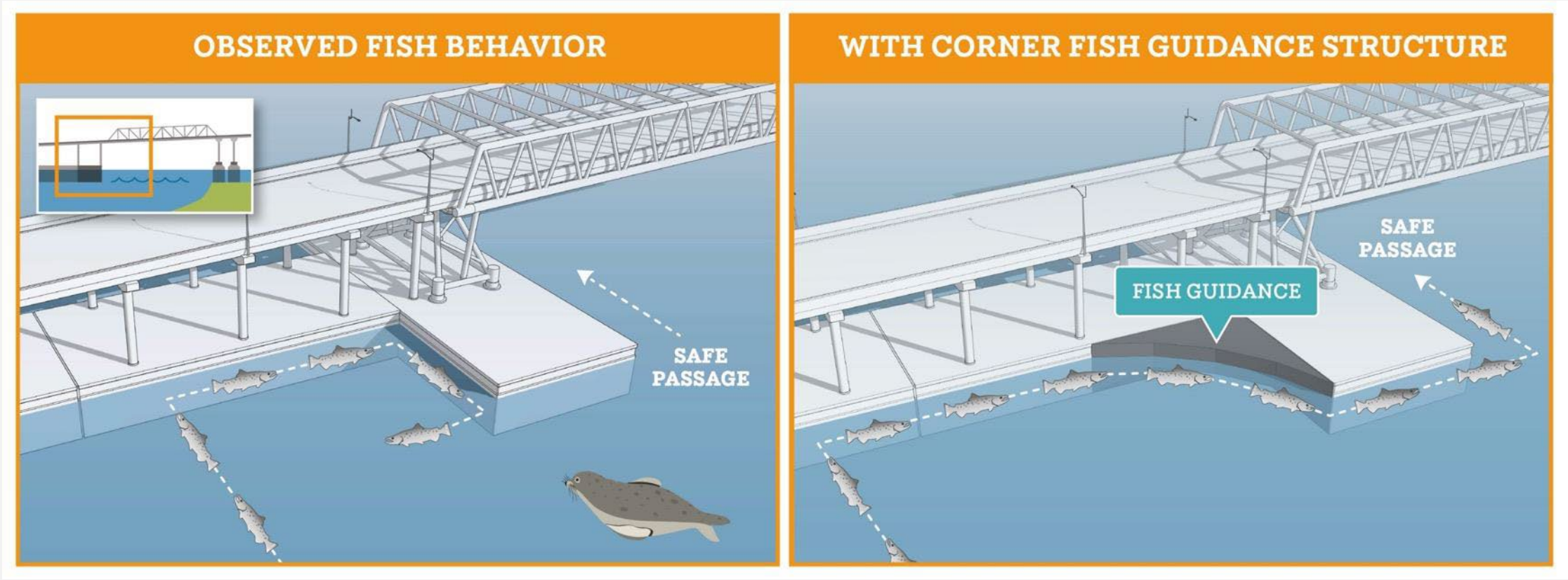
PACIFIC SALMON FOUNDATION

Implementation of Findings

- Promising new tools and technologies are helping with advances
- Improving models to guide adaptive management.
- Innovative and collaborative approaches.
- **Actively testing solutions.**

PREDATION: HOOD CANAL BRIDGE PASSAGE TRIAL STUDY

WA



LONG LIVE THE KINGS

NOAA

nəxʷqíyt nəxʷsƛ̓áýəm
PORT GAMBLE S'KLALLAM TRIBE

Note: Fish are not to scale

Research Gaps

- Climate change
- Understanding mechanisms (connecting the dots)
- Integrating impacts through the full life cycle
- **Long-term monitoring programs and datasets**

OFFSHORE MONITORING OF JUVENILE SALMON & HERRING

WA

- Need for long-term offshore monitoring of salmon and herring in Puget Sound
- Comparable to DFO's offshore salmon trawl surveys

LONG LIVE THE KINGS

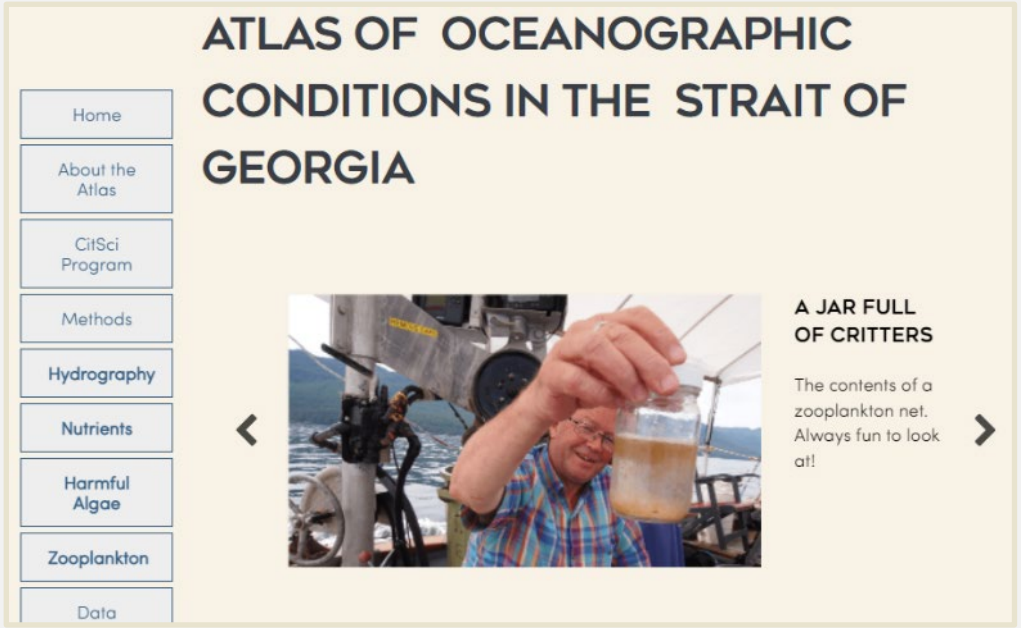
TULALIP TRIBES

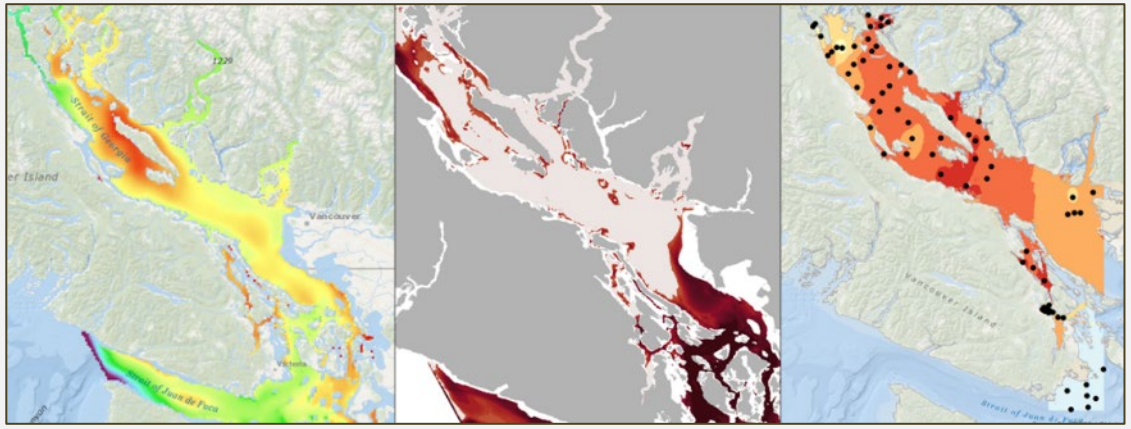
Research Gaps

- Climate change
- Understanding mechanisms (connecting the dots)
- Integrating impacts through the full life cycle
- Long-term monitoring programs and datasets
- **Shared & Accessible data**

SHARED DATA ACCESS FOR STRAIT OF GEORGIA

- Atlas of Oceanographic Conditions
- Marine Data BC Portal
- Spatial Data Layer Services
- Map Catalogue
- List of Salish Sea Researchers
- List of Publications
- Educational Webpages
- SOG Marine Reference Guide





What About Collaboration?

- **More** is better
- **Variety** is best
- Include **Social** time
- Provide organized **Facilitation**
- Need for dedicated **Funding**

SSMSP Overview

Findings & Recommendations

2023 Workshop

Outcomes & Next Steps

Workshop Outcomes

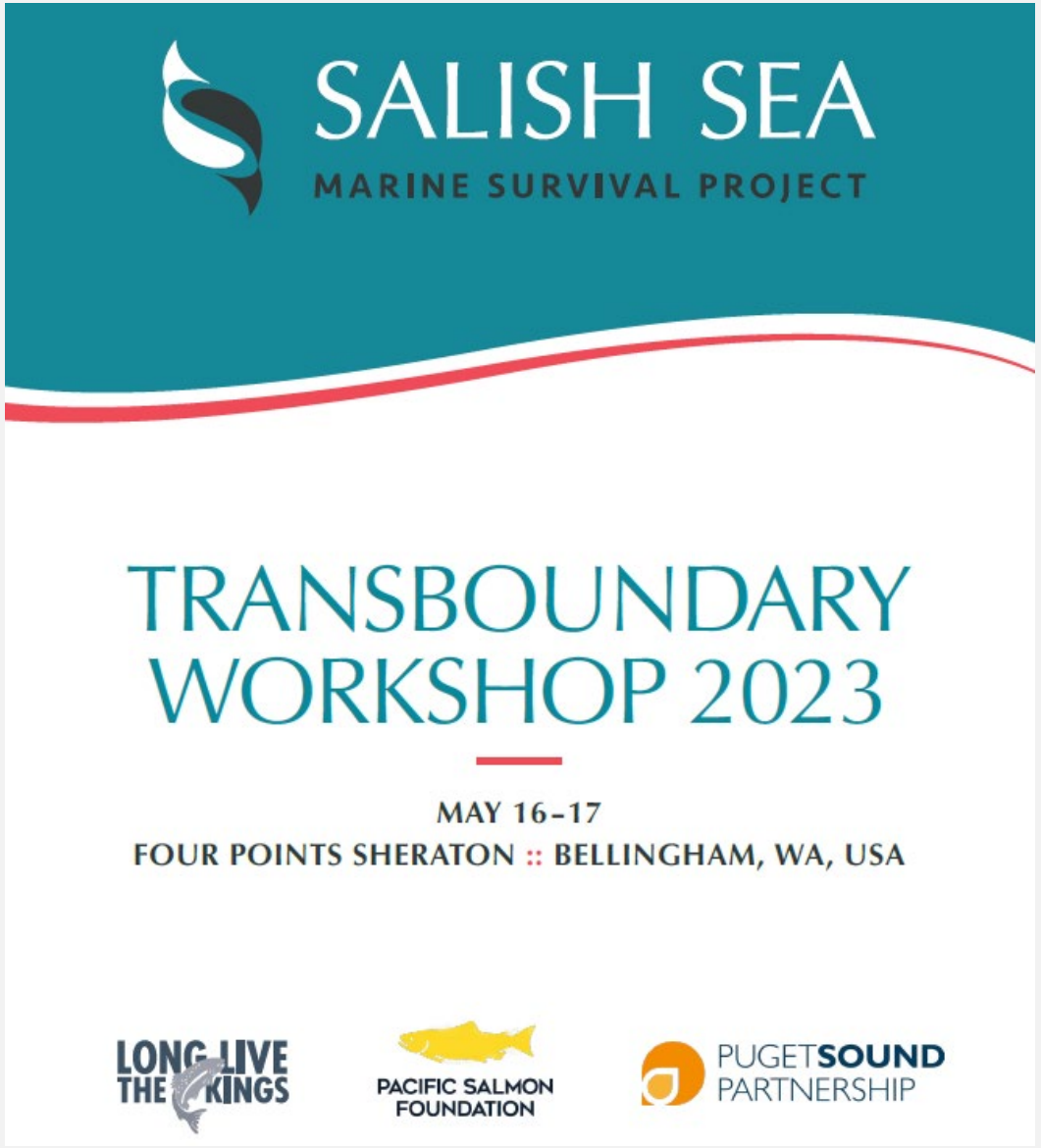
Outcomes:

(1) Workshop Summary

(2) Interactive Map

(3) SSMSP Website Update

- Workshop Post
- Updated Publications
- 27 Presentations



SSMSP Ongoing Projects Map

What is it?

An interactive map displaying information on ongoing SSMSP-related work. Toggle a point for a pop-up box with project details.

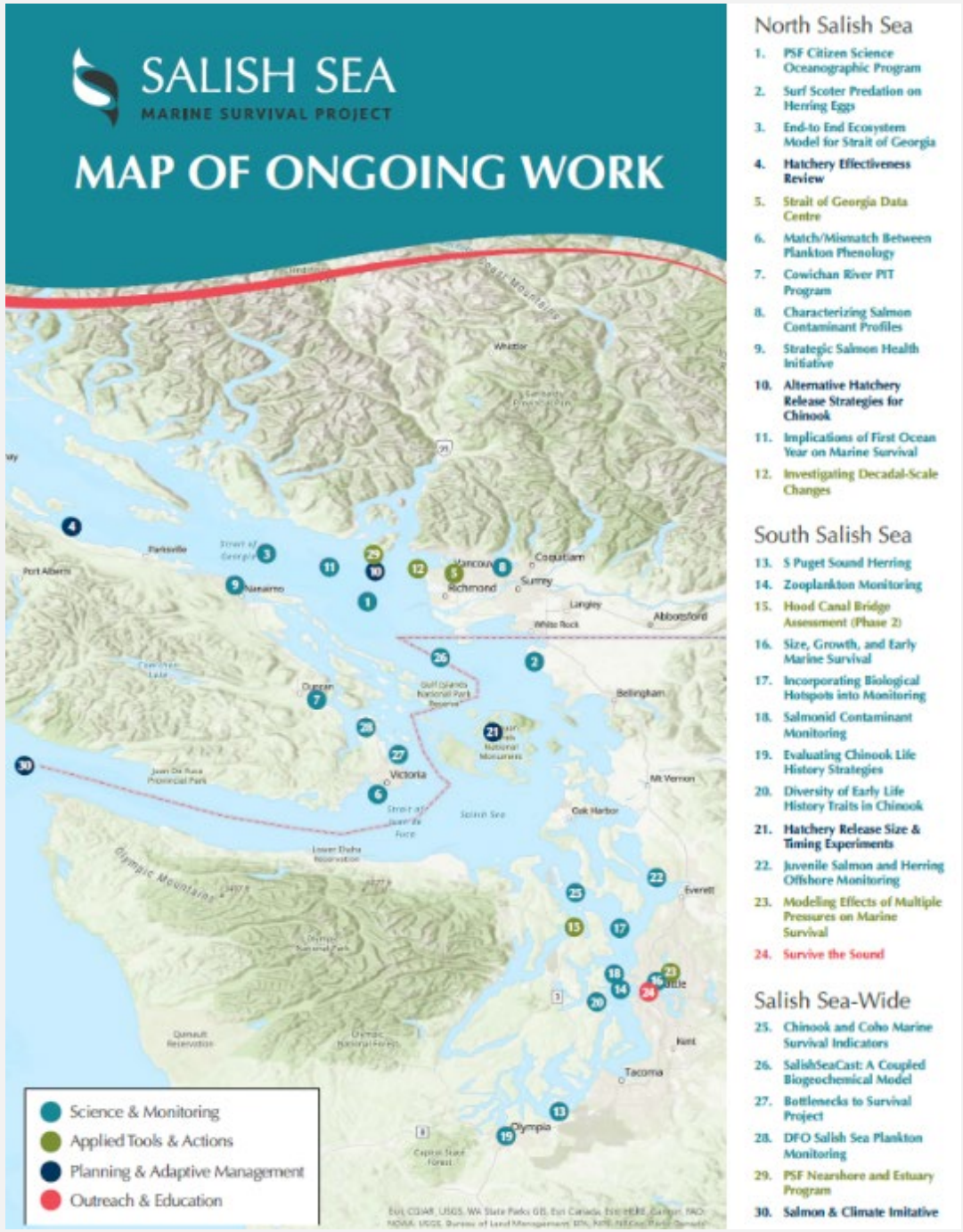
Goal: Visual communications tool to demonstrate SSMSP impact & foster collaboration.

Location:

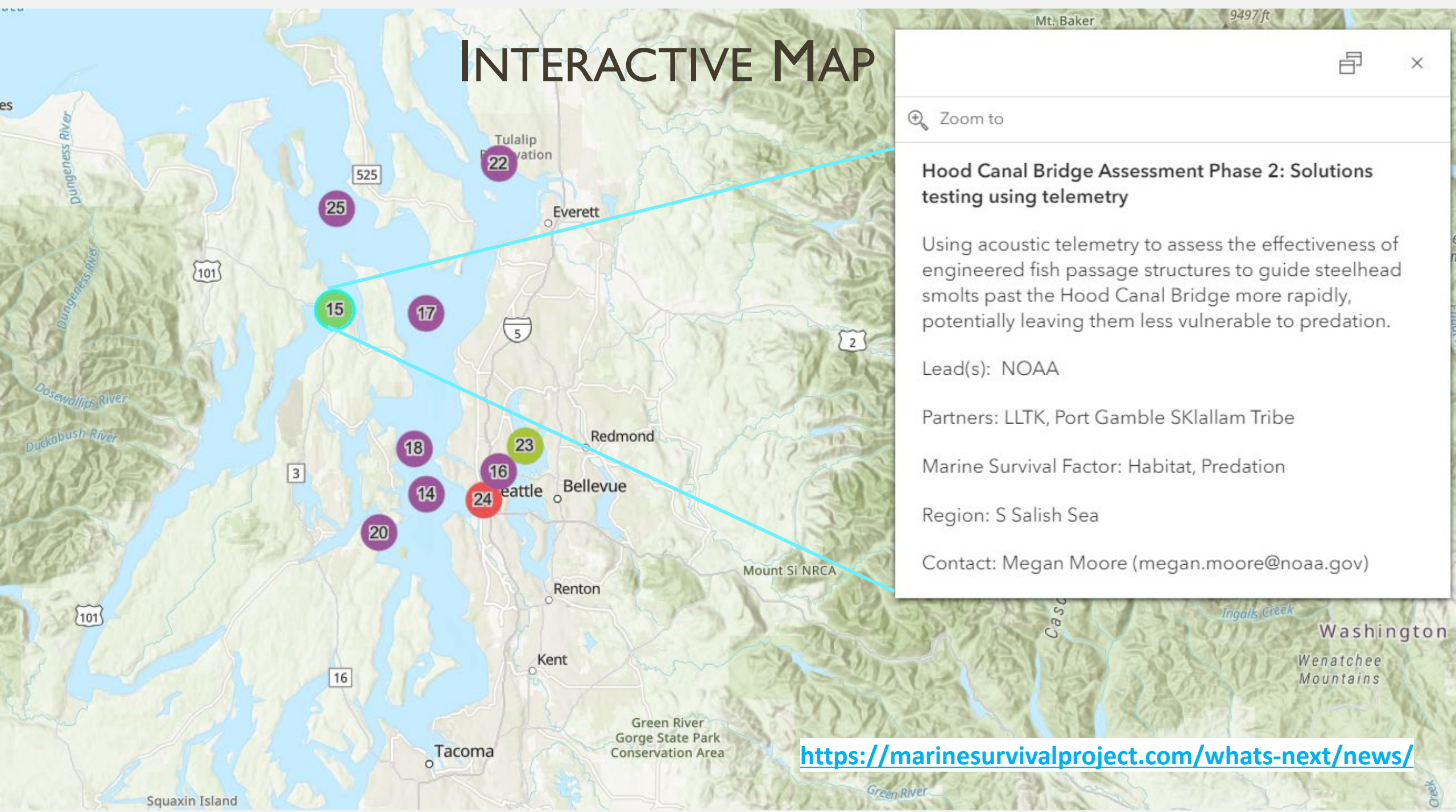
https://marinesurvivalproject.com/whats-next/news/

Caveat: The project list is preliminary, not comprehensive nor fully vetted. We plan to update this map and use as a living resource.

Credit: Ben Skinner (PSF)



Interactive Map



Zoom to

Hood Canal Bridge Assessment Phase 2: Solutions testing using telemetry

Using acoustic telemetry to assess the effectiveness of engineered fish passage structures to guide steelhead smolts past the Hood Canal Bridge more rapidly, potentially leaving them less vulnerable to predation.

Lead(s): NOAA

Partners: LLTK, Port Gamble SKlallam Tribe

Marine Survival Factor: Habitat, Predation

Region: S Salish Sea

Contact: Megan Moore (megan.moore@noaa.gov)

https://marinesurvivalproject.com/whats-next/news/

Next Steps

- Maintain and increase collaboration
  - **Biannual Workshops**: 2025 in British Columbia
  - *More frequent:* Monthly or quarterly seminars
    - Thanks Salish Sea Science Roundtable!
  - *Smaller-scale:* Themed chat groups (Slack, Basecamp)
  - *Written updates:* Newsletter, annual data updates

QUESTIONS?

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