SALISH SEA

MARINE SURVIVAL PROJECT

TRANSBOUNDARY WORKSHOP 2023

MAY 16–17

FOUR POINTS SHERATON :: BELLINGHAM, WA, USA

LONG LIVE THE KINGS

PACIFIC SALMON FOUNDATION

PUGETSOUND PARTNERSHIP

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Workshop Organizers & Facilitators

- Long Live the Kings: Liz Duffy, Lucas Hall, Scott Jenkins, Shaara Ainsley
- Pacific Salmon Foundation: Isobel Pearsall, Nicole Christiansen, Ben Skinner

Workshop Funding

- Puget Sound Partnership
- Pacific Salmon Foundation

Background

The Salish Sea Marine Survival Project (SSMSP), initiated and coordinated by Long Live the Kings (LLTK) and the Pacific Salmon Foundation (PSF), was a seven-year collaborative, international research effort focused on identifying factors affecting early marine survival of Chinook and coho salmon and steelhead in the Salish Sea. As part of this herculean effort involving 200+ participants and 60+ entities, transboundary teams collaborated on more than 90 studies, culminating in the 2021 publication of a final synthesis report and related summary documents (**https://marinesurvivalproject.com/research-findings/**). Between 2014 and 2020, participants met in person at least annually and communicated regularly. The last official SSMSP meeting was held in late 2020, on Zoom. Between the challenges of the COVID-19 pandemic era and the publication of findings indicating the ostensible end of the SSMSP, many people were left wondering about the future of transboundary collaboration on Salish Sea salmon science and recovery efforts.

Recognizing that the transboundary network forged by the SSMSP was incredibly valuable, LLTK and PSF decided it was time to reunite the team (bring the band back together). LLTK and PSF planned to host a 2023 Transboundary SSMSP workshop geared towards approximately 30 participants (half U.S. and half Canadian) that had either been part of the technical teams or were currently leading research that had its origins in the SSMSP. The goal was to check in on where the SSMSP was now and explore avenues for the future.

On May 16 and 17, 2023, thirty-seven U.S. and Canadian members of the scientific and salmon recovery community convened in Bellingham, Washington, for the first in-person transboundary gathering of the SSMSP in three years. The objectives of the meeting were to:

1. **Identify how the science and findings from the Salish Sea Marine Survival Project (SSMSP) are being advanced and implemented within Washington State and British Columbia,**
2. **Identify remaining gaps and opportunities for research, action, and transboundary collaboration, and**
3. **Discuss how the strong SSMSP transboundary network plans to engage and collaborate in the future.**

This was envisioned to be the first of many workshops that LLTK and PSF plan to host to maintain the SSMSP network and advance transboundary collaboration toward implementing SSMSP findings and recommendations. Funding for this workshop was provided by the Puget Sound Partnership (PSP), with contributions from PSF and LLTK.

This document provides a summary of this workshop, details workshop outcomes, and outlines next steps.

TUESDAY, MAY 16

Day 1

Opening Remarks

Elden Hillaire, Chairman of the Lummi Nation Fisheries and Natural Resources Commission, was invited to open the workshop. Elden, whose traditional name is Sel mas el ten, was born in Bellingham. In 1994, after two decades of harvesting salmon, halibut, and shellfish, he was elected to the Lummi Fisheries & Natural Resources Commission by the fishers of Lummi and has served as its Chairman for over 20 years. He has been the lead negotiator for international and domestic salmon and shellfish agreements and represents the Lummi Nation at Washington state, national, and international salmon and shellfish management meetings. The Lummi have been active participants in the Salish Sea Marine Survival Project, and as co-managers and original stewards of this land, we were grateful to have an esteemed Lummi voice to open our workshop, provide a broader historical, cultural and spiritual context, and inspire us to continue this urgent and important work.

Participant Presentations: Updating the Science

One of the primary objectives of this workshop was to share updates on projects that had been under the umbrella of the Salish Sea Marine Survival Project as well as new projects and actions that were initiated based on SSMSP findings and recommendations published in the 2021 SSMSP synthesis report. Since it had been more than two years since this group had met and/or collaborated in a formal setting, the goal was to reacquaint ourselves, welcome new faces, and advance our collective understanding of the status of the SSMSP-related science and work being done throughout the Salish Sea. Secondarily, we aimed to get an understanding of ongoing priorities and the appetite and opportunities for collaboration.

To that end, the bulk of this workshop featured short, high-level overview talks from each of the invited participants. To get through twenty-eight presentations in one and a half days, each presenter was challenged to distill the key components of their complicated and comprehensive projects and/or programs in only 10-15 minutes. Opportunities for questions and discussions were largely delegated to breaks, small group discussions, social events, and future interactions.

The focus of the 1st day's talks was on the state of the science related to the factors identified during the SSMSP that affect early marine survival (Table 1). Presentations were largely grouped by these factors.

FACTOR TYPE	MARINE SURVIVAL FACTOR
Overarching	Climate Change
Primary	Food Supply
	Predation
Contributing	Habitat Loss
	Contaminants
	Disease
	Cumulative Effects

TABLE 1. Factors, identified in Salish Sea Marine Survival Project, that affect marine survival of Chinook and coho salmon and steelhead throughout the Salish Sea. Primary factors were found to have direct impacts, contributing factors are believed to exacerbate impacts, and overarching factors compound the problem by impacting all of the factors.

Session 1

The first session focused on bottom-up factors influencing the food supply for salmon (Table 2). This included updates on the long-term and more recent oceanographic monitoring programs, links between climate, physical variables, phytoplankton and zooplankton dynamics, and planktonic feeding by juvenile salmon and herring. The final talk of that session was a recorded presentation by Josh Chamberlin (who had a last minute conflict) that linked feeding, size, and growth to early marine survival.

TABLE 2. Session 1 presentations focused on the topic of food supply. Presenters are listed in bold.

PRESENTER(S)	PRESENTATION TITLE	DESCRIPTION
Rich Pawlowicz, Svetlana Esenkulova	Oceanographic Conditions in the Salish Sea 2015-2022	Overview of trends based on a long-term citizen science oceanographic monitoring program, 2015-present. Ongoing work to link regional climatologies to planktonic food webs and salmon as well as tracking the impact of harmful algal blooms on salmon.
Kelly Young, Akash Sastri, Ian Perry, **Isobel Pearsall**	DFO Salish Sea Plankton Monitoring	A long-term monitoring program, initiated in 1996, for zooplankton in the Salish Sea. Initially just for the Strait of Georgia, transboundary collaboration began in 2019 including evaluation of regional zooplankton biomass in the Salish Sea.
Karyn Suchy, **Susan Allen**	Untangling how the NPGO influences Salish Sea zooplankton using SalishSeaCast	Investigating the impact of N Pacific climate indices (NPGO specifically) on nutrients, phytoplankton, and zooplankton dynamics in the Salish Sea (2014-2019 transboundary dataset).
Maycira Costa, Karyn Suchy	Match/Mismatch Between Phytoplankton and Crustacean Zooplankton Phenology in the Strait of Georgia, Canada	Using remote sensing to characterize and better understand the timing and linkages between phytoplankton and zooplankton blooms and subsequent impacts on salmon and food web dynamics.
Emily Seubert	The Puget Sound Zooplankton Monitoring Program & Forage Fish Research in the Southern Salish Sea	Updates on a collaborative Puget Sound zooplankton monitoring program, 2014-present, and long-term monitoring of herring spawn abundance in Puget Sound.
Josh Chamberlin *(video recording)*	Assessing early marine size and growth as indicators of marine survival for Puget Sound Chinook salmon	Investigating the interplay between early marine size and growth and their impacts on marine survival of Puget Sound Chinook salmon.

Key Takeaways Included:

- Long-term monitoring programs are essential to untangling impacts of climate and the physical environment on food webs.
- Citizen Science networks can make great contributions to long-term monitoring.
- Climate has a strong influence on primary productivity in the Salish Sea.
- The NPGO, in particular, is strongly linked to bottom-up processes in the Salish Sea including plankton productivity, phytoplankton and zooplankton dynamics, and timing of plankton blooms.
- Plankton dynamics, including presence and/or intensity of harmful algal blooms, have a strong impact on feeding opportunities for salmon.
- Timing of phytoplankton blooms impacts feeding conditions for juvenile salmon.
  - Early and late phytoplankton blooms produce poorer feeding conditions (mismatches in quantity, quality, and type of plankton) than normal (average) bloom timing.
- Remote Sensing and other emerging technologies are valuable tools for expanding our oceanographic monitoring.
- Size, growth, and their interplay influence early marine survival of salmon.

Session 2

The second session focused on predation (top-down factor) and various approaches to tracking stage-specific early marine mortality (Table 3). This included updates on studies quantifying stage-specific feeding and mortality of Chinook through the first year, food web dynamics of marine mammals, and impact of predation on juvenile salmon and herring populations.

TABLE 3. Session 2 presentations focused on predation and dynamics of early marine mortality. Presenters are listed in bold.

PRESENTER(S)	PRESENTATION TITLE	DESCRIPTION
Will Duguid, Kevin Pellett	1) Cowichan River PIT program update and Bottlenecks to Survival introduction and 2) The first winter at sea for Strait of Georgia Chinook Salmon	A PIT tag-based method for investigating stage-specific survival of juvenile Chinook from the E coast of Vancouver Island during their first year of life.
Dave Beauchamp	Incorporating biological hotspots explicitly into early marine salmon research and monitoring	Bioenergetics analyses show biological hotspots of plankton and forage fish are critical to the feeding and growth of juvenile salmon.
Andrew Trites	Role of marine mammals in ecosystems	Using ecosystem models to understand the past and current role of marine mammals in the Salish Sea food web.
Megan Moore, Barry Berejikian	Harbor seal predation impacts on salmonids: Assessments and Solutions	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.
Kathryn Sobocinski, Heidi Stewart	Avian and Shallow Water Community Response to Pacific Herring Spawning Events	Investigating predation on herring eggs and associated mortality in the Cherry Point herring spawning stock using a field experiment.

Key Takeaways Included:

- Passive Integrated Transponder (PIT) tags, combined with robust monitoring, are a promising tool for quantifying stage-specific mortality for juvenile salmon.
- Acoustic telemetry, a critical tool used to identify the impact of pinniped predation on steelhead in the SSMSP, is now being used to evaluate solutions.
- Feeding conditions are patchy (hotspots and food deserts) and monitoring needs to better address this.
- Marine mammals play a diverse role in structuring food web interactions.
- It is challenging to pinpoint causes in declines of herring populations (& herring eggs have a wide range of predators).

Session 3

The third session focused on contributing factors like contaminants, disease, and the influence of life history diversity (Table 4). This included updates on contaminant monitoring on both sides of the border, disease monitoring in the Strait of Georgia, and experimental and retrospective studies on how life history impacts migration and survival.

TABLE 4. Session 3 presentations focused on contaminants, disease, and life history. Presenters are listed in bold.

PRESENTER(S)	PRESENTATION TITLE	DESCRIPTION
Bonnie Lo, Tanya Brown	Characterizing contaminant levels and profiles in salmon and their habitat in the Salish Sea	Using contaminant profiles of salmon populations to assess localized exposure and risks, and track migration.
Sandra O'Neill, Andrea Carey	Research and monitoring update for contaminants in salmonids	Updates and new additions to long-term toxic contaminant monitoring for salmon in Puget Sound.
Art Bass, Kristi Miller-Saunders	Strategic Salmon Health Initiative: Key Findings	Studying the impact of pathogens on salmon survival rates, using new FitChip technology.
Lance Campbell	Successful Juvenile Life History Strategies in Returning Adult Chinook from Western Washington	Using otolith microchemistry to determine relative success of Chinook life history types in different watersheds.
Barry Berejikian, Michael Malick	Diversity of early life history traits in Puget Sound Chinook salmon	Experimental approach to understanding population-level differences in fitness-related life history traits.

Key Takeaways Included:

- Chinook in Puget Sound are exposed to high levels of PCBs and accumulate them in estuaries and the nearshore, and recent studies show a high over-winter accumulation of PCBs in the offshore.
- PCBs, DDTs, and PBDEs are prevalent in adult Chinook but vary regionally in the Salish Sea.
- Pharmaceuticals and personal care products are widely found in salmon and are an emerging concern.
- Chemical tracers are powerful tools for contaminant hotspot monitoring and source tracing.
- Omics-based approaches are powerful for evaluating health effects of contaminants.
- In addition to acute impacts, disease can act as a chronic stressor and have population-level impacts on survival.
- Climate change/temperature impacts the composition of pathogens and their virulence.
- Habitat types and environmental factors shape the expression and success of fitness-related life history traits.

Session 4

The fourth session focused on salmon habitat and hatcheries (Table 5). This included updates on PSF's work to restore, protect, and understand key salmon habitats, experiments evaluating hatchery rearing strategies, and retrospective analyses on the effectiveness of hatchery management in the Strait of Georgia.

TABLE 5. Session 4 presentations focused on habitat and hatcheries. Presenters are listed in bold.

PRESENTER(S)	PRESENTATION TITLE	DESCRIPTION
Nicole Christiansen, Isobel Pearsall	PSF Nearshore and Estuary Program: an overview	Using new methods to study and protect nearshore habitat and kelp forests.
Brian Beckman, Liz Duffy	Release size and timing hatchery experiments in Puget Sound	Evaluating experimental hatchery rearing and release strategies for Chinook salmon in Puget Sound.
David Willis, Esther Guimond	Alternative release strategies for hatchery Chinook in the Salish Sea	Assessing interactions between wild and hatchery salmon in the Salish Sea
Brian Riddell, Andy Rosenberger, Isobel Pearsall	Synthesis of PSF's Hatchery Effectiveness Review	A comprehensive review of hatcheries comprised of several reports considering the effectiveness of hatcheries at meeting objectives, the interactions between wild and hatchery salmon, cutting-edge scientific tools to optimize hatchery management, hatchery release strategies, and recommendations.

Key Takeaways Included:

- Climate change and water temperatures impact the prevalence, persistence, and potential for restoration of kelp and other submerged aquation vegetation.
- Exposure level is important for kelp establishment and resilience.
- Biobanking may be a key tool for habitat restoration and resilience to climate change.
- Education and Outreach efforts are effective for nearshore issues like protecting eelgrass, removing debris, and tracking invasive species.
- Hatchery release size and timing can impact marine survival for Chinook and coho.
- It can be difficult to untangle the influence of hatchery practices from impacts of harvest and environmental variability.
- There is extensive variability between hatcheries and years.
- Future hatchery experiments should consider using molecular tools (like Omics and parentage based tagging) to distinguish effects.

Small-Group Discussion

Following the presentations, attendees gathered in small facilitated "break-out" groups of 6-8 people to reflect on what they'd learned and discuss specific topics. There was an effort to have groups of varied expertise and affiliation to ensure that diverse connections were made. Discussions lasted 45 minutes with facilitators sharing out their group's key takeaways at the conclusion. The theme and guiding questions for the discussions were as follows:

Theme: State of Knowledge

- Has our understanding of key factors changed since the SSMSP synthesis report?
- What are the priority information gaps?
- How can we maintain and increase collaboration?
- How can we best assimilate and communicate our findings?

The consensus of the groups was that though there had been a large amount of new information gathered since the publication of the 2021 SSMSP synthesis report, it had only served to reinforce the conclusions that had already been drawn; our understanding of key factors has remained consistent. It was noted that as there had only been a couple years to analyze new data, it may just be too soon to tell. Several individuals clarified that new data has helped to refine conclusions and provide more detailed insight, while not altering the fundamental results. A consistent message was that climate change has been and will be an increasingly large factor in our research and findings.

Priority information gaps and areas to focus research, identified and echoed by multiple groups, included:

- Improving our understanding of the impact of predation, such as non-mammal predation or predation on juveniles other than steelhead
- Better integrating impacts throughout the full life cycle (e.g., life-cycle models), including better connecting freshwater and saltwater life stages
- Increased food web modeling, such as understanding the connection between salmon, zooplankton, and phytoplankton
- Understanding the mechanisms for survival rather than just making correlations
- Identifying key factors in marine survival and understanding 'what makes a successful fish'
- Focusing on the impacts of pathogens and contaminants
- Need for longer-term and more detailed datasets
- Incorporating climate change impacts throughout research

It was noted that because some of these gaps may already be adequately addressed on either the Canadian or American side, it is important for researchers to learn from each other and follow the examples of their peers across the border.

With regards to increasing collaboration and communication, all four groups shared a desire for more frequent interaction and opportunities to connect with one another. Suggestions to facilitate this included regularly scheduled virtual meetings, small group discussions, small-scale workshops, monthly seminars, or thematically focused working groups. No matter the format, participants felt strongly about the need to connect with other groups and researchers beyond large workshops like this one. Other suggestions for increased collaboration included opportunities for student involvement, a centralized nexus or database through which research results could be shared, greater facilitation from organizers, and additional funding to achieve any or all of these goals.

Multiple groups also expressed how important it is to have clear and concise communication that can be understood by individuals outside of the scientific community. It was noted that media often struggles with reporting on complicated research projects like those under the umbrella of the SSMSP. Therefore, outreach and education efforts are an important piece of the puzzle, both with members of the public as well as with policy makers on the state/provincial, tribal/First Nations, and/or federal levels.

WEDNESDAY, MAY 17

Day 2

Participant Presentations: Implementing Recommendations

After a fun dinner social where delicious food and beverages fueled rousing discussions and new and renewed connections, participants returned for another round of presentations and discussion. After getting caught up on the more distinct scientific elements the day before, day two focused on modeling, tools, and implementation.

Session 5

The fifth session focused on efforts to integrate the recommendations of the SSMSP (Table 6). This included taking long-term and broader views of trends to inform priorities in the Strait of Georgia, an overview of SSMSP-inspired salmon recovery projects led by the Nisqually Indian Tribe, and the development of a collaborative offshore monitoring program in Puget Sound.

TABLE 6. Session 5 presentations focused on implementation and monitoring. Presenters are listed in bold.

PRESENTER(S)	PRESENTATION TITLE	DESCRIPTION
Dick Beamish	State of the Salmon	The future of salmon and why we need to see a bigger picture to inform current priorities in the Salish Sea.
Chris Ellings, **Jed Moore**	Ongoing efforts to integrate and advance the SSMSP through Nisqually Salmon and Steelhead management	SSMSP-inspired projects focused on reducing impacts of predation and contaminants, boosting food supply, and restoring habitat.
Chrys Neville, Dick Beamish	Implications of the first ocean year on total marine survival for coho and Chinook salmon	Surveying Chinook and Coho populations in the Strait of Georgia
Mike Crewson, **Liz Duffy**	Puget Sound Offshore Marine Juvenile Salmon and Herring Monitoring Program	Development of a collaborative long-term regional monitoring program in Puget Sound to assess the status of juvenile salmon and herring during the critical first marine summer.

Key Takeaways Included:

- There is more to learn about the mechanisms driving marine survival and salmon population trends.
- Salmon are inherently resilient; we just need to give them opportunities.
- Biofiltration of road runoff shows promising results for reducing contaminants like 6PPD-quinone.
- Indigenous knowledge can help boost salmon recovery strategies.
- There are carrying capacity limits for coho salmon in the Strait of Georgia.
  - > Abundance and size of juvenile coho salmon in the Strait of Georgia are linked to food supply.
  - > 2002-2009 trends distinct from 2010-2022 for coho following a shift in zooplankton and herring productivity.
- Chinook diets in the Strait of Georgia have been consistent since 2002.
- Long-term offshore monitoring of juvenile salmon and herring in the summer provides an important diagnostic snapshot critical to understanding mechanisms impacting marine survival, responses to climate change, and informing salmon recovery efforts.

Session 6

The sixth and final session focused on projects that inform planning and adaptive management (Table 7). This included two complementary ecosystem modeling efforts to understand how multiple pressures interact to affect early marine survival, the development of a Pacific-coast wide initiative to incorporate climate resilience into salmon recovery, and the benefits of a collaborative regional data archive.

TABLE 7. Session 6 presentations focused on planning and adaptive management. Presenters are listed in bold.

PRESENTER(S)	PRESENTATION TITLE	DESCRIPTION
Hem Nalini Morzaria-Luna	Effect of multiple pressures on early marine survival of juvenile salmon in Puget Sound	Creating ecosystem models that incorporate multiple pressures and stressors on salmon populations.
Greig Olford	Investigating decadal-scale changes in the Strait of Georgia using the SS1500 end-to-end model	Using an integrated modelling framework to evaluate multiple stressors and to test hypotheses about salmon and killer whale recovery in the Strait of Georgia.
Shaara Ainsley, Jacques White	Salmon and Climate Initiative	Collaborative effort to develop a multi-disciplinary, multi-scale initiative that seeks to create a climate-resilient path to protect and restore salmon throughout the NE Pacific.
Ben Skinner	The Strait of Georgia Data Centre	The SGDC is a collaborative program to build a secure data archive for marine ecosystem information on the Strait of Georgia.

Key Takeaways Included:

- The Atlantis model is a powerful tool to test cumulative scenarios and recovery actions and rank explanatory factors.
  - > Bottom-up effects (linked to herring and gelatinous zooplankton) were stronger than top-down.
  - > Synergistic effects can lead to unexpected outcomes.
  - > The SS1500 end-to-end model is useful for linking environmental data to food web interactions to examine decadal scale changes in trophic dynamics and test hypotheses and scenarios.
  - > Increased stratification linked to phytoplankton shifts (flagellates increasing, diatoms decreasing).
- Climate change is an overarching factor influencing salmon throughout its range and lifecycle and its effects are real and accelerating. It must be included in our planning and management.
- A broad geographic collaboration around climate and salmon recovery will help accelerate progress by sharing findings on science and recovery actions across a suite of climate conditions and life history diversity.
- The Strait of Georgia Data Centre is an amazing resource for relevant datasets, maps, and visual tools for a wide range of audiences.
  - > Metadata is essential and captured as well.
  - > Web-based, open access system is accessible, easy-to-use, and reproducible.

Small-Group Discussion

Following the morning's presentations, the participants once again gathered into break-out groups. The focus of this discussion was on strategies for implementing ongoing or future projects and feedback on the future of the SSMSP. The theme and guiding questions were as follows:

Theme: Implementation

- Which promising tools and actions are being implemented or considered for implementation?
- What are barriers (logistical, physical, financial, political) to this work and how do you suggest we overcome them?
- What should the SSMSP look like moving forward? How can we best assimilate and communicate our findings?

When asked to identify tools and actions that seemed particularly exciting and impactful, participants gave an expansive list, with a great deal of overlap among groups. Multiple groups identified PIT tags, FitChips, ecosystem-wide modeling, genomic tools, and shared data centers as the most promising tools. Participants also expressed interest in acoustic monitoring, satellite imaging (and other remote-sensing tools), and the use of intrinsic tracers and chemical fingerprints to provide more information about population movements.

As for barriers, although participants mentioned several potential barriers to their ongoing work, the most overwhelmingly consistent barrier was a lack of funding, particularly the lack of long-term and consistent funding as well as funding that prioritized transboundary collaboration. On a related note, it was mentioned that it can be prohibitively expensive to utilize many of the new and emerging technologies that participants had just highlighted as promising tools for the future of their research. Suggestions to remedy this included advocating funding agencies to prioritize transboundary and collaborative work and increasing collaboration around identifying and applying for funding sources.

In addition to financial concerns, multiple groups shared the need for clear and unified messaging when communicating science to policy makers and members of the public, especially youth. Participants support an increased focus on public-facing communications and education, increased data sharing and accessibility (like the SOG Data Centre), and more frequent updates to the consensus-based latest science.

When asked to consider the future of the SSMSP, attendees agreed that continued and increased collaboration was desirable with many of the previous day's recommendations reiterated. Each group expressed a strong desire for more frequent but small-scale interactions with their peers. It was proposed that there could be annual hybrid meetings, interspersed with monthly or quarterly small-group seminars. A communication platform, such as Slack or Basecamp, was offered as a potential way to keep individuals connected. In addition, many participants once again requested that there be a standardized platform for sharing data and results.

Wrap-Up and Next Steps

After a densely packed 1.5 days, the workshop concluded quickly as many Canadian participants had a tight timeline to cross the border and reach ferries. Overall, there was very positive energy and excitement inspired by this opportunity to gather again as a transboundary work group. This renewed sense of engagement and energy will fuel the next steps.

Next Steps:

- LLTK will reach out to participants and invitees for feedback and with outputs from the workshop.
- Beginning in fall 2023, LLTK and PSF will work to develop increased opportunities for collaboration and communication (building off feedback from break-out groups).
- LLTK and PSF will collaboratively plan future workshops and gatherings. PSF has offered to host the next workshop, based in B.C., and tentatively scheduled for 2025.

As part of the follow-up, LLTK developed the following workshop products:

- Workshop Summary (this document)
- Shared Presentation files:
  - PDFs will be shared with participants, PSP*, and on the SSMSP website*
- **Interactive Map** (see Appendix A)
- SSMSP Website Update, including:
  - **Workshop Recap**
  - Update to the **Publications page**

Thank you to all participants, LLTK, PSF, and PSP for making this a productive and enjoyable gathering!

**Pending permission from presenters*

Appendix A. SSMSP Implementation Map

As one of the participant engagement tools at the workshop, we began creating an interactive SSMSP projects map to reflect the breadth of ongoing SSMSP work. Our goal is for this map product to be used as a visual tool that captures the ongoing implementation of the SSMSP, promotes collaboration, and can be adapted to communicate to a wide variety of audiences.

To gather project information, we had participants enter information on their SSMSP-related projects in an online survey. They were encouraged to fill out the survey at the conference as well as in the month following, and LLTK added projects based on the presentations at the workshop.

We used this information to create a more **streamlined interactive map** as well as the static map image on the following page. These will be shared on the SSMSP website. We'd like to emphasize that the project list is preliminary, it is neither comprehensive nor fully vetted. Moving forward, we plan to review and update this map regularly.

For the static image, we focused on featuring a concise high-level overview of the projects. For this we organized projects into 4 categories (Table 1) and 3 geographic regions (N Salish Sea, S Salish Sea, and Salish Sea-Wide & Beyond).

TABLE 8. Categories used to organize and display SSMSP-related projects in a mapping tool. Example project types are listed below each category.

Applied Tools & Actions

- Restore and protect habitat
- Assess strategies to reduce seal predation

Planning & Adaptive Management

- Incorporate climate change in recovery plans
- Improve forecasting with new data and models

Science & Monitoring

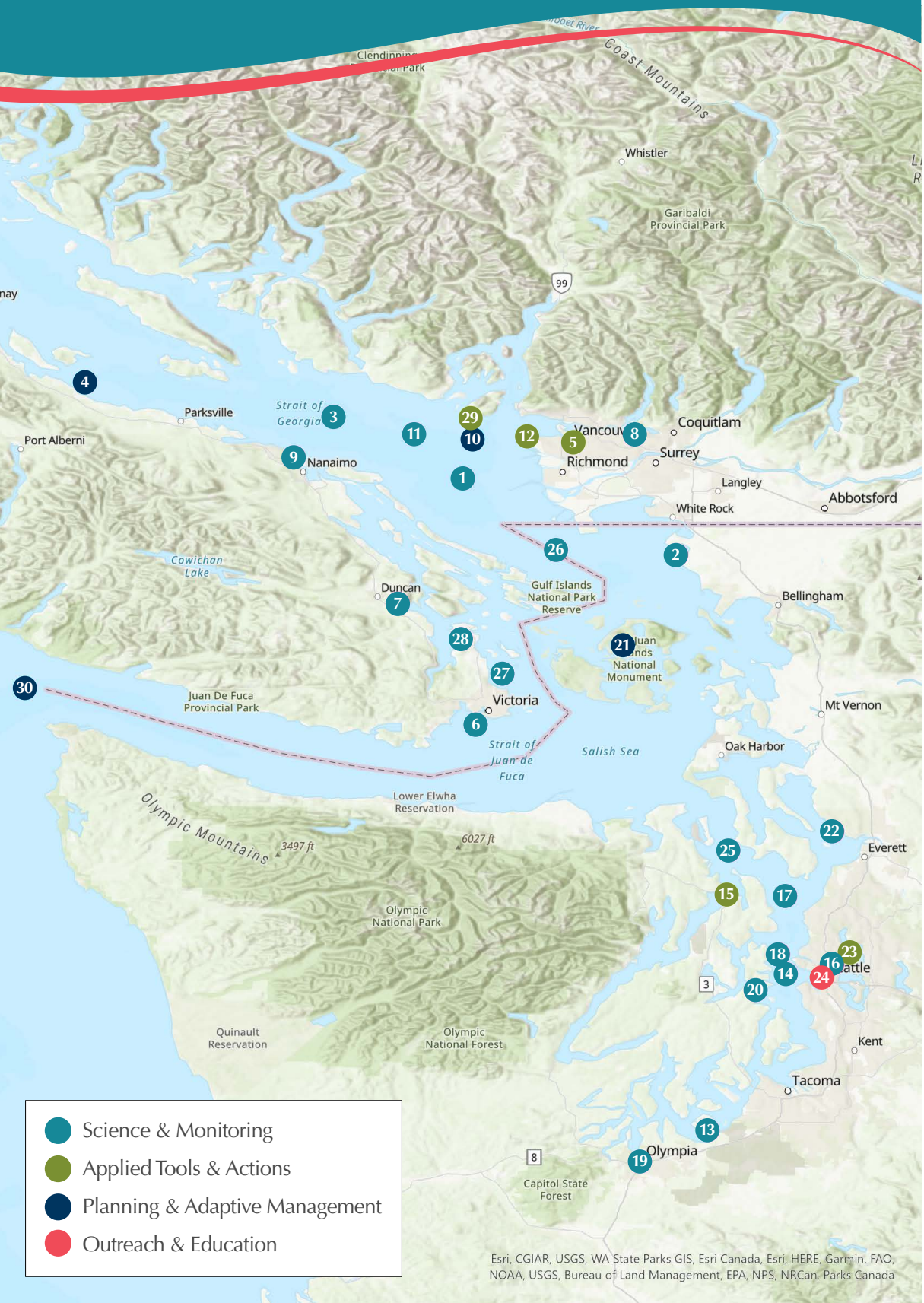
- Continue critical science
- Maintain and improve monitoring

Outreach & Education

- Improve education and communication
- Strengthen and support international collaboration

SALISH SEA
MARINE SURVIVAL PROJECT

MAP OF ONGOING WORK



North Salish Sea

1. PSF Citizen Science Oceanographic Program
2. Surf Scoter Predation on Herring Eggs
3. End-to End Ecosystem Model for Strait of Georgia
4. Hatchery Effectiveness Review
5. Strait of Georgia Data Centre
6. Match/Mismatch Between Plankton Phenology
7. Cowichan River PIT Program
8. Characterizing Salmon Contaminant Profiles
9. Strategic Salmon Health Initiative
10. Alternative Hatchery Release Strategies for Chinook
11. Implications of First Ocean Year on Marine Survival
12. Investigating Decadal-Scale Changes

South Salish Sea

13. S Puget Sound Herring
14. Zooplankton Monitoring
15. Hood Canal Bridge Assessment (Phase 2)
16. Size, Growth, and Early Marine Survival
17. Incorporating Biological Hotspots into Monitoring
18. Salmonid Contaminant Monitoring
19. Evaluating Chinook Life History Strategies
20. Diversity of Early Life History Traits in Chinook
21. Hatchery Release Size & Timing Experiments
22. Juvenile Salmon and Herring Offshore Monitoring
23. Modeling Effects of Multiple Pressures on Marine Survival
24. Survive the Sound

Salish Sea-Wide

25. Chinook and Coho Marine Survival Indicators
26. SalishSeaCast: A Coupled Biogeochemical Model
27. Bottlenecks to Survival Project
28. DFO Salish Sea Plankton Monitoring
29. PSF Nearshore and Estuary Program
30. Salmon & Climate Imitative