Participation in Ecosystem-Scale Research

A Case Study of the Salish Sea Marine Survival Project

A Senior Thesis in Environmental Studies

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Directory of Acronyms

ESA: Endangered Species Act
LLTK: Long Live The Kings
NIFC: Northwest Indian Fisheries Commission
NOAA: National Oceanic and Atmospheric Administration
PI: Principal Investigator
PSF: Pacific Salmon Foundation
PSP: Puget Sound Partnership
SSMSP: Salish Sea Marine Survival Project
TEK: Traditional Ecological Knowledge
USGS: United States Geological Survey
UW: University of Washington
WDE: Washington Department of Ecology
WDWF: Washington Department of Fish and Wildlife
WSG: Washington Sea Grant

Abstract

Over the past few decades, the marine survival rates of salmon have declined drastically in the Salish Sea. In 2012, U.S. nonprofit Long Live the Kings and Canadian nonprofit Pacific Salmon Foundation came together to form the Salish Sea Marine Survival Project (SSMSP). With over 150 participating scientists from federal, state, county, academic, nonprofit, and tribal sectors, the SSMSP conducts research to figure out the science behind salmon population declines. This thesis uses interviews with project participants to examine what factors influence participation within the SSMSP. For each group (e.g. academic, tribal), the impacts of factors are classified as positive, neutral, or negative. It is argued that the SSMSP is successful because the factors that unite participants, a common goal and a skilled facilitator, overpower those that create differences. An analysis of tribal participation is used to further argue that these uniting factors must have the strongest impact on the most marginalized groups. This work concludes that as conservation research tackles larger landscapes with more diverse voices, a successful project requires that conscious work must be done to identify and manage the factors impacting participants.

Figure 1: Map of the Salish Sea[1]

"When you look at the Salish Sea, our cities like Seattle, like Vancouver, they're not defined by their skylines as much as they're defined by their shorelines, and it's those shores, it's the Salish Sea that's lapping at their shore that's creating those million dollar views, that's making people want to emigrate here and move here, it's also producing the food that fills their bellies, it's sustaining the wildlife that fills their soul, so like it or not, we are the Salish Sea. We're not just a part of it, but we are that. And we have to remember that we have an obligation to take care of this place."

-Joseph K. Gaydos, Salish Sea Marine Scientist

"Coming together is a beginning, staying together is progress, and working together is success."

- Henry Ford, American Industrialist

"Water links us to our neighbor in a way more profound and complex than any other."

-John Thorson, Specialist in Water Law and Policy

[1] Salish Sea Marine Sanctuary, "Map of the Salish Sea."

Collaboration Creates a New Sea

Before 2009, the Salish Sea did not officially exist. Home to over three thousand species of marine life and over eight million people, the area was known as three distinct water bodies: Puget Sound and the Strait of Juan de Fuca in Washington, USA, and the Strait of Georgia in British Columbia, Canada (Figure 1). A large scale scientific study undertaken in the 1970s showed that it was only humans who paid attention to those imposed boundaries, while marine life operated in an integrated ecosystem consisting of the entire inland sea.[2] And that was not the end of the story; this 'newly discovered' sea was also under threat from development, industry, and climate change.

Naming the sea initiated a call to action for everyone with a stake in the region: federal and state governments, tribes, academics, nonprofits, fishermen – these entities would all be required to collaborate to preserve this sea so central to the way of life in the Pacific Northwest. But before such a collaboration could happen, the region need a defined problem to come together over. Bert Webber, a marine biologist at Western Washington University, proposed the name "Salish Sea" as early as 1989. He wrote, "names are important because they define an area and allow us to look at it as an entity, to get beyond artificial boundaries and decide how we're going to manage it."[3] Chosen for the Coast Salish, an umbrella term for the area's indigenous tribes, the name recognizes those who inhabited the area long before the arrival of Europeans. These tribes, with deep connections to the land and a long-held relationship with its resources, supported the naming, believing that a single identity could be the only hope for restoration at a large

[2] Audrey DeLella Benedict and Joseph K. Gaydos, "Our Lives and Livelihoods Depend on Saving the Salish Sea," *The Seattle Times*, April 9, 2015.
[3] Sid Tafler, "Meet the Man Behind the 'Salish Sea'," *The Globe and Mail*, March 13, 2008.

scale.[4] Natural resources managers were also quick to offer their support, for their work often dealt with issues not confined by international borders.[5] After years of increasing support, alongside growing concern for the health of the ecosystem, the label was officially adopted by the U.S. Board on Geographic names in 2009.[6] Gaining official recognition of the name was a complex process: it required two federal governments, two state/provincial governments, and the approval of many tribes and First Nations, in addition to input from stakeholder agencies and some academics. While the work to craft a holistic Salish Sea vision is complete on the map, a name is only symbolic; the region-wide collaborations needed to save this ecosystem are just beginning.

Aptly drawing from this new name and the pressing issue of ecosystem decline, the Salish Sea Marine Survival Project (SSMSP) is the next chapter in this story of collaboration across the Salish Sea region. The participants in the SSMSP closely parallel those involved with the naming of the area of study. These stakeholders of the region come from a variety of backgrounds and perspectives: federal, state, county, academic, tribal, and nonprofit. Just as Webber's "Salish Sea" has created a larger geographical community that did not exist before, at least in name, the SSMSP is working to create a community of scientists, each participating for individual reasons, but united by a common goal of understanding the place they call home.

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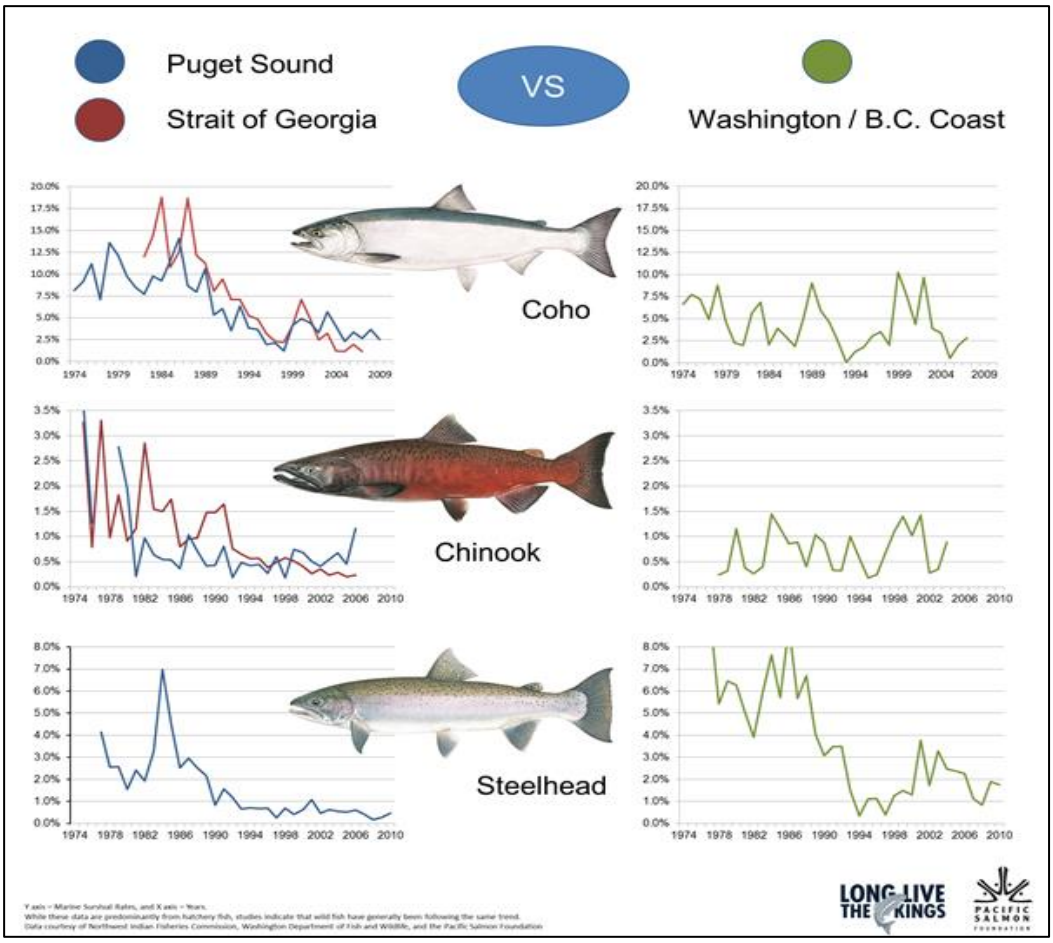
[4] Bert Webber, "Naming the Salish Sea," http://www.wwu.edu/salishsea/history.shtml.
[5] Ibid.
[6] The Associated Press, "National Board Adopts Salish Sea Name," *The Seattle Times* 2009.

The Problem: Why the Project Exists

Salmon are dying in the Salish Sea. This simple statement masks an extremely complex problem taking place in a historically understudied ecosystem. The Salish Sea is home to over 3000 species of marine life, including all seven species of Pacific salmon and steelhead.[7] Over the past 30 years, the marine phase (when the fish are in salt water) survival rates of chinook, coho, and steelhead have declined tenfold.[8] This abnormality is unique to the Salish Sea, for other Pacific salmon populations have not undergone the same rapid decline (Figure 2).

Figure 2: Decline of Salmon and Steelhead Survival in the Salish Sea[9]



[7] Salish Sea Marine Survival Project, "The Project," http://marinesurvivalproject.com/the-project/.
[8] Ibid.
[9] Ibid.

While there is a lot of money for salmon conservation in the Pacific Northwest, previous efforts have been unsuccessful in stabilizing populations. Understanding the causes behind these declines – and figuring out how to address them - requires new research to fill in the black box that is the interactions between salmon and their Salish Sea environment. This is the goal of the Salish Sea Marine Survival Project (SSMSP), a joint research effort between the US and Canada that consists of 150+ participating scientists. Chosen by the project coordinators for their expertise in marine science and their stake in the region, these participants do scientific research to support or refute hypotheses jointly crafted through collaboration. But the participant role goes beyond that – in working across agency lines and within multiple disciplines, the SSMSP hopes that its scientists will also form working relationships and collaborate in ways that push the research in directions not before explored.

According to its participants, the SSMSP has evolved into a surprisingly successful example of how to do collaborative research at a large scale. However, such a scope means that each participant's experiences of working within the project are unique. This thesis examines the question, *what factors influence participation in the Salish Sea Marine Survival Project?* Interviews with participants about their experiences illuminate not only which factors are most influential on participation, but also how such factors differentially impact participants based on their associated sector. The relevant factors, taken from the literature on participation, will be introduced and discussed in depth later in this paper. This analysis of the SSMSP seeks to expand our understanding of how to carry out successful participation-based research projects at the ecosystem level.

This paper will first explain the history and structure of the SSMSP to provide background on how the project functions. The next section examines some of the literature on large-scale conservation and research efforts to identify factors that impact participation. Section three provides cultural context for the project through an explanation of the role of salmon in the Salish Sea Region. Interviews with participants are analyzed in section four, with a focus on how the factors identified in the literature review impact each group. The final section summarizes the results of the analysis and examines how ideas from this study can be used in a general context.

I. History and Structure of the Salish Sea Marine Survival Project

History of the SSMSP[10]

The idea behind the SSMSP began in 2009, when the Vancouver-based Pacific Salmon Foundation (PSF) drafted the *Strait of Georgia Chinook and Coho Proposal*, a multi-disciplinary research approach to understanding chinook and coho mortality in the Strait of Georgia. This project would bring together government, universities, private consultants, community members, and nonprofits to carry out studies on the salmon.[11] With a price tag of almost eleven million dollars over four years, however, the project was put on hold.[12] The idea of an international collaborative effort was born in 2010 at the State of the Salmon Conference in Oregon, where questions were posed regarding the impact of the changing Salish Sea environment on salmon mortality. Later that year, Seattle-based nonprofit Long Live the Kings (LLTK) formed a partnership with PSF and drafted a U.S. research plan to parallel the Canadian one from 2009. The Pacific Salmon Commission, an international body tasked with upholding the Pacific Salmon Treaty[13], agreed to fund the project with a lump sum of $5 million over 5 years. With $2.5 million now working to jumpstart the project on each side of the border, the effort got off the ground in a way that PSF's earlier iteration was not able to.[14]

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[10] "How We Got Here," http://marinesurvivalproject.com/the-project/how-we-got-here/.
[11] B Riddell and I Pearsall, "Strait of Georgia Chinook and Coho Proposal."
[12] Ibid.
[13] The Pacific Salmon Treaty is an agreement between the U.S. and Canada regarding cooperation in studying, managing, and enhancing Pacific salmon stocks of mutual concern. See: http://psc.org/about-us/history-purpose/pacific-salmon-treaty.
[14] Funding has also come through competitive grants, private funding (Boeing/Vulcan), the EPA, and Washington state appropriations on the US side. While outside the scope of this paper, it is interesting to consider how reliance on outside funding may push the project in certain directions. To receive money, grants may have to be tailored to a funder's interests. So far, most of the money that has been received has been available for use in any desired way.

In 2012, the U.S. technical team published its *Hypotheses and Preliminary Research Recommendations for Puget Sound*, setting the stage for collaborative work. The First Salish Sea marine survival workshop was hosted by LLTK and PSF in November of 2012, where 90 participants from both sides of the border convened to determine the research areas requiring greatest international collaboration.

The SSMSP Today

After the success of the 2012 marine survival workshop, LLTK and PSF worked together to formally create the Salish Sea Marine Survival Project (SSMSP), with each nonprofit overseeing the coordination of the project in their respective country. The SSMSP is a bi-national effort to determine the primary factors affecting juvenile Chinook, coho, and steelhead survival in the Salish Sea Marine environment. Its facilitators believe that finding answers requires a "comprehensive, multi-disciplinary and highly coordinated research program at an ecologically relevant scale – the entire Salish Sea." The project brings together 150+ scientists from over 40 agencies and organizations with a variety of backgrounds: federal, state, county, tribal, academic, and nonprofit. As a research effort, the project relies upon participation from the scientists in many different sectors, and so throughout this paper the words scientist and participant will be used interchangeably. The research is based upon hypotheses created through collaboration between all scientists.[15] These hypotheses are being tested separately in both Canadian and U.S. waters, but efforts have been made to align the research between the two countries per the

[15] The three key hypotheses are: (1) Bottom-up processes (weather, water, plankton) within the Salish Sea are changing, and salmon can't keep up, limiting their growth and survival; (2) top down processes (predators) are changing, meaning that fewer fish are reaching adulthood; (3) other factors are exacerbating the ecological changes, including toxins, disease, and competition.

2015 *US-Canada Operating and Alignment Summary*. While data sharing is most useful for areas of high alignment, all data are available to participants through an online platform. Fundraising efforts are also coordinated – the project has a $20 million budget, with $10 million allocated for the work in each country. $17.5 million will go towards actual research, with the remaining going towards management, coordination, communication, and fundraising.

Ultimately, the project aims to understand the factors affecting salmon survival for three main purposes: (1) improving management actions for increased survival; (2) improving adult return forecasting for better fisheries management; (3) improving understanding of the marine environment and how it influences salmon.[16] Participants may be motivated by any or all of these goals.

The Structure of Participation

Within the SSMSP, participants are organized using a multi-tiered approach, summarized in Table 1. The coordinating committees meet quarterly, but the bulk of groupwide collaboration occurs when all participants come together each December for the annual retreat. There, scientists can discuss current research, results, funding, and next steps. Larger workshops were also planned for the midway point (2016) to evaluate progress and discuss future work, and for the end of the five-year research phase (2019) to discuss future research goals and the translation of research results into management actions.[17]

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[16] Michael Schmidt and Isobel Pearsall, "Salish Sea Marine Survival Project - Project Foundation, Operating, and U.S.-Canda Alignment Plan," (2015), 9.
[17] Ibid.

Table 1: The Organizational Structure of the SSMSP

Role	Affiliation	Responsibility
Coordination	Long Live the Kings, Pacific Salmon Foundation	Coordinate research, establish funding, handle outreach and communications, and translate research into management actions
Oversight: Coordinating Committees	Lead representatives from each of the agencies engaged in salmon recovery in the Salish Sea (12 people sit on the US Coordinating Committee[18])	Ensure proper administration of funding, maintain project as a priority for participants, coordinate with other initiatives, tie research to management
National Multi-Disciplinary Technical Teams	Made up of experts from a variety of disciplines related to marine ecology and oceanography (20 people sit on the US Technical Team[19])	Develop, implement, and review research; ensure within-nation collaboration across different disciplines
International Workgroups	Made up of members from the US and Canada technical teams	Tackle cross-boundary issues
Dynamic Task Teams	Members of the technical team or coordinating committee; may also include new participants if necessary for the project	Formed as needed for specific projects – can be national or international
The Doers	Scientists, technical staff, and volunteers associated with participating agencies/institutions/tribes	Collect data in the field and in the lab, analyze samples, process data

[18] See Appendix B for US Coordinating Committee Participants and Associated Agencies
[19] See Appendix C for US Technical Team Participants and Associated Agencies

It should be noted that there are two coordinating committees and two technical teams – one on each side of the border. At the 2016 project-wide retreat, a new US-Canada Synthesis Committee was proposed to ensure that both countries are on the same page regarding the five-year joint statement. While the Canadian portion of this project is equally important, the focus of this study will be on participants from the U.S. side due to interviewee accessibility. Given the distinct teams for each country, the results of this study may not necessarily apply to the Canadian portion.

Participation in Large-Scale Research: What makes the SSMSP special?

From the number of people involved to the operating budget to the area covered, the SSMSP is a complex project in a relatively new field. Over the past few decades, ecosystem (or landscape) level conservation has become increasingly popular as the impacts of climate change work at larger scales.[20] Theories of landscape level conservation acknowledge that setting aside protected areas is generally inadequate for conserving biodiversity, as such spaces are usually too small, lack connectivity, and animals pay little heed to such boundaries.[21] Glennon and Didier also note that, "planning for conservation without taking the needs of humans into account creates inherent conflict, and biological diversity often loses in the long run."[22] They propose a Landscape-Species Approach towards conservation planning, which aims to balance the competing interests, both human and not, within a landscape.[23]

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[20] U.S. Fish and Wildlife Service, "Conservation in Transition: Leading Change in the 21st Century," (2009), 4.
[21] Michael J. Glennon and Karl A. Didier, "A General Model for Site-Based Conservation in Human-Dominated Landscapes: The Landscape Species Approach," in *Landscape-Scale Conservation Planning*, ed. S.C. Trombulak and R.F. Baldwin (Springer Science and Business Media, 2010), 370.
[22] Ibid.
[23] Ibid.

Conservation biologists are not the only ones moving in this direction. A 2014 Whitehouse blog post reads:

> Responding to these challenges [climate change, pollution, development] involves working across jurisdictions and with all partners, because Mother Nature pays no attention to political or bureaucratic boundaries. That means Federal agencies, tribes, state and local governments, and other stakeholders all have to come to the table and work together. It is this approach – considering all lands and listening to all voices – that best defines landscape-level conservation.[24]

Working at an ecosystem scale means encountering a diverse array of voices, and thus projects must be constructed with participation in mind. Ideally, bringing different stakeholders together will create a result greater than the sum of its parts. This is the goal of the SSMSP: it involves stakeholders from a variety of backgrounds sharing information, labor, and money to tackle a problem at a scale far beyond individual capabilities, both scientifically and socially.

[24] Mike Boots to The White House, https://www.whitehouse.gov/blog/2014/10/24/thinking-big-landscape-level-approach-conservation.

II. Participation in the Literature: Factors that Influence Participation

The History of Participation

A brief history of participation in resource management and conservation work can put the SSMSP in context. In the 1970s, theories of participation emerged within development discourses as ways to include the poor in the decisions that were directly impacting their lives.[25] This initially started out as "participatory development", where locals were involved in projects that were predetermined by development organizations or the state.[26] While people were technically "participating" in the work that was being done, they had very little agency. Throughout most of the 20th century, the communication of science to the public operated through the public deficit model. This model assumed that public acceptance of science must stem from the ability to understand science "correctly" as defined by experts, leading to a linear method of communication from expert to public.[27] The 1980s saw an alternative in "people's self-development", where the focus was on collective action and a rejection of these conventional forms of expertise.[28] There was an increased recognition that, as Bucchi and Neresini write, "lay knowledge is not an impoverished or quantitatively inferior version of expert knowledge; it is qualitatively different".[29] Today, conservationists are also giving increasing weight to Traditional Ecological Knowledge (TEK), a type of expertise gained through many generations of living

[25] Andrea Cornwall, "Beneficiary, Consumer, Citizen: Perspectives on Participation for Poverty Reduction," *Sida studies* 2 (2000): 11.
[26] Ibid.
[27] M. Bucchi and F. Neresini, "Science and Public Participation," *Handbook of Science and Technology Studies, Third Edition* (2007): 450.
[28] Cornwall, "Beneficiary, Consumer, Citizen: Perspectives on Participation for Poverty Reduction," 24.
[29] Bucchi and Neresini, "Science and Public Participation," 451.

on the land. While TEK is not a uniquely indigenous way of knowing, it is often the channel through which participation is sought from native groups.[30] Although the process of integrating many different types of knowledge is complicated and sometime inequitable, participation today is open to a broader pool of knowledge than ever before.

While the SSMSP is casting a wide net, both geographically and organizationally, for its participants, the type of knowledge sought is narrower. Unlike in most communities targeted for development projects, all participants in the SSMSP are trained scientists. Within SSMSP publications, the words 'scientist' and 'participant' are used interchangeably, but the public is rarely mentioned. This makes understanding participation within the project slightly more complex. However, the project was constructed while thinking about which groups *should* be at the table because they had a stake in the outcomes. Each group brings expertise, but also a diverse set of backgrounds, goals, and interests.[31] In this way, the SSMSP embodies ideals of participation.

Zooming out: A Literature Review of Participation

A more general exploration of the literature on participation can help clarify the factors that influence participation within the SSMSP. Many authors have written about how participation functions in research processes.[32,33,34,35] To start, Goodwin rejects the

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[30] Paul Nadasdy, "The Politics of Tek: Power and the "Integration" of Knowledge," *Arctic Anthropology* 36, no. 1/2 (1999): 1.
[31] See Appendix D for a list of participants, their affiliations, and their roles
[32] P. Goodwin, "'Hired Hands' or 'Local Voice': Understandings and Experience of Local Participation in Conservation," *Transactions of the Institute of British Geographers* 23, no. 4 (1998).
[33] Jennifer L. Shirk et al., "Public Participation in Scientific Research: A Framework for Deliberate Design," *Ecology and Society* 17, no. 2 (2012).
[34] Andrea Cornwall, "Unpacking 'Participation': Models, Meanings and Practices," *Community Development Journal* 43, no. 3 (2008).
[35] Monica E. Mulrennan, Rodney Mark, and Colin H. Scott, "Revamping Community-Based Conservation through Participatory Research," *The Canadian Geographer / Le Géographe canadien* 56, no. 2 (2012).

strategy of approaching participation as, "a management tool to achieve a predetermined product," claiming instead that participation needs to be thought of as a process through which objectives and actions emerge.[36] Mulrennan et al. elaborate upon this, writing that successful community based participatory research (CBPR) requires community involvement throughout all phases of the research process.[37] This includes asking the original research question, collecting and analyzing data, and coming up with ways to disseminate results in an equitable and accessible way.[38] Thinking about participation as a process allows for consideration not only for what actions are taken within the project, but also for motivations (why participate?) and outcomes (what do participants gain?).

While it is generally agreed upon that the more participation the better, the question remains as to who exactly "participants" is referring to. Mulrennan et al. point out the oversimplification of the idea of community as a common pitfall.[39] Participation is straightforward when 'community' is homogenized into one group with a shared set of ideals. But how does this work for a large-scale effort where there are many different participants, all with potentially conflicting interests? Different groups must be thought of not as isolated entities, but as related to one another in existing social networks.[40] The **composition** of the project, specifically with respect to **diversity** of participants, is especially important to understand when investigating a project with the scope of the SSMSP.

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[36] Goodwin, "'Hired Hands' or 'Local Voice': Understandings and Experience of Local Participation in Conservation," 495.
[37] Mulrennan, Mark, and Scott, "Revamping Community-Based Conservation through Participatory Research," 248.
[38] Shirk et al., "Public Participation in Scientific Research: A Framework for Deliberate Design," 3.
[39] Mulrennan, Mark, and Scott, "Revamping Community-Based Conservation through Participatory Research," 244.
[40] Cornwall, "Unpacking 'Participation': Models, Meanings and Practices," 278.

As noted earlier, all participants in the SSMSP are scientists with high levels of **expertise**. This is not the case in much of the literature, where researchers/experts are put in opposition to participants/public/ community.[41,42,43] The creation of this dichotomy is problematic in that it perpetuates the discourse of the superiority of Western science over other forms of knowledge. Shirk et al. write that successful public participation in scientific research should have three kinds of outcomes: those for research (new science), those for participants (new skills/knowledge), and those for social-ecological systems (new policy/action).[44] In separating the first two, Shirk implies that participants are only involved to gain new research skills. This seems to contradict her claim that degree of participation (as defined by extent of involvement in the *scientific research process*) influences the outcomes of the effort. A high level of involvement in the research process requires that participants are the ones asking the questions. As such, the scientific outcomes should be meaningful to the participants. In having participants who are scientists, this alignment should always hold true within the SSMSP. However, the focus on scientific expertise may exclude those with other types of knowledge from participating.

Before any knowledge can be gathered, a project needs participants. Many authors imply that if a project is well put together, everyone will want to participate, but this is idealistic. Sometimes, there are systemic imbalances that inhibit participation, often through differential **access to resources** and the distribution of **funding**. Potential participants simply may not have the means, motivation, or the time to be involved, despite

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[41] Shirk et al., "Public Participation in Scientific Research: A Framework for Deliberate Design."
[42] Cornwall, "Unpacking 'Participation': Models, Meanings and Practices."
[43] Bucchi and Neresini, "Science and Public Participation."
[44] Shirk et al., "Public Participation in Scientific Research: A Framework for Deliberate Design," 1-2.

interest in a project.[45] For those with greater access to resources, participation requires no personal sacrifice. It can also happen that certain pieces of the project receive more funding than others, and thus some groups can participate more. This can create a bias against smaller, lesser-known organizations or sectors of the population with less history in the study area. Such a lack of representation goes against all the ideals of comprehensive community participation. Garnett et al. propose a solution to this, stating that participants should not only be used for local expertise, but also trained and employed as co-investigators.[46] Doing so may also increase local buy-in to the results. In the case of the SSMSP, where all participants are employed by other agencies, it is more important to examine how funding and access to resources may either promote or impede participation.

Perhaps the most important factor in participation is **power**. In most cases, the power lies with the project coordinator, especially in inviting participants to a project.[47] How the coordinator uses this power may greatly impact the experience of participants within the project. Many projects fall into the trap of invoking participation only as a means to an end, and subsequently exploit the knowledge of participants.[48,49] Another word for this practice is 'tokenism' – using the discourse of participation to make a project seem more legitimate without actually making any attempt to use the knowledge in a productive and equitable way.[50] Goodwin presents this as a spectrum of "hired hands"

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[45] Stephen T. Garnett et al., "Transformative Knowledge Transfer through Empowering and Paying Community Researchers," *Biotropica* 41, no. 5 (2009): 571.
[46] Ibid.
[47] Shirk et al., "Public Participation in Scientific Research: A Framework for Deliberate Design," 4.
[48] Goodwin, "'Hired Hands' or 'Local Voice': Understandings and Experience of Local Participation in Conservation," 495.
[49] Mulrennan, Mark, and Scott, "Revamping Community-Based Conservation through Participatory Research," 245.
[50] Cornwall, "Unpacking 'Participation': Models, Meanings and Practices," 270-71.

versus "local voice" – where 'hired hands' represents the use of public knowledge only as supplementary, leaving locals to feel that their voices have been ignored.[51] It is possible for power dynamics to exist even within communities of trained scientists like the SSMSP. This comes in part through each scientist's role within the project, and when they were asked to participate. As Cornwall points out, logistically, participatory practices cannot include everyone, meaning that some people will be represented by others.[52] Such representation can lead to the erasure of certain ideas or opinions. The coordinating figure may govern the extent of such erasure in whom they select to participate. Another pitfall may be the alteration of a project to fit certain participation agendas pushed by donors.[53] Entrapment within a certain discourse of participation, as chosen by an outside entity, can make the implementation of participation in practice impossible.[54]

Successful participation in a project requires more than just a seat at the table. These authors describe the ideal participation experience: 1) participants should have a say in the research question and the direction of the project; 2) participation should be a process, not a means to an end; 3) participants should share their own knowledge, but also gain knowledge as co-researchers, increasing ownership over results; 4) results should be beneficial to participants, and thus must be easily interpretable for all levels of expertise. For each participant, certain factors may work towards or against meeting this ideal. As taken from the literature, these factors include expertise, diversity/composition of the

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[51] Goodwin, "'Hired Hands' or 'Local Voice': Understandings and Experience of Local Participation in Conservation," 489.
[52] Cornwall, "Unpacking 'Participation': Models, Meanings and Practices," 277.
[53] Mulrennan, Mark, and Scott, "Revamping Community-Based Conservation through Participatory Research," 245.
[54] David Mosse, "Is Good Policy Unimplementable? Reflections on the Ethnography of Aid Policy and Practice," *Development and Change* 35, no. 4 (2004): 657.

participant community, access to resources, allotment of funding, and power of the facilitator. As the impacts of factors may differ across projects, success requires engaging with all players in a local community and developing relationships. In considering what factors may be influential on a case by case basis, participation may be able to transition from being an idealized discourse to an implementable practice within a project. In the case of the SSMSP, one final factor stands out as unique: salmon. This factor is influential enough that it requires further exploration.

III. Salmon in the Northwest: A Cultural, Economic, and Environmental Icon

Why Study Salmon?

Every year, the Washington State Department of Fish and Wildlife runs the School Cooperative Program (formerly called Salmon in the Classroom), which provides salmonid eggs to classrooms across the state. Students learn about the salmon life cycle and environmental stewardship as part of their science curriculum, while watching the eggs hatch and grow into fry in an aquarium. The students then release the young fish into their local watershed.[55] The salmon life cycle: hatch in a river, migrate to the ocean, eat and grow, return to stream of birth, spawn, die, becomes ingrained in the minds of children all over Washington.[56] This lesson plan requires a significant amount of effort by both the Department of Fish and Wildlife as well as the teacher. Why the focus on salmon in schools?

The answer to this question is undoubtedly related to the reason that the Salish Sea Marine Survival Project exists. Put simply, salmon have become the icon of the Pacific Northwest.[57] John Findlay, a professor at the University of Washington writes, "salmon seem to stand for all that is good about the Pacific Northwest," citing their indigeneity, their connection to nature, and their ability to cross divides both social and geographic.[58] He warns, however, that in casting salmon as a unifying symbol of the Pacific Northwest, there

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[55] Washington Department of Fish and Wildlife, "School Cooperative Program," http://wdfw.wa.gov/conservation/research/school_coop_program/.
[56] National Park Service, "The Salmon Life Cycle," https://www.nps.gov/olym/learn/nature/the-salmon-life-cycle.htm.
[57] Priscilla Long, "What Can Humans Do to Save the Iconic Northwest Salmon," *Smithsonian*.
[58] John Findlay, "To Whom Does the Pacific Northwest Belong?," *Center for the Study of the Pacific Northwest:*, http://www.washington.edu/uwired/outreach/cspn/Website/Classroom%20Materials/Pacific%20Northwest%20History/Lessons/Lesson%202/2.html.

exists power to obscure existing fault lines, such as Eastern vs. Western or tribal vs. non-tribal. While it is important to note these very real divisions within Washington state, this created unity around salmon is what makes collaborative projects like the SSMSP possible. Obscuring these differences may be necessary in creating a research effort with a common goal.[59] All participants want to know why salmon are dying off because the fish are important to them. For this work, however, it is useful to examine the different reasons why salmon may be meaningful to each group - this can help shed light on why people choose to participate in a project aimed at saving the species. On their website, the SSMSP divides these reasons up into three distinct categories: cultural, economic, and environmental.[60] However, it is difficult to identify a singular motivation for any individual, for each participant is driven by a unique set of interactions between these variables.

Salmon in Northwest Culture, Then and Now

Native Americans of the Pacific Northwest Coast have been relying on salmon for thousands of years for subsistence. While indigenous tribes across the country made the transition from transient hunter-gathering to early agriculture, the Native Americans on the northwest coast relied little on cultivation.[61] Instead, they could settle into semi-permanent villages through their reliance on fish. Like a yearly crop cycle, the salmon life cycle was predictable; indigenous people depended on the return of salmon to their native streams each summer. They would set up nets to catch the salmon as they came upstream

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[59] Anna Tsing, "The Forest of Collaborators," in *Friction: An Ethnography of Global Connections* (New Jersey: Princeton University Press, 2005), 246.
[60] Salish Sea Marine Survival Project, "The Project".
[61] R.G. Matson, "Introduction: The Northwest Coast in Perspective," in *Emerging from the Mist: Studies in Northwest Coast Culture History*, ed. Gary Coupland Quentin Mackie, and R.G. Matson (Vancouver: UBC Press, 2011), 5.

Figure 3:
"Salishan man named William We-ah-lup smoking salmon, Tulalip Indian Reservation, Washington, 1906."
Image courtesy of the University of Washington Digital Collections[62]

Figure 4:
"Lummi men trolling for salmon from canoe, near Bellingham, Washington, ca. 1900."
Image courtesy of the University of Washington Digital Collections[63]

[62] Norman Edson, *Salsihan Man Named Willliam We-Ah-Lup Smoking Salmon, Tulalip Indian Reservation, Washington, 1906*, *American Indians of the Pacific Northwest* (Seattle).
[63] Asahel Curtis, *Lummi Men Trolling for Salmon from Canoe, near Bellingham, Washington, Ca. 1900 American Indians of the Pacific Northwest Images* (Seattle).

to spawn, relying on traditional knowledge of the best fishing spots.[64] Wooden canoes were also used to troll for fish (Figure 4). Everyone would then pitch in to dry most of the meat to preserve it for sustenance over the winter (Figure 3).[65]

Salmon were held as sacred, and several myths and taboos existed around their catch and consumption. As a resource, the salmon were treated with utmost respect – otherwise, it was believed, they would not return. Stories described salmon more like humans than animals, inhabiting an unknown, underwater world, and sometimes paying visits to their human neighbors.[66] This understanding promoted a sustainable relationship between humans and the ecosystem that allowed salmon population levels to remain relatively stable.[67] However, the arrival of settlers in the 1790s changed this, as natural resources became commoditized and their extraction became mechanized throughout the 1800 and 1900s.[68] The creation of canneries along rivers in the late 1800s incentivized overharvesting, and created a massive amount of waste as workers discarded many fish, believing that supplies were endless.[69] This showed a complete reversal from the way that indigenous peoples interacted with the resource. Salmon were still seen as food, but at a scale much above subsistence, and by the early 20th century populations were declining.[70]

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[64] Jay Miller, "Salmon, the Livegiving Gift," *University Libraries Digital Collections at the University of Washington*.
[65] Ibid.
[66] Jay Miller, "Salmon, the Livegiving Gift," *University Libraries Digital Collections at the University of Washington*.
[67] University of Washington, "Salmon in the Northwest," University Libraries Digital Collections, http://content.lib.washington.edu/salmonweb/.
[68] Timothy Quinn, "An Environmental and Historical Overview of the Puget Sound Ecosystem," in *Puget Sound Shorelines and the Impacts of Armoring—Proceedings of a State of the Science Workshop*, ed. H. Shipman, Dethier, M.N., Gelfenbaum, G., Fresh, K.L., and Dinicola, R.S. (U.S. Geological Survey Scientific Investigations Report 2010-5254).
[69] University of Washington, "Salmon in the Northwest".
[70] Ibid.

Indigenous tribes pushed back against these new practices, and beginning in the 1850s entered into treaties with the state. In exchange for exclusive access to certain areas (reservations) and the rights to fish anywhere, tribes gave up most of their traditional lands.[71] However, overfishing by commercial fishermen continued, and conflicts remained between native and non-native fishermen. Commercial fishermen began harvesting in the marine waters, taking in a majority of the catch before the salmon could return to their native streams, where Native Americans usually fished.[72] The installation of hydroelectric dams further compounded the problem as they blocked salmon migration.[73] In 1974, Judge George Boldt upheld the treaty rights in a landmark decision, granting tribes co-management of salmon Another case in 1980 gave tribes a 50/50 share in both hatchery produced and wild salmon. Today, this co-management continues.[74] However, as the Northwest Indian Fisheries Commission points out, "the existence of fish for harvest is fundamental for the right to fish to have meaning."[75] As salmon are threatened by habitat degradation and overfishing, so too is the Pacific Northwest indigenous way of life.

The Economics of Salmon

Salmon are economically important for tribal, commercial, and recreational fisheries, as well as associated tourism industries.[76] The increasing prevalence of salmon hatcheries over the past century indicates a commitment to salmon fishing as an industry,

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[71] Northwest Indian Fisheries Commission, "Understanding Tribal Treaty Rights in Western Washington," http://nwifc.org/w/wp-content/uploads/downloads/2014/10/understanding-treaty-rights-final.pdf.
[72] Ibid.
[73] University of Washington, "Salmon in the Northwest".
[74] Northwest Indian Fisheries Commission, "Understanding Tribal Treaty Rights in Western Washington" 3.
[75] Ibid., 4.
[76] Salish Sea Marine Survival Project, "The Project".

despite the potential negative consequences for wild stocks.[77] There are 146 hatcheries total, run by the Washington Department of Fish and Wildlife, Native American tribes, and the federal government; these hatcheries release millions of fish each year to supplement wild populations.[78] The industry is increasingly reliant on these hatcheries, as 75% of the annual catch in Puget Sound are hatchery fish.[79] Some groups blame hatcheries for increased mortality due to competition with wild fish for food, while others argue that this is not true because hatchery fish are suffering the same declines. There is much more to be said about the hatchery controversy in Washington State, but this debate is beyond the scope of this paper.[80]

It is estimated that the salmon harvest contributes over $1 billion annually to the state's economy.[81] Salmon bring in many recreational fishermen and tourists who put money into local economies when buying from independent gear shops and eating at restaurants.[82] The state also gets money when fishermen purchase fishing licenses from the Department of Fish and Wildlife.[83] The industry provides tens of thousands of jobs for residents both in fisheries and through tourism.[84] Declining stock are threatening the vitality of this industry, in part because there are simply fewer fish to catch. The more complex problem, however, lies in reaching an agreement between the state and tribes

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[77] Long, "What Can Humans Do to Save the Iconic Northwest Salmon."
[78] Ibid.
[79] Washington Department of Fish and Wildlife, "Salmon Hatcheries Overview," http://wdfw.wa.gov/hatcheries/overview.html.
[80] For more on controversy over hatcheries in the Northwest, see: Ernest L. Brannon et al., "The Controversy About Salmon Hatcheries," *Fisheries* 29, no. 9.
[81] Long, "What Can Humans Do to Save the Iconic Northwest Salmon."
[82] Washington Department of Fish and Wildlife, "Fish, Wildlife, and Washington's Economy," (2010).
[83] Ibid.
[84] Andy Hobbs, "These Little Fish Play a Big Role in Puget Sound's Health - and Washington's Economy," *The Olympian*.

regarding harvest quotas and the fair distribution of fewer fish.[85] Usually, a joint permit is submitted to NOAA for review, but in 2016, the two sides were unable to come to an agreement and areas remained closed at the start of fishing season for the first time in 30 years[86] While an agreement was reached a few weeks later, many communities were hit hard by the loss of multiple weeks of business.[87] If salmon returns continue to decline, this could become a recurring problem. In a time where money is a major driver of political decisions, the threat of economic loss from declining salmon populations has the potential to unite various stakeholders in working towards sustainable solutions.

Salmon as an Indicator Species

In the context of large-scale environmental impacts such as climate change, salmon are an important indicator species for the entire Puget Sound ecosystem.[88] An indicator species is one whose presence, absence, or abundance can be used as a proxy for the health of an entire ecosystem.[89] Such species are usually sensitive to change and react consistently, are easily measurable, and are representative of other organisms in their ecosystem; salmon check all of these boxes.[90] Rapidly decreasing salmon populations, at a rate above that which could be caused by overharvesting, indicate that there are biological, physical, and chemical changes occurring within the Salish Sea. The deteriorating health of the ecosystem has consequences for all of its inhabitants, from copepods to killer whales.[91]

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[85] The Associated Press, "Q&A: Here's Why Salmon Fishing Is Off Limits in Puget Sound," *The Seattle Times*.
[86] Ibid.
[87] Ibid.
[88] Salish Sea Marine Survival Project, "The Project".
[89] Catlyn McDonough, David Jaffe, and Mary Watzin, "What Is an Indicator Species?," *Encyclopedia of the Earth*.
[90] Carolyn Csanyi, "Examples of Indicator Species," *Seattle PI*.
[91] Angela Thomas, "United for Salmon: Preserving the Pacific Northwest," http://voices.nationalgeographic.com/2015/10/23/united-for-salmon-preserving-the-pacific-northwest/.

The studies that are being undertaken to look at declining salmon populations also have implications for the future of the entire ecosystem.

Not only do salmon indicate ecosystem health, but they also play an important role within the ecosystems themselves. At their simplest, the fish provide an important food source for local carnivores such as bears. Salmon are also a vehicle to carry nutrients from the ocean back inland as they return to spawn. Since salmon die after spawning, they decompose in inland streams, providing vital nutrients such as nitrogen and phosphorous to surrounding forests and food webs.[92,93] The effects of salmon-carried nutrients trickle through the ecosystem. Trees with greater access to nitrogen grow more leaves and thus photosynthesize more, growing more quickly and stopping streambank erosion.[94] These trees eventually fall into the river, creating logjams that enhance salmon habitat.[95] However, the increasing reliance on hatchery salmon means that there are fewer naturally-spawning salmon to bring nutrients inland, as hatcheries are usually positioned close to marine waters.[96] Programs are underway to bring fish carcasses of the adults used for brood stock at the hatcheries back into the watersheds.[97] This unnatural process is a clear indication of the amount of impact that humans have had on salmon; creating a healthy and sustainable ecosystem will require changes that allow it to function without human intervention.

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[92] Guido Rahr, "Why Protect Salmon," *Wild Salmon Center*, https://www.wildsalmoncenter.org/work/why-protect-salmon/.
[93] Predators play an important role in spreading nutrients through forests, both through bringing carcasses away from the river and also through defecation post-salmon consumption.
[94] Rahr, "Why Protect Salmon".
[95] Ibid.
[96] Washington Department of Fish and Wildlife, "Salmon Hatcheries Overview".
[97] Ibid.

Saving an Icon

For those who have not spent a significant amount of time in the Pacific Northwest, such dedication to salmon can be almost baffling. For locals, it is just a way of life. However, hundreds of millions of dollars are spent each year on various recovery programs in the Pacific Northwest, none of which have been effective at restoring salmon populations to historic levels.[98] With so much money being thrown at salmon recovery, such a result is extremely frustrating to those with stakes in salmon. The SSMSP is carving a space for itself in a region saturated with salmon-focused efforts by going back to square one: doing the scientific research to figure out how the fish are interacting with their ecosystem. In doing so, they hope to identify where exactly restoration efforts should be targeted, which will ensure that resources are used most effectively. Because of the multiple types of interest in salmon: cultural, economic, environmental, or any combination of the three, the project is able to find support from many groups across the region.

[98] Lackey, R T. Science, Policy, and Pacific Northwest Salmon Recovery. Presented at Lecture at Southern Oregon University, Ashland, OR, February 25, 2004.

IV. Research Methods

This study of how factors differentially impact participation for certain groups within the SSMSP began with an email exchange with Michael Schmidt, deputy director of Long Live the Kings. Schmidt provided a list of contacts that contained 22 participants from the federal (4), state (3), county (1), tribal (5), academic (5), nonprofit (3), a private industry (1) sectors. Four participants were from the Canadian side of the project, and the rest were American. Schmidt emailed all contacts to introduce the project and the intents of the author regarding interviews. Participants were given the option to decline the interview, but none responded as such.

Since the research involved interviews of human subjects, an application for exemption under category 2 (which includes interviews) was submitted to the Human Subjects Committee at Yale University. Exemption was granted from IRB review under federal regulation 45 CFR 46.101(b)(2). The exemption protocol number is 1610018512.

An email was sent out to the 22 participants on the contact list. A follow up email was sent one month later to those in underrepresented categories. Interviews were arranged over email and then conducted over phone or skype. Interviews were semi-structured, based upon a set of 13 questions (Appendix A) but flexible in allowing participants to talk about their experiences. Not every question was posed to every participant when answers were given naturally. Unscripted follow-up questions were asked when deemed appropriate and relevant. The purpose of each interview was to understand that individual's participation within the project, from reasons to involvement to interactions with other participants. Interviews took place between November 9, 2016 and February 9, 2017. All interviews were recorded and transcribed. Eleven interviews

were completed in this matter; a breakdown in the interviews is given in tables 2 and 3. Eight participants never responded to requests for interviews, and three others responded initially, but times for interviews were never resolved. An in-person informal interview was also conducted with Michael Schmidt, the deputy director of LLTK. All interviewees were from the U.S. side of the project.

Table 2: Affiliation of Interviewees

Affiliation	**# Interviewed**
Federal	0
State (Washington Department of Fish and Wildlife, Washington Department of Ecology)	2
County (King County)	1
Tribal (Tulalip Tribes, Lummi Nation)	3
Academic (University of Washington)	3
Nonprofit (Kwiaht, Northwest Indian Fisheries Commission)	2
Private Industry	0

Table 3: Role of Interviewees

Role	**# Interviewed**
Technical Team	6
Coordinating Committee	2
Active Science Participation	3

V. Results and Discussion of Interviews with Participants

The literature review identified six factors that influence participation: standards of expertise, project composition/diversity, access to resources, funding protocols, power of the coordinator, and the importance salmon. Drawing upon interviews with SSMSP participants, the following sections explore the impact of these factors on each of five groups: state, county, academic, nonprofit, and tribal. For each group, individual factors are evaluated as having a positive, neutral, or negative impact. This evaluation will clarify the ways in which factors interact to differentially impact participation for any one group. All interviewees will remain anonymous, but their associated group will be clarified.

State

While participants at the state level were impressed with the project and saw its value, they were less engaged in the full process of participation than other groups. State interviewees noted that the primary reason for their inclusion in the project was their *expertise* in long term trends. Through doing science in the area for many years, they have gained a big-picture idea of the ecosystem that allows them to put new data in context. Much of their work within the project has been presenting these trends to other participants at the yearly workshops. While direct interaction with other participants is limited, state interviewees did mention their appreciation for the *composition/diversity* of the project. One noted that the project has led to more holistic thinking through involvement in work that has stretched beyond previous experiences.[99] Another interviewee appreciated that collaboration was occurring both laterally and vertically; for

[99] Anonymous (state), phone interview with the author, 9 November 2016.

example, scientists working on individual species are now connecting with those researching food webs or genetics.[100] Interviewees also felt that collaboration could occur in real time with all participants; "it's not so big that you can't pick up the phone and call a specific researcher [to discuss their work]."[101] This is especially important at the state level, where agencies are working with many groups on a variety of projects.

Of all sectors, state participants were the least impacted by factors such as *access to resources* and *funding.* State agencies such as the Department of Fish and Wildlife or the Department of Ecology have many resources, including funding specifically designated for salmon. Employees also have salaried positions, which means that their work is not dependent on receiving funding from grants. Similarly, while the state agencies recognize the importance of salmon both environmentally and culturally, employees have no personal dependence on the fish. One interviewee noted that, "having not a personal stake in it allows us to be a very good objective review of issues. Also being on the state level and providing data we have a lot of insight into a lot of other programs so we kind of understand the larger picture of efforts…"[102] For scientists at the state level, the SSMSP is just one of many projects that they participate in. However, they did acknowledge that for other participants, access to funding has been a key reason for success. An interviewee also appreciated the collaborative process through which funding was distributed, and felt that the consensus-based approach has ensured that the money is being used appropriately. This interviewee believed that LLTK has done a good job facilitating this process, as well as tracking the money after distribution.

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[100] Anonymous (state), phone interview with the author, 16 November 2016.
[101] Anonymous (state), phone interview with the author, 16 November 2016.
[102] Anonymous (state), phone interview with the author, 9 November 2016.

In considering the impact of *power* within the project, interviewees' evaluations of the job done by LLTK as a coordinating body were very positive. An interviewee noted that for any organizing agency, "the tradeoff is that how do you maintain your nimbleness, which is what you kind of need, but at the same time how do you make sure that you're accountable and transparent and that no single person or no projects or values get ranked higher than others".[103] This interviewee thought that LLTK has found the correct balance of providing opportunities to give feedback without imposing too much structure on the day to day work of participants. Participants also appreciated the single vision presented by the leadership of LLTK, where, "The project was broad but the focus was narrow. From the beginning, it had a very tight question."[104] This tight focus is meant to keep the project moving in one clear direction, a necessary condition when working with so many different people.

For state-level participants, factors have either neutral (access to resources, funding) or positive (expertise, diversity/composition/power, salmon) impacts on participation. While state participants are not deeply involved in the research or personally invested in its outcomes, the balance of factors is incentive enough for continued participation in the SSMSP.

County

At the county level, at least for King County, participation is mostly limited to sampling. Like participants at the state-level, the county was included because of previous research experience with relevant species. However, a county interviewee noted that their

[103] Anonymous (state), phone interview with the author, 16 November 2016.
[104] Anonymous (state), phone interview with the author, 16 November 2016.

department had no *expertise* in lab analysis, and thus being a part of the project made their data more useful. The interviewee also appreciated the *diversity/composition* of the project, in that it is, "just very helpful to figure out what other entities are doing, and to get the contacts for if we want to have more information, or if we want to have future collaborations, so it's good now to have this network of people that we know what they're doing and who to contact, so that has been very, very valuable."[105]

Prior to the first project-wide meeting, the interviewee was unaware of the amount of work being done by the tribes. Now, the county is following the same sampling protocols as the tribes, which has made participants more aware of the impacts of *access to resources*. The county interviewee related an anecdote in which the University of Washington distributed a sampling protocol which involved pulling large nets behind boats. While groups like the county, UW, and NOAA all had boats capable of following the protocol, the tribes and some of the nonprofits did not. Their smaller boats were pulled backwards by the nets, and they were unable to sample accurately. This episode demonstrated the importance of designing protocols executable by all parties, as failure to do so can cause frustration and disincentivize participation. This story also relates to the factor of *power*, in that LLTK, alongside PI's, must accept responsibility for taking feedback from all entities and, "tweaking things along the way." LLTK's use of power has successfully promoted active participation through their receptiveness to input from participants.

Like the state, the county already had money for sampling and so *funding* had no direct impact. However, the interviewee did stress the importance of continued project funding, noting that, "hopefully then there can be sustained monitoring for this, because

[105] Anonymous (county), phone interview with the author, 16 November 2016

they really are getting a lot of bang for their buck, to have this many entities doing this much sampling for the cost, it's kind of unheard of really." In creating a usable dataset for various agencies, continuous sampling over a long period of time is crucial, and the security of sustained funding may be more appealing to certain groups operating on a longer time-scale. As with the state, the county cares about *salmon* from a more academic perspective– understanding why the fish are dying does not personally impact county scientists.

For county-level participants limited to a narrower sampling role, the impacts of certain factors are more varied. While expertise, diversity/composition, salmon and power are all positive, there is more awareness about the potential negative impacts of funding and access to resources on certain groups, even if the county itself is not specifically impacted.

Academic

Expertise was especially important to those in the academic sector. One interviewee credited the high levels of expertise within the project as the main reason for success, noting that LLTK was, "very selective in the experts that they have invited to the project in the first place. [This selectivity kept the] group constrained to productive people, so it never had the opportunity to balloon out of control in ways that I've seen some projects that are open to everyone who's interested."[106] In taking the best scientists from each discipline, the project is kept at a reasonable size while still covering a lot of ground.[107] These scientists all want to share their knowledge, a motivation which came through in interviews. Although primarily asked about the social dynamics within the project, many

[106] Anonymous (academic), phone interview with the author, 8 December 2016.
[107] Michael Schmidt, interview with the author, Seattle, 13 January 2017.

interviewees talked extensively about their own research and findings, and this was especially true of certain academic interviewees. This may have been because academic participants generally felt that their expertise in a particular facet of marine science was the reason for their inclusion in the project.

In terms of *diversity/composition*, while the possibility of a large coalition focused on one problem was intriguing, one academic participant was, "skeptical about whether or not this sort of a program would actually work or whether it would simply implode based on its own weight."[108] However, this factor has turned out to be very positive in providing, "a variety of perspectives both in terms of background, but also how you approach questions, that provided some checks and balances against going too deeply into one particular approach where it may not bear as much fruit as doing a combination of things where you can really generate some synergy."[109] This has meant that participants have gained more from being a part of the larger group than they would have from doing similar work on their own. One interviewee especially appreciated the moral support that comes from being a part of a scientific community.[110] However, academic participants also acknowledged some conflict in their approach to the project compared to that of groups like the tribes, especially regarding time-scale. One academic interviewee mentioned that tribes seem much more vested in *salmon* than people at universities or other agencies, where "it's just their job, they don't really care that much. Care, from an academic perspective, but not a personal perspective."[111] While tribes want new management in the

[108] Anonymous (academic), phone interview with the author, 15 November 2016
[109] Ibid.
[110] Anonymous (academic), phone interview with the author, 8 December 2016.
[111] Anonymous (academic), phone interview with the author, 8 December 2016.

short term, academics are more interested in understanding long-term trends and publishing peer-reviewed papers, which can increase the legitimacy of the results. However, one academic noted that the SSMSP was compelling because, "this is real work, like there's a real problem that they're addressing".[112] Although they have little personal stake in salmon health, academic interviewees are interested in moving beyond the data to create a solution.

Academic participants, in coming from university settings, have some of the greatest *access to resources*, including laboratories and sampling equipment. However, interviewees have certainly been made aware of the differential impacts of this factor, for they are the ones developing the sampling protocols. An academic interviewee said, "I feel it in the tribes, where they have limited resources, but they're really passionate about this science, so it's a little bit of a push and pull of how much can they donate to this effort versus how much do they feel like they can't do extra because they have such limited resources."[113] This is another case where although a factor may not influence the participation of one group, they are still made aware of its presence by interaction with other groups.

When it came to *funding*, however, the academic interviewees saw mostly positive. One interviewee was especially pleased with the funding process, describing how all researchers are able to submit grant proposals, which are then read, discussed, and voted upon by a representative subset of the participants.[114] This "strikes an interesting and difficult balance of having peer review, but not being overly formal, and still being able to

[112] Anonymous (academic), phone interview with the author, 15 November 2016.
[113] Anonymous (academic), phone interview with the author, 8 December 2016.
[114] Anonymous (academic), phone interview with the author, 15 November 2016.

be nimble."[115] Certain grantmaking processes are extremely formal and standardized, but very hands-off once the money is awarded, while others have "no transparency and no collaboration on how money is distributed – it just shows up or it doesn't." In the case of the SSMSP, this collaborative format operates much more quickly than the formal processes, but still has enough competition to ensure that quality, well-crafted proposals are being written.[116] While those at the academic level are directly impacted by which proposals are funded, those interviewed were generally happy with this process. The only room for improvement lies within the goal of any project: having more money. An interviewee noted, "if I'm disappointed with anything, it's that it really hasn't gotten the funding and support necessary to achieve the level of collaboration that the parties were ready to enter into three years ago."[117]

Like those from the state and county, academic participants have been impressed with LLTK and how the coordinating group has used their *power.* One academic participant expressed appreciation for how LLTK is constantly checking in and keeping participants accountable.[118] Another noted that LLTK has ensured that project momentum is maintained. This is especially important when researchers have multiple projects going on at once, and it is easy to let one slip through the cracks.[119] Schmidt is aware of these split priorities, noting that "you just have to accept that you're only going to get 20% of their time," and thus understands that this time needs to be used as effectively as possible. An interviewee recognized this effort:

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[115] Anonymous (academic), phone interview with the author, 15 November 2016.
[116] Anonymous (state), phone interview with the author, 16 November 2016.
Anonymous (academic), phone interview with the author, 15 November 2016.
[117]Anonymous (academic), phone interview with the author, 15 November 2016.
[118] Anonymous (academic), phone interview with the author, 15 November 2016.
[119] Anonymous (academic), phone interview with the author, 15 November 2016.

> That respect for time and enabling us to use our time valuably I think is one of the primary reasons that so many of us that have been involved in a voluntary basis have stayed involved and are quite loyal to the program, because we feel like our time's respected and that we can do good things with the expenditure of that time. And more importantly, they follow through on getting significant amounts of funding to support a number of these really important research projects.[120]

At the academic level, participants have their hands in many different parts of the project, from data collection to publishing papers to grant proposals, which has meant direct interaction with many different groups. This means that participants have been exposed to factors from many directions. Expertise stands alone as the most positive factor, and power is also viewed with favor. Working on salmon is positive, but from a purely academic standpoint. While academic participants have been generally positively impacted by the other three factors, there is an awareness of the problems they may cause for other groups.

Nonprofit

The category of nonprofit is difficult, in that the interviewees came from two nonprofits with very different roles – one was a coordinating body for tribes, while the other was directly involved in the sampling. However, both nonprofits exist because they think that *salmon* are extremely important. In terms of *expertise,* nonprofit interviewees felt similarly to the county in that they had general knowledge of marine ecosystems and had been doing similar work, but were reliant on outside groups (e.g. those with laboratories) to make their data more useful.[121] As such, the collaboration stemming from the *diversity/composition* of the group has been positive. Having the voices of a diverse set

[120] Anonymous (academic), phone interview with the author, 15 November 2016.
[121] Anonymous (nonprofit), phone interview with the author, 5 December 2016.

of stakeholders calling for action is also helpful within a project that is challenging the status-quo of how money should be spent on salmon recovery in the region. One interviewee noted that, "you need a very loud megaphone to shout down the bureaucrats who are not being bad people, it's just they're doing what they've been doing for years."[122] Furthermore, participants from the tribes or smaller agencies may be able to accomplish work not possible by federal or state agencies, which are bound to inaction by often-conflicting legislation.[123,124]

The existence of the steering committee, made up of representatives from regional agencies involved in salmon recovery, helps to bridge the gap between science and decision making. Nonprofit interviewees also appreciated the focus on science, because, "everybody's used to being either on opposite sides, or is used to simply not doing any academic research at all because you're too busy fighting over quotas - and so in a way it's very liberating when you create a research project that is way beyond the issue of quotas."[125] While the results that come out of the project may be used for certain political agendas, a strict scientific protocol tends to be less biased. In this case, the goal of collecting new data creates a space for relationships that never could have existed before. While the nonprofit interviewees did not talk specifically about the *power* of LLTK, they seemed to think that the creation of a non-political space, where the science can be taken "out of the context of institutional conflicts" should be the primary use of their influence.[126]

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[122] Anonymous (academic), phone interview with the author, 15 November 2016
[123] Anonymous (tribal), phone interview with the author, 9 February 2017
[124] One example of conflicting legislation is the Marine Mammal Protection Act and the Endangered Species Act. Sea lion populations, protected under the MMPA have boomed in recent years. Sea lions are a major predator of salmon, some populations of which are listed. Under the ESA, the state has an obligation to protect salmon populations, but cannot do anything about the sea lions under the MMPA.
[125] Anonymous (nonprofit), phone interview with the author, 5 December 2016.
[126] Ibid.

In terms of *access to resources*, one nonprofit interviewee related the same anecdote as the county participant about the failed sampling protocol, although in this case it was nonprofit boats that were failing. The participant mentioned that, "it was a credit to the good humor that goes along with positive collaboration where people really do see the point of working together that all of these bugs were worked out over the last couple of years… It was a big project to get the coordination so that we have comparable data coming from multiple teams.[127] In this case, this discrepancy in access to resources actually sparked further collaboration, although there was certainly the potential for frustration and inhibited participation. The interviewee also noted that nonprofits and tribes had to approach the project very differently than other entities, in that, "instead of saying what can we afford to do, we were instead saying what was the sampling frequency that would be optimal - and oh, once a week, and everybody was saying, 'can we do that?'[128] The interviewee believed that more *funding* is crucial to the sustainability of collaborations in ensuring that all groups are able to participate at the same level.

Those in the nonprofit sector are more variably impacted by factors than any of those previously examined. Diversity/composition and subsequently expertise are generally positive, but the factor of salmon has a higher level of influence than for other groups. For smaller organizations, access to resources and funding are increasingly likely to have negative influence. Nonprofit participants, especially those with strong ties to the tribes, are also aware of potential conflicts between participants, but hope that the focus on

[127] Ibid.
[128] Anonymous (nonprofit), phone interview with the author, 5 December 2016.

science can smooth these over and allow the project to move forward. They see the potential in power in accomplishing this, and thus view it positively.

Tribal

Among all participants, those from the tribal sector have had the most complicated participatory experience, and thus it deserves more in-depth exploration. However, it must first be acknowledged that the region is home to many different tribes, all of which have independent governments and differing views on how resources should be managed. Interviews were done with participants from two different tribes, but many other opinions are likely to exist beyond those presented here.

From the beginning, tribal interviewees wanted to make clear that they are happy to be a part of a project that is addressing an issue of such great concern to them, and they see value in what the project is trying to do. However, the limiting of the tribal role to collecting samples has led participants to sometimes feel that their *expertise* is discounted.[129] This can raise questions of whether the input of tribes is actually desired, or if they are only included out of obligation. One tribal interviewee spoke of an appreciation for how LLTK has respected the tribes and continues to increase their involvement, but hopes to see the tribal role expand in the future to other areas beyond sampling. The interviewee, "would like to see a more concerted effort to recognize and include tribal input and expertise where it exists."[130] Some of the tribes are independently involved in other research and monitoring efforts in their own areas, and feel that "making that effort [to increase tribal involvement] will pay off in dividends because tribes are intricately

[129] Anonymous (tribal), phone interview with the author, 30 November 2016.
[130] Anonymous (tribal), personal e-mail communication with the author, 16 January 2017.

involved in the management of the watersheds in which their recovery is absolutely required to sustain their culture and heritage and thus have numerous important contributions to make in the effort to better understand" the problems impacting the Salish Sea ecosystem.[131] Tribes have a lot of experience in resource management, and usually use science to this end; acknowledging this type of expertise may involve expanding the definition beyond having a PhD. An interviewee explained that while most scientists do science to gain knowledge, the tribes want "information that's suitable for operational use," and believe that they can play a role in getting such data.[132] In the meantime, another interviewee noted, "knowledge is power," and that the tribe appreciates getting to take advantage of everyone else's expertise in guiding their resource management.[133]

It is interesting to note that while all tribal interviewees were employed by tribes and represented their interests within the project, none of them were actually indigenous. When pressed on this issue, an interviewee explained that most tribes lack members with expertise at the level required for the project, due to "a [cultural] lag between the education level."[134] According to this interviewee, this gap reaches back to when indigenous peoples were forced on to reservations by white settlers, and thus came to believe that white education was bad and should not be pursued. Furthermore, native people who achieve higher education often choose to work in policy instead of science, because they feel that they can make a bigger difference there. In a project founded in expertise, where roles are assigned based primarily on "who knows how to do what," there is little point in using

[131] Ibid.
[132] Anonymous (tribal), phone interview with the author, 8 January 2017.
[133] Anonymous (tribal), phone interview with the author, 9 February 2017.
[134] Anonymous (tribal), phone interview with the author, 9 February 2017.

extra resources to train indigenous scientists in disciplines already covered by scientists in other sectors. Schmidt did note that there has been one tribal PI on a project, and that, "we also focus on state and tribal resource managers to operate certain elements where we already know there is a long-term benefit for them." For tribes specifically, this means working on projects that tie more directly to management.

In recent decades, literature on tribal participation in research and conservation has given increased attention to the role of Traditional Ecological Knowledge (TEK). When TEK is discussed in the context of indigenous groups, it is most often considered as a foil to Western science.[135] Since the SSMSP is based upon Western science but also includes tribes, it is interesting to consider the role (if any) of TEK in the project. At this point, while tribes may have members that possess TEK, the work of tribal scientists participating in the SSMSP (especially non-native representatives) is fully fixed in Westernized science. This could in part stem from the high standard of expertise held by the project, and the general presumption that Western science is "better". This is another example of the factor of expertise impacting tribes and their participation. However, Schmidt made the important point that TEK is generally more useful for long historic looks with coarser datasets.[136] Since the SSMSP is focused on ecosystem change over a relatively short time frame (1980s to present), knowledge regarding the presence or absence of certain species may not be detailed enough. Once again, the factor of power is relevant in considering who is crafting the research questions and determining which data is useful. Even if TEK has no clear

[135] For a more complete exploration of the complexities of using both TEK and western science, see Nadasdy (1999).
[136] Schmidt, personal communication, 16 March 2017.

place within the SSMSP in its present state, it is necessary to consider how certain factors may be prohibitive in integrating alternative forms of knowledge.

Just as with expertise, tribes are greatly impacted by *diversity/composition*. One tribal participant noted that a primary difficulty in making sure that the tribal perspective is represented is that the region is home to seventeen different tribes, all with different governments, meaning that a single tribal perspective may not actually exist. The interviewee said that better tribal participation will require more unified tribal voice.[137] This shows the problematic nature of having a "tribal" category at all, for it assumes a homogeneity among tribes where there are actually many conflicts. In putting together the list of participants, Schmidt noted that while decision making works best with fewer than fifteen people, "we couldn't, I mean wouldn't, close the doors on tribal involvement," and thus LLTK invited all tribes to attend any meetings.[138] Not all tribes have chosen to participate, and for those that have, it is not always a straightforward process. While this open-door policy for tribes is important and necessary, one tribal interviewee felt frustrated about not being sought out in the same way as other scientists (e.g. for certain expertise), which led to a rocky start.[139] The interviewee then clarified that the relationship with the project has since improved through increased efforts at inclusion. Another tribal participant felt slightly wary of the motivations behind including the tribes: "the tribes get somewhat concerned when people look for their participation to bolster the weight of anything that comes out of the process, and there is a bit of the feeling that they

[137] Anonymous (tribal), phone interview with the author, 8 January 2017.
[138] Schmidt, interview with the author, 13 January 2017.
[139] Anonymous (tribal), phone interview with the author, 30 November 2016.

get used from time to time."[140] Both interviewees agreed that increasing the tribal role with in the project would go a long way towards building a lasting working relationship, and that this is something that LLTK has tried to do, but should continue to invest energy in.[141]

Unfortunately, a long history of prejudice against indigenous people in the US and Canada is working against this process. In Washington State, it took until the landmark Boldt decision in the 1970s for tribal rights to harvest and co-management of salmon to even be recognized. A tribal interviewee spoke of the lasting mistrust between tribes and federal and state governments. Two interviewees agreed that tribal involvement is only possible in this case because the coordination is being done by a nonprofit, which does not have the same legal baggage.[142] However, bias can occasionally trickle into the best-intentioned projects, and one tribal interviewee noted that it felt like if the tribes said something, other entities would avoid that conclusion until there were no other valid possibilities.[143] While participants from other groups would likely disagree with this statement, even perceptions of bias can hamper efforts at collaboration. The interviewee also made it clear that the work of LLTK was both surprising and hopeful; even with the presence of built in bias that permeates "all types of collaborative work, they still did it right - that's even more of a credit to them that they were able to keep an open mind and go

[140] Anonymous (tribal), phone interview with the author, 8 January 2017.
[141] Anonymous (tribal), phone interview with the author, 30 November 2016.
Anonymous (tribal), phone interview with the author, 8 January 2017.
[142] Anonymous (tribal), phone interview with the author, 9 February 2017.
Anonymous (nonprofit), phone interview with the author, 5 December 2016.
[143] Anonymous (tribal), phone interview with the author, 30 November 2016.

where the technical science led, no matter what, and by doing that, then they've done the right thing so far, so kudos to them."[144]

For the tribes, the main motivation behind their participation is their relationship with *salmon*. All three tribal interviewees talked about how salmon are the cultural foundation of the tribes they worked for. Through their treaty harvest rights and hatcheries, a large portion of tribal economies are based upon salmon. For these reasons, the tribes have a high personal stake in salmon vitality in the Salish Sea, and thus want to create new management actions as quickly as possible. One tribal interviewee noted that the inclusion of scientists from academic institutions means that, "there is still difficulty in separating academic pursuits from management requirements."[145] This variation in desired time-scale can cause tension between participants, and has the potential to cause tribes to want to work independently. However, tribes have access to more valuable data from being a part of the project than they would working alone, and thus have incentive to stay. There is also a certain value in the focus on science, because as an interviewee mentioned, "at the scientific level, there's no problem – the problems come when you get to the policy level."[146]

Access to resources and *funding* are also complicated for the tribes. Just as with the nonprofits, tribes do not have access to the same types of sampling equipment as other agencies. A tribal participant believes that the resource differential (size and funding), "contributes to the perception that the tribes inherently lack expertise, which is mainly due to lack of manpower, or the inability to contribute expertise due to lack of manpower." As

[144] Anonymous (tribal), phone interview with the author, 8 January 2017.
[145] Anonymous (tribal), e-mail/phone interview with the author, 8 January 2017.
[146] Anonymous (tribal), phone interview with the author, 9 February 2017.

tribes then become reliant on those with greater access to resources to do the work, the cycle of inequity in research is perpetuated, which "does not foster tribal self-sufficiency and competence nor enable tribes to steward and protect the resources that their cultural identities depend upon".[147] This creates a catch-22 situation for tribes, in that they have the most stake in the outcome of the project, both culturally and economically, but the fewest resources to throw into the project. It was actually a non-tribal interviewee who described this tension best:

> That was a huge issue in making this work in that the tribes are using their resources, their equipment, their expertise, their funds to maintain datasets that are of absolutely basic fundamental importance to them… for their annual negotiations with the state and federal government over harvest, and to suddenly get into an academic exercise [was difficult] in the sense that it was conceived very academically, with big questions and with big datasets.[148]

In terms of funding, one tribal interviewee felt that tribes were sometimes asked to support budgets without being involved in their development, and that these budgets often did not align with tribal values. The interviewee noted, "no one wants to fund any research or monitoring unless it's directly affecting their viewpoint, which makes it very difficult."[149] While the collaborative funding process is intended to combat this bias, it only works if all entities are represented within the collaboration. On the other hand, another interviewee felt that, "some tribes have directly submitted grant proposals and/or have been involved in a few studies as collaborators to the extent that tribal involvement or sponsorship was perceived to increase the probability the projects might get funding." While this is not the reason for the inclusion of the tribes, the interviewee believed that tribal involvement has

[147] Anonymous (tribal), phone interview with the author, 30 November 2016.
[148] Anonymous (nonprofit), phone interview with the author, 5 December 2016.
[149] Anonymous (tribal), phone interview with the author, 8 January 2017.

helped certain vital monitoring efforts to continue uninterrupted. As such, some tribes feel that, "where warranted, more funding going to the tribes for similar types of duties as experienced by the governmental agencies involved in the study could help them feel more like equal participants and perhaps may be critical in achieving project success."[150]

Schmidt noted that it is important to look at the distribution of funding in terms of the geographic responsibility of any given research manager. Trust issues between tribes and the federal and state government, as well as each other, have led to the creation of independent natural resource management groups for each tribe. This means that funding allocated to "tribes" may actually be divided many ways, leading to sums that appear much smaller than those allocated to the entire state or a county. Again, this is an instance where a more unified tribal voice could be valuable. One tribal participant did have a more positive view, saying, "my attitude is we need to support this project, and if we had a lot of money, I wouldn't be taking money, I'd be giving them money. But we don't, so we only take what we need to make sure that we can keep it going…"[151] This goes to show how important the tribes think this project is, and the sacrifices that they are willing to make to help it continue.

While the tribes have mixed feelings about how their role in the project has been crafted, they are generally impressed with the job done by LLTK, and thus feel positively about the factor of *power* within the SSMSP. One interviewee said,

> A program is only as good as its leadership, and LLTK has provided incredibly amazing leadership… If there were different players at that level, it might not have been functional, so it comes down to that the people in the leadership

[150] Anonymous (tribal), phone interview with the author, 30 November 2016.
[151] Anonymous (tribal), phone interview with the author, 9 February 2017.

> positions, were not only qualified to do it, but were able to do it and garner support.[152]

Another tribal participant appreciated that LLTK has followed the recommendations of the participating groups in determining the direction of the project.[153] While the work done by LLTK is necessary and appreciated, one tribal interviewee did feel that sometimes "the project is looked at as an LLTK project, where in fact it is a coordinated project with all the parties."[154] This means that in official documents, published papers, etc., it should be clear that while LLTK is doing the coordination work, it is not just *their* project. This can be tricky when there are so many moving pieces – it is easy for the LLTK name to become equivalent with the U.S. portion of the project. Schmidt noted that LLTK works to combat this assumption, but also must balance taking a "certain amount of ownership to help sell the project".[155] Understandably, though, this may be frustrating to participants who feel that such a naming diminishes their role in the work in the public eye.

Clearly, tribal participation has been impacted by these factors in ways that other sectors have not experienced. The only truly positive factor is the focus on salmon, and while the tribes see some areas of improvement for LLTK, they have been generally happy with their use of power. However, the tribes are negatively impacted by the remaining factors, which can create barriers to their ability to participate fully, and perhaps subsequently their desire to.

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[152] Anonymous (tribal), phone interview with the author, 9 February 2017.
[153] Anonymous (tribal), phone interview with the author, 8 January 2017.
[154] Anonymous (tribal), phone interview with the author, 8 January 2017.
[155] Schmidt, personal communication, 16 March 2017.

Summary

The results from the above sections are summarized in Table 4

Table 4: Impacts of Factors on the Participation of Each Group

	Expertise	**Diversity/ Composition**	**Access to Resources**	**Funding**	**Power**	**Salmon**
State	**+**	**+**	**0**	**0**	**+**	**+**
County	**+**	**+**	**0 (-)**	**0 (-)**	**+**	**+**
Academic	**++***	**+ (-)**	**+ (-)**	**+ (-)**	**+**	**+**
Nonprofit	**+**	**+**	**- (+)**	**0**	**0 (+)**	**+**
Tribal	**--***	**-**	**-**	**-**	**+**	**++***

+ : positive impact **0** : neutral impact **-** : negative impact
( ) : indicates an awareness of an alternate impact on other groups
*double characters symbolize an impact of greater magnitude

Table 4 shows the directional impact that each factor has on a group's participation in the project. Where one group might be impacted positively by a factor, another may find that same factor difficult or frustrating. For example, while those in the academic sector laud the focus on expertise within the SSMSP, tribal participants feel that it has limited their ability to participate. There are also cases where a group is directly impacted by a factor in one way, but has been made aware of alternate impacts through interaction with other participants. This was most common with funding and access to resources, where those at the county and academic levels had no real problems, but were working closely with tribes who were negatively impacted. Furthermore, the groups discussed are very broad, and impacts may differ from participant to participant even within a single group. Two factors stand out as least divisive, however: power and salmon. The relation of these factors to the overall success of the project will be explored in the conclusion.

The Partners Up North: Canadian Participation in the SSMSP

As noted previously, this study examines only the U.S. side of the project. While the scope of this thesis is not wide enough to fully discuss what is happening in Canada, the binational design of the project proved important to interviewees. Many made note of their collaborations with Canadian participants, and how the annual retreat has provided an opportunity for increased understanding of the knowledge coming from up north. They all saw this collaboration, though not always the most direct, as valuable in moving towards a solution. One of the participants noted that, "if you just do the Puget Sound without thinking about the waters to Canada, you miss half the picture."[156] While the interviewee was referring to the science, this statement also holds true in thinking about the SSMSP itself. As such, it is important to acknowledge that the project is not operating identically under PSF, the Canadian equivalent of LLTK. Part of the research done in Canada includes citizen science, where citizens go out at regular intervals to take water quality measurements and collect samples.[157] This data is then transferred to a coordinating organization, which disseminates the data to the public. While this is only a small sector of the research being done, the use of citizen science introduces a whole new sector of participation in which expertise becomes less relevant and the project becomes more open to the general public.[158] Further analysis is necessary to understand how factors influence each group, including that of 'citizen', under this approach.

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[156] Anonymous (nonprofit), phone interview with the author, 16 November 2016.
[157] Salish Sea Marine Survival Project, "Citizen Science Program," http://marinesurvivalproject.com/research_activity/list/citizen-science-program/.
[158] For a further explanation of citizen science and public participation in scientific research, see http://www.birds.cornell.edu/citscitoolkit/about/defining-citizen-science/.

VI. Evaluating Participation in the SSMSP

Differential Effects of Factors on Participation

This research set out with the goal of answering the question, *what factors influence participation in the Salish Sea Marine Survival Project?* Drawn from the literature and developed through interviews with participants, these factors include expertise, composition/diversity, access to resources, funding, power, and salmon. As shown in Table 4, the type of impact of each factor (positive, neutral, negative) is dependent on group. Certain groups (e.g. academic) see almost entirely positive impacts, while others (e.g. tribes) are impacted negatively by most factors. Despite these differential impacts, interviewees generally agreed that the SSMSP has been successful as a model for how to do collaborative research at a large-scale. So, what makes this project work?

In the case of the SSMSP, the factors that unite all participants outweigh those that create differences, and these uniting factors are working most strongly on the most marginalized groups. Many of the factors discussed above are not unique to the SSMSP; they will likely be present – and controversial- in any large-scale participatory effort. Thus, it must be considered what makes the SSMSP unique in its success. Table 4 shows that the most unity exists around two specific factors: the importance of salmon and how LLTK, as a facilitator, has handled power.

Salmon: A Common Goal

The work of anthropologist Anna Tsing can help to make sense of why the discourse of conserving salmon makes the SSMSP possible. She writes:

> We must move beyond the common-sense assumption that solidarity means homogeneity. [However,] it is impossible to participate in a movement without representing one's demand through its ruling discourses… Difference is thus both a pre-established frame for connection and an unexpected medium in which connection must find local purpose.[159]

The group of participants working on the SSMSP was constructed to represent a diverse array of backgrounds, skillsets, and motivations. However, as Tsing points out, a movement cannot exist without some common discourse to tie its participants together. In the case of the SSMSP, this discourse is salmon. While the project requires an overarching target that can bring people in, participants must also figure out a way for their individual purposes to be realized within this larger context. Sometimes, these individual purposes may be competing (e.g. more hatcheries versus no hatcheries), but zooming out brings the focus back to understanding why salmon are dying, a purpose that everyone agrees on. Through both allowing these competing individual purposes to exist among its participants, and finding a larger common discourse within which these purposes can come together, the SSMSP is able to create a successful participatory project with a diverse group. Just as salmon are a keystone species in the Salish Sea, they are a keystone variable within the SSMSP.[160] While it may not be possible in every instance to find a species quite as charismatic as salmon, the presence of some uniting factor is invaluable in smoothing over other tensions to make collaboration possible.

The factor of salmon is also crucial in facilitating continued participation from the tribes. At a glance, the number of negative factors for tribes would seem to tip the balance towards non-participation. However, those involved are desperate to make progress in

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[159] Tsing, "The Forest of Collaborators," 245.
[160] A keystone species is defined as one that plays a disproportionately large role in its ecosystem. See: Wagner, S. C. (2010). Keystone Species, *Nature Education Knowledge* 3(10): 51.

understanding the causes behind salmon mortality. Many tribal livelihoods are dependent on the fish as a source of food and income. Even those who have no economic dependence on salmon are still aware of the cultural importance of the fish to tribes of the Pacific Northwest and have concern regarding declining populations. Tribes see the research being done within SSMSP as a way to get important data for future management decisions at a scale not possible through independent work. While other groups are interested in salmon from a more objective perspective, the tribes' deeply personal attachment to salmon alone outweighs all negative factors.

Power: A Skilled Facilitator

The phrase "skilled facilitator" is borrowed from Mark Reed, who in his paper on stakeholder participation writes:

> The outcome of any participatory process is far more sensitive to the manner in which it is conducted than the tools that are used… A successful facilitator needs to be perceived as impartial, open to multiple perspectives and approachable. They need to be capable of maintaining positive group dynamics, handling dominating or offensive individuals, encourage participants to question assumptions and re-evaluate entrenched positions, and get the most out of reticent individual.[161]

While LLTK has not fully met the ideal that Reed describes, they are on the right track. Of most importance is that participants do not feel that power is being abused, or that LLTK is only in it for their own gains. Even those who are critical of some parts of LLTK's work (e.g. funding distribution) have noted their appreciation of the organization's effort at being unbiased and open to feedback. Through building a trusting relationship

[161] Mark S. Reed, "Stakeholder Participation for Environmental Management: A Literature Review," *Biological Conservation* 141, no. 10 (2008): 2425.

with the project's participants, LLTK has kept project momentum moving in the right direction and towards a common vision.

Reed also argues that, "to overcome many of its limitations, stakeholder participation must be institutionalized, creating organizational cultures that can facilitate processes where goals are negotiated and outcomes are necessarily uncertain." [162] As a research effort, the SSMSP may have more room for these uncertain outcomes; not knowing exactly what will come out of the project allows differently motivated participants to still work together. However, as Reed notes, this can only happen if LLTK creates an organizational culture around the process of participation. Buy-in will only occur if participants feel that their voices are being heard, regardless of background or motivation. This is dependent on how participants actually relate to the project – positive and relevant outcomes will only occur if participants are co-learners ("local voice"), and not simply instruments ("hired hands") in the effort.[163] It is up to LLTK to make sure that participants fall on the correct side of the dichotomy. While their work has not been perfect, so far it has been sufficient to make the project successful.

Just as with salmon, the positive impact of power has been most important with respect to the tribes. There is a long history of tribes being exploited in research and conservation efforts, and many tribes have grown wary of efforts that seek their participation. As participants noted, it has been to the credit of LLTK that tribes have been included and treated with respect. With all of the other negative factors, even the pull of salmon would not be able to overcome abuse of power in keeping the tribes involved. Even

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[162] Ibid., 2426.
[163] Goodwin, "'Hired Hands' or 'Local Voice': Understandings and Experience of Local Participation in Conservation," 489.

though the tribes are not fully satisfied with their role within the SSMSP, they have been impressed with the work of LLTK so far, and see further potential for collaboration. Moving forward, continuing to ensure that tribal participants can take on the role of co-learner should be a primary task of LLTK.

Moving Forward with the SSMSP: Lessons for the Future

As the project moves forward, it should not be assumed that the scale will always tip towards success in the balance between positive and negative factors. Even within the salmon world, splinters are being caused by bitter battles over hatcheries and habitat impacts, as well as harvest techniques and management decisions. While it is hoped that new, collaborative science can move towards resolving these conflicts, tensions remain high. As Schmidt noted, even the best science must be balanced with political, social, and economic feasibility.[164] In terms of power, the work by LLTK has been considered successful so far, but there remains a great deal of pressure to acquire more funding, something that becomes less certain as the project nears the five-year mark, the initial timeframe proposed for the work. To maintain balance, more work must be done with respect to the factors currently causing the most tension. For the tribes, this would look like an expanded role throughout the project, coupled with a greater recognition of expertise and increased access to funding. Of course, almost all participants would say that they could do better work with more funding, so this tension is not easily addressed. Despite the challenge, it is crucial to the project's longevity to continue

[164] Schmidt, personal communication, 16 March 2017.

to confront the most complicated issues. If certain groups begin to feel too differentially impacted by certain factors, they may not wish to participate at all, which would greatly lessen the effectiveness of the effort and the potential to create positive change in the region.

Broader Implications and Future Research: Beyond the SSMSP

As conservation work tackles larger landscapes encompassing more diverse voices, effectively facilitating participation is becoming increasingly important. If done well, participatory research has huge potential for success in finding answers not attainable by any single group. In this study, factors and their impacts were identified after the project was well underway, but ensuring success requires this process to occur from the project's inception. Further research is necessary to understand how project coordinators can create their own version of table 4, describing the impacts of factors on groups, at the beginning of a project. Having such a table will allow coordinators to identify the groups that may be most differentially impacted by factors, and to ensure that there is some keystone variable strong enough to keep participants engaged. Consciously identifying and managing the factors at play within a project will help to push participation beyond just a seat at the table.

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Appendix A: Interview Questions

What is your role within the SSMSP?

How did you get involved with the SSMSP?

Were you involved in the process of creating the initial hypotheses for the project?

How do you interact with other participants in the SSMSP? Are these people that you've worked with before?

Do you feel that being a part of this project has allowed you to do work that you couldn't have otherwise done?

Who within the project do you work with most closely?

Often times, projects this big collapse under their own weight. Do you feel that the SSMSP has been successful? Why or why not?

Why do you care about salmon?

What are your goals in being involved with this project? What do you hope will come out of it?

Have you written any papers from the data collected?

How does funding work for your group?

What does it mean to you to be a participant in the SSMSP?

Is there anything else that you want to tell me about your experience?

Appendix B: United States Coordinating Committee
updated 2/9/2017 (courtesy of M. Schmidt)

Murchie, Peter	Manager, Puget Sound and NEP	Environmental Protection Agency
Currens, Ken	Conservation Program Manger	Northwest Indian Fisheries Commission
Dalton, Penny	Director	Washington Sea Grant, U. of Washington
Kinley, Randy	ESA/Harvest Policy Representative	Lummi Nation
McCollum, Paul	Natural Resources Director	Port Gamble S'Klallam Tribe
Neatherlin, Erik	Fisheries Science Director	Washington Department of Fish and Wildlife
Redmond, Scott	Program Director, Science and Evaluation	Puget Sound Partnership
Rolland, Jill	Director, Western Fisheries Research Center	US Geological Survey
TBD (new hire)	Science & Research Director	NOAA, Northwest Fisheries Science Center
Troutt, David	Director of Natural Resources	Nisqually Tribe
White, Jacques	Executive Director	Long Live The Kings
Williams, Terry	Fisheries and Natural Resources Commissioner	Tulalip Tribes

Appendix C: United States Scientific Technical Team

updated 6/9/2016 (courtesy of M. Schmidt)

Alan Chapman	ESA Coordinator	Lummi Nation
Barry Berejikian	Research Fisheries Biologist, Behavioral Ecology Team Leader	NOAA Northwest Fisheries Science Center
Correigh Greene	Research Fish Biologist, Watershed Program	NOAA Northwest Fisheries Science Center
Chris Ellings	Research Biologist and Salmon Recovery Program Coordinator	Nisqually Indian Tribe
Chris Harvey (Isaac Kaplan alt.)	Fishery Biologist	NOAA Northwest Fisheries Science Center
Christopher Krembs	Senior Oceanographer	Washington Department of Ecology
Dave Beauchamp	Professor, Fish Ecology Ecologist	University of Washington US Geological Survey
Erik Neatherlin	Fisheries Science Director	Washington Department of Fish and Wildlife
Jan Newton	Principal Oceanographer	University of Washington
Joe Anderson	Research Scientist	Washington Department of Fish and Wildlife
Josh Chamberlin	Fish Biologist	NOAA Northwest Fisheries Science Center
Julie Keister	Assistant Professor, Biological Oceanographer/Zooplankton Ecologist	University of Washington
Ken Warheit	Molecular Genetics Laboratory Leader	Washington Department of Fish and Wildlife
Lance Campbell	Fish Aging Unit Leader	Washington Department of Fish and Wildlife
Mike Crewson	Fisheries Enhancement Scientist	Tulalip Tribes
Neala Kendall	Research Scientist	Washington Department of Fish and Wildlife
Neil Banas	Senior Lecturer, Math and Statistics	University of Strathclyde
Parker MacCready	Professor, Oceanography	University of Washington
Paul Hershberger	Research Fisheries Biologist, Ecology and Disease	US Geological Survey
Sandie O'Neill	Research Fish Biologist, Toxics	Washington Department of Fish and Wildlife

Appendix D: Primary Participants in the SSMSP and their Roles *(courtesy of M. Schmidt)*

Salish Sea Marine Survival Project - Primary Participants (ϕ = direct contact, 0 = keep informed on work. Inc. * = data aggregators)			Role	(1) Trend Analysis & Modeling				(2) Bottom-up Sampling & Studies				(3) Disease, Contaminants, HABs	(4) Predator-prey dynamics	(4) Tracking Juvenile Salmon
Contact Information				Group	Subgroups			Group	Subroups					
Country	Name	Affiliation	Partner = P Coord = C Affliate = A		Survival & Life History	Indi-cators	Eco-system Model		(a) Physical	(b) Zoo / Ich - plankton	(c) Juvenile Salmon & Forage F.			
US	Alan Chapman	Lummi Nation	P	O	O	O	O	ϕ	O	O	ϕ			
US	Andrea Carey	WDFW	A									ϕ		
US	Andrew Claiborne	WDFW	A											
CA	Andrew Trites	UBC	P										ϕ	
CA	Angelica Pena	DFO/IOS Sidney	P	O		ϕ	ϕ	ϕ	ϕ					
US	Austen Thomas	UBC / U.S. independent	P										ϕ	
US	Barry Berejikian	NOAA	P										ϕ	ϕ
CA	Ben Nelson	UBC	P										ϕ	
US	Brian Beckman	NOAA	P					O			O			
CA	Carl Walters	UBC	P	O			O	O			ϕ		ϕ	
US	Casey Ruff	SRSC	P	ϕ	ϕ	ϕ								
US	Chris Ellings	Nisqually Tribe	P	O	O	O	O	ϕ	O	O	ϕ		O	
US	Chris Harvey	NOAA	P	ϕ *		O	ϕ							
US	Christopher Krembs	DOE	P	O		O	O	ϕ	ϕ	O				
CA	Chrys Neville	DFO	P	ϕ	ϕ	O	O	ϕ	O	ϕ	ϕ			
US	Correigh Greene	NOAA	P	ϕ *	ϕ	ϕ	O	ϕ	O	ϕ	ϕ			
US	Dave Beauchamp	UW	P	ϕ	O	O	O	ϕ	O	ϕ	ϕ		O	
CA	Dave Preikshot	Independent	P	ϕ *	O	O	ϕ	O			ϕ			
CA	David Welch	Kintama	P	O		O								ϕ
CA	Dick Beamish	DFO/PBS (retired)	P	ϕ	ϕ			ϕ			ϕ		ϕ	
CA	Eddie Carmack	DFO/IOS (retired)	P	O		O		ϕ	ϕ	ϕ				
US	Erik Beamer	SRSC	A											
US	Erik Neatherlin	WDFW	P	O				O					O	
US	Eric Ward	NOAA	A										ϕ	
CA	Erin Rechisky	Kintama	P											ϕ
US	Evelyn Brown	Lummi Nation	P	O	ϕ	O		ϕ	O	ϕ	ϕ	O	O	O
US	Mike Mackay	Lummi Nation	P	O				ϕ		ϕ	ϕ			
CA	Frances Juanes	UVIC	P					ϕ			ϕ			
CA	Hassen Allegue	UBC	P										ϕ	
CA	Helen Gurney-Smith	VIU	P					O	ϕ	ϕ				
CA	Ian Perry	DFO	P	O		O	O			ϕ				
US	Isaac Kaplan	NOAA	P	ϕ *		O	ϕ							

Salish Sea Marine Survival Project - Primary Participants (ϕ = direct contact, 0 = keep informed on work. Inc. * = data aggregators)			**Role**	**(1) Trend Analysis & Modeling**				**(2) Bottom-up Sampling & Studies**				**(3) Disease, Contaminants, HABs**	**(4) Predator-prey dynamics**	**(4) Tracking Juvenile Salmon**
Contact Information				Group	Subgroups			Group	Subroups					
Country	**Name**	**Affiliation**	Partner = P Coord = C Affliate = A		Survival & Life History	Indi-cators	Eco-system Model		**(a)** Physical	**(b)** Zoo / Ich - plankton	**(c)** Juvenile Salmon & Forage F.			
CA	James Irvine	DFO	P	ϕ	ϕ	O		ϕ			ϕ			
US	Jan Newton	UW	P	O			O	ϕ	ϕ	O				
US	Jed Moore	Nisqually Tribe	P					ϕ		ϕ				
CA	John F. Dower	UVIC	P					ϕ		ϕ				
US	John Mickett	UW (alt)	P						ϕ					
US	Joseph Anderson	WDFW	P	ϕ	ϕ	O		ϕ			ϕ			
US	Josh Chamberlin	NOAA	P	ϕ		O		ϕ			ϕ			
US	Julie Keister	UW	P	ϕ		ϕ	O	ϕ	O	ϕ	ϕ			
CA	Karia Kaukinen	DFO	P					O			ϕ	ϕ		
US	Kathryn Sobocinski	NOAA	P	ϕ *	O	ϕ	O							
US	Karyn Suchy	U Vic	A											
CA	Ken Denman	U Vic	P	ϕ			ϕ	ϕ	ϕ					
US	Ken Warheit	WDFW	P	O	O			ϕ			ϕ	ϕ		
CA	Kevin Pellett	BC Cons. Foundation	P	O	O			O			ϕ			
CA	Kristi Miller	DFO	P					O			ϕ	ϕ		
US	Lance Campbell	WDFW	P	ϕ	ϕ	O		ϕ			ϕ			
CA	Lu Guan	UVIC	P					ϕ	ϕ	ϕ				
US	Madi Gamble	UW	P					ϕ			ϕ			
US	Mara Zimmerman	WDFW	P	ϕ	ϕ	ϕ								
CA	Marc Trudel	DFO	P	ϕ	ϕ	ϕ		ϕ	ϕ	ϕ	ϕ		O	
CA	Maycira Costa	UVic	P	ϕ		ϕ		ϕ	ϕ	ϕ	O		ϕ	
US	Megan Moore	NOAA	P										ϕ	
CA	Mel Sheng	DFO	P					O			ϕ			
US	Mike Crewson	Tulalip Tribes	P	O	O	O	O	ϕ	O	ϕ	ϕ			
CA	Moira Galbraith	DFO	P					ϕ	ϕ	ϕ				
CA	Nathan Furey	UBC	P					ϕ			ϕ		ϕ	
US	Neala Kendall	WDFW	P	ϕ *	ϕ	ϕ		O			O			
US	Neil Banas	UW	P	ϕ			ϕ		O	O				
CA	Nikki Wright		P											
US	Parker MacCready	UW	P	ϕ		O	ϕ	ϕ	ϕ	O				
US	Paul Hershberger	USGS	P									ϕ		
US	Pete Lawson	NOAA	P	ϕ		ϕ								

Salish Sea Marine Survival Project - Primary Participants (ϕ = direct contact, 0 = keep informed on work. Inc. * = data aggregators)			Role	(1) Trend Analysis & Modeling				(2) Bottom-up Sampling & Studies				(3) Disease, Contaminants, HABs	(4) Predator-prey dynamics	(4) Tracking Juvenile Salmon
Contact Information				Group	Subgroups			Group	Subroups					
Country	Name	Affiliation	Partner = P Coord = C Affliate = A		Survival & Life History	Indi-cators	Eco-system Model		(a) Physical	(b) Zoo / Ich - plankton	(c) Juvenile Salmon & Forage F.			
CA	Peter Ross	Vancouver Aquarium	P									ϕ		
US	Raphael Girardin	NOAA	P	ϕ *			ϕ							
CA	Ramona de Graaf	SeaWatch Society	P								ϕ			
CA	Rana El-Sabaawi	UVic	P					O	O	ϕ	ϕ			
CA	Ryan Flagg	ONC	P					ϕ	ϕ					
US	Brandon Sackmann	Integral Consulting	A	O		ϕ								
US	Sandie O'Neil	WDFW	P									ϕ	ϕ	
CA	Scott Hinch	UBC	P					ϕ			ϕ		ϕ	
US	Scott Pearson	WDFW	P	O			O						ϕ	
CA	Sophia Johannessen	DFO/IOS Sidney	P	ϕ		ϕ	O	ϕ	ϕ	ϕ				
CA	Stephane Gauthier	IOS	P					ϕ	ϕ	ϕ	ϕ			
CA	Stephanie King	Sea This Consulting	P						ϕ	ϕ				
US	Steve Jeffries	WDFW	P	O			O						ϕ	
CA	Svein Vagle	DFO	P					ϕ	ϕ	ϕ				
CA	Svetlana Esenkulova	PSF	P											
CA	Terry Curran	DFO (RET)	P	O *			O							
US	Todd Sandell	WDFW	A											
CA	Tony Farrell	UBC	P											
CA	Villy Christensen	UBC	P	ϕ			ϕ							
US	Wendi Ruef	UW (alt)	P					ϕ	ϕ					
CA	Will Duguid	UVic	P					ϕ	ϕ	ϕ	ϕ			
CA	Susan Allen	UBC	A				ϕ							
CA	Elise Olsen	UBC	A				ϕ							
CA	Jennifer Boldt	DFO	A								ϕ			
CA	Brian Riddell	PSF	C											
CA	Isobel Pearsall	PSF	C	ϕ *	O	O	O		O	O	O	O	O	O
US	Michael Schmidt	LLTK	C	O *	O	O	O		O	O	O	O	O	O
US	Iris Kemp	LLTK	C	ϕ *	O	O	O		O	O	O	O	O	O
US	Jacques White	LLTK	C											

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