2022

COMPREHENSIVE REVIEW OF THE 2012 PORT SUSAN MARINE STEWARDSHIP AREA CONSERVATION ACTION PLAN

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ESA

Snohomish County Marine Resource Committee

Island County Marine Resources Committee

Prepared For:
Island and Snohomish County Marine Resource Committees

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OUR TEAM

Grace Adams

Grace pursued a BS in Environmental Science from Loyola University of Chicago where she found her budding passion for aquatic ecosystem restoration and stewardship. Following her graduation, she decided to pursue an MPA at the Evans School to further this passion. While at the Evans School, Grace gained experience in developing creative communication strategies and analyzing local, state, and federal regulations for coastal industries (maritime, aquaculture, and invasive species management). She is excited to pursue community-led stewardship and to implement nature based solutions for climate adaptation and mitigation in her future career.

Madison Rose Bristol

Madison holds a BA in Dance and a BS in Environmental Science from the UW, and will soon be attaining an MPA from the Evans School and an MMA from the School of Marine and Environmental Affairs. Their work has included conducting human dimensions research on the impacts of marine reserves, running community-based EcoArts programs, facilitating strategic planning processes, and providing consulting services through their company Bristol EcoCreative Services. Madison's studies have been centered in community-determined climate resilience efforts, Indigenous sovereignty movements, and collaborative governance.

Michael Cervantes

Michael graduated from the University of California, San Diego with a BA in History and attained a Multiple Subjects Teaching Credential for elementary level education from San Diego State University. He taught for tribal schools and educational programs in Alaska, California, and Washington State before turning his attention to policy. Recognizing the existential threat of the climate crisis, Michael entered the Evans School with the intention of supporting tribal nations in developing robust climate mitigation policies and institutions.

Tiffany Ha

Tiffany works to contextualize and humanize research to support decision-making on climate adaptation as a research assistant at the Evans Policy Analysis & Research Group. She has focused her graduate studies at the Evans School on collaborative and equitable decision making and community and place-based environmental policy processes that center local and Indigenous knowledge. She has worked in the non-profit, international development, and education sectors and holds a degree in Political Science from UCLA.

Tori Shaw

After graduating with degrees in biology and environmental science from Gonzaga University, Tori worked for several environmental advocacy non-profits. She became increasingly interested in the intersection of science and policy and moved from Denver to attend the Evans School. She has focused on collaborative policy processes that center local knowledge in planning and decision-making to promote robust and equitable climate resilience.

ACKNOWLEDGEMENTS

Land Acknowledgement

The University of Washington and Parrington Hall reside on the lands of the **Coast Salish peoples**, the land which touches the shared waters of all tribes and bands within the **Duwamish, Puyallup, Suquamish, Tulalip,** and **Muckleshoot nations** who have lived here *since time immemorial*. We live, work, and study on the unceded lands of the **Duwamish Tribe**, the first people of Seattle, with gratitude and respect to the **Duwamish**. We must also honor the **Coast Salish, Stillaguamish, Tulalip, Skagit, KiKiallus**, and **Snohomish tribal nations** and the **Hul'qumi'num Treaty Group**, whose land and shared waters are called the Port Susan Bay.

Statement of Positionality

The research and perspectives represented in this paper are directly informed by our life experiences, both academic and non-academic. We are not part of the Port Susan community, do not hold intergenerational knowledge about Port Susan Bay, and were limited in our ability to connect directly to Indigenous and non-Indigenous community members. Our policy and science training is primarily rooted in Eurocentric methods as taught by the Evans School of Public Policy, the School of Marine and Environmental Affairs, and previous university experiences. We acknowledge that our cultural origins, ethnicities, gender identities, abilities, ages, and other personal attributes might inform implicit biases present in this report, though we aimed to be reflexive throughout this process to present information equitably.

Partner & Mentor Support

We would like to thank our partners at the Island and Snohomish County Marine Resources Committees – Elisa Dawson, Alex Pitman, Kelly Zupich, & Jennifer Johnson – for their thoughtful guidance and support throughout our project. We are also grateful for our faculty advisor, Matt Steuerwalt, for his valuable feedback and suggestions as we navigated this process. Lastly, we are grateful for our colleagues at the Evans School for their time and encouragement.

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EXECUTIVE SUMMARY

The **Port Susan Marine Stewardship Area (MSA)** comprises diverse marine and estuarine ecosystems and has been identified as a high priority conservation area in the Puget Sound. In 2012, the **Island County and Snohomish County Marine Resources Committees (MRCs)** collaborated with community partners to create a **Conservation Action Plan (CAP)** aimed at conserving and restoring Port Susan Bay to achieve thriving biodiversity and to support strong recreational and resource-based industries. The 2012 CAP serves as a vital planning tool that outlines conservation targets, threats, and strategies relevant for Port Susan. As 10 years have passed since the initial development of the CAP, the Island County and Snohomish County MRCs are working collaboratively to re-engage community partners. This process aims to review the 2012 CAP in order to identify how conservation and restoration efforts in Port Susan can remain effective to support the needs of key habitats and species and to promote inclusive stewardship of the area.

Our research team is composed of five University of Washington graduate students from the **Evans School of Public Policy and Governance Student Consulting Lab**. We conducted a comprehensive review of the 2012 CAP based on the following **research questions**:

1 Updating Knowledge

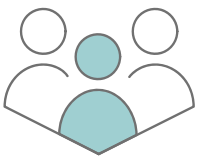
- Based on updated scientific information, how have the viability and threat rankings for each conservation target outlined in the CAP changed over the past 10 years?
- What are the relevant regional policies and environmental justice considerations that should be included in a CAP review, update, or alternate process?

2 Effectiveness

- What best practices should the MRCs and relevant partners take to effectively steward the Port Susan MSA?

3 Community Engagement

- What community engagement tools would be most effective in communicating the successes and challenges of the CAP and eliciting relevant feedback/suggestions for continued conservation and restoration efforts in Port Susan?



In collaboration with the **Island County and Snohomish County MRCs** and **Environmental Science Associates (ESA)**, our team analyzed **stakeholder survey** and **interview data**. This information together with an extensive **literature review** and a **Strengths, Weaknesses, Threats, and Opportunities (SWOT) analysis** aimed to answer these research questions.

Findings from the survey and interview data revealed insights on **future opportunities** for the continued conservation and restoration of the Port Susan MSA:

- Based on updated scientific understanding, survey respondents stated that they were most concerned with prioritizing **sea level rise** and **climate change** in future conservation action and planning.
- Roughly half of the survey respondents indicated that **they had not used the CAP** in their professional work setting in the last 5 years.
    - To **increase the utility** of the CAP, survey respondents recommended making a shorter version of the report, creating more concrete and actionable steps, meeting more regularly with stakeholders, and linking efforts to related local initiatives.
- Interviewees shared **additional opportunities for improvement** including incorporating a place-based approach, refining community engagement strategies, and increasing the relevancy of the overall project.

Literature review findings suggested that the emphasis on biological systems and indicators in the 2012 CAP **limited the opportunity for the sociocultural values of the local community** to be integrated into the plan. Community "buy-in" was lacking, which led to reduced collective ownership in the project and its successes.

The **recommendations** proposed in this report include **opportunities for improving the 2012 CAP** and **alternative pathways for future conservation planning** that centers local community values and creates space for the co-development of knowledge among scientists and community members.

Improvements to the 2012 CAP include:

- Updating the **conservation targets** based on new information
- Revising the **viability indicators** of conservation targets for congruency
- Incorporating **sociocultural conservation targets** to capture community values, needs, and visions
- Establishing a **process to better track progress of strategic actions** to ensure efforts remain coordinated and efficient
- Creating a **communication tool**, such as a digital dashboard, to share key information and highlight successes

Other opportunities for strengthening conservation action planning include:

- Creating a **crosswalk** with the Puget Sound Partnership Action Agenda to align related efforts
- Joining the Washington State Environmental Justice Council's interagency work group to learn best practices for **equitable community engagement** and incorporating **environmental justice** into government projects
- Creating **relationships with additional community members** to include in future planning and decision-making
- Utilizing **diverse participatory tools** when engaging stakeholders
- Enhancing modes of **collaborative governance** to inform a more community-based approach

KEY ABBREVIATIONS

CAP - Conservation Action Plan
ESA - Environmental Science Associates
ESS - Eastern soft-shell clam
IHI - Indigenous Health Indicators
KEA - Key Ecosystem Attributes (and Indicators)
LWD - Large woody debris
MRC - Marine Resources Committee
MSA - Marine Stewardship Area
NMFS - NOAA Fisheries
SLR - Sea level rise
TNC - The Nature Conservancy
U&As - Usual and Accustomed Places
WDFW - Washington Department of Fish and Wildlife
WDNR - Washington Department of Natural Resources
WECY - Washington Department of Ecology

Chapter 1: Introduction

Background

In 2012, a diverse planning group consisting of community partners from Island and Snohomish County Marine Resources Committees (MRCs), the Tulalip Tribes, the Stillaguamish Tribe, the Northwest Straits Initiative, The Nature Conservancy (TNC), Washington Sea Grant, and Washington State University Extension Beach Watchers worked to create a conservation action plan for Port Susan.[1] The 2012 Port Susan Marine Stewardship Area Conservation Action Plan (CAP) aims to achieve a healthy, biodiverse marine and estuarine ecosystem with strong recreational and resource-based industries by identifying target species and habitats, describing major threats, and outlining key conservation strategies and actions associated with each target.

As 10 years have passed since the adoption of this plan, our project aims to compile new scientific and regulatory information, as well as provide recommendations to integrate place-based considerations to help inform a path forward for continued conservation and restoration efforts in Port Susan now and into the future.

Port Susan – Geography

As the second largest estuary in the United States, the Puget Sound encompasses an intricate network of coastal waterways and provides critical habitat for marine, freshwater, and wetland species. Port Susan Bay is located within the largest sub-basin of the Puget Sound, Whidbey Basin, and is bordered by Island County (Camano Island) and Snohomish County (Figure 1).[2]

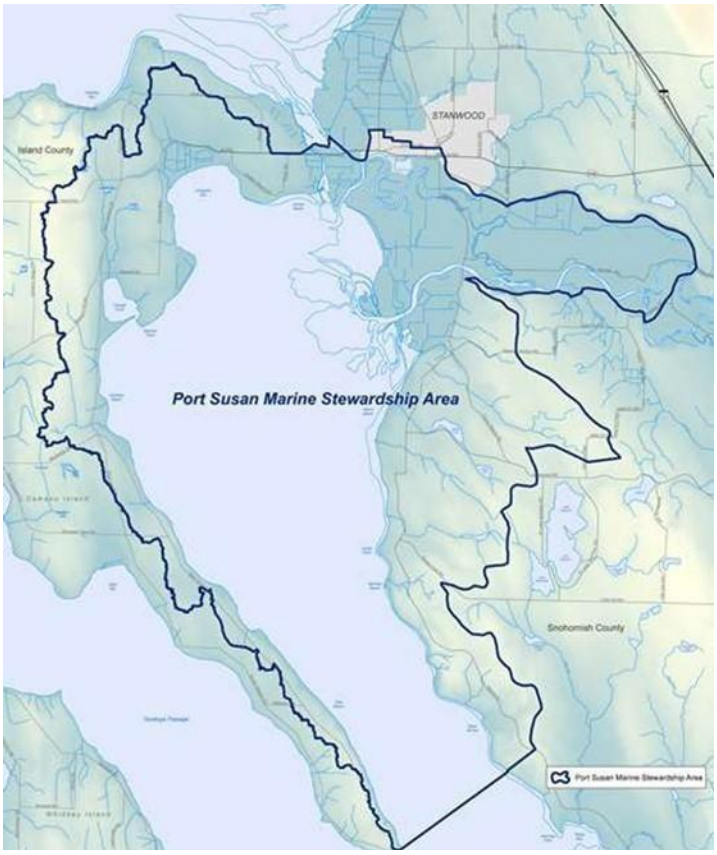


Figure 1: Map of Port Susan Marine Stewardship Area

Port Susan comprises diverse landscapes, including forests, farms, marine shorelines, and the Stillaguamish River delta. The mix of freshwater from the Stillaguamish River into Port Susan Bay creates extensive estuarine marshes and mudflats that support thousands of invertebrates, fishes, and shorebirds.[3] In addition to the estuarine habitat formed by the river delta, the Port Susan ecosystem has two large coastal inlets that provides refuge for several species, including Pacific salmon, as

[1] Massaua, M., Kuklok, A., Hook, A., Herrmann, K., Litle, K., & Toro, J. (2012). Port Susan Marine Stewardship Area Conservation Action Plan Phase II.

[2] Ibid.

[3] The Nature Conservancy. *Port Susan Bay Preserve.* *https://www.nature.org/en-us/get-involved/how-to-help/places-we-protect/port-susan-bay/*

well as supports productive shellfish and eelgrass beds.[4] The extensive beaches along the shorelines are comprised of coarse, mixed sand and gravel which provide critical fish spawning areas and maintain sediment deposition.[5]

The ecosystem faces a multitude of threats, including bank hardening, levee maintenance, agricultural runoff, loss of vegetative buffers, derelict gear, and others.[6] Since 2012, several threats have become more prominent due to climate change, particularly increased frequency and intensity of storm events, flooding due to sea level rise (SLR), rising ocean temperatures, and ocean acidification.[7] Additionally, agricultural runoff and other runoff pollution continue to be a concern regarding the health and consumption of several key marine species such as Chinook salmon and Eastern softshell clams.[8]

Port Susan – Demographics

This area is home to the peoples of the Coast Salish, Stillaguamish, Tulalip, Skagit, KiKiallus, and Snohomish tribal nations since time immemorial.[9] Members of The Hul'qumi'num Treaty Group also recognize Port Susan within their traditional marine territory.[10] Throughout Washington, the tribal nations exercise the treaty right to take fish and shellfish from waters and tidelands within their traditional harvesting boundaries - otherwise known as Usual and Accustomed Places (U&As).[11]

This culturally vital treaty right was and continues to be affirmed by the federal court, including the Boldt Decision which designated the tribes as co-managers of fisheries in Washington (United States v. Washington, 1974-present)[12] and the Rafeedie Decision which ruled all public and private tidelands subject to treaty harvest, with the exception of shellfish in artificial beds.[13] Both the Tulalip and Stillaguamish tribal nations' U&As encompass Port Susan, where they co-manage and operate fisheries, hatcheries, and aquaculture facilities; Figure 2 depicts the Tulalip Tribes U&A area.

Additional demographics of the bordering Island and Snohomish Counties are varied. The counties are predominantly white; the percentage of white residents for Snohomish County and

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[4] Salish Sea Wiki. (2016, January 13). *Port Susan Bay Ecosystem.* *https://salishsearestoration.org/wiki/Port_Susan_Bay_Ecosystem*

[5] Snohomish County Marine Resources Committee. *Port Susan Owner's Manual.* *https://www.snocomrc.org/media/19743/port-susan-owners-manual-final.pdf*

[6] Massaua, M., et al. (2012).

[7] Puget Sound Partnership. (2019, December 2). *State of the Sound.* *https://www.psp.wa.gov/sos.php*

[8] Moran, P., Perez, F., & McBride, D. (2020). *Contaminants in fish and shellfish in the Stillaguamish River and Port Susan marine areas, Washington* (No. 2020-3043). US Geological Survey. *https://pubs.usgs.gov/fs/2020/3043/fs20203043.pdf*

[9] Native Land Digital. *Native Land Map*. *https://native-land.ca*

[10] Evans, B., J. Gardner, and B. Thom. (2005) *Shxunutun's Tu Suleluxwtst: In the footsteps of our Ancestors: Interim Strategic Land Plan for the Hulqiminum Core Traditional Territory.* Hulqiminum Treaty Group. *http://www.hulquminum.bc.ca/pubs/HTG_LUP_FINAL.pdf*

[11] Gallagher Law Library. (2022). *Introduction to United States v. Washington.* University of Washington. *https://guides.lib.uw.edu/law/indian-tribal/us-v-wash*

[12] Dougherty, P. (2020). Boldt Decision: United States v. State of Washington. *https://www.historylink.org/file/21084*

[13] Northwest Indian Fisheries Commission. *Rafeedie Decision*. *https://nwifc.org/*

Island County are 74% and 85.4%, respectively.[14] Snohomish County is the 4th largest county in Washington and, according to US census data, is experiencing a 1.07% growth rate.[15] Island County, the 16th largest county in Washington, has a notably higher proportion of residents 65 and older comparatively.[16]

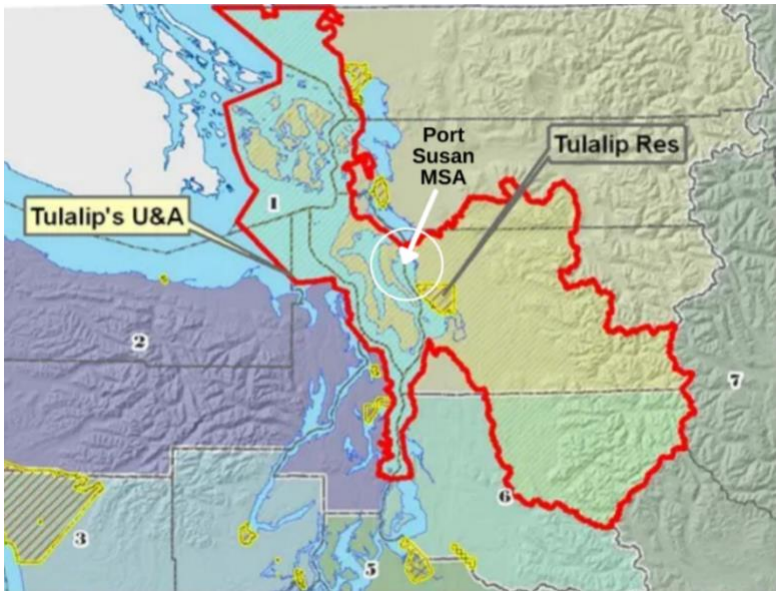

Figure 2: Map of Tulalip Tribe Usual & Accustomed Boundary

Port Susan's ecologically rich composition attracts a variety of industries, namely agriculture, forestry, fishing, and hunting.[17] The bay is known for prime fishing opportunities both onshore and in small boats as well as some waterfowl hunting.[18,19] Additionally, Port Susan is home to four recreational shellfish beaches where the public can harvest several invertebrates including clams, geoduck, scallops, mussels, and oysters.[20] The Stillaguamish River Delta, on the northeast end of Port Susan, supports hay, corn, cereal grains, potatoes, and rotating seed crops.[21]

Marine Stewardship Areas

In 2014, the Snohomish County Council designated Port Susan as a Marine Stewardship Area (MSA) with the goal to promote a shared community vision for Port Susan and enhance stewardship to conserve natural, cultural, economic, and scenic values. This designation is a result of dedicated leadership from the Tulalip Tribes and the Stillaguamish Tribe who recognized the declining health of many marine species and expressed concern for the ecological well-being of Port Susan Bay. Although a MSA is a non-regulatory designation, it can be an

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[14] *Demographics*. Snohomish County. *https://snohomishcountywa.gov/1349/Demographics*
[15] *Snohomish County, Washington Population 2022.* World Population Review. https://worldpopulationreview.com/us-counties/wa/snohomish-county-population
[16] Vance-Sherman, Annelise. (2020). Island County Profile. Washington State Employment Security Department. *https://esd.wa.gov/labormarketinfo/county-profiles/island*
[17] Massaua, M., et al. (2012).
[18] Washington Department of Fish & Wildlife. *Ports Susan and Garner - Marine Area 8-2*. *https://wdfw.wa.gov/fishing/locations/marine-areas/ports-susan-gardner#major-fishing*
[19] Hamer, M. Washington Department of Fish & Wildlife. (2021). *2021 District 13 Hunting Prospects: Snohomish, San Juan, and Island Countries; Skagit Islands*. *https://wdfw.wa.gov/sites/default/files/publications/02275/district_13_hunting_prospects_2021.pdf*
[20] Washington Department of Health. *Washington Shellfish Safety Map*. *https://fortress.wa.gov/doh/biotoxin/biotoxin.html*
[21] Snohomish Conservation District. (2019) *Agriculture Resilience Plan for Snohomish County*. Snohomish Conservation District. *https://snohomishcd.org/ag-resilience-plan-document*

effective strategy to promote community engagement and coordinate action between local, multi-agency partnerships.

The Island County MRC has also advocated for similar designations in the Puget Sound region, effectively establishing the Admiralty Inlet and Saratoga Passage as MSAs. To the north, the San Juan MRC initiated a MSA in the San Juan Islands, northwest of Port Susan. The San Juan MSA aims to protect the area's rich marine diversity through increasing participation of local communities and groups in marine stewardship activities, with current outreach efforts targeted at the broader community.[22,23] Concurrently, the MSA designation provides an opportunity for MRCs to advocate for increased regulatory measures through collaborative governance.

Conservation Action Planning Overview

The development of the 2012 CAP in Port Susan followed TNC's conservation action planning process, which is a "collaborative, science-based approach used to identify the biodiversity that needs to be conserved, to decide where and how to conserve it, and to measure effectiveness."[24] Conservation action planning is an iterative process that emphasizes the development and implementation of strategies to address priorities, achieve goals, and measure results. The four main planning themes are (1) defining the project, (2) developing strategies and measures, (3) implementing strategies and measures, and (4) using results to adapt and improve (Figure 3).[25] The planning groups in Port Susan utilized this structure to develop a CAP to effectively implement and monitor species

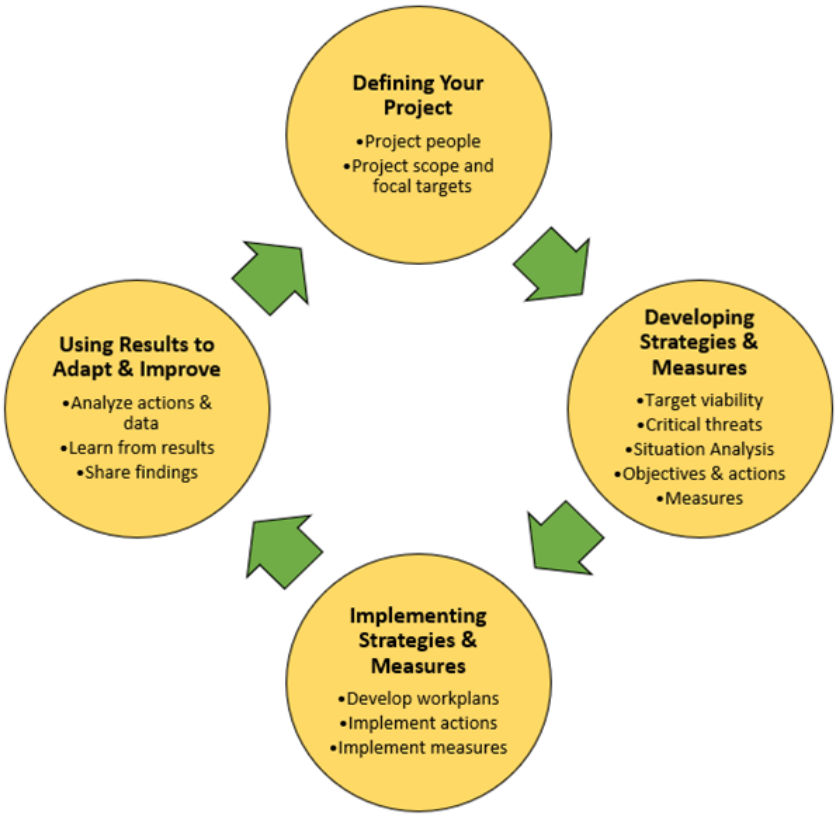

Figure 3: The Conservation Action Planning Process

[22] Evans, K., & Kennedy, J. (2007). San Juan County marine stewardship area plan. San Juan County Marine Resources Committee.
[23] Rawson, K., Kennedy, J., & White, J. Marine Stewardship Area Offers a Model for Integrating Science, Management, Stewardship and Ecosystem Thinking in the Conservation of Coastal Resources. 21st International Conference of the Coastal Society.
[24] The Nature Conservancy. (2007). Conservation Action Planning Handbook. The Nature Conservancy, Arlington, VA. Retrieved from: *http://conserveonline.org/workspaces/cbdgateway/cap/resources/index_html*
[25] The Nature Conservancy. (2007)

actions to protect the region's biodiversity and resources.

In addition to the representatives from the groups mentioned above in the background section, representatives from the Snohomish Conservation District and the Island County Shore Stewards were also included on the Advisory Team that helped to guide the CAP process.

The sections below briefly highlight the four main planning themes relevant to the creation of the Port Susan MSA CAP.

Defining the Project

According to TNC, a conservation project is "any set of strategies taken by a group of practitioners to work to achieve a set of goals and objectives within a specified geographic area."[26] Following several workshops with experts, managers, citizens, and stakeholders facilitated by the consulting firm Native Habitat Restoration, the planning team identified the following conservation targets for Port Susan:

- River Delta
- Chinook Salmon
- Crustaceans
- Embedded Invertebrates
- Beaches
- Forage Fish
- Shorebirds

Developing Strategies and Measures

The next phase of TNC's CAP process involved determining target viability, critical threats, situation analysis, objectives, actions, and measures. For Port Susan, the CAP presents viability rankings for each of the conservation targets: Very Good, Good, Fair, and Poor. Figure 4 provides an overview of the results from the previous CAP's assessment.[27]

	Conservation Targets	Landscape Context	Condition	Size	Viability Rank
1	Shorebirds	-	-	Good	**Good**
2	Chinook Salmon	Poor	Fair	Fair	**Fair**
3	Forage Fish	Good	Good	Good	**Good**
4	Embedded Invertebrates	-	-	-	**Good**
5	Dungeness Crab	-	Good	Good	**Good**
6	River Delta	Poor	Poor	Poor	**Poor**
7	Beaches	Fair	Poor	Good	**Fair**
	Project Biodiversity Health Rank				**Fair**

Figure 4: Conservation Target Viability Rankings from 2012 CAP

[26] The Nature Conservancy, & Kiesecker, J. (2005, August). *Conservation Action Planning (CAP) Process* [Slides]. Conservation Gateway. *https://www.conservationgateway.org/Files/Pages/action-planning-cap-detai.aspx*

[27] Massaua, M., et al. (2012).

Implementing Strategies and Measures

The strategies implemented from the CAP guided the MSA to develop targeted restoration efforts to steward a healthier regional ecology. The resulting projects implemented following the 2012 CAP report through 2021 have been classified into two main categories: (1) Capital Projects and (2) Initiatives. The completed capital projects and their corresponding conservation target can be seen in Figure 5. The completed Port Susan initiatives were directed toward community engagement and environmental education.

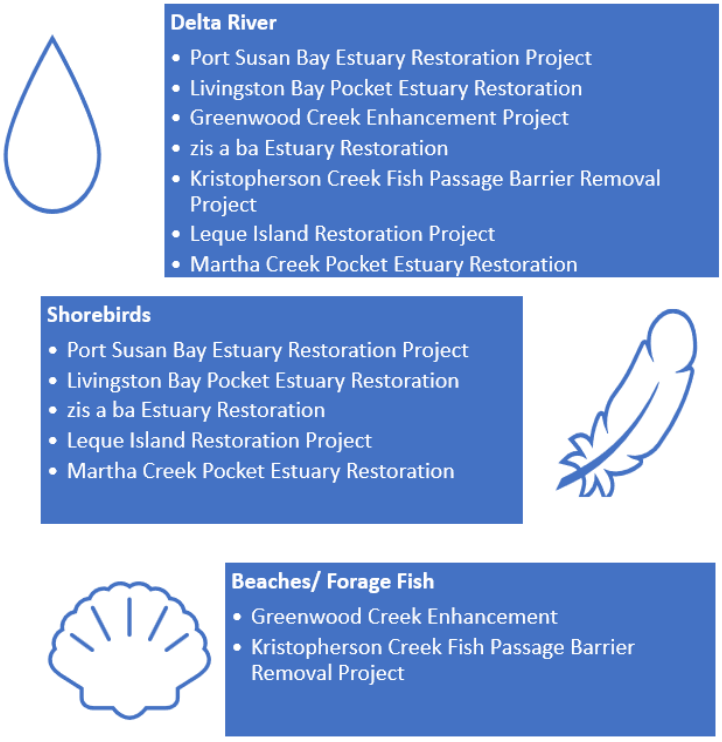

Figure 5: Port Susan MSA Completed Capital Projects

Using Results to Adapt and Improve

The final stage of the process outlined by TNC is to analyze actions and data, share findings, and adapt the CAP where necessary. Our project aligns with this stage of the conservation action planning process, as our primary goals include reviewing the 2012 CAP, researching newly available scientific information, identifying relevant community knowledge and perspectives, and synthesizing this information to provide recommendations for future conservation planning in Port Susan.

Project Scope

As 10 years have passed since the initial development of the Port Susan MSA 2012 CAP, Island County and Snohomish County MRCs are working collaboratively with community partners to review the CAP and identify how conservation and restoration efforts within Port Susan can remain effective to support the needs of key habitats and species, as well as the local community to promote long-term, inclusive stewardship. As such, the MRCs contracted two consulting groups – Environmental Science Associates and the Evans School Consulting Team – to support these goals.

Project Team

The project team consisted of five University of Washington graduate students from the Evans School of Public Policy and Governance (our team); two members of the Island County Marine Resource Committee; two members of the Snohomish County Marine Resource Committee; and two consultants from Environmental Science Associates (ESA).

Scope and Timeline – Marine Resource Committees

Phase 1

Island and Snohomish Counties contacted our team to review and compile updated scientific and regulatory information related to the Port Susan MSA 2012 CAP. Our team also sought to consider how environmental justice could be integrated into future conservation planning and actions within Port Susan. Simultaneously, Snohomish County MRC partnered with ESA to focus on re-engaging stakeholders through a collaboratively-developed survey, follow-up interviews, and additional meetings and engagement events. The four groups communicated frequently to share information, data, and results to ensure community input shaped the research process and allowed for the development of shared goals regarding the 2012 CAP review process.

Phase 2

The information collected from our team and ESA, both in partnership with the continued leadership of the MRCs, guided recommendations to inform a path forward for conservation strategies and actions within Port Susan. The recommendations aim to form the foundation of future planning processes and stewardship tools of the MRCs to continue to make progress towards the ultimate goal of restoring and improving Port Susan. This phase also considers how best this information will be shared with relevant partners to inform action as well as community members to share progress and monitor success. Each phase and their respective timelines are shown in Figure 6.

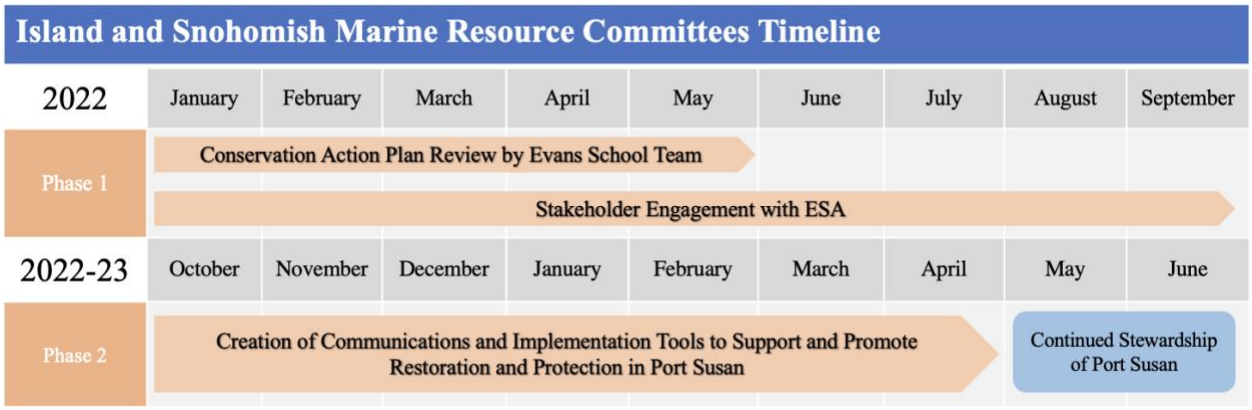

Figure 6: Island County and Snohomish County Marine Resource Committees' Project Timeline

Scope and Timeline – Environmental Science Associates

As mentioned, ESA aimed to engage a variety of stakeholders to help understand the priorities, opportunities, and general insight regarding the Port Susan CAP. To do so, ESA developed a stakeholder engagement plan that outlined their engagement goals, key messages, timeline (Figure 7), stakeholder groups, and the projected tools and activities.

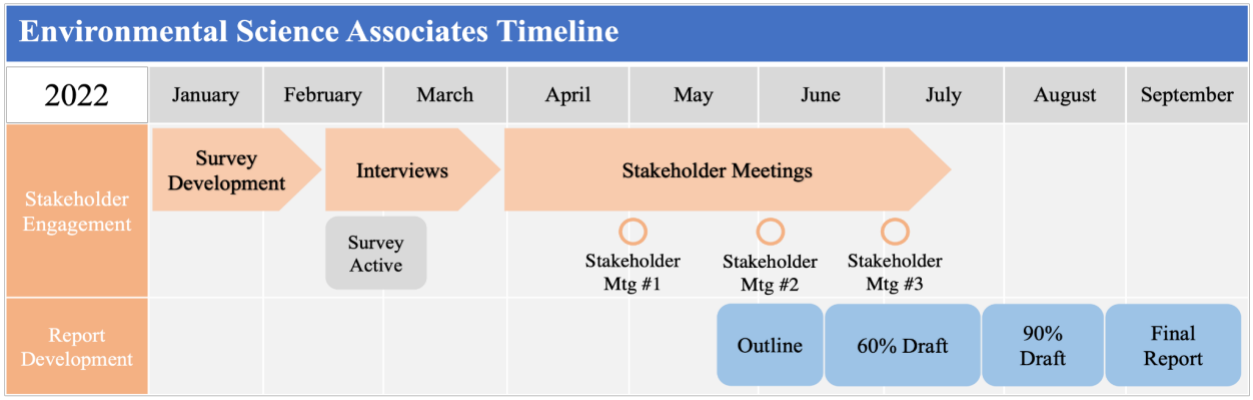

Figure 7: Environmental Science Associates Project Timeline

Scope and Timeline – Evans School Consulting Team

Our team contributed to the CAP review at the early stages, beginning in January 2022 and ending in May 2022, hence our efforts focused primarily on researching emergent science, regulatory actions and guidance, as well as considering potential community outreach strategies (Figure 8). Our team also assisted with the stakeholder engagement process, including analyzing survey results and conducting semi-structured interviews, in partnership with ESA's efforts. Our team's process resulted in several recommendations that, along with ESA's results, will be used to inform the planning process moving forward to progress towards the ultimate goal of restoring and improving Port Susan.

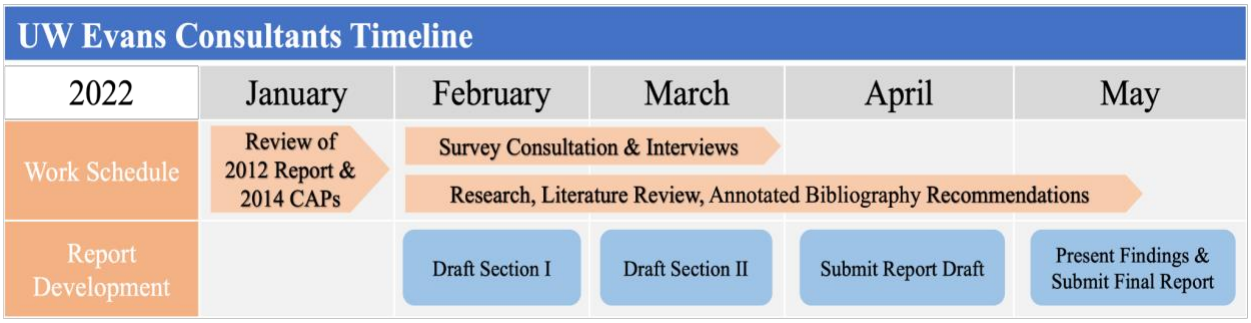

Figure 8: Evans School Consulting Team's Project Timeline

Chapter 2: Research Design and Methodology

Research Questions

Following conversations with our client, our research was informed by four key questions centered on updating knowledge, effectiveness, and community engagement:

1. *Updating Knowledge:*
    a. Based on updated scientific information, how have the viability and threat rankings for each conservation target outlined in the 2012 Port Susan MSA CAP changed over the past 10 years?
    b. What are the relevant regional policies and environmental justice considerations that should be included in a CAP review, update, or alternate process?
2. *Effectiveness:*
    a. What best practices should the MRCs and relevant partners take to effectively steward the Port Susan MSA?
3. *Community Engagement:*
    a. What community engagement tools would be most effective in communicating the successes and challenges of the 2012 CAP and eliciting relevant feedback/suggestions for continued conservation and restoration efforts in Port Susan?

To answer these questions, we conducted an extensive literature review, a preliminary community mapping process, co-designed and analyzed ESA's stakeholder survey, and assisted with semi-structured interviews.

Literature Review

The first portion of our research included a comprehensive review of scientific literature regarding the existing conservation targets (identified in *Defining the Project*) and their identified threats. The targets were divided amongst our team to ensure adequate information was collected on each target. Our team used source material, including government reports and assessments, from the original Port Susan CAP to guide our review and identify key terms. We sought out recent scientific literature on target species populations and habitat conditions using Google Scholar and the University of Washington Libraries search engine. Our team prioritized sources that were published after 2012 to ensure we compiled updated information.

Simultaneously, our team examined relevant policies and programs that have been implemented since 2012 related to the Port Susan area. We began our search by systematically reviewing the progress of the strategic actions and objectives that were outlined for each conservation target in the initial CAP. This research was informed by a list provided by our client containing all of the capital projects and initiatives that the MRCs were aware of, as well as a progress report published in 2014. We also reviewed updated annual reports from agencies such as the Washington Department of Fish and Wildlife (WDFW), NOAA Fisheries (NMFS), and the

Puget Sound Partnership (PSP) to identify potential circumstances where regulatory guidance may have been updated within the last 10 years.

We supplemented this research by reviewing alternative approaches to conservation planning and other related reports from similar coastal communities, including those within the Puget Sound, to discover areas of success that could be emulated in future Port Susan stewardship. In an iterative process, we analyzed stakeholder data concurrently to identify potential source material pertinent for our team to analyze and include in our report.

This information was compiled in an accompanying annotated bibliography and synthesized to inform specific recommendations related to updating the science from the 2012 CAP as well as key policy considerations (see *Revisit Conservation Targets and Threats*).

Community Mapping Process

To inform our recommendations for future inclusive community engagement, our team conducted a community mapping process to identify partners shaping the CAP and those who are impacted by the issues covered by the CAP (see *Community Engagement Process*). We referenced recommendations from interviewees and researched local organizations that represent diverse populations that have been left out of the CAP. This process serves as a starting point to determine who should be included in future restoration planning in Port Susan. We acknowledge that our analysis may be incomplete without local community members' input. Further analysis should be undertaken with local community members who have deeper knowledge on relationships, patterns of influence and power, and impact of policies to include relevant parties who are currently excluded from the process.

Stakeholder and Co-manager Engagement Process

Our team assisted in stakeholder and co-manager engagement in two primary ways: a qualitative and quantitatively based survey and one-on-one interviews. The following details the survey design and analysis process as well as interview methodology.

Stakeholder Survey Methods

The Port Susan Stakeholder Survey was co-designed by the ESA consultants, the Snohomish County MRC, and our team. The following is a general overview of the survey design, including our team's suggestions that were incorporated into the final design.

Survey Design

The 21-question survey was divided into *two separate sections*:

Part 1 (11 questions): Background information on the survey respondent, including their basic contact information and organization, their familiarity with and use of the CAP, and recommendations for updating the CAP. Part 1 primarily consisted of *multiple-choice questions*, with the option to fill in "other."

Part 2 (10 questions): This section began with a question on the respondent's preferred mode of information sharing - including through a conversation, emails, through the survey itself, or

"other" - to be filled in. Respondents were then prompted to fill in the final 9 questions in a way that best met their needs and time constraints. These primarily *open-ended questions* were designed to collect information on the respondent's personal or work-related engagement with the CAP over the last 10 years, resources they have come across related to the CAP, and their perception of the relevance or strengths of CAP objectives.

Survey Design Recommendations

In addition to understanding how a person's organizational or personal affiliation with the CAP might have changed over time, we also wanted to understand their overall *perception of community engagement and inclusivity*. Therefore, we added the following question to Part 1: "Were there engagement methods you appreciated, or possible improvements?" (Part 1, Question 4).

In 2020, Island County conducted a resident survey to understand residents' natural resource values. An ex-post survey review found that the survey process lacked diverse inputs, which limited the reach of the Island County survey especially for Spanish-speaking community members.[28] Therefore, in addition to time/capacity, internet access/bandwidth, and relevance, we suggested that *language/translation* also be included as a choice for barriers to engaging with the CAP revision process (Part 1, Question 10).

We suggested three key revisions to a question regarding the relative importance of scientific areas to be included in the revised CAP (Part 2, Question 4):

1. *Convert the question from a single-choice answer to a Likert scale.* Instead of choosing one area out of 12 options as the most important topic, we suggested that respondents be prompted to analyze whether each area was 1 - not important, 2 - slightly important, 3 - somewhat important, 4 - important, or 5 - very important to include. We believed that Likert scale responses would give us more nuanced information about each of the 12 options, rather than focusing on just the most important one.

2. *Disaggregate "human wellbeing" into more meaningful sub-categories.* Originally, the question provided seven options on ecological science (climate change, sea level rise, salmon, nearshore ecology, ocean acidification, harmful algal blooms, hypoxia), and only one option on social science: human wellbeing. Human well-being is a broad metric, and it would be difficult to provide substantive recommendations on the CAP using this metric. To lend to a more nuanced analysis, we substituted this option with three more specific social options: environmental justice, social and cultural wellbeing, and economic impacts.

[28] Trimbach, D.J., and L. Rivas. (2021). *Island County Survey Report*. Human Dimensions Lab, Department of Fisheries and Wildlife, Oregon State University. Corvallis, Oregon.

3. *Include "microplastics" as an additional area.* Our literature review revealed the increasing prevalence and toxicity of microplastics to species in the Salish Sea.[29] Therefore, we explicitly included this category to see how respondents viewed the severity of this threat.

The final question of the survey prompted respondents to share who they believed should be interviewed regarding the 2012 CAP and its forthcoming update. We wanted to give survey respondents the opportunity to suggest proxy representatives for themselves or others, in case individuals did not want to be contacted or interviewed directly. Therefore, we included this question: *"Would you prefer to suggest a proxy representative?*" (Part 2, Question 10).

Survey Analysis

The survey helped us identify key stakeholders and co-managers, their present and past organizational affiliations, the extent of their involvement in the original CAP planning process, how they wanted to be included in the CAP update process, and barriers to continued engagement (Part 1, Questions 1-4, 9-10; Part 2, Questions 1, 11). These data were analyzed to (1) identify potential interviewees, (2) to understand the duration and extent of an individual's relationship with the CAP, (3) to construct the stakeholder map, and (4) to recommend ways of removing barriers to further stakeholder engagement.

Various questions addressed how much people have engaged with the CAP, to what purpose, and how to make the plan more useful to their work (Part 1, Questions 5-8). These questions pertained to the relevance and utility of the CAP and were used to (1) establish a quantitative and qualitative baseline of use of the CAP (Part 1, Question 5-6) and (2) to inform recommendations on improved stakeholder engagement and utility of the CAP in the future (Part 1, Questions 7-8).

A series of open-ended questions directly aided in the development of our literature review (Part 2, Questions 2-3, 5-6). These questions prompted respondents to share resources, connections with relevant people, organizations, scientific articles, newspaper articles, project reports, webpages, etc. on the application of the CAP that they have come across. Information shared was then reviewed and incorporated into our literature review.

The final qualitative and quantitative analysis we conducted pertained to the scope and priorities of the CAP objectives (Part 2, Questions 4, 7-9). We first ran a quantitative analysis to determine the relative rankings of scientific areas to be included in the updated CAP (Part 2, Question 4). This was done by calculating an average score for each area, and then ranking the areas from highest to lowest priority. Additionally, individual scores were contextualized by their organizational affiliation and other open-ended responses to better understand a respondent's individual scoring choices qualitatively. Finally, we pulled quotes from the final open-ended

[29] Sorensen, M. (2021). *Predicting the Ecotoxicological Impacts of Microplastics in the Northern Salish Sea: A Novel Approach to Marine Risk Assessment Using GIS* (Doctoral dissertation, Royal Roads University (Canada)).

responses and organized emerging themes to provide recommendations on priority CAP objectives moving forward (Part 2, Questions 7-9).

Stakeholder Interview Methods

The analytic objective of conducting interviews for the MRCs was to gather expert insights on ecological updates and policy needs. We collaborated with ESA to assist in facilitating four of the nine interviews conducted. Most interviews were conducted as a follow-up to the survey with respondents who agreed to being interviewed.

Limitations

Our positionality as outsiders of this MSA both geographically and relationally meant that our understanding of the community and group dynamics was limited to the information we could gather from publicly available documents and resources shared through the MRCs. While we conducted the stakeholder and co-manager mapping process using an inclusive framework, we could have missed critical populations or connections that could affect or be affected by the CAP.

The stakeholder survey, which we helped review and provided comments for, was sent to a predetermined group of individuals identified by ESA, the Snohomish County MRC, and the Island County MRC. Furthermore, those who were interviewed by ESA and members of our team were a part of this sample group or were identified by a member of the predetermined group. Both quantitative and qualitative data collected came from primarily the same pool of respondents. These individuals primarily consisted of ecological experts or government agency personnel and were determined via their previous engagement in the 2012 CAP development and their 'primary anticipated interest.'[30] These 'interests' included salmon recovery, habitat restoration, flooding & water, agriculture & land use, and region-wide interests.[31] As such, the information derived from the survey and interviews focused heavily on the ecology of the Port Susan socio-ecological system, rather than human dimensions. Additionally, as many of these individuals interact with Port Susan in a professional manner, we did not receive significant information regarding local or Indigenous knowledge and the capacity of some individuals and organizations to participate and engage in planning activities was limited due to a focus on program implementation.

[30] Archer, C. and Kralj, J. (2022). *Stakeholder Engagement Plan: Port Susan Marine Stewardship Area Conservation Action Plan Update*. Prepared by Environmental Science Associates for Snohomish County Marine Resource Committee.

[31] Ibid.

Chapter 3: Findings - Surveys and Interviews

Survey Findings

The survey findings offer insights into community partners' perspectives and their level of engagement with the Port Susan CAP. Using quantitative and qualitative methods, our team analyzed the composition of survey respondents and their responses to the survey, including their familiarity with the CAP and proposed suggestions.

Survey Respondent Information

The composition of survey respondents included professionals from 20 organizational affiliations: 2 tribal nations, and 1 unaffiliated respondent. The participating professionals had ecological or regulatory backgrounds and were employed in governmental, non-profit, academic, or private business positions. The organizations consisted of 6 local government agencies, 7 state agencies, 2 tribal employees, 2 federal agencies, 3 non-profits, 1 academic institution, and 2 private businesses (Figures 9 & 10).

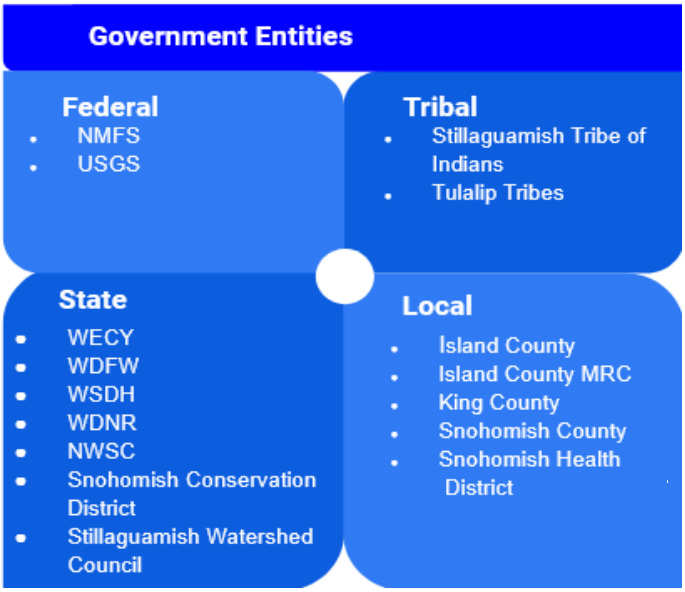

Figure 9: Government Entities Represented in Survey Respondents

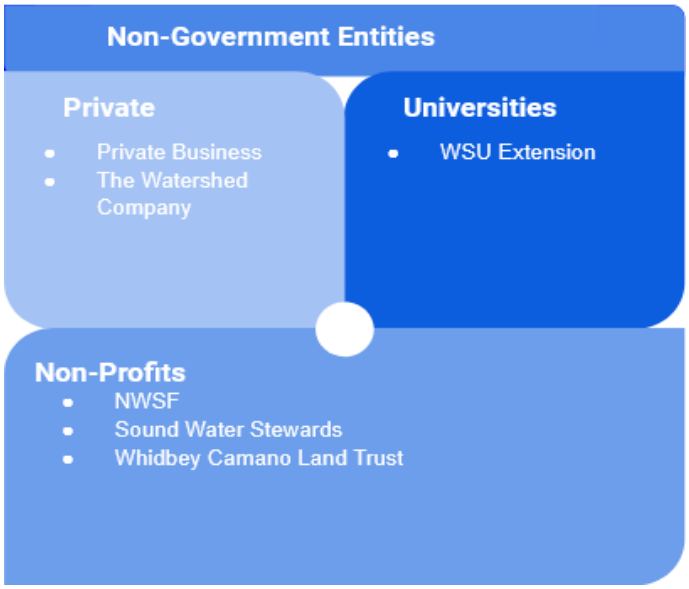

Figure 10: Non-Governmental Entities Represented in Survey Respondents

The previous involvement of respondents ranged from having never heard of the CAP to planning and developing the plan. Of the 34 survey respondents, 15 (44%) were previously involved in the 2012 CAP (Figure 11). 19 respondents (56%) did not previously work with the 2012 CAP. Of those with experience, 4 helped facilitate or participated in 2012 CAP workshops, 5 developed plan content, 9 attended stakeholder meetings, and 7 provided scientific or technical information. The 3 participants that responded with "other" either did not recall the specifics of their contributions (2) or were a citizen scientist (1).

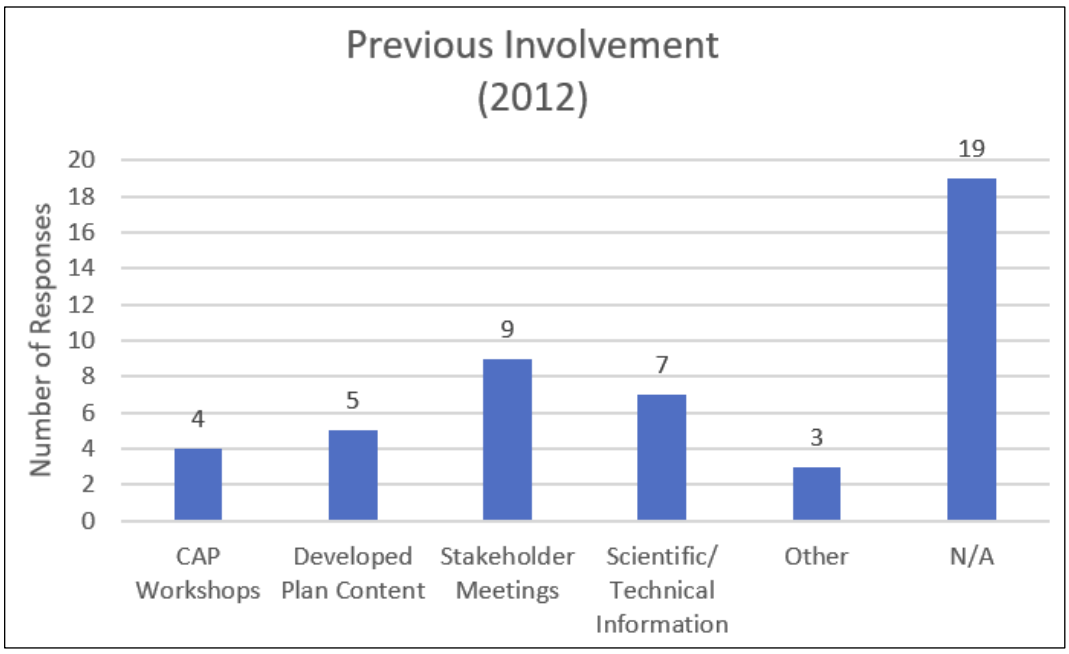

Figure 11: Survey Results – Respondents' Previous Involvement with the 2012 CAP

Familiarity and Utility of the 2012 CAP

Prior to the survey, respondents indicated a large temporal spectrum since they had last referenced the CAP in their work. From Question 5 of the survey, 9 individuals last referred to the CAP more than 5 years ago in their work, 10 from one to five years, 5 selected 1 year, 2 individuals used it within the last 6 months, and 9 persons had either never used or never heard of the CAP prior to the survey (Figure 12).

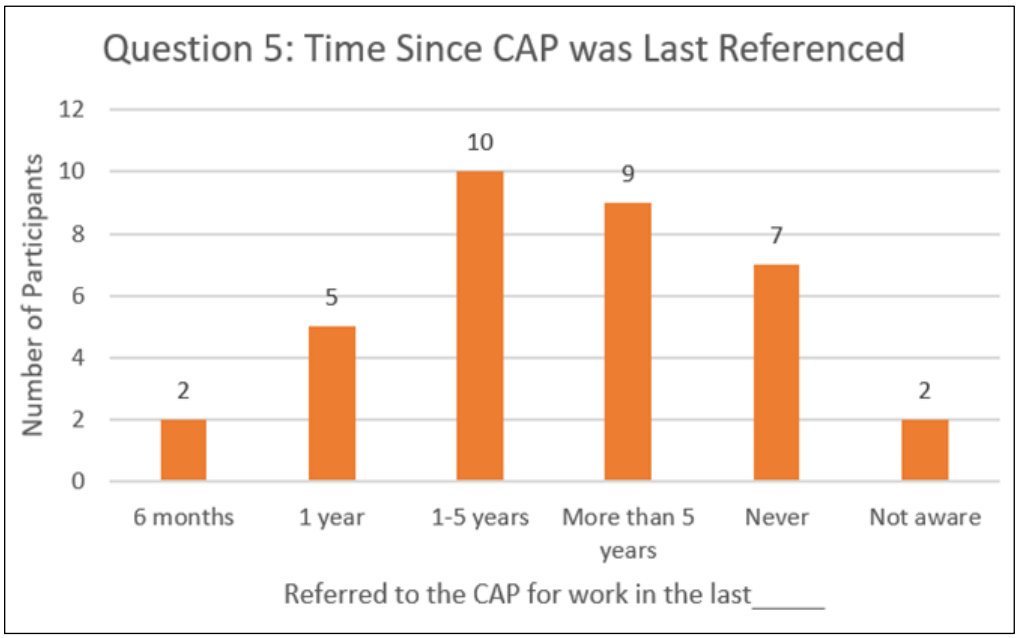

Figure 12: Survey Results – The Last Time the 2012 CAP Was Referenced

In analyzing the CAP utility, the partners who participated in the survey are regionally based and used the CAP to varying degrees. As Figure 13 shows, there were some uses for the CAP, including setting project goals, supporting grant proposals/funding requests, informing communication materials, and identifying project opportunities. 44% of respondents, however, indicated that they did not use the CAP plan in their work. Interestingly, 5 of the 7 "other" selections specified that the CAP was used as an example or model for their work in developing or advocating for collaborative conservation projects.

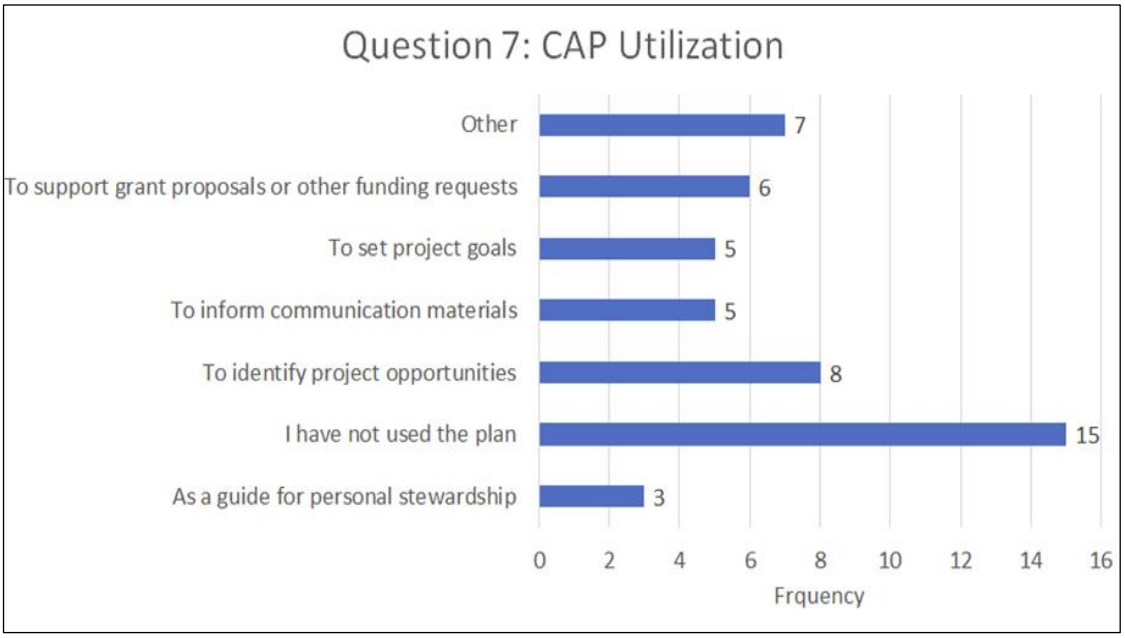

Figure 13: Survey Results – How the 2012 CAP Has Been Used by Respondents

Survey Respondents Recommendations

Improving Utility

In reviewing the utility of the 2012 CAP, the survey revealed that 44% of respondents have not used the CAP in their professional work settings and 28% have not used it in over 5 years (Figure 13). To help provide additional context, the survey probed respondents to consider what may be useful to increase the CAP's utility, including:

- Update or new maps and graphics
- Condensing the text
- Additional visual content or organization
- More up-to-date and relevant strategies
- More up-to-date and relevant science
- Companion documents (factsheets or report cards with key highlights)
- Convene twice yearly (or other timeframe) to discuss ways for continued implementation
- Create a crosswalk with the Puget Sound Partnership's Action Agenda to provide access to the National Estuary Program funding to implement the CAP

Respondents were allowed to select as many options as they'd like, so the frequency of options exceeds the number of respondents. "Other" and "creating a crosswalk with the PSP Plan" were the most frequently selected (Figure 14). Notably, respondents who answered "other" suggested:

- The report was too long (3)
- Recommendations should link to other local initiatives, such as the Puget Sound Partnership Action Agenda or the Local Integrating Organization Ecosystem Recovery Plans (3)
- Stakeholders should meet periodically (3)
- Recommendations should be concrete and actionable (2)

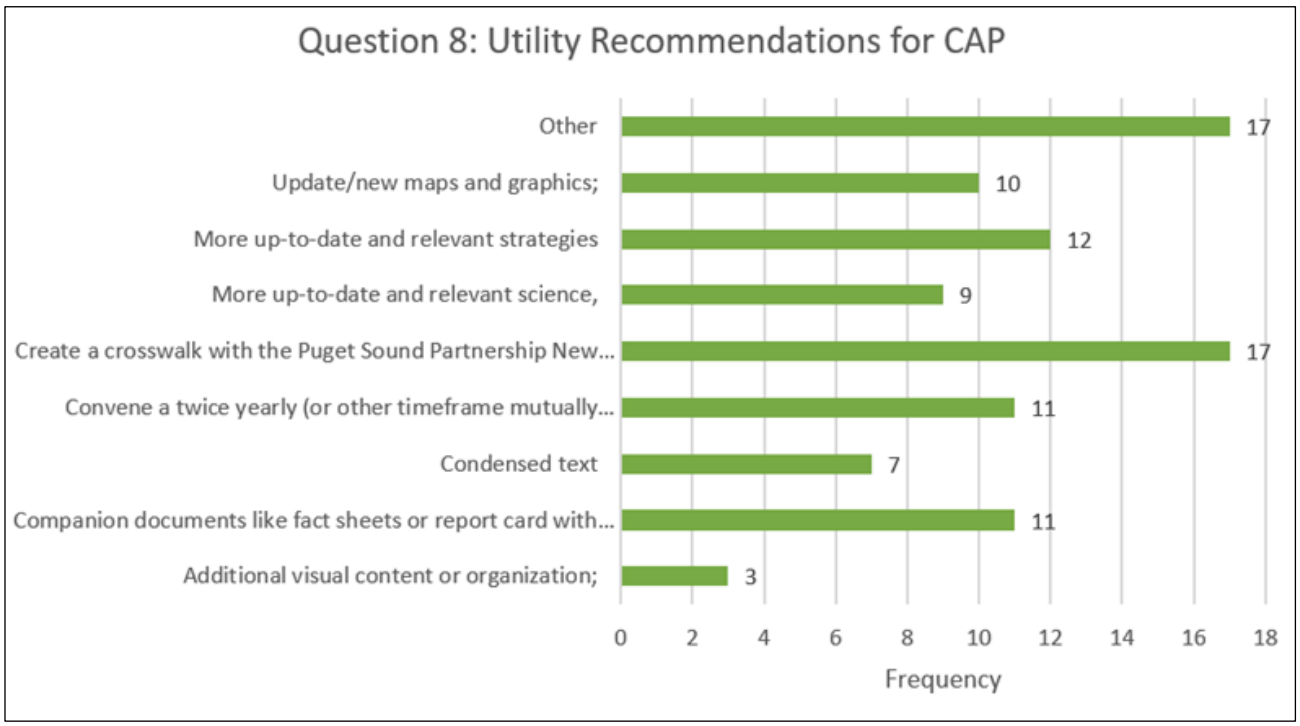

Figure 14: Survey Results – Respondents' Recommendations for Improved Utility

These results suggest a significant interest in exploring options to increase the utility of the CAP and provide our team with important considerations in our recommendations section (*Chapter 6: Recommendations*).

Setting New Priorities

In the past decade, environmental planners and stakeholders' priorities have changed. Those changes reflect new environmental concerns as well as social concerns regarding those environmental threats. The survey asked professionals to rank from 1-12 in order of priority areas that should be explored, expanded upon, or updated in reviewing the existing CAP. Some topics were a focus of the 2012 CAP (i.e. salmon), others are environmental threats that have become more prominent in recent years (i.e. ocean acidification, SLR, climate change, microplastics etc.). The survey also included environmental justice as a potential priority area given the disproportionate impact of environmental threats on BIPOC and underserved

communities. Additional categories that were not captured explicitly in the CAP are expanding on social factors, like human well-being and economic impacts.

Our team aggregated the responses to this question by assigning scores to the rankings: a 1st place ranking received 12 points, 2nd place received 11 points, and so on. We used this strategy because 10 of the survey respondents partially ranked the topics, leaving some of the topics unranked while assigning rankings to others. Our team made the assumption that unranked topics were considered not as important by respondents. Calculating the average ranking would not account for the frequency that a topic was ranked or left blank by respondents who answered that question. Figure 15 represents the summed scores for each of the categories identified in the survey, with a higher score signifying a higher priority by respondents.

We found that respondents were most concerned with prioritizing sea level rising and climate change in a new version of the CAP (Figure 14). Nearshore ecology was ranked as the 3rd most prioritized topic in the overall results. Notably, environmental justice and human well-being tied for 4th most prioritized topics, which reveals a desire to prioritize social elements in Port Susan conservation planning alongside ecological aspects. The next cluster of topics in order of priority include: salmon, ocean acidification, social and cultural wellbeing, microplastics, hypoxia, and harmful algae blooms. Economic impacts were ranked last amongst the options offered.

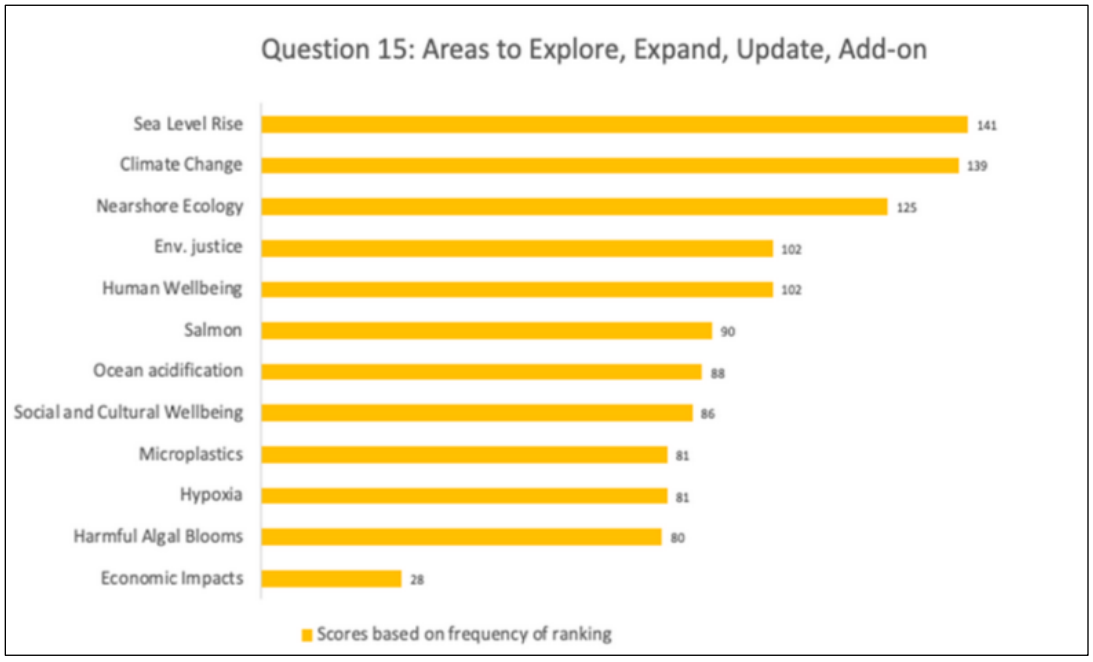

Figure 15: Survey Results – Areas to Explore, Expand, Update, and Add when Setting New Priorities

Helpful Resources

In addition to the above questions, respondents were also probed about resources that would be helpful to make the CAP more effective moving forward. Respondents provided a variety of answers, including specific individuals to talk to, other regional plans and initiatives, websites, and recent publications (academic, technical, or government reports). See Figure 16 for a list of recommended resources.

Figure 16: Survey Results – Resources to Consider to Improve Effectiveness

Initial Interview Findings

We assisted ESA with facilitating four of the initial nine interviews with established MRC partners and individuals identified by the ESA survey. Our interview analysis is limited to the four collaborative interviews and ESA notes from the remaining five initial interviews. The initial interview findings complement the findings of the survey results. The regional ecological experts of the Puget Sound offered insights into planning fatigue, the desire for well-developed action plans, and the willingness to pursue collaborative strategies structured with accountability measures. Although we began with the intention of emphasizing ecological updates and policy needs, the interviews also provided local perspectives on best practices for implementing a practical conservation plan.

Interviewees and their Affiliated Organizations

The individuals who participated in the interviews were affiliated with the following organizations and departments. Interview responses represented the opinions of individual interviewees and did not represent opinions of their affiliated organizations or entities.

- Meridian Institute
- Snohomish County - Agriculture and Economic Development
- Snohomish County - Marine Resources
- Snohomish County - Stillaguamish Watershed
- Snohomish County - Surface Water Management
- Tulalip Tribes - Natural Resources
- WA Department of Ecology - Water & Shorelines
- Washington State University - Beach Watchers
- Washington Sea Grant Program

Important Areas to Further Explore

When asked about key ecological considerations that merited further investigation, interview respondents focused on issues pertinent to water quality and climate change in Port Susan. The Tulalip Tribes and Snohomish County interviewees expressed concerns about hypoxia resulting from wastewater treatment facilities affecting nutrient/ nitrogen concentration. The Tulalip Tribes interviewee emphasized the importance of nutrient and nitrogen concentration influencing the variability in plankton blooming time. A Washington Sea Grant (WSG) interviewee also highlighted the necessity of incorporating sea level rise planning into restoration projects moving forward and recommended referencing WSG's work with Island County on the issue.

Challenges Discussed

The questions focused on the interviewees' relationship to the CAP offered reoccurring sentiments surrounding human-centered considerations and the real-world application of the 2012 model. The Tulalip Tribes' interviewee raised concerns about the previous CAP lacking an implementation mechanism, follow-up procedures after the planning process, and an unclear outcome. According to an interviewee who was a primary contributor to the 2012 CAP, the original model was very ecosystem focused. This ecological model appears to have neglected human-centered consideration to support "buy-in" and community engagement. The Tulalip Tribes' interviewee reflected on participants lacking a sense of ownership over the project. A Snohomish County Agricultural Coordinator reflected on climate impacts being hard on farmers and agriculture. Raising community and regional concerns impacting humans may increase engagement from the greater community.

Opportunities

The ESA interviews revealed potential opportunities for improving the CAP or an alternative process to steward Port Susan. Interviewees recommended developing a cross walk process with other programs, improving water quality monitoring, incorporating a place-based approach, refining community engagement strategies, and increasing the relevancy of the overall project.

Regardless of the category, a general sentiment was that the plan should identify a few key action items and focus on feasible implementation strategies requiring less planning engagement from partners.

More specifically, an interviewee affiliated with the Washington Sea Grant recommended referencing SWIMM (Social Wellbeing Indicators for Marine Management) to consider wellbeing metrics beyond ecological frameworks. A primary contributor to the 2012 CAP suggested exploring possibilities of including Tribal members in addition to Tribal nations' natural resource managers in the discussions. They also suggested communication strategies to reach the broader public to better understand community sentiment and identify supporters of the plan from the start. A coordinator at Snohomish County referenced a vulnerability assessment currently being conducted for communities in the Stillaguamish watershed that could shed light on how restoration increases resilience in the area. See Figure 17 for a list of opportunities.

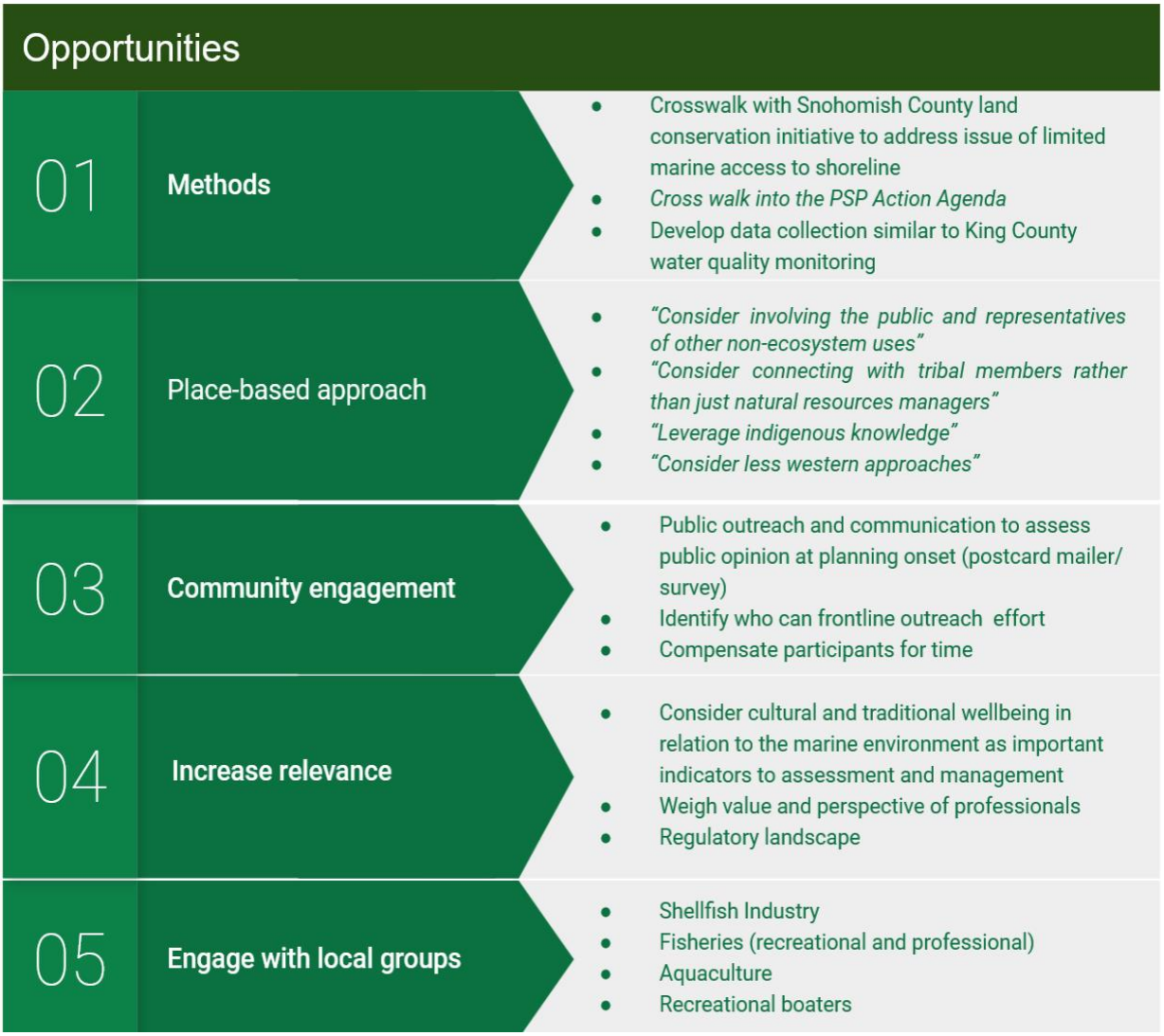

Figure 17: Interview Results – Opportunities Identified by Interviewees

Chapter 4: Findings - Literature Review

This chapter includes an iterative literature review regarding (a) the 2012 CAP conservation targets, their key ecosystem attributes (KEAs), threats, and strategic actions, (b) a review of alternative initiatives to conservation planning and local examples, and (c) a discussion on how to best incorporate sociocultural factors into conservation planning. This information helped shape our ultimate recommendations regarding new knowledge, the effectiveness of the CAP and MSA processes, how to improve the CAP's overall utility, and how to integrate sociocultural factors.

Background

Defining 2012 CAP Metrics

In the 2012 CAP, each conservation target was assigned a viability and threat ranking. These metrics were used to determine health and threat indicators to each conservation target.[32] The following provides further details on each of these metrics.

Viability Ranking

"Viability" in this context is the health of the conservation target and its ability to withstand and recover from ecological and human-caused disturbances. Target viability was rated categorically in the 2012 CAP as very good, good, fair, or poor (Figure 18)[33].

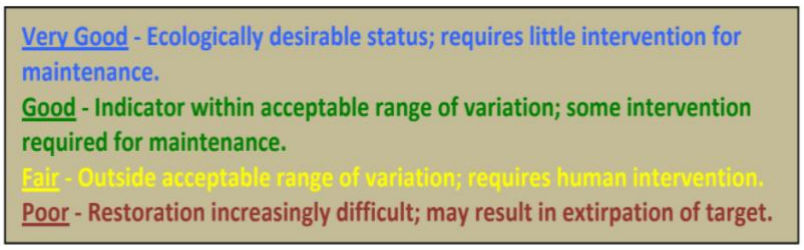

Figure 18: Viability Ranking Definitions from 2012 CAP

These categories were defined numerically, and the threshold ranges for each category were target-specific. Furthermore, viability was broken down into three sub-groups for analysis, described as "key ecosystem attributes and indicators (KEAs)" – landscape context, condition, and size. These three groupings were left undefined in the 2012 CAP, which limited the extent to which our literature review could be precise. However, for the purpose of our literature review, we inferred relevant definitions based on the kinds of information that was be captured within each group.

Landscape Context

"Landscape context" can be understood as landscape-level characteristics that affect the health and well-being of target species and ecosystems. These viability indicators include:

- *Connectivity among communities and ecosystems* – This attribute compares historic levels of habitat connectivity with present levels, and the accessibility of such habitats for species.

[32] Massaua, M. et al. (2012).
[33] Ibid.

- *Landscape pattern (mosaic) and structures* – This attribute assesses the relative presence of historic landscape features compared to present landscape features.
- *Hydrologic regime* – This attribute generally describes changing hydrological patterns in an area, especially pertaining to the river delta.
- *Soil or sediment stability and movement* – This attribute assesses how well soil or sediment regimes currently function compared to historically. Sediment regimes affect feeding behaviors, as well as sediment deposition along beaches.
- *Water or soil temperature* – This attribute measures water and soil temperature, and their impacts on species and ecosystems. It also includes habitat features that affect water temperature, such as marine riparian shade.
- *Water quality* – This emergent attribute, which was mentioned but not examined further in the 2012 CAP, assesses water quality and its impacts on species and ecosystems.

Condition

"Condition" can be understood as the habitat conditions that allow species to thrive and to move through their various life stages. These indicators include:

- *Abundance of food resources* – This attribute assesses the overall abundance of key food sources for target species.
- *Community architecture* – This attribute describes varied and specific habitat conditions that are essential for species to access while developing and reproducing. These include metrics such as large woody debris (LWD) deposits for bird roosting, nearshore environments for juvenile salmon development, and intertidal sand areas for forage fish feeding.
- *Population structure and recruitment* – This attribute describes population dynamics regarding development and reproduction, including juvenile density and growth and species size classes.
- *Biological legacies* – This attribute is specifically related to the river delta, and what attributes promote the health and well-being of species in the delta.
- *Habitat composition/dominance* – This attribute appears in relation to beaches and describes the percentage of the beach subject to tidal inundation. In this, this metric can be used to describe how environmental changes affect habitat and/or species composition or the dominance of certain species over others.

Size

"Size" can be understood as either a measure of the total size of a species' population, or as the size of key ecosystem features. These indicators include:

- *Population size and dynamics* – Depending on the target species, this attribute either measures the number of individuals in a population, the population biomass, or the density or abundance of that population.
- *Size/extent of characteristic communities/ecosystems* – This attribute measures the size of key characteristics of target ecosystems, including the river delta and beaches. For

example, this indicator measures the total tidal inundation area and the extent of the river bluff that delivers sediment to marine environments.

Threat Ranking

The 2012 CAP identified 22 different threats affecting the conservation targets and provided a definition for each threat. The threats are in order of their threat level in 2012, so the top 5 threats to Port Susan are bank hardening, levee maintenance, agricultural runoff, loss of vegetative buffer, and increased flooding.

For clarity, we provided these threats in the Table 1, and included the root cause (drivers) of each threat. These drivers included: fossil fuel extraction, climate change (driven by fossil fuel combustion), increased land development, population growth, externalities specific to agricultural, fisheries, shipping, forestry, recreational, or other industries, and public infrastructure shortfalls.

Table 1: Threats Posed to the Port Susan Ecosystem and Their Drivers

Threat	Definition	Drivers
Bank Hardening	Includes any form of hardening/shoreline armoring (e.g. bulkheads, rip rap, etc.) and development along the nearshore or Stillaguamish delta.	Increased Development
Levee Maintenance	Building or upkeep of levees, including vegetation removal, along the Port Susan/Stillaguamish shoreline.	Increase in Population, Increased Development, Agricultural Industry Externalities, and/or Climate Change (Fossil Fuel Combustion)
Agricultural Runoff	Runoff originating from agricultural sources that adversely affect water quality, marine organisms, and hydrology by containing contaminants (e.g. metals, pesticides and polyaromatic hydrocarbons), altering water temperature, increasing sedimentation and/or changing flow patterns.	Agricultural Industry Externalities
Loss of vegetated buffer	Loss of vegetation along marine shoreline freshwater streams and rivers.	Increased Development and Climate Change (Fossil Fuel Extraction)

Increased Flooding	Changes in water regime due to climate change and stormwater runoff from commercial and residential development, which alters hydrology.	Climate Change (Fossil Fuel Extraction), Increased Development, Public Infrastructure Shortfalls, and Industry Externalities
Acidification	Altered water chemistry due to climate change, specifically decreasing pH caused by the uptake of anthropogenic carbon dioxide from the atmosphere.	Climate Change (Fossil Fuel Extraction)
Spills	Catastrophic and/or significant oil spills (i.e. a low probability, high impact event) occurring within the Port Susan MSA or close enough to the MSA that wind and/or currents distribute the oil over a significant portion of the MSA. A specific size of vessel or volume of oil spilled was not designated.	Fossil Fuel Extraction
Derelict Gear	Includes both lost crab pots and fishing nets in Port Susan.	Fisheries Industry Externalities
Illegal Harvest	Harvesting outside of regulations for all species.	Fisheries Industry Externalities
Increased Storm Events	Beach disturbance and nearshore habitat loss caused by increasingly severe weather events	Climate Change (Fossil Fuel Extraction) and Increased Development
Incompatible Recreation	Recreational practices that could leave environmental footprints and/or disturb wildlife, such as hunting debris, dogs on beaches, and kayaking.	Increase in Population and Recreational Externalities
Invasive Species	Non-native species that have established populations (or may become established) in Port Susan, such as *Spartina spp.*, *Zostera japonica*, the purple varnish clam (*Nuttallia obscurata*), and the zebra mussel (*Dreissena polymorpha*).	Fisheries or Shipping Externalities (Industries or Recreational)
Incompatible Harvest	Unsustainable harvest for all species.	Fisheries and Other Industry Externalities

Municipal Discharge	Point source pollution from the wastewater treatment plants.	Public Infrastructure Shortfalls
Docks and Piers	Overwater structures affect both eelgrass via shading and disrupting habitat connectivity and nearshore drift.	Increased Development
Incompatible Forest Practices	Such as loss of vegetative buffer, increased chronic sediment sources, and altered hydrology.	Forestry Industry Externalities
Pollution from Stormwater	Degraded water quality as a result of runoff from the built environment.	Increased Development and Public Infrastructure Shortfalls
Septic Failure	Residential septic systems that are not functioning properly and result in discharge/leakage into nearshore environments.	Public Infrastructure Shortfalls
Tide Gates	Flood control structures located at the mouths of streams/entrance to estuary, which close during incoming tides to prevent tidal waters from moving upland, and open during outgoing tides to allow waters to drain out. Tide gates may block passage of salmon and other fish.	Climate Change (Fossil Fuel Extraction), Increase in Population, and Public Infrastructure Shortfalls
Water Withdrawal	The drawing down of water from either groundwater or surface water sources for residential, commercial and agricultural use.	Increased Development, Agricultural and Other Industry Externalities
Removal of Natural Wood	Removal of LWD in Port Susan project area and contributing upstream area.	Increased Development
Urban Pests	Domestic pets like dogs and cats, which disturb wildlife.	Increase in Population and Recreational Externalities

Conservation Targets

River Delta

The 2012 CAP identified River Delta as an ecological system conservation target due to the role the Stillaguamish River delta serves as a key ecological system in Port Susan. The Stillaguamish River drains an 1800 km^2 watershed, which is dependent on rain and snowmelt from the North

Cascade Range and the Puget lowlands.[34] The river's physical processes and function as a habitat are encapsulated in this target. Additionally, since delta habitats are critical to shorebirds, Chinook salmon, and embedded invertebrates, these species will be ecologically embedded into this target. This section assesses the current status of the KEAs and threats identified in the CAP.

Viability Ranking - Poor

The CAP graded the delta river's overall viability as "poor." Similarly, the landscape context of the river delta was also graded as "poor." The 2012 CAP landscape context included attributes related to hydrologic regime and landscape pattern. Hydrologic regime refers to the flow of the Stillaguamish River's timing, duration, frequency, and extent. Unfortunately, the Stillaguamish River's historical hydrologic patterns can no longer be solely relied upon to forecast the water future. Precipitation and runoff patterns are changing due to climate change, which increases the uncertainty for water supply and quality, flood management and ecosystem functions. Extreme climatic events are projected to become more frequent, necessitating improvement in flood protection, drought preparedness and emergency response.[35] Considering these alterations, the "poor" ranking for the landscape pattern (mosaic) and structure of the river delta from 2012 may be exacerbated by future climate stressors. Considering climate change's influence on soil and water temperatures, the temperature regime of the river should be included in future CAP measurements. The hyporheic exchange flows and groundwater discharges of rivers are important to maintain the current temperature regime and reduce maximum daily instream temperatures.[36] Such metrics should be monitored as an indicator of the landscape context KEA.

The condition indicators emphasized the biological legacies and community architecture of the river delta. Biological legacies for the Stillaguamish include the quantity of LWD per unit area. The magnitude of modern wood abundance has reduced exponentially compared to the pre-European settlement conditions in the Snohomish and Stillaguamish basins. This poses a concern, as the presence of large wood and reasonable wood recruitment are critical to maintain reliable hydraulic patterns and healthy habitat formation.[37] The community architecture of delta habitats (scrub, shrub, tidal wetlands, mudflats) areas was also ranked as "poor" on the CAP scale. The size/extent of characteristic communities and ecosystems due to tidal inundation areas' exposure to salinity decreases the health of the interior delta habitats.

Threat Ranking - High

The 2012 CAP identified and ranked threats to the Stillaguamish River delta in a medium to high range. The primary threats listed as "high" were levee maintenance, loss of vegetation buffer, and increased flooding. Levee maintenance pertains to building or the upkeep of levees, including vegetation removal, along the Port Susan/Stillaguamish shoreline. The loss of

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[34] Boyd, Joelene. The Nature Conservancy. 2012. Port Susan Bay Stewardship Plan.

[35] The Nature Conservancy. (2016). Floodplains by design: Vision, strategies and actions for Puget Sound major river floodplains. Final report prepared for Puget Sound Partnership and Washington State's Department of Ecology.

[36] Pelletier, G. J., & Bilhimer, D. (2004). *Stillaguamish river watershed temperature total maximum daily load study*. Washington State Department of Ecology.

[37] Collins, B. D., Montgomery, D. R., & Haas, A. D. (2002). Historical changes in the distribution and functions of large wood in Puget Lowland rivers. *Canadian Journal of Fisheries and Aquatic Sciences*, *59*(1), 66-76.

vegetation along marine shoreline freshwater streams and rivers leads to erosion and reduced access to nutrients and shelter for species within the habitat. Changes in water regime due to climate change and stormwater runoff from human developments alters river hydrology and increases flooding. Mid-range threats involve direct anthropogenic sources such as agricultural runoff, oil spills, municipal discharge of wastewater treatment plants, and water withdrawal.

The climate science findings over the last decade offer significant insights into previously identified threats. Climate change will influence precipitation levels in the Puget Sound region that will drastically alter the natural course of the Stillaguamish River. Climate projections indicate that summer rainfall levels will decrease by 27 percent by the end of the century. Additionally, the wet seasons will experience more intense heavy rain by 2050. This dramatic shift in seasonal timing and water quantities will increase the risk and severity of flooding, erosion, and landslides. Climate change will also contribute to an estimated peak snowpack decrease between 42 and 55 percent by 2100. Similar projections indicate that the temperature in rivers and streams in the Puget Sound could exceed 4°C-4.5°C above historical levels by 2100.[38]

Chinook Salmon

Chinook salmon (*Oncorhynchus tshawytscha*) were identified as a key conservation target in the 2012 CAP due to their ecological and cultural importance in Port Susan.[39] The Chinook salmon present in Port Susan include two genetically distinct populations of Chinook – North Fork and South Fork Chinook, both of whose natal streams are in the Stillaguamish Watershed (Figure 19).[40]

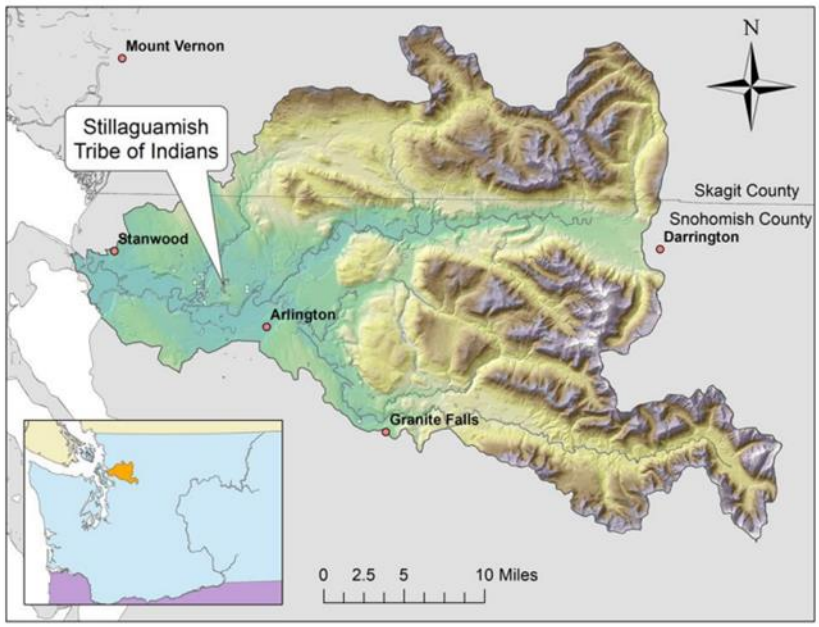

Figure 19: The Stillaguamish Watershed

Most of the Chinook in the Stillaguamish Watershed are North Fork Chinook, meaning they spawn in the middle and upper areas of the watershed in the summer.[41] Meanwhile, a smaller group of South Fork Chinook spawn in the lower part of the watershed in

[38] Puget Sound Partnership. (2021, August 31).
[39] Massaua, M., et al. (2012).
[40] Scofield, C. and Pope, J. (2019). *Stillaguamish Tribe of Indians Natural Resources Department Wetlands Program Plan. https://www.epa.gov/sites/default/files/2019-03/documents/stillaguamish_tribe_wetlands_program_plan_2019-2024.pdf*
[41] Stillaguamish Implementation Review Committee. (2005). *Stillaguamish Watershed Chinook Salmon Recovery Plan.http://www.stillaguamishwatershed.org/Documents/Stillaguamish%20Watershed%20Salmon%20Recovery%20Plan%20--%20Jun.pdf*

the fall. Because of their anadromous nature, these Chinook pass through the Port Susan estuary during two different times of the year - in the summer or fall as adult salmon migrating to their natal streams to spawn, or as juvenile Chinook migrating out to the ocean from mid-March to June.[42] Therefore, Port Susan fulfills three different needs for the development and reproduction of resident Chinook – (1) as a migration route to their natal streams, (2) as a estuarine sanctuary for developing Chinook juveniles, and (3) as a home for adult Chinook in the open ocean.

Chinook salmon are considered an ecological and cultural keystone species in Port Susan and the Salish Sea as a whole.[43] Chinook salmon are the primary food source of the Southern Resident Orca Whales, another culturally and ecologically vital marine species.[44] Additionally, the nutrients released when salmon decompose after spawning supports the viability of riparian, aquatic, and forest ecosystems throughout the watershed.[45] Beyond their ecological function, Chinook salmon are harvested commercially, recreationally, and by Indigenous fisheries whose U&As encompass the area.[46]

Unfortunately, all evolutionarily distinct populations of Chinook salmon in the Puget Sound were listed as threatened under the Endangered Species Act in 1999, including the North and South Fork Chinook.[47] Their population status has remained stagnant or worsened since 1999 due to a variety of threat factors. In order to ensure their treaty right to fish despite declining wild stocks, the Tulalip Tribes operate their own hatchery – the Bernie Kai-Kai Gobin Salmon Hatchery – which releases 2.4 million Chinook annually.[48] The Stillaguamish Tribe also rears 220,000 North Fork Chinook at their Harvey Creek Hatchery, and 200,000 South Fork Chinook at their Brenner Creek Hatchery every year.[49]

Viability Ranking – Fair

The 2012 CAP rated the overall Chinook viability as "fair," indicating that conditions were below an acceptable level, and humans should intervene to enhance their viability status.[50] Specifically the landscape context was rated as "poor," condition as "fair," and size as "fair."

Two indicators were assessed within landscape context: connectivity among communities and ecosystems (% of non-armored shoreline) and landscape pattern and structure (% of historic intertidal marsh habitat). Armored shorelines reduce the viability of Chinook by physically

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[42] Massaua, M., et al. (2012)
[43] Earth Economics. (2021). *The Sociocultural Significance of Pacific Salmon to Tribes and First Nations.* *https://static1.squarespace.com/static/561dcdc6e4b039470e9afc00/t/60c257dd24393c6a6c1bee54/1623349236375/The-Sociocultural-Significance-of-Salmon-to-Tribes-and-First-Nations.pdf*
[44] Shields, M., Lindell, J., and Woodruff, J. (2017). Declining spring usage of core habitat by endangered fish-eating killer whales reflects decreased availability of their primary prey. *Pacific Conservation Biology, 24,* 189–193.
[45] Earth Economics. (2021).
[46] Massaua, M., et al. (2012)
[47] Ibid.
[48] Tulalip Tribes Natural Resources. (2021). *Salmon Hatchery.* *https://nr.tulaliptribes.com/Programs/SalmonHatchery*
[49] Stillaguamish Tribe of Indians. (2021). *Fisheries Program.* *https://www.stillaguamish.com/natural-resources/fisheries-program/*
[50] Massaua, M., et al. (2012)

impeding movement toward and from their natal streams and by changing the benthic invertebrate prey population available for juvenile Chinook.[51,52] The CAP reported that in 2012, 50-80% of shorelines were unarmored compared to historic levels.[53] Between 2011 and 2018, there was a reported 5.3% decrease in shoreline armoring in Snohomish County.[54] Meanwhile, there was a 4.1% increase in shoreline armoring in Island County. Though this increase in armoring on the west side of the Port Susan Bay could impact juvenile salmon development, the relative decrease in armoring in Snohomish County – where the Stillaguamish Watershed resides – perhaps has more of a positive impact on salmon movement. For more information on shoreline armoring impacts, see *Beaches - Threat Rankings*.

Reported intertidal marsh habitat in 2012 was less than 20% of historic levels.[55] This metric suggests a significant level of both habitat destruction and deterioration from development and industrial activities pre-2012. In the late 1800s-1900s, dikes were built in the Stillaguamish River Estuary to convert estuaries, shrub-scrub wetlands, and forested floodplains into agricultural land – a change that reduced intertidal habitat by up to 3,756 acres.[56] Intertidal restoration efforts since 2012 suggest that some tangible steps have been made to improve the habitat viability of Port Susan for Chinook.

The 2012 CAP also specified three indicators of habitat condition: community architecture – arrival of juveniles to the nearshore and population structure and recruitment – juvenile density and juvenile growth, and one indicator for size – number of Chinook salmon entering the Stillaguamish River from Port Susan. These metrics together focus on the first critical period of Chinook survivorship – the growth that happens in the first year of life after entering the Salish Sea, and the second critical period of survivorship – survival post-Salish Sea habitation and reproductive capacity.[57] For Chinook salmon, overall survivorship strongly correlates with high growth rates during this first critical period. Since the 1970s, Salish Sea wild and hatchery Chinook have experienced a substantial decline in their marine survivorship, which is mostly driven by reduced or changing prey availability, moderately driven by low water quality and high seal predation, and somewhat driven by physical habitat conditions, a temporal mismatch between when prey are available and outmigration patterns, and contaminants. There is inconclusive evidence as to whether changing juvenile Chinook arrival patterns in Port Susan

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[51] Stillaguamish Implementation Review Committee. (2005). *Stillaguamish Watershed Chinook Salmon Recovery Plan.http://www.stillaguamishwatershed.org/Documents/Stillaguamish%20Watershed%20Salmon%20Recovery%20Plan%20--%20Jun.pdf*

[52] Morley, S., Toft, J., and Hanson, K. (2012). Ecological Effects of Shoreline Armoring on Intertidal Habitats of a Puget Sound Urban Estuary. *Estuaries and Coasts, 35,* 774–784.

[53] Massaua, M., et al. (2012)

[54] Puget Sound Partnership. (2021, August 31). *Net Change in Permitted Shoreline Armor.* Puget Sound Info. *https://www.pugetsoundinfo.wa.gov/ProgressMeasure/Detail/42/VitalSigns*

[55] Massaua, M., et al. (2012)

[56] Woo, I., Fuller, R., Iglecia, M., Turner, K., and Takekawa, J. *The Nature Conservancy Port Susan Bay Restoration Monitoring Plan*. *http://www.tidalmarshmonitoring.net/pdf/Woo-et-al-2011_PSB-Monitoring-Plan.pdf*

[57] Pearsall, I., Schmidt, M., Kemp, I., and Riddel, B. (2021). *Synthesis of Findings of the Salish Sea Marine Survival Project*. *https://salishsearestoration.org/images/3/3f/Pearsall_et_al_2021_salmon_marine_survival_synthesis.pdf*

negatively impact overall survivorship – other than creating more problems with temporal mismatch in seal predation. In total, wild North Fork and South Fork Chinook populations have not improved since their 1999 ESA listing.[58] Their reported recovery between 2015-2019 was only a 0-2% increase from the lowest Chinook recovery goal (Figure 20).[59]

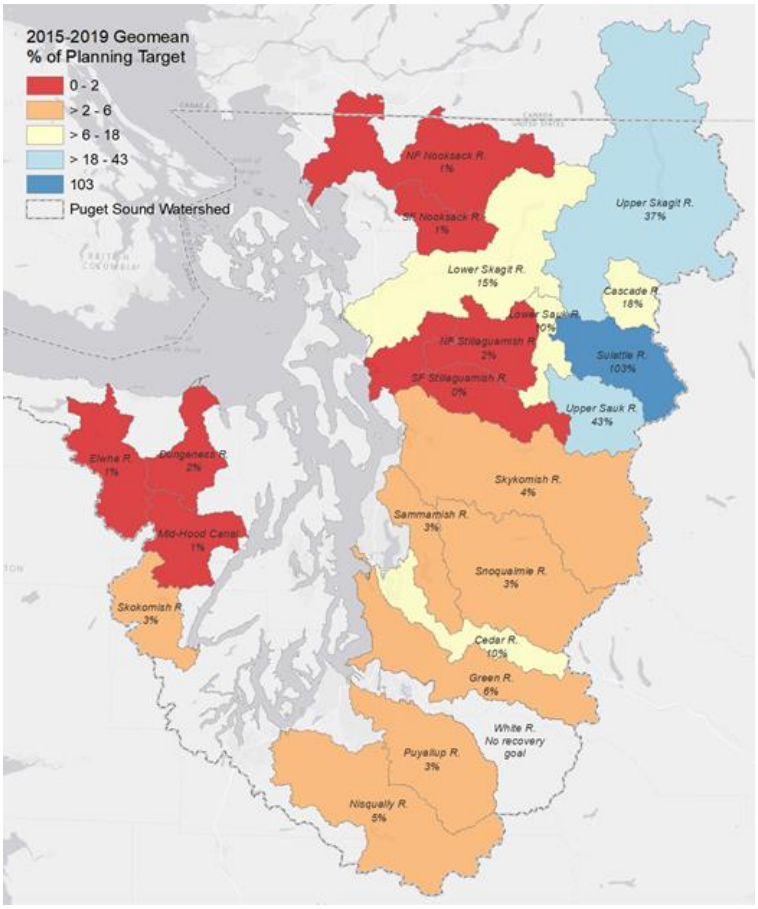

Figure 20: Relative Improvement of Chinook Populations across the Salish Sea

Threat Ranking - Very High

In 2012, bank hardening, levee maintenance, and agricultural runoff were listed as very high threats to Chinook, overwater structures, stormwater pollution, and tidal gates were listed as medium threats to Chinook, and the other 16 threats identified in the CAP were not given a threat ranking. Overall, this culminated in an overall threat ranking of "very high." Though many of these factors do play a role in threatening the health of North Fork and South Fork Chinook, the science today points toward different key threats to target.

According to the EPA, Salish Sea Chinook declines can be generally attributed to habitat loss and degradation, unsustainable harvest rates, hostile water infrastructure, physical and biological ocean conditions, and marine mammal interactions.[60] Hatcheries should be taken on a case-by-case basis to determine whether practices enhance overall runs of Chinook, or whether they reduce the well-being of wild Chinook stock. Evidence suggests that Tulalip and Stillaguamish tribal hatchery practices have buffered some threats to wild Chinook while also benefiting tribal and non-tribal fisheries - even when wild Chinook harvests are prohibited. This has been accomplished through a careful monitoring and marking program of hatchery fish and increasing available hatchery stock of Chinook for all fisheries.[61] Climate change impacts – including changes to stream flows and temperatures, increased flooding, and sea level rise (SLR) – are

[58] Puget Sound Partnership. (2022). *Chinook Salmon Population Abundance.* *https://www.pugetsoundinfo.wa.gov/ProgressMeasure/Detail/4/VitalSigns*
[59] Ibid.
[60] EPA. (2021). Chinook Salmon. *https://www.epa.gov/salish-sea/chinook-salmon*
[61] PCC. (2020). Chinook Salmon Fishery Evaluation. *https://www.pccmarkets.com/wp-content/uploads/2020/08/PCC-Sustainability-Standards_Chinook-Salmon-Fishery-Evaluations-Collection-2020-2.pdf*

projected to exacerbate existing threats in the future.[62] Figure 21 categorizes and describes the main threats facing Salish Sea Chinook salmon – all of which are important to evaluate and monitor when managing North and South Fork Chinook.

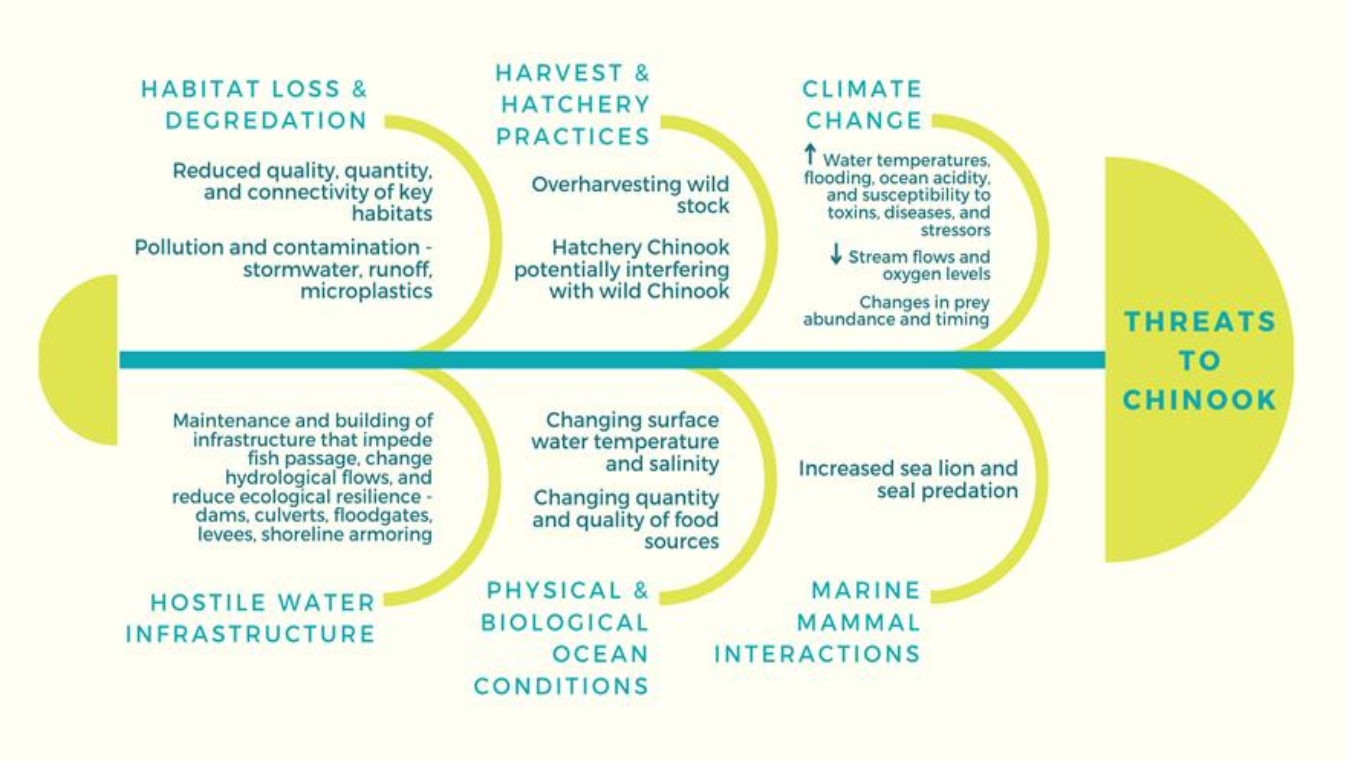

Figure 21: Current and Future Threats to Chinook Salmon in Port Susan

Beaches

The CAP identified beaches as an ecological system conservation target because of their importance in maintaining the health of the shoreline. The structure and composition of beaches form a habitat base for many species. Dunes and adjacent fine sand beaches provide roosting, foraging and nesting habitat for shorebirds; forage fish use the intertidal areas along beaches to spawn.[63]

Viability Ranking - Fair

Similarly to the overall viability ranking score, the CAP referred to the landscape context of beaches as "fair," including attributes related to connectivity of ecosystems/communities, sediment stability, and water/soil temperature. Connectivity of ecosystems/communities is primarily related to the presence of shoreline armor, which is the most common type of shoreline modification in Puget Sound and includes structures such as bulkheads, seawalls, and rip rap.[64] As of 2019, 41% of the single-family waterfront properties in Island County have some type of

[62] EPA. (2021).
[63] *Marine shorelines.* Washington Department of Fish and Wildlife. (n.d.) Retrieved February 26, 2022. *https://wdfw.wa.gov/species-habitats/ecosystems/marine-shorelines*
[64] Puget Sound Partnership. (2021, August 31). *Net Change in Permitted Shoreline Armor.* Puget Sound Info. *https://www.pugetsoundinfo.wa.gov/ProgressMeasure/Detail/42/VitalSigns*

hard armoring.[65] Research suggests that armored shorelines negatively impact coastal ecosystem functions and are associated with lower biodiversity and vegetative cover.[66] A 2016 study in Puget Sound found that shoreline armoring reduces spawning habitat for forage fish as well as indirectly impacts the abundance of shorebirds and invertebrates.[67]

The other attributes related to the landscape context for beaches include sediment stability and water and soil temperature. Climate change will impact both attributes and thus alter the landscape context of Port Susan beaches. There are a variety of physical and chemical stressors that will be exacerbated due to climate change, including SLR and increased ocean temperature and acidity. As the sea levels rise, low-lying shores will be regularly flooded with high tides, which negatively impacts ecosystem functions.[68] As the atmosphere warms, ocean and soil temperatures will increase. In the Puget Sound region, temperatures are projected to rise between 4.2°F to 5.9°F on average under low and high greenhouse gas scenarios, respectively (by mid-century).[69]

The second viability consideration is the condition of beaches, in which the CAP referred to the community architecture of pocket estuaries and amount of tidally accessible area. Ranked as "poor," these ecosystem indicators are expected to continue to worsen due to climate change. SLR and associated changes in coastal hazards, such as flooding, erosion, and saltwater intrusion, are expected to cause significant changes to Puget Sound's nearshore ecosystems.[70] Additional research reveals that the compounding effect of SLR will also increase scour to beaches and estuary wetland areas.[71]

These effects will also impact the last viability attribute, size, which was ranked as "good" for beaches in 2012. By 2100, SLR projections for Washington State indicate a high likelihood (~50% probability or greater) of at least 1.5 feet of SLR; at the low end, there is an 83% probability that sea level will rise by at least one foot by 2100.[72] Potential impacts of SLR to

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[65] Côté, J., & Domanski, A. (2019). *Benefit Cost Analysis of Shore Friendly Practices in Island County.* Prepared for Island County Department of Natural Resources.

[66] Lee, T. S., Toft, J. D., Cordell, J. R., Dethier, M. N., Adams, J. W., & Kelly, R. P. (2018). Quantifying the effectiveness of shoreline armoring removal on coastal biota of Puget Sound. *PeerJ*, *6*, e4275.

[67] Dethier, M. N., Raymond, W. W., McBride, A. N., Toft, J. D., Cordell, J. R., Ogston, A. S., ... & Berry, H. D. (2016). Multiscale impacts of armoring on Salish Sea shorelines: evidence for cumulative and threshold effects. *Estuarine, Coastal and Shelf Science*, *175*, 106-117.

[68] Huppert, D. D., Moore, A., & Dyson, K. (2009). Impacts of climate change on the coasts of Washington State.

[69] Climate Impacts Group. (2016, February). Climate Change Impacts on Puget Sound Floodplains. *https://cig.uw.edu/wp-content/uploads/sites/2/2014/11/TNC_Floodplains_3_25_16_bothlogos.pdf*

[70] Raymond, C., Conway-Cranos, L., Morgan, H., Faghin, N., Spilsbury Pucci, D., Krienitz, J., ... & Mauger, G. (2018). Sea level rise considerations for nearshore restoration projects in Puget Sound. A report prepared for the Washington Coastal Resilience Project. *Sea Level Rise Considerations for Nearshore Restoration Projects*, *2*, 3.

[71] Grossman, E. E., Hooshmand, A., Rubash, B., Donatuto, J., Gelfenbaum, G., Stevens, A. W., ... & Barnard, P. (2016). Storm Surge Inundation Model to Inform Puget Sound Ecosystem Impacts in a Future of Sea-Level Rise.

[72] Miller, I.M., Morgan, H., Mauger, G., Newton, T., Weldon, R., Schmidt, D., Welch, M., and Grossman, E. (2018). Projected Sea Level Rise for Washington State – A 2018 Assessment. A collaboration of Washington Sea Grant, University of Washington Climate Impacts Group, Oregon State University, University of Washington, and US Geological Survey. Prepared for the Washington Coastal Resilience Project.

shorelines include increased coastal flooding, habitat loss, surface and groundwater salinity changes, and altered erosion and sediment deposition patterns.[73] The combination of SLR and extreme weather events caused by climate change will cause more consistent and severe coastal flooding, which will cause beaches to be submerged and also transported offshore through the deposition process.[74]

Threat Ranking - High

The highest threat risk (very high) to beaches identified in 2012 was bank hardening, which refers to shoreline armoring and development along the nearshore. Since 2012, there have been widespread efforts across Puget Sound aimed at removing existing shoreline armoring and preventing permitting for new armoring. A 2018 study concluded that removing shoreline armor is effective to improving the health and productivity of coastal ecosystems, and that armoring removal in Puget Sound has resulted in diverse, positive responses by coastal biota.[75] As a part of its ecosystem recovery goals to protect and restore habitat, Puget Sound Partnership reported that between 2011-2020, more armor was permitted for removal than for construction (Figure 22).[76]

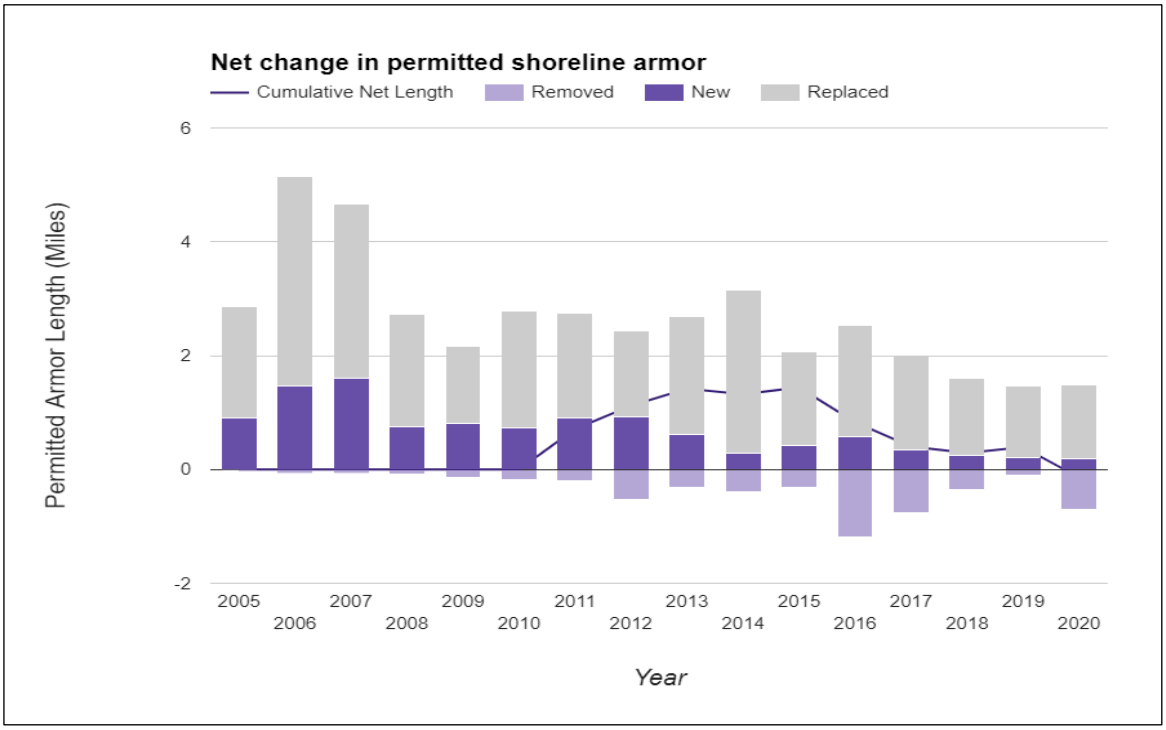

Figure 22: Net Change in Shoreline Armor Permits in Puget Sound from 2005 to 2020

[73] Mulkern, D., Cloutier, D, and Faghin, N., 2020. Island County Sea Level Rise Strategy. Prepared for Island County and the Washington Coastal Resilience Project.
[74] Ibid.
[75] Lee, T. S., et al., (2018).
[76] Puget Sound Partnership. (2021, August 31).

As a part of the 2020 Shoreline Master Program update for Island County, the Planning and Community Department researched and developed guidance related to community-based coastal resilience planning and identified SLR adaptation best practices to inform future planning efforts along the County's shoreline.[77]

Although these efforts reflect dedicated work to address environmental changes and shoreline armoring, new armor continues to be permitted for construction, with single family residences being the most common applicant type.[78] Figure 23 distinguishes the percent total of new and removed shoreline armor by county, in which both Island County and Snohomish County are represented. However, a significant amount of armoring remains unpermitted and under reported, which may impact the validity of such assessments.

County	New Armor	Removed Armor
Clallam	6.8%	21.7%
Island	12.2%	8.1%
Jefferson	4.2%	5.6%
King	2.0%	6.9%
Kitsap	12.1%	18.4%
Mason	14.7%	5.1%
Pierce	20.1%	10.4%
San Juan	10.4%	6.4%
Skagit	10.7%	3.4%
Snohomish	1.3%	6.6%
Thurston	4.2%	7.2%
Whatcom	1.5%	0.1%

Figure 23: Percentage of New and Removed Shoreline Armor across Several Washington Counties[79]

Concerns about hardened shorelines are heightening interest in alternatives for natural coastal protections. Research suggests that coastal habitats like coral and oyster reefs, seagrass beds, marshes, mangroves, and coastal forests have the potential to attenuate waves and surge associated with storms.[80] It is imperative that future coastal planning incorporates a nature-based

[77] Island County. Shoreline Master Program (SMP) Overview. *https://www.islandcountywa.gov/Planning/Documents/Shorelines/ConsultantContractor_Guide_OnlineViewing.pdf*

[78] Ibid.

[79] Puget Sound Partnership. (2021, August 31).

[80] Silver, J. M., Arkema, K. K., Griffin, R. M., Lashley, B., Lemay, M., Maldonado, S., ... & Verutes, G. (2019). Advancing coastal risk reduction science and implementation by accounting for climate, ecosystems, and people. *Frontiers in Marine Science*, 556.

approach to leverage critical ecosystem services as opposed to undergoing additional shoreline hardening.

Localized efforts in Port Susan, like the Shore Friendly Program, have aimed at educating community members on the impacts of shoreline armoring and providing information on alternative erosion protection, including natural soft shore protection.[81] Based on the emergence of numerous efforts to prevent shoreline armoring and remove existing armoring, this threat seems to be lessening in terms of its significance to the health of beaches in Port Susan.

The other primary threat risk, ranked as "high", was an increase in storm events due to climate change, which causes beach disturbance and habitat loss. Based on the information discussed earlier in this section, it is anticipated that these impacts will continue to worsen and thus this threat risk should be updated to reflect the updated scientific understandings related to the impacts climate change will have within Puget Sound.

Additional threats listed under the beaches target included incompatible recreation, invasive species, and overwater structures like docks and piers. Research suggests that the invasive spartina plant (*Spartina alterniflora*) remains a challenge in Port Susan Bay. Spartina is an aggressive non-native saltmarsh grass that crowds out native estuarine vegetation and reduces the overall biodiversity of the coastal ecosystem. This is particularly worrisome for Chinook salmon and forage fish, as research has found that these species spend more time in native eelgrass beds than any other structured habitats, including *Spartina alterniflora*.[82]

Forage Fish

Forage fish are small schooling fish that are a vital food source for salmon, sea birds, and marine mammals, making them a key component in the delicate marine food web.[83] The Port Susan CAP selected several forage fish to evaluate, including Pacific herring (*Clupea pallasi*), surf smelt (*Hypomesus pretiosus*) and Pacific sand lance (*Ammodytes hexapterus*). Forage fish provide critical ecological, economic, and cultural benefits within the Port Susan ecosystem and play a foundational role to bolster many other species in the region.[84]

Viability Ranking - Good

The CAP attributed an overall viability ranking of "good" for forage fish in 2012, however, an updated ranking is required to reflect the increased pressures forage fish face in Puget Sound. Many of the intertidal and subtidal areas within the Port Susan Basin form spawning habitat for these species, making the landscape context, condition, and size of the beaches target (discussed in *Beaches – Viability Ranking* and *Threat Ranking*) particularly relevant for the forage fish

[81] Shore Friendly. (2022). *Protecting Your Property and Puget Sound*. *http://www.shorefriendly.org/*

[82] Rubin, S. P., Hayes, M. C., & Grossman, E. E. (2018). Juvenile Chinook salmon and forage fish use of eelgrass habitats in a diked and channelized Puget Sound River delta. *Marine and Coastal Fisheries*, *10*(4), 435-451.

[83] Island County Marine Resources Committee. (2020). *2020 Annual Report*. *https://www.nwstraits.org/media/3040/isl-2019-2020-annual-report.pdf*

[84] The Salish Sea Pacific Herring Assessment and Management Strategy Team. (2018, December 11). *Assessment and Management of Pacific Herring in the Salish Sea: Conserving and Recovering a Culturally Significant and Ecologically Critical Component of the Food Web.* Prepared for The SeaDoc Society.

target. Beyond what was discussed related to the beaches target, additional research related to forage fish illustrated increasing vulnerabilities.

All three viability rankings were ranked "good" in the CAP. The first viability ranking for forage fish was related to their landscape context, which includes sediment stability as well as water/soil temperature. Pacific sand lance are unique among local forage fish in their habitual burrowing into fine, coarse sediment to avoid predation.[85] This burrowing behavior is likely to be impacted by climate change, as changes in oxygen levels in sediment is expected to disrupt sand lance burrowing behavior.[86] Changes in water/soil temperature have also impacted forage fish behavior and distribution since the CAP was created in 2012. Rapid warming and sea ice loss, both symptoms of climate change, have facilitated a northward expansion of Pacific sand lance into a region far beyond their traditional range.[87] In 2017, the first evidence of Pacific sand lance was reported in the Canadian Arctic Archipelago, and a similar outcome is expected for Pacific herring, portending a decline in the current, historical areas of these key species.[88,89] Furthermore, predicted increases in sea surface temperatures, as well as changes in upwelling patterns, will affect the timing and abundance of prey for forage fish.[90]

The condition viability ranking for forage fish is related to the overall community architecture of the populations and the habitats they reside. As previously mentioned, forage fish spawn in shallow subtidal and intertidal areas along beaches and occupy the nearshore for feeding.[91] Therefore, the quality of the beaches and marine ecosystem is crucial for continued survival and success of forage fish.

The last viability ranking to be considered for forage fish is population size, which the CAP referred to as herring spawning biomass. It can be inferred that this was selected as the indicator due to the amount of research available for Pacific herring compared to that available for Pacific sand lance and surf smelt. The Puget Sound Partnership identified herring spawning biomass as a key indicator of ecosystem health in 2020. Using data collected from WDFW, Pacific herring density is characterized by broad year-to-year fluctuations, which likely reflects environmental and demographic variability.[92] It was reported in 2020 that some herring stocks within Puget Sound saw a decrease in adult spawner abundance, as well as a north- and west-ward

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[85] Penttila, D. (2007). *Marine forage fishes in Puget Sound*. Washington Dept of Fish and Wildlife. Olympia.

[86] Bizzarro, J. J., Peterson, A. N., Blaine, J. M., Balaban, J. P., Greene, H. G., & Summers, A. P. (2016). Burrowing behavior, habitat, and functional morphology of the Pacific sand lance (*Ammodytes personatus*). *Fishery Bulletin*, *114*(4).

[87] Falardeau, M., Bouchard, C., Robert, D., & Fortier, L. (2017). First records of Pacific sand lance (Ammodytes hexapterus) in the Canadian Arctic Archipelago. *Polar Biology*, *40*(11), 2291-2296.

[88] Ibid.

[89] *Pacific Herring (Clupea pallasaii)*. Washington Department of Fish & Wildlife. (n.d.). Retrieved February 10, 2022, from *https://wdfw.wa.gov/species-habitats/species/clupea-pallasii*

[90] Ibid.

[91] Penttila, D. (2007)

[92] The Salish Sea Pacific Herring Assessment and Management Strategy Team. (2018, December 11).

expansion.[93] More comprehensive monitoring of the forage fish stocks is required, but this KEA should be adjusted given the known decrease and increase in range of these species.

Threat Ranking - High

The CAP identified several "high" ranked threats to forage fish, including bank hardening, loss of vegetated buffer, and incompatible forest practices. The beaches target discussed the updated status of bank hardening along the Port Susan shoreline, which is relevant for forage fish as well (see *Beaches - Threat Ranking*). Forage fish are particularly sensitive to changes in habitat, so continued development along the shoreline and additions of shoreline armoring pose a risk to these species. Research suggests that forage fish face what is known as "coastal squeeze," which is the combined effect of SLR and shoreline armoring.[94] Because forage fish use intertidal beaches for spawning, and the backshores of these beaches tend to be armored with structures, rising sea levels will effectively eliminate these habitats.

Dungeness Crab

Dungeness crab (*Cancer magister*), also previously referred to as *Metacarcinus magister*, is native to the Pacific Northwest and has been a part of Coast Salish indigenous people's diet and culture since time immemorial.[95,96] The species was identified as a key conservation target in the 2012 CAP for its cultural, economic, and ecological importance to the Port Susan area. Dungeness crab is co-managed by WDFW and the Tribes for tribal, commercial, and recreational harvests.[97] While commercial Dungeness crab fisheries are an important part of the Puget Sound economy, with fishery landings valued at over $75 million dollars in Washington state in 2020, part of the

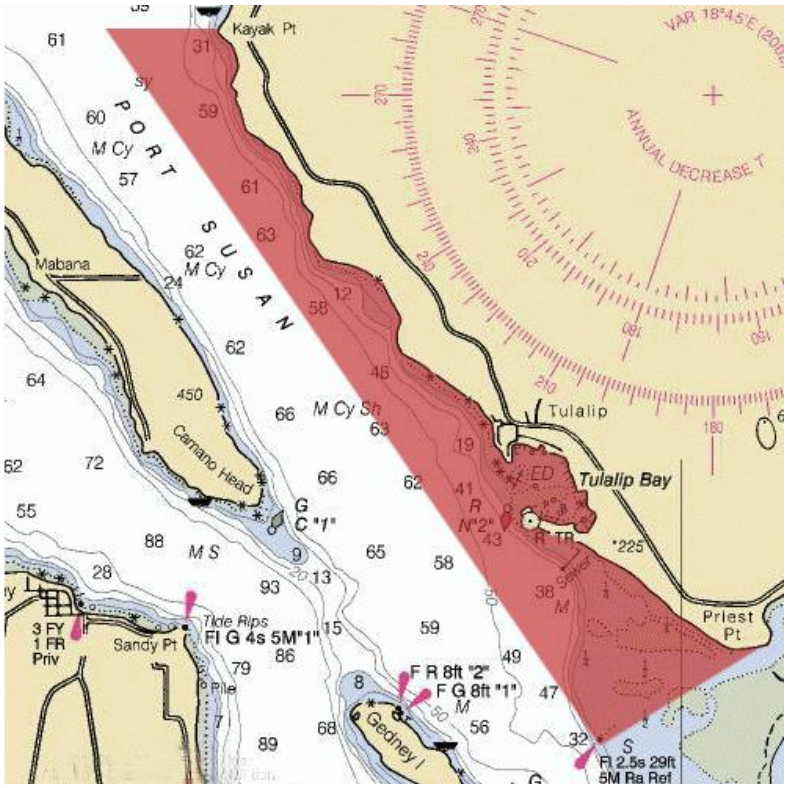

Figure 24: Port Susan Area Closed to Year-Round State Commercial Crabbing

[93] The Salish Sea Pacific Herring Assessment and Management Strategy Team. (2018, December 11).
[94] *Surf Smelt (Hypomesus pretiosus).* Washington Department of Fish & Wildlife. (n.d.). Retrieved from February 10, 2022, from https://wdfw.wa.gov/species-habitats/species/hypomesus-pretiosus
[95] WDFW. (2019, June 14). 2018-19 WDFW Puget Sound Dungeness Crab Fishery Report: Prepared for the Fish and Wildlife Commission. *https://wdfw.wa.gov/sites/default/files/about/advisory/psrcsac/2018-19_crabreport_19june14_final.pdf*
[96] Northwest Indian Fisheries Commission. (2020). Tribal Natural Resources Management 2020 Annual Report. Slideshare. *https://www.slideshare.net/nwifc/tribal-natural-resources-management-2020-annual-report-224128386*
[97] Massaua, M., et al. (2012)

Port Susan area (shown in Figure 24) is closed to State commercial crabbing year-round.[98,99]

Dungeness crab is designated as a priority species in WDFW's Priority Habitats and Species List.[100] Dungeness crabs go through a complex life cycle from the larval stage when they are dispersed by currents to the juvenile stage when they start to resemble adults and dwell on the bottom of shallow intertidal areas and estuaries.[101] As they grow into their adult stage, they venture into deeper waters and grow to their mature size to about 6-7 inches.[102] While juvenile crabs like to hide among shell debris and plants, adult crabs prefer sandy or muddy substrate and eelgrass beds.[103] Dungeness crabs feed on prey ranging from clams, fish, small mollusks, etc. depending on their life stage.[104] The larvae are part of Coho and Chinook salmon's diets and juveniles are preyed on by a variety of fish in the region.[105] They serve a valuable ecological role in the Port Susan area.

Viability Ranking - Good

The 2012 CAP ranked Dungeness crab's overall viability as "good". While the report did not provide a ranking on the species' landscape context, recent research has found that habitats frequently associated with the Dungeness crab have seen changes in the past ten years. Dungeness crabs tend to inhabit different environments as they go through their complex life cycle, as such, their degree of vulnerability to threats depends on the seasonality of the ocean conditions in conjunction with their life stages.[106] One of the challenges of assessing the landscape viability of Dungeness crab is the lack of data. In December 2018, the Swinomish Indian Tribal Community and Lummi Nation launched the Pacific Northwest Crab Research Group to improve Dungeness crab science and management.[107] The group initiated a Washington statewide project to monitor larval Dungeness crab abundance and examine any regional variation. The data collected would help build understanding of larval crab populations and the timing of larval pulses, which could inform future strategic conservation planning.[108]

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[98] NOAA. (2021). NOAA Fisheries Landings Report. NOAA Fisheries. *https://www.fisheries.noaa.gov/foss/f?p=215:200:9313621049967::NO:RP*

[99] Maps and charts. (2022). Washington Department of Fish & Wildlife. *https://wdfw.wa.gov/fishing/commercial/crab/pugetsound/maps-charts#*

[100] Dungeness crab. (2021). Washington Department of Fish & Wildlife. *https://wdfw.wa.gov/species-habitats/species/cancer-magister#conservation*

[101] Snohomish County Marine Resources Advisory Committee. Dungeness Crab Snohomish County Marine Fact Sheet. Snohomish County. *https://snohomishcountywa.gov/Archive/ViewFile/Item/2095*

[102] Ibid

[103] Ibid

[104] Ibid.

[105] Ibid.

[106] Berger, H. M., Siedlecki, S. A., Matassa, C. M., Alin, S. R., Kaplan, I. C., Hodgson, E. E., ... & Newton, J. A. (2021). Seasonality and life history complexity determine vulnerability of Dungeness crab to multiple climate stressors. AGU Advances, 2(4), e2021AV000456.

[107] Northwest Indian Fisheries Commission. (2020). *Tribal Natural Resources Management 2020 Annual Report.* Slideshare. https://www.slideshare.net/nwifc/tribal-natural-resources-management-2020-annual-report-224128386

[108] Ibid.

Threat Ranking - High

The 2012 CAP identified and ranked several threats for the Dungeness crab population in the Port Susan MSA. One of the top threats to the species identified in the literature is ocean acidification, which was ranked by the 2012 CAP as a high threat. According to the 2012 CAP, ocean acidification is defined as "altered water chemistry due to climate change, specifically decreasing pH caused by the uptake of anthropogenic carbon dioxide from the atmosphere."[109] Dungeness crab in the early life stages can be especially vulnerable to ocean acidification-related stressors; effects on pre-larval Dungeness crab include reduced survival and slower development.[110] Researchers have found evidence of extensive exoskeleton dissolution and mechanoreceptor damage in Dungeness crab exposed to acidification as well as a correlation between decreasing larval width and carapace dissolution, which could impact Dungeness crab population dynamics.[111] One study identified a stress threshold of pH <7.65 as a condition that would likely have a negative impact on most life stages of Dungeness crab.[112] Using climate change modeling under the RCP 8.5 carbon emissions scenario, which represents one of the most drastic average temperature change projections, the study projected a 63% increase in vulnerability to low pH for Dungeness crab by 2100.[113] However, another assessment found that the decline in Dungeness crab caused by acidification was largely due to the decline in its prey like clams and other invertebrate species.[114]

In addition to low pH level, high water temperature and low dissolved oxygen (DO) can also present possible threats to Dungeness crab.[115] As the ecosystems experience greater climate variabilities, exposure to these threats will likely rise for Dungeness crab populations. However, as mentioned above, the level of vulnerability Dungeness crab faces depends on seasonality, life stage, and the interactions between stressors.[116] Aside from biophysical threats, the European Green Crab (EGC), an invasive species, can also pose a threat to Dungeness crabs by damaging eelgrass beds that Dungeness crab rely on for protection and habitat.[117] Studies have shown that juvenile's food and shelter were vulnerable to EGC threats and that smaller Dungeness crab were

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[109] Massaua, M., et al. (2012)

[110] Miller, J.J., Maher, M., Bohaboy, E., Friedman, C.S., McElhany, P., 2016. Exposure to low pH reduces survival and delays development in early life stages of Dungeness crab (Cancer magister). Mar. Biol. 163, 118.

[111] Bednaršek, N., Feely, R. A., Beck, M. W., Alin, S. R., Siedlecki, S. A., Calosi, P., ... & Spicer, J. I. (2020). Exoskeleton dissolution with mechanoreceptor damage in larval Dungeness crab related to severity of present-day ocean acidification vertical gradients. Science of The Total Environment, 716, 136610.

[112] Berger, H. M., Siedlecki, S. A., Matassa, C. M., Alin, S. R., Kaplan, I. C., Hodgson, E. E., ... & Newton, J. A. (2021). Seasonality and life history complexity determine vulnerability of Dungeness crab to multiple climate stressors. AGU Advances, 2(4), e2021AV000456.

[113] Ibid.

[114] UW News staff. (2017, January 12). Ocean acidification to hit West Coast Dungeness crab fishery, new assessment shows. UW News. *https://www.washington.edu/news/2017/01/12/ocean-acidification-to-hit-west-coast-dungeness-crab-fishery-new-assessment-shows/*

[115] Berger, H. M., Siedlecki, S. A., Matassa, C. M., Alin, S. R., Kaplan, I. C., Hodgson, E. E., ... & Newton, J. A. (2021). Seasonality and life history complexity determine vulnerability of Dungeness crab to multiple climate stressors. AGU Advances, 2(4), e2021AV000456.

[116] Ibid.

[117] Drinkwin, J., Pleus, A., Therriault, T., Talbot, R., Grason, E. W., McDonald, P. S., ... & Litle, K. (2018). Salish Sea transboundary action plan for invasive European green crab.

preyed upon or displaced by larger EGC.[118] Washington Sea Grant established a Crab Team to monitor EGC populations with the help of volunteers and partner agencies. According to the Salish Sea Transboundary Action Plan for Invasive European Green Crab, action priorities should be (1) collaborative management, (2) prevention of human-mediated introduction and spread, (3) early detection, (4) rapid response to newly detected incursions, (5) control of infested sites, and (6) strategic research to improve adaptive management.[119]

Derelict crab pots remain one of the most serious threats to Dungeness crabs in the Puget Sound region and was ranked by the 2012 CAP as a high threat. Lost crab pots can continue to trap crabs for up to 2.2 years. Captured crabs will eventually die unless they can escape, but those who die will attract other crabs to the derelict pot and continue the cycle of "ghost fishing".[120] New research found that even crab pots equipped with an escape cord entrapped crabs for 126 days.[121] Escape cords need to disintegrate in a timely manner and trapped crabs need to be able to escape through the pot escape hatches for those crab pots with escape cords to prevent ghost fishing. A recent study found that the escape hatch designs employed by a number of commonly used recreational crab pots do not effectively let crabs' escape.[122] Data from 2015 showed that a total of 14,235 crab pots were lost from commercial (2,193) and recreational (12,043) harvesting in the Puget Sound area, with a total of 4,471 Dungeness crabs found in the removed lost pots.[123] Figure 25 shows the recorded reasons for crab pots that were lost in the Puget Sound.[124]

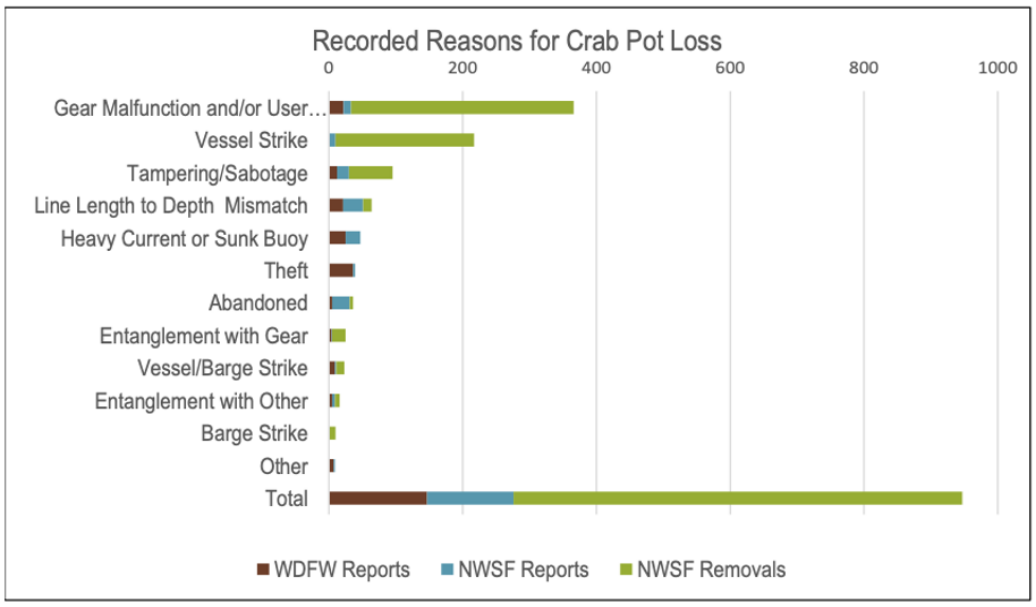

Figure 25: Recorded Reasons for Crab Pot Loss in the Puget Sound Area

[118] Drinkwin, J., et al. (2018).
[119] Ibid.
[120] JMD Consulting, & Drinkwin, J. (2016, June). Puget Sound Lost Crab Pot Prevention Plan. Northwest Straits Foundation. *https://www.researchgate.net/publication/326143928_Puget_Sound_Lost_Crab_Pot_Prevention_Plan*
[121] Ibid.
[122] Ibid.
[123] Ibid.
[124] Ibid.

In 2005 and 2006, the Stillaguamish Tribe found over 400 abandoned crab pots in Port Susan with side scan sonar survey and removed 168 derelict pots that were accessible to divers.[125] Updated data on lost crab pots specific to the Port Susan area appear to be unavailable. Illegal harvesting of Dungeness crab was ranked as a high threat in the past CAP. However, data regarding landings of illegally harvested Dungeness crab in the Port Susan area is unavailable, making it difficult to assess the severity of this threat. In Washington state, only males that are 6.25 inches or greater in carapace width are allowed to be harvested within the determined season when legal-sized males are likely to be in hard-shell condition.[126] Puget Sound has a limit of 5 crabs per day for fishers and all Dungeness crab fishers are required by Washington state law to have a Dungeness crab endorsement and a current Catch Record Card (CRC).[127,128] While CRCs present an opportunity to provide up-to-date counts of crabbers' catches throughout the season and help with the conservation efforts for Dungeness crabs, the CRC data are currently only collected after the season ends.

Embedded Invertebrates

Located primarily in intertidal and shallow subtidal habitats, embedded invertebrates serve important ecological functions within Port Susan, such as maintaining water quality by filter feeding, sequestering nitrogen, and acting as bio-turbulators, aerating the substrate.[129] In 2012, the CAP identified two species to specifically monitor for the assessment of this conservation target, the Eastern softshell clam (*Mya arenaria*) and sand shrimp (*Neotrypaea californiensis*). Both species prefer muddy or sandy substrate in the mid- to upper-intertidal zone and are found embedded within the substrate.[130,131] Eastern softshell clams are commercially and recreationally harvested within Port Susan, depending on the year and presence of biotoxins, grow to about 6 inches long, and are buried between 8 and 14 inches into the substrate.[132] Sand shrimp, also known as ghost shrimp, are known to be "ecosystem engineers," as they burrow into the substrate, creating tunnels that facilitate nutrient exchange.[133] Sand shrimp are also an important

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[125] Natural Resources Consultants. (2006, June 30). *Derelict Fishing Gear Identification and Removal Project - Port Susan*. The Stillaguamish Tribe. https://www.stillaguamish.com/documents/DFG-FinalRept06.pdf

[126] Crab Rules - Washington Fishing. (2021, July 1). eRegulations. *https://www.eregulations.com/washington/fishing/crab-rules/*

[127] Ibid.

[128] Puget Sound Dungeness crab catch record card. (2022). Washington Department of Fish & Wildlife. https://wdfw.wa.gov/licenses/fishing/catch-record-card/dungeness

[129] Massaua, M. et al. (2012).

[130] Dethier, M. N., Mumford, T., Leschine, T., Presh, K., Simenstad, S., Shipman, H., ... & Goetz, F. (2006). *Native shellfish in nearshore ecosystems of Puget Sound*. University of Washington, Seattle, Washington.

[131] Hiebert, T.C. (2015). Neotrypaea californiensis. In: Oregon Estuarine Invertebrates: Rudys' Illustrated Guide to Common Species, 3rd ed. T.C. Hiebert, B.A. Butler and A.L. Shanks (eds.). University of Oregon Libraries and Oregon Institute of Marine Biology, Charleston, OR.

[132] *(Eastern) softshell clam (Mya arenaria)*. Washington Department of Fish & Wildlife. (n.d.). *https://wdfw.wa.gov/species-habitats/species/mya-arenaria#desc-range*

[133] Heibert, T.C. (2015).

food source for transient (migrating) Gray whales who inhabit Whidbey Basin from March to June.[134]

Viability Ranking - Good

The overall viability ranking for embedded invertebrates was ranked "good," however, each of the individual KEA's – landscape context, condition, and size – were not given ratings. Landscape context specifically aimed to measure the estuarine habitat spatial extent and connectivity by identifying the spatial distribution of both the Eastern softshell clam and sand shrimp in their suitable habitats. The condition KEA focused on population structure and recruitment, specifically assessing the relative frequency of size classes of Eastern softshell clams. Lastly, the size KEA examined two metrics, (1) the density and abundance of Eastern softshell clams per unit area (current sample clam beds, not the entire mudflat), and (2) sand shrimp biomass per unit area.

In the 2012 CAP, the KEAs were not given ratings due to a lack of information regarding the abundance and distribution of these two species. Since 2012, there has not been significant additional information to truly assess the viability status of embedded invertebrates in the Port Susan MSA. However, a study done in 2015 by the Washington Department of Natural Resources' Aquatic Assessment Monitoring Team, assessed sand shrimp stock and distribution in Whidbey Basin in relation to Gray whale feeding patterns. The study sampled two locations in Port Susan, the first was on the north, northwest part of Port Susan, near the Iverson Trail Preserve, and the second was on the western shoreline of Port Susan, near Pirates Cove Private Beach. Sand shrimp biomass for each location was estimated. Near the Iverson Trail Preserve, sand shrimp biomass was just below 600g/m^2, whereas the second location on the western shoreline was just above 600g/m^2.[135] This information can be used for the size KEA for sand shrimp biomass, however, without a baseline determined in the 2012 CAP, it is difficult to determine the implications of this study's findings.

Threat Ranking - Medium

The 2012 CAP identified three threats to embedded invertebrates and ranked their overall threat level as "medium." Acidification, driven by climate change, and invasive species were listed as "medium" threats, and incompatible harvest was listed as a "low" threat.

Ocean acidification will likely impact growth and shell production, disturb mechanical responsiveness to predators, and impact embryonic and larval development, primarily increasing the chance of abnormal development and increasing the overall length of the development period.[136,137] Additionally, long-term ocean acidification will likely lead to sediment

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[134] Pruitt, C., and C. Donoghue. (2016, October 28). G*host shrimp and gray whale feeding: North Puget Sound, Washington*. Aquatic Assessment and Monitoring Team, Aquatic Resources Division, Washington Department of Natural Resources. Olympia, Washington.

[135] Ibid.

[136] Gazeau, F., Parker, L. M., Comeau, S., Gattuso, J. P., O'Connor, W. A., Martin, S., ... & Ross, P. M. (2013). Impacts of ocean acidification on marine shelled mollusks. *Marine biology*, *160*(8), 2207-2245.

[137] Glaspie, C. N., Longmire, K., & Seitz, R. D. (2017). Acidification alters predator-prey interactions of blue crab Callinectes sapidus and soft-shell clam Mya arenaria. *Journal of Experimental Marine Biology and Ecology*, *489*, 58-65.

acidification. Sediment acidification is already present in coastal ecosystems, especially estuarine environments, but ocean acidification will likely exacerbate the decrease in pH levels.[138] Additional sediment acidification will likely have long-term negative impacts on juvenile Eastern softshell clams' burrowing behavior, and increase the dispersal rate of juvenile clams.[139] However, impacts of acidification on mollusk species varies widely, so additional research is needed to understand the broad implications of ocean acidification in Port Susan.

In addition to the two species to monitor in the 2012 CAP, the MRCs and other stakeholders made note to monitor the invasive purple varnish clam (*Nuttallia obscurata*) as there was a lack of consensus regarding its harmfulness.[140] Varnish clams tend to prefer the mid- and upper-intertidal zones, but have also been found in the lower intertidal zone.[141] Its preference for higher intertidal areas could be due to its higher tolerance for variable temperatures and salinities at both the juvenile and adult stages.[142] Additionally, varnish clams are more tolerant of freshwater than other species, and can typically be found in areas with freshwater inflow.[143] In Port Susan, varnish clams are abundant on the eastern shoreline, in the Warm Beach area.[144] While studies have been conducted to better understand the varnish clam, since 2012 there has not been significant research regarding the clams' harmfulness on Puget Sound, or Port Susan, ecosystems.

The final threat for embedded invertebrates is incompatible harvest, which as described in *Beaches – Threat Ranking*, the possibility of unsustainable harvesting of species. In Port Susan, recreational harvesting of clams is limited to four public beaches, Cavalero Beach, Further North Camano Head, Kayak Point County Park, and South Port Susan.[145] Each year, WDFW publishes a list of (1) public beaches that are open to harvesting and when in the year they are open and (2) the ones that are closed for conservation concerns, pollution, or other potential threats to human health.[146] This year, in 2022, Kayak Point County Park is closed for the year. Recreational

[138] Clements, J. C., & Hunt, H. L. (2014). Influence of sediment acidification and water flow on sediment acceptance and dispersal of juvenile soft-shell clams (Mya arenaria L.). *Journal of Experimental Marine Biology and Ecology*, *453*, 62-69.
[139] Ibid.
[140] Massaua, M. et al. (2012).
[141] Gordon, C. M., Martin, R. B., Lee, B. A., Sutherland, T. F., & Martin, A. J. (2018). *Population Attributes of the Invasive Varnish Clam (Nuttallia obscurata) in Whaling Station Bay, Hornby Island, British Columbia*. Fisheries and Oceans Canada, Science Branch, Pacific Region, Marine Ecosystems and Aquaculture Division, Centre for Aquaculture and Environmental Research.
[142] Ibid.
[143] Pacific Shellfish Institute. (2014, December). *Shellfish Foraging Guide to Port Susan and South Skagit Bay*. Pacific Shellfish Institute with help from the Stillaguamish River Clean Water District of Snohomish County.
[144] Ibid.
[145] Washington Department of Fish and Wildlife. (n.d.). *Public clam, mussel, and oyster beaches*. Washington Department of Fish and Wildlife. *https://wdfw.wa.gov/places-to-go/shellfish-beaches?name=&county=All&marine_area=22100*
[146] Ibid.

sand shrimp harvesting in Port Susan typically occurs from May to June and July to August.[147] Specific open and close dates each year are determined by WDFW.

Shorebirds

Port Susan is recognized by the Audubon Society as an "Important Bird Area" as it is home to roughly 20,000 shorebirds each season (Figure 26).[148,149]

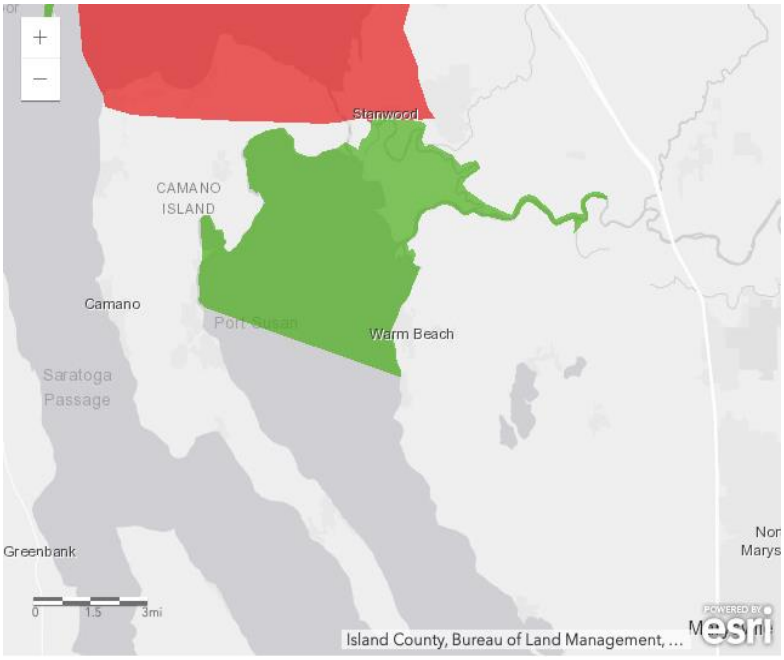

Figure 26: Port Susan Important Bird Area (Green) Identified by the Audubon Society

To more effectively monitor this target, three species that migrate through or to Port Susan were selected – dunlin (*Calidris alpina*), western sandpipers (*Calidris mauri*), and least sandpipers (*Calidris minutilla*). All three species are in the sandpiper family and, thus, have similar preferred habitats, diets, and feeding behaviors. Dunlins can be found in Port Susan between October and April and prefer mudflats and sandy beaches.[150,151] Least sandpipers and western sandpipers pass through Port Susan during their winter migration and are typically observed from August to October.[152] During migration, least sandpipers prefer inland habitats, specifically muddy edges of marshes, ponds, rivers.[153] If settling in a coastal area, they are found in narrow tidal creeks and edges of salt marshes.[154] Western sandpipers prefer open shorelines, mudflats, sandy beaches, and tidal estuaries.[155] All three species prey on small invertebrates in the intertidal zone including marine worms, amphipods, small snails, and

[147] Washington Department of Fish and Wildlife. (n.d.). *Recreational shrimp fishing regulations by marine area*. Washington Department of Fish and Wildlife. *https://wdfw.wa.gov/fishing/shellfishing-regulations/shrimp/areas#8-2*
[148] Massaua, M. et al. (2012).
[149] Audubon Society. Port Susan Bay | Important Bird Areas, Washington. Audubon Society. *https://www.audubon.org/important-bird-areas/port-susan-bay*
[150] Audubon Society. Dunlin | Guide to North American Birds. Audubon Society. *https://www.audubon.org/field-guide/bird/dunlin*
[151] Massaua, M. et al. (2012).
[152] Ibid.
[153] Audubon Society. Least Sandpiper. | Guide to North American Birds. Audubon Society. *https://www.audubon.org/field-guide/bird/least-sandpiper*
[154] Ibid.
[155] Audubon Society. Western Sandpiper | Guide to North American Birds. Audubon Society. *https://www.audubon.org/field-guide/bird/western-sandpiper*

mollusks.[156] If located inland, least sandpipers are also known to feed on insects and seeds.[157] As their food sources are often embedded in the intertidal zone (mudflats, beaches), the species are known for 'probing' the substrate for invertebrates as well as picking prey off of the surface of the substrate.[158,159,160]

Viability Ranking - Good

Unlike other conservation targets, the shorebird target was not given a specified landscape context KEA. After reviewing the other landscape context KEAs for other targets (described in *Landscape Context*), it is somewhat understandable why shorebirds did not have one. Other targets' landscape context attributes revolved around juvenile habitat and/or habitat connectivity or fragmentation. Neither dunlins, least sandpipers, or western sandpipers breed in Port Susan, so juvenile habitat is not of concern. Habitat connectivity is also less of a concern for shorebirds, as their mobility is not restricted to the land or water, but rather they can fly to available habitats. Additionally, the abundance of shorebird habitat is included under the condition KEA below. However, when updating the CAP to include more relevant information, this KEA should be reconsidered due to the potential inundation of mudflats and beaches from sea level rise as well as further fragmentation due to development.[161]

The condition KEA for shorebirds is defined by the density of invertebrates in the water column (food abundance) and the community architecture, specifically the abundance of large woody debris (LWD) and the area of winter forage habitat. This KEA was not given a specific viability ranking. Since the mid 1990's, Washington Department of Ecology (WECY) has studied the abundance and diversity of benthic invertebrates in Puget Sound. From 2004 till 2021, they determined that invertebrate populations are being adversely affected by factors such as higher concentrations of nutrients (primarily carbon and nitrogen) and lowered dissolved oxygen (DO), which are sometimes paired with the presence of large algal blooms.[162] In Puget Sound these conditions typically are seen in terminal inlets, such as Port Susan, due to less water circulation from the Sound and additional nutrients deposited from streams and river inputs.[163] Whidbey Basin, in particular, receives about 40% of all human-sourced pollution introduced to the watershed from discharging rivers as well as about 10% of Puget Sound's marine point-source pollution.[164] Due to these factors, the presence of invertebrates in the water column has declined over the years, a trend that will likely continue if measures are not taken to combat increased nutrient levels and lowered DO levels.

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[156] Audubon Society. Dunlin.
[157] Audubon Society. Least Sandpiper.
[158] Ibid.
[159] Audubon Society. Western Sandpiper.
[160] Audubon Society. Dunlin.
[161] Ibid.
[162] Marine Sediment Monitoring Team. (2021). 'What's bugging Puget Sound benthos?.' Washington Department of Ecology. *https://ecology.wa.gov/Blog/Posts/November-2021/What-s-bugging-Puget-Sound-benthos*
[163] Ibid.
[164] Roberts, M. (2014). *Puget Sound and the Straits Dissolved Oxygen Assessment: Impacts of Current and Future Human Nitrogen Sources and Climate Change Through 2070*. Washington State Department of Ecology, Environmental Assessment Program.

Regarding the community architecture portion of the condition KEA, while information regarding the status of LWD abundance was lacking, studies have shown that shorelines modified for human use, either recreational or domestic (armored shorelines), typically have less LWDs than shorelines that are not modified.[165,166,167] However, in recent years, there has been a push to restore armored shorelines, which has been observed to have a positive impact on LWD recruitment (see *Beaches - Threat Ranking*).[168]

Mudflats, marshes, and agricultural fields are important winter forage habitats for dunlins, least sandpipers, and western sandpipers. Climate change induced SLR is likely to impact the availability of these habitats. Dunlin habitat is likely to be adversely affected at +3°C, whereas least sandpiper and western sandpiper habitat is expected to expand with SLR.[169,170] A study in 2018 assessed this possibility further and determined that shorebirds that forage in vegetated estuarine habitats will likely be adversely affected, but intertidal mudflat abundance might increase under some SLR scenarios.[171] However, even with a possibility of habitat expansion tied to SLR, there is not a guarantee shorebirds will use the newly available habitat.[172]

In 2012, the size KEA was rated as "good," and is determined by population size and dynamics, particularly the number of dunlins per year. For 2012, the CAP relied on population numbers from 1988, estimating a population of about 31,000 in the winter and 35,000 in the spring, and noted population numbers were mildly increasing.[173] While the exact population numbers of dunlins is difficult to determine, a study done in 2021 for Puget Sound Partnership's (PSP) Puget Sound Ecosystem Monitoring Project estimated the population of dunlins in Puget Sound was roughly 556,000 in the winter and 109,000 in the spring.[174] This study also suggested that dunlin presence increased with the amount of mudflats and estuarine emergent wetlands available, suggesting further need to monitor the abundance and fragmentation of said habitats.[175] Over the past 5 years, according to the Cornell Lab of Ornithology's eBird project, the total number of dunlins seen in Port Susan throughout the year ranged from 10,141 to 102,106 which can be seen

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[165] Herrera Environmental Consultants, Inc. (2005). Marine shoreline sediment survey and assessment, Thurston County, Washington. Prepared for: Thurston Regional Planning Council. Olympia, WA.

[166] Higgins, K., P. Schlenger, J. Small, D. Hennessy, and J. Hall. (2005). Spatial relationships between beneficial and detrimental nearshore habitat parameters in WRIA 9 and the City of Seattle. Proceedings of the 2005 Puget Sound Georgia Basin Research Conference.

[167] MacDonald, D.D. (1994). Approach to the Assessment of Sediment Quality in Florida Coastal Waters. Volume I: Development and Evaluation of Sediment Quality Assessment Guidelines. Prepared for Florida Department of Environmental Protection. November. Cited in Stratus 2005b.

[168] Lee, T. S., et al., (2018).

[169] Audubon Society. Dunlin.

[170] Wilsey, C., Bateman, B., Taylor, L., Wu, J. X., LeBaron, G., Shepherd, R., ... & Stone, R. (2019). Survival by degrees: 389 bird species on the brink. *National Audubon Society: New York, NY, USA*.

[171] Thorne, K., MacDonald, G., Guntenspergen, G., Ambrose, R., Buffington, K., Dugger, B., ... & Takekawa, J. (2018). US Pacific coastal wetland resilience and vulnerability to sea-level rise. *Science Advances*, *4*(2), eaao3270.

[172] Ibid.

[173] Massaua, M. et al. (2012).

[174] Michel, N., T. Bayard, A. Summers, G. Slater, and K. Spragens. 2021. Avian Habitat Suitability Models for Puget Sound Estuary Birds. Prepared for the Puget Sound Ecosystem Monitoring Program, Puget Sound Partnership. Tacoma, WA.

[175] Ibid.

in Figure 27.[176] However, this only includes sightings within the Audubon Society's Port Susan Important Bird Area, which does not encompass the entirety of Port Susan Bay.

Year	Total Number Spotted
2017	57,576
2018	14,600
2019	10,141
2020	102,106
2021	89,054

Figure 27: Number of Dunlins Seen from 2017 to 2021

Threat Ranking - High

The threats identified for shorebirds were numerous. Increased flooding due to climate change was determined to pose a high threat. As mentioned previously, SLR is likely to alter shorebird habitat in Port Susan, specifically shifting the mosaic of intertidal mudflats, marshes, and other estuarine habitats.[177] However, while the exact response from shorebirds to changing habitats is unknown, the Audubon Society regards sandpipers and western sandpipers as a "stable species" in terms of their climate vulnerability.[178,179]

Potential oil spills are another high-ranking threat to the shorebird conservation target. There are currently five state-led response plans within the MSA.[180] Four of the plans include collection strategies to prevent spilled oil from continuing downstream into the estuary or the Bay. According to ECY, between July 2015 and March 2021, there have been two reported spills within the MSA.[181] The first, in 2017, occurred inland, just west of Livingston Bay and was the result of an equipment or material failure (9 gallons). The second occurred on the shoreline in 2019, at the southern end of the MSA border in Snohomish County (20 gallons). However, it is important to note that many spills go unreported, so it is difficult to determine the true impact of spills on Port Susan.[182]

Agricultural runoff, municipal discharge from wastewater treatment plants, and septic tank failure pose a "medium" threat to shorebirds. All three can carry excess nutrients such as nitrates, phosphates, and carbon; pathogens; and toxic chemicals or metals into the MSA system.[183] The introduction of these additives can lead to decreased water quality. Excess nutrients can cause

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[176] eBird. Dunlin, Port Susan Bay | 2017-2021 | Bird Observations. Cornell Lab of Ornithology. *https://ebird.org/barchart?byr=2017&eyr=2021&bmo=1&emo=12&r=US-WA_287&spp=dunlin&separateYears=true*

[177] Thorne, K. et al. (2018).

[178] Ibid.

[179] Wilsey, C., Bateman, B., Taylor, L., Wu, J. X., LeBaron, G., Shepherd, R., ... & Stone, R. (2019). Survival by degrees: 389 bird species on the brink. *National Audubon Society: New York, NY, USA*.

[180] Washington Department of Ecology. Statewide Response Plans | Spills Maps. Washington Department of Ecology. https://apps.ecology.wa.gov/coastalatlas/storymaps/spills/spills_sm.html?CustomMap=y&BBox=-13757083,5728006,-13532358,5873695&Tab=nt8&Opacity=1&Basemap=esriLightGray&ShowGrpItems=48

[181] Washington Department of Ecology. Reported Spills to Water | Spill Maps. Washington Department of Ecology. *https://apps.ecology.wa.gov/coastalatlas/storymaps/spills/spills_sm.html?CustomMap=y&BBox=-13757083,5728006,-13532358,5873695&Tab=nt8&Opacity=1&Basemap=esriLightGray&ShowGrpItems=48*

[182] Ibid.

[183] NOAA. Human Disturbances to Estuaries. (2021). National Ocean Service website. *https://oceanservice.noaa.gov/education/tutorial_estuaries/est09_humandis.html*

eutrophication, a process whereby algal blooms grow rapidly and subsequently create anoxic conditions (low DO) when they die and are consumed by bacteria.[184] As mentioned in *Shorebirds – Viability Ranking* low DO levels are known to adversely affect one of shorebirds main sources of sustenance – invertebrates.[185]

Conservation Planning

Considerations for Conservation Planning

As conservation planning continues to evolve, there is growing awareness around the importance of integrating human dimensions, including considerations of how people value natural resources, how they want those resources to be managed, and how they affect and are affected by those resources and related decisions.[186] This represents a shift towards a more holistic approach of conservation and restoration planning that allows for the interdependencies between humans and nature to be addressed concurrently and meaningfully.[187] Moving beyond the traditional ecological framework, it is critical for conservation planners and decision makers to understand the role conservation plays in a given location as well as the social, economic, and cultural context in that area.[188] By complementing social considerations with an integrated understanding of the ecology of a region, social-ecological systems perspective offers a balanced and nuanced approach to ecosystem protection and management.[189] Incorporating this perspective can help identify socially and ecologically focused conservation actions that will benefit ecosystems and human communities and assist in the development of more consistent evaluation.[190]

One example that manifests successful implementation of the social-ecological framework is a sustainable development plan for a coastal community in the Bahamas. Using a mixed methods approach, the plan aimed to link community members values and visions for the future with the likely impacts of certain conditions based on future scenarios.[191] The research team used an inclusive and iterative stakeholder engagement process to incorporate diverse visions and values of different stakeholders into the island's plan and inform investments in the sustainable

[184] NOAA. Human Disturbances to Estuaries. (2021).
[185] Marine Sediment Monitoring Team. (2021).
[186] Bartuszevige, A. M., Taylor, K., Daniels, A., & Carter, M. F. (2016). Landscape design: integrating ecological, social, and economic considerations into conservation planning. *Wildlife Society Bulletin*, *40*(3), 411-422.
[187] Wyatt, K., Arkema, K., Wells-Moultrie, S., Silver, J., Lashley, B., Thomas, A., ... & Ruckelshaus, M. (2021). Integrated and innovative scenario approaches for sustainable development planning in The Bahamas. *Ecology and Society*, *26*(4).
[188] Ban, N. C., Mills, M., Tam, J., Hicks, C. C., Klain, S., Stoeckl, N., ... & Chan, K. M. (2013). A social–ecological approach to conservation planning: embedding social considerations. *Frontiers in Ecology and the Environment*, *11*(4), 194-202.
[189] Cumming, G. S., & Allen, C. R. (2017). Protected areas as social-ecological systems: perspectives from resilience and social-ecological systems theory. *Ecological applications*, *27*(6), 1709-1717.
[190] Ban, N. C., et al. (2013).
[191] Wyatt, K. et al. (2021).

management of coastal ecosystems.[192] This integrated approach offered an opportunity to link human well-being and the environment in a participatory, inclusive process.

Local Examples

King County Clean Water Healthy Habitat Strategic Plan 2020-2025[193]

The 2020-2025 Clean Water Healthy Habitat Strategic Plan is intended to align King County's divisional work around shared goals of protecting and restoring clean water to preserve the health and well-being of communities, fulfill tribal treaty rights, eliminate inequities, and recover threatened species. Instead of listing specific targets, the plan describes six overarching goals that aim to promote cleaner waters and habitats. These include: healthy forests and more green spaces; cleaner, controlled stormwater runoff; reduced toxins and fecal pathogens; functional river and floodplains; better fish habitat and resilient marine shorelines. For each goal, the plan describes what success would mean in the next 30 years to cultivate a long-term commitment to fulfilling these goals. To achieve this, the plan outlines measures of success and specific actions (what/who/when/with what resources) for each goal. King County employees are responsible for monitoring these activities every five years, which allows for ongoing evaluation and adjustment.

Western Washington Treaty Tribes 2016 Report[194]

In 2016, the treaty tribes in western Washington developed a report that synthesized emerging climate threats as well as outlined ongoing responses and adaptation strategies. This comprehensive report acknowledged how major threats due to climate change impact the ecosystems that play a central role in the tribes' culture, health, identity, and lifeways. This localized approach created a report that captured community values and reflected meaningful strategies to protect those values and continue local stewardship. The report also acknowledged the need for collaboration across federal, state, and local partners, and described several strategies for regulatory action like shoreline development restriction, risk prevention planning, incentives for protecting natural areas, and developing emergency preparedness.

Puget Sound Partnership's Vital Signs and Action Agendas[195]

In 2007 the Washington State Legislature passed legislation to create the Puget Sound Partnership (PSP), a state agency, to lead and develop a comprehensive ecosystem recovery framework for the Puget Sound.[196] This legislation also detailed six overarching recovery goals to guide the development of an Action Agenda.[197] To track the progress towards the recovery goals (represented on the outer ring of Figure 28 below), PSP, with the help of a variety of

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[192] Wyatt, K. et al. (2021).

[193] King County Clean Water Healthy Habitat Strategic Plan. 2020-2025. *https://your.kingcounty.gov/dnrp/library/water-and-land/cwhh/clean-water-healthy-habitat-strategic-plan.pdf*

[194] Treaty Tribes in Western Washington. (2016). *Climate Change and our Natural Resources: A Report from the Treaty Tribes in Western Washington. https://nwifc.org/w/wp-content/uploads/downloads/2017/01/CC_and_Our_NR_Report_2016-1.pdf*

[195] Puget Sound Partnership. *The 2018-2022 Action Agenda for Puget Sound.* https://psp.wa.gov/action_agenda_center.php.

[196] RCW 90.71.200

[197] Ibid.

regional partners, developed the Puget Sound Vital Signs (seen in the inner ring of Figure 28).[198] Each vital sign has one to four indicators, resulting in a total of 52 regularly reported Vital Sign Indicators.[199]

Per legislative mandate, PSP created the 2018-2022 Action Agenda for Puget Sound to provide clear opportunities for federal, state, local, tribal, and private entities to better invest resources and coordinate actions to recover the ecosystem. The Action Agenda defined attributes of a healthy Puget Sound and established a strategic, prioritized, and science-based plan to address the complex connections among the land, water, species, and humans within the Puget Sound.

Figure 28: Puget Sound Partnership's Puget Sound Recovery Goals (Outer Ring) and Vital Signs (Inner Ring)

In a similar process the Island and Snohomish County MRCs are undertaking, the Partnership recently solicited feedback to identify successes, challenges, and opportunities for improvement from the 2018-2022 action agenda. Relevant feedback included comments related to a lack of specificity in the Action Agenda tasks, and that it did not reflect local needs and priorities.[200] Similarly, feedback revealed that better communication is required to help show how the strategies/actions are responsive to updated scientific information. This feedback has helped to shape an updated 2022-2026 Action Agenda, whose draft was released in March 2022.

The 2022-2026 Action Agenda identified 23 desired outcomes, 11 of which were designated "multi-benefit," and long-term targets for six vital signs, both of which informed the development of 31 Action Agenda Strategies.[201] The Strategies include policies, actions, and approaches to guide partner implementation and will be tracked by Action Agenda Progress Indicators.[202] Additionally, eight of the Strategies include Program Targets which outline commitments by an existing Puget Sound recovery program and will be completed in the next four years.

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[198] Puget Sound Partnership. Puget Sound Vital Signs | All Indicators. *https://vitalsigns.pugetsoundinfo.wa.gov/VitalSignIndicator/ViewAll*

[199] Ibid.

[200] 2022-2026 Action Agenda: An Update to the Puget Sound Recovery Plan for Protected Habitat, Thriving Species, and Healthy People. (March 2022). Puget Sound Partnership. *https://psp.wa.gov/2022AAupdate.php*

[201] Ibid.

[202] Ibid.

Washington Department of Natural Resources Watershed Resilience Action Plan[203]

The Watershed Resilience Action Plan is a holistic and comprehensive tool to coordinate and enhance efforts that aim to protect and restore salmon habitat. Although focused on salmon, the plan emphasizes the importance of community well-being throughout the plan, as this work aims to build healthier, more equitable communities. It is guided by five goals that drive action toward outcomes that can be measured in short- and long-terms, including:

- Protect and clean up aquatic habitat
- Restore, conserve and connect forests and riparian habitat
- Revitalize urban forests and streams
- Engage and invest in communities
- Reduce and combat climate impacts

The strengths of the plan include the creation of an online dashboard, which visually depicts the outcomes relevant for each of the five goals and briefly highlights the current status of each outcome. Users can click on each outcome to learn more about short (0-3 years) and long-term (4-10 years) actions that WDNR is tracking. The accountability and transparency of this plan is captured in the dashboard, as it allows for accessible, concise information to be shared for the public to track progress and potentially identify opportunities to amplify efforts. The Watershed Resilience Action Plan coordinates with and supports ongoing efforts for salmon recovery in a way that fosters private and public partnerships to build an effective, coordinated, and powerful salmon recovery community.

Puget Sound Kelp Conservation and Recovery Plan[204]

In 2020, the Northwest Straits Initiative, NMFS, WDNR, and several non-profits developed the Puget Sound Kelp Conservation and Recovery Plan. The plan aims to provide a research and management framework for coordinated action to improve understanding of kelp forest population changes and declines while also working to implement and strengthen recovery and protective measures. The plan lays out the current state of kelp forests in the Puget Sound, including the distribution, trends, critical ecosystem roles, and cultural values. It also provides a blueprint to protect and restore kelp forests by outlining actions and strategies that are relevant to reduce stressors. The six strategic goals include: understand and reduce kelp stressors; deepen understanding of the value of kelp to Puget Sound ecosystems and integrate into management; describe kelp distribution and trends; designate kelp protected areas; restore kelp forests; promote awareness, engagement, and action for user groups, tribes, the public, and decision-makers.

The Puget Sound Kelp Conservation and Recovery Plan includes a nine-page appendix that focuses specifically on the cultural importance of kelp for the Pacific Northwest tribes, which is a meaningful attempt to include tribal perspectives and values. It discusses specifically the role of kelp in traditional ecological knowledge, subsistence practices, and symbolic uses of kelp. It serves as an ecological and cultural foundation species for the Coast Salish peoples, whose

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[203] Washington Department of Natural Resources. (January 2022). Watershed Resilience Action Plan. *https://www.dnr.wa.gov/publications/em_watershed_resilience_plan_feb_2022.pdf*

[204] Northwest Straits Commission, NOAA's National Marine Fisheries Service, Puget Sound Restoration Fund, Washington State Department of Natural Resources, and Marine Agronomics. (May 2020). Puget Sound Kelp Conservation and Recovery Plan. *https://nwstraits.org/media/3020/pugetsoundkelpconservationandrecoveryplan.pdf*

traditional territories are within the geographic scope of this plan, so it is pertinent that this information be captured in a meaningful and respectful way.

Snohomish County's Sustainable Lands Strategy[205]

The Sustainable Lands Strategy (SLS) was established through a collaborative partnership between Snohomish County, Tulalip and Stillaguamish Tribes, state and federal agencies, and agricultural and environmental stakeholders to coordinate fish, farm, and flood (F3) management interests to generate net gains in agricultural, tribal culture, and ecological productivity. The SLS Executive Committee represents key partners and is facilitated by the county in a neutral forum. The committee brings technical information, design support, and other resources to coordinate priorities and implement projects. SLS's F3 management projects are "packaged" together to encourage coordination of funding, permitting, implementation, and support. The resulting reach-scale plans identify coordinated sets of multi-benefit projects to improve natural functions and promote F3 management interests. This framework provides the MRCs with potential insights into harnessing socio-cultural interests to structure long-term collaborative partnerships and garner community support.

San Juan County Marine Stewardship Area Plan[206]

San Juan County, which encompasses the San Juan Islands in the Salish Sea, underwent a similar collaborative process to develop a Marine Stewardship Area Plan in 2007. The plan represents a vision of a healthy marine ecosystem with thriving populations of marine species and strong recreational and resource-based industries, similar to the Port Susan CAP goals. The authors employed the "Five-S Framework" in their approach to create the San Juan plan. This included identifying relevant *systems* of conservation concern, the *stresses* they face, the upstream *sources* of the stresses and creating relevant *strategies for action* with appropriate measures of *success*. This framework was modified, however, to incorporate project-specific needs. The San Juan MRC decided to expand the scope of the Five-S Framework to include a set of socio-cultural focal targets (in addition to the traditional biodiversity targets). To compile relevant information for these targets, the MRCs held a series of community workshops, much like the process for Port Susan. This process, however, resulted in the creation of three socio-cultural targets, including:

- *Enjoyment of the marine environment* - This target discusses the numerous ways in which residents and visitors enjoy the marine environment and the different values obtained
- *Thriving marine-based livelihoods* - This target assesses the local food security, marine transportation opportunities, and the ability to make a living in diverse ways, all of which are tied to the natural resources of the area.
- *Cultural traditions* - This includes the relevant ceremonial, subsistence, and spiritual uses and aspects, which are impacted by spiritual values, feelings of fulfillment, personal stewardship efforts, and appreciation for trivial treaty rights.

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[205] Snohomish County Surface Water Management and the SLS Executive Committee, 2018. Mainstem Stillaguamish River Reach-scale Plan. Snohomish County Department of Public Works and the Executive Committee of the Sustainable Lands Strategy. *https://snohomishcountywa.gov/DocumentCenter/View/60305/Stillaguamish-Reach-Scale-Plan-PDF?bidId=*

[206] Evans, K., & Kennedy, J. (July 2, 2007). San Juan County Marine Stewardship Area Plan. *https://www.sjcmrc.org/media/1161/msa-plan-02-jul-2007-final.pdf*

Integrating Sociocultural Factors

Including sociocultural factors in the San Juan County MSA Plan was seen as a novel addition to a CAP process at the time.[207] Explicitly measuring sociocultural factors that were intrinsically linked with ecological systems expanded the definition of conservation "success" to include human well-being. Furthermore, discussing human indicators made the planning process more inclusive of diverse socioecological interests, likely making the planning process more collaborative and effective:

> "Some participants appeared to be *most engaged* when discussing the viability of the sociocultural targets and threats affecting them. Many of the stressors affecting the sociocultural targets are also perceived as threats to the *quality of life*, about which *residents care deeply*. Explicitly incorporating, and hence valuing, marine-based livelihoods, cultural traditions, and recreational opportunities *likely facilitated adoption of the plan,* possibly *reducing negotiation-related transaction costs.* Including sociocultural targets also provided a place for concerns about the status of resources that were not captured elsewhere, such as contaminants in fish in the archipelago."[208]

Though the Puget Sound Vital Signs framework and the indicators chosen in the San Juan County MSA Plan are high quality examples of how to measure sociocultural indicators, ultimately these indicators should be developed in a participatory, community-based manner.[209] A growing body of human dimensions literature on coastal and ecosystems-based management speaks to key factors to consider when seeking to include sociocultural indicators.

Best Available Social Science[210]

Many federal, state, and local laws and ecosystems plans require "best available science" to be a part of decision-making processes. Though the definition of "science" is intended to be interdisciplinary in nature, most sciences represented in environmental planning are biophysical sciences. Of the social sciences, economics is disproportionately overrepresented compared to other disciplines. Social science and scientists often represent different worldviews, ontologies, epistemologies, and philosophies as compared to the biophysical sciences:

- *Ontological perception of reality* - In the biophysical sciences, one reality exists and is supported by the scientific method. In the social sciences, multiple realities can exist alongside one another due to the complex nature of socioecological and belief systems.
- *Epistemological theory of knowledge creation* - By following the scientific method in the biophysical sciences, it is believed that one can discover knowledge objectively and without bias. The social sciences often recognize that knowledge is socially constructed, and therefore bias is inherently a part of knowledge creation. Therefore, approaches like

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[207] Evans, K. E., & Klinger, T. (2008). Obstacles to bottom-up implementation of marine ecosystem management. *Conservation Biology*, *22*(5), 1135-1143.

[208] Ibid.

[209] Puget Sound Partnership. Puget Sound Vital Signs | All Indicators. *https://vitalsigns.pugetsoundinfo.wa.gov/VitalSignIndicator/ViewAll*

[210] Charnley, S., Carothers, C., Satterfield, T., Levine, A., Poe, M. R., Norman, K., ... & Martin, K. S. (2017). Evaluating the best available social science for natural resource management decision-making. *Environmental Science & Policy*, *73*, 80-88.

feminist inquiry value reflexivity over objectivism, where the researcher openly reflects on their own biases and positionality in relation to their research.

- *Philosophical view on research applications* - Often, biophysical sciences seek to produce research that is generalizable and replicable in other contexts. However, social sciences are typically context-specific, and it could be unethical to attempt to expand this research to other contexts.

All in all, biophysical and social science disciplines represent different worldviews and approaches to environmental stewardship. In conversation, these disciplines can inform more inclusive and informed policy choices.

Sociocultural Wellbeing

Many frameworks exist for defining sociocultural wellbeing and operationalizing it in a management context. These frameworks can provide a starting place for structuring conversations regarding sociocultural indicators, though ultimately these indicators should be context-specific and defined by the Port Susan community themselves.

Past lessons from marine protected area management link best practices with sociocultural wellbeing.[211] These include integrating cultural and traditions into the design and implementation of marine management plans, regularly engaging stakeholders and the public, maintaining livelihoods and wellbeing, promoting economic sustainability, resolving community conflicts, increasing institutional transparency of decision making processes, legitimate governance structures, and seeking social justice and community empowerment in practice. These factors speak to the *Puget Sound Vital Signs'* indicators of cultural wellbeing, economic vitality, and good governance.[212] This example illustrates how the application of sociocultural indicators should extend beyond defining and measuring parameters - sociocultural wellbeing should be directly integrated into governance and decision-making practices.

The following studies describe some of the ways in which sociocultural wellbeing can be categorized, measured, and operationalized.

Indigenous Community Health and Climate Change: Integrating Biophysical and Social Science Indicators[213]

This study was created in collaboration with the Swinomish Indian Tribal Community and the Tsleil-Waututh First Nation. Researchers and tribal members sought to develop a set of Indigenous Health Indicators (IHI) to assess the impacts of climate change on holistic indicators of Indigenous community health. After thorough testing, the IHI indicators that were developed included community connection, natural resources security, cultural use, education, self-determination, and well-being (Figure 29). These indicators were then used during discourses

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[211] Christie, P., Bennett, N. J., Gray, N. J., Wilhelm, T. A., Lewis, N. A., Parks, J., ... & Friedlander, A. M. (2017). Why people matter in ocean governance: Incorporating human dimensions into large-scale marine protected areas. *Marine Policy*, *84*, 273-284.

[212] Puget Sound Partnership. Puget Sound Vital Signs | All Indicators.

[213] Donatuto, J., Grossman, E. E., Konovsky, J., Grossman, S., & Campbell, L. W. (2014). Indigenous community health and climate change: integrating biophysical and social science indicators. *Coastal Management*, *42*(4), 355-373.

regarding how Indigenous communities are being and will be affected by climate change, and how Indigenous communities can respond and adapt to climate change stressors in a way that honors their holistic wellbeing.

Community Connection: Members actively participate in community functions and help each other, particularly in connection with the harvest, preparation, and storage of natural resources.
Natural Resources Security: Local natural resources (air, water, land, plants and animals) are abundant, accessible and support a healthy ecosystem(s) and healthy human community. The community equitably shares these natural resources.
Cultural Use: The community is able to perform their cultural traditions in a respectful and fulfilling way using the local natural resources.
Education: Knowledge, values and beliefs are actively passed from elders to youth.
Self Determination: Communities develop and enact their own healing, development and restoration programs.
Well-being: Community members maintain connections to meaningful locations, confident that their health and the health of the next seven generations are not at risk due to contaminated natural resources.

Figure 29: Indigenous Health Indicators[214]

Cultural Dimensions of Socioecological Systems: Key Connections and Guiding Principles for Conservation in Coastal Environments[215]

In the framework, sociocultural wellbeing exists within the context of a socioecological system that also includes ecological integrity and viable economies. In the context of Port Susan, this would mean that the socioecological system is the Port Susan MSA and its embedded communities. Sociocultural wellbeing is then disaggregated into 5 dimensions (Figure 30):

- Meanings, values, and identities
- Local and traditional ecological knowledge and practice
- Livelihood dynamics
- Governance and access
- Bio-cultural interactions

[214] Donatuto, J., et. al. (2014).

[215] Poe, M. R., Norman, K. C., & Levin, P. S. (2014). Cultural dimensions of socioecological systems: key connections and guiding principles for conservation in coastal environments. *Conservation Letters*, *7*(3), 166-175.

Following the development of context-specific definitions of these dimensions, the community should seek to understand the current condition of each dimension, establish baseline levels of wellbeing fulfillment, and should anticipate future pressures on each dimension and appropriate responses to pressures. The development of this shared understanding should involve community members at all times and should seek to understand and incorporate diverse values into the definition of dimensions. Furthermore, Indigenous cultural practices and resource access needs should be brought explicitly into this conversation. Some traditional knowledge is privileged among Indigenous community members, and therefore cannot be shared directly with outside communities. Therefore, it will be essential to create spaces where Indigenous access needs and cultural traditions are respected no matter the level of knowledge sharing they can provide to settler-colonizer communities and institutions.

Figure 30: Cultural Dimensions of Socioecological Systems

"Sense of Place": Human Wellbeing Considerations for Ecological Restoration in Puget Sound[216]

Sense of place is often cited as an indicator for human wellbeing in the literature. Sense of place is included under the *Vibrant Quality of Life* goal in the Puget Sound Vital Signs tool, though the definition of this indicator is limited, likely because sense of place is a nuanced and community-specific attribute of wellbeing, and as such should be defined directly by community

[216] Poe, M. R., Donatuto, J., & Satterfield, T. (2016). "Sense of place": Human wellbeing considerations for ecological restoration in Puget Sound. *Coastal Management*, *44*(5), 409-426.

members. [217] The framework introduced in this paper describes the multidimensional aspects of a sense of place for tribal and nontribal community members. Influential factors include:

- Activities in the nearshore
- Cultural practices and familial heritage
- Sensory and emotional experiences
- Maintaining and strengthening social connections

Building connections to a place over time is also contingent on access to, knowledge of, and the ecological integrity of such places. Therefore, sense of place as an indicator should be multidimensional, measuring how people engage with the environment as well as factors that enhance or impede one's sense of place.

Engage key social concepts for sustainability[218]

In this model, four dimensions of social sustainability are defined, along with associated ways of defining and measuring each metric. Components of wellbeing, values, agency, and inequality that could be applied to the context of Port Susan are as follows:

- Wellbeing
    - The OECD Regional Wellbeing mapping tool, which quantifies the indicators of access to services, civic engagement, education, jobs, community, environment, income, health, safety, housing, and life satisfaction.[219]
    - The 2003 Millennium Ecosystem Assessment's components of wellbeing, including security, basic material for a good life, health, good social relations, and freedom and choice.[220]
    - Nussbaum's 10 universal capabilities, a framework rooted in human rights discourse.[221] These include life, bodily health, bodily integrity, senses, imagination, and thought, emotions, practical reason, affiliation, other species, play, and control over one's environment. This framework was intended to be a starting point, so that the capabilities could be redefined depending on specific cultural contexts.
- Values
    - Shalom Schwartz's Theory of Basic Human Values of 2012 defines the ways in which human values are multidimensional and linked to human behavior.[222] Figure 31 depicts these layers, showing how some values are oriented toward oneself and

[217] Puget Sound Partnership. Puget Sound Vital Signs | All Indicators.

[218] Hicks, C. C., Levine, A., Agrawal, A., Basurto, X., Breslow, S. J., Carothers, C., ... & Levin, P. S. (2016). Engage key social concepts for sustainability. *Science*, *352*(6281), 38-40.

[219] Washington. OECD Regional Well-Being. *https://www.oecdregionalwellbeing.org/US53.html*

[220] McMichael, A., Scholes, R., Hefny, M., Pereira, E., Palm, C., & Foale, S. (2005). Linking ecosystem services and human well-being. Island Press.

[221] *Capability approach*. *https://en.wikipedia.org/wiki/Capability_approach*

[222] Giménez, A. C., & Tamajón, L. G. (2019). Analysis of the third-order structuring of Shalom Schwartz's theory of basic human values. *Heliyon*, *5*(6), e01797.

others have a more socially-oriented focus. Additionally, a combination of values can lead to behaviors that promote personal growth or self-preservation.

- Agency
    - The Alsop and Heinsohn Measuring Empowerment framework is both a guide on how to gather data on social empowerment and is a tool for interpreting how one's level of agency can be transformed into action.[223] This tool is particularly helpful in the context of governance and policy interventions.
- Inequality
    - Ethnic fractionalization indices seek to measure both the geographic and socioeconomic distribution of ethnic groups in an area. This analysis helps one understand spatial socioeconomic disparities relative to distinct cultural identities.

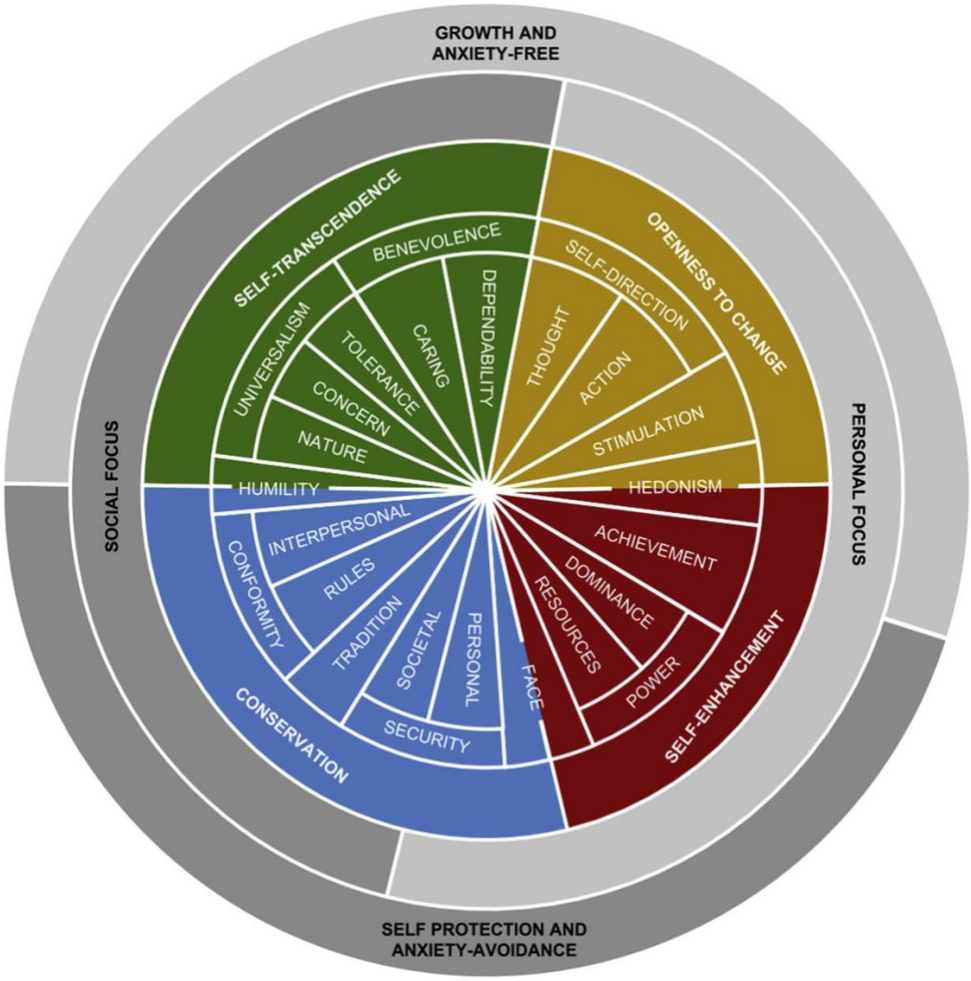

Figure 31: Shalom Schwartz's Theory of Basic Human Values[224]

[223] Alsop, R., & Heinsohn, N. (2005). *Measuring empowerment in practice: Structuring analysis and framing indicators* (Vol. 3510). World Bank Publications.

[224] Giménez, A. C., & Tamajón, L. G. (2019).

It should be noted that in recent years, enhancing equity has been viewed as a more meaningful goal than addressing inequalities in public policy. This is due to how each word is defined: equality seeks to give everyone the same resources and opportunities, regardless of their personal needs and desires. Meanwhile, equity seeks to recognize differences between people and to meet their needs and desires in a way that respects and honors such differences. In other words, equity enhances agency through explicitly addressing power imbalances in society.

Evaluating indicators of human wellbeing for ecosystem-based management[225]

This framework outlines a systematic way of developing measurable indicators for human wellbeing. First, analysts should define the conceptual objective, or overall goal of the assessment - which in this case would be attaining human wellbeing. Then, constituents - or broad categories of the objective, are defined. Wellbeing is characterized by four constituent parts in this framework: connections, capabilities, conditions, and cross-cutting. Each of these constituent parts is then described through domains that are relevant to an ecosystem-based management or natural resource management process. These include:

- *Connections* - culture and identity, intangible and tangible connections to nature, and social relationships
- *Capabilities* - Freedom and voice, governance, knowledge and technology, and livelihood and activities
- *Conditions* - Economy, environment, health, and safety
- *Cross-cutting* - Equity and justice, security, resilience, and sustainability. These domains are meant to be assessed across all indicators and over time.

In order to begin developing indicators to measure wellbeing, analysts should then define focal attributes of each domain and the dimensions of those attributes. For example, an analyst could be concerned with assessing resource access, which is an attribute of tangible connections to nature. Resource access is multidimensional, with significant cultural, ecological, economic, political, physical, social, and technical considerations. These dimensions can be further honed into a measurable indicator through crafting a list of attributes related to that indicator, and then defining direct or proxy measures of that attribute. All in all, this involved process can allow researchers to clearly identify measures of wellbeing relevant to ecosystem-based management. Furthermore, this process is enhanced through direct community participation, as participatory processes can better reflect community attributes and thus enhance the quality of indicators.

[225] Breslow, S. J., Allen, M., Holstein, D., Sojka, B., Barnea, R., Basurto, X., ... & Levin, P. S. (2017). Evaluating indicators of human well-being for ecosystem-based management. *Ecosystem Health and Sustainability*, *3*(12), 1-18.

Chapter 5: Analysis

This section of the report focuses on our team's research questions related to the overall effectiveness of the Port Susan MSA CAP in promoting responsible stewardship of Port Susan's diverse ecosystems and the community engagement process.

Community Engagement Process

To inform our recommendations for inclusive community involvement in the future, our team drafted a process-involvement and impact map that helps to identify relevant parties influencing and influenced by the CAP topics. Community-based planning and stewardship require collaborative partnerships with local community members in planning and implementation. The map can act as a template to question which perspectives are missing from the planning process and to highlight opportunities for learning; allyship; relationship- and coalition- building.[226,227]

Involved Parties in the 2012 CAP

a. Primary Partners and Financial Contributors[228]
    i. Island County Marine Resources Committee
    ii. Native Habitat Restoration
    iii. The Nature Conservancy
    iv. The Northwest Straits Marine Conservation Initiative
    v. Snohomish County Marine Resources Committee
    vi. Stillaguamish Tribe
    vii. The Tulalip Tribes
    viii. Washington Sea Grant
    ix. Washington State University Extension Beach Watchers
b. Port Susan MSA Advisory Team
c. Technical Advisors / CAP Workshop Participants
d. Stakeholders interviewed in the engagement process before the vision statement and goals were finalized for the MSA in 2008[229]
    i. Residents

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[226] Simon Fraser University's Morris J. Wosk Centre for Dialogue. (2020). *Beyond Inclusion: Equity in Public Engagement.*
[227] Community Wealth Partners by Share Our Strength. (2022). *Engaging Stakeholders in Developing Strategies: A Field Guide*
[228] Ibid.
[229] Ibid.

ii. Land and resource managers
iii. Local business owners
iv. State and local government officials
v. A tribal elder
vi. Representatives from conservation groups
vii. A public access/ hunting advocate
viii. A farmer

Organizations involved in the planning process are depicted by the figure below with direct lines showing their levels of involvement (Figure 32). The gray circles represent communities that directly interact with Port Susan's environments but were not involved in the 2012 planning process, as well as those who may have been systematically excluded from conservation spaces.

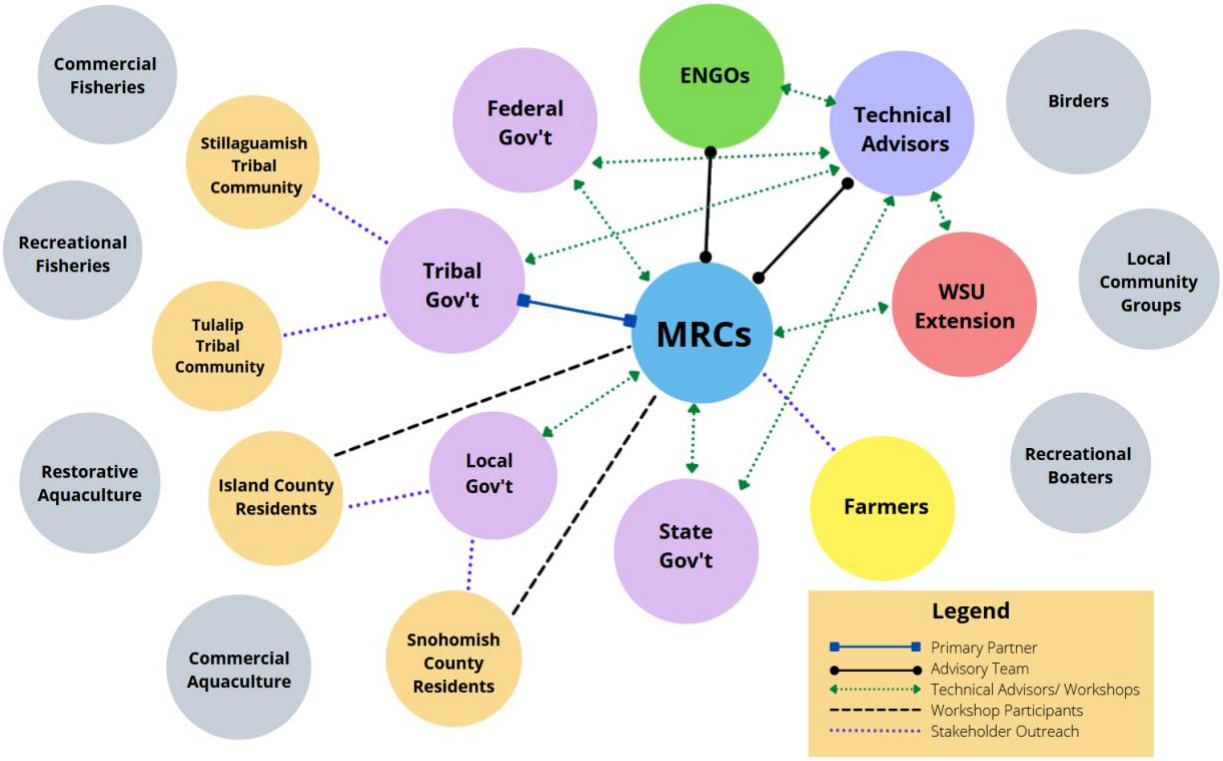

Figure 32: Partner Relationship Map for Port Susan MSA Stewardship Planning and Implementation

Relevant Relationships to the Port Susan MSA

The lists below are not comprehensive and only serve as starting points to conduct a deeper participatory, place-based, iterative, and environmental-justice informed analysis.

Native territories of: [230]

- Tulalip Tribes[231]
- Snohomish Tribe[232]
- Stillaguamish Tribe[233]
- Hul'qumi'num Treaty Group[234] (Figure 33)

"Users" of the territory:[235]

- Fisheries
- Shellfish industry
- Farmers
- Aquaculture producers
- Recreational boaters

Figure 33: Hul'qumi'num Traditional Territory Statement of Intent from 2004

Potential local groups representing communities that may face higher likelihood of experiencing environmental impacts and injustices:

- BLACK SnoCo.[236]
- Snohomish County Latino Coalition[237]
- Snohomish County Equity Alliance[238]
- Snohomish for Equity[239]

Potential partners for stewardship collaboration or learning opportunities:

- Sea Potential[240]

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[230] *Native Land Digital*. (2021, October 8). Native-Land.Ca. *https://native-land.ca/*
[231] *We are Tulalip*. (2022). The Tulalip Tribes. *https://www.tulaliptribes-nsn.gov/*
[232] *Home*. (n.d.). The Snohomish Tribe. *https://snohomishtribe.org/*
[233] *stulǝgʷábš (People of the River)*. (2020). The Stillaguamish Tribe of Indians. *https://www.stillaguamish.com/*
[234] Hul'qumi'num Treaty Group. (2005). *Interim Strategic Land Plan for the Hul'qumi'num Core Traditional Territory*. *http://www.hulquminum.bc.ca/pubs/HTG_LUP_FINAL.pdf*
[235] Recommendations from interviewees, see interview analysis section for full list of organizations interviewed
[236] *About – BLACK SnoCo*. (2022). BLACK SnoCo. *https://blacksnoco.com/about/*
[237] *Snohomish County Latino Coalition*. (2019). Snohomish County Latino Coalition. *https://snohomishcountylatinocoalition.org/about.html*
[238] *Snohomish County Equity Alliance*. (2022). Facebook. https://www.facebook.com/snocoequityalliance/
[239] *Our Mission*. (2022). Snohomish for Equity. *https://snohomishforequity.org/*
[240] *Mission*. (n.d.). Sea Potential. https://www.letsseapotential.com/#services

- Duwamish Valley Sustainability Association[241]

Community Involvement Considerations

To achieve the objective of a "community-based marine stewardship plan" for the Port Susan MSA, the CAP process needs to be community driven.[242] Our team acknowledges the limitations of our analysis given that we are not members of the community. We present information on community involvement practices below and recommend that the engagement process be planned alongside diverse community members.

Spectrum of Community Engagement Practices

Referencing practices in collaborative governance, community engagement can be placed on a spectrum from: (1) informing, (2) consulting, (3) engaging, and (4) collaborating.[243] The difference between engagement and collaboration lies in the decision-making power and implementation responsibilities.

Public "engagement" processes run the risk of collecting community feedback that does not become incorporated into the final plan meaningfully and losing community trust along the way. As several interviewees mentioned, one of the challenges faced by the CAP has been the lack of clarity on how strategies were being implemented and who was responsible or accountable for those actions. As one tribal staff interviewee noted, participation demands significant time and resources; facing limited resources, partners may be hesitant to participate in planning that does not lead to tangible implementation.

Collaborative processes aim to reach consensus recommendations and invite shared responsibility in decision making and implementation between parties involved.[244] The figure below outlines the steps to a collaborative decision-making process which includes assessing whether collaboration could be successful for the issue and making commitments to implement the plan (Figure 34 below).[245] The process should also include monitoring and evaluation which would inform the agenda for the next convening of collaborators in the iterative process. While building consensus could be more time consuming, policies that result from a collaborative process often facilitate the implementation process that could otherwise be challenged by resistance or unanticipated consequences.

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[241] *Duwamish Valley Sustainability Association*. (n.d.). Facebook. *https://www.facebook.com/Duwamish-Valley-Sustainability-Association-105129891357067/*

[242] Port Susan Marine Stewardship Area, Snohomish MRC. (2022). Snohomish County Marine Resource Committee. *https://www.snocomrc.org/projects/port-susan-marine-stewardship-area/*

[243] Policy Consensus Initiative. (n.d.). Understanding the Spectrum of Collaborative Governance Practices. Kitchentable. *https://www.kitchentable.org/sites/default/files/documents/A-Practical-Guide-Excerpt.pdf*

[244] Ibid.

[245] William D. Ruckelshaus Center. (n.d.). Stages of Collaborative Decision Making [Diagram].

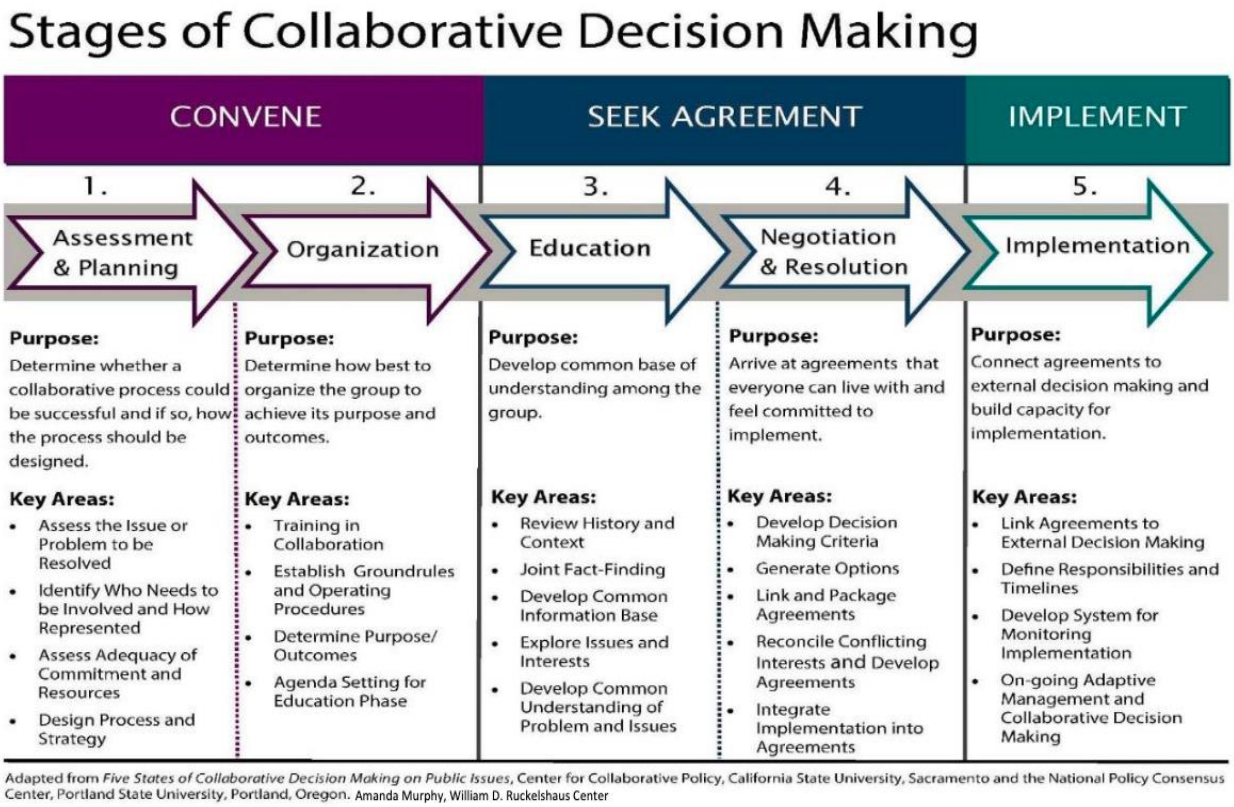

Figure 34: The Stages of Collaborative Decision Making

Agenda Setting for Collaboration

Participatory decision-making that incorporates diverse experiences and expertise can be challenging due to differences in priorities, assumptions, and biases. One tactic that could seem appealing is to frame diverse participation and discussion around narrow, low stake topics; however, the output may not be meaningful and participants could perceive that they are not valued. On the other hand, certain topics are not appropriate for an open collaborative decision-making process. For example, the planning process might involve legal duties to consult Tribal nations native to the area, which would be a government-to-government process and should be considered separately from community engagement. The MRCs and planning organizations should differentiate between legally-obligated consultation regarding Indigenous rights and sovereignty and collaboration with Indigenous peoples, other diverse communities, and intersecting identities and perspectives within those groups.[246]

SWOT Analysis

In order to assess the effectiveness of the 2012 CAP, we developed a Strengths, Weakness, Opportunities, Threats (SWOT) analysis for the 2012 CAP that synthesizes research reflected in our literature review. This analysis guides recommendations that can be found in *Chapter 6*.

[246] Simon Fraser University's Morris J. Wosk Centre for Dialogue. (2020). Beyond Inclusion: Equity in Public Engagement.

Strengths	Weaknesses
• Collaboration between government agencies and NGOs	• Unclear strategies to monitor and evaluate delegated responsibilities • Challenges with long-term coordination and tracking of progress • Limited engagement of the general public (non-scientists) in the planning process • Holistic community values underrepresented • Species and/or habitats identified as CAP targets might not be the most relevant or effective for stewardship efforts
Opportunities	**Threats**
• Incorporation of local traditional knowledge • Adopting an environmental justice lens by assessing environmental impacts on people and being informed on regional environmental justice actions • Building authentic partnerships with BIPOC and low-income communities • Policy engagement with elected officials (local and state)	• Exclusion of sociocultural and economic community interests • Overreliance on "expert" knowledge in target assessment and monitoring • Discontinuity between targets, threats, and proposed actions

Strengths

The strongest aspect of the 2012 CAP was its organizational collaboration. A member from the Snohomish County MRC and a staff member from the Tulalip Tribe lead the CAP development which included a variety of stewardship volunteer programs; environmental non-governmental organizations; relevant local, state, and federal agencies; and the Tulalip and Stillaguamish tribes. The figure presented in the *involved parties in the 2012 CAP* section above shows parties involved denoted by a direct line to the MRCs (Figure 32 above). Those involved also differed from both Island and Snohomish County MRCs' personnel composition, which allowed the CAP to cover different aspects of the ecological system, engage with experts, and incorporate local input through public workshops and a community science project.[247] For those who were involved, the CAP process was intensive and collaborative, however, it did not involve the full swath of organizations or individuals with ties to Port Susan.

As a variety of ecological experts and government employees were involved in the CAP's development, the conservation targets were likely influenced by topics of future projects of the respective organizations and agencies. The subsequent collaborative target determination should

[247] The community science project was originally called a "citizen science project," but recently there has been a shift to the more inclusive term "community science" project.

not be mistaken for capturing the Port Susan system holistically (discussed further below); however, the process did result in conservation targets that were poised for action on various scales.

Weaknesses

Many of the weaknesses of the 2012 CAP are rooted in the limited representation of community values in strategic actions. Additionally, for those who were involved, strategies were largely ineffective at monitoring progress over time. The following details these factors and includes consideration for how to improve upon such weaknesses.

Unclear Strategies to Monitor and Evaluate Delegated Responsibilities

One of the primary limitations of the 2012 Port Susan CAP is a lack of specificity in how the proposed strategic actions, in which there are over 30, will be monitored and evaluated. The CAP identified partner organizations responsible for each strategic action, as well as listed action steps to reach the conservation goals outlined in the plan. However, the mechanism for how these action steps would be shared with partner organizations and monitored over time was unclear. Due to limited capacity of the MRCs, the authors recognized the need to rely on the cooperation of partner organizations and the community to implement the plan, but details on how these efforts would be coordinated and over what timescales were lacking.[248] This makes it difficult to track progress across the various groups and potentially creates an environment for duplicative work. It also does not promote consistent assessment over time, which limits the capacity of the CAP to achieve its goals in the long-term.

Limited Public Engagement

Another limitation of the CAP is related to broader community involvement, particularly in how this plan is situated within the unique needs and priorities of the local community. The CAP methodology reflected a variety of efforts to include members of the public in the planning process, including four public outreach workshops and citizen science volunteer opportunities. Within workshops, situation diagrams and results chains were developed collectively, though the process would have benefited from more participatory exercises. For those who were involved, this collaborative process worked well to generate feedback and incorporate additional considerations for the biological targets and threats. The resulting material outlined in the CAP suggests that these public forums prioritized a scientific, western perspective and thus may not have captured other perspectives or forms of knowledge. It is important to acknowledge how the broader factors of power within these community spaces impact who is willing to participate and share information and who may be left misrepresented or rendered silent altogether.[249] Furthermore, for conservation planning and implementation to be effective, it is pertinent to first understand the role conservation plays within the social, economic, and cultural context of the

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[248] Massaua, M., et al. (2012).

[249] Cram, F., & Adcock, A. (2021). Indigenous Ways of Knowing and Participatory Research. *The SAGE Handbook of Participatory Research and Inquiry*, 108.

local community.[250] This includes conversation related to how people value natural resources, how they want those resources to be managed, and how they are affected by those resources and related decisions.[251]

Targets Represented a Limited Range of Community Values and Interests

The lack of human dimensions in the 2012 CAP is further manifested in the selection of the conservation targets, which prioritize biological systems. TNC's Conservation Action Planning framework was designed to be flexible enough so that collaborative bodies can fit the plan to their localized needs. In this, groups designing a CAP must define their conservation targets, which are "a limited suite of species, communities, and ecological systems that are chosen to represent and encompass the full array of biodiversity found in a project area."[252] In theory, if these targets are truly representative of the local ecological system, then conservation efforts will be more successful.

From this perspective, a key limitation of the 2012 CAP is that the species and habitats identified as targets in the CAP might not have been the most relevant targets for local decision-making processes. Though these biological species and ecosystems do serve important ecological functions, they might not be the most relevant or effective targets when assessing the health of the whole Port Susan socioecological community. For example, shorebirds provide enjoyment, are culturally important, and can serve as an indicator of ecosystem health. Selecting a species that is identifiable by the community, is a part of an existing monitoring program, and will likely be affected by climate change would allow future planners to better connect human values and ecological processes to policy decision making. Both the brant (*Branta bernicla*) and dunlin (*Calidris alpina*) – the latter of which was included in the 2012 CAP – could fit this description.[253,254] However, further community engagement would be needed to select the most socially and ecologically-relevant target species.

Species and habitats also provide important ecosystem services to human populations. Understanding how these services impact different people, vary spatially, and support the health of the whole system can help inform more targeted stewardship practices. One salient model for designing and implementing an ecosystem services assessment that is equitable and relevant to decision makers is presented in Figure 35.[255] An ecosystem services assessment should detail all aspects of the Ecological Production Function, including physical place attributes and ecosystem processes, and the Socioeconomic Utility Function, which includes biophysical services that improve human wellbeing and human values. All institutions and actors involved and decisions relevant to the process should be made explicit. Mediating factors – or barriers that hinder people

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[250] Bartuszevige, A. M., Taylor, K., Daniels, A., & Carter, M. F. (2016). Landscape design: integrating ecological, social, and economic considerations into conservation planning. *Wildlife Society Bulletin*, *40*(3), 411-422.

[251] Bartuszevige, A., et al. (2016).

[252] The Nature Conservancy. (2007). *Conservation Action Planning Handbook.* *https://conservationstandards.org/wp-content/uploads/sites/3/2020/10/Cap20Handbook_June2007.pdf*

[253] Michel, N. et al. (2021).

[254] Wilsey, C. et al. (2019).

[255] Mandle, L. et al. (2021). *Increasing decision relevance of ecosystem service science.* Nature Sustainability, 4, 161-169.

from realizing the benefits of ecosystem services, factors that enhance ecosystem services, and factors that transform biophysical services into something of human value – should also be included. Finally, in order to realize distributional and procedural equity through this process, demographic data should be disaggregated and community members should be directly involved in the design of the assessment itself. All in all, what is considered relevant or effective should be defined by community member's values, as species-specific, ecosystem, and sociocultural targets can all help shape management decisions that have tangible impacts on local wellbeing.

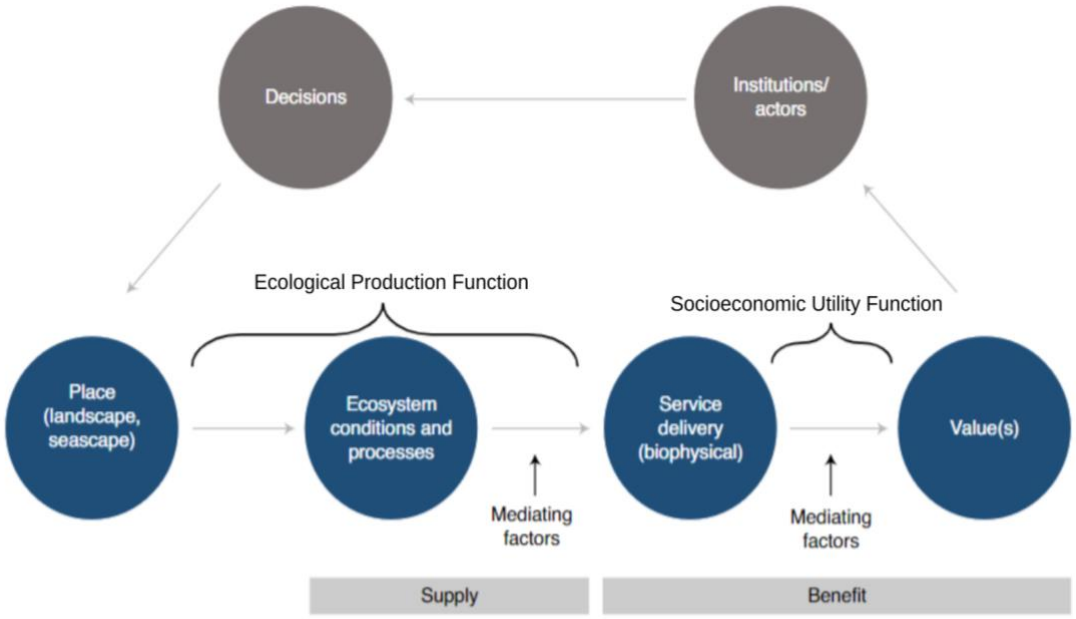

Figure 35: Modified Ecosystem Services Chain Model[256]

Opportunities

In assessing opportunities for improving both the planning process and the content outlined in the 2012 CAP, our team sought to base our assessment on a decolonizing framework focused on environmental justice. It is critical to acknowledge how individual identities and values, methods of data collection, methods of analysis, theoretical frameworks, structural and relational hierarchies can all privilege the narratives of dominant cultures; shape outcomes of conventional research and planning processes; and further exclude the ways of knowing and seeing of marginalized communities.[257]

The diagram below (Figure 36) depicts some of the ways injustices continue to show up in conventional conservation science and practice, which ultimately impacts the kinds of policy and programmatic responses that are created to address these issues. Addressing areas identified

[256] Mandle, L. et al. (2021).
[257] Chilisa, B., & Tsheko, G. N. (2014). Mixed methods in Indigenous research: Building relationships for sustainable intervention outcomes. Journal of Mixed Methods Research, 8(3), 222-233.

in Figure 36, including nature-based definition of conservation success and structural barriers, could help Port Susan MSA's conservation and stewardship efforts be more equitable and relevant for local communities.

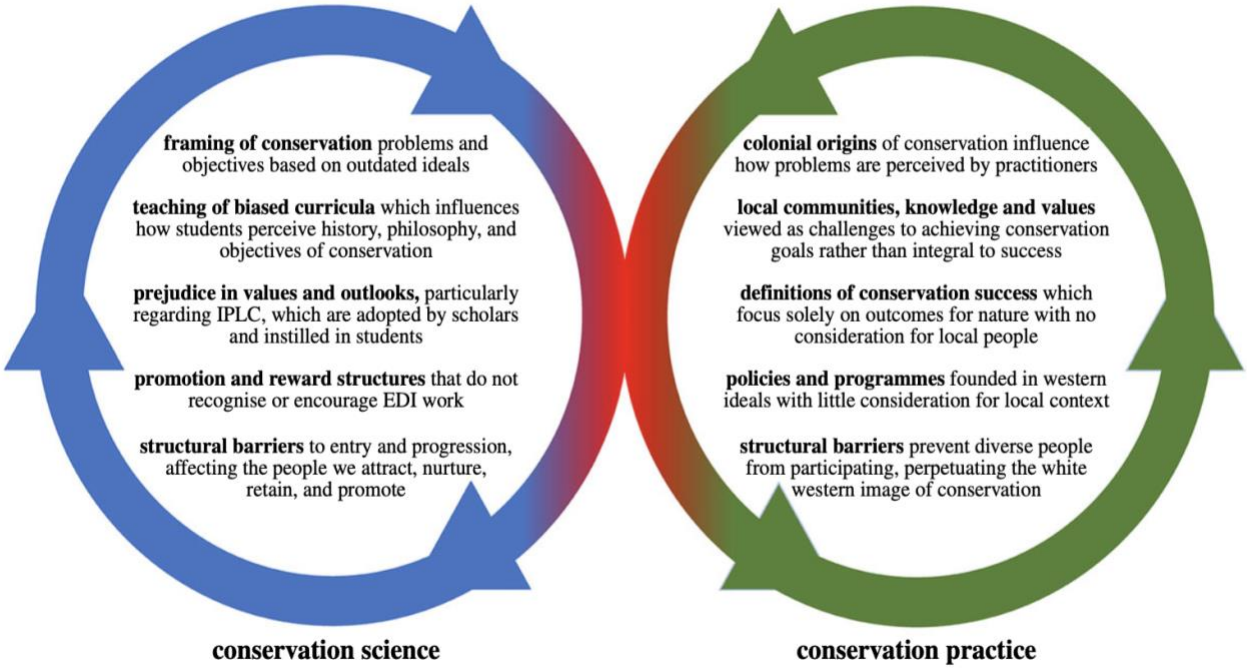

Figure 36: Conservation Science and Conservation Practice Spheres[258]

Environmental Justice

Survey results presented in *Chapter 3* showed that *environmental justice* and *human wellbeing* were considered the fourth most important topics out of twelve potential issue areas for the CAP. However, the 2012 CAP did not explicitly address environmental justice or human wellbeing issues and thus there is an opportunity for further work in these areas.

At the 2019 Salish Sea Equity & Justice Symposium, Sean Watts described traditional environmentalism as work to protect nature from people; and environmental justice as work to protect people from human-degraded nature.[259] Environmental efforts rooted in protecting people from human-generated environmental harm require addressing the human systems that contribute to those environmental impacts, understanding how those impacts disproportionately affect BIPOC communities, and working with those communities to find culturally-appropriate, sustainable, and equitable solutions.

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[258] Rudd, L. F., Allred, S., Bright Ross, J. G., Hare, D., Nkomo, M. N., Shanker, K., ... & Dávalos, A. (2021). Overcoming racism in the twin spheres of conservation science and practice. *Proceedings of the Royal Society B*, *288*(1962), 20211871.

[259] Watts, S. (2019, November). Bridging the great divide: Reconciling environmental justice and traditional environmental movements [Conference presentation]. Salish Sea Equity & Justice Symposium, Seattle, WA. *https://www.youtube.com/watch?v=fg5XMX8Uxqw*

The questions below aim at highlighting opportunities for equitable improvements in the conservation practices of the 2012 CAP:

1. Were the conservation practices based solely on outcomes for nature? To what extent did they consider outcomes for the local community?
    a. Who are the conservation targets aiming to benefit?
    b. How do the local communities relate to the Port Susan MSA (i.e. their "sense of place," place-based identities, and practice-based and meaning-based attachment?) [260]
2. Were the policies and programs framed by western ideals?
    a. Whose perspectives are missing from the planning process?
3. What are the structural barriers that prevent diverse people from participating in the CAP process?

Relevant Case Studies

Traditional Knowledge and Cultural Resource Assessment in Marine Protected Areas[261]

The Makah Tribe conducted a traditional knowledge and cultural resource assessment and built a preliminary framework to consult traditional knowledge in climate change planning. The program highlighted desired outcomes of culturally appropriate planning strategies and objectives that aligned with community values.[262] Translating climate science and impacts into place-based and culturally relevant dialogue helps to bring communities into the conversation. An important distinction to note is that the process was Makah community-led. The report outlined approaches to reduce inherent ethical challenges of Traditional Knowledge-Western Science collaborations, which may be relevant for the Port Susan MSA planning process moving forward:

> "…emphasizing a broader acceptance of different types of knowledge systems, ontologies, and epistemologies and their methods of transmission; directly addressing how scientific research is an extension of colonialism; and gathering TK through mutually agreed upon methods and frameworks."[263]

Incorporating traditional and Indigenous knowledge in the planning process needs to be based on free, prior, and informed consent of the Indigenous individuals and communities. The MRCs should acknowledge different worldviews and create meaningful opportunities for diverse knowledge systems to be incorporated while respecting Indigenous communities' rights to their intellectual and traditional knowledge.

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[260] Poe, M. R., Donatuto, J., & Satterfield, T. (2016). "Sense of place": Human wellbeing considerations for ecological restoration in Puget Sound. *Coastal Management*, *44*(5), 409-426.

[261] Bush, O., Master of Environmental Studies at the Evergreen State College. (2014). Incorporating Tribal Interests in Marine Protected Areas: Case Studies of Treaty Tribes on the Washington Coast. Evergreen State College. *https://archives.evergreen.edu/masterstheses/Accession86-10MES/Bush_OMESthesis2014.pdf*

[262] Makah Traditional Knowledge and Cultural Resource Assessment: A preliminary framework to utilize traditional knowledge in climate change planning – PSF. (2020). Parks Stewardship Forum - Berkeley. *https://parks.berkeley.edu/psf/?p=1706*

[263] Ibid.

Equitable Partnerships and Community Empowerment [264]

A program established by Public Health-Seattle & King County (PHSKC) conducted a community capacity building process to train local Community Health Advocates to explore solutions to protect community health and address environmental justice issues in the Lower Duwamish Superfund Site.[265] The process addressed barriers that prevented community voices from being heard in decision-making.[266]

Regional Actions in Environmental Justice

Washington State Environmental Justice Council

The Healthy Environment for All (HEAL) Act of 2021 (WA SB 5141) created the foundation for a statewide Environmental Justice Council (EJC).[267] This council convened for the first time on April 4th, 2022, under the mandate to advise environmental agencies "on incorporating environmental justice into agency activities".[268] Though the Snohomish and Island County MRCs are not directly included as agencies within the EJC's purview, MRC partners are represented in the council as agencies required to comply with EJC actions, agencies opting to be informed on the process, and as councilmembers themselves.[269] These partners include:

- *Agencies required to comply* - Department of Natural Resources, Department of Health, Department of Ecology, and the Puget Sound Partnership
- *Agencies opting to be informed* - Department of Fish and Wildlife
- *Councilmembers* - Misty Napeahi, Vice Chair of the Tulalip Tribes

Other agencies that are required to comply with the process include the Department of Transportation, Department of Agriculture, and the Department of Commerce. The Attorney General's office has volunteered to comply with the process, and the Recreation and Conservation Office and the State Board of Health have opted to be informed of future activities.

By July of 2022, the EJC is anticipated to produce an Equitable Community Engagement Plan, which will serve as a guidebook for best practices for community engagement. This plan will be implemented by all agencies mandated by the HEAL Act to be involved in the EJC and will be a resource for those opting into the process. The EJC will also create guidelines for how agencies should incorporate environmental justice into agency strategic plans, and budget and funding

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[264] María Cárdenas, L., Maceda, E., & Tran, B. (2019, November). Equitable Partnerships and Community Empowerment: Building a Health Promotion Program to Advance Environmental Justice in the Lower

[265] Duwamish Superfund Site [Presentation]. Salish Sea Equity & Justice Symposium, Seattle, United States. *https://www.youtube.com/watch?v=8cGMJYEuBsw*

[266] Ibid.

[267] Washington State Legislature. 2021. SB 5141 - 2021-22: Implementing the recommendations of the environmental justice task force. *https://app.leg.wa.gov/billsummary?BillNumber=5141&Year=2021&Initiative=False*

[268] 67th Legislature. 2021. ENGROSSED SECOND SUBSTITUTE SENATE BILL 5141. *https://lawfilesext.leg.wa.gov/biennium/2021-22/Pdf/Bills/Senate%20Passed%20Legislature/5141-S2.PL.pdf?q=20220409194435*

[269] WA State Department of Health. 2022. Environmental Justice Council Meetings. *https://waportal.org/partners/environmental-justice-council/environmental-justice-council-meetings*

decisions. Finally, the EJC will conduct environmental justice assessments of all included agencies. As the MRCs pursue action for the Port Susan MSA with key partners, it will be important to understand how partners will be affected by environmental justice mandates. Furthermore, EJC outputs could create guidelines for best practices that the MRCs could directly implement in partner meetings, workshops, and community engagement activities.

Threats

Whether the MRCs decide to update the 2012 CAP and/or move forward with an alternative planning process, key threats to effectively stewarding the Port Susan MSA should be addressed. These include the exclusion of sociocultural and economic community interests, an overreliance on "expert" knowledge in target assessment and monitoring, and discontinuity between targets, threats, and proposed actions.

Exclusion of Sociocultural and Economic Interests

The 2012 CAP excluded diverse social, cultural, and economic targets. Human communities, just as much as other species targets, are an integral part of the ecological system that makes up Port Susan. If the CAP is intended to measure local stewardship effectiveness, then the question that must be asked is – *effective stewardship for whom*? In other words, who benefits from CAP implementation? The conservation targets of the 2012 CAP suggest that some people intrinsically value the ecological health of the Port Susan MSA. However, other valuations of the local environment are excluded, which might reflect who was invited to be at the CAP planning table, who could and wanted to attend, and who was considered a source of valid knowledge.

As discussed in *Chapter 4*, studies suggest that opening up a discussion on sociocultural targets can lead to increased engagement in the planning process, decreased negotiation transaction costs, and can support more equitable outcomes overall.[270] By including more targets that reflect the interests of community members, people are more willing to support the process and be directly involved in long-term implementation. Alternatively, if people and their interests are excluded from the process, this could increase internal and external tensions and transaction costs and reduce the overall effectiveness of collaborative stewardship. This is especially important given that the Port Susan MSA is a non-regulatory designation and relies on community efforts and institutional relationships to be successful. All in all, not including diverse community voices and interests in MRC planning processes undermines and threatens the short- and long-term effectiveness of Port Susan collaborative stewardship efforts.

Over Reliance on "Expert" Knowledge

Throughout the 2012 CAP, "expert knowledge" is drawn upon as the basis for viability rankings and other planning decisions.[271] However, who is providing this knowledge is largely left undefined, with the exception of one descriptor of "scientific and technical experts".[272] Based on the list of original participants, it is likely that these anonymous experts drew from the western

[270] Evans et al. (2008).
[271] Massaua, M. et al. (2012).
[272] Ibid.

scientific fields of ecology, biology, fisheries, and other biophysical sciences. It is unclear if local knowledge was regarded as "expert knowledge," and Traditional Ecological Knowledge (TEK) seems to be limited throughout the CAP – especially given only one tribal elder was directly involved.

Though there might be valid reasons why such experts were kept anonymous, not defining who is considered an expert and what forms of knowledge are included in that category could threaten the credibility, transparency, inclusivity, and overall effectiveness of CAP strategies. For example, of the 38 indicators of viability for CAP targets, 53% were based on "expert knowledge," 32% were unspecified or left blank, 11% were a "rough guess," and 5% were based on "onsite research." All of these categories are undefined and do not include citations of specific sources. This lack of transparency creates barriers for future efforts to build upon 2012 CAP methods, as the rationale for and source of rankings is not shared.

Additionally, it is possible that one of the reasons so many indicators were left blank was because of the limitations of expert knowledge. At one point, it was noted that "less input from experts left the viability of the individual KEAs currently unspecified. Viability will be re-examined in the future, upon further consultation with experts." Instead of seeking to include knowledge from other valid knowledge holders, like those with local knowledge and TEK, this overreliance on expert knowledge impeded the process from moving forward.

In future planning processes, scientific and technical experts should still be involved, but it is also essential that other sources of knowledge are regarded as valid and are respected throughout the process. Diversifying knowledge sources and being transparent about criteria in decision making can increase people's trust in the process. Lastly, developing a system to address uncertainties over time - such as through adaptive management - can reduce the burden on participants to present immediate answers while ensuring effectiveness in the long run.

Discontinuity in Conservation Strategy Development and Prioritization

Conservation strategy development focused on addressing critical threats and restoring degraded conservation targets. Initial strategies consisted of (1) an objective stating the desired outcomes, (2) strategic actions to achieve the objective, and (3) an opportunity rank for each strategic action. Once two to four conservation strategies were developed for each conservation target, 22 strategic actions were selected for the Conservation Work Plan and Measures Plan, where action steps and indicators were determined for each of the selected strategic actions.

As seen in *Beaches – Threat Rankings*, the top five threats to the Port Susan system are bank hardening, levee maintenance, agricultural runoff, loss of vegetative buffer, and increased flooding; however, only 10 of the 22 strategic actions prioritized addressed these threats (levee maintenance was not addressed at all). Additionally, the shorebirds, Dungeness crab, and beaches conservation targets had high threat levels associated with non-top five threats:

- Shorebirds - Spills
- Dungeness crabs - Acidification, Derelict Gear, and Illegal Harvest
- Beaches - Increased Storm Events

Out of these threats, four of five were addressed in the prioritized strategic actions, although not always under the corresponding conservation target (i.e. acidification concerns were addressed in the prioritized embedded invertebrate target). In total, these four threats were addressed in 5 of the 22 actions. With this information, we can conclude that 15 of the 22 prioritized conservation strategies (via strategic actions) addressed high level threats to the Port Susan ecosystem, or about 68% (Figure 37).

In addition to threats, conservation strategies aimed to address conservation targets with poor viability overall or specific key ecosystem attributes (KEAs) ranked as poor (see *Developing Strategies and Measures* for target viability measures and *Viability Ranking* for KEA definitions). Three conservation targets had KEAs ranked as poor (see below), and the River Delta conservation target was determined to be poor overall.

- River Delta (Poor Viability)
    - Landscape Context
    - Condition
    - Size
- Chinook Salmon (Fair Viability)
    - Landscape Context
- Beaches (Fair Viability)
    - Condition

Figure 37: Summary of Action Prioritization in the 2012 CAP

Of the strategic actions prioritized by the 2012 CAP, only one action addressed a poorly ranked KEA (measure of viability), specifically part of the Chinook salmon's Landscape Context KEA which was defined as the percent of non-armored shoreline. Interestingly, as this KEA relates to concerns with bank hardening, this strategic action was under the Beaches/Forage Fish conservation strategies and is accounted for in the 68% of actions addressing high threat levels mentioned above.

Unfortunately, only five of the strategic actions have been addressed through either capital projects or initiatives (23%). Of these five, two actions directly addressed major threats to the system (bank hardening and loss of vegetative buffers) and one addressed a high-level threat to Dungeness crabs (derelict gear), or 14% of strategic actions. The other two strategic actions focused on improving landowners' awareness of environmental stewardship and water quality concerns and promoting local sustainable seafood in communities surrounding Port Susan.

Chapter 6: Recommendations

Based on our analysis, we propose the following recommendations for Island County and Snohomish County MRCs to consider as they continue to explore and develop a plan for the Port Susan Marine Stewardship Area. We understand that the MRCs are exploring the possibility of either providing updates to the 2012 CAP framework or pursuing an alternate strategy. As such, we offer several recommendations related to potentially different outcomes. The first section of our recommendations include strategies that we encourage the MRCs to consider regardless of what strategy is pursued. The second section includes opportunities for improvement related to the current CAP's content and process. Finally, the last section of recommendations explores alternate stewardship strategies for Port Susan.

Overarching Recommendations

Plan for Equitable and Meaningful Community Engagement

The 2012 CAP reflects a comprehensive strategy for targeted action to protect, conserve, and restore critical species and habits in order for the Port Susan ecosystem to thrive. Although the planning process included stakeholders at various stages, our findings revealed that the social considerations that underpin Port Susan were not conveyed in meaningfully and clear ways.

We recommend that, as the MRCs consider a path forward to achieve their goals for Port Susan, a more place-based, equitable approach be implemented to ensure community values, needs, and aspirations are reflected throughout future conservation planning and decision making. A place to start could be to use the community engagement analysis in *Chapter 5* along with the probing questions below to help identify whose perspectives should be invited into the planning and decision-making processes.

- What are the patterns of influence between the parties involved with the planning process and communities impacted by or relevant to the conservation and stewardship issues?
- Of the communities that are impacted by or relevant to the conservation and stewardship issues, which ones are included in the planning process and which are not?
- What are the potential unintended impacts of the plan on local and relevant communities?
- Are communities that have been historically and systematically excluded from recreational and conservation spaces included in this process?
- What are the different parties' levels of interaction in the process, are there any inequitable patterns?
- Are there any constraints on relationships like different interests, bottom line, positionality, depth of commitment, pressures faced, circle of influence etc.?
- Are community inputs meaningfully incorporated in the planning and implementation processes?

As non-local consultants, we recognize our limitations on local community knowledge and dynamics. The MRCs should consult communities identified for recommendations on any missing perspectives that would be important to include. Next, the MRCs should organize several local knowledge-building workshops to answer overarching questions related to the community's relationships with the area, use of natural resources, and the goals/visions they have for the future related to Port Susan's coastal environment. This process generates a more nuanced, context-specific perspective and allows for multiple ways of understanding and categorizing relationships between people and nature.[273] This is based on our analysis related to the growing awareness that the co-development of knowledge among scientists and stakeholders is indispensable in successful integrated planning, as it presents an opportunity to combine the wealth of visions and values of the local community with the goals for conservation of natural resources.[274]

The MRCs should use a variety of participatory tools to equitably engage community members before, during, and after the planning process. As mentioned in *Research Design* and *Chapter 5 - SWOT Analysis*, public engagement tools for past and current MRC planning efforts have included public workshops, citizen science training and volunteering opportunities, creating situation diagrams and results chains in workshops, and surveys and interviews with members of the original planning group. For future planning efforts, we recommend that the MRC's employ a range of participatory tools to achieve equitable, inclusive, and representative outcomes. Additional promising tools that the MRCs could feasibly implement are depicted in Table 2 below, along with key considerations for using each tool.

[273] Díaz, S., Pascual, U., Stenseke, M., Martín-López, B., Watson, R. T., Molnár, Z., ... & Shirayama, Y. (2018). Assessing nature's contributions to people. *Science*, *359*(6373), 270-272.)

[274] Wyatt, K., et al. (2021).

Table 2: This table captures a wide range of participatory tools that the MRCs could use to engage community perspectives equitably and meaningfully in the planning process. The participatory mapping, scenarios development, spidergram, 4Rs, and who counts tools[275]

Tool	Description of the tool	What is an appropriate setting to use this tool?	Does this tool help planners identify which stakeholders should be included in the planning process (Yes/No)?	What level of facilitation is needed to use this tool (low, medium, or high)? Can community members implement this tool themselves (Yes/No)?	End Product
Participatory Mapping	Individuals or groups draw out spatial relationships, which can then be digitized and mapped using software like GIS or InVest.	Participatory mapping is best developed in a group or workshop setting. Maps should be iteratively developed to accurately reflect relationships.	No	Medium - some guidance needed, and technical experts recommended for digitization Yes - can feasibly be community-driven	Maps capturing spatial, quantitative, and qualitative information
Scenarios Development	Collaboratively developed future scenarios, or options for moving forward. Scenarios could be centered in different visions for future action, projected scenarios depending on actions taken, pathways scenarios for strategic planning, and alternative scenarios that consider tradeoffs and uncertainty.	All aspects of scenario development are best developed in groups and workshops.	Depends on the application	Medium - some guidance needed Yes - can feasibly be community-driven	Stories, drawings, and diagrams
Spidergrams	Visually represents the attributes and dimensions of a research question through branching logic.	Can be used by individual planners and in a group or workshop setting.	Depends on the application	Medium - some guidance needed	Diagrams and tables

[275] Lynam, T., Jong, W., Sheil, D., Kusumanto, T., and Evans, K. (2007). A Review of Tools for Incorporating Community Knowledge, Preferences, and Values into Decision Making in Natural Resources Management. *Ecology and Society* 12(1): 5.

		Working through a spidergram can help generate discourse.		Yes - can feasibly be community-driven	
4Rs: Respective rights, Responsibilities, Returns, and Relationships	This analytic framework assesses the relative balance of power between stakeholders regarding relationships and responsibilities	An evaluator can synthesize 4Rs information before planning processes, and/or the 4Rs can be developed in a group or workshop setting	Yes	High - need a skilled facilitator Yes - community members can be trained to implement this tool themselves	Tables
Who Counts	Identifies people and communities whose wellbeing is related to management activities and ranks them based on proximity to ecosystems, pre-existing rights, dependency on the ecosystem, poverty, local knowledge, socio-ecological integration, and power deficits.	Can be used by individual planners working collaboratively with different people, or in a group or workshop setting	Yes	Medium - some guidance needed on scoring methods Yes - can feasibly be community-driven	Tables and matrices
Educational Offerings	Create opportunities to engage with a targeted audience around a specific topic. For example, the Northwest Straits Foundation hosts a Shore Friendly Workshop for Waterfront Owners.[276]	Can be a valuable offering for stakeholders that lead to further engagement. Can be used in conjunction with other participatory tools.	Yes	Medium - some organization and facilitation needed Yes - once core community members are involved, they could organize workshops to further engage others	Increased community engagement and knowledge

[276] Northwest Straits Foundation. (2021, May 3). *Shoreline Landowner Workshops and Webinars | NWStraitsFoundation.org*. NWStraitsFoundation.Org | Partners in Marine Conservation. *https://nwstraitsfoundation.org/project/shoreline-landowner-workshops/*

Promote Environmental Justice

For more equitable conservation and stewardship outcomes, we recommend first reflecting on areas of the CAP that could be more inclusive of diverse perspectives and experiences. The Opportunities analysis section in Chapter 5 detailed environmental justice considerations and offered the following guiding questions to help evaluate inherent biases and perspectives centered in the planning processes.

1. Are the conservation practices based solely on outcomes for nature? Who are the conservation targets aiming to benefit?
2. To what extent do the conservation practices consider outcomes for local and relevant communities?
3. Are the policies and programs framed by western ideals and ontologies?
4. Whose perspectives are historically or systematically excluded from conservation spaces and missing from the planning process?
5. What are the structural and systemic barriers that prevent diverse people from participating in the CAP process?

Ideally, these questions would be considered at the beginning of the project scoping phase and adjustments to the project focus would be made to be more inclusive in conjunction with the community engagement recommendations. We recognize that assessing and possibly adjusting priorities of the plan could entail a lot of work. The current review process of the CAP presents an opportune time to align priorities with environmental justice considerations and community needs. A more inclusive and community-based plan would ultimately lead to a more successful stewardship effort.

The following recommendations present additional opportunities to incorporate environmental justice practices into the CAP.

Join the Washington State Environmental Justice Council's (EJC) Interagency Work Group in a "Listen and Learn" Capacity

The EJC is WA State's most dedicated effort yet toward implementing environmental justice best practices within environmental agencies and organizations. Many of the MRC's partners are required to comply with the process through the Interagency Work Group, while others have volunteered to be involved in different capacities or are council members themselves. Since we recognize that the MRCs are groups of voluntary members and are limited in capacity, we understand how it might be infeasible for the MRCs to opt in to being consistently involved in the Work Group. However, we believe the MRCs should at a minimum be involved in a "listen and learn" capacity. This means that members of the MRCs would attend all monthly EJC public meetings and have the option to submit public comments, would review published documents, and would implement some or all environmental justice best practices recommended by the council.

To receive updates on EJC meetings and publications, the MRCs should contact EJC staff and subscribe to receive email updates.[277,278]

Review and Make Actionable Guidelines from EJC's Equitable Community Engagement Plan

The EJC's Equitable Community Engagement Plan is expected to be published in July 2022 and is intended to serve as a guide of best practices for environmental agencies and community organizations. The timing of this publication aligns well with Phase II of the MRC's timeline, which is scheduled to begin in October of 2022. We recommend that the MRCs and ESA consultants fully review the plan and integrate it into Phase II community engagement plans. Furthermore, if stakeholder meetings are still being held by the time the report is published, the MRCs should bring these best practices into these meetings. Lastly, the MRCs should collaborate with partner agencies who are involved in the EJC process to implement best practices from the plan across organizational and community boundaries.

Enhancements for the 2012 CAP Framework

Revisit Conservation Targets and Threats

As presented in *Chapter 4*, a variety of new information and knowledge has emerged since 2012 regarding the Port Susan system. As such, we recommend this new information is used while revisiting CAP elements such as the conservation targets, threats, and conservation strategies (see Table 3, New and Relevant Information). We also recommend that the MRCs incorporate considerations regarding climate change, SLR, and ocean acidification to CAP elements, as these three threats continue to pose a significant threat to the Port Susan system and will likely continue to increase in severity. While these three threats impact the entire system, they threaten the beaches, Dungeness crab, and embedded invertebrates the most, and thus should be reassessed for those specific conservation targets.

Additionally, stewardship and recovery efforts have continued throughout the Puget Sound that should be reviewed by the MRCs to inform action in Port Susan (see Table 3, Using Existing Efforts to Inform Action). While reviewing said efforts, the MRCs should identify where long term goals are aligned and/or where the MRCs could provide increased capacity or further the actions in Port Susan. Lastly, while the understanding of the Port Susan, and broader Puget Sound, has increased over the past 10 years, we recommend a host of actions the MRCs could conduct to increase awareness and understanding of the conservation targets and/or improve stewardship, especially if continuing with the CAP process used in the 2012 CAP (see Table 3, Actions to Improve Understanding and/or Stewardship).

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[277] Washington State Department of Health. 2022. Environmental Justice Council Staff. *https://waportal.org/partners/environmental-justice-council/environmental-justice-council-staff*

[278] Washington State Department of Health. 2022. Environmental Justice Council Meetings. *https://waportal.org/partners/environmental-justice-council/environmental-justice-council-meetings*

Table 3: Compiled List of New and Relevant Information to Consider when Revisiting 2012 CAP Elements

Conservation Target	New and Relevant Information	Using Existing Efforts to Inform Action	Actions Improving Understanding and/or Stewardship
River Delta	New indicators to consider: o Elevated stream temperatures o Fecal coliform bacteria o Fine sediment and nutrients levels	• Snohomish County SLS to identify aligned stewardship actions and areas where MRCs could increase capacity • Mirror King County Clean Water Healthy Habitat monitoring strategy	Develop socio-cultural strategies to incentive communities to engage in long-term partnerships
Chinook Salmon	New indicators to consider o Each distinct population o Food-web dynamics o Sociocultural well being linked to salmon	• Tulalip and Stillaguamish tribally-led Chinook salmon recovery actions (e.g. Stillaguamish Watershed Chinook Salmon Recovery Plan and hatchery practices) • 2021 Salish Sea Marine Survival Project • Utilize NOAA's regularly updated GIS database on changing juvenile Chinook salmon carrying capacity in Puget Sound estuaries[279]	• Prioritize relationship-building with Indigenous Tribes • Create respectful and consistent communication networks between MRCs and the Tribes • Partner with relevant agencies and organizations to measure ecosystem services generated by thriving Chinook salmon populations

[279] NW Fisheries Science Center. (2022). *Estuarine chinook capacity - Estimating changes in juvenile Chinook rearing area and carrying capacity in estuarine and freshwater habitats of the Puget Sound region.* NOAA.

Beaches	• Newly updated Island County and Snohomish County Shoreline Master Programs • Island County Hazard Mitigation Plan (2020 revision will include updated SLR projections)	• WDNR's Shore Friendly program for educational materials and outreach • 2019 Friends of the San Juans' inventory of shoreline modifications	Conduct an evaluation on existing permitting compliance along Port Susan shorelines
Forage Fish	• Align forage fish and salmon recovery as forage fish are a critical input to salmon recovery • Puget Sound Partnership's Vital Signs - Forage Fish	Utilize Island and Snohomish Counties SMPs to leverage importance of shorelines for forage fish spawning	Coordinate with local fisherpeople and WDFW to update stock assessments (sand lance, surf smelt)
Dungeness Crab	Consult with the Pacific Northwest Crab Research Group and invite collaboration on improving Dungeness crab science and management with MSA stewardship effort.	• Pacific Northwest Crab Research Group for population and larval data • Washington Sea Grant's Green Crab Monitoring Program to aid in stewardship outreach	Advocate for real time data collection from catch record card system to improve adaptive management abilities

Embedded Invertebrates	WDNR 2015 sand shrimp population assessment to define viability KEA baseline	Work with the Tulalip Tribes and WDNR's ANeMoNe team to install an acidification monitoring site within Port Susan	Work with WDFW and the Tulalip Tribes to conduct a varnish clam population assessment
Shorebirds	Audubon Society's Avian Habitat Suitability Models for Puget Sound Estuary Birds	• Audubon Society's Puget Sound Conservation Strategy • Puget Sound Partnership's Puget Sound Ecosystem Monitoring Project • Cornell Lab of Ornithology's eBird platform	Implement the Avian Monitoring Strategy recommended by the Stillaguamish Tribe and the Audubon Society

Revise Viability Indicators for Conservation Targets

The 2012 CAP measured conservation targets' viability (health) by defining three key ecosystem attributes (KEAs) – landscape context, condition, and size. These three KEAs were defined specifically for each target and then given a viability ranking (see *Viability Rankings* for full description of viability process). However, three conservation targets had one undefined KEA, one of these was still given a viability ranking (Chinook salmon - Size) and the other two were not given viability rankings (Shorebirds - Landscape Context; Dungeness Crab - Landscape Context). On the other hand, all three KEAs for Embedded Invertebrates were defined, but were not given viability rankings. Of those without viability rankings, there was either no data presented in the CAP's Appendix B: Viability Table, or they were listed as known data gaps. Besides the acknowledgement of data gaps, there does not appear to be an effort to identify the several unknowns. Without information on how to measure the health of conservation targets, it will be difficult to determine if any improvements, or further degradation, have occurred.

To address this, we recommend the MRCs and their management partners ensure health or viability indicators are (1) defined for all conservation targets and (2) have relevant metrics identified to properly track the progress of conservation efforts in Port Susan. If a health indicator is defined

and the relevant metric is not readily available (a likely possibility), then determining the status of the health indicator should be a top priority.

Incorporate Sociocultural Conservation Targets

As previously outlined, *Chapter 4* addresses the importance of social science and social targets in marine stewardship planning and describes several frameworks that can be used to develop culturally responsive and community-specific sociocultural targets. Additionally, the *SWOT analysis* explains how including a conversation on sociocultural targets and values in Port Susan MSA planning processes can enhance collaboration by representing diverse community interests in the planning process. Meanwhile, excluding these interests can threaten short- and long-term engagement and increase the transaction costs of planning, therefore reducing the overall effectiveness of Port Susan stewardship efforts. Thus, we recommend the MRCs consider initiating a process to develop community-determined sociocultural targets.

This process should follow four key guidelines:

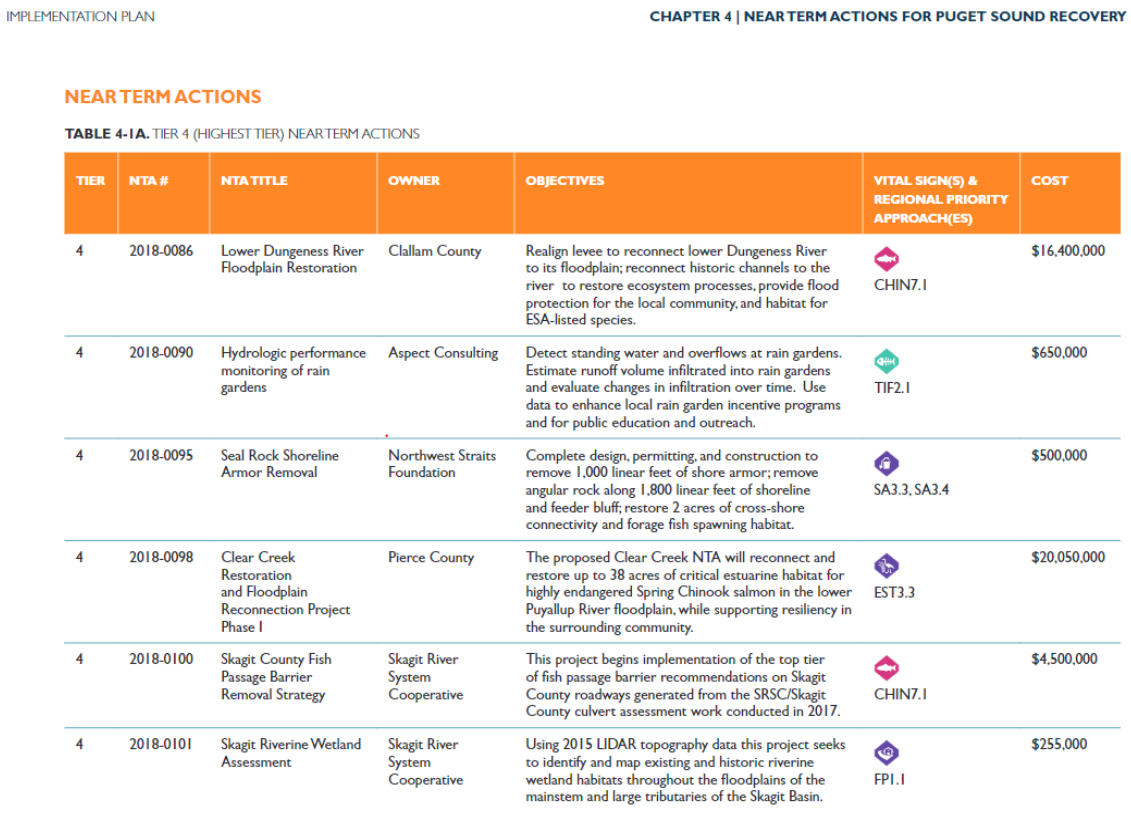
1. Recruit at least one social scientist to help lead and inform this process. As informed by *Chapter 4 - Best Available Social Science*, though economists can provide important insights into environmental planning processes, their discipline tends to be overrepresented in practice. Ideally, multiple social scientists representing diverse disciplines can lend their voice and expertise to this effort.
2. Facilitators should familiarize themselves with the literature on sociocultural targets and measurement proxies. The *integrating sociocultural factors section* of this paper is a helpful starting point for this work.
3. Those involved in developing indicators should be representative of the community.
4. Empower community members to define their own values and sociocultural targets in a collective manner. Facilitators can guide target development by referencing the literature, but ultimately targets should be community-determined and specific to place.

Establish Process to Track Progress of Strategic Actions

Our analysis revealed a limitation in the CAP functionality due to a lack of specificity in how the proposed strategic actions will be monitored over time. Although the CAP identified strategic actions and relevant authorities to complete each action, there was no mechanism for following up with partner organizations on progress beyond informal conversations. As such, we recommend the MRCs consider implementing a more robust process to track progress of strategic actions over time. This will allow for relevant partners to share successes and challenges to continue to work towards a thriving coastal community.

There are several previously mentioned local examples that provide opportunities to incorporate within the ongoing work of the MRCs. The King County Clean Water Healthy Habitat Strategic Plan (discussed here) centers around six 30-year goals that are connected to 12 provisional measures to be improved upon over time and evaluated in a larger context established by comprehensive environmental monitoring. The implementation section of the strategic plan is

especially strong and details who will be evaluating the goals, at what time scales, and with what resources. They mention that the County will monitor progress every 5 years to ensure the most critical problems are prioritized and that measures reflect new knowledge, changes in revenue, and community priorities. This adaptive and responsive implementation plan is something that the MRCs could consider and could be implemented by creating actionable tasks related to conservation and restoration within Port Susan. Another local plan that exemplifies this process is the Puget Sound Partnership Action Agenda. The agenda was created using a "collective impact" approach, which aims to create large-scale change in which groups of people commit to a common agenda to solve specific problems and then work to implement actions, change laws and policies, and communicate with the public. Ingrained in this approach is the commitment to share measurement and monitoring infrastructure that enables adaptive management. The Partnership is responsible for reporting data and ensuring progress and accountability to evaluate the effectiveness of groups in achieving agenda actions. This includes an online database that reflects a complete list of near-term action items (Figure 38)[280]. Users can sort and filter action items to provide more meaningful organization and categorization that aligns with the readers specific needs. This tool also requires regular updates from the Partnership, which allows for partners to trust the validity of the status of each action item and work towards implementation where relevant.



IMPLEMENTATION PLAN

CHAPTER 4 | NEAR TERM ACTIONS FOR PUGET SOUND RECOVERY

NEAR TERM ACTIONS

TABLE 4-1A. TIER 4 (HIGHEST TIER) NEAR TERM ACTIONS

TIER	NTA #	NTA TITLE	OWNER	OBJECTIVES	VITAL SIGN(S) & REGIONAL PRIORITY APPROACH(ES)	COST
4	2018-0086	Lower Dungeness River Floodplain Restoration	Clallam County	Realign levee to reconnect lower Dungeness River to its floodplain; reconnect historic channels to the river to restore ecosystem processes, provide flood protection for the local community, and habitat for ESA-listed species.	CHIN7.1	$16,400,000
4	2018-0090	Hydrologic performance monitoring of rain gardens	Aspect Consulting	Detect standing water and overflows at rain gardens. Estimate runoff volume infiltrated into rain gardens and evaluate changes in infiltration over time. Use data to enhance local rain garden incentive programs and for public education and outreach.	TIF2.1	$650,000
4	2018-0095	Seal Rock Shoreline Armor Removal	Northwest Straits Foundation	Complete design, permitting, and construction to remove 1,000 linear feet of shore armor; remove angular rock along 1,800 linear feet of shoreline and feeder bluff; restore 2 acres of cross-shore connectivity and forage fish spawning habitat.	SA3.3, SA3.4	$500,000
4	2018-0098	Clear Creek Restoration and Floodplain Reconnection Project Phase I	Pierce County	The proposed Clear Creek NTA will reconnect and restore up to 38 acres of critical estuarine habitat for highly endangered Spring Chinook salmon in the lower Puyallup River floodplain, while supporting resiliency in the surrounding community.	EST3.3	$20,050,000
4	2018-0100	Skagit County Fish Passage Barrier Removal Strategy	Skagit River System Cooperative	This project begins implementation of the top tier of fish passage barrier recommendations on Skagit County roadways generated from the SRSC/Skagit County culvert assessment work conducted in 2017.	CHIN7.1	$4,500,000
4	2018-0101	Skagit Riverine Wetland Assessment	Skagit River System Cooperative	Using 2015 LIDAR topography data this project seeks to identify and map existing and historic riverine wetland habitats throughout the floodplains of the mainstem and large tributaries of the Skagit Basin.	FP1.1	$255,000

Figure 38: Screenshot of the Puget Sound Partnerships Near Term Actions Online Database

[280]Puget Sound Partnership. 2018 Action Agenda Tiered List of Near-Term Actions. *https://pspwa.app.box.com/s/xb3xoidt1eyiv6flwxwz5fdbbpgbgnao*

Create Communication Tool to Share Key Information

By following TNC's conservation action planning process, the Port Susan 2012 CAP aimed to guide conservation and restoration efforts to ensure present and future work remained coordinated, impactful, and feasible. The resulting report totaled 146 pages that outlined the planning process as well as shared detailed information related to the conservation targets and strategies and their associated objectives and strategic actions. In 2014, a Port Susan MSA Progress Report card was made to briefly highlight partner progress since the creation of the CAP to reconnect partners and galvanize new efforts.

However, there is a need to re-consider how best the information captured in the CAP be shared to promote continued action related to conservation and restoration in a way that is transparent and accessible. Survey and interview results indicate the need to produce additional materials that will increase access to this information in an accessible and clear way. As outlined in the *improving utility section*, several survey respondents had varying ideas for how to better share information related to conservation and restoration efforts in Port Susan, including adding visuals, condensing the text, or creating companion documents such as a factsheet or report card with key highlights.

As the MRCs continue with the review process for the 2012 CAP, it is important to consider the purpose behind communication strategies to different groups as well as what platform will allow for the greatest engagement and use. Therefore, as the MRCs continue to re-engage local partners, we recommend eliciting input on communication preferences, including what platforms work best, the level of detail in content that is shared, and the cadence with which information is updated.

There are several local examples that utilize different communication tools to share various information related to conservation and restoration in the Puget Sound. WDNR emphasized the importance of accountability and transparency in their Watershed Resilience Action Plan and sought to create clear, accessible tools that clarify needs and outcomes related to their work. This resulted in an online dashboard as well as a watershed connect tool. The online dashboard visually depicts the 34 outcomes and shares the status overview for each as well as a graphic (Figure 39).[281] This dashboard allows for community members to learn more about the work and stay engaged in monitoring progress to achieve each outcome. The watershed connect tool is an interactive map that shows the geographical

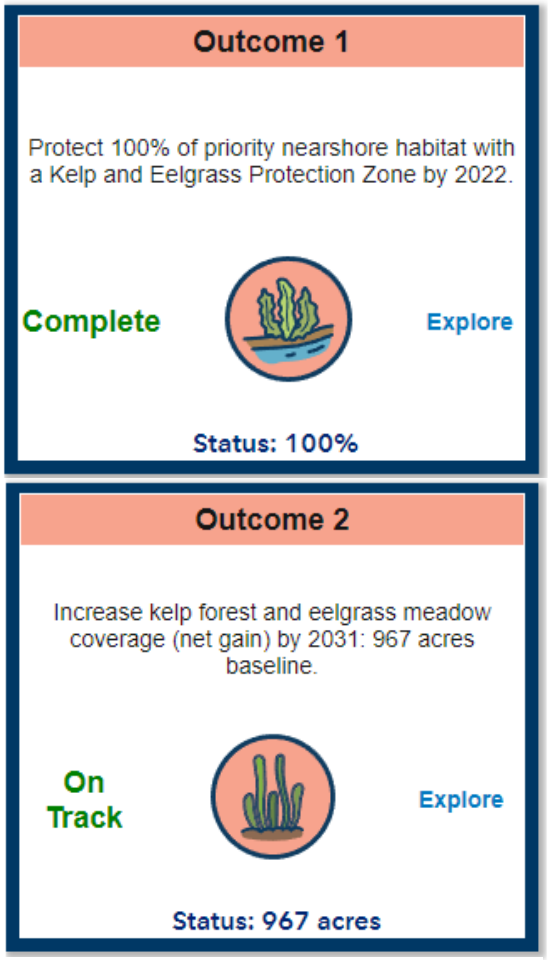


Figure 39: Screenshot of WDNR's Watershed Resilience Action Plan Dashboard

[281] Washington Department of Natural Resources. *Watershed Resilience Action Plan Dashboard.* *https://watershed-connect-wadnr.hub.arcgis.com/*

location of related conservation efforts and shares relevant project-specific information including cost, phase, and sponsors (Figure 40). This is more relevant for local partners to visualize project locations to ensure actions remain coordinated and efficient.

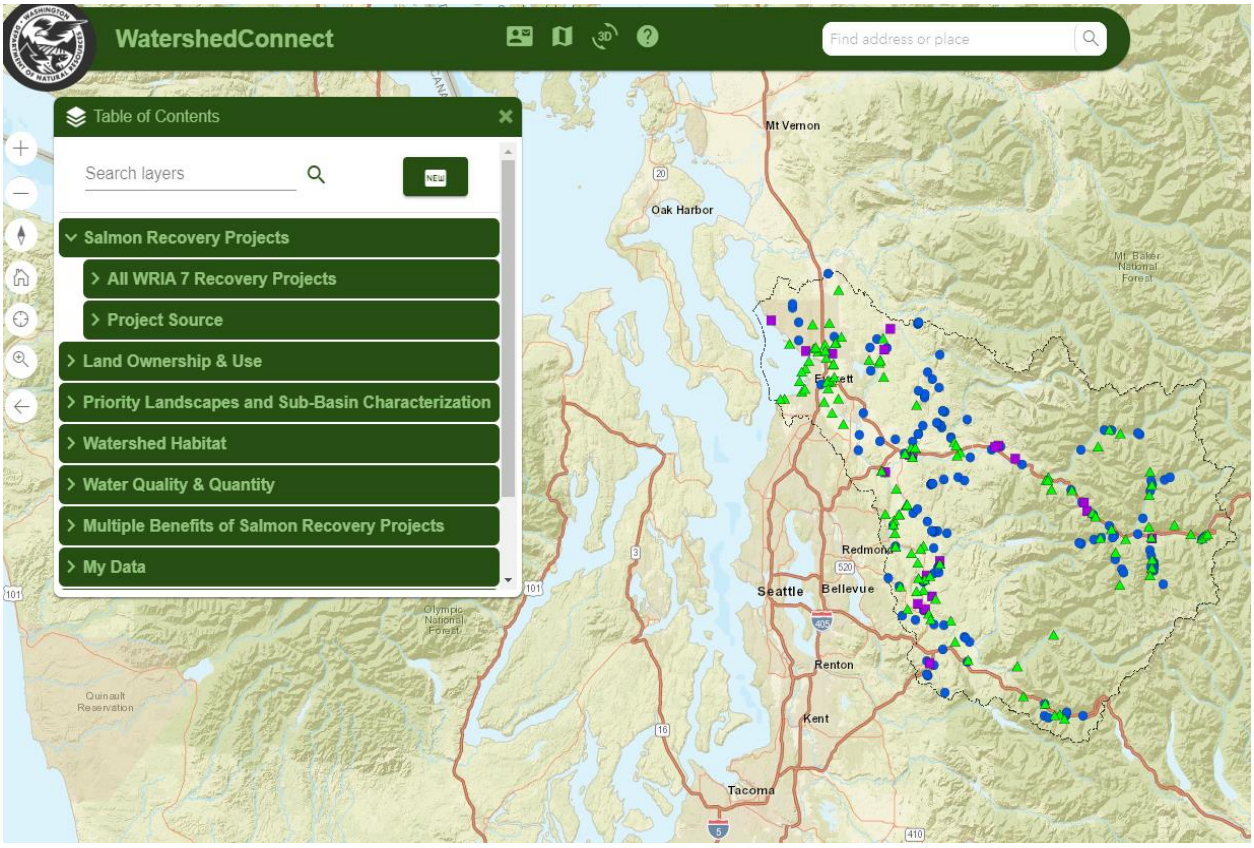


Figure 40: Screenshot of WDNR's Watershed Connect Tool[282]

The purpose for communicating this information should also be discussed by the MRCs and those that conduct related work within Port Susan to ensure it remains a useful and relevant tool to share pertinent information and track progress effectively. It also is important to mention the need for inclusive science communication that respects and values the ideas, experiences, questions, and expertise of the local community that live, work and recreate in Port Susan.[283] Such communication aims to cultivate belonging and engagement of the audience and collaborators and is relevant across formal and informal settings.[284] This requires the MRCs to engage thoroughly with the local community who will be accessing this information to ensure that both the content and platform remain relevant and embrace varied forms of expertise and ways of knowing.

[282] Washington Department of Natural Resources. *Watershed Connect Tool*. *https://watershedconnect.dnr.wa.gov/*
[283] Canfield, K. N., Menezes, S., Matsuda, S. B., Moore, A., Mosley Austin, A. N., Dewsbury, B. M., ... & Taylor, C. (2020). Science communication demands a critical approach that centers inclusion, equity, and intersectionality. *Frontiers in Communication*, 2.
[284] Ibid.

Alternative Pathways for Conservation Planning and Action

Create a Crosswalk with the Puget Sound Partnership Action Agenda

Puget Sound Partnership's Action Agenda is a comprehensive agenda for Puget Sound recovery and can be used by all entities tasked with the stewardship of Puget Sound. Creating a "crosswalk" between the Port Susan CAP and the Action Agenda was included and selected at the highest frequency in the stakeholder survey as a potential action for the MRCs to improve the utility of the 2012 CAP, we felt it was pertinent to include a possible framework for the "crosswalk" development.

Implementation Considerations

- The 2022-2026 Action Agenda Draft for Public Comment was used to inform this recommendation, so all components of this recommendation should be adjusted to any significant revisions following the public comment period.
- Each step outlined below should be conducted in collaboration with management partners and the Port Susan community (see *Community Engagement Process* & *Plan for Equitable and Meaningful Community Engagement*).
- If timing allows, implementation could begin at the stakeholder meetings planned by ESA over the next few months.

Step 1: Cross Examine 2012 CAP's Conservation Targets, Vital Signs, and Indicators

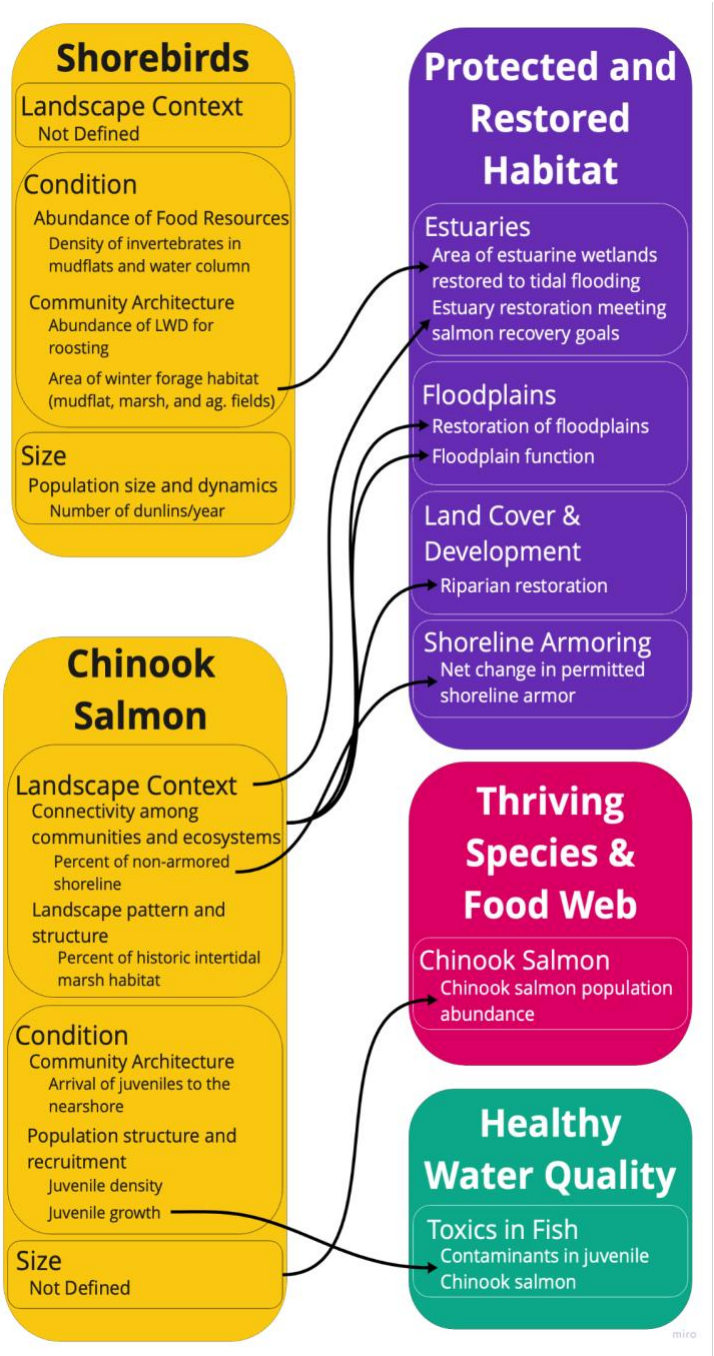


Figure 41: Conservation Targets Identified in the 2012 CAP (Yellow) Cross Examined with PSP's Vital Signs (Purple, Pink, Green)

As the Action Agenda is heavily tied to and informed by the Vital Signs, we recommend cross examining the conservation targets identified in the 2012 CAP and their key ecosystem attributes (KEAs) to the Vital Signs and their Indicators.

An example of this is shown for both the Shorebirds and the Chinook Salmon conservation targets in Figure 41 above.

Step 2: Cross Examine the 2012 CAP and the Action Agenda's Comprehensive Plan

The 2022-2026 Action Agenda is split into two parts – the Comprehensive Plan and the Implementation Plan. The Comprehensive Plan focuses primarily on long term recovery and identifies 23 desired outcomes and 6 targets which are directly related to the Vital Sign Indicators (Indicators). Of the 23 desired outcomes, 11 are designated as having multiple benefits, meaning progress related to these outcomes should result in improvements to at least 25% of Indicators.[285]

We recommend that the following are directly compared to help define the Port Susan MSA's long term recovery goals as it relates to the Action Agenda:

1. Conservation targets and their KEA's → 6 Vital Sign Indicator Targets
2. Conservation targets, their KEA's, and threats → Desired Outcomes
    a. Note: Prioritize the 11 multi-benefit outcomes
3. Conservation strategies → 6 Vital Sign Indicator Targets
4. Conservation strategies → Desired Outcomes
    a. Note: Prioritize the 11 multi-benefit outcomes

When cross examining the two plans, MRC members, management partners, and community members should consider the following questions:

1. Where do objectives and goals overlap?
2. What resources can the MRCs provide to advance long-term goals and the desired outcomes?

Step 3: Cross Examine 2012 CAP and the Action Agenda's Implementation Plan

The Implementation Plan outlines 31 strategies (26 for advancing progress toward the desired outcomes and 5 institutional strategies)[286] that identify actions to guide Puget Sound recovery partners over the next four years. First, we recommend the MRCs examine the strategies (1) where "Marine Resources Committees" were defined as a "Collaborating Partner" (see Figure 42 below) and (2) where Vital Signs and their Indicators identified in Step 1 are also identified as a "Connecting Vital Sign." Second, when examining these strategies, the MRCs should determine which "Actions" and "Key Opportunities" align with the long-term goals identified in Step 2 and any outstanding actions from the 2012 CAP's Workplan and Measures Plan.

[285] 2022-2026 Action Agenda. (March 2022).
[286] Ibid.

Step 4: "Crosswalk" Compilation

After conducting Steps 1-3, the MRCs, managing partners, and community members should have a comprehensive set of long-term goals, desired outcomes, Vital Sign Indicators, and Action Agenda strategies that complement the conservation targets and strategies outlined in the 2012 CAP. While the ideal format of this "crosswalk" will ultimately be decided by the group, we recommend at least drafting an addendum to the 2012 CAP or a document similar to the 2014 Report Card that highlights how the CAP and Action Agenda align. In addition to discussing how the two plans align, this document could focus on what actions and initiatives the MRCs plan to take given this programmatic alignment and/or have taken since 2014.

Figure 42: Action Agenda Strategies where "Marine Resource Committees" were Identified as a Collaborating Partner

Develop Framework for Collaborative Decision-Making

Collaborative governance tools provide structure to reach consensus among diverse interests and perspectives. Start by asking what the goals of this process are and what learning needs to happen to achieve the goals. Consider how communities and diverse representatives could be involved in designing the collaborative process. Before reaching out to underrepresented communities, determine ways in which the engagement process could be generative for those communities and how their input would be tangibly incorporated into the plan. After outlining intention for outreach and collaboration, reference the Community Engagement Process section in Chapter 5 for steps to collaborative decision making.

We highlight and elaborate on a few steps from the collaborative decision-making process we discussed in *Chapter 5* below:

1) Invite a skilled facilitator to guide the process (consider someone with no stakes in the outcome of the plan if there are parties with conflicting interests)
2) Reference the section on *Agenda Setting for Collaboration* to determine which aspects of the plan may be appropriate for collaborative decision making
3) In collaboration with communities identified from the *Engagement Analysis*, determine desired outcomes. Below are some ideas and steps to consider:
    a) Define "community-based"
    b) Define "stewardship"
    c) Determine which socio-cultural factors are important to incorporate (see *Integrating Sociocultural Factors*)

d) Draft collective vision on a healthy, equitable, and sustainable marine stewardship area

e) Agree on roles, responsibilities, and measures of accountability for program implementation

f) Plan for monitoring and evaluation

The planning organizations should strive to create an equitable collaborative process. Figure 43 from the Institute for Engagement and Negotiation outlines principles crucial for equity considerations.[287]

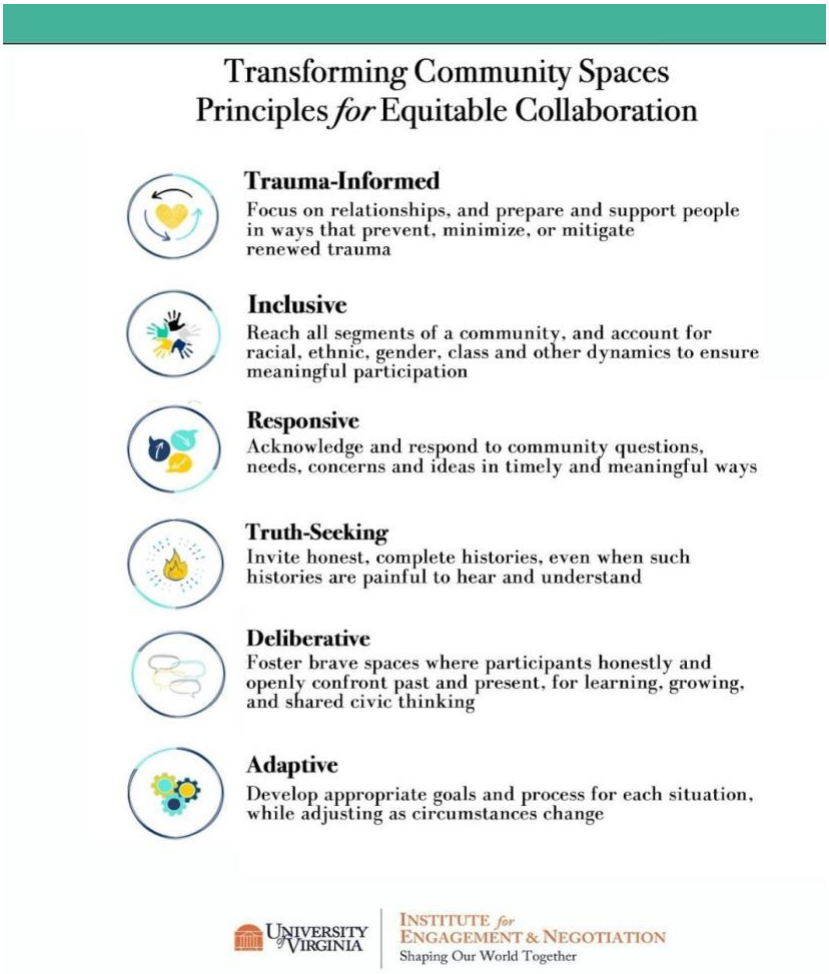


Figure 43: Principles for Equitable Collaboration

[287] A Toolkit for Institutions and Communities | Transforming Community Spaces. (2022). Transforming Community Spaces. http://transformingcommunityspaces.org/toolkit