Regional Perspectives on the Effectiveness of Puget Sound Shellfish Recovery Actions

Report prepared for Washington State Department of Natural Resources (CONTRACT NO. 93-100602) and Puget Sound Partnership by Ross Strategic

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Acronyms and Abbreviations

BMP	Best Management Practice
CAFO	Concentrated Animal Feeding Operation
CD	Conservation District
CWA	Clean Water Act
DOH	Washington State Department of Health
DNMA	Dairy Nutrient Management Act
DNMP	Dairy Nutrient Management Program
DNR	Washington State Department of Natural Resources
Ecology	Washington State Department of Ecology
EIM	Environmental Information Management System
ERTS	Environmental Report Tracking System
HCCC	Hood Canal Coordinating Council
Legislature	Washington State Legislature
MS4	Municipal Separate Storm Sewer System
MST	Microbial Source Tracking
NPDES	National Pollutant Discharge Elimination System
NEP	National Estuary Program
NRCS	Natural Resources Conservation Service
OSS	On-site Sewage System
PDT	Project Delivery Team
PIC	Pollution Identification and Correction
PSP	Puget Sound Partnership
QAPP	Quality Assurance Project Plan
SPD	Shellfish Protection District
SWMP	Stormwater Management Program
WCC	Washington Conservation Commission
WDFW	Washington State Department of Fish and Wildlife
WQP	Water Quality Portal
WSDA	Washington State Department of Agriculture
WQX	Water Quality Exchange

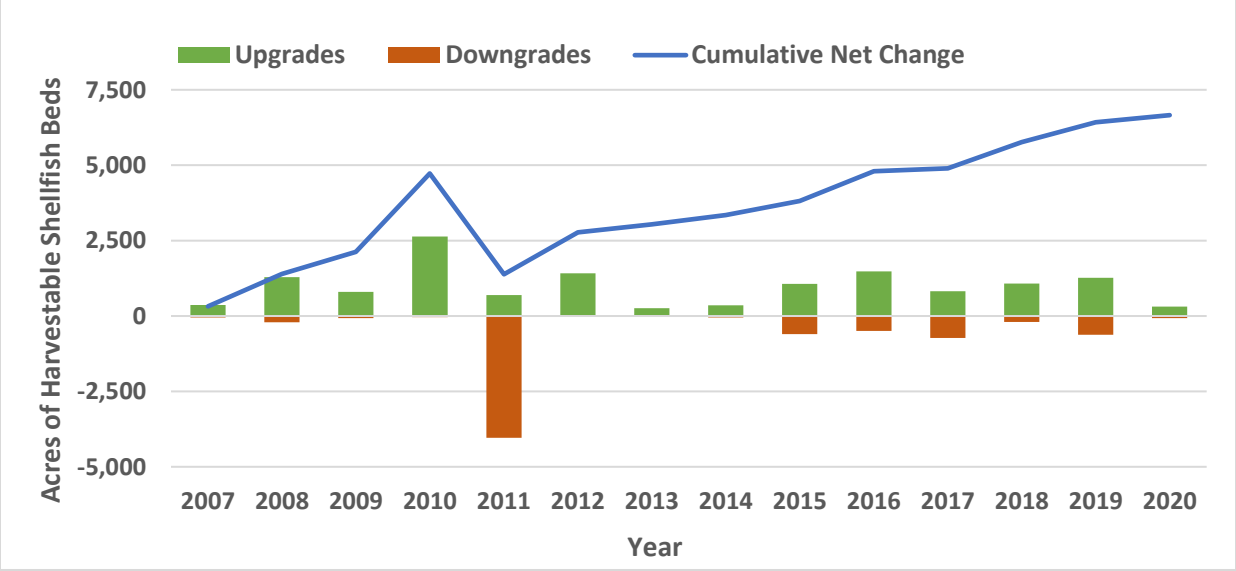
Executive Summary

Project Overview

To support Puget Sound Partnership (PSP) Priority Science Work Actions identified in its 2016-18 Science Work Plan, the Washington State Department of Natural Resources (DNR) contracted with Ross Strategic to 1) capture regional perceptions of the effectiveness of recovery and long-term protection efforts intended to restore Puget Sound shellfish beds to harvestable condition and 2) develop recommendations to enhance regional shellfish recovery action effectiveness based on interview data.

Commercial and recreational shellfish harvest is an important part of Puget Sound's culture and economy and multiple organizations and agencies, led and coordinated by the Washington State Department of Health, devote significant resources to maintaining harvestable acres and restoring areas that are closed due to water quality issues. Since 2007, 13,838 acres of harvestable shellfish beds were upgraded and 7,179 acres downgraded, a net increase of 6,659 acres (Figure ES-1). Of Puget Sound's approximately 257,000 acres of classified commercial and recreational shellfish beds, around 33,000 acres, or 13%, do not meet water quality standards and are closed to harvest. **Given the demonstrated success of existing programs, this report identifies *additional* potential actions at the state or local level, or in combination, that could bolster shellfish bed recovery and achieve further positive gains, in support of PSP's shellfish bed recovery target.**[1] Actions were identified based on interviews mainly with shellfish protection experts in local and tribal jurisdictions and guided by a project steering committee which included local, tribal, and state agency representatives.

Figure ES-1: Shellfish Bed Upgrades and Downgrades Across Puget Sound (2007-2020)[2]



Shellfish protection programs in Puget Sound are governed by multiple local and state agencies which operate under various regulatory regimes; these agencies also manage and implement voluntary and

[1] See PSP Vital Signs webpage for detail on the Shellfish Bed Vital Sign: https://vitalsigns.pugetsoundinfo.wa.gov/VitalSignIndicator/Detail/40
[2] Data courtesy of WA Department of Health.

incentive-based programs designed to improve shellfish bed health. Funding for these programs comes from numerous sources including local government, state agencies, and federal agencies; some funding is built into county tax structures; other funding is grant-based. This report focuses on three aspects of shellfish bed recovery programs, each of which are explored below and in depth in the full report:

1. Role and effectiveness of Shellfish Protection Districts (SPDs)
2. Water quality regulations, enforcement, and lean opportunities as they pertain to shellfish growing areas[3]
3. Shellfish protection program data types, needs, and sources

To understand the shellfish bed protection and recovery landscape, develop case studies, identify shellfish protection program barriers and challenges, and develop recommendations, the project team conducted desk research and collected qualitative data through approximately twenty semi-structured, one-hour interviews with regional shellfish recovery program staff. Note: Interviews included pollution identification and correction (PIC) program staff and county-level staff tasked with implementing closure response plans for specific SPDs. Because of the overlap between PIC programs and SPDs, some findings are specific to SPDs, while other findings are applicable to PIC programs.

Shellfish Protection Districts: Key Takeaways

SPD effectiveness depends on many factors, including environmental conditions, types of nonpoint pollution sources in the area, political support for staff, amount of funding available for programmatic needs, and staff capacity to communicate and coordinate with key partners. Local political and economic conditions vary among counties and there is no "typical" SPD in Puget Sound. However, conversations with SPD staff (interviewees) revealed best practices and successes in various areas, challenges for program staff, and opportunities to improve effectiveness through aligning multiple stakeholder activities that target shellfish bed protection.

Shellfish Growing Area Regulations and Enforcement: Key Takeaways

Many organizations, programs, and regulations affect Washington's recreational and commercial shellfish harvest areas through their responsibilities to protect and maintain water quality. Washington State Department of Health (DOH) is the state's Shellfish Control Authority;[4] it classifies commercial shellfish growing areas and publicly owned recreational shellfish harvesting beaches based on water quality and current and potential pollution sources. Other state agencies, local government health jurisdictions, and counties regulate and enforce key factors that drive shellfish area classification, including stormwater, on-site sewage systems, wastewater treatment plants and marinas, and animal waste management on farms. Coordination within and between organizations involved in shellfish bed health was a central theme in findings related to challenges and barriers, as well as recommendations. As with any complex system, coordination among key components is a significant contributing factor to success.

[3] The project team looked at potential lean opportunities – for example, programmatic activities for water quality that could apply to shellfish protection programs (thereby reducing duplication of effort). The project team found limited lean opportunities from discussions with interviewees; examples are noted in the report where appropriate.
[4] See Chapter 69.30 RCW and Chapter 246.282 WAC

Data Collection and Use: Key Takeaways

High quality data is one of the cornerstones of an effective shellfish protection program. State agencies and local jurisdictions use data to 1) identify water quality status and trends, 2) identify pollution sources, and 3) support outreach and enforcement efforts. Data collection, analysis, and use varies widely across shellfish protection programs depending on various factors within the jurisdictions such as funding availability, staffing, and program maturity. Although funding is a significant challenge for local programs as they collect and analyze water quality in connection with shellfish bed health, there are opportunities to gain efficiencies and share best practices. Some of these opportunities are found at the local level while others are under state agencies purview.

Case Studies

The project team developed two short case studies to illustrate approaches that local jurisdictions are taking to address the challenges and barriers associated with implementing activities aimed at protecting and recovering shellfish beds: 1) Jefferson County Foundational Monitoring Project and 2) Hood Canal Regional Pollution Identification and Correction (PIC) Program. The Jefferson County example illustrates a local jurisdiction approach to data collection while the Hood Canal example illustrates a regional approach to information sharing and cross-jurisdictional project coordination. The project team selected the case studies by analyzing initial interview data for examples, conducting further online research for background where available, and then following up with interviewees (and contacts suggested by these interviewees) for additional detail.

Conclusion and Potential Future Work

Shellfish protection in Puget Sound is the result of longstanding, well-developed, nested state and local programs and is largely successful as measured by the positive change in open shellfish growing areas. The findings and recommendations in this report are intended to support shellfish program staff as they work to further improve the effectiveness of shellfish recovery programs around Puget Sound. **They are based on interviewee perspectives and may therefore reflect issues specific to a local area within Puget Sound rather than systemic issues.** This context is important to consider when reviewing findings and determining the appropriate scale of action. As a follow up step, Agencies might consider convening interviewees and other local program implementers in a workshop format to further test these ideas and identify specific next steps. A workshop format would have the advantage of bringing together both state and local program experts to share information and perspectives and would be responsive to interest in providing additional opportunities for program implementer to coordinate with and learn from one another.

Introduction

Purpose and Context of Evaluation

Puget Sound Partnership's (PSP) Science Panel developed a 2016-2018 Science Work Plan that describes the information, learning, and interaction needed to support coordinated efforts to recover, protect, and improve the resilience of Puget Sound's ecosystem.[5] The Science Work Plan identifies Priority Science Work Actions that will advance the region's recovery goals as measured through the Puget Sound Vital Signs, including monitoring the effectiveness of actions intended to restore shellfish beds to harvestable condition. Commercial and recreational shellfish harvest is an important part of Puget Sound's culture and economy and multiple organizations and agencies, devote significant resources to maintaining harvestable acres and working to open those harvest areas that are closed due to water quality issues. Since 2007, 13,838 acres of harvestable shellfish beds were upgraded and 7,179 acres downgraded, meaning a net increase of 6,659 acres, as shown in Figure 1. Of Puget Sound's approximately 257,000 acres of classified commercial and recreational shellfish beds, around 33,000 acres, or 13%, of this area do not meet water quality standards and are closed to harvest. **Given the demonstrated success of existing programs, this report identifies *additional* potential actions at the state or local level, or in combination, that could bolster shellfish bed recovery and achieve further positive gains, in support of PSP's shellfish bed recovery target.[6]**

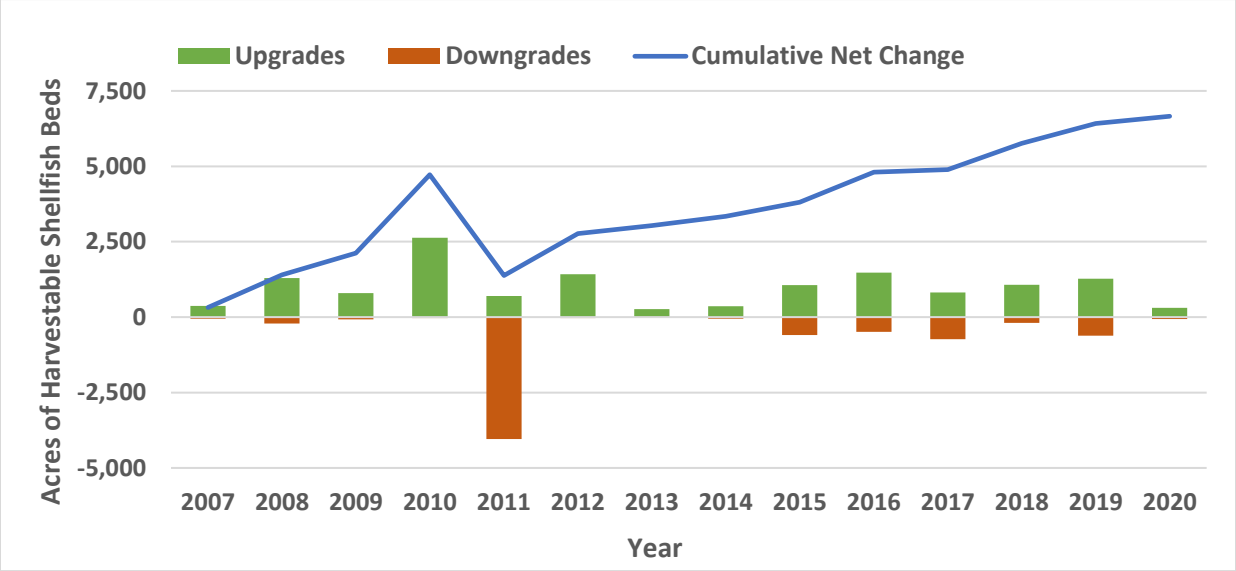


Figure 1: Shellfish Bed Upgrades and Downgrades Across Puget Sound (2007-20)[7]

To support the Priority Science Work Actions, the Washington State Department of Natural Resources (DNR) contracted with Ross Strategic to 1) capture regional perceptions of the effectiveness of recovery and long-term protection efforts intended to restore Puget Sound shellfish beds to harvestable

[5] Puget Sound Partnership Science Panel. "2016–18 Biennial Science Work Plan."
[6] See PSP Vital Signs webpage for detail on the Shellfish Bed Vital Sign: https://vitalsigns.pugetsoundinfo.wa.gov/VitalSignIndicator/Detail/40
[7] Data courtesy of WA Department of Health.

condition and 2) develop recommendations to enhance regional shellfish recovery action effectiveness based on interview data. This report focuses on three aspects of shellfish bed recovery programs:

1. Role and effectiveness of Shellfish Protection Districts and actions to fulfill program requirements (for example, a Pollution Identification and Correction (PIC) program might help an SPDs collect data or communicate with the public)
2. Water quality regulations, enforcement, and lean opportunities as they pertain to shellfish growing areas
3. Shellfish protection program data types, needs, and sources

Because the project team's tasking included looking at Shellfish Protection Districts specifically (task 1 above) as well as shellfish programs generally (tasks 2 and 3 above) there is some overlap in findings. SPDs commonly support activities associated with PIC programs; however, PIC programs are not always associated with SPDs. Furthermore, SPDs sometimes operate under a title such as "Clean Water District" and can span large shellfish growing areas even though they are functionally recognized as SPDs.

Various organizations have spent a significant amount of time and effort cataloging aspects of shellfish bed recovery programs, with accompanying recommendations, and this evaluation is intended to build on these previous efforts.[8] As a starting point, the Ross Strategic project team began with the findings from the most relevant, recent and comprehensive report to-date "Exploring Options, Assigning Responsibilities, and Building Program Capacity for State Oversight of Pollution Identification and Correction Programs" (Peterson, 2019). This evaluation builds on these three areas through additional research and interviews to identify more specific recommendations. The findings and recommendations in this report are intended to support shellfish program staff as they work to further improve the effectiveness of shellfish recovery programs around Puget Sound.

Evaluation Methodology

To understand the shellfish bed protection and recovery landscape, develop case studies, identify shellfish protection program barriers and challenges, and develop recommendations, the project team conducted desk research and collected qualitative data through approximately twenty semi-structured, one-hour interviews with regional shellfish protection program staff. The project team began with an initial set of interviewees selected to cover a range of variables including:

- Size of Shellfish Protection District (or equivalent program)
- Agricultural presence and type (i.e., proportion of dairies, concentrated animal feeding operations, hobby farms)
- Geographic location within Puget Sound (i.e., North Sound, Central, South Sound)
- Status and known characteristics of local Pollution Identification and Correction (PIC) program

For primary interviewees, the project team used a set of interview questions designed to uncover information within the three lines of inquiry around program effectiveness, data needs, and regulatory/lean opportunities. Within these topic areas, the interviews explored what worked well within interviewees' shellfish protection program, examples of innovative approaches, barriers and

[8] For example, Governor Inslee's Shellfish Initiative White Paper and Work Plan, "How to Guide" for Water Pollution Identification and Correction; funding criteria, methods and resources (Crim, 2014).

challenges, and recommendations (interview questions are included in Appendix C). The project team used a deductive approach to analyze interview content and formulate findings around barriers and challenges, and recommendations for addressing these barriers and challenges. From the initial round of interviews, the project team drafted a set of findings around barriers, challenges, and recommendations that the project team tested with subsequent interviewees in a targeted approach, depending on interviewees' area of expertise. The project team identified patterns or themes from the interviews and formed the findings and recommendations in the report. In some cases, a single data point (something that one person said) led to a theme and in other cases, several data points (similar comments made by several people) led to a theme. The project team did not rank, or weight, themes for purposes of prioritization (in other words, it is not assumed that because many people shared one observation or opinion that it is more significant than an observation or opinion shared by a single person). The findings and recommendations in this report are **based on interviewee perspectives and may therefore reflect issues specific to a local area within Puget Sound rather than systemic issues.** This context is important to consider when reviewing findings and determining the appropriate scale of action for response.

A Steering Committee consisting of staff from state agencies, counties, conservation districts, and tribes provided feedback throughout the project (see Appendix A for a list of Steering Committee members).

Throughout the project, the project team collected suggestions from interviewees for additional local experts to provide detail in specific areas. In most cases the project team interviewed these individuals as an opportunity to affirm or provide counterfactuals to findings and recommendations or add nuance and perspective to the lines of inquiry. Interviewees included county staff, state agency staff, and conservation district staff; nearly all Puget Sound counties were represented (see Appendix B for a complete list of interviewees). Most interviews were guided by a set of questions relating to the projects three lines of inquiry. The exception to this was when an interview was conducted to follow up on specific topics. Information in this report is not attributed to specific interviewees, but instead overall themes that were observed during conversations.

Shellfish Protection Districts

The line of inquiry related to Shellfish Protection Districts (SPDs) is intended to understand the role and effectiveness of SPDs across their various forms and complexities. This section also highlights best practices and successes in various areas, challenges for program staff, and opportunities to improve effectiveness through aligning multiple stakeholder activities that target shellfish bed protection.

The following interview questions addressed shellfish protection districts:

1. How do you measure effectiveness of the actions implemented in your area to improve water quality?
2. What stands out as significant successes of your program?
3. Which projects, actions or relationships remain challenging?
4. How can state agencies and local jurisdictions improve coordination and alignments of activities for effectiveness?
5. We are interested in how your program could influence water quality improvement in other areas. What successes could be replicated in other programs facing similar issues of water quality?
6. If your program could add additional staff capacity for data collection, monitoring, outreach, or other activities, how would you use it to improve shellfish protection activities?

Key Takeaways

SPDs provide an organizing framework and connect local jurisdictions with technical support for developing and implementing response plans; they also focus attention on specific geographic areas and demonstrate to the public that state and local governments are working to improve local water quality conditions impacting shellfish bed harvest. SPD effectiveness depends on many factors, including environmental conditions, types of nonpoint pollution sources in the area, political support for staff, amount of funding available for programmatic needs, and staff capacity to communicate and coordinate with key partners. Local political and economic conditions vary among counties and there is no "typical" SPD in Puget Sound. However, conversations with interviewees revealed best practices and successes in various areas, challenges for program staff, and opportunities to improve effectiveness through aligning multiple stakeholder activities that target shellfish bed protection.

Overview of Shellfish Protection Districts

Portions of Washington's productive shellfish beds are closed to harvesting and/or are threatened because of water pollution from nonpoint sources such as failing on-site sewage systems or improper animal waste management. In response to this problem, in 1985 the Washington State Legislature enacted RCW 90.72 which encouraged those counties with shellfish tidelands to establish a shellfish protection district or program.[9] Through RCW 90.72 the Legislature provided county legislative

[9] "Shellfish tidelands" means all saltwater tidelands on which shellfish are grown or harvested for human consumption (RCW 90.72.020).

authorities with authority to establish, manage (including abolish), regulate, and control both SPD programs and fees to achieve three goals: 1) prevent closures of recreational and commercial shellfish beds; 2) restore water quality in saltwater tidelands to allow the reopening of at least one restricted or closed shellfish bed each year; and 3) ensure Washington's international position in shellfish production.[10] When Washington State Department of Health (DOH) closes the classification of a shellfish bed, RCW 90.72 requires the respective county legislative authority to create an SPD within 180 days of the downgrade, unless an equivalent program already exists (details on required activities of the SPD or equivalent program are described below). SPDs include areas in which suspected nonpoint pollution threatens the water quality upon which shellfish tidelands depend and areas in which documented water quality problems have caused closure of shellfish beds. (See Appendix D for more information on active and inactive Puget Sound SPDs.)

SPDs vary in size and scope based on the preferred approach of the implementing jurisdiction. Some SPDs are large and cover an entire county (e.g., the Surface Water Management Utility District is all of Snohomish County) and some are small and concentrated on the water body in which a shellfish area downgrade is in effect (e.g., Filucy Bay SPD is one of several smaller SPDs in Pierce County). Figure 2 illustrates the range of sizes for SPDs across Puget Sound.

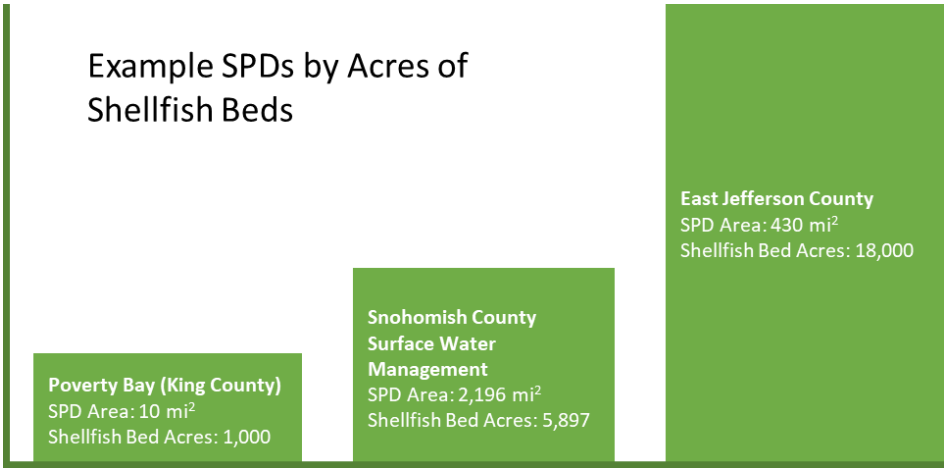


Figure 2: Range of SPD Size by Shellfish Acreage

Some SPDs encompass an entire watershed, and because watershed and county-jurisdictional boundaries are not the same, SPDs can be cross-jurisdictional (e.g., Minter Bay SPD will be co-managed by Pierce County and Clean Water Kitsap). Figure 3 depicts current active Puget Sound SPDs (as of May 2021 – additional SPDs exist but are currently inactive for various reasons).

[10] See Findings—1992 c 100 in RCW 90.72.030.

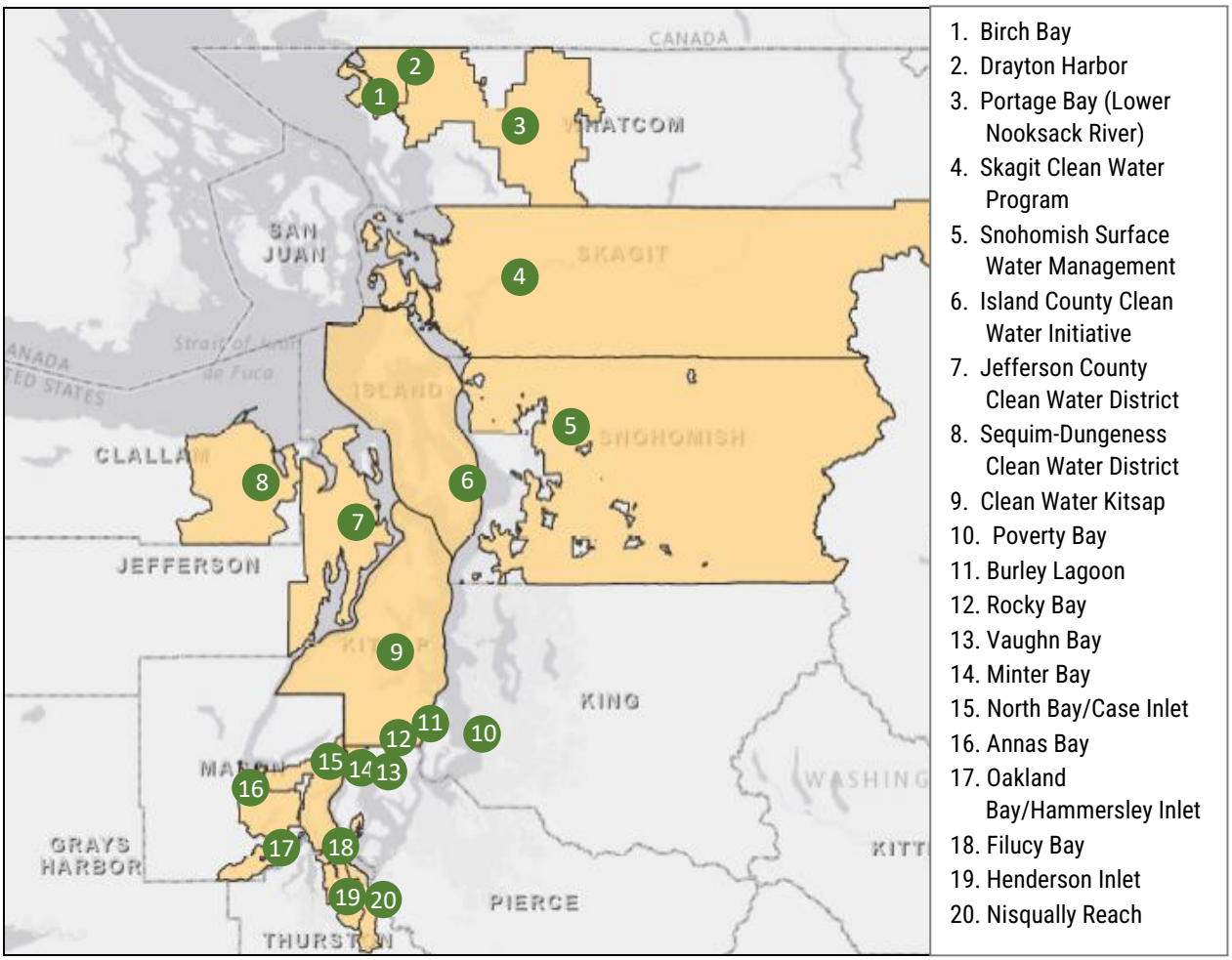


Figure 3: Active Puget Sound SPDs (as of May 2021)

Note: Mason County is in the process of consolidating its SPDs (15, 16, and 17 in the map above plus an additional four SPDs currently listed as "inactive") into a single clean water district supported by a new clean water district fee.

SPD Structure and Organization

An SPD is under the jurisdiction of the county or counties where it is located.[11] County legislative authorities are responsible for coordinating with cities, towns, and water-related special districts within the SPD boundary; the county authority then develops a closure response plan to address the shellfish bed classification. To do this, they may (and frequently do) appoint a local advisory council to advise the preparation and implementation of shellfish protection programs within the SPD (RCW 90.72.030). For example, Portage Bay and Drayton Harbor SPDs in Whatcom County each have an eleven-member Advisory Committee, including nine County Council-appointed positions and two positions reserved for tribal representation.

[11] The commissions of more than one county can agree to create cross-jurisdictional SPDs or shellfish protection programs (RCW 90.72.040).

SPDs are managed by different departments in different jurisdictions. SPD staffing also varies because SPD responsibilities are often taken on by staff with other related (or adjacent) responsibilities. For example, Pierce County SPDs are managed by the county's Planning and Public Works Department, which funds a Watershed Coordinator position. The Watershed Coordinator collaborates with Pierce County Shellfish Partners to conduct water quality protection and improvement activities in the county's shellfish watersheds and fulfills SPD responsibilities.[12] In Mason County, the SPDs are managed by the county's Public Health Department where the Environmental Health division absorbs all SPD-related responsibilities. The Snohomish County SPD was staffed by Snohomish County Surface Water management until 2019, when the Snohomish County Conservation District assumed responsibility.

SPD Activities

SPD staff collaborate with a variety of external partners and agencies, including Tribal governments, county departments, county Conservation Districts, and the Washington Departments of Health, Ecology, and Agriculture. For example, to help guide SPD programming, the Whatcom SPD Advisory Committees work with several Whatcom SPD partners, including the Lummi Nation, the Nooksack Tribe, Whatcom County Public Works, Whatcom County Health, Whatcom County Planning and Development Services, Whatcom Conservation District, City of Blaine, Port of Bellingham, Washington State Department of Health (DOH), Washington State Department of Agriculture (WSDA), and Washington State Department of Ecology (Ecology).

With partner support, an SPD engages in a range of activities and programs that best suit the area it identifies and works to upgrade or maintain the classification status of its shellfish beds. All SPDs coordinate with external partners and agencies to conduct three main activities: 1) pollution control; 2) public education and outreach; and 3) regulation enforcement. SPDs are required to submit annual reports to DOH, detailing specific activities undertaken the prior year. Annual SPD reports include outcomes for metrics such as miles of shoreline evaluated, number of OSSs in the SPD, number of community events, and whether the SPD used new source tracking technology or not. If rates or fees are collected using RCW 90.72 for an SPD. The report must also provide detail of the expenditure of the revenue collected. Table 1 includes a more comprehensive list of SPD metrics grouped by activity.

Table 1: SPD Activities and Metrics (Adapted from SPD Annual Report to DOH)

SPD Activity Category		SPD Metric
Data Collection	*General SPD Characteristics*	Farms w/ animals in SPD
		OSS in SPD
		OSS without current inspection report
		Low-interest OSS repair loans
		Reports of System Status (OSS)
		Miles of shoreline evaluated

[12] Pierce County Shellfish Partners include Tacoma-Pierce County Health Department, Pierce Conservation District, Pierce County Surface Water Management, Northwest Indian Fisheries Commission, Puyallup Tribe of Indians, Squaxin Island Tribe, WA DOH, and WA ECY.

SPD Activity Category		SPD Metric
	Water Quality Data Collection	Discharges/streams monitored
		Sites with elevated bacteria or hot spots
		Used new source tracking technology
		Water quality summaries
	Nonpoint Source Data Collection	Surveillance flights
		Farms evaluated
		Ag BMPs installed
		Parcel/property evaluations
		OSS dye tests
		Failed OSS
		Stormwater activities
Regulation Enforcement		Penalties
		Incentives/rebates
Education/Outreach and Community Engagement		Workshops
		Community events
		Mailers/flyers
		Social marketing surveys
		Newsletters
		Letters of support/recommendations to council/commission

SPD Revenue Sources and Implementation Costs

The county legislative authority that establishes an SPD can finance the program through one or more methods such as county tax revenues, fees for services provided (e.g., inspection fees), charges or rates specified in its protection program (e.g., parcel fees), or federal, state, or private grants. Washington prioritizes counties with established SPDs for state grants and loans that provide water quality financial assistance (RCW 90.72.080). According to analysis of existing SPDs, very few charge a fee directly connected to the SPD boundaries. Most active SPDs are funded through grant programs or other county revenue sources (e.g., special utility fees or parcel fees), or a combination of both.

SPD fees do not apply to property owners who already pay fees for similar programs or services (e.g., stormwater control or sewer/drainage systems); owners of facilities that pay fees for wastewater discharge; or owners of forestland or timberland. Dairy animal feeding operations or commercial agricultural operations cannot be charged more than $500.00 per calendar year in SPD fees (RCW 90.72.070).

Implementation costs for SPDs vary widely according to the extent of data collection and analysis, outreach efforts, enforcement, and other program activities. DOH Puget Sound Geographic Funds are a common funding source, which include a priority for Pollution Identification and Correction (PIC) grant contracts. These grants are subawards of the US EPA National Estuary Program (NEP) and are often referred to simply as NEP grants or NEP funds. NEP grants fund a variety of activities, as demonstrated in Table 2, which provides a snapshot of PIC program funding via DOH's Pathogens grant from 2011-19. Funding can vary depending on the size of the geographic area covered and program services offered. Some Puget Sound counties also operate PIC programs independent of established SPDs.

Table 2: 2011-19 PIC Program Funding with DOH Pathogens Grant[13]

Current Funding	Primary Funded Entities	Activities
$100,711 PIC plan **$279,430 PIC implementation**	Clallam County Health District Clallam Conservation District	PIC plan to help restore shellfish growing areas in the Sequim-Dungeness Clean Water District. In 2015, Clallam County Health District received funds to pilot test the plan along a tributary to Dungeness Bay working with the Conservation District, Jamestown S'Klallam Tribe, and Streamkeepers to track down and reduce inputs from OSS, farms, and pets.
$99,626 PIC plan **$601,500 PIC implementation**	Hood Canal Coordinating Council	In 2012, HCCC developed a comprehensive, coordinated regional PIC plan for three counties and two tribes and in 2014 received implementation funds.
$400,000	Island County Health	Island County Health is carrying out a PIC program in SW Whidbey Island and Triangle Cove on Camano Island, working with Conservation District to conduct outreach to the community and working with landowners to correct bacteria sources.
$657,492	Kitsap County Public Health	Kitsap Public Health tracked down and removed hot spots that threatened 935 acres of shellfish beds in Yukon Harbor. In other areas they are conducting shoreline monitoring to investigate malfunctioning and failing septic systems that could directly impact the shoreline and/or a shellfish growing area. They are conducting records review, field inspections, and sampling/dye testing to verify septic system failure or malfunction; and helping enforcement correct confirmed septic system failures.
$831,429	Mason County Public Health	Mason County Public Health is partnering with the Squaxin Island Tribe and Mason Conservation District to conduct PIC investigations in Oakland Bay, McLane Cove, and North Bay through monitoring, field work, and dye tests. This includes outreach in the project areas to inform and engage the community. Mason Public Health is convening advisory teams

[13] Retrieved from: https://www.doh.wa.gov/CommunityandEnvironment/Shellfish/EPAGrants/PathogensGrant/PIC on 12/6/2020.

Current Funding	Primary Funded Entities	Activities
		and developing shellfish protection district closure response plans in response to downgrades in the Big Bend/Alderbrook area of Hood Canal and McLane Cove in Pickering Passage.
$464,000	Whatcom County Public Works	Through the structure of the Whatcom Clean Water Program, Whatcom County Public Works is working with Whatcom County Planning Department, the Whatcom Conservation District, Washington Departments of Agriculture and Ecology, tribes, and other partners to engage landowners in finding and fixing sources of preventable bacteria pollution related to livestock and septic systems.

SPD funding is not limited to NEP PIC grants and several programs receive funding from a mix of sources. For example, in addition to grant funding, the Portage Bay SPD and Drayton Harbor SPD funding sources include the Whatcom County Flood Tax.

SPD Effectiveness

SPDs use the DOH growing area classification as one of the key measures of effectiveness. For existing SPDs, a DOH shellfish growing area downgrade triggers action to identify and correct the water quality impairment and this concentrated action continues until funding is exhausted or the downgraded shellfish growing area associated with the SPD is upgraded. SPDs that cover larger geographic regions contain multiple shellfish areas that can have differing classifications. The effectiveness of a given SPD is difficult to parse and would require analyzing historical classification from DOH within the SPD boundary and then correlating classification with variables such as SPD activities and funding levels.

> *The SPD process is imperfect but there are advantages in that it forces local jurisdictions to recognize there is an issue and pay attention to it, at least for a little while. It also creates an opportunity to get in front of more far-flung communities and is a good way to focus on water quality issues.*
> *- County Interviewee*

SPD effectiveness depends on many factors including environmental factors, types of nonpoint pollution sources in the region, political support for staff, amount of funding available for programmatic needs, and staff capacity to communicate and coordinate with key partners. An SPD can provide an effective mechanism to address local water quality problems connected with shellfish bed closures by focusing attention and resources on a specific geographic area. An SPD also provides an opportunity for stakeholder and public involvement in water quality improvement planning and demonstrates to citizens that local government and state government are aware of a pollution issue and actively working to resolve it. When an SPD is in place it also provides a mechanism for the local jurisdiction to act if a shellfish bed is downgraded again without the whole administrative process of re-creating the district. For example, the SPD can reconvene its advisory group and begin the process of notifying citizens that the SPD is resuming activity, and water quality sampling to begin narrowing down

possible pollution sources. SPDs can be more politically palatable than a larger clean water district or stormwater district, because of the difficulty of establishing a new fee on residents. A fee is not required to establish an SPD and the limited size and scope of the SPD limits the perception of a large government program. The SPD also focuses on a specific problem, with the implication that once the problem is resolved the SPD will no longer be needed. As a supplement to the interview process the project team compared available classification data for harvestable shellfish beds in Puget Sound SPDs with data for larger shellfish programs in Puget Sound. The analysis did not include attempted correlation of classification data with other variables (e.g., funding amount available, number of staff, water quality monitoring) as it was beyond the scope of the project. This supplemental analysis is included in Appendix F, with suggestions for additional research.

Opportunities for Enhanced Effectiveness

There are several features that a county can select when forming a shellfish protection district, such as development of an advisory council, water quality monitoring regime, and fee system. Because local political and economic conditions vary among counties, and decisions around specific SPD features are dictated by such conditions, there is no "typical" SPD in Puget Sound. However, conversations with SPD staff (interviewees) revealed the following common barriers and challenges associated with SPDs, and recommendations.

Reactive Approach at Local Level

Most SPDs are formed as the result of a DOH shellfish bed downgrade due to a pollution threat in the growing area. However, interviewees pointed out that water quality pollution problems that trigger shellfish bed downgrades are not usually found to be recent phenomena, and likely began many years prior before eventually reaching the point at which the downgrade occurred. Therefore, once formed, SPDs often take on problems that have gone unaddressed over a significant period, and the cost of and difficulty of addressing these problems is almost always higher than a preventative approach. In many cases, a pollution threat may be temporarily mitigated by SPD activity but if it recurs, the reclassification cycle will be repeated.

> *When we talk about water quality we don't talk about the proactive part – all our work is reactive, and we need to be proactive, which can be inexpensive, by following up on routine maintenance and unfortunately, we catch failures years too late which are harder to fix.*
> *- County Interviewee*

Intermittent Funding and Capacity

Under RCW 90.72, counties with established water quality protection programs are not required to form an SPD to address water quality impairments in the event of a shellfish bed downgrade, although they are required to respond to the pollution problem and create a closure response plan. However, counties that have experienced a shellfish growing area

> *Money helps get things done; we wouldn't have to chase grants all the time or wait for NEP funds to become available.*
> *- County Interviewee*

downgrade, and subsequently formed an SPD in response, often lack sustainable funding for a pollution identification and correction program for political and economic reasons. Forming an SPD creates a potential funding mechanism, but if the county opts to forego using tax revenue, inspection fees, or other rates/charges (i.e., the first three options described in legislation), then the primary funding source for the SPD's program is grants, which typically only last a few years. Counties must re-apply for grant funding and the associated administrative overhead needs and the short-term nature of the funding leads to increased staff turnover and associated loss of institutional knowledge, experience, and connections.

Process to Reclassify Downgraded Shellfish Beds and Maintain Open Status

DOH provides guidance for shellfish protection programs to develop closure response plans to reclassify downgraded shellfish beds and uses the water quality standards detailed in the National Shellfish Sanitation Model Ordinance as criteria for achieving upgrades[14] A closure response plan is developed by "all agencies and stakeholders with the ability to contribute to a solution of the fecal coliform problem(s) responsible for the…downgrade…[and focuses] on actions needed to restore and protect water quality in the affected area."[15] In its closure response plan, a shellfish protection program must outline information about objectives and tasks to address the closure, including actions and desired outcomes. Because every shellfish bed downgrade has different sources of bacteria pollution and the path to reclassification (upgrade) differs, DOH does not have a single process to upgrade beds. While most established programs understand the processes and requirements, some shellfish protection programs noted challenges with determining objectives and metrics for a closure response plan or progress tracking.

> *We were told that we needed to take actions to improve water quality and to provide "surety" that monitoring stations would stay below certain benchmarks. However, the specific actions and their effect on water quality were not defined, nor was the term "surety."*
> *- County Interviewee*

Municipality Responsibility

While RCW 90.72 requires the county to be the party responsible for the SPD, several SPDs include cities or towns, which are not required to take on any of the actions in SPD programs. SPD staff can coordinate with counterparts in cities and towns on water quality actions but ultimately any SPD actions undertaken by these local municipalities are voluntary. This issue is most prominent SPDs in the urbanized Puget Sound counties with the most cities and towns.

[14] Further detail available at: https://www.fda.gov/food/federalstate-food-programs/national-shellfish-sanitation-program-nssp
[15] DOH Closure Response Plan Guidelines

Alignment Opportunity: Education and Outreach

Many Puget Sound cities and counties are required to obtain a general National Pollutant Discharge Elimination System (NPDES) permits (through municipal stormwater permits) from Ecology for discharges from municipal separate storm sewer systems (MS4s). MS4 NPDES permittees must develop and implement a Stormwater Management Program (SWMP) Plan designed to reduce the discharge of pollutants from MS4s to the maximum extent possible and protect water quality. Two of the many required components of every SWMP Plan are (1) public education and outreach and (2) public involvement and participation.

These public education and involvement components overlap with shellfish protection program activities. Municipalities and regional shellfish protection programs could coordinate and combine resources to develop more sophisticated water quality campaigns and reach a broader audience.

SPD Recommendations for Enhanced Effectiveness

SPD Geographic Boundaries

SPDs are typically created to deal with a water pollution issue in a specific local geographic area (e.g., Filucy Bay in Pierce County or Holmes Harbor in Island County). While this can help focus resources and attention on the area in question, it can also limit the county's ability to collect fees to support the types of pollution identification and correction efforts required because the SPD's boundaries include a limited number of residents/parcels that could be charged a fee for the SPD program. Interviewees noted that when an SPD's boundaries are relatively large it becomes easier to levy fees and create more robust outreach, monitoring, and correction programs.

Discussions with interviewees suggest a trend toward larger geographic areas for shellfish protection, either through SPDs or similar water quality protection districts. Some counties can justify including a wide swath of county lands in their SPDs, both adjacent to Puget Sound and in the upland areas of watersheds that drain to Puget Sound and affect a shellfish growing area. Examples include Jefferson County's Clean Water District, which encompasses the eastern portion of the County, and Skagit County's three SPDs, which together cover unincorporated Skagit County. Mason County has seven SPDs but most of them are inactive; the county is currently proposing to combine existing SPDs into a single, county-wide Clean Water District. The separate Mason SPD committees will be combined into a single Mason County Clean Water District Committee, and under the proposal the county will adopt a $5.06 fee for non-exempt parcels within the proposed District boundaries.

Classification Process

Recognizing the need for flexibility in the classification process, and that DOH considers many pieces of technical information for shellfish bed classification including the variability of local geographies and programs, there is feedback from some interviewees that improved process transparency would be helpful for local staff implementing closure response plans. This recommendation could be more applicable to local jurisdiction staff that are relatively new to the closure response plan process and unfamiliar with the required details. DOH staff interviewed for this project noted that they are aware of potential areas for increased transparency and are working internally on improvements.

> *Clarifying the [shellfish bed health] decision-making process would be helpful. Jurisdiction responses vary; this could help understand paths forward.*
> *- State Agency Interviewee*

Revisiting Chapter 90.72 RCW: Shellfish Protection Districts

The Washington State Legislature enacted RCW 90.72 in 1985 to address water pollution problems resulting in shellfish bed closures. Puget Sound's population has grown over the past 35 years, along with understanding of water pollution drivers and how to address them. Interviewees were asked whether any changes to the SPD enabling legislation might be needed to maximize its effectiveness. Interviewees for this project did not provide specific suggestions for changes to RCW 90.72. Several interviewees pointed out that although RCW 90.72 prioritizes funding for SPDs, it does not compel counties to assess a fee to support SPD activities; however, no interviewees suggested that the RCW should be revised to require a fee assessment.

Reframe the Funding and Capacity Question

One interviewee commented that the traditional approach to program funding is to determine the type of program and its features desired, and then determine the funding level needed for program implementation. The interviewee suggests that an alternative approach that may prove more successful is to determine the most politically feasible funding amount and build the program based on this number. Different funding amounts provide different services, and a county could, for example, set a per-parcel fee at an amount that people can pay and use that as a starting point for the program's services (whether through an SPD or other program).

Water Quality Regulations and Enforcement for Shellfish Beds

This line of inquiry is intended to describe the landscape of water quality regulations and agencies that support shellfish growing areas, challenges and barriers associated with regulatory enforcement and organizational coordination, and recommendations for program enhancement. The agencies and organizations described in this section were mentioned during interviews but are not an exhaustive list of all partners involved in shellfish protection and recovery work. For example, Puget Sound tribes have a significant role in protecting and restoring shellfish aquaculture on their lands, and in many areas, they partner with neighboring jurisdictions around areas such as data collection and habitat protection and restoration.

The following interview questions addressed regulations and enforcement:

1. How successful has regulatory enforcement been in improving water quality in your area?
2. Do you monitor or keep track of compliance rates?
3. Do you have suggestions for improving regulatory requirements (related to shellfish recovery) to increase program effectiveness while also improving efficiency?
4. Do you see any opportunities to fulfill multiple regulatory requirements with program actions?
5. What other opportunities do you see to address regulatory requirements and increase program effectiveness?

Key Takeaways

Many organizations, programs, and regulations affect Washington's recreational and commercial shellfish harvest areas through their responsibilities to protect and maintain water quality. DOH is the state's Shellfish Control Authority;[16] it classifies commercial shellfish growing areas and publicly owned recreational shellfish harvesting beaches based on water quality and current and potential pollution sources. Other state agencies, local government health jurisdictions, and counties regulate and enforce key factors that drive shellfish area classification, including stormwater, on-site sewage systems, wastewater treatment plants and marinas, and animal waste management on farms. As with any complex system, coordination among key components is a significant contributing factor to success.

Overview of Organizations and Roles

There are many organizations, programs, and regulations that affect Washington's recreational and commercial shellfish harvest areas through their responsibilities to protect and maintain water quality. Regulation and enforcement activities are carried out by state agencies, local government health jurisdictions, and counties. Voluntary actions also contribute to water quality (and by extension shellfish

[16] See Chapter 69.30 RCW and Chapter 246.282 WAC

bed health) and are covered by a mix of local government, state agencies, and local conservation districts. The relationship between these entities is illustrated in Figure 4.

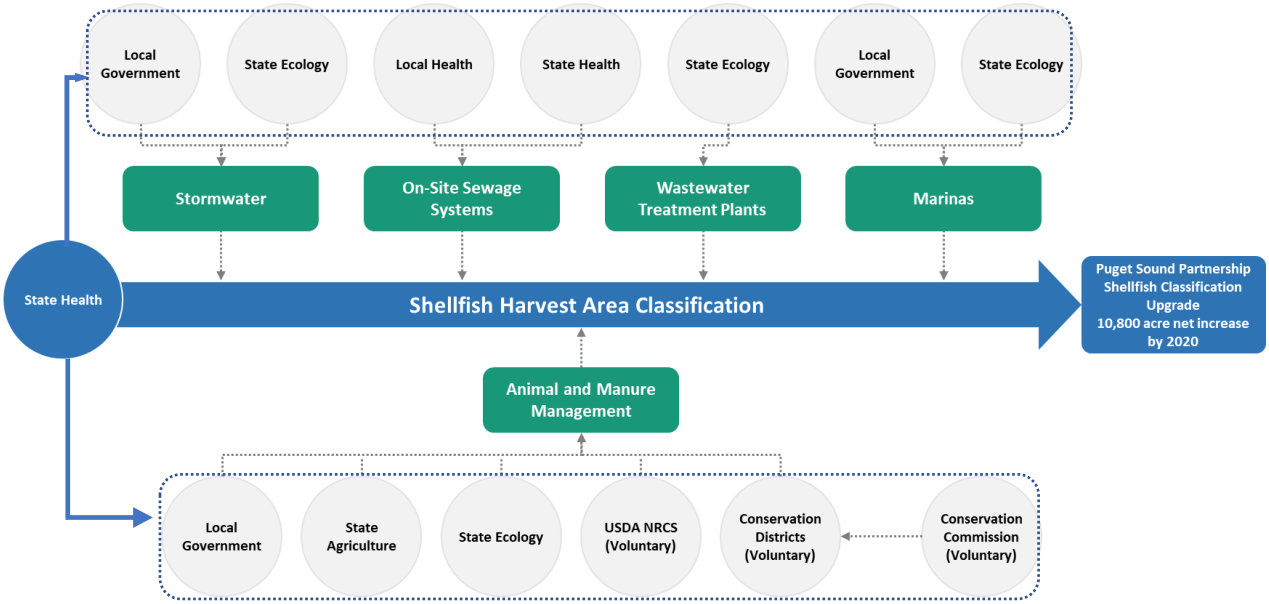


Figure 4: Washington Water Quality Partnerships (Adapted from DOH Shellfish Bed Closure Response Plan Guidelines)

Shellfish Harvest Area Classification

Department of Health is Washington's Shellfish Control Authority (Chapter 69.30 RCW and Chapter 246.282 WAC), and the agency monitors shellfish harvest areas by collecting fecal coliform bacteria data from marine water stations throughout Puget Sound and governs shellfish safety based on the National Shellfish Sanitation Program's Model Ordinance.[17] DOH then classifies commercial shellfish growing areas and publicly owned recreational shellfish harvest areas based on water quality, hydrographic and meteorological factors, and current and potential pollution sources, including closing shellfish areas when spills, stormwater runoff, or other events compromise water quality (Chapters 69.30 RCW; 246.280 WAC; and 246.282 WAC). DOH classifies commercial shellfish harvest areas as: Approved, Conditionally Approved, Restricted, or Prohibited. DOH classifies recreational shellfish harvest areas as: Open, Conditionally Open, Emergency Closure, or Closed.[18] The key factors driving shellfish area classification (as illustrated in the green boxes in Figure 4) and the role of the organizations involved, are described in Table 3 below.

[17] The National Shellfish Sanitation Program is the federal/state cooperative program recognized by the US Food and Drug Administration and the Interstate Shellfish Sanitation Conference for the sanitary control of shellfish produced and sold for human consumption. Its purpose is to promote and improve the sanitation of shellfish moving in interstate commerce through federal/state cooperation and uniformity of state shellfish programs.

[18] Definitions for each classification available at https://www.doh.wa.gov/CommunityandEnvironment/Shellfish/GrowingAreas

Table 3: Factors Related to Shellfish Bed Classification and Affiliated Regulating Organizations

Factors Related to Shellfish Bed Classification	Affiliated Regulating Organization(s)	Notes
Stormwater	• Local governments (e.g., Public Works or Stormwater Utility) • Ecology	Because pollutants in stormwater runoff can compromise water quality and affect shellfish bed classification status, Ecology issues stormwater permits to cities and densely populated counties and counties managing stormwater infrastructure.
On-site sewage (OSS) systems	• Local health departments • DOH	Failing or poorly functioning OSS are a significant contributor to water quality problems in Puget Sound and directly affect shellfish bed health. Local health departments and DOH work together on OSS system location, design, installation, operation, maintenance, and monitoring.
Wastewater treatment plants and marinas	• Ecology	Ecology regulates wastewater treatment plants to ensure that discharges meet state water quality standards and permit requirements. Shellfish harvest near wastewater treatment plant outfalls is generally prohibited. Ecology, with local governments, is also responsible for regulating marinas. Due to their pollution potential (e.g., sewage discharges), shellfish harvest near marinas is also generally prohibited.
Farms and other properties with livestock	• Washington State Department of Agriculture (WSDA) • Ecology	WSDA administers the Dairy Nutrient Management Program (DNMP) with assistance from the Washington Conservation Commission and local Conservation Districts. Ecology issues permits for Concentrated Animal Feeding Operations (CAFO) that confine livestock for long periods of time in pens or barns and discharge pollution to surface or groundwater. Runoff from dairy farms and CAFOs can enter rivers and streams that drain to Puget Sound and impact water quality in adjacent shellfish beds.
N/A	• Washington State Department of Fish and Wildlife (WDFW) • DNR	WDFW does not have a role in shellfish growing area classification and water quality but is responsible for enforcing shellfish-related rules and regulations such as issuing fines to those harvesting despite bed closures. DNR is tasked with preserving and enhancing water-dependent uses such as aquaculture, and to provide opportunities to use renewable resources, including shellfish. To this end DNR manages state-owned aquatic lands, including leases to aquaculture operations for oysters, clams, and mussels.

Opportunities for Enhanced Effectiveness

Coordination Within and Across Organizations[19]

Interviewees provided significant feedback on the relationship between organizations that affect shellfish harvest areas. In Figure 5, the Washington Water Quality Partnerships chart, red arrows indicate points of coordination between organizations; each point of coordination can be relatively stronger or weaker depending on the capacity and resources of the participating organizations. Given the number of organizations and their responsibilities that affect shellfish bed protection and recovery, there is a need for both cross-organizational coordination as well as internal organization coordination to maximize their respective strengths. DOH's role as lead agency is indicated with blue connections.

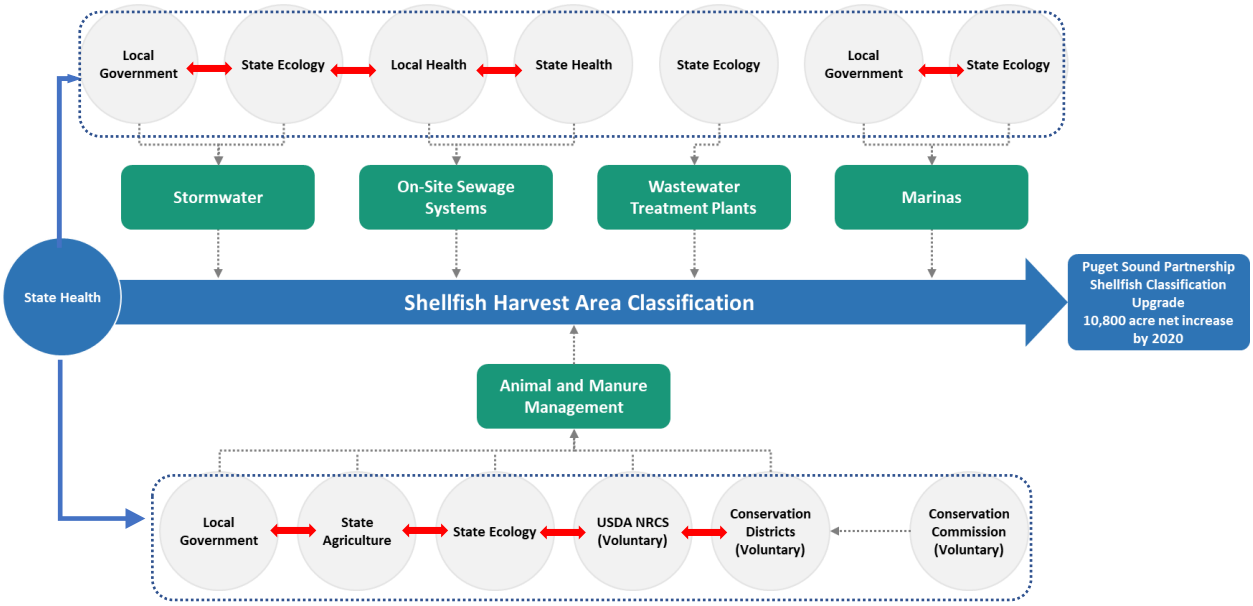


Figure 5: Washington Water Quality Partnerships and Points of Coordination

Coordination Between State Agencies

Several interviewees mentioned the topic of multi-agency coordination and because of this, the project team posed this follow-up question to interviewees: "How would you characterize the relationship between your organization and organizations with which you partner for shellfish protection and recovery?" Interviewees' perspectives on the degree and quality of the relationship varied. Some interviewees, for example, noted a high degree of coordination between state agency field staff and their county counterparts but felt that this did not permeate vertically to state agency senior managers and presented a communications gap, where field staff would benefit from increased management

[19] In 2016, a state agency Memorandum of Understanding (originally from 1997) was updated to outline agency duties and responsibilities when shellfish growing areas are downgraded due to nonpoint pollution. This document was signed by the directors of Ecology, Health, Agriculture, Conservation Commission, and Puget Sound Partnership.

support. Other interviewees cited existing state agency partnerships at the senior manager level (specifically between Ecology and WSDA) that served this coordination function. Several interviewees acknowledged that Ecology and WSDA have different management structures, notably that WSDA's management structure is relatively flat compared with Ecology, and that these differences in structure contribute to differing experiences in how each agency operates.

Ecology and WSDA implement parallel programs with field staff who work to mitigate nonpoint pollution and issue penalties if needed under the Water Pollution Control Act for CAFOs and the Dairy Nutrient Management Act (DNMA) for dairies, respectively. This leads to one point of friction identified by interviewees, which is inter-agency coordination, when agency field staff identify an issue on a property that does not fall under their regulatory purview. For example, a WSDA representative may begin working with a dairy owner to mitigate a water quality issue and realize a neighboring farm is also contributing to the water quality issue. If the neighbor is not operating a dairy, the WSDA representative can only notify Ecology field staff through the agencies' referral process about the issue – they cannot approach the neighboring property owner to enforce water quality standard compliance.

Coordination Between Ecology and Local Jurisdictions

Interviewees identified a second issue at the point of coordination between Ecology and local jurisdictions. If a local jurisdiction is unable to address a water quality problem, the jurisdiction contacts Ecology to provide the necessary regulatory and enforcement backstop. However, Ecology has its own processes which include first attempting to incentivize voluntary action by the landowner, beginning with technical assistance. This process reflects the agency's responsibility to do its due diligence. Some interviewees noted that this is frustrating to local jurisdiction staff who believe that voluntary action and technical assistance approaches have been exhausted and enforcement action should begin.

Evolving Fecal Coliform and E. coli Standards

As an example of potential for improved state-local coordination, in January 2019, Ecology adopted amendments to Chapter 173-201A WAC, Water Quality Standards for Surface Waters of the State of Washington. The rulemaking updated fresh and marine water quality standards for protecting water contact recreational uses in state waters. Several interviewees noted that the change in water quality standard from fecal coliform to E. coli can impact programs that rely on other programs' water quality monitoring, including shellfish protection programs. The fecal coliform standard required for shellfish beds now does not match the water quality standard, which can result in dual sampling (and additional cost). Additionally, counties have traditionally used fecal coliform data to communicate with the public around water quality status and meeting water quality standards and changing to an E. coli standard raises several questions about how that communication will occur. Interviewees commented that better communication between DOH and Ecology, as well as an opportunity for local input, would have been helpful.

Local Enforcement Capacity

One-size-fits-all support tools for local programs are difficult to develop because local enforcement activities vary among jurisdictions based on presence or absence of local regulations, available resources, and political will. Interviewees noted that even when local regulations are present, without support from elected officials for enforcement, local health districts and shellfish protection programs are reluctant to move from voluntary efforts to enforcement action. Variable funding and political support among local programs also complicate state agency efforts to support local programs, because of the time and resources required to tailor state agency policy implementation to provide the greatest value to local programs.

Enforcement Approaches

Interviewees commented that compliance programs that can issue "cease and desist" orders or take regulatory action contribute to a quicker shift in cultural practices, and programs benefit from a firm commitment from agencies that provide a regulatory backstop. Ecology and WSDA approach their regulatory responsibilities by first offering technical and/or financial assistance to landowners and then proceeding through a series of actions (such as issuing warning letters) before issuing a penalty. However, several interviewees remarked on the impression that Ecology issues infrequent but severe penalties while WSDA is known to issue more frequent but minor penalties. This perception is likely due to several factors: The DNMP (managed by WSDA) works with a very specific group of property owners (licensed dairy farms) who are aware of their regulated status and expect regular inspections. Ecology, however, is responsible for regulating all other nonpoint pollution sources; many property owners are unaware of water quality regulations that apply to them and the agency experiences more pushback on enforcement than WSDA. Regardless of the reason for the different approaches, the issue noted by interviewees is the how this disparity is experienced on the ground, which creates distrust between regulated entities and regulatory agencies and more pushback to heavier Ecology enforcement penalties. Shellfish program coordinators (such as county PIC staff) must balance this disparity and pushback as they seek to develop and maintain relationships at the local level.

> *Like most anything a regulation is already there, and, in some cases, it is more about field staff needing to feel empowered and supported when enforcing the regulations.*
> *- Conservation District Interviewee*

> *Compared to commercial dairy farms, it is less common for non-dairy livestock farms to received penalties for non-compliance from Ecology, but once it happens it's a big deal for the farmer…WSDA issues more frequent but lower-level enforcement to dairy farms rather than large penalties. WSDA isn't seen as heavy-handed but as a more effective backstop and its relationship with the community is less antagonistic.*
> *- State Agency Staff Interviewee*

> *Without political support, it's difficult to get approval to enforce planning and environmental health codes, which also require money, time, and resources*
> *- County Interviewee*

Recommendations for Organizations Connected with Shellfish Bed Health

Models for Enhanced Coordination Between Organizations

Shellfish protection programs bring together many organizations that affect shellfish bed health, a complex undertaking that requires the implementing program staff to build and maintain effective relationships. One pathway to advancing this foundational work is to provide replicable models of shellfish partner organization, with different options for scale depending on user needs. Several examples are provided below.

An interviewee associated with a PIC program described the use of a Project Delivery Team (PDT) model featuring monthly meetings of key partners involved in water quality work that impacts the local shellfish growing areas. The PDT focuses on known or suspected water quality impairment locations within the PIC project area and provides a record of recent actions, responsibilities, and next steps. An example PDT meeting agenda is provided in Appendix E. Replicating this model in other parts of Puget Sound could strengthen and clarify roles and responsibilities of partner organizations. Coordination also includes partnering with local tribes as they often operate their own monitoring programs and sample analysis, as well as other water quality programs. For example, as part of its Shellfish Program Hood Canal Coordinating Council works with the Port Gamble S'Klallam tribe and as part of this partnership HCCC uses tribal lab facilities for MST and DNA testing. A final example relates to coordination around enforcement: An MOA between Skagit Conservation District and Ecology outlines roles and responsibilities for both organizations regarding landowners who may be in violation of clean water regulations – see Appendix D.

> *The regular monthly meeting of the project delivery team keeps the partnering agencies coordinated to strategically address higher priority issues. Though not perfect, having regular communication between the non-regulatory and regulatory parties brings a bigger toolbox to solve the problem and allows for continuous improvement.*
> *- Conservation District Interviewee*

Central Coordination for Shellfish Recovery Organizations

One of the most consistent recommendations offered by interviewees was the need for a central coordinator position within a state agency (most likely DOH) to provide a connective role among the many organizations working in areas that affect shellfish bed health. This individual would support regular convening of key staff at state and local levels, and tribes, to disseminate best practices and lessons learned from around Puget Sound. They would also support a forum in which emerging issues such as dual sampling for fecal coliform and e. coli could be discussed by those organizations directly responsible for implementation. Interviewees specifically cited the work carried out for the 2019 Peterson report, which included convening a series of workshops with shellfish program practitioners, as valuable and practical

> *Relationships - people have good ideas but they're off doing their own thing…coordination is really valuable for the people doing this work.*
> *- County Interviewee*

examples of peer learning and education. A central coordinator could also provide opportunities for agencies charged with regulatory enforcement to connect with local program staff and provide regular communications around enforcement approaches.

Interviewees stated that they have benefitted from previous opportunities to collaborate with their peers across Puget Sound by providing insights on successful approaches to implementing shellfish protection programs. For example, methodologies for water quality sampling and analysis are continually evolving and resource-constrained staff have been able to interact with peers and other experts during Puget Sound-wide convenings. However, opportunities to do so have been limited and inconsistent from lack of staff. Some counties with sufficient resources can provide staff support to disseminate best practices around shellfish bed protection and recovery but more reliable, long-term support in the form of a central coordinator position would be highly impactful.

Data Collection and Use

Overview of Data Collection and Use

This section describes shellfish protection program data types, needs, and sources as well as barriers associated with data collection and use. High quality data is one of the cornerstones of an effective shellfish protection program. State agencies and local jurisdictions use data to 1) identify water quality status and trends, 2) identify pollution sources, and 3) support outreach and enforcement efforts. Data collection, analysis, and use varies widely across shellfish protection programs depending on various factors within the jurisdictions such as funding availability, staffing, and program maturity.

The following interview questions addressed data collection and use:

1. What internal and external data do you use to inform management of your shellfish program?
2. What's working for you now?
3. What remains the most challenging in monitoring or analyzing water quality?
4. When problems are identified through data, how are they managed on the ground?
5. What are the most effective ways to share information with staff from other programs or partner agencies?
6. In areas of data monitoring/management that have proven successful, what aspects could be transferrable to other shellfish growing areas?

Key Takeaways

High quality data is one of the cornerstones of an effective shellfish protection program. State agencies and local jurisdictions use data to 1) identify water quality status and trends, 2) identify pollution sources, and 3) support outreach and enforcement efforts. Data collection, analysis, and use varies widely across shellfish protection programs depending on various factors within the jurisdictions such as funding availability, staffing, and program maturity. Although funding is a significant challenge for local programs as they collect and analyze water quality in connection with shellfish bed health, there are opportunities to gain efficiencies and share best practices. Some of these opportunities are found at the local level while others are under state agencies purview.

Data Needs, Types, and Sources

Water Quality Data

Shellfish protection programs are commonly administered either as a PIC program, a shellfish protection district, or as part of another surface water quality program and they rely on water quality data collected by program staff and/or external partners. Water quality data informs SPD closure response plans and is used by DOH to determine shellfish bed status. A central feature of a robust shellfish protection program (whether a PIC, SPD, or other program) is a standardized, consistently maintained multi-year database of water quality data that jurisdiction staff and partners can use to identify water quality trends; shellfish protection program staff also access parcel-scale information on properties

within their watersheds through the county assessor agency. This information includes records from septic system databases (where available) and property information. The combination of data sources provides a roadmap of the contributing factors to shellfish bed health and where action by shellfish protection partners is required. Table 4 outlines common data needs, types of data collected, and data sources in the jurisdictions as discussed by interviewees. Note that the information presented in Table 3 is not inclusive of all water quality data collected around Puget Sound; it includes data needs, types, and sources described by interviewees; other agencies or jurisdictions (not interviewed) may collect different or additional data.

Table 4: Monitoring Goals, Data Types, and Data Sources

	Monitoring Goal	Data Type	Data Source	Process Notes
A	Marine Water Quality to classify areas for commercial shellfish harvest	Fecal coliform bacteria	DOH	WA DOH collects samples 6 – 12 times per year and shares results ~2 weeks after samples are collected
B	Shoreline Surveys to maintain safe recreational access of public beaches and to classify commercial shellfish growing areas	Fecal coliform bacteria	Counties/DOH	Meeting homeowners to check on OSS, provide best practices information, potential dye tests
C	Freshwater Quality for pollution tracing in areas draining to shellfish beds	• Fecal coliform bacteria • MST/DNA	• Counties • Tribes • Conservation Districts • Ecology • WSDA	
D	Property Records for pollution identification	• OSS installation date, O&M records (including inspections, failures) • Assessor data	• Counties	Typically maintained at county level
E	Outfall locations	• GIS or identified spatial coordinates	• Ecology PARIS database • County stormwater data	

In certain jurisdictions, some or all the water quality data collected for shellfish protection data and management is compiled in locally managed databases (usually a county department of health or public

works water quality database). In some cases, data also are uploaded to DOH, Ecology, and US EPA databases as described in Table 5. Counties upload data funded through NEP grants, NPDES receiving water studies, and certain Clean Water Act (CWA) assessments to Ecology's Environmental Information Management System (EIM) as part of their funding requirement. Shellfish program staff access these databases to retrieve information that could complement their own monitoring data (e.g., data collected by an adjacent jurisdiction or another organization) for additional detail around which water quality issues are most pressing to address, given limited resources.

Table 5: Commonly Used Data Resources

Database	Data Type	Notes/Hyperlinks
Environmental Information Management System (EIM)	• Ecology Centennial Clean Water Grants • NPDES receiving water studies • Water quality data for 303(d) and 305(b) Clean Water Act (CWA) assessment	Ecology website: https://ecology.wa.gov/Research-Data/Data-resources/Environmental-Information-Management-database
Environmental Report Tracking System (ERTS)	• Illegal water use • Polluted, oily, or murky water (high turbidity) • Complaints related to spills or discharges	Ecology website: https://ecology.wa.gov/About-us/Get-involved/Report-an-environmental-issue
Water Quality Portal (WQP)		Mechanism to retrieve water monitoring data from US EPA: https://www.waterqualitydata.us/
Water Quality Exchange (WQX)		Mechanism for data partners to submit water monitoring data to US EPA
WA Shellfish Safety Information	• Water quality classification • Harvest status • Closure zones	Commercial Shellfish: https://fortress.wa.gov/doh/oswpviewer/index.html Recreational Shellfish: https://fortress.wa.gov/doh/biotoxin/biotoxin.html

How Data Are Used

Program Planning and Management

A basic description of data use in a typical shellfish protection program is outlined in Figure 6. Local jurisdictions use water quality monitoring data to analyze water quality trends at specific locations and at the watershed scale. These data sets include both ambient monitoring stations for freshwater quality (as described in Table 4, row C) and targeted sampling when a water quality impairment is suspected. County water quality managers often combine their water quality data with data from other partners (e.g., tribes, conservation districts) and with marine water quality data provided by DOH (Table 4, row A) to build a more complete picture of water quality within their jurisdiction. These sources are used in conjunction with shoreline surveys (Table 4, row B) and external sources (such as data from adjacent

jurisdictions pulled from the databases described in Table 4) to build a complete water quality data set within the program boundaries. If the water quality data indicate a potential impairment, or problem, or county water quality managers are notified by another agency (DOH shellfish harvesting area downgrade or ERTS notification), program staff will initiate follow up actions to identify the source of the problem depending on the program's protocols and resources.

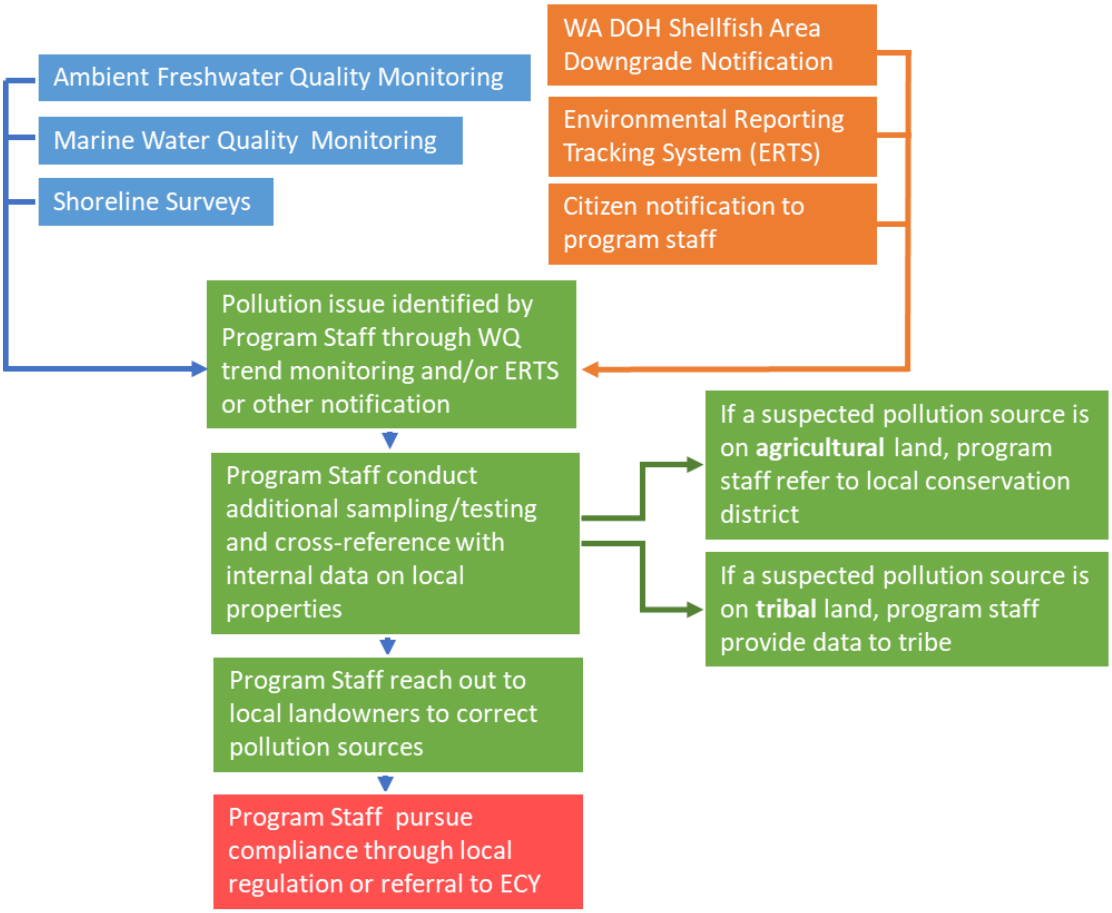


Figure 6: Typical Shellfish Protection Program Processes

Data Sharing and Reporting

Information sharing varies between shellfish protection program partners. As mentioned previously, some programs share water quality data with EPA in exchange for laboratory analysis. Some programs share data with tribal partners when a water quality impairment is suspected on tribal lands, and conversely some tribal partners share water quality data for suspected impairments on county lands. Data sharing between shellfish protection program staff and local conservation districts often depends on the strength of staff-to-staff relationships. Confidentiality laws restrict conservation districts from sharing information about actions undertaken on agricultural lands (i.e., farm plans), although conservation districts can share when no actions have been undertaken. Regional PIC programs such as the program operated by Hood Canal Coordinating Council (HCCC) include data-sharing agreements among the participating counties.

Shellfish protection programs that receive grant funding are required to submit water quality data to certain funding agencies. For example, if a grantee receives a Centennial Clean Water Grant from Ecology, they must share their data in Ecology's Environmental Information Management System database; when a grantee receives a National Estuary Program (NEP) subaward through DOH, they must enter the data in Ecology's Water Quality Exchange database. However, if a local public works department funds its own water quality monitoring through local funds, the department does not have to submit that water quality data (even if the department receives grant monies to support other tasks).

Some jurisdictions also dedicate resources toward a public facing website to display water quality monitoring data such as downloadable reports (e.g., Kitsap County) as a method of public education and transparency. A recommendation from Henry Peterson's report is to "(C)onsider using task management software or a common database to help track multi-partner contacts with and observations about project area properties." Knowledge sharing among program staff about what task management software works well for their needs would help facilitate the dissemination of best practices.

Opportunities for Enhanced Effectiveness

Sustainable Funding to Support Data Collection and Analysis

Sustainable and reliable funding not only supports efficient use of funds, but also better data collection and program management. Shellfish protection programs rely on funding from sources such as state and federal grants, fees collected from special purpose districts (e.g., shellfish protection districts, clean water districts, stormwater districts), and or from respective county department budgets. Jurisdictions that have been able to assess annual fees have a reliable funding source, but not all jurisdictions have this option, and many counties prioritize budget allocations for other services before shellfish protection programs. This results in reliance on state and federal grants for funding, and several interviewees reiterated that uncertainty and time associated with managing grant cycles and sometimes multiple grant commitments reduces the time program staff can spend implementing and refining programs. The grant funding could support a specific data collection and analysis effort as part of a project to improve shellfish bed health, but often the program activity associated with a grant will end when the grant ends, at least temporarily, until additional grant funding can be secured.

> *Money helps get things done; we wouldn't have to chase grants all the time or wait for NEP funds to become available.*
> *- County Interviewee*

Reliable, Long-term Regional Freshwater Quality Data Sets

When analyzing water quality trends, interviewees stated that shellfish programs need to know regional historic water quality baselines to detect changes, rank their significance, and develop a proactive approach to solve problems. Although DOH provides regular marine water quality data throughout the year, access to reliable, long-term data sets for fresh or estuarine water in a region varies widely among jurisdictions and depends on funding, technology, staff, and standards. Water quality data sets vary by county; some have robust collections of historical data that is easily accessed through a database. Others have paper records of historical water quality data that are essentially unusable because of inability to access them and lack of resources to transfer these data into an electronic database.

> *Without ambient monitoring capacity we don't have the historical data to know how these areas change – no data library – which would help identify sources of fecal coliform bacteria.*
> *- County Interviewee*

Information Sharing with Key Partners

Positive collaborative relationships with partners allow programs to coordinate responses to potential problems, and interviewees identified two areas where information sharing between partners would benefit shellfish protection programs, but policy or other considerations prevent such activity. The first is related to information sharing around farms. Conservation Districts, per federal law[20], cannot share specific farm plans but they can share information such as when a landowner declines to participate or otherwise interact with CD staff. However, CD staff are sometimes hesitant to share this type of information because building relationships with landowners is a long-term prospect and protecting confidentiality of farmers is a high priority. While this is understandable, this means shellfish programs sometimes lack access to information that would benefit them; if program staff were aware of which landowners declined to participate in an agriculture program, other tools to influence voluntary action could be directly deployed. Another similar example involves data on low interest loan programs[21] and locations for OSS repair or maintenance, where shellfish protection programs would benefit from information sharing related to landowners that are working to fix a deficient OSS. Having more information on where work is already occurring would allow shellfish program staff to provide more direct support to areas where more work is needed.

Timeliness of Water Quality Analysis

The longer the water quality sampling and analysis process takes, the longer a potential water quality problem can fester. Interviewees from jurisdictions with robust monitoring and analysis programs reported a preference for using privately-operated laboratories for analysis because of the short turn-around time (often within 24 hours during a workweek). However, several programs have partnership agreements with EPA for analytical services at the Manchester Laboratory in Kitsap County, which

[20] See Section 1619 of the 2008 Farm Bill; further information available here: https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1166474.pdf

[21] Craft3, a regional non-profit, is the primary organization providing loans for OSS repair and maintenance in and around Puget Sound (https://www.craft3.org/)

provides these services in exchange for co-ownership and use of the resulting data. While this represents a significant cost savings, a drawback is longer analytical turn-around time.

On a related note, shellfish programs rely on DOH for marine water quality sampling and analysis; marine water quality sampling is expensive and time consuming and, as such, is outside the capacity of most local programs. DOH marine water quality sampling is conducted 6 to 12 times per year (varies by location). After sample collection, data analysis takes up to two weeks before results are available. The time between data collection, analysis, and sharing is an important consideration, particularly for programs that rely on external data from partners.

> *DOH does marine water sampling but we don't get this as frequently as we'd like, and it takes up to two weeks before we get results. I'd like to see downgrade info once a month.*
> *- County Interviewee*

Effective Outreach and Education

Interviewees noted that many jurisdiction residents may assume their jurisdiction has the resources to collect data regularly and monitor water quality at lakes, beaches, and other popular swimming areas. However, this may not be the case and, in some instances, a public health concern (i.e., pet or human illness) is the event that precipitates shellfish harvest downgrades. Educating the public and conducting outreach increases jurisdiction residents' awareness of the impacts they can have on their region's water quality and shellfish growing areas and reduces public health concerns by informing affected citizens of actions underway to mitigate these impacts, including monitoring of water quality. Local jurisdictions noted the need for social marketing expertise, often through contracting with specialized organizations, to reach the public and communicate around how citizens can act to improve water quality conditions. Obtaining ongoing funding for this work is challenging.

Data Recommendations

Ensure Critical Conditions are Adequately Captured

Some interviewees commented that for marine water quality data, seasonal shellfish bed closures indicate high bacteria levels, but the underlying cause could be extreme weather events. Identifying the underlying cause through additional data collection is essential for mitigating those causes and keeping shellfish beds open. For example, during the dry season the data can more effectively identify illicit discharges, while during the wet season pollutants are often transported from their sources by stormwater or groundwater. PIC programs, for example, may be able to better define critical conditions if storm event sampling is included in their data collection practices. Defining critical conditions can entail several variables depending on the size and complexity of the watershed flowing to the shellfish growing area. More well-defined critical conditions and the classifications driven by them (rather than seasonal closures) would be ideal. For example, one program reported it collects "impact" data; staff install monitoring substations in impaired areas for major land use delineations and collect data during dry and wet weather. The resulting data illustrate how different problems come out at different times of

the year. This type of more granular data analysis could provide a better method of screening for potential shellfish bed closures.

Frequency of Marine Water Quality Sampling

As mentioned in the "barriers" section above, several interviewees noted that more frequent DOH marine water quality sampling could benefit programs by providing greater resolution on marine water quality conditions within the program area. Increased sampling frequency would provide more detail on critical conditions as well. Not all interviewees agreed that increased marine water quality sampling was necessary, and as such a potential modification to this recommendation is for DOH to survey Puget Sound programs to ascertain which areas would benefit from increased sampling.

Conservation Districts

Conservation districts are subdivisions of state government codified under RCW 89.08**.** Conservation districts in Washington are led by five-member boards. Conservation Districts' method of providing guidance for private natural resource protection is collaborative, voluntary, and non-regulatory. Districts work with individual landowners and lessees on soil erosion activities, irrigation efficiencies, livestock management, forest stand improvements. Conservation Districts play an important role in water quality through their work with farms and dairies throughout Puget Sound. (link)

Opportunities for Information Sharing on Emerging Data Practices

As noted in the section on organizational responsibilities, opportunities to share ideas, discuss challenges, and brainstorm solutions are valuable to program staff, and data needs and uses are no exception. A state agency, such as DOH or ECY, or PSP, could fill a convening role for PIC program staff through which they can share best practices around data collection, analysis, and use, and build consistency among programs. This could include presentations by subject matter experts (SMEs) on emerging methods for sample analysis and modeling of results. It could also provide a venue for program staff to share best practices around internal data sharing. Interviewees acknowledged the value of regularly scheduled workshops (twice annually was a common recommendation) as a method of information sharing. PIC program staff from various jurisdictions around Puget Sound meet on an ad hoc basis using their own resources, further illustrating the value of this type of interaction.

> *PIC work needs shepherding from the state, which has happened on an intermittent basis and [without] a lot of continuity. Our work has been good, but things have changed since it started in '94.*
> *- County Interviewee*

Coordination Opportunity: Data Collection

Many government agencies and organizations throughout Puget Sound collect water quality data on a regular basis, including tribes, counties, and commercial shellfish operators. For example, jurisdictions with municipal stormwater permits are also required to test water quality as a stormwater permit condition. Coordinating data collection activities between organizations operating in the same geographic region is a best practice for many of these entities and should be encouraged whenever possible. For example, county water quality sampling programs coordinate with permitted jurisdictions to collect data during the same time frames/intervals to build out the data set as much as possible and create a comprehensive view of water quality. Coordinating data collection activities continues the overall theme of coordination as a tool for increasing harvestable shellfish acres throughout Puget Sound.

Access and Connectivity with State Databases

Two suggestions emerged from interviewees related to Ecology's databases. Ecology uses ERTS as an initial way to document and send out information about pollution sources, but it is not used as a tracking tool to follow up on responses to problems. Interviewees suggested that, to improve ERTS' notification system, e.g., when a violation is reported in ERTS, the notification should be sent to the appropriate person to manage it. Partner agencies do not have the ability to access ERTS to update information or send progress updates; often these changes only happen at the request of the partner agency. Another suggestion is to allow local jurisdictions a minimum of read-only access to ERTS so that if a complaint is registered locally, it can be searched and/or verified within ERTS. This could be approached from both the ECY side and the local jurisdiction side, to ensure alignment.

The second suggestion from interviewees is to create a Shellfish-Specific Query for Ecology's Environmental Information Management System (EIM). EIM includes data relevant to shellfish protection programs but as a comprehensive environmental database it also contains a massive amount of data that is not useful to local shellfish protection programs. One suggested solution is a pre-made template designed to query EIM for data related to shellfish and water quality.

Publicly Accessible Data-sharing Systems

Access to updated data is important for public confidence in shellfish protection programs. Providing access to such data builds confidence with the public and provides program staff with evidence to bring to a landowner to support approaches to addressing water quality impairments. Peterson (2019) noted that not all counties have a publicly accessible septic systems database, which could also provide greater public confidence in water quality monitoring. Many programs have excellent public data-sharing systems that could potentially be expanded or made accessible to jurisdictions that need one.

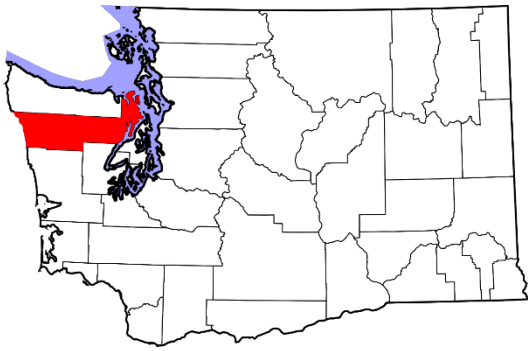
Case Studies

The project team developed two short case studies to illustrate approaches that local jurisdictions are taking to address the challenges and barriers associated with implementing activities aimed at protecting and recovering shellfish beds. The project team selected the case studies by analyzing initial interview data for examples, conducting further online research for background where available, and then following up with interviewees (and contacts suggested by these interviewees) for additional detail. These case studies are provided below.

Jefferson County Foundational Monitoring Project

This case study illustrates a county-operated SPD approach to addressing administrative overhead associated with responding to declining water quality, and the need for increased water quality monitoring during wet and dry seasons.

Background



Jefferson County's SPD is officially known as the Jefferson County Clean Water District and is run by the Water Quality division of Environmental Public Health. The Clean Water District spans the eastern side of the county, which has 200 miles of shoreline. Through the SPD, Jefferson County runs a PIC program focused on septic systems while work with agricultural interests is led by the local Conservation District. Jefferson County established a $20 per parcel fee in 2009. Funding from 2019 totaled $422,282, which was primarily used as matching funds for clean water projects.[22] The County has also pursued the maximum number of Centennial Clean Water grants to leverage local funding, which results in high administrative cost due to project management requirements.

Foundational Monitoring and PIC Project

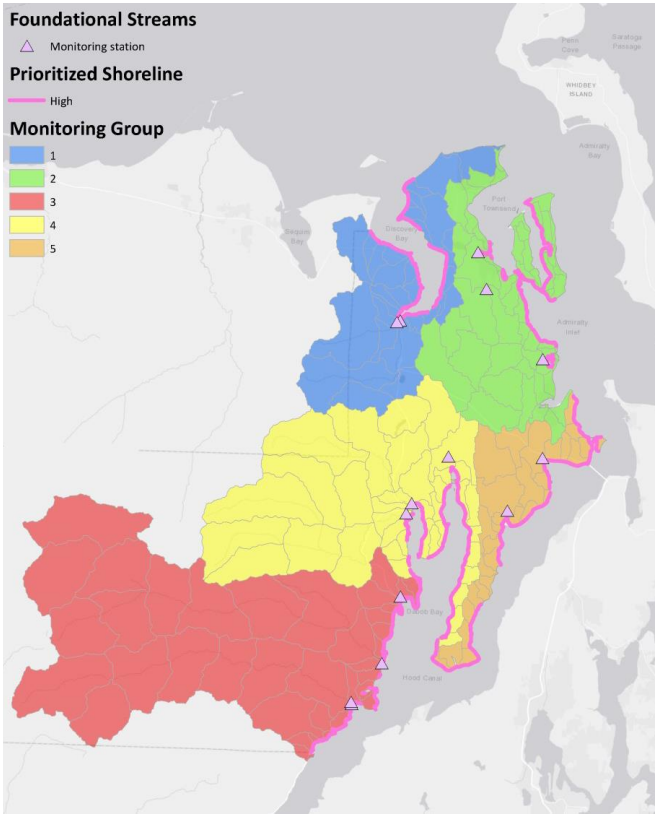
The goal of Jefferson County's Foundational Monitoring & PIC project is to provide a base-level of monitoring for the entire Jefferson County Clean Water District that will be sustained through future local funds and add programmatic support district-wide for Pollution Identification and Correction activities.[23] The Clean Water District has responded to numerous downgrades over the years and as noted by Peterson, Jefferson County's PIC program staff identified a significant challenge in the time required to respond to these downgrades. Previously, if the state reported a water quality decline in a certain area the County would develop a project to address the issue, and as part of the project develop

[22] Jefferson County Clean Water District Annual Report, August 13, 2020. https://www.jeffersoncountypublichealth.org/DocumentCenter/View/10957/Jefferson-County-Clean-Water-District-Annual-Report-2020

[23] Excerpted from project description in Ecology's Grants and Loans Program.

a quality assurance project plan (QAPP) which required significant staff time. To be proactive and to reduce administrative inefficiency, Jefferson County developed its Foundational Monitoring project, which includes a single QAPP to cover the entire Clean Water District that can be adapted to specific areas. Jefferson County began the Foundational Monitoring and PIC project in early 2020. During the fall/winter wet season, County staff monitor for E. coli at all freshwater inputs which includes over 118 miles of high priority shorelines and 14 high-volume perennial streams (See Figure CS-1). In addition to bacteria monitoring, staff follow up on previously identified violations.[24] The project provides status and trend analysis of key streams and rivers draining to shellfish beds to provide early warning of emerging problems, better analysis of existing impairments, and documentation of post-correction improvements.

Figure CS-1: Jefferson County Foundational Monitoring Project Map



Program staff noted that water quality problems are prioritized for PIC action (such as OSS maintenance and repairs and agricultural best management practices). Septic system education, surveys, permitting, and repair financial assistance information are distributed in the areas surrounding the hot spots.[25]

The Clean Water District notes that implementation of the new model will be difficult given the existing grant projects underway through 2020 and into 2021. This will require careful planning to ensure that, as current projects are concluded, the Foundational Monitoring program expands to cover all areas of the Clean Water District. Additional grant funding may be needed for PIC work including the tracking site correction work from initial discovery through compliance and code enforcement, financial assistance, repair permitting, installation and case completion.[26]

Because the Foundational Monitoring Project is in early implementation, results are forthcoming. However, this model could potentially be adopted by other jurisdictions seeking to reduce

[24] East Jefferson County Water Quality News, Fall 2020. https://www.co.jefferson.wa.us/DocumentCenter/View/10772/2020-Fall-Water-Quality-Newsletter
[25] East Jefferson County Water Quality News, Spring 2020. https://www.co.jefferson.wa.us/DocumentCenter/View/10773/2020-Spring-Water-Quality-Newsletter
[26] Jefferson County Clean Water District Annual Report, August 16, 2019. https://www.jeffersoncountypublichealth.org/DocumentCenter/View/8771/Jefferson-County-Clean-Water-District-Annual-Report-2019

administrative overhead associated with developing QAPPs for submission to the state, and to address the previously identified barrier of freshwater quality monitoring during wet and dry seasons.

Hood Canal Regional PIC Program

This case study illustrates how a regional PIC approach can leverage the resources and expertise of multiple organizations in neighboring jurisdictions with overlapping water quality concerns and similar sources of water quality impairment. It illustrates an approach to addressing issues such as administrative overhead associated with grant funding and data sharing among adjoining jurisdictions. This approach applies to PIC programs and is not applicable to SPDs with fixed geographic boundaries.

Background

Hood Canal Coordinating Council is a council of governments formed in 1985 in response to community concerns about water quality problems and related natural resource issues in the Hood Canal watershed. Member governments include Jefferson, Kitsap, and Mason Counties, and the Port Gamble S'Klallam and Skokomish Tribes. The Hood Canal region includes over 29,000 on-site sewage systems (OSS).[27] In 2020, there were approximately 31,300 acres of approved and conditional shellfish growing areas within Hood Canal. Roughly 2,980 acres remain prohibited to shellfish growing.[28]

Regional PIC Program

The Hood Canal Regional PIC Program is the most formal developed regional coordination effort around PIC work in Puget Sound and is a cooperative effort involving Jefferson, Kitsap, and Mason Counties, Port Gamble S'Klallam and Skokomish Tribes, Hood Canal Salmon Enhancement Group, Jefferson, Kitsap, and Mason Conservation Districts, and the Hood Canal Coordinating Council (HCCC). The regional approach is intended to consolidate and streamline work such as grant applications, contracts, QAPPs, and reporting to coordinate water quality efforts more efficiently. HCCC and its partners developed the Hood Canal Regional PIC program in three phases. The first phase, planning, spanned 2012 – 2014 in which a regional workgroup developed a project framework and program guidance while building inter-jurisdictional relationships. During the second phase, partners identified and prioritized Hood Canal shoreline work and submitted a QAPP in December 2014, with field work beginning in early 2015. Phase three consisted of a second implementation phase, with a QAPP approved in August 2017. Field work in phase three were identified for local health jurisdictions. A workplan for phase four is under development.

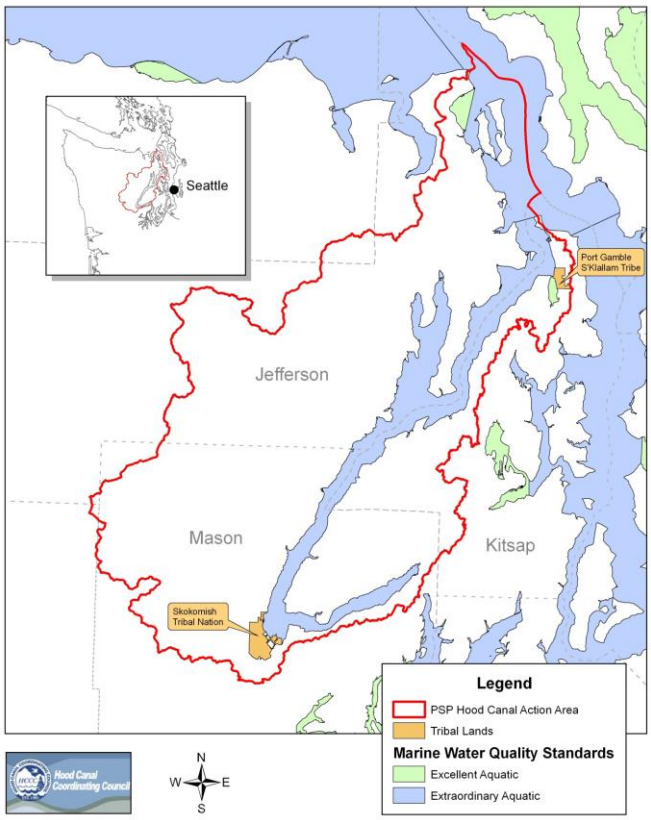
Each local jurisdiction and tribe that participate in the Hood Canal Regional PIC program have challenges and barriers. Mason County has limited staff time and resources, and frequent staff turnover. Kitsap County is experiencing rapid population growth and has a significant number of vacation and rental homes along Hood Canal. Jefferson County has limited staff and lacks sustainable funding for PIC activities. The common bond between the three counties is Hood Canal, with its unique geography posing challenges for addressing water quality issues. This includes limited marine water exchange due

[27] Hood Canal Regional Pollution Identification and Correction Program, Phase II – Implementation (April 2017 – June 2019). Final Report, August 2019.
[28] Retrieved from https://ourhoodcanal.org/content/shellfish

to sub-sea topography and poor vertical mixing of freshwater which results in dense algal bloom die-offs.

The regional PIC program model provides several benefits to organizations working together towards a common goal. One benefit, mentioned briefly in the background section above, is reduced administrative overhead through combined grant applications, QAPPs, and reporting. Another benefit is the ability to share resources; this has been helpful for instance with Kitsap County staff providing training for Mason County staff. Mason County can also upload data to Kitsap County's water quality database, reducing the resource burden on Mason County to develop and maintain its own data system. Another benefit to the program is it provides a regular structure and resources to support communications and working relationships between staff in participating organizations, to coordinate and align PIC work; this includes, for example, common templates for progress reporting and data reporting. Tribal participation included technical expertise and field work in addition to their contribution to the regional PIC program development.

Figure CS-2: Hood Canal Action Area (map excerpted from Hood Canal Coordinating Council Hood Canal Regional Pollution Identification and Correction Monitoring Plan)



In lieu of reorganizing the management boundaries within Puget Sound to reflect a watershed approach (as suggested by one interviewee), the regional PIC program is a potential model for local jurisdictions to consider when water quality issues cross political/administrative borders. It addresses barriers related to coordination between multiple entities, including data sharing, and provides support to jurisdictions with limited resources and capacity.

Appendix A: Steering Committee Members and Affiliations

Bill Blake	Executive Director, Skagit County Conservation District
Seth Book	EPA Grants Coordinator, Skokomish Indian Tribe
Scott Chernoff	Water Quality Restoration Program Lead, Shellfish Growing Area Section, Office of Environmental Health and Safety, Washington State Department of Health
Kyrre Flege	Regulatory Lead, Nutrient Management Program, Washington State Department of Agriculture
Andrea Hood	Whatcom Clean Water Program Coordinator, Washington State Department of Health
Michael See	Natural Resources Division Manager, Skagit County Public Works
Barbara Ann Smolko	Senior Planner, Pierce County Surface Water Management
Shawn Ultican	Environmental Specialist, Water Quality Program, Washington State Department of Ecology

Appendix B: Interviewees and Affiliations

Leslie Banigan	Water Pollution Identification and Correction Program, Kitsap Public Health District
Bill Blake	Skagit County Conservation District
Scott Brewer	Hood Canal Coordinating Council
Lori Clark	Natural Resources Department, Island County Public Health
Ron Cummings	Water Quality Program, Washington State Department of Ecology
Erika Douglas	Whatcom County Public Works
Karen DuBose	Pollution Identification and Correction Program, Skagit County Public Works
Sean Edwards	Formerly with Snohomish County Water Surface Management
Jean Frost	Shellfish Growing Area Section, Office of Environmental Health and Safety, Washington State Department of Health
Catherine Gockel	Puget Sound Geographic Program, EPA Region 10 Water Division
Haley Harguth	Hood Canal Coordinating Council
Grant Holdcroft	Water Pollution Identification and Correction Program, Kitsap Public Health District
Todd Hunsdorfer	King County
Linda Lyshall	Snohomish County Conservation District
Corrina Marote	Skagit County Public Health
Alex Paysse	Mason County
Ann Prusha	Island County
Chery Sullivan	Dairy Nutrient Management Program, Washington State Department of Agriculture
Ian Tracy	Mason County Environmental Health
Nate White	Hood Canal Coordinating Council

Appendix C: Interview Questions

Background

1. Please describe your current role and experience with the shellfish/water quality program.

Effectiveness

1. How do you measure effectiveness of the actions implemented in your area to improve water quality?
2. What stands out as significant successes of your program?
3. Which projects, actions or relationships remain challenging?
4. How can state agencies and local jurisdictions improve coordination and alignments of activities for effectiveness?
5. We are interested in how your program could influence water quality improvement in other areas. What successes could be replicated in other programs facing similar issues of water quality?
6. If your program could add additional staff capacity for data collection, monitoring, outreach, or other activities, how would you use it to improve shellfish protection activities?

Data

1. What internal and external data do you use to inform management of your shellfish program?
2. What's working for you now?
3. What remains the most challenging in monitoring or analyzing water quality?
4. When problems are identified through data, how are they managed on the ground?
5. What are the most effective ways to share information with staff from other programs or partner agencies?
6. In areas of data monitoring/management that have proven successful, what aspects could be transferrable to other shellfish growing areas?

Regulatory/Lean

1. How successful has regulatory enforcement been in improving water quality in your area?
2. Do you monitor or keep track of compliance rates?
3. Do you have suggestions for improving regulatory requirements (related to shellfish recovery) to increase program effectiveness while also improving efficiency?
4. Do you see any opportunities to fulfill multiple regulatory requirements with program actions?
5. What other opportunities do you see to address regulatory requirements and increase program effectiveness?

Appendix D: Puget Sound Shellfish Protection Districts

SPD	Jurisdiction(s)	Coordinating Agency	Status	Dates Active	Advisory Group and Affiliations
Birch Bay SPD	Whatcom County	Whatcom County Planning and Development Services	Active	2009 - present	Yes; Appointed advisory committee with up to 11 members (two seats reserved for tribal representation from Lummi Nation and Nooksack Tribe); Non-appointed participants include: • Whatcom County Conservation District and departments of Public Works, Health, and Planning and Development Services • WA departments of Agriculture and Ecology
Drayton Harbor SPD	Whatcom County	Whatcom County Planning and Development Services	Active	1995 - present	Same as above.
Portage Bay SPD	Whatcom County	Whatcom County Planning and Development Services	Active	1998 - present	Same as above.
Skagit Clean Water Program	Skagit County	Skagit County Public Works	Active	1995 - present	No
Sequim-Dungeness Clean Water District	Clallam County	Clallam County Health and Human Services/Environmental Health	Active	2001 - present	Yes; the Clean Water Workgroup is a non-appointed technical team that includes: • local citizens • Battelle Marine Laboratory • Streamkeepers of Clallam County • Jamestown S'Klallam Tribe • Clallam County Conservation District

SPD	Jurisdiction(s)	Coordinating Agency	Status	Dates Active	Advisory Group and Affiliations
					• WA Departments of Ecology and Health • US Fish and Wildlife Service
Jefferson County Clean Water District	Eastern Jefferson County	Jefferson County Public Health	Active	2007 - present	Yes; Appointed advisory committee with nine members
Island County Clean Water Utility	Island County	Island County Public Works	Active	2010 - present	Yes
Snohomish Surface Water Management Utility District	Snohomish County	Snohomish Conservation District	Active	2009 - present	Yes
Poverty Bay SPD	King County	King County Department of Natural Resources and Parks	Active	2018 - present	Yes
Clean Water Kitsap	Kitsap County	Kitsap County Public Works	Active	1994 - present	No
Burley Lagoon SPD	Pierce County and Kitsap County	Pierce County Planning and Public Works	Active	1999 - present	Yes; Appointed advisory group known as Pierce County Shellfish Partners includes Pierce County Stormwater Management, Conservation Districts, and Health Department; Non-appointed participants include citizen community groups (Friends of Burley Lagoon) and Kitsap County Surface and Stormwater Management
Filucy Bay SPD	Pierce County	Pierce County Planning and Public Works	Active	2002 - present	Same as above.
Rocky Bay SPD	Pierce County and Kitsap County	Pierce County Planning and Public Works	Active	1995 - present	Same as above.

SPD	Jurisdiction(s)	Coordinating Agency	Status	Dates Active	Advisory Group and Affiliations
Vaughn Bay SPD	Pierce County	Pierce County Planning and Public Works	Active	2016 - present	Same as above.
Minter Bay SPD	Pierce County and Kitsap County	Pierce County Planning and Public Works	Active	2021 - present	TBD – likely same as above.
Annas Bay SPD	Mason County	Mason County Public Health	Active	2008 - present	Yes; Non-appointed participants include: • Puget Sound Action Team • Hood Canal Coordinating Council • Taylor Shellfish Company • Skokomish Tribe Natural Resources Department and Department of Fisheries • Mason County Conservation District and departments of Public Health Water Quality Program, Community Development Planning Division, and Utilities and Waste Management • UW Sea Grant and WSU Extension • WA departments of Agriculture, Ecology, and Fish and Wildlife
North Bay / Case Inlet SPD	Mason County	Mason County Public Health	Active	1994 - present	Yes
Oakland Bay / Hammersley Inlet SPD	Mason County	Mason County Public Health	Active	2007 – present	Yes; Appointed advisory group includes: • County citizens and shellfish growers • City and Port of Shelton • Squaxin Island Tribe • Mason County Conservation District, County Commissioner, and other departments • UW Sea Grant and WSU Extension • Puget Sound Partnership

SPD	Jurisdiction(s)	Coordinating Agency	Status	Dates Active	Advisory Group and Affiliations
					• WA departments of Agriculture, Ecology, and Health • US EPA
Henderson Inlet SPD	Thurston County	Community Planning Department	Active	2001 - present	Yes; Appointed advisory committee with 13 members; Non-appointed participants include: • Thurston County Conservation District • WA departments of Ecology and Health
Nisqually Reach SPD	Thurston County	Community Planning Department	Active	2001 - present	Same as above.
South Holmes Harbor	Island County	Island County Public Works	Inactive	2006 – 2010	N/A
Big Bend Creek SPD	Mason County	Mason County Public Health	Inactive	2016 - 2019	N/A
Lower Hood Canal SPD	Mason County	Mason County Public Health	Inactive	1993 - ?	N/A
McLane Cove SPD	Mason County	Mason County Public Health	Inactive	2016 - 2018	N/A
Totten / Little Skookum Inlet SPD	Mason County	Mason County Public Health	Inactive	1993 - ?	N/A

Appendix E: Example Project Delivery Team Agenda

PDT Agenda

Date:_____

Attendees:_____

Old Business:

Location/Subject	Condition	Past PDT member Action	Landowner Action	Future Action to be taken

New Business:

Location/Subject	Condition	Past PDT member Action	Landowner Action	Future Action to be taken

Condition ratings – bad, worse, same, better, good

Presentations:

Appendix F: Shellfish Bed Classification Data

Methodology

The project team compiled Washington State Department of Health (DOH) data on upgrades and downgrades in shellfish growing areas in Puget Sound with data on shellfish protection district activity (SPDs), county parcel fee rates, and affiliated clean water districts (CWDs). Data analysis focused on comparing cross-county trends in acreage upgrades and downgrades and the external factors that influence each shellfish protection district. To explore factors that might contribute to SPD performance, the project team disaggregated data by SPD location, size, and status.

To develop a deeper understanding of factors leading to restoration of shellfish growing areas, the project team highlighted four counties: Jefferson County, Mason County, Pierce County, and Kitsap County. These counties were selected because all have robust data available and well-documented trends in growing area status. Within the four selected counties, 26 growing areas within 11 SPDs were profiled, in addition to two shellfish protection districts in Thurston and King County, which were included as examples of standalone SPDs. Each profiled county exemplifies different administrative approaches to shellfish protection: some have county-wide or sub-regional clean water districts to complement the SPDs, as is the case in Jefferson and Mason County. Others take a large county-wide SPD approach, such as Snohomish County, while some have smaller SPDs associated with each individual growing area, such as in Pierce County. All four profiled counties have subsets of growing areas that remain active. In total, six highlighted SPDs are active as of 2020. Among the profiled SPDs, clean water districts support Jefferson County, Mason County, and Pierce County.

Example Shellfish Protection District Data

Mason County

Mason County has seven named shellfish growing areas comprising over 1,400 acres. As of 2020, three SPDs remain active, including Anna's Bay, North Bay, and Oakland Bay. Inactive SPDs in Mason County include Big Bend Creek, Lower Hood Canal, McLane Cove, and Totten/Little Skookum Inlet. The data depicted in Figure 1 for Mason County is comprised of seven growing areas including Anna's Bay, Hood Canal, Pickering Passage, Spencer Cove, North Bay, Hammersley Inlet, and Oakland Bay. The growing areas range in program maturity, with individual growing areas established from 1993 to 2016.

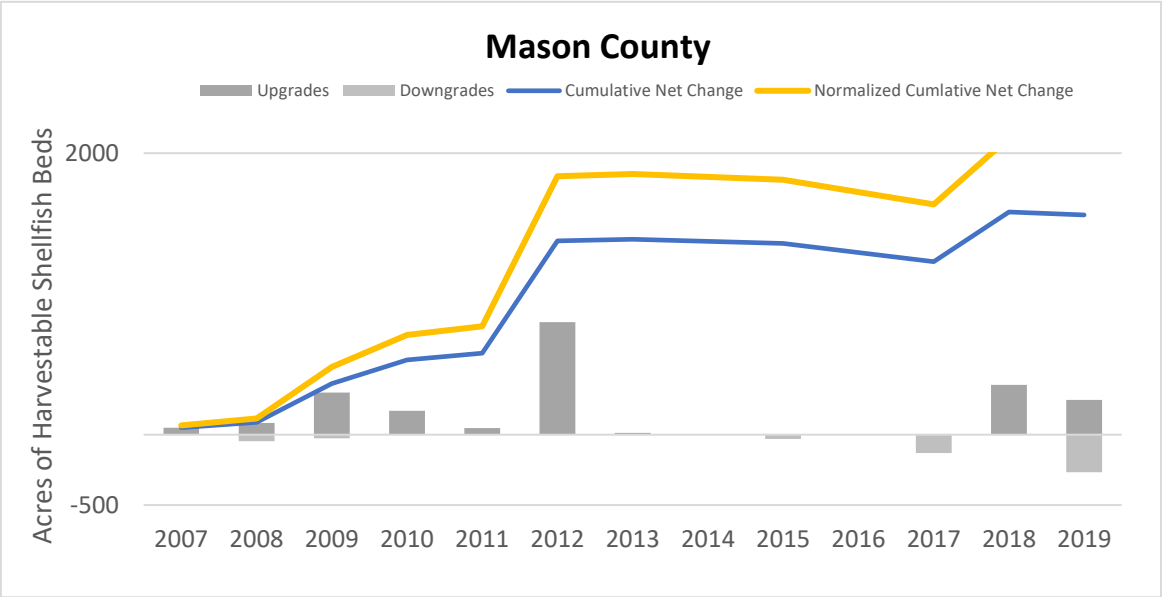


Figure 7: Changes in Mason County Harvestable SPD Acreage

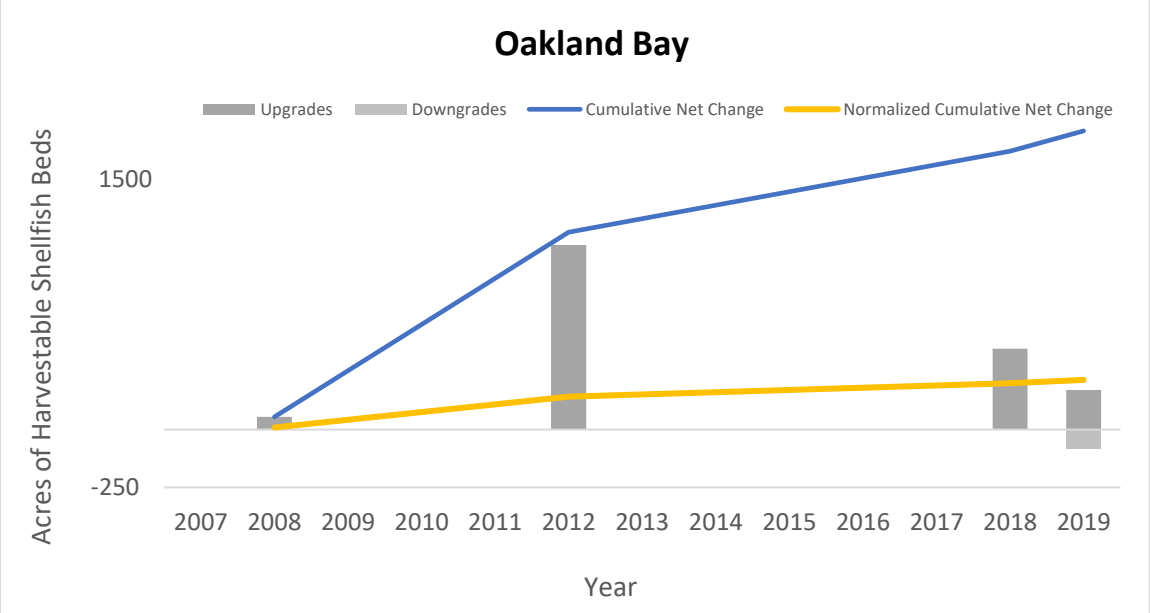


Figure 8: Changes in Oakland Bay Harvestable SPD Acreage

Most downgrades within Mason County were found in Pickering Passage, which is no longer an active SPD. Established in 2007, the Oakland Bay Clean Water District was developed to reduce water pollution and ensure safe access to recreational activities. The CWD is composed of over 20 partners including businesses, tribes, industry, governmental organizations, and residents. With the resources and partnership of the Oakland Bay Clean Water District, Mason County has upgraded over 1,500 acres of harvestable shellfish beds since its establishment. Data specific to Oakland Bay can be found in Figure 2.

The above trend lines indicate the cumulative net change in harvestable shellfish bed acreage over 12 years. To illustrate the change, the Y-axis has been scaled to Mason County's upgrades and downgrades size, ranging from -500 to 2000 acres. The normalized cumulative net change indicates the trend in

acreage change on a scale of -1500 to 1500 acres. To show variance in acreage change on consistent scales, normalized cumulative net change can be found in Figures 1-7.

Jefferson County

Jefferson County has four named shellfish growing areas, all falling within the Jefferson County Clean Water District SPD. These include Discovery Bay, Mystery Bay, Port Townsend, and Quilcene Bay, which total over 50 acres. As of 2018, Discovery Bay, Mystery Bay, and Quilcene Bay transitioned to approved. As of 2014 Port Townsend remained prohibited in status.

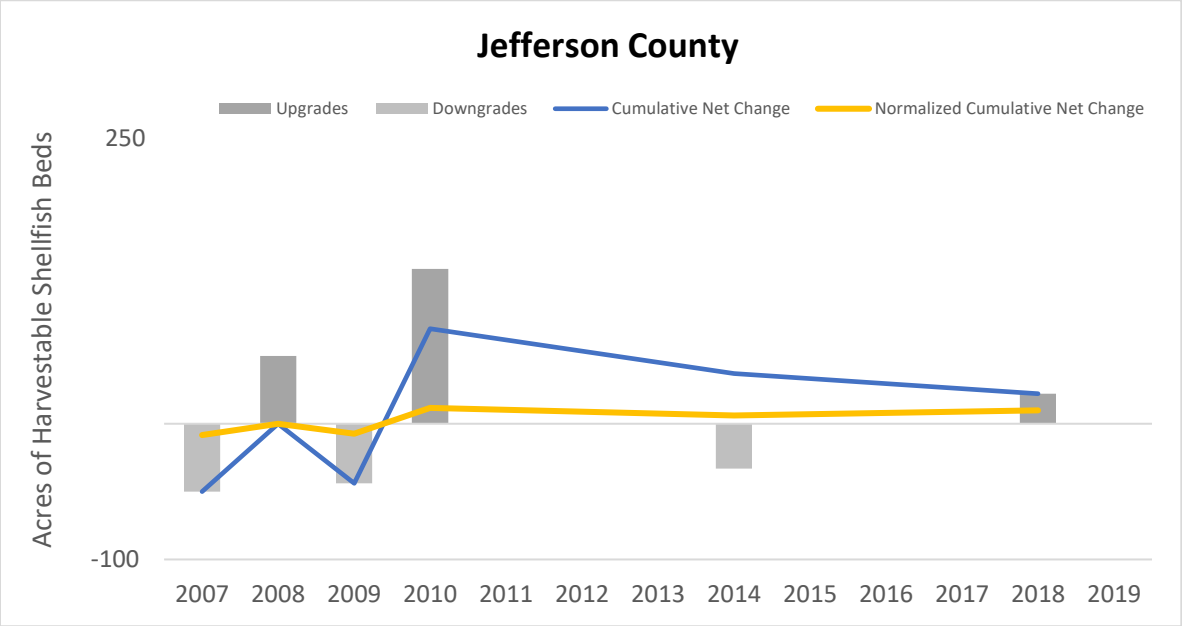


Figure 9: Changes in Jefferson County Harvestable SPD Acreage

The data depicted in Figure 3 for Jefferson County is comprised of four growing areas, including Discovery Bay, Mystery Bay, Quilcene Bay, and Port Townsend, with most growing areas established in 2007. Jefferson County growing areas are further supported by the Jefferson County Clean Water District, which provides funding through parcel fees, currently set at a rate of $20 per parcel. In 2019, the Water Quality division of Jefferson County Public Health received $422,282 from CWD fees. Continued funding and the implementation of a “no discharge zone” led to acreage gains for Jefferson County in 2018. Substantial marine and coastal monitoring indicated that previously threatened Discovery Bay had water quality improvements in 2018. As one of the few counties supported by substantial CWD and PIC funding, Jefferson County illustrates the importance of secure, ongoing funding for clean water projects.

Figure 3 indicates the cumulative net change in harvestable shellfish bed acreage for Jefferson County, as well as both upgrades and downgrades by year. As Jefferson County operates on a smaller scale, the Y-axis has been scaled to indicate change on a -100-to-250-acre scale. The normalized cumulative net change indicates the trend in acreage change on a scale of -1500 to 1500 acres. To show variance in acreage change on consistent scales, normalized cumulative net change can be found in Figures 1-7.

Henderson Inlet

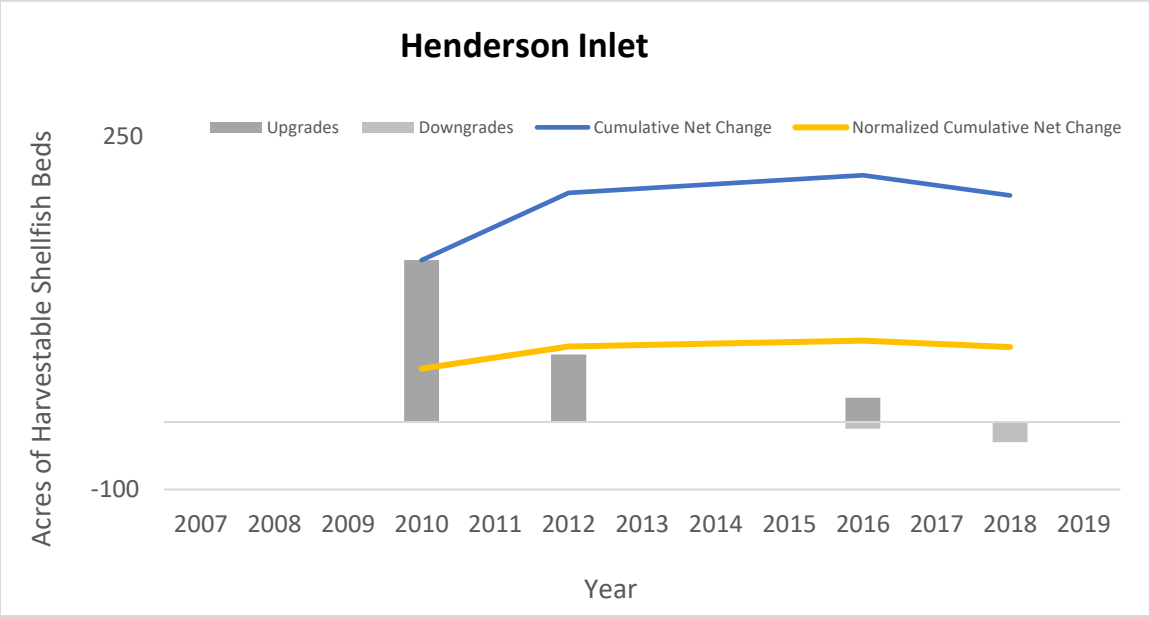


Figure 10: Changes in Henderson Inlet Harvestable SPD Acreage

The data depicted in Figure 4 for Henderson Inlet represents a standalone SPD in Thurston County. Henderson Inlet SPD, in conjunction with Thurston County, receives $146,000 per year in grant funding to support water quality improvement projects.

Figure 4 indicates the cumulative net change in harvestable shellfish bed acreage for Henderson Inlet, as well as both upgrades and downgrades by year. As Jefferson County operates on a smaller scale, the Y-axis has been scaled to indicate change on a -100-to-250-acre scale. The normalized cumulative net change indicates the trend in acreage change on a scale of -1500 to 1500 acres.

Poverty Bay

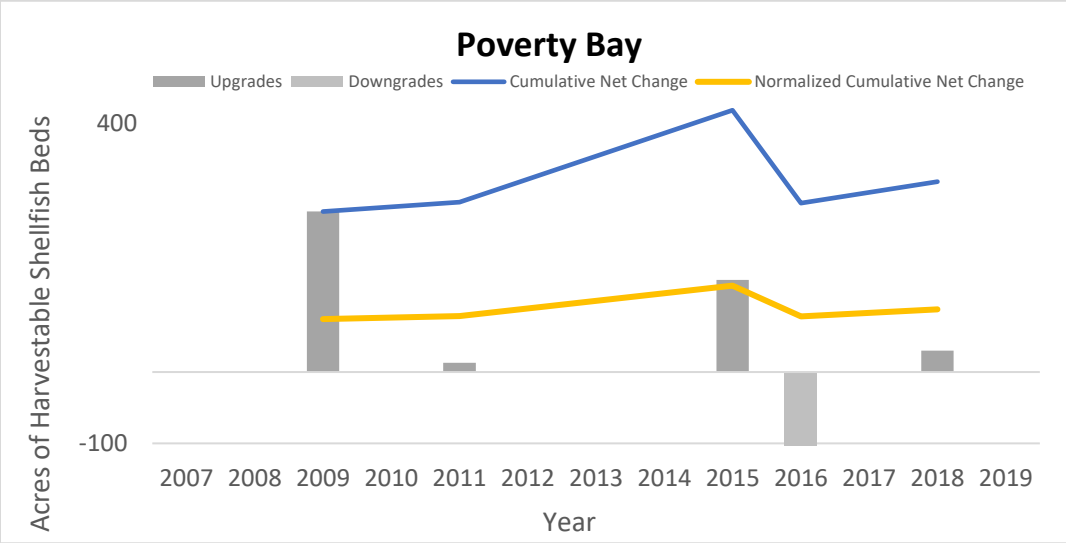


Figure 11: Changes in Poverty Bay Harvestable SPD Acreage

Poverty Bay is an active SPD in King County; it is comprised of 10 square miles of primarily urban and suburban development, with limited agricultural production. When two monitoring stations failed National Shellfish Sanitation Program water quality standards in 2016, additional focus was placed on the need for a strategy to address bacterial pollution in the region. In response to the downgrade, King County developed the King County Poverty Bay Technical Committee (TC). As a standalone SPD not affiliated with a clean water district, Poverty Bay is now monitored by the TC and supported through an EPA Pollution Identification and Correction (PIC) field monitoring program, in addition to EPA National Estuary Program funds.

Figure 5 indicates the cumulative net change in harvestable shellfish bed acreage for Poverty Bay, as well as both upgrades and downgrades by year. The normalized cumulative net change indicates the trend in acreage change on a scale of -1500 to 1500 acres.

Pierce County

Pierce County has five named shellfish growing areas, comprising over 400 acres. As of 2020, three SPDs remain active, including Filucy Bay, Rocky Bay, Vaugh Bay, and Minter Bay. Burley Lagoon SPD, which is partially located in Pierce County, also remains active as of 2020. As of 2016, two growing areas were conditional in status: Vaughn Bay and Rocky Bay. Henderson Bay, Ketron Island, and Penrose Point remain approved.

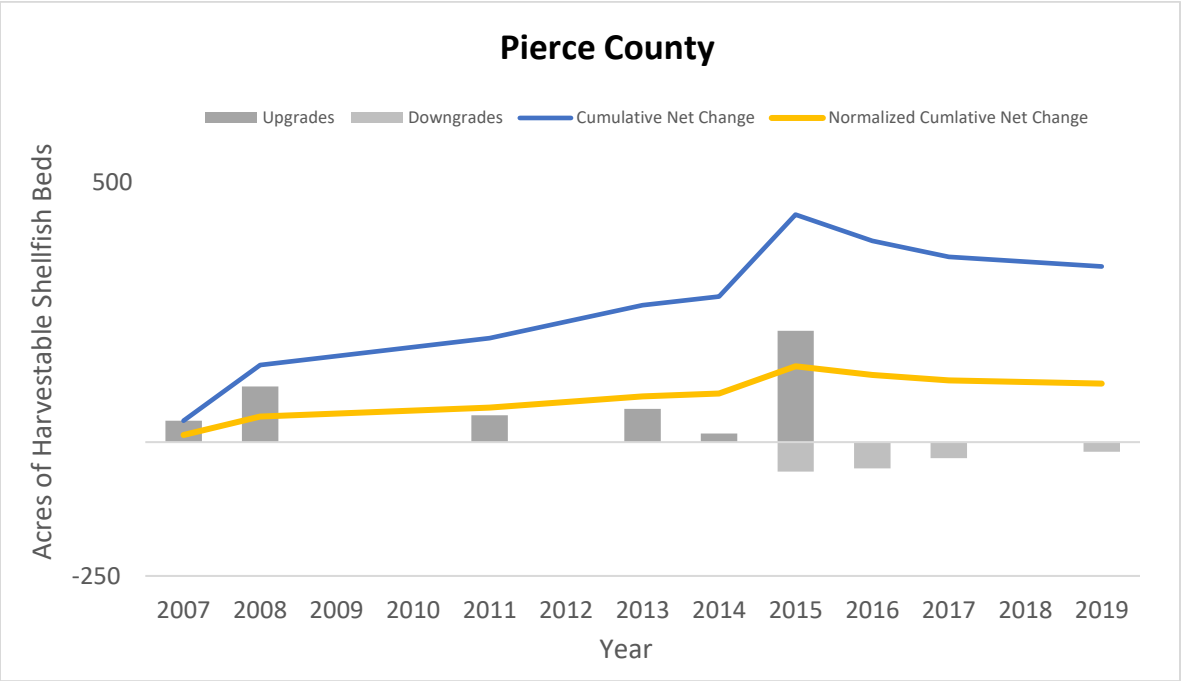


Figure 12: Changes in Pierce County Harvestable SPD Acreage

The data depicted in Figure 6 for Pierce County is comprised of five growing areas including Henderson Bay, Penrose Point, Ketron Island, Rocky Bay, and Vaughn Bay. The growing areas range in program maturity, with individual growing areas established from 1995 to 2020. Although Pierce County does not have an affiliated clean water district, the SPDs are supported by the Pierce County Surface Water Management Division (SWM) and EPA Pollution Identification and Correction (PIC) grant funding. Through SWM, Pierce County SPDs receive funding through an established per parcel service charge dedicated to improving water quality.

Due to increasing downgrades illustrated in Figure 5 from 2016 on, Pierce County is in the process of developing a Closure Response Plan (CRP) to address the high fecal coliform bacteria levels. The Pierce County Shellfish Partners 2020 Strategic Plan will help guide the development of the CRP. Data collected in 2020 and 2021 will offer further insight into the effectiveness of strategies including Closure Response Plans. Most downgrades within Pierce County were found in Vaughn Bay, which remains an active SPD. The above trend lines indicate the cumulative net change in harvestable shellfish bed acreage over 12 years. To illustrate the change, the Y-axis has been scaled to Pierce County's upgrades and downgrades size, ranging from -250 to 500 acres. The normalized cumulative net change indicates the trend in acreage change on a scale of -1500 to 1500 acres.

Kitsap County

Kitsap County has ten named shellfish growing areas, comprising over 2,000 acres. Clean Water Kitsap acts as the encompassing SPD, comprised of all growing areas in the county. The data depicted in Figure 7 for Kitsap County reflects all ten growing areas, including Burley Lagoon, Dyes Inlet, Port Gamble, Blake Island, Yukon Harbor, Port Orchard Pass, Hood Canal, Port Madison, Kingston, and Liberty Bay. The growing areas differ in program maturity, with individual growing areas established as early as 1993. The only remaining active portion of an SPD in Kitsap County is Burley Lagoon, which accounted for a large portion of downgrades.

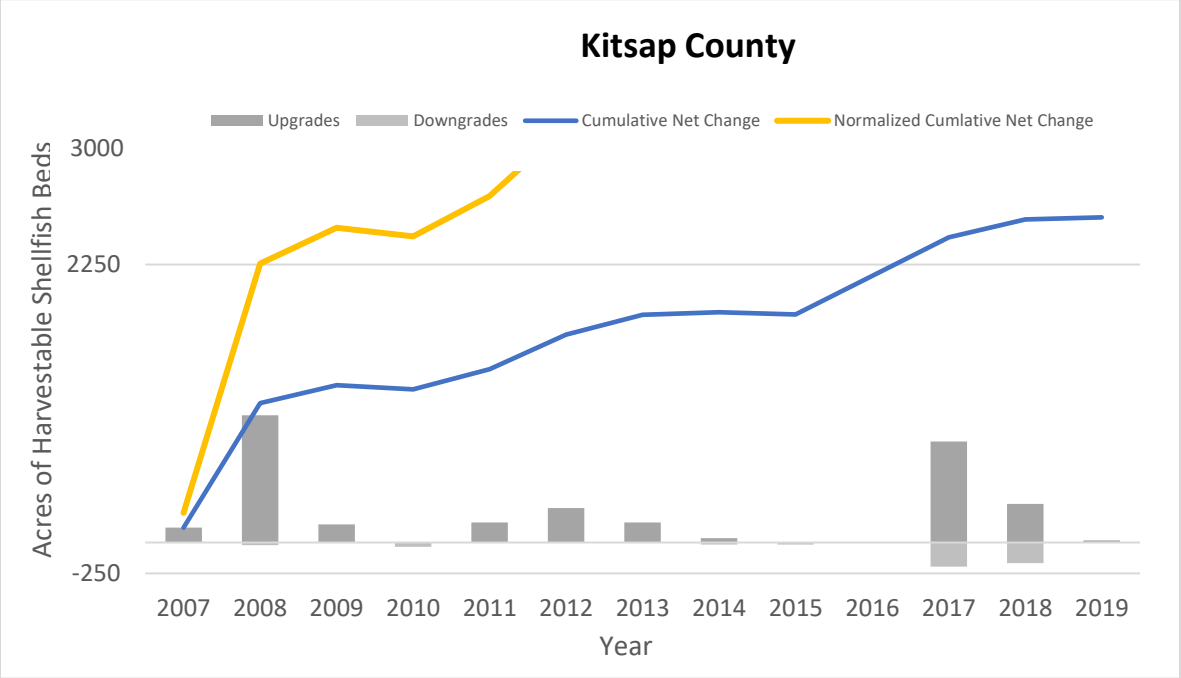


Figure 13: Changes in Kitsap County Harvestable SPD Acreage

Although Kitsap is not supported by a clean water district, the Kitsap County's Surface Water Management District functions similarly to that of an CWD. Further partners include Kitsap Conservation District and Kitsap Public Health District, which work to protect public health and natural resources, meet state and federal regulatory requirements, and provide funding to address nonpoint pollution. Figure 7's trend lines indicate the cumulative net change in harvestable shellfish bed acreage over 12 years. To illustrate the change, the Y-axis has been scaled to Kitsap County's upgrades and downgrades size, ranging from -250 to 3000 acres. The normalized cumulative net change indicates the trend in acreage change on a scale of -1500 to 1500 acres.

Future Analysis

This quantitative analysis was not originally part of the overall shellfish report; it was added near the end of the project timeline and there was not sufficient time to assemble add relevant data sets or to work with data managers and program implementers to ensure an accurate analysis. Doing this work could add valuable information and insight into the discussion. Potential areas to explore include:

- Whether different funding strategies for shellfish protection are correlated with different results
- Whether different combinations of PIC, CWD, and SPD efforts yield different results

- Whether the SPDs that address multiple growing areas perform differently from those that address a single growing area
- Whether population density, land uses adjacent to growing areas, or other upland factors (such as the impairment and TMDL status of rivers and streams that drain into the growing area and or the stormwater permit status of associated jurisdictions) affect success of PIC, CWD, and SPD programs
- How PIC, CWD, and SPD program activities are correlated with restoration speed and results, for example, whether certain types of activities are more correlated with rapid restoration

Program implementers and experts might suggest additional fruitful areas of analysis.