Public comments received on the draft SMP Chapters between the March 1, 2018 Planning Commission meeting and October 31, 2018.

Ian Lefcourte

From: Anne Van Sweringen <avansw2@gmail.com>
Sent: Saturday, August 18, 2018 11:52 AM
To: SMP
Subject: 9/12 BoCC briefing

Categories: Orange category

Hi Brad,

Will there be a chance at the September 12 BoCC briefing to speak/ask questions or present testimony after your presentation?

Thank you,

Anne Van Sweringen
Representative, Thurston County Environmental Community Stakeholders
Black Hills Audubon Society, Thurston Climate Action Team, Thurston Environmental Voters, Sierra Club, Thurston League of Women Voters

A Washington State Chapter of the National Audubon Society
P.O. Box 2524, Olympia, WA 98507
(360) 352-7299 www.blackhills-audubon.org

Black Hills Audubon Society is a volunteer, non-profit organization of more than 1,300 members in Thurston, Mason, and Lewis Counties whose goals are to promote environmental education and protect our ecosystems for future generations.

September 24, 2018

Thurston County Commissioners John Hutchings, Gary Edwards, Bud Blake

Dear Commissioner Hutchings, Edwards, and Blake:

I am writing on behalf of the Black Hills Audubon Society, which represents approximately 1300 members in Thurston, Mason, and Lewis Counties. Please consider these comments concerning the Thurston County Draft Shoreline Master Program Update (SMP).

We are concerned about the trend in Thurston County of converting shorelines to other uses.

First and foremost, we support regulations designed to achieve *no net loss* of shoreline ecological functions. Such regulations are necessary to sustain a shoreline's environment. Management of shoreline aquatic systems is critical for the health and safety of the public. The principle of *no net loss* follows the SMP guidelines (WAC 173-26-186(8)) that provide for development standards and use of shorelines. Shoreline buffers provide many benefits for water bodies, including protecting habitat and water quality.

Specifically, we support the following:

- **Buffers**. Maintain the 2017 (not 7/2018) draft SMP standard buffer widths or setbacks, without modification. This applies to Shoreline Environmental Designations, vegetation conservation, and other areas.

- **Mitigation**. Encourage long-term net gains in both planning-level decisions and site-specific design detail. Require compensatory mitigation to occur in the same or related habitat area.

- **Aquaculture**. Aquaculture's use of shorelines must be consistent with the regulations of the Shoreline Management Act, the Shoreline Master Program, and Best Available Science. Under current practice, the pervasive use of plastic by the aquaculture industry will increase with industry expansion. Geoduck mitigation practices, when based on Best Available Science, are known to reduce risks to birds and other wildlife.

We advocate use of mitigation methods to reduce these and other risks:

1. **Avoid plastics in aquaculture when possible**. If not possible, restrict their use and use non-toxic plastics. Mandate what is necessary to keep birds, fish, and wildlife from ingesting micro-plastics, which cause starvation.

2. In order to reduce the risk of birds being trapped, **limit the use of predator control area netting**.

3. **Change geoduck aquaculture procedures during site preparation and harvesting** in order to eliminate, or at least reduce, damage to benthic communities.

4. Limit changes (i.e., **use little or no scraping, dredging**) in the benthic (ocean floor) community. Such changes occur during geoduck site preparation and planting, and other commercial shellfish harvest.

We urge you to take the necessary steps to protect the county's natural environment, habitats, and shoreline ecological functions, so the marine and freshwater shorelines and shorelands of our county will flourish into the future.

Thank you.

Sincerely,

Sam Merrill, Chair
Conservation Committee
Black Hills Audubon Society

Ian Lefcourte

From: hwbranch@aol.com
Sent: Wednesday, May 30, 2018 9:32 AM
To: SMP
Subject: shoreline planning

Categories: Orange category

Our appeal of the Westman Mill development was rejected by the City Hearing Examiner without a hearing because we lack standing and Moxlie Creek, being in a pipe, does not exist. Wow. Where to start?

First, this is public land. It's the commons. All citizens have standing.

Second, a stream in a pipe hasn't disappeared. It's still there.

And thirdly, This is not a stream. The tide goes up the pipe. It's an estuary. An estuary is a semienclosed coastal body where fresh water coming from land meets salt water. There is no more critical area on earth. Historically, State, Chestnut and Cherry streets didn't exist. The Westman Mill development lies in the exact center of the historic estuary. The current location of the pipe is irrelevant. This is an assault against nature of the most egregious kind. An assault that can never be undone. Science has been thrown out the window. It makes a mockery of all other talk about shorelines.

Those of us attempting to convey the truth have been ignored, marginalized and silenced. What can we do other than acknowledge our despair, anger and grief? How can we reconcile this? What's the point of trying when the power-holders manipulate the process and create a climate of confusion.

As of today the pilings still haven't been driven and as long has they haven't there's still a shred of hope. Perhaps the County will decide that enough is enough and put this abomination against nature on hold.

Harry Branch
239 Cushing St NW
Olympia WA 98502
360-943-8508
hwbranch@aol.com

Ian Lefcourte

From: Brad Murphy
Sent: Monday, September 17, 2018 11:53 AM
To: SMP
Subject: FW: Thurston County SMP/Nonconforming Structures

From: Joshua Cummings
Sent: Monday, September 17, 2018 11:26 AM
To: Heather Burgess <hburgess@phillipsburgesslaw.com>; Brad Murphy <brad.murphy@co.thurston.wa.us>
Cc: Richard Phillips <rphillips@phillipsburgesslaw.com>; Erin Hall (erin@omb.org) <erin@omb.org>; Angela White (angela@omb.org) <angela@omb.org>; Ramiro Chavez <ramiro.chavez@co.thurston.wa.us>; David Schaffert <DSchaffert@thurstonchamber.com>; Doug Mah <Doug@dougmahassociates.com>; Mike Kain <mike.kain@co.thurston.wa.us>; Polly Stoker <polly.stoker@co.thurston.wa.us>
Subject: RE: Thurston County SMP/Nonconforming Structures

Thank you Heather for your comments on Thurston County's Shoreline Master Program (SMP) update. I have passed them along to the lead Community Planning & Economic Development (CPED) staff, Brad Murphy for his review.

We look forward to an on-going conversation on this topic to create an updated SMP that will increase flexibility for citizens and maintain care for our natural environment.

Best,
Josh

Joshua Cummings
Director
Community Planning & Economic Development (CPED)
Thurston County
360.754.4995

From: Heather Burgess [mailto:hburgess@phillipsburgesslaw.com]
Sent: Friday, September 14, 2018 1:37 PM
To: Joshua Cummings <joshua.cummings@co.thurston.wa.us>
Cc: Richard Phillips <rphillips@phillipsburgesslaw.com>; Erin Hall (erin@omb.org) <erin@omb.org>; Angela White (angela@omb.org) <angela@omb.org>; Ramiro Chavez <ramiro.chavez@co.thurston.wa.us>; David Schaffert <DSchaffert@thurstonchamber.com>; Doug Mah <Doug@dougmahassociates.com>
Subject: Thurston County SMP/Nonconforming Structures

Dear Josh,

I'm writing in follow up to recent discussions I've had with Romiro as well as OMB regarding how nonconforming structures are addressed in the current draft of the County's SMP update. Romiro suggested that I provide these comments directly to you.

In the current draft (section 19.400.100), I find no provisions for the expansion, alteration, or remodeling of existing structures that will be rendered non-conforming upon adoption of the SMP. The only authorized activities I find in the draft allow for repair, maintenance, and rebuilding of such structures in the event of destruction (within 24 months).

In my view, this is a far more restrictive approach than other local jurisdictions have taken as part of their SMP updates, including Lacey and Olympia. Ecology approved both of these SMPs. I note that Lacey went well out of its way to characterize existing development as conforming notwithstanding the SMP, and provides extensive provisions governing expansion, remodel, and redevelopment (see link and information below). During its update, Olympia also adopted provisions allowing for alteration and expansion, even for structures that were located entirely within the new setback, at least to some degree (partially excerpted below).

I strongly encourage the County to review what Lacey and Olympia did and expand the current draft to create more flexibility for alteration, modification, expansion, and remodeling of nonconforming structures using one or more of these tools – all of which have been in Ecology approved programs – in order to avoid being overly restrictive and adversely impacting the values of impacted properties.

Separately, I also encourage the County to review the proposed setbacks for freshwater lakes containing shared jurisdiction with all three Cities for consistency of approach if this has not been done already; in general, it makes little sense for one set of rules to apply to homeowners on one portion of the lake, and a different set on another, simply because of an externally invisible jurisdictional boundary.

Please let me know if any additional information would be useful.

Best regards,

Heather

Heather Burgess
Attorney
hburgess@phillipsburgesslaw.com |website |v-card

724 Columbia St. NW, Suite 320, Olympia, WA 98501 | 360.742.3500
505 Broadway, Suite 408, Tacoma, WA 98402 | 253.292.6640

CITY OF LACEY

See pp. 49-54 of the City's adopted SMP, which defines existing structures as conforming post-adoption, subject to certain regulations for re-development/expansion.

https://www.ci.lacey.wa.us/Portals/0/docs/community_development/planning_documents/part_1_2015_update_to_SMP_2011_final_version.pdf

CITY OF OLYMPIA – See provisions below; structures are defined as nonconforming but can be expanded vertically or away from setback and can be re-built if destroyed as-is provided that permit is applied for within one year.

18.20.910 Alteration of Nonconforming Structures in Shoreline Jurisdiction

A. Shoreline Structures – The following regulations apply to nonconforming structures located in shoreline jurisdiction. Alterations pursuant to this section shall not result in a net loss of shoreline ecological functions and processes. The applicant shall obtain all required permits or approvals prior to construction. All alterations shall comply with applicable development regulations.

1. Structures within Shoreline Setbacks - Alteration of structures located landward of the Ordinary High Water Mark within a required shoreline setback is limited to:

a. For structures located partially within the shoreline setback, alterations shall be limited to the addition of height and expansion into areas outside the shoreline setback.

b. For structures located entirely within the shoreline setbacks, alterations shall be allowed for the addition of height or expansion on the upland side of the structure, or both.

c. Interior and exterior remodels and the addition of upper stories are permitted. Except as provided above, such additions shall not extend beyond the existing or approved building footprint. Any expansion of nonconforming structures that further encroach on the Ordinary High Water Mark setback by decreasing the distance between the structure and the Ordinary High Water mark shall require a shoreline variance.

2. Overwater Structures – Alteration of structures located water-ward of the Ordinary High Water Mark is prohibited except:

a. Alterations to the footprint or building envelope may be permitted when required by Washington State Department of Natural Resources for light penetration;

b. Alterations that do not increase or expand the building footprint nor increase the height are permitted; and

c. Existing covered moorage may be maintained, repaired or replaced pursuant to WAC 173-27-040.

3. Structures within Vegetation Conservation Areas. Alteration of structures located landward of the Ordinary High Water within a required Vegetation Conservation Area (VCA) that include expansion of the building footprint is prohibited. Only interior and exterior remodels and the addition of upper stories are permitted.

B. Unintentionally damaged or destroyed nonconforming structures.

1. In the event that a structure or building that does not conform to the shoreline setback is damaged or destroyed by fire, explosion, act of nature, or act of public enemy, the structure may be restored within the existing footprint.

2. In order to take advantage of this section, a complete application for a building permit must be submitted within one year of the unintended event that caused the destruction of the structure. The applicant loses their rights under this subsection if the building permit lapses without construction of the structure proposed under the building permit.

(Ord. 7028 §4 (Exh. B), 2016).

Ian Lefcourte

From: Maureen Canny <mocanny@comcast.net>
Sent: Wednesday, May 30, 2018 4:00 PM
To: SMP
Subject: No shoreline buffer reduction!

Categories: Blue category

Please do not reduce the SMP buffers in your new plan.
Thank you,
Maureen Canny

Thurston County Shoreline Stakeholders Coalition

4108 Kyro Rd SE. Lacey, WA 98503

September 4, 2018

TO: Thurston County Board of County Commissioners
Bud Blake, Chairman
John Hutchings, Vice Chairman
Gary Edwards, Commissioner

From: John Woodford, Chairman
Doug Karman, Vice-Chairman
Thurston County Shoreline Stakeholders Coalition

Re: Resubmittal of Public Comments for Draft Update of the Shoreline Master Program (SMP)

As shoreline home owners in unincorporated Thurston County, we have actively sought meaningful revisions to the draft Shoreline Master Program document since the beginning of the process in September 2017. We respectfully resubmit some of our comments to the Board of County Commissioners as you prepare for the SMP briefing on September 12, 2018.

Thousands of homeowners are now in place along shorelines and wetlands regulated by this program. This puts homeowners on the front line every day to carry out the shoreline program's detailed environmental regulations. This part of the County's Code has not been opened up for revision for 28 years. Thurston County's homeowners have a lot at stake. We ask your consideration of our comments.

- You have asked and Brad Murphy acknowledged in a presentation to you on November 14, 2017, that the SMP "will be written to meet the least restrictive possible shoreline regulation".
    - **THIS IS NOT THE CASE**: The SMP has been written to be more restrictive than Ecology requires.

- In the 1990 SMP the "Setback" was set at 50 feet. The original current draft changed it to a "buffer" width of 75 feet. At the request of a vast majority of shoreline residents, including our Coalition, the buffer in the current draft was changed to 50 feet. This makes sense because 98% of the shoreline residential property is already developed under the 1990 SMP or earlier at the 50 foot "setback". HOWEVER, this most recent draft includes both a buffer and a setback. So, the result is a 50 foot buffer plus a 15 foot setback from the buffer which makes it a total 65 foot setback from the shoreline. This obviously increases the restriction.
    - **WE RECOMMEND**: Reduce the buffer to 35 feet with a 15 ft setback resulting a 50 foot setback from the shoreline. Mason County is doing this and it would result in no net change from the 1990 version. In addition the Ecology handbook provides this latitude. Future development would be governed by variance - section 19.400.120, pg 45.

- The focus of the new "no net loss" requirement is to direct **new** development. It is noted that the State Dept. of Ecology in its "Shoreline Master Program Handbook", Chapter 4, states, "The no net loss standard is designed to stop the introduction of new negative impacts to shoreline ecological functions resulting from new development."
    - **WE RECOMMEND THAT**: "New development" be redefined to differentiate it from "Repair and Maintenance" and "Remodeling" or "Rebuilding" of existing residential structures. The current definition covers all of the above.

- The "no net loss" requirement also relies in part upon incentives for restoration of ecological functions during "redevelopment of existing houses and other buildings". (See Chapter 3 of Ecology's "SMP Handbook").
    - **WE REQUEST THAT**: incentives need clarification in subsequent sections of the SMP and explanation of whether they are voluntary or regulatory.
    - **WE REQUEST THAT:** Voluntary improvements to ecological function of a property both past and present be credited toward future potential development mitigation.

- Permits and their reviews should be site specific.
    - **WE OBJECT** to vague wording in the draft which allows for unrestricted bundling of shorelines or broad area designations to serve as an "activity" for permitting.

- **THERE NEEDS TO BE CLARIFICATION** of the principles underlying how cumulative loss will be assessed and "fairly allocating the burden of addressing such impacts among development opportunities". See draft SMP update, 19.100.130 C.(3)

- **THE DRAFT ERRONEOUSLY** includes all Puget Sound shorelands under "statewide significance" requirements - Section 19.300.100, page 27 of July draft. This is an error which must be corrected.

- The current draft declares existing legally constructed residences and appurtenances as nonconforming if constructed closer to the shoreline than the prescribed buffer/setback in the current draft. Section 19.400.100, pg. 38 of July draft.
    - **THESE RESIDENCES** should be declared "legally conforming". Other jurisdiction have incorporated this concept successfully.

- The Draft has a 24 month timeline limit to apply for reconstruction after fire, explosion or other casualty - Section 19.400.100, pg 38.
    - **THIS TIMELINE SHOULD BE LENGTHENED**. In many cases this cannot be accomplished due to financial, insurance, FEMA, and other unanticipated delays.

- Revise various goal statements to recognize role of residential property owners as stewards and support with incentives as appropriate.

- The maximum hard surface area, table 19.400.140 is left blank and the reference to 19.400.125 has nothing to do with hard surfaces.

- The definition of "Hard Surface" in the SMP includes a "vegetative roof".
    - **What is a vegetative roof?** Is it a roof with grass, moss or other plants growing on it? Is it the tree canopy? There is no definition
    - **Will the addition of trees** reduce the buildable surface area?
    - **If you cut down a tree** can you increase your buildable surface area?

- The Coalition concurs with the statements and requests made in a letter to Joshua Cummings dated July 27, 2018 from the Olympia Master Builders, Re: Proposed Amendments to the Shoreline Master Program of Thurston County, attached.

- There are many more examples of regulations being set at a higher than "Lest restrictive as possible".

- There are many more examples of missing data and confusing, overlapping definitions.

As Stakeholders, we stand ready to assist in making the new SMP a "least restrictive" workable document that Ecology will approve.

Respectfully submitted,

John Woodford, Chairman

Doug Karman, Vice-Chairman

Attachments
Cc: Joshua Cummings
Brad Murphy

OMB
Olympia
MasterBuilders
Building Industry Association
Office
Permit and Planning
Mailing

July 27, 2018

Joshua Cummings
Community Planning & Economic Development
Thurston County Courthouse
2000 Lakeridge Drive SE
Olympia, WA 98502

Re: Proposed Amendments to the Shoreline Master Program of Thurston County

Dear Mr. Cummings:

Olympia Master Builders ("OMB") is a trade organization that represents home builders across five counties. OMB frequently engages as an active participant in local public policy discussions, such as the current update to Thurston County's Shoreline Master Program ("SMP"). Over the last several years, we have been active stakeholder participants in the amendment of Shoreline Master Programs in many of our region's local jurisdictions.

We are eager to see Thurston County's update to the SMP provide consideration to both the need prevent harm from uncoordinated and piecemeal development of the county's shorelines, as well as the inherent rights of property owners to exercise self-determination over their assets. OMB has identified two policy areas that directly impact safeguards to the reasonable use of property: No-Net Loss Standards and Legally Existing Uses and Development.

A. Considerations for No-Net Loss Standards

Shoreline Management Act handbooks issued by Department of Ecology emphasizes the importance of incentives for homeowners to improve nearshore ecological functions. We heartily concur; emphasizing the importance of voluntary incentives as opposed to static mandates as the best way to ensure quality conservation. To not accidentally disincentivize these proactive measures, OMB suggests that voluntary improvements to ecological function of a property should be credited toward future potential development mitigation. We understand that the goals of the Department of Ecology are to mitigate and recover concurrently. As such, this mitigation might occur at less than a 1:1 ratio to achieve recovery while allowing homeowners to benefit from participating in voluntary compliance when they seek to redevelop or remodel.

When assessing the no-net loss standard at the project level, it is our hope that the County will be mindful of the impact of outside actors of the ecological function of shoreline beyond the scope of what a private property owner can compensate for (e.g., existing county stormwater drains in proximity to shoreline properties, where insufficient drainage often causes down-hill stormwater run-off). We recommend that, in addition to the mitigation options available to an individual, the county partner with its citizens to offer additional mitigation options for homeowners who have such county owned or administered impacts to shoreline ecology.

The Shoreline Management Act required cumulative impact analysis mandates that variables are accounted for at the site-specific level as well as programmatically. Therefore, it is only reasonable that the County examine the mechanism of that analysis at both levels and provide the broadest range of policies that minimize the challenges for property owners to be in compliance with the SMP.

B. Legally Existing Uses and Development

While the majority of the SMP focuses on the form and use of future development, the importance of addressing legally existing structures and uses is critical in Thurston County. We recommend that the County address existing development with an eye to providing clarity and protection for property owners.

RCW 90.58.620 states that new or amended SMPs approved by Ecology after September 1, 2011 may include provisions that allow:

a. Legally established residential structures and appurtenant structures that are used for a conforming use to be considered a conforming structure even though they do not meet SMP standards for setbacks, buffers, yards, area, bulk, height or density;
b. Redevelopment, expansion, change with the class of occupancy, or replacement of the residential structure if consistent with the SMP, including the provisions for no net loss of shoreline ecological functions.

RCW 90.58.620 and its subsequent interpretations in various SMPs across the state provide an underpinning, from which we recommend the following:

- That all legally established existing structures, inclusive of appurtenances, uses and lots are conforming and that provisions that change of ownership, tenancy or management does not affect the structure, use or lot's nonconforming status.
- That 'remodeling' be included as an allowed activity in addition to "redevelopment, expansion, change with the class of occupancy, or replacement of the residential structure" in order to provide homeowners with the ability to update their property to current design standards and as new, ecologically sound materials and technologies emerge on the market.
- That limited expansion of a nonconforming structure be permissible if it is tied to other actions to bring the overall use into conformity (e.g., upgrade of nonconforming septic system).
- That non-conforming structures with conforming uses within commercial or mixed-use developments may be expanded or enlarged within the existing building footprint as a conditional use.
- That in pre-existing shoreline lots that are vacant but too small to meet the buffer requirements for new development, the SMP should allow for use-conforming development if a building area appropriately sized for the use exists and is not located in a hazard area.
- That residences destroyed by catastrophe may be reconstructed to the size, density and location that existed prior to the catastrophe with allowances for additional expansion, as otherwise defined within the master program.
- That as a conditional use, a non-conforming dock may be modified, reoriented or altered within the same general location to be more consistent with the provisions of the SMP. This provision allows structures to be maintained, and minor location adjustments of dock/float structures, to improve consistency with the SMP without defaulting to the current standards.
- That property owners, in specific circumstances, be allowed to make environmental improvements to non-conforming structures (i.e. docks) through an administrative conditional use rather than tearing the entire structure out and applying for a shoreline variance.
- That new single-family development on non-conforming lots consisting of property under contiguous ownership less than 20,000 square feet in size and not subject to landslide hazard areas, alluvial fan hazard areas, or riverine and coastal erosion hazard areas or associated

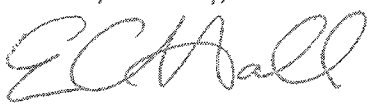
buffers as provided in Thurston County Code may be allowed without a variance in accordance with the following criteria:

a. Non-conforming lots with a building area of 3,000 square feet or more available for a single-family residence and normal appurtenances and unrestricted by setbacks or buffers from shorelines or critical areas shall comply with the provisions of this Program. The building area means the entire area that will be disturbed to construct the home, normal appurtenances (except drainfields), and landscaping.
b. Non-conforming lots that do not meet the requirement of subsection 1 above shall provide the maximum setback and buffer dimension feasible while providing for a building area of not more than 3,000 square feet on the portion of the lot farthest from the required setback or buffer; provided that consideration be given to view impacts and all single-family residences approved under this section shall not extend waterward of the common-line setback.
c. Facilities such as a conventional drainfield system may be allowed within critical areas or their buffers, except wetlands and buffers, outside of the building area specified above.

We hope that the staff at Community Planning and Economic Development will review the above recommendations and consider their inclusion in the SMP draft scheduled to be presented to the Board of County Commissioners on August 30, 2018. As that draft becomes available to the public, we will have to work with county staff to identify additional areas of improvement.

Thank you for the opportunity to provide these comments. If you wish to correspond with us further on this issue, please feel free to contact Executive Officer, Angela White at angela@omb.org or 360-754-0912.

Very Sincerely,



Erin Hall
Government Affair Director

Cc: Bud Blake
Gary Edwards
John Hutchings

Ian Lefcourte

From: Brad Murphy
Sent: Monday, October 8, 2018 6:19 PM
To: John Woodford
Subject: RE: SMP Schedule and Timeline
Attachments: SMP Timeline for PC Review.doc

Categories: Orange category

Hi John,

Here is a memo which includes dates based on the Board of County Commissioners preferred timeline of Planning Commission holding a hearing on December 5th. This is for Planning Commission (PC) review/discussion at this coming Wednesday's PC meeting and could change based on their discussions. The document is meant to give Planning Commission an idea of what the schedule could possibly look like working backwards from a December 5th public hearing date.

Please let me know if you have any questions.

Sincerely,

Brad Murphy

Senior Planner
Long Range Planning
Thurston County Community Planning
and Economic Development
2000 Lakeridge Dr. SW
Olympia, WA 98502
360-754-4465
murphyb@co.thurston.wa.us

From: John Woodford [mailto:jwoodford.aia@gmail.com]
Sent: Monday, October 08, 2018 1:08 PM
To: Brad Murphy <brad.murphy@co.thurston.wa.us>
Subject: SMP Schedule and Timeline

Hi Brad,

Will you be releasing any information regarding the current thinking on the Schedule and Timeline prior to the Planning Commission meeting on October 10th?
We're still really in the dark out here.

Thanks,
John Woodford

Ian Lefcourte

From: Brad Murphy
Sent: Monday, October 15, 2018 3:41 PM
To: John Woodford
Subject: RE: Buffers

Categories: Blue category

Hi John,

The quick definition is that the standard buffers are the buffer widths for each shoreline designation or stream reach. Reduced buffers are the standard buffer width reduced by implementing some kind of mitigation (i.e. plantings, rain garden, move septic drain field, etc.) to ensure no net loss of functions to the shorelines.

Here is Section 19.400.120 from the Draft SMP:

19.400.120 Vegetation Conservation Buffers

A General Regulations

1. Vegetation conservation buffers provide a means to conserve, protect and restore shoreline vegetation in order to provide for ecological and habitat functions as well as human health and safety. Buffers shall consist of a non-clearing area established to protect the integrity, functions and values of the affected critical area or shoreline, but may also be modified and reduced to accommodate allowed uses when consistent with the Act and this Program. The standards below provide a flexible approach to maximize both ecological functions and water-dependent uses.

2. Vegetation conservation standards shall not be applied retroactively in a way which requires lawfully existing uses and developments (as of the effective date of this Program), including residential landscaping and gardens, to be removed, except when required as mitigation for new or expanded development.

3. In order to implement this Program's policies for preservation of native plant communities on marine, river, lake, and wetland shorelines, mitigation sequencing shall be applied during site planning for uses and activities within the shoreline jurisdiction so that the design and location of the structure or development minimizes native vegetation removal. Development or uses that require vegetation clearing shall be designed to avoid the following in the order indicated below, with a. being the most desirable vegetation to retain:

a. Native trees,
b. Other native vegetation,
c. Non-native trees, and
d. Other non-native vegetation.

B. Buffer Widths

1. Standard Buffer. Each shoreline environment designation shall have a starting, or standard, buffer as measured landward from the OHWM. This buffer shall be adhered to unless otherwise allowed as described in the Reduced Standard Buffer provisions below or other critical area buffers are required. The Standard Buffers for each environment designation are as follows:

		Marine	Freshwater Lakes
a.	Shoreline Residential:	50 feet	50 feet
b.	Urban Conservancy:	125 feet	125 feet
c.	Rural Conservancy:	150 feet	150 feet
d.	Natural:	200 feet	200 feet

e. The Standard Buffer for shoreline jurisdictional freshwater streams and rivers is 250 feet.

f. Buffer widths for all other streams, including Type F streams less than 20 feet wide and Type Np and Ns streams are in Table 24.25-1 TCC.

2. Reduced Standard Buffer. Utilizing the Mitigation Options to Achieve No Net Loss for New or Re-Development Activities table (Appendix B) to achieve no net loss of shoreline ecological functions, the Standard Buffer may be reduced down to the Reduced Standard Buffer as specified below. Mitigation options shall be reviewed and approved by the County for applicability to the project site commensurate with project impacts. The Shoreline Restoration Plan (Appendix C) shall serve as an initial review source. The Reduced Standard Buffers for each environment designation are as follows:

a. Shoreline Residential: 50 feet (no reduction without Type III variance)

b. Urban Conservancy: 90 feet; 75 feet where a net gain in shoreline ecological functions can be achieved. Applications for reductions below 90 feet shall include information documenting: a) mitigation necessary to achieve no net loss of shoreline ecological functions for the reduced 90-foot buffer; b) additional mitigation necessary to achieve no net loss for any reduction below 75 feet; and c) additional actions proposed to achieve a net gain in shoreline ecological functions. Proposed restoration activities shall not include projects previously identified for public funding, except that public-private partnerships may be utilized. A minimum five-year monitoring plan shall be required to demonstrate project success, in accordance with Section 19.400.110(C), Mitigation Compliance.

c. Rural Conservancy: 110 feet

d. Natural: 150 feet

e. Shoreline jurisdictional freshwater streams and rivers: buffers may be reduced pursuant to the standards in Section 19.400.120(C) below.

3. Additional Standards for Applying the Reduced Standard Buffer, in a through e above, within the Rural Conservancy and Natural designations and shorelines of statewide significance. Buffers may be reduced for single-family residences and water-oriented uses in the Rural Conservancy designation, Natural designation, and shorelines of statewide significance only under the following circumstances with appropriate mitigation:

a. The lot is physically constrained by slopes, wetlands or other natural features such that the Standard Buffer cannot be met; or

b. The lot is legally constrained by its size or shape, such that it would not support a home and garage with a footprint of at least 1,200 square feet if placed at or above the Standard Buffer.

4. An additional 15-foot building setback shall be maintained beyond the outer boundary of the buffer. This building setback may be reduced provided that the resulting setback is protective of existing vegetation within the buffer.

5. Buffer widths may be increased in situations where steep slopes, the presence of important habitat or species, landslide hazard areas, marine bluffs, areas of inadequate vegetation to protect water quality, or other hazards are identified during project review.

Hope the information helps. Please let me know if you have any additional questions.

Thanks,
Brad

-----Original Message-----
From: John Woodford [mailto:jwoodford.aia@gmail.com]
Sent: Monday, October 15, 2018 12:46 PM
To: Brad Murphy <brad.murphy@co.thurston.wa.us>
Subject: Buffers

Hi Brad,

Can you give me a quick definition/explanation of Reduced Buffers and Standard Buffers? ...and how do they relate to the buffers that we now think we know?

Thanks a lot,

John Woodford

Sent from my iPhone

Ian Lefcourte

From: Gary Cooper <gary-cooper1@hotmail.com>
Sent: Thursday, August 9, 2018 3:31 PM
To: SMP
Subject: Shoreline Master Program Update

Categories: Orange category

I am writing to inquire about whether you have any documents – a summary, table, or matrix of some kind – that shows what the proposed SMP development regulations would be compared to the existing SMP? Information comparing setbacks, lot sizes, etc. would be very useful to have for comparison. Thank you.

Gary Cooper

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360.791.0453
gary-cooper1@hotmail.com

Thurston County
Environmental Community Stakeholders

Black Hills Audubon Society, Sierra Club, Thurston League of Women Voters, Thurston Climate Action Team, and Thurston Environmental Voters

Dear Thurston Community Planning and Economic Department and Thurston County Planning Commission, 7/15/2018

Please accept this summary of our comments for the Thurston County Draft SMP 2017 Update. The summary was drawn from earlier comments I emailed, as representative, regarding two separate combined chapters (19.100-.300 and 19.400-.700). I emailed the two documents to Thurston County CPED on 3/26 and 5/31, 2018, and the Thurston County Planning Commission on 5/25 and 5/31, 2018.

Citizens of the environmental and stakeholder groups ask Thurston County and Thurston County Planning Commission to consider, support, and include our earlier comments, and this summary of those comments, in the draft SMP. Environmental management is critical for the health and safety of the public. Stakeholders also ask the county and planning commission to heed the aquaculture comments, since this industry is currently poorly regulated.

In the summary, stakeholder comments are in green print; statements in black print are from the draft SMP Update. Additional comments have been added to the summary from environmental and other community stakeholders, with references. References for all other comments can be found in the combined chapters.

Respectfully submitted,

Anne Van Sweringen
Representative, Environmental Community Stakeholders group
1630 Central St NE
Olympia, WA 98506

Thurston County Draft Shoreline Master Program
2017 Update

Environmental Community Stakeholders
Summary of Comments
Chapters 19.100 - 19.700

7/15/2018

Based on comments originally sent to:

Thurston County CPED
(3/26 and 5/31, 2018)
and
Thurston County Planning Commission
(5/25 and 5/31, 2018)

By:

Anne Van Sweringen, Representative
Environmental Community Stakeholders group
Black Hills Audubon Society, Sierra Club, Thurston League of Women Voters, Thurston Climate Action Team, Thurston Environmental Voters

and

Additional support from other community stakeholders

Chapters 19.100-.300: Definitions, Shoreline Environment Designations (SEDs), General Goals and Policies

Chapter 19.100 Introduction

19.100.110

The Shoreline Management Act of 1971 (the Act) expresses a preference for appropriate development that requires a shoreline location, protection of shoreline environmental resources, and protection of the public's right to access and use of shorelines (RCW 90.58. 020). Three interrelated policy areas of the act of include: 1) shoreline use, 2) environmental protection, and 3) public access.

The overarching policy of the SMA states, "The public's opportunity to enjoy the physical and aesthetic qualities of natural shorelines of the State shall be preserved to the greatest extent feasible, consistent with the overall best interest of the State and the people."

Thurston County's shorelines provide valuable habitats for the diversity of fish and wildlife, economic diversity, and recreational opportunities used by residents of all ages.

Shorelines play an important role in enhancing the quality of life for the County's citizens.

The purpose of the Shoreline Master Program is to regulate shoreline uses and future development in Thurston County in a manner consistent with the Act.

Under the Growth Management Act, the Shoreline Management Act and the Program (SMP) comprise the state and county law regulating use of shorelines.

The county SMP program is the regulating document for WA Growth Mgt Act's critical areas, which include shoreline management planning (14th goal), within the shoreline jurisdiction.

The county must apply the SMP provisions for regulating critical areas in Thurston County's unincorporated territory to all land, all water areas, all structures, and all uses, irrespective of lot lines (except for existing and on-going agricultural activities, which meet other requirements).

The SMA (the act) requires that "uses shall be preferred which are consistent with control of pollution and prevention of damage to the natural environment, or are unique to or dependent upon use of the state's shorelines..."

To the maximum extent possible, reserve the shorelines for water-oriented uses, including water-dependent, water- related, and water-enjoyment uses.

Protect ecological functions, and aquatic and terrestrial life, associated with shorelines.

"No Net Loss" - The public and environmental organizations have a right to complete clarity on the concept, especially when they are funding restoration projects with the idea of "improving and restoring" Puget Sound. The County must be "up-front" about the facts of "No Net Loss" so

individuals and groups who willingly give funds for Puget Sound restoration projects are not misled and are made aware of the fact that they are not donating to improve Puget Sound, but to maintain the status quo for someone else's financial or personal benefit.

Direct the county to integrate ecological functions and aquatic and terrestrial life into all considerations for development in shorelines.

The SMA must not allow new land alterations and development that results in a net loss to ecological functions. The county must encourage net gains in both programmatic (planning-level decisions) and project (site-specific design detail) bases, when conducting mitigation sequencing.

Require compensatory mitigation to occur in the same or related habitat areas to allow for gain in the same ecological functions and ecosystem-wide processes.

Tell the county to replace the special interest group representing shellfish protection districts on the Shoreline Master Program Regulatory Group with a county staff person who manages the county Shellfish Protection District plan or program.

We request the county reverse the decision to cancel the SMP Regulatory and review groups, reconvene the groups according to original timetable, and continue to engage in a public process that will yield a SMP that the involved parties can support. These two groups give the public and agencies a chance to comment on, and discuss, a refined draft SMP Update *before* it is sent to the Thurston County Planning Commission for its process. Changing the timetable will only create more public dissent over the issues into the future, further delaying the process. We believe that maintaining these groups will save the county money into the future, with a plan based on the public trust.

We request Thurston County Community Planning and Economic Development (CPED) write a letter to the state (Commerce?) regarding its shoreline planning process, demonstrating good faith, to be considered in compliance (work with other counties who are also out of compliance) and extend its date, so the county can continue on the original timetable.

The county must add to definition 19.150.170 Best Management Practices: A BMP may be an activity, a maintenance procedure, a physical or structural device, or a management practice used to prevent or reduce the release of pollutants to stormwater.

Tell county to ensure all proposed uses and development in a shoreline jurisdiction (shoreline environment designation) conform to the SMA (RCW 90.58), the county Master Program, and Thurston County Code (TCC), whether or not a permit is required.

When a site contains more than one regulated critical area, developers must apply standards and requirements for each critical area's feature.

Protecting the shoreline environment is an essential statewide policy goal. The no net loss standard is designed to halt the introduction of new impacts to shoreline ecological functions resulting from new development. Both protection and restoration are needed to achieve no net loss [from ECY Handbook].

The county shall prevent impairment of shoreline ecological functions and processes by permitted and/or exempt actions taken prior to, or after, the Act's adoption, and/or unregulated activities. Here are ways the county can do this:

- Develop a process that identifies, inventories, and ensures meaningful understanding of current and potential ecological functions and processes provided by shorelines and freshwater, marine and estuarine environments, and documents a baseline procedure of current functions performed by an independent consultant.

- Include policies and regulations that ensure cumulative impacts from all development will address the burden of those impacts and achieve no net loss of shoreline ecological functions and processes.

- Establish a list for each site that includes a site plan, baseline description of existing and seasonal conditions, operational plan and other applications and reports.

- Require the county to recommend baseline surveys and other information essential to determining necessary mitigation measures. For example, cross-referencing between aquaculture Use provisions and general regulations will make the regulations easier to administer and clearer to interested parties.

- Include policies and regulations that require mitigation of all adverse impacts in a manner that ensures no net loss of shoreline ecological functions.

- The Program and any future amendment shall ensure no net loss of shoreline ecological functions and processes, including environmental baseline functions.

19.150 Definitions

Do not allow ~~predator~~ wildlife control to deliberately kill or harass birds, invertebrates, or mammals. Remove predator control equipment no longer than two years after installation.

Re: **Definition:** Change the term "Predator Exclusion" to "**Wildlife** Exclusion." "Predator Exclusion" is shellfish industry concept. "Predator exclusion" is an environmentally disruptive process of excluding native wildlife from certain aquaculture installations. Such an industry definition has no place in a governmental regulation that is specifically designed to protect and preserve natural ecological conditions. It should also be noted that "predator exclusion" almost certainly includes endangered, sensitive, and/or threatened species.

The use of language including "Predator Exclusion" is a way of normalizing concepts that are abnormal and favor the viewpoint of a specific industry rather than the citizens of Thurston County. Are we to take our children down to the beach and see starfish and crabs and explain to them that they are "bad" because they are predators of the commercially grown geoduck? Enshrining this in county documents is unacceptable and counter-productive.

Add: Low-impact development (LID) is a term describing a land planning, and engineering design approach, to manage stormwater runoff as part of green infrastructure. LID emphasizes conservation and use of on-site natural features to protect water quality.

Add: Sustainability is the property of biological systems to remain diverse and productive indefinitely, so environmental functions and processes can endure. Long-lived and healthy wetlands and forests are examples of sustainable biological systems.

19.200.115 ~~Shoreline~~ Residential Shoreline Environment Designation (SED)

Design development to preserve and enhance the visual quality of the shoreline, including views over and through the development from the upland side, and views of the development from the water.

Priority should be given to residential and water-oriented commercial development where such development can be accommodated with no net loss of shoreline ecological functions.

Preferred Uses are those which are consistent with control of pollution and prevention of damage to the natural environment.

[Where I have used Vulnerable: WDFW uses the word sensitive instead of vulnerable. ITIS, the national database, uses vulnerable.]

Design and locate new development to preclude the need for shoreline armoring, vegetation removal, flood control, and other shoreline modifications.

Primary uses allowed in Residential and Urban Conservancy SEDs must be uses that preserve, or restore for a gain in ecological functions, the natural character of the shoreline area, critical areas, floodplain, or other sensitive or vulnerable marine, estuarine, or freshwater fish and wildlife habitats, or promote preservation of open space, either directly or over the long term.

19.200.120 Urban Conservancy Shoreline Environment Designation (SED)

Primary uses allowed in Residential and Urban Conservancy SEDs must be uses that preserve, or restore for a gain in ecological functions, the natural character of the shoreline area, critical areas, floodplain, or other sensitive or vulnerable marine, estuarine, or freshwater fish and wildlife habitats, or promote preservation of open space, either directly or over the long term.

19.200.125 Rural Conservancy Shoreline Environment Designation (SED)

Change the Purpose to: To protect ecological functions, conserve existing natural resources and valuable historic and cultural areas to provide for sustainable resource use, achieve natural floodplain processes, and provide recreational opportunities.

Support lesser-intensity resource-based uses, such as agriculture, aquaculture, forestry, or recreational uses, or are designated agriculture or forest lands; Expansion of a once less-intense use to that of a higher intensity may remove that use from the SED.

The highly concentrated growth of the geoduck aquaculture industry does not qualify it as a low or lesser intensity industry. Scientific studies have found the average natural density of a Puget Sound geoduck bed is 2.1 geoducks/m^2 (.195 geoducks/ft^2) or 8,494 geoducks/acre. Industrial aquaculture currently grows geoducks at a rate of 1 geoduck/ft^2, or 43,560 geoducks/acre (and PVC tube and netting structures) - over a 5-fold increase!

A 500% increase in the number of geoducks the acre may be able to sustain without environmental degradation, all placed on local marine, nearshore, and estuarine ecosystems. At three geoduck seeds planted per tube, that percentage could be at least doubled.

At four years in one location, geoduck aquaculture is not a non-permanent use. Since the County is issuing permits with no term of lease, when the harvest occurs, the tideland in use will go through the same cycle for an indefinite period of time, making commercial/industrial geoduck aquaculture a "permanent" event!

19.200.130 Natural Shoreline Environment Designation (SED)

B. **Designation Criteria**. Shorelines having a unique asset or feature considered valuable for its natural or original condition that is relatively intolerant of intensive human use. This includes shorelines both in and out of the ~~UGA or LAMIRD~~ urban growth area (UGA) or limited area of more intensive rural development (LAMIRD) when any of the following characteristics apply: … **add 7.:**

7. The shoreline has spawning or migrating endangered, threatened, sensitive, vulnerable, or otherwise protected (forage fish), species.

Prohibit commercial, industrial (includes aquaculture) and non-water-oriented recreation.

Prohibit any use that would degrade ecological functions, natural features, and overall character of the shoreline area.

Allow single-family residential development only if the density and intensity of the use is limited to protect ecological functions and is consistent with the intent of the natural shoreline environment.

Develop new land divisions consistent with Low Impact Development (LID) techniques.

Facilitate private and public enjoyment through low-intensity development such as passive, recreational, scientific, historical, cultural, and educational uses, provided that no net loss in ecological function and processes will result.

Limit low intensity agricultural and forestry uses to ensure the intensity remains low.

Do not permit commercial, industrial, multi-family residential, or non water-oriented recreation uses.

Do not permit new development or vegetation removal that would reduce ecological functions or processes.

Allow scientific, historical, cultural, educational research uses, and low-intensity water- oriented recreational access uses, provided that no significant ecological impact on the area will result.

Prohibit industrial or commercial water-dependent uses, or their expansion, in estuaries and along Natural shorelines.

Require compensatory mitigation to occur in related habitat areas to allow for gain in same ecological functions and ecosystem-wide processes.

19.200.135 Aquatic Shoreline Environment Designation (SED)

Use this Purpose: To protect, restore, and manage the quality and health of marine and fresh waters and the species that depend upon these ecosystems, while allowing for limited modification for water-dependent uses and public access, when located in appropriate areas waterward of the ordinary high-water mark (OHWM) and developed to avoid a net loss of shoreline functions.

Allow overwater linear public transportation and utility facilities when it is the most technically, economically, and environmentally, feasible option.

Primary allowed uses must be uses that preserve the natural character of the area or promote preservation of open space, floodplain or other sensitive lands either directly or over the long term.

Locate and design all development on navigable waters and submerged lands to reduce impacts to public views and allow for the safe, unobstructed passage of fish and wildlife, particularly those species dependent on migration.

Do not permit development that adversely impacts the ecological functions of marine, estuarine, and freshwater habitats; except where necessary to achieve the objectives of the SMA (RCW 90.58.020) ("Use" Preferences), and then, when impacts are mitigated to assure maintenance of shoreline ecological functions and processes.
("Use" Preferences:
(1) Recognize and protect the *statewide interest over local* interest;
(2) Preserve the natural character of the shoreline;
(3) Result in *long term over short term* benefit;
(4) Protect the resources and ecology of the shoreline;
(5) Increase public access to publicly owned areas of the shorelines;
(6) Increase recreational opportunities for the public in the shoreline;
(7) Provide for any other element…or as deemed appropriate or necessary.)

Design and manage shoreline development and modifications to prevent degradation of water quality and alteration of natural hydrographic conditions.

Require compensatory mitigation to be located in same/related habitat areas to allow for gain in same ecological functions and ecosystem-wide processes.

Establish buffers large enough, and/or necessary to, protect critical areas.

Chapter 19.300 General Goals and Policies

19.300.105 ~~Critical Areas and~~ Ecological Protection

How would “adaptive management” be implemented: 1) once permits are given for aquaculture activities or other activities on the shoreline? 2) if tideland/shoreline activities are allowed without a permit? Please give examples of activities or operations subject to “adaptive management.”

Apply the following Ecological Protection policies to all uses and development, within all shoreline environment designations.

Assure no net loss of ecological functions and processes in shorelines, shoreline buffers, and when protecting critical areas.

Establish and manage shoreline uses and development in a manner that mitigates adverse impacts so the resulting ecological condition is maintained or improved;

Prevent, avoid, or minimize adverse impacts by all shoreline uses and development on the shoreline environment;

Recognize the value of adaptive management as a means of providing for flexibility in administering ecological protection provisions of the Master Program.

Assure that shoreline modifications, individually and cumulatively, do not result in a net loss of ecological functions by:

a. limiting the number and extent of shoreline modifications;
b. giving preference to the types of shoreline modifications that have a lesser impact on ecological functions; and
c. requiring mitigation of identified impacts resulting from shoreline modification.

Plan for the county to have commercial and industrial developers restore and enhance impaired ecological functions while accommodating permitted uses and development. As shoreline modifications occur, incorporate all measures to protect ecological shoreline functions and ecosystem-wide processes, on a seasonal basis. (Modifications include dike, breakwater, pier, weir, dredged basin, fill, bulkhead, or other structure; other actions, such as clearing, scraping, grading, dredging, or application of chemicals.)

Preserve and protect existing trees and native vegetation within shorelines to maintain shoreline ecological functions and mitigate the direct, indirect, and cumulative impacts of shoreline development. Enhance with native vegetation where shoreline vegetation is inadequate to protect against the impact of new uses or development.

Avoid impacts to shorelines through application of mitigation sequencing, giving highest priority to impact avoidance whenever new uses or development are proposed in shorelines.

Vegetation management, conducted through practices such as pruning, trimming, or limbing for purposes of views and access paths, must result in no net loss of shoreline ecological functions or processes.

Protect shoreline ecological functions in adjacent areas that provide primary and secondary ecological functions.

Conduct and maintain baseline analyses of existing ecological functions for water-dependent and water-related development.

Partner with tribes, agencies and universities to conduct regular monitoring to determine loss of shoreline ecological functions and account for cumulative and secondary impacts.

Implement monitoring and feedback systems for adaptive management, and create a central database for baseline survey data and the streamlining of guidance, to prevent significant impacts and improve accuracy and effectiveness.

The county and cities must classify and designate the following fish and wildlife habitat conservation areas. Include the best available science. F&WHCA areas are:

(a)Areas where endangered, threatened, and sensitive species have a primary association;
(b) Habitats and species of local importance, as determined locally;
(c) ~~Commercial~~ and recreational shellfish areas;
[NOTE- (c) should be just shellfish areas. Commercial includes an industry using habitat as a resource, not a conservation area. Tell TCPC to encourage F&W Commissioners to change the WAC and remove commercial.]
(d) Kelp and eelgrass beds; herring, smelt, and other forage fish spawning areas;
(e) Naturally occurring ponds under twenty acres and their submerged aquatic beds that provide fish or wildlife habitat;
(f) Waters of the state;
(g) Lakes, ponds, streams, and rivers planted with game fish by a governmental or tribal entity;
(h) State natural area preserves, natural resource conservation areas, and state wildlife areas. (WAC 365-190-130)

The SMP must state the county and cities must cooperatively consider fish and wildlife habitat conservation areas (WAC 365-190-130) by:

(i) Creating a system of fish and wildlife habitats with connections and open space corridor planning;
(ii) Considering the level of human activity (passive or active recreation) for certain areas and habitats;
(iii) Protecting marine nearshore areas with associated riparian ecosystems and salmonid habitat;
(iv) Evaluating land uses surrounding ponds and fish and wildlife habitat conservation areas that may negatively impact these areas, or conversely, that may contribute positively to their function;
(v) Establishing buffer zones around these areas to separate incompatible uses from habitat areas.

The SMP must also state the county and city must (not may) consider the following:

(i) Potential for restoring lost and impaired salmonid habitat;

(ii) Potential for designating areas important for local and eco-regional biodiversity (regions with

characteristic flora, fauna and ecosystems);
(iii) Establishing or enhancing non-regulatory approaches in addition to regulatory methods to protect fish and wildlife habitat conservation areas (WAC 365-190-130).

19.300.110 Vegetation Conservation

Preserve native plant communities on marine, estuarine, river, lake and wetland shorelines. In order to maintain shoreline ecological functions and processes, development along the shoreline should result in minimal direct, indirect, or cumulative impacts.

Replace designated noxious weeds and invasive species with native vegetation and other non-invasive vegetation to establish and maintain shoreline ecological functions and processes.

When eelgrass beds are disputed as a critical saltwater habitat, the county and cities shall consult appropriate state agencies and co-managing tribes to assist with the determination. All eel-grasses, native or otherwise, are protected by the Clean Water Act. Japanese eelgrass may have beneficial value; it has numerous positive non-invasive impacts on *unmanaged* tidelands.

Retain existing vegetation within the entire 200-foot shoreline jurisdiction, including trees. Re-taining existing trees is particularly important.

Remove invasive species; and noxious species of concern, which include Himalayan blackberry (Rubus armeniacus), Canada thistle (Cirsium arvense), Scotch broom (Cytisus scoparius), and invasive cultivars of English Ivy (http://www.co.thurston.wa.us/tcweeds/).

Tell the county to prioritize vegetation replanting for all development, uses, or activities, whether a permit is required or not. Require replanting when existing native vegetation is altered. Priori-tize retaining vegetation in requirements for shoreline buffers or vegetation management areas.

Develop a County administrative vegetation management manual with minimum requirements for Planting Plans.

19.300.115 Water Quality and Quantity

Locate, construct, and operate development in a manner that maintains or enhances the quantity and quality of surface and ground water over the long term.

Prevent impacts to water quality and stormwater quantity that would result in a net loss of shore-line ecological functions.

Prevent contamination of surface and ground water and soils.

Minimize the need for chemical fertilizers, pesticides, or other similar chemical treatments.

Encourage the use of low impact development (LID) techniques.

Minimize the use of impervious surfaces.

Protect marine and fresh water species and habitats from damaging sources of pollution.

19.300.125 Historic, Archeological, Cultural, Scientific and Educational Resources

Encourage private and public owners of archaeological, cultural, or historic sites to provide public access and educational opportunities in a manner consistent with long-term protection of both historic values and shoreline ecological functions.

19.300.130 Shoreline Use and Site Planning

The county must require water-dependent and water-related development to conduct and maintain baseline analyses of existing ecological functions. Baseline analyses must be conducted by a qualified third party professional who is independent of the developer. Tribes, agencies and universities and other entities may partner to conduct regular monitoring to determine loss of shoreline ecological functions and account for cumulative and secondary impacts.

19.300.140 Restoration and Enhancement

Prioritize restoration actions identified in the Shoreline Restoration Plan or other restoration plans that address regional environmental needs.

Encourage restoration actions that enhance aquatic and upland ecological functions, processes, and physical features (such as native vegetation) and that address the needs of regulated fish and wildlife species.

Encourage and support cooperative restoration efforts between local, state, and federal public agencies, tribes, non-profit organizations, and landowners to improve shorelines with impaired ecological functions and/or processes.

Incorporate public education regarding shoreline ecological functions and processes, the role of human actions on the environment, and the importance of public involvement in shorelines management in restoration and enhancement plans.

19.300.145 Transportation and Utilities

Provide for present and future utility services and facilities that produce, convey, store, or process power, fuel, wastewater, communications, or solid waste while minimizing conflicts with other permitted shoreline uses and development.

Locate new public and private utilities inland from the land/water interface, preferably out of shorelines.

Consolidate utility facilities within existing rights-of-way wherever possible.

Allow non-water-oriented utility production and processing facilities (power, gas, sewage, communications, oil, and waste), or parts of those facilities within shorelines, only when there is no other feasible option.

Prohibit new solid waste disposal facilities or transfer facilities in shoreline areas, except water-dependent solid waste transfer facilities which may be allowed in port or industrial areas.

Coordinate utility right-of-way acquisition and construction with transportation and recreation planning and also with other local government agencies and utility providers.

19.200.110 Mining

Thurston County should be positioning to control outside interests that want the rich gravel deposits located here. The county should be passing stringent mine reclamation and other rules that lower mining impacts. Protecting aquifers here should be the highest priority.

Mining, by itself, is a noisy/dusty operation. If other permitted uses are allowed in a mine, even larger impacts occur on neighbors (e.g., water/air pollution, heavy truck traffic). A reasonable buffer around mines should be viewed as a necessity.

The aggregate and hard rock needs of Thurston County are much smaller than in larger urban areas. Mining's use of the county's water resources can pose challenges in this time of climate change. Mining can affect surface and ground water, and cause water shortages and changes in groundwater hydrology and vegetation, resulting in cumulative impacts.

I would like to see Thurston County provide adequate mineral resources locally while limiting land use conflicts where mining could lead to environmental degradation in environmental functions and processes, including diminished water quality and quantity and other environmental issues.

Do not allow water-dependent uses such as mining interfere with visual and physical public access to shorelines, shorelands, or Shorelines of Statewide Significance.

Limit and design mineral resource land uses to preserve the natural character and ecology of the shoreline.

The county must locate, design, and manage mining operations so other legally established uses and development are not subjected to unnecessary adverse impacts, such as diminished water quality or quantity, flooding, or bank erosion.

Avoid adverse impacts to shoreline geomorphic processes, ecological functions, water quality, fish and wildlife habitat, and scenic resources.

Require mining operations, through a reclamation process, to accomplish the timely restoration of disturbed areas to a biologically productive, semi-natural condition.

The county must provide adequate protection to ecological functions, processes, and shorelines against sediment and silt production when mining operations remove rock, sand, gravel, and minerals from shoreline areas.

Mining must not preclude public recreation of the public shoreline.

Mining must not interfere with visual and physical public access to shorelines, shorelands, or Shorelines of Statewide Significance.

19.300.x Commercial, Civic, and Industrial Uses

Encourage restoration of impaired shoreline ecological functions and processes as part of commercial, civic and industrial development.

Encourage multiple-use concepts such as including open space and recreation in commercial, civic and industrial development.

Maximize use of existing ports and other industrial areas prior to expansion or development of new industrial sites.

19.300.x Flood Hazard Management

Demonstrate avoidance of adverse impacts to shoreline uses, resources, and values, including shoreline geomorphic processes, water quality, fish and wildlife habitat, commercial aquaculture, scenic resources, and bank erosion.

Give preference to flood hazard reduction measures that consist of nonstructural measures such as setbacks, land use controls, wetland restoration, dike removal, impervious surface reduction, use relocation, vegetation retention, biotechnical measures, and stormwater management programs.

Limit development, flood control structures, and other shoreline modifications that may adversely impact property or public improvements, or result in a net loss of ecological functions associated with rivers and streams, by interfering with channel migration processes.

Return river and stream corridors to more natural hydrological conditions, recognizing that seasonal flooding is an essential natural process.

Consider the removal or relocation of structures in flood hazard areas when evaluating alternate flood control measures.

Allow flood hazard management structures only when the following can be demonstrated:

a. They are necessary to protect development;
b. Nonstructural measures are not feasible; and
c. Appropriate vegetation conservation actions are undertaken.

Give preference to placing new flood hazard reduction structures landward of wetlands and associated buffers.

19.300.XXX Aquaculture (policy)

Environmental groups and shoreline residents would like to see Thurston County develop policies and regulations to severely limit or restrict industrial/commercial geoduck aquaculture, a water-dependent use, and its expansion, in South Puget Sound.

Create a policy to encourage aquaculture to develop upland aquaculture facilities, with water quality and filtration regulations, to grow geoducks as well as other shellfish and spat. Upland facilities will create local jobs and protect the marine environment. (See http://vancouversun.com/business/local-business/chinese-firm-to-open-massive-land-based-shellfish-hatchery-on-sunshine-coast.)

Prohibit the use of shellfish spat sources from other countries.

Strike Policy 19.300.130 SH-31.This policy gives carte blanche freedom to the shellfish industry to use unproven and unregulated methods on the sensitive tidelands of Puget Sound. The concept of pre-approved experimentation with unprecedented and unapproved technologies in Washington State waters is irresponsible. No one monitors geoduck operations (not the U.S. Army Corps of Engineers, the state, or the county).
For instance, from 2013-2016, Seattle Shellfish's use of "experimental" plastic cups as wildlife exclusion devices on a geoduck operation created extensive plastic pollution on tidelands on, and adjacent to, Tolmie State Park on Nisqually Reach. The Policy:

> Policy 19.300.130, SH-31: Potential locations for aquaculture activities are relatively restricted by water quality, temperature, dissolved oxygen content, currents, adjacent land use, wind protection, commercial navigation, and salinity. The technology associated with some forms of aquaculture is still experimental and in formative states. Therefore, some latitude should be given when implementing the regulations of this section, provided that potential impacts on existing uses and shoreline ecological functions and processes should be given due consideration. However, experimental aquaculture projects in water bodies should include conditions for adaptive management. Experimental aquaculture means an aquaculture activity that uses methods or technologies that are unprecedented or unproven in Washington.

Prohibit aquaculture's industrialization and expansion without strict water pollution regulations (RCW 90.48 Water Pollution Control; WAC 173-201A, toxics, solids).

Commercial aquaculture leads to a monoculture that leads to a loss of biodiversity, which may be impacting forage fish habitat and threatening salmon and orca recovery.

We are spending billions to restore salmon, eelgrass, and forage fish in Puget Sound, but there's a loss of marine or terrestrial habitat and/or wildlife every time a geoduck farm is established. The short and long term nearshore effects on marine ecosystems are potentially great, including effects on the forage fish, salmon, eelgrass, marine invertebrates, and sea and shorebirds who have trouble foraging amidst the dense infrastructure.

Seabirds and shorebirds are displaced from prime foraging areas because they feed on invertebrates from the sand and mud, critical during migration and breeding. Marine invertebrates and sediments are displaced every time an aquaculture farm is established.

Geoduck farms could realistically reduce populations of herons, eagles, seabirds, and shorebirds by making it harder to forage amid the dense infrastructure. The commercial/industrial shellfish industry not only frequently scrapes the beach of marine life before planting, but at harvest, dredges the entire areas to 3 feet in depth with water jets. The impact exists. Without question, based on the SMA itself, commercial/industrial shellfish aquaculture alters the natural condition of the shorelines of the state.

Expansion has occurred at a rapid pace in recent years on tidelands and in estuaries on Natural, Residential, and Urban Conservancy SEDs. Our reasons for concern involve marine and estuarine functions and processes, aesthetics, and health and safety, all of which are detailed in the Shoreline Management Act and Water Pollution Control Act.

A severe and growing aesthetic and plastics pollution problem has come with the aquaculture industry. Please heed this as an early warning. The geoduck aquaculture industry uses plastic infrastructure such as nets, buoys and ropes, netting, and sometimes rebar. Netting, which can break down and become micro-plastic pollution that shellfish ingest and we consume, is used to cover over 40,000 PVC tubes per acre. That's a geoduck, possibly two or three, per square foot. The highly concentrated growth of geoducks in aquaculture farms, and the expansion of these farms, does not qualify the geoduck aquaculture industry as a low or lesser intensity industry.

Of particular note is the recent study from Leah Bendell, professor of marine ecology and ecotoxicology at Simon Fraser University, British Columbia. Her study reports finding "microbeads in the smallest bits of sediment and in a concentration equal to the amounts of silt and organic matter" on sites around Baynes Sound. These sites "coincide with regions of extensive shellfish aquaculture equipment." (http://www.cbc.ca/news/canada/british-columbia/shellfish-microplastics-bc-aquaculture-1.4675672), (http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0196005)

Puget Sound has lost 70 percent of its critical habitat in the last 125 years, and 30 percent of its shoreline is armored by bulkheads, seawalls, and other disruptive structures. Geoduck farming is yet another stressor on an ecosystem already being pressured by the weight of human infrastructure.

Yet the geoduck industry continues to expand, as it fills the shoreline, nearshore and estuaries! And the majority of geoducks are shipped overseas!

Consider local ecological conditions and provide limits and conditions to assure appropriate compatible types of aquaculture for the local conditions as necessary to assure no net loss of ecological functions.

Adjacent and nearby residents must be consulted in permitting aquaculture operations that will take place within the view lines of their residences.

Developers must undertake a survey of the tideland area to be leased for aquaculture prior to permitting by a certified surveyor.

A setback of 10 feet from property line of adjoining tidelands must be observed so as not to trespass on neighboring properties during operations.

Baseline conditions of the tideland area to be leased for shellfish aquaculture must be documented as to substrate, eelgrass, native geoduck, sand dollars, crabs, (everything else), habitat for resident bald eagles and blue heron, diving ducks, etc etc. before permitting is considered.

The developer must develop a written plan for monitoring of an operation based on permit requirements, and make that plan available to adjacent landowners and other landowners who have a view or access to the tideland area near the lease area.

The County must provide personnel to monitor the operation to assure its compliance with permit requirements. Monitoring must occur on a regular schedule that is distributed to adjacent landowners and all those landowners in view of the leased area.

Condition leases for aquaculture on private tidelands related to the use of barges and boats.

The lessor of the tideland for aquaculture must apply for, and comply with, all permitting requirements for aquaculture in Thurston County, including an Army Corps of Engineers permit.

The county must keep an updated list of geoduck aquaculture leases and locations. WDNR must notify the county when shoreline, intertidal, or estuary, aquaculture leases are created or converted to geoduck leases. The county must alert, and conduct consultations with, shoreland and/or upland owners to ensure that issues important to the landowners are appropriately taken into account from the beginning of, and reflected in the final, leases.

Base the county's rationale for aquaculture decisions on inventory and characterization, scientific studies, and input from federal and state agencies with special expertise with respect to any environmental impact (RCW 90.58.100(1)(b)). Include information from other interested parties.

The county and all permittees must use caution regarding studies and information from locations where the physical conditions, regulatory framework, and industry operations are different and the conclusions may not be relevant to Washington or a specific jurisdiction.

The county must develop a system to conduct and maintain independent baseline analyses for aquaculture of existing ecological functions. Partner with tribes, agencies and universities to conduct regular monitoring and adaptive management to determine loss of shoreline ecological functions and account for cumulative and secondary impacts.

To prevent significant impacts and improve accuracy and effectiveness, the county must implement monitoring and a feedback system for adaptive management, and create a central database for baseline survey data and the streamlining of guidance.

The SMP must establish buffers necessary to protect immediate and adjacent tidelands, aquatic life, vegetation, and sediment transport from planting, maintenance, and harvest operations and from moorage of boats and barges.

Define in the SMP "sediment dispersal" from aquaculture operations, such as geoduck harvesting, based on aerial photos of sediment flow from geoduck harvest operations. Sediment so disrupted, cannot be kept off of adjoining neighbor tidelands, and would be unacceptable for upland properties.

How will the county work with aquaculture operators to guarantee that buffers containing vegetation/sea life around aquaculture installations remain intact? Unlike upland areas that can be fenced, the tides and current inevitably cause sediments from, for example, geoduck harvesting, to fall on neighboring tidelands. Since there are no fences, workers, barges, PVC pipes, and netting inevitably encroach on neighboring tidelands, and lawsuits ensue. (e.g. in Totten Inlet in the past when Taylor Shellfish encroached on state-owned tidelands.)

Aquaculture is not a preferred use if it results in adverse impacts that result in a net loss of ecological functions or native eelgrass or microalgae, or that conflict with navigation or other water-dependent uses.

Chapters 19.400-.700:
19.600 Shoreline Use and Modification Development Standards

19.600.115 Aquaculture ("use" regulations)

Do not site aquaculture in locations where it would:
a. Result in a net loss of shoreline ecological functions;
b. Adversely affect the quality or extent of habitat for Federal and State listed species and species of local importance, including eelgrass, kelp, and other macroalgae; or
c. Adversely impact other habitat conservation areas or connectivity between such areas; or significantly interfere with navigation or other water-dependent uses.

Show aquaculture activity boundaries on a site plan consistent with the legal description of the property. Stake aquaculture activity boundaries and property corners (RCW 58.17, WAC 332-130).

Do not locate aquaculture activities within tidal channel portions of streams and rivers with direct use by anadromous species. Prohibit aquaculture activities within 300 feet of streams and rivers.

Aquaculture development in shorelines shall not significantly or cumulatively increase pollution, erosion, or siltation.

The County shall require an analysis of cumulative impacts, by an independent consultant, in advance of proposed aquaculture activities for more complex projects including, but not limited to:
a. operations on shorelines of statewide significance;
b. multi-species operations and/or farms;
c. operations and/or farms proposed within enclosed waters;
d. operations and/or farms proposed in locations where similar farms exist or are proposed; or
e. operations and/or farms that would be the first of their kind in the area.

Do not deploy site-wide canopy nets.

Phase out the use of plastics, which are unsightly, damaging to marine life, and are a pollution hazard, now.

Do not permit plastics in canopy nets, bags, or tubes in the planting site.

Prohibit the use of new plastic and polyethylene tubes and netting in commercial aquaculture, and phase out current uses as soon as possible, no later than 2025. U.S. cities and companies are approving plastic bans in 2018.
(Note: Corn plastic (PLA) is not easily biodegradable and can only be composted in high-temperature commercial composting systems: https://www.oregonlive.com/environment/index.ssf/2008/10/pla_corn_plastic_problems.html).)

The county should not allow unproven materials in Puget Sound without independent studies of those materials in marine waters for at least a two-year period. Long-term research about bioplastics is currently lacking. New plastics should be thoroughly tested in the marine environment over a period of time with strict controls to determine how long it takes to break down and biodegrade, if it actually biodegrades, and how it assimilates with marine environmental functions, ecological processes, native marine animals, and vegetation.

Until phase-out, significantly reduce the amount of PVC pipe placed onto planting site by increasing the distance between pipes.

For an overview and history of shellfish aquaculture's use of plastics, and current issues regarding industrial aquaculture, in Puget Sound, visit:
http://coalitiontoprotectpugetsoundhabitat.org
http://protectzanglecove.org
https://protectourshoreline.org/slideshow/POS_ShellfishAquacultureConcerns.pdf

Prior to design of aquaculture planting sites, make an independent site-specific assessment of impacts on benthic community structure.

Prohibit the use of tubes and nets within public or residential view corridors such as public parks or public access points.

Aquaculture permits should not restrict the public's right to beach and water access.

Prohibit any new commercial aquaculture permits on public lands.

Maintain habitat structural integrity by designing grow-out site around existing embedded natural rocks and natural woody debris.

Safely relocate existing embedded natural rocks and natural woody debris to adjacent plot outside the grow-out bed and enhance with additional natural materials to mitigate loss of habitat structure.

Select alternate site that lacks habitat structure, embedded natural rocks and/or natural woody debris.

Do not remove, purge or relocate any species of individual native animal life, including native shellfish, crabs, sea stars, moon snails, sand dollars.

Require commercial shellfish operation permits to preserve natural sea beds, limiting damage to naturally occurring starfish, sand dollars and eel grass.

Locate industrial geoduck beds away from sand dollar beds and native shellfish beds and separate with at least a 185-foot buffer to protect native animal life from impacts due to aquaculture activities.

Prohibit clearing or thinning of native aquatic vegetation.

Employ 185-foot buffers around all native aquatic vegetation beds to protect both native aquatic vegetation and fish, marine mammals, birds and other native animal life that depend on the beds for one or more of their life histories.

Prevent all entry, including barges and equipment, into native aquatic vegetation beds and buffers during all site work.

A qualified independent third party consultant shall monitor vegetation density and bed size prior to any site work from planting to harvest, plus one post-harvest growing period.

Developers must not create adverse impacts on ecological functions fostered by the policy of the Shoreline Management Act or the Thurston SMP.

Minimize adverse impacts from aquaculture-related noise, light, and glare on nearby properties to the extent feasible in proposals. Do not permit permanent lighting except as required for navigation.

Consider policies and regulations to control geoduck aquaculture's growing plastics pollution problem.

Prohibit, or severely limit, new aquaculture structures, in accordance with Hearing Examiner Judge Bjorgen's 2011 decision that the placement of tubes and netting structures on the beach in geoduck operations constitute construction of a *structure*, and consequently, a *development*.

Prohibit aquaculture adjacent to residential neighborhoods in bays and inlets in South Puget Sound and adjacent to such islands due to water quality issues, visual impacts, or pollution.

The county must specify in the Shoreline Conditional Use Permit whether or not aquaculture activities are subject to review of a new Shoreline Conditional Use Permit.

The overarching focus for aquaculture practices must be avoidance or minimization of negative impacts. The County must establish monitoring procedures to ensure aquaculture operations are in compliance with permit conditions.

Prohibit aquaculture in estuaries within 300 feet of the mouth of freshwater streams (measured at extreme low tide).

Make sure Commercial aquaculture conforms to Regulated Uses and Activities of Critical Areas.

Set aquaculture activities back a minimum of 10 feet from adjacent parcels not associated with the aquaculture activity (WAC 365-190-130). The 10-foot setback requirement shall be increased:
a. when the shoreline contains multiple individual aquaculture activity areas, and/or
b. when plans proposed by aquaculture demonstrate that a greater distance is needed between areas or adjacent parcels.

Base expanded setbacks on water body and shoreline characteristics and an analysis of the shoreline development. Setback distances ensure maintenance of other shoreline uses, such as recreation or public access, or to ensure protection of shoreline ecological functions and processes.

The county must approve a schedule by which aquaculture identifies ownership of, and removes, all equipment and structures (marked tubes, nets, and bands).

Make sure aquaculture proposals demonstrate methods to be used to secure tubes, nets, bands and other equipment and structures so they will not escape from the site during the life of the operation.

Prohibit aquaculture proposals that may result in significant adverse environmental impacts, as demonstrated through an independent scientific analysis.

The operator of any aquaculture activity must provide contact information to abutting waterfront property owners and must, in a timely manner, respond to and rectify any complaint relating to materials, equipment, or operation activities.

NEW: The County will maintain a database and phone number for complaints related to aquaculture materials, equipment, operation activities, trespass, etc.

Encourage the county, from baseline work to tube removal, to establish the following regulations to meet no net loss of marine/estuarine functions or processes for geoduck and other aquaculture: (parts were adapted from WDFW 10/15/07 (http://www.dnr.wa.gov/Publications/aqr_aqua_2007bmp.pdf))

Baseline Surveys
The baseline survey will establish a biological determination of shellfish species and their densities, and a baseline evaluation of the site focusing on aquatic vegetation, sediment characteristics, and water quality parameters.

Document the abundance and distribution of existing naturally recruited shellfish stocks on the lease area/parcel.

Conduct a survey of the leasehold/parcel for all attached or rooted aquatic vegetation.

The biological baseline survey will reference GPS leasehold/parcel corner points, as defined in the land survey.

Brood Stock and Seed Selection
The following must be required for aquacultured geoduck seed planted on all private and state-owned aquatic lands or waters of the state:

Provide records that seeds comply with WDFW transfer regulations according to WAC 220-72.

Provide records that brood stock sources are disease and pest free and that the seed supplier conducts regular pathological exams.

Site Preparation and Seed Planting

Monitor potential impacts during beach/site preparation, with prohibitions on:
a. Clearing and grading that alters marine habitat, changes in benthic habitat structure, beach community (substrate, forage fish spawning habitat, overhanging vegetation) or associated ecological functions.
b. Disturbance by the activity to affect the beach community, structure, and function.
c. Site preparation that causes a "Net-Loss" of shoreline functions and values.
d. Clearing, scraping, or grading that creates a net loss of site functions and values once mitigation sequencing (avoid, minimize, mitigate) is applied to a site.

Bed preparation and planting are intensive activities on the site. Planting must be preceded by the installation of a protection system that is safe for wildlife.

Boundary Markers. During the land survey, leasehold/parcel boundary corners will be assigned GPS coordinates. Corner markers should be in place during site preparation and planting, and during the period when wildlife exclusion devices are in place. The devices may be removed during the grow out period, but the corner marker positions must be replaced at the GPS coordinates recorded by the land survey prior to any harvest activities. They must remain in place during harvest activities. Rebar must not be used for markers.

Restrict initial tube siting and placement to those locations where eelgrass (Zostera marina) is either absent or greater than ten feet away.

A ten-foot buffer zone is required around established eelgrass beds (Zostera marina), or where eelgrass is present at densities greater than 4 turions per square meter. No geoduck planting or operational activities will be undertaken within this buffer zone. The county reserves the right to increase or decrease this buffer as new data become available on environmental effects.

Ensure tube placement, netting installation, tube removal, harvest and other geoduck maintenance practices prevent damage to existing eelgrass mapped during baseline site survey. Staging areas must be strategically placed to prevent foot traffic through sensitive areas for all activities.

If eelgrass (Zostera marina) grows into, and encroaches on, the planting area during grow-out, harvest and replanting of geoduck must not be allowed within those areas of new eelgrass growth.

There is no authorization of net loss of eelgrass (Zostera marina) from baseline conditions. If a net loss of eelgrass on the leasehold/parcel is determined to be the result of aquaculture activity, then replanting will not be permitted and mitigation will be required.

Install non-plastic marine-safe wildlife exclusion devices that do not pollute, are safe to people and wildlife, and are appealing to upland observers.

Wildlife exclusion nets should be designed with non-plastic material so they do not break free and/or cause beach littering onsite or offsite.

Do not use rubber bands, which negatively affect wildlife.

Prohibit the use of rebar on large-cover nets. Use other anchoring systems.

Remove all excess or non-secured tubing, netting and other materials from the beach prior to the next incoming tide so all unnatural debris, nets, bands, etc., are maintained and prevented from littering the waters or the beaches.

No seeding, culture or other operations are conducted in biologically sensitive areas of the beach, such as herring or smelt spawning grounds.

Bed Maintenance and Tube Removal

Tube and net removal must be subject to the same regulations as initial tube installation. No materials should escape from the site. Every effort must be made that tubes, nets, and fasteners do not wash off the area.

Set up maintenance operations (foot traffic, equipment, vehicles, vessels) so that they prevent impacts to eelgrass, normal public use, and navigation. Avoid impacts to other submerged aquatic vegetation and sea life.

Maintain site in an orderly fashion.

Remove unnatural materials (pipe, nets) as soon as practical. Remove marker stakes when no longer necessary.

Secure and remove all materials from the beach prior to the next incoming tide.

Patrol area beaches on a regular basis to retrieve debris that escapes the farm as well as other non-natural debris. Due to wave, current or wind action, debris tends to accumulate in certain areas. These areas should be identified early in the growing cycle and crews shall also patrol these areas to pick up debris after weather events. Sometimes these areas are in deeper water and it may be necessary to dive for debris and litter. Keep a log of this activity for performance reviews.

Harvest and Processing

Geoduck aquaculture must minimize turbidity to, and total suspended solids in, the water column that risks impacting aquatic vegetation and the intertidal bed. The county and SMP must regulate as follows:

Geoducks planted within 50 feet of eelgrass must only be harvested when exposed at low tide (i.e. dry harvest only). If eelgrass is not present within 50 feet of planted geoducks, then wet harvest (at flooded tidal stages) can occur.

Vessels should be moored in water greater than -18 feet (MLLW) in depth, or deeper than the photic zone, to minimize impacts from shading.

Use only low-pressure water-jets with nozzles having a 5/8-inch diameter inside tip or less (WAC 220-52-019(2a)). The operator must hand-hold and control the nozzles. Limit nozzle pressure to about 100 psi, measured at the pump.

Require harvest activities on fine-grained beaches to use sediment containment methods including sediment control fencing, hose line, or cloth tubes. Fine-grained beaches are susceptible to sediment transport.

Prohibit new raft culture and phase out current raft culture in Thurston County.

Place water pumps on current floating rafts or boats that do not come in direct contact with the substrate (https://wsg.washington.edu/wordpress/wp-content/uploads/Small-Scale-Clam-Farming.pdf). Screen the pump intakes to minimize the capture of marine organisms.

Hand harvest geoducks.

Separate water jet injection sites a sufficient distance waterward from the tide line to allow for greater water infiltration of sediment liquefaction (sediment plumes/runoff) from water jet “stinger” hoses.

Harvesting during low tides may occur at night or on weekends only if low tide harvesting is necessary.

Do not allow the processing of aquaculture products in or over water. Exceptions include the sorting or culling of the cultured organism and the washing or removal of surface materials or organisms after harvest.

Locate all processing and processing facilities on land (subject to policies, regulations, and applicable county codes).

Do not allow aquaculture operations to accumulate garbage, waste, or debris at sites.

If significant mortality of species under cultivation occurs, the aquaculture operator shall immediately report the event to the State and local Health Departments, as well as the County.

At two years, a geoduck aquaculture site shall remove all tubes and netting from an aquaculture site.

The SMP must ensure aquaculture operators regularly patrol for aquaculture-related materials and debris. Operators must contact landowners each time they patrol to legally gain access to adjacent properties and to notify landowner that unknown persons will be coming onto landowner's property on a certain date and time (as would be the case for any upland property).

Chapters 19.400-.700:

19.400 General Regulations

The county's 2017 draft SMP must support the Shoreline Management Act regarding use, and development of, land adjacent to shorelines.

A development undertaken without obtaining applicable shoreline permits, or one that is inconsistent with use regulations of the Master Program, is unlawful.

Aquaculture uses and actions within the shoreline, whether they constitute "development" or not, must be consistent with the regulations of the Shoreline Management Act and shoreline master program.

In the event of a conflict between use requirements, such as water-dependent and water-enjoyment, ensure that the requirement that better promotes the priorities and policies of the Shoreline Management Act prevails. (e.g. The use of plastics by the aquaculture industry does not support the SMA.)

The county's program administrator must identify and apply those policies and regulations that will best promote the policies of the Shoreline Management Act, with a focus on environmental designations on which uses are to be located, and the public trust (public access and enjoyment).

Preserve the public's opportunity to enjoy the physical and aesthetic qualities of natural Shorelines of the State and region to the greatest extent feasible, consistent with the overall best interest of the state and the people generally. (RCW 90.58.020).

We prefer uses that are consistent with control of pollution and prevention of damage to the natural environment.

Prohibit the use of plastics in tubes and netting in all, particularly in geoduck, aquaculture.

The SMA must ensure developers design and conduct uses of the Shorelines of the State and region to minimize damage to the ecology and environment of the shoreline area and interference with the public's use of the water.

The county must ensure developers who apply the county's mitigation sequence achieve no net loss of ecological functions and processes on each and every site.

The county must require developers to conduct monitoring that includes a habitat assessment or environmental baseline study.

Tell commissioners geoduck aquaculture must avoid displacing marine life by scraping sediments or with water jets; allow material to settle naturally.

Developers must not create adverse impacts on ecological functions fostered by the policy of the Shoreline Management Act or the Thurston SMP.

Developers and commercial growers must locate and design all new development to first avoid, then minimize, the need for new and maintenance dredging, clearing, grading, or scraping.

Urge commissioners not to support grading, filling, and/or excavation of sites with significant assemblages of individual native animal life, including native shellfish, crabs, sea stars, moon snails, sand dollars, etc.

Tell commissioners to prevent new development that requires structural shoreline stabilization over the life of the development. Exceptions may be made where no alternative locations are available and no net loss of ecological functions will result.

The SMP must state developers must relocate or reconstruct existing shoreline structures rather than use a proposed stabilization measure, and only if no net loss of ecological functions will result.

Minimum stream flows should be established as a public right and maintained on all streams in all river basins in the state.

All benefits of the forests - ecological, human and economic - are inextricably interconnected. Healthy forests are essential to habitat for a diversity of plant and animal life, to the hydrologic cycle, and to carbon storage to mitigate global warming.

Remnant forests with old growth forest fragments are critical for protection.

Riparian zones are an integral part of the forest ecosystem and must be regulated adequately to protect the streams and the wildlife dependent on the streams.

Tell commissioners to ensure docks, bulkheads, bridges, fill, floats, jetties, utility crossings and other human-made structures do not intrude into, or over, critical saltwater habitats.

Prohibit any new commercial aquaculture permits on public lands.

Aquaculture permits should not restrict the public's right to beach and water access.

Require commercial shellfish operation permits to protect natural sea beds, limiting damage to naturally occurring starfish, sand dollars and eel grass.

Do not introduce new aquatic species not previously cultivated in Washington State into the County without prior written approval of the directors of the Washington Department of Fish and Wildlife and Washington Department of Health.

Prohibit new commercial shellfish aquaculture operations within the Nisqually Reach Aquatic Reserve, with the exception of Olympia Oyster propagation (a conditional use).

Consider as a new use/development, and require a new permit and compliance with this SMP for, the introduction of a new finfish species, changing the finfish species cultivated, expansion of the physical area cultivated, or relocating the finfish aquaculture operation.

Prohibit nonnative finfish in marine finfish aquaculture sites (enclosures, net pens, or other rearing vessels) per Senate Bill 6086 (first reading).
Note: Prefiled 1/05/18; read first time 1/08/18. non-native removed (now Atlantic salmon) by March 8, 2018; returned to Senate Rules Committee for 3rd reading) (http://lawfilesext.leg.wa.gov/biennium/2017-18/Pdf/Bills/Senate%20Bills/6086.pdf).

Prohibit projects that involve supplemental food sources, pesticides, herbicides, or antibiotic applications.

Prohibit all aquaculture that uses or releases herbicides, pesticides, fertilizers, pharmaceuticals, non-indigenous species, parasites, viruses, genetically modified organisms, feed, or other materials known to be harmful into surrounding waters.

19.400.100 Existing Development

Limit structures waterward of the ordinary high water mark (OHWM) to uses that require overwater facilities, are floating, or are on piling or other open-work. Facilities in marine waters shall consist of an open framework (e.g., pilings, grated surfaces, cable railings, floating facilities held in place with anchors) as opposed to solid surfaces with no openings, to the maximum extent feasible.

Prohibit uses that are not water-oriented (water dependent, water-related, or water-enjoyment) unless the uses provide ecological restoration and eliminate the impact of the proposed use and development upon the shoreline.

It is imperative that new development include environmental cleanup and restoration of the shoreline in accordance with State and Federal laws.

Move structures away from the shoreline. When re-development occurs, condition projects with shoreline restoration or mitigation. Set structures back from required shoreline buffers to ensure compatibility between uses and protection of buffer areas from residential activities.

Remove shoreline armoring or replace hard armoring with soft armoring.

Restore riparian vegetation. Remove invasive plants and plant native species.

Encourage the use of low impact development (LID) techniques; implement LID techniques with stormwater retrofits.

19.400.105 Proposed Development

A. Location

Locate and design new development to avoid the need for future shoreline stabilization such as a dike, breakwater, pier, weir, dredged basin, fill, or bulkhead. Situate lots created through subdivision of land so development on the created lots will not require soft or hard shoreline stabilization methods.

Locate and design new development to avoid, or at least minimize, the need for modifications including dredging, clearing, grading, or scraping. Do not allow modifications for new development that cause significant impacts to adjacent or down-current properties.

Change Shoreline Residential to Residential SED. All environmental designations are shoreline. WAC 173.

Prohibit the use of bonus density provisions of the underlying zone classification, for lots created in shoreline environment designations containing sensitive ecological functions.

When on-site sewage systems are required for residential development, install the systems and associated drainfields outside of shorelines. Locate septic tanks and drain fields for new sewage disposal systems outside of shoreline setbacks and buffers.

Locate new development a sufficient distance from steep slopes or bluffs, to ensure stabilization measures are unlikely to be necessary during the life of the development.

Accessory uses should preserve open space, be visually and physically compatible with surrounding development, and be reasonable in size and purpose.

Preserve existing vegetation, open space, habitat, and critical areas in residential development.

Locate new residential structures with respect to views.

Ensure that residential structures do not exceed a height of 35 feet.

For all uses and structures, do not allow more than one third of an upland parcel within shoreline jurisdiction to be covered by impervious areas.

For all uses and structures, limit new lots in a Natural or Conservancy SED to 10 percent effective impervious surfaces, including parking areas.

Minimum lot widths for newly-created or adjusted lots in Shoreline Environmental Designations (SEDs), measured at the ordinary high water mark (OHWM), MUST be as follows (unless a greater dimension is required):
a. Natural SED = 100 feet,
b. Conservancy SED = 75 feet, and
c. Residential SED = 50 feet.

Do not allow bonus density provisions in Natural Shoreline Environment Designations (SEDs).

In Natural SEDs, new land divisions and subsequent development (including subdivisions) MUST comply with Low Impact Development (LID) regulations to control urban runoff and protect water quality and associated aquatic habitat. (Thurston County Stormwater Management and Site Development Manual, Volume VI)

To maintain the natural visual appearance and ecological functions of the waterfront, and to provide shoreline access for the benefit of all lots within a subdivision, ensure that residential developments/subdivisions containing five or more dwelling units provide and maintain a commonly owned tract between the water's edge and the first tier of lots closest to the water's edge.

The county must protect critical areas and associated buffers, open space, access areas, shoreline recreational space, and other common areas in a tract. Alternative protective mechanisms, such as a protective easement, public, or private land trust dedication, can be used prior to final approval of any division of land.

NOTE: Each lot owner within the land division shall have an individual taxable interest in the tract(s) or protective mechanism, unless otherwise approved by the Director or Hearing Examiner. Pierce County states that approval of an alternative protective mechanism will be subject to a determination by the Director or Hearing Examiner that such alternative mechanism provides the same level of permanent protection as designation of a tract.

B Standards for Work Waterward of OHWM

The county must regulate water-dependent uses to ensure they submit a pollution prevention plan with their permit or lease for in-water structures and activities in accordance with Water Pollution Control (RCW 90.48.386) and/or Water Quality Standards for Surface Waters of WA State (WAC 173-201A).

Developers must limit alterations, such as the significant removal of vegetation or rocks that disturbs the shoreline bank or bank vegetation on a site, to that necessary to perform work in fresh or salt water. All such alterations to the natural condition of the site must be restored and protected from erosion or siltation, using vegetation or other means, and the natural slope and sediments must be regraded.

Prohibit filling waterward of the OHWM for the purpose of creating upland, except for restoration projects, or when necessary to support a water dependent use, public access, or alteration of a transportation facility of statewide significance (RCW 47.06.140).

Allow activities waterward of the OHWM only after the proponent has demonstrated that alternative locations and designs have been considered and found to be infeasible, and the dump site or destination and staging area for dredged material has been provided.

Prohibit stabilization structures to be located waterward of either the ordinary high water mark (OHWM), or any existing shoreline stabilization structure, unless overriding safety, structural, or environmental concerns exist. Place stabilization structures intrinsically (in a natural way) below

the OHWM and abut with existing shoreline stabilization structures. Permit soft shoreline stabilization measures that provide restoration of shoreline ecological functions and processes waterward of the OHWM.

Prohibit launching ramps and covered moorage and facilities that are not light penetrable (except covered walkways for a ferry terminal or shipyard) waterward of the OHWM.

Prohibit launching ramps that result in increased beach erosion of, or alterations to, shoreline substrate within 1/4 mile of the site or a net loss of intertidal or riparian habitat or functions or migration corridors, or that adversely impact critical fish or wildlife habitat areas and associated wetlands.

Prioritize non-permanent water access facilities (e.g. buoys rather than docks) that can be removed seasonally, or that minimize the amount of shoreline modification. Do not allow water access stairs to be constructed waterward of the OHWM. Limit landings within the stairway to the minimum size necessary to meet applicable building codes.

Encourage WDFW to develop guidelines for residential docks to reduce the adverse impacts of these structures on Puget Sound and Washington's waterways. Design the guidelines to assist the public in minimizing potential impacts to fish, wildlife, and habitat resources associated with docks. Guidelines would include minimizing the footprint of the structures and using light penetrable grating to allow for natural light to filter through.

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Thurston Environmental Community Stakeholders

Black Hills Audubon Society, Sierra Club, Thurston League of Women Voters, Thurston Climate Action Team, and Thurston Environmental Voters

Honorable Bud Blake
Commissioner District 3
Thurston County Board of County Commissioners

Dear Commissioner Blake, 8/14/2018

On behalf of the five environmental groups I represent (Black Hills Audubon Society, Thurston County's Sierra Club, League of Women Voters, Climate Action Team, and Environmental Voters), please accept this summary of our comments for the Thurston County Draft Shoreline Master Program 2017 Update. Citizens of the Thurston Environmental Community Stakeholder groups ask you to consider, support, and include this summary of those comments, in the draft SMP update.

Our comments support the overarching goal of the Shoreline Management Act of 1971. The Act states the importance of preserving the public's opportunity to enjoy the physical and aesthetic qualities of natural shorelines of the State to the greatest extent feasible. No net loss of shoreline ecological functions must be achieved.

The SMP guidelines (WAC 173-26-186(8)) are designed to assure development standards and use regulations achieve a no net loss of shoreline ecological functions. No net loss is necessary to sustain a shoreline's marine, estuarine, and freshwater aquatic environments and their terrestrial wildlife and habitats, which sustain public health. Environmental management of shoreline aquatic systems is critical for the health and safety of the public.

No Net Loss concepts include the following: existing shoreline ecological functions should not deteriorate due to actions from permitted development. Mitigation involves first avoiding, then minimizing and compensating for ecological impacts. Mitigation for development projects alone cannot prevent all adverse cumulative impacts to the shoreline environment, so restoration is also needed. Restoration projects must achieve a net environmental benefit to aid shoreline functions. In addition, please heed the enclosed Aquaculture comments.

The Summary of Comments was drawn from comments I emailed earlier this year to Thurston County CPED (3/26 (chapters 19.100-.300) and 5/31 (chapters 19.400-.700) and Thurston County Planning Commission (5/25 (19.100-.300) and 5/31 (19.400-.700)). In the Summary of Comments, stakeholder comments are in green print, and statements in black print are from the draft SMP Update. Additional comments have been added from environmental and other community stakeholders, with references in the summary.

Future generations of county residents, young and old, are counting on your help to protect and manage South Puget Sound and its shorelines.

Respectfully submitted,

Anne Van Sweringen
Representative, Environmental Community Stakeholders group

1630 Central St NE
Olympia, WA 98506

Thurston Environmental Community Stakeholders

Black Hills Audubon Society, Sierra Club, Thurston League of Women Voters, Thurston Climate Action Team, and Thurston Environmental Voters

Brad Murphy, Senior Planner, SMP
Thurston County Long Range Planning

Dear Brad Murphy, September 10, 2018

On behalf of the five environmental groups I represent (Black Hills Audubon Society, Thurston County's Sierra Club, League of Women Voters, Climate Action Team, and Environmental Voters), please accept our comments on "**Appendix B**: Mitigation Options to Achieve No Net Loss for New or Re-Development Activities" for the Thurston County Draft Shoreline Master Program (SMP) 7.2018 Update.

Citizens of the Thurston Environmental Community Stakeholder groups ask you to consider, support, and include these comments on the county's plans for mitigation, in the draft SMP update.

The SMP guidelines (WAC 173-26-186(8)) provide development standards for local governments. The use regulations are designed to achieve no net loss of ecological functions that sustain marine and freshwater shorelines and their environment. Shoreline buffers provide many benefits for water bodies, including protecting habitat and water quality.

Management of shoreline aquatic systems, often through mitigation, is critical for the health and safety of the public. Mitigation, including larger buffers, is especially critical during these times of climate change and impending sea level rise.

The Department of Ecology commended Pierce County for the significant effort the county made in preparing their draft SMP. Pierce County's issues are similar to those in Thurston County. Many of our comments include mitigation sections from Pierce County's draft SMP submittal to Ecology. I moved many of these comments from our original 19.100-700 comments. Please consider each of these detailed comments.

We hope you will include long-term net gains in shoreline ecological functions in both planning-level decisions and project (site-specific design detail) level in the SMP, particularly when conducting mitigation sequencing.

We urge you to take the necessary steps to protect the county's marine and freshwater shorelines by mitigating the impacts of development in this SMP, for the benefit of future Thurston County generations.

Respectfully submitted,

Anne Van Sweringen
Representative, Environmental Community Stakeholders group
1630 Central St NE
Olympia WA 98506

Appendix B:
Mitigation Options to Achieve No Net Loss for New or Re-Development Activities

Thurston Environmental Community Stakeholders, Comments

No net loss is necessary to sustain a shoreline's overall marine, estuarine, and freshwater aquatic environments. Environmental management of shoreline aquatic systems is critical for the health and safety of the public. The intention of the SMP is to protect the functions shoreline vegetation provides. Shoreline buffers provide many benefits for water bodies, including protecting habitat and water quality.

The SMP guidelines (WAC 173-26-186(8)) provide development standards to guide local governments when implementing shoreline management under the Shoreline Management Act of 1971 (RCW 90.58) (SMA). The guidelines use regulations designed to achieve no net loss of shoreline ecological functions.

We ask commissioners to recognize and protect the statewide interest over the local interest, resulting in long term over short term benefit. In doing so, permits that adversely impact ecological functions of marine, estuarine, and freshwater habitats must not be allowed. Permits must only be given to achieve the objectives of the SMA (RCW 90.58.020) ("Use" Preferences). Developers must mitigate their impacts to assure shoreline ecological functions are maintained. Use preferences include preserving the natural character of the shoreline, while protecting the resources and ecology of the shoreline.

The county must incorporate public education regarding shoreline ecological functions and processes, the role of human actions on the environment, and the importance of public involvement in shoreline management.

B.1. General Mitigation Standards

Encourage county planners to enhance urban and city development with open spaces and vegetation buffers and corridors when considering mitigation planning for properties. Both open spaces and buffers have significant effects on, and importance concerning, sustainability of environmental functions over time.

Buffers and open spaces lessen the impacts of human activity, development and land disturbance, such as stormwater and other water quality and quantity impacts. Green spaces can improve urban climate, abate the urban heat-island effect, and reduce environmental damages. Vegetation stabilizes streambanks and improves water quality. Poll after poll show support for open spaces with trees, shrubs, and other vegetation by residents in neighborhoods world-wide.

Mitigation for development projects alone will not minimize adverse cumulative impacts to the shoreline environment, so restoration with a net gain in environmental functions is also required. Please assure that shoreline modifications, such as filling, dredging, or flood-control do not result, individually or cumulatively, in a net loss of ecological functions.

The first, and most important step in the Mitigation Sequence, avoidance, is ignored more often than it is implemented. Climate change is creating considerable threats to wetlands globally.

Permit Review Process, Tracking
The success of this SMP will depend on improved mitigation in the permitting process. Improvements include more effectively quantifying information from environmental baseline conditions. The county must track net changes (gain or loss) over time to meet the standard of no net loss. The no net loss standard is intended to stop habitat loss that has occurred on the state's shorelines over the years. The potential for mitigation to succeed has to be estimated against a baseline.

The county must develop a systematic permit review process and tracking system that achieves no net loss. A tracking system will measure a permit's baseline conditions and track net changes in habitats and natural resources over time. A systematic review process requires an accurate assessment of impacts, avoiding unnecessary and un-mitigable impacts, and mitigating the unavoidable impacts through a process that includes monitoring. Site visits are crucial, as they may differ significantly from a planner's views of a site plan or GIS map in the office.

To assure project mitigation is accomplished, the county must consider using financial guarantees. Financial guarantees have the advantage of assuring developers will complete the mitigation work and submit monitoring reports. Authorize financial guarantees in the code or other regulations. Require estimates, and a binding clause for access to the property. Write conditions for staging, and tie compensatory mitigation to the stages.

The county can use general boilerplate conditions of approval as checks on compliance for phased projects. The developer then has an incentive to comply before moving on to the next project. Customized staging conditions can effectively tie compensatory mitigation to stages.

It may involve extra work initially for the county, but a streamlined system will far outweigh the benefits to the public and environment in the long run.

B.1.A. Critical areas

The county must include land necessary for critical area buffers in the SMP. A net gain in buffer width means a net gain in ecological functions for all, including water quality and quantity, habitat, and amelioration of climate change. The county must direct cities and local jurisdictions to do the same.

The county must establish buffers large enough, and/or necessary to, protect critical areas. Critical area buffers may be greater than standard shoreline buffers.

B.1.B. mitigation sequencing, compensatory mitigation
(SMP 19.400.110 Mitigation: A. Mitigation Sequencing, B. Mitigation Options, C. Mitigation Compliance.)

Avoid impacts to shorelines when applying mitigation sequencing. The county must give the highest priority to avoiding impacts whenever new uses or development are proposed in shorelines.

To achieve no net loss using mitigation, the county must:

- Stand firm on avoiding and minimizing impacts and require effective compensation for any remaining impacts, with complete review of all potential impacts.
- Honor the required buffers;
- Move structures back from buffers for uses that are not truly water dependent. Protect areas with intact vegetation.
- Rarely use variances or exemptions; keep as a rare exception rather than the rule.
- Ensure developers provide full compensatory mitigation.

The county must require compensatory mitigation to occur in related habitat areas to allow for gain in same ecological functions and ecosystem-wide processes.

19.400.110.A.2. Please change the wording:
"Application of the mitigation sequence shall achieve no net loss of ecological functions for each new development. ~~and shall not result in required m~~ Mitigation~~.~~ in excess of that which is necessary is not a requirement." There is no reason to penalize additional mitigation, should a developer create it.

The SMP must not allow new land alterations and development that results in a net loss of ecological functions. The county must encourage net gains in both programmatic (planning-level decisions) and project (site-specific design detail) bases, when conducting mitigation sequencing.

The county can prevent net losses from happening by including the following in the SMP:

- Carefully design mitigation to replace all ecological functions lost by development or activities. Good designs avoid more rigorous permit requirement follow-up and the need for enforcement of impacts.
- Require high enough replacement ratios so the mitigation can replace the functions lost.
- Make sure mitigation is located in an area in which it can function, and that it is monitored and maintained until it is fully established.
- Make site visits more cost-effective:
- Conduct both pre-application site visits and normal application site visits, if possible.
- Schedule consistent site visits for a day with time slots, fill the schedule in advance, and include group-scheduled site visits into geographic areas, to reduce travel time.
- Prepare support materials in advance to make the most of site visit time (GIS materials, natural resource information, proposal sketches, etc.).
- Include staff, either from the local jurisdiction or another agency, with training and experience conducting natural resource assessments related to development.
- Opportunistically include site visits for projects, such as when driving by a site for other reasons. Such visits might include a second visit to confirm conditions, adding a new pre-application site visit, emergency situations, etc.

B.1.B. shoreline vegetation buffers; setbacks

19.400.110. Mitigation conducted when buffer widths are reduced in size must result in no net loss of environmental functions.

Buffer Width Increases

When site conditions require protecting habitat area functions and ecological values, the Department may require an increased buffer width. When a larger buffer is necessary, such a determination shall demonstrate any of the following:

- A larger buffer is necessary to maintain viable populations of existing species or protect existing functions of habitat areas identified in the county code.
- The adjacent land has minimal vegetative cover.
- The adjacent land has slopes greater than 20 percent.
- The habitat area is in an area with a high potential for tree blow-down. In these cases, the habitat area may be expanded an additional 50 feet on the windward side.
- A deviation from the standard buffer shall not be allowed when an application for a development permit has not been submitted in association with a proposed forest practice activity (other than a site development permit)

Buffer Width Averaging

Developers must propose buffer width averaging through submittal of a habitat assessment study or report.

Modify standard buffer widths by averaging or increasing as follows. Buffer width averaging shall be allowed only when the applicant demonstrates all of the following:

- The decrease in buffer width is minimized by limiting the degree or magnitude of the regulated activity.
- Buffer averaging will not adversely impact the water body.
- Buffer averaging is consistent with other buffer requirements set forth under this Title (e.g., wetlands, critical fish and wildlife species and habitats, landslide hazard areas, etc.).
- Buffer averaging will not increase the risk of slope failure or downslope stormwater drainage impacts.
- The total buffer area after averaging is no less than the buffer area prior to the averaging. (Refer to Figure_.)
- The minimum buffer width after averaging will not be less than 50 percent of the widths established in the county code.
- Averaging is accomplished within the project boundaries or through an off-site conservation easement or tract (or other acceptable protective mechanism) approved by the Department.
- The applicant demonstrates one or more of the following conditions:
  - The proposed buffer area contains a diversity of native vegetation distributed within at least two stratum (i.e., groundcover, shrub, sapling, tree); or
  - The project includes a buffer enhancement plan as part of the required mitigation. The plan shall use plant species that are native and non-invasive to the project area. The plan must substantiate: 1) the enhanced buffer will improve the functional attributes of the buffer, and: 2) provide additional protection for a habitat's functional values.

Aquaculture
The county shall include Aquatic standard buffers in the Buffer Width section and environmental designation table.

The aquaculture industry's use of shorelines must be consistent with the regulations of the Shoreline Management Act, the shoreline master program, and best available science. A water-dependent use, aquaculture is polluting western coastlines, sounds, and estuaries with plastics. The use of plastic by the aquaculture industry is pervasive, and will increase with industry expansion.

Geoduck aquaculture mitigation practices, when based on Best Available Science, are known to reduce risks to birds and other wildlife. Use these mitigation practices to reduce these and other risks.

A setback of 10 feet from the property line of adjoining tidelands must be observed to avoid trespass on neighboring properties during aquaculture operations.

A ten-foot buffer zone should be required around established native eelgrass beds, or where native eelgrass is present at densities greater than 4 leaf shoots (turions) per square meter. No geoduck planting or other operational activities will be undertaken within this buffer zone. The county reserves the right to increase or decrease this buffer as new data become available on environmental effects.

Regulated Activity (Table from Pierce Co)	**Table TCC__ Submerged Aquatic Vegetation Required Undisturbed Area Widths**
	Intertidal Manual Harvest: 25-feet
Shellfish Harvest	Intertidal Mechanical Harvest: 50-feet
	Subtidal: 180-feet
Mussel Rafts	50-feet within low-energy shoreline areas including, but not limited to, bays, coves, and estuaries
Fish Pens	300-feet
Docks and Floats	4-feet vertical separation or 25-feet horizontal separation, whichever is greater.
Other	A minimum separation of 25-feet shall be required for all other activities.

The following table presents buffer widths to protect Submerged Aquatic Vegetation from aquaculture and other activities. Include these buffer widths in the SMP:

Employ 185-foot buffers around all native aquatic vegetation beds to protect both native aquatic vegetation and fish, marine mammals, birds and other native animal life that depend on the beds for one or more of their life histories.

Locate geoduck aquaculture beds away from sand dollar beds and native shellfish beds, and separate with at least a 185-foot buffer to protect native animal life from impacts due to aquaculture activities.

Consider a financial guarantee from aquaculture operators to ensure buffers containing vegetation/sea life around aquaculture installations remain intact.

Prevent all entry, including barges and equipment, into native aquatic vegetation beds and buffers during all site work.

A qualified independent third party consultant shall monitor vegetation density and bed size prior to any site work from planting to harvest, plus one post-harvest growing period.

Setbacks (19.400.140 Bulk and Dimension Standards)
Do not allow standard SMP buffer widths or setbacks to be modified or reduced; not for Shoreline Environmental Designations, vegetation conservation, or other areas. Adequate buffer widths are the most straight-forward protection method available for ecological functions; buffer widths should be maximized to account for unforeseen effects, including climate change and sea level rise.

19.400.120.B.4. Vegetation Conservation Buffers - "An additional 15-foot building setback must be maintained beyond the outer boundary of the buffer. This building setback may be reduced provided that the resulting setback is protective of existing vegetation within the buffer." Please ensure this setback, at a minimum.

Move structures away from the shoreline. Set structures back from required shoreline buffers to:

- ensure compatibility between uses, and
- protect buffer areas from residential activities.

Aquaculture activities shall be set back a minimum of 10 feet from adjacent parcels that are not associated with the aquaculture activity (WAC 365-190-130). The 10-foot setback requirement shall be increased:

- When the shoreline contains multiple individual aquaculture activity areas, and/or
- When plans proposed by aquaculture demonstrate that a greater distance is required between areas or adjacent parcels.

Base expanded setbacks on water body and shoreline characteristics and an analysis of the shoreline development. Base expanded setbacks on:

- Water body and shoreline characteristics, and
- An analysis of the legally established shoreline development.

Setback distances ensure that other shoreline uses, including recreation or public access, are maintained to ensure protection of shoreline functions and processes.

When re-development occurs, condition projects with shoreline restoration or mitigation. Locate septic tanks and drain fields for new sewage disposal systems outside of shoreline setbacks and buffers. When on-site sewage systems are required for residential development, install the systems and associated drainfields outside of shorelines.

Buffer Width Reductions - Marine, Rivers, Streams

All Marine standard buffer widths were decreased from the SMP 2017 draft update to the 7.2018 draft update:

Marine Buffer Widths, changes 2017 to 7.2018:

- Shoreline Residential: standard = 85 to 50 feet, reduced = 60 to 0 or 50
- Urban Conservancy: standard = 250 to 125 feet, reduced = 100/75/below to 90/75/below
- Rural Conservancy: standard = 250 to 150 feet, reduced= 150 to 110
- Natural: standard = 250 to 200 feet, reduced = 200 to 150

(Mining): standard = 250 to 200 feet, Reduced = 0 or Type III to 0 or 200

- Shoreline Residential: A 35 foot decrease in buffer width can diminish buffers to a lower condition. Fifty feet total from edge of buildings, along with increased population levels, is the absolute minimum and may not be protective of ecological functions in built areas with the additional impervious surfaces and stormwater issues.In addition, the county must mandate open spaces to create play areas and wildlife corridors. Cluster buildings away from buffers, toward streets and use homeowner agreements or other mechanisms to protect and maintain open space.
- Urban Conservancy: This buffer has been cut in half. Septic fields can directly affect shorelines and water quality. See Shoreline Residential, above.
- Rural Conservancy: Buffers suffer from septic and agricultural chemical use. Maintain the 2017 update width.
- Natural: Natural SEDs are considerably smaller in size than in the past. The Natural buffer width should be increased from the 2017 draft update, not decreased, to protect remaining ecological functions within and supporting adjacent SEDs.
- Mining: A reasonable Marine buffer, between 200 and 1000 feet, around mines should be viewed as a necessity. A Type III permit should still be considered for mining. Allowing no Reduced buffer width is unacceptable.

The 7.2018 Marine and Freshwater Lakes standard and reduced buffer widths should be the same as, or greater than, the 2017 update.

River and Stream buffer widths, changes 2017 to 7.2018:

All SEDs: standard = 250 to 250, reduced = 10% or 25% or less to 10% or 25% or less (no change).

Reducing river and stream buffers by 10-25% can severely reduce river and stream benefits such as flood reduction. Consider no more than 10-12%.

Keep buffer widths as established in the 2017 update, or greater.

Benefits of rivers and streams, and lakes to the county's citizens are many and should not be overlooked. Rivers and streams carry water and nutrients to the county's landscape as they flow

to the ocean. Water replenishes wetlands along the way. Rivers provide important habitat to wildlife and fish, both in streams and along the banks.

Wetland, marine, and riparian buffers are critical to maintain. Reduced buffers means reduced ecological functions including hydrology, water quality, and habitat. It is critical that the county adheres to the SED marine and Freshwater Lakes buffers that are in the 2017 SMP or greater when permitting shoreline development. Achieving no net loss of ecological functions requires maintaining shoreline buffers in native vegetation.

A buffer width reduction may be proposed through submittal of a habitat assessment study or report. A reduction in a buffer width shall be allowed only when the applicant demonstrates all of the following:

- Buffer reduction is unavoidable.
- Buffer reduction has been minimized by limiting the degree or magnitude of the regulated activity.
- Buffer reduction is consistent with other buffer requirements set forth under this code (e.g. wetlands, critical fish and wildlife species and habitats, landslide hazard areas, etc.)
- Buffer reduction will not adversely impact water bodies.
- The buffer width will not be reduced more than 25 [consider 12-15] percent below the provisions of the code.
- The buffer meets the requirements of the code, or
- A buffer enhancement plan is provided (as required by the code): 1) The buffer enhancement plan shall use plant species that are native and non-invasive to the project area; and 2) The plan must substantiate that the enhanced buffer will improve the functional attributes of the buffer to provide additional protection for the habitat's functional values.
- The buffer has less than 15 percent slopes.

Buffer Width Reduction – Lakes

Freshwater Lakes:

The Freshwater section is incomplete, and associated information is confusing and difficult to find. Why are Freshwater Lakes included only in 2018? The 2017 update, 19.400.120.B.1. lists standard buffers for Marine and only Freshwater. Later, it refers to rivers and streams, but not lakes. Was Freshwater supposed to be Freshwater Lakes? We cannot comment until this information is corrected.

The 7.2018 update states standard and reduced Lake buffers are the same. Yet (if Freshwater meant Freshwater Lakes) Shoreline Residential and Natural SED standard buffers were reduced from 2017 to 7.2018 by 25 and 50 feet, respectively. Place larger buffers on Lakes.

County lakes lead to streams that reach Puget Sound. Landowners on a lake or stream bank without adequate buffers may use chemicals (pesticides etc.), fertilizers, detergents, or household wastes that end up in the water, killing fish and causing algae blooms.

A lake or stream buffer width should consist of three zones at a minimum of 55 feet. The first zone, trees and shrubs and other vegetation, extending from the water's edge, should be at least 15 feet. Zone 2, which focuses on nutrient uptake upslope, should be 20 feet. These two zones provide travel corridors for wildlife. Zone 3 extends a minimum of 20 feet upslope and landward of Zone 2, and consists of tall grasses or herbaceous cover. On steeper slopes, the minimum width must be 40 feet or more. The county should incorporate this methodology, developed in Michigan, into the SMP.

The standard buffer in a vacant lot along a lake may be reduced as follows:

- Where the vacant lot has a common property line with two or more lots that 1) abut the ordinary high water line and 2) are developed with single-family residences, the standard buffer may be reduced to the greater of 50 feet or the average of the standard buffer and the setbacks of the residences on the adjacent properties. This reduction does not apply where the criteria of the county code apply.
- Any water dependent accessory use may be allowed in the reduced buffer with the issuance of a Conditional Use Permit. The permit shall be predicated on a determination that the project will be consistent with the Conditional Use criteria (WAC 173-14-140), if applicable; and the use will cause no reasonable adverse effects on the environment and other uses. The Conditional Use Criteria include:
  - Views from surrounding properties will not be unduly impaired.
  - Adequate separation will be maintained between the structure and adjacent properties and structures.
  - Screening and/or vegetation will be provided to the extent necessary to ensure aesthetic quality.
  - Design and construction materials shall be chosen so as to blend with the surrounding environment.
  - No additional harm to the aquatic environment will result from the project.

B.1.C. Impacts requiring compensatory mitigation

Aquaculture

Once mitigation sequencing (avoid, minimize, mitigate) is applied to a site, the county must work with the aquaculture industry to monitor for and prohibit the following potential impacts:

- Clearing and grading (alters marine habitat, creates changes in benthic habitat structure and beach community (substrate, spawning habitat for forage fish, overhanging vegetation) or related ecological functions).
- Activity's disturbance that affects the natural beach community, structure, and function. Site preparation that causes a "Net-Loss" of shoreline functions and values.
- Clearing, scraping, or grading that creates a net loss of site functions and values.
- Clearing or thinning of native aquatic vegetation. If a net loss of native eelgrass on the leasehold/parcel is found to be the result of aquaculture activity, replanting will not be permitted and mitigation will be required.

The county must give critical saltwater and freshwater habitats consideration and protection from development, especially dredging. These aquatic habitats, especially un-vegetated marine habitats, include mudflats, sandy beaches, forage fish spawning beaches, intertidal areas, oyster/barnacle beds, estuaries, and pocket estuaries. The county must protect these very important areas, as well as vegetated areas.

Mining

NOAA NMFS recommends the county make all reasonable efforts to identify gravel sources in upland areas and terraces before deciding to site project operations in or near streams:

1. Use upland aggregate sources, terraces and inactive floodplains before using active channels, their deltas, and floodplains. Situate gravel extraction sites outside the active floodplain. Do not excavate gravel from below the water table. Dry-pit mining on upland outcrops, terraces or the floodplain is preferable to any in-stream alternative.
2. Site pit excavations located on adjacent floodplains or terraces outside the stream's channel migration zone (CMZ), and as far from the stream as possible. Separate pits from active channels with a buffer designed to maintain this separation for several decades. Ecology has tools to help the county in identifying CMZs. CMZ is the channel where a stream moves over time, providing important habitats and natural diversity.
3. Use larger rivers and streams before small rivers and streams. Instream gravel extraction is environmentally unsafe since erosion changes the CMZ as soon as gravel extraction begins. In larger systems, the overall impact and disturbance of gravel extraction is proportionally smaller. On a smaller river or stream, the extraction site's location is more critical since exposed gravel deposits are limited and the floodplain is narrower. In either case, NMFS recommends a low extraction volume relative to coarse sediment load.
4. Strictly limit in-stream gravel removal quantities so that gravel recruitment and accumulation rates are sufficient to avoid prolonged impacts on channel morphology and anadromous fish habitat.
5. Allow gravel bar skimming only under restricted conditions:
    - Gravel be removed only during low flows and from strictly-defined areas above the low-flow water level;
    - Berms and buffer strips be used to direct stream flow away from the site and to provide for continued migratory habitat;
    - The final grading of the gravel bar does not significantly alter the flow characteristics of the river during periods of high flows;
    - Bar skimming operations be monitored to ensure they are not adversely affecting gravel recruitment or channel morphology either upstream or downstream from the site;
    - Geomorphic features be monitored using methods that quantify their physical dimensions and changes at appropriate time scales; and
    - Any gravel removal in streams or rivers that have a recent history of eroding bars or banks, or stream bed lowering, be discouraged.
6. Prior to gravel removal, conduct a thorough review of sediments and of point and non-point sources of contaminants.

7. Gravel extraction activities must avoid removing or disturbing large woody debris and other types of in-stream roughness, and replace or restore those that are disturbed.
8. Manage gravel extraction operations to avoid or minimize damage to stream/river banks and riparian habitats.
9. Cumulative impacts of gravel extraction operations to anadromous fishes and their habitats must be addressed by the Federal, state, and local resource management and permitting agencies. Cumulative impacts must be considered in the permitting process.
10. An integrated environmental assessment, management, and monitoring program must be a part of any gravel extraction operation, and encouraged at Federal, state, and local levels.
11. Mitigation must be an integral part of the management of gravel extraction projects.
12. Gravel extraction projects proposed as stream restoration activities be regarded with caution. Any proposals to perform gravel extraction for habitat enhancement purposes must be conducted in consultation with NMFS regional field offices and technical experts. NMFS recommends that gravel extraction in conjunction with commercial gravel operations for habitat enhancement purposes not take precedence over, and not be a substitute for, habitat protection.

B.1.D. Mitigation is not required for impacts outside of the standard buffer

The SMA provides local governments with the option to include critical areas buffers that extend outside the minimum shoreline jurisdiction within shoreline jurisdiction [RCW 90.58.030 (2)(d)(ii)]). Is the county using this option?

B.1.I. In-Kind Measures

Keep in-kind mitigation measures in-place. In-kind mitigation is typically the best approach to replicate functions that would otherwise be lost. In rare occasions when in-kind mitigation is not possible, the county must require out-of-kind mitigation that can reverse (mitigate for) the impacts of the new development on the specific ecological function within 200 feet. For example, if a new dock increases potential for predation of juvenile fish, mitigation should provide function to either reduce predation in other ways or increase salmon population.

B.1.J. Public Access

We recognize the benefits of creating access for the public, yet we have questions about the extent to which access is being used instead of mitigation:

- How does the county intend to achieve no net loss if it allows developers to require public access as a way to reduce the amount of required mitigation by 50%?
- What are “measures” from public access projects that mitigate impacts to ecological functions?
- How can public access accommodate mitigation of ecological functions?

Allowing a developer to reduce his mitigation by half by including public access is not the way to protect ecological functions. Unmanaged, public access can create a net loss of environmental functions. Reducing mitigation would create a rush of developers placing public access to avoid having to mitigate. Any measure to protect the environmental functions that would be lost by reducing mitigation is gone. Adding public access to a project comes with its own set of damages to environmental functions that would require greater buffers. Conservation easements

Adverse environmental impacts to shoreline ecological processes and functions resulting from public access should preclude public access. Do not allow public access if it creates impacts that would need to be mitigated.

Placing a conservation easement on half of a natural area, and surrounding it with development of the other half, is not an effective way to protect environmental functions. Land trusts use conservation objectives to place conservation easements, not mitigation areas reduced by 50% for public access.

B.2.A., B.2 Mitigation Standards for Specific Development Activities

Vegetation Clearing
Why is mitigation for lawns halved? Including public access in a development that is removing lawn should not reduce a permit's mitigation by up to 50%.

If a large property has one acre or more of grass, under Thurston's scenario, the developer may not mitigate enough to show no net loss. Lawn is a combination of exotic vegetation. Most turf grasses are native to Europe. Planting natives in small areas surrounded by non-native vegetation, with no regular maintenance, could be expected to fail. Pierce County's approach removed the issue that lawns provide no shade and are primarily exotic vegetation.

Thurston County would benefit from using Pierce County's Tiered Mitigation Program (18E.40.050) based on EPA's methodology for functions, and supersedes the current wetland methodology approach, rather than Kitsap's Mitigation Option, which includes a provision for public access that halves mitigation.

Pierce County, in their Tiered Mitigation strategy, prescribes simpler requirements for minor projects, and customized requirements for larger projects, under 1,000 square feet called an "*Abbreviated Planting Plan.*" Projects that affect 1,000 square feet or more must conduct a *Habitat Assessment Study*. More complex projects with additional mitigation requirements must submit a *Habitat Assessment Report.* The goal of tiered mitigation is to insure existing stream functions are not lost from the watershed. By establishing an acre as the standard, city and many urban properties have less mitigation and therefore, less costs.

Pierce County recommends the use of the following table for the Abbreviated Planting Plan:

Table __. Vegetation Conservation Mitigation Planting

Plant Type	Spacing	Number of Plants = Square Footage of Area to be Planted Divided By:
Trees	12-15 feet on-center	144-225 square feet (based on tree spacing)
Shrubs	6 feet on-center	36 square feet
Herb/Groundcover	3 feet on-center	9 square feet

B.2.A. Vegetation Clearing - The county must prioritize retaining vegetation or replanting for all development, uses, or activities, whether a permit is required or not, inside or outside a buffer.

Require replanting when existing native vegetation is altered. Prioritize retaining vegetation in requirements for shoreline buffers or vegetation management areas.

Enhancing vegetation within shoreline buffers or setbacks should consist of using plants that do not require use of fertilizers, pesticides or chemicals that are detrimental to water quality or harmful to aquatic life.

B.3. New/Replacement Shoreline Armoring or Barrier Structures

Do not permit new or expanded structures in shoreline or shoreland standard or reduced buffers under any circumstances.

B.5 Alternative Mitigation Options

B.5.C. In-Lieu programs, Restoration

"While in-lieu programs are attractive, innovative and can result in better mitigation outcomes, when well-designed and effectively implemented, they require accurate accounting of impacts and the needed mitigation. In addition, these programs require the conversion of that mitigation into units provided by the program, and establishment of fees to cover the mitigation units." (Futurewise)

Old stream mitigation is based on, among other things, restoration priority levels and/or changes to create a stable channel. This results in a push for maximum stream channel shape change to get a maximum number of credits and a focus on shape, rather than stream functions.

Why isn't the county using the stream functions approach to quantifying mitigation for credits, a newer approach established by EPA? The county must consider this approach as a strategy to determine mitigation credits.

To evaluate projects for mitigation credits, a five-level Stream Functions Pyramid approach is now being used by EPA. The new approach is based on the functions of streams, rivers, and their riparian zones, the first layer. Compensatory mitigation credits are now determined by functions lost at each level and success standards for replacing those functions.

Pierce County's SMP Update includes tiered levels of required mitigation reports with less complex reports required for projects covered by built-in mitigation and more detailed reports required for other projects.

Program and Funding gaps:

1) MRC - The county must establish a Marine Resources Committee to coordinate efforts to restore and preserve the county's ecological functions and natural resources. The MRC's mission is to address, using sound science, the needs of Thurston County's marine ecosystem. The committee would work closely with local and state officials to help implement the committee's recommendations and promote public outreach and education.
2) Armoring Structures - The county needs a program, similar to the septic loan program for private property owners, for removing unwanted or unnecessary structures. The county needs long-term funding sources for alternatives to hard armoring. The county suggests two solutions: one, to encourage alternatives, may be to lower the property owner's property tax for a set number of years, to make up the difference in cost between hard and soft armoring methods. Another solution involves a type of bulkhead-specific in-lieu fee program.
3) Restoration and Mitigation - The county suggests Parcel Advance Mitigation, a type of mitigation system that involves restoration before development. Restoration must include monitoring and demonstrate benefits to environmental functions (a tiered approach, starting with groundwater recharge and discharge), during the 5 years prior to development.
4) Monitoring and Restoration - Please heed the county's statement that current local funding does not provide for effective regulatory on-site monitoring. The system does not allow for enough time for monitoring to be meaningful. It also does not provide for an effective program structure for restoration. As a result, restoration projects are limited in their timelines and scope (goals, deliverables, tasks)).

References:

Futurewise, August 2014, "Practical Guide: Shoreline Permitting and Mitigation to Achieve No Net Loss"(https://www.eopugetsound.org/sites/default/files/features/resources/FuturewisePracticalGuide_Mitigation_201408.pdf).

Hogarth, W.T. 2005. Final National Marine Fisheries Service (NMFS) National Gravel Extraction Guidance. Memorandum, NOAA.

(http://www.westcoast.fisheries.noaa.gov/publications/reference_documents/esa_refs/gravel_policy_2005.pdf)

Istvan and Takacs. 2011. The significance of urban open spaces and green areas in urban property developments. First International Conference "Horticulture and Landscape Architecture in Transylvania." Agriculture and Environment Supplement (2011) 110-121. (www.acta.sapientia.ro/acta-agrenv/Supl2011/11_Balogh.pdf).

Kettlewell et. al. 2008. An Assessment of Wetland Impacts and Compensatory Mitigation in the Cuyahoga River Watershed, Ohio, USA. March 2008. Wetlands, Vo. 28 No. 1. Pp. 57-67.

Merkel & Associates Inc. 2016. 48-Month Eelgrass Monitoring Report for the Anaheim Bay Eelgrass Transplant in Support of the 2010 Anaheim Bay Naval Weapons Station Maintenance Dredging Project, Anaheim Bay, CA. Prepared for NAVFACSW Coastal IPT and NAVFACSW PWD Engineering Naval Weapons Station Seal Beach. (https://www.ecoatlas.org/upfiles/5014/48%20Month%20Eelgrass%20Survey.pdf)

Pierce County's draft SMP update submittal to Ecology: "Pierce-PCC-2016_Pierce_County_ SMP_As_Submitted;" Exhibit G to Ordinance No. 2013-45s4.

Southeast Michigan Resource Conservation & Development Council. Lake and Stream Owners' Guide for Riparian Buffer Establishment. Water Quality Improvement, Wildlife Habitat and Stream Bank Stabilization. http://semircd.org/buffers/bufferguide.pdf

USEPA. 2012. A Function-Based Framework for Stream Assessment & Restoration Projects. EPA 843-K-12-006. May. 340 pp.

Ian Lefcourte

From: Tededenstrom@gmail.com <donotreply@wordpress.com>
Sent: Friday, August 3, 2018 10:02 AM
To: SMP
Subject: Incoming SMP Comment

Your Name (Optional): Ted Edenstrom

Your email address: Tededenstrom@gmail.com

Comment: Please specifically define shorelines "of the state".
Thank you.

Time: August 3, 2018 at 5:01 pm
IP Address: 174.21.125.103
Contact Form URL: https://thurstoncomments.org/comment-on-the-proposed-shoreline-code-update/

Sent by an unverified visitor to your site.

Ian Lefcourte

From: Brad Murphy
Sent: Wednesday, September 5, 2018 1:28 PM
To: SMP
Subject: FW: Shoreline Management Program Review

From: Robin Courts
Sent: Wednesday, September 05, 2018 12:30 PM
To: Brad Murphy <brad.murphy@co.thurston.wa.us>
Cc: Ramiro Chavez <ramiro.chavez@co.thurston.wa.us>
Subject: FW: Shoreline Management Program Review

Hi Brad,

Forwarding this email received by the board with comments on the SMP.

Would you please add this to your file of public comment?

Thank you!
Robin

From: County_Commissioners
Sent: Tuesday, September 4, 2018 3:05 PM
To: Robin Campbell <robin.campbell@co.thurston.wa.us>; Robin Courts <robin.courts@co.thurston.wa.us>; Ramiro Chavez <ramiro.chavez@co.thurston.wa.us>; Erin Birklid <erin.birklid@co.thurston.wa.us>; Kelli Kennedy <kelli.kennedy@co.thurston.wa.us>; Vickie Larkin <vickie.larkin@co.thurston.wa.us>; Bud Blake <bud.blake@co.thurston.wa.us>; John Hutchings <john.hutchings@co.thurston.wa.us>; Gary Edwards <gary.edwards@co.thurston.wa.us>
Subject: FW: Shoreline Management Program Review

From: Thurston County | Send Email
Sent: Tuesday, September 4, 2018 10:05:08 PM (UTC+00:00) Monrovia, Reykjavik
To: County_Commissioners
Subject: Shoreline Management Program Review

This email was created by the County Internet web server from the email masking system. Someone from the Public has requested to contact you with the following information:

To: **the Thurston County Commissioners**

Subject: **Shoreline Management Program Review**

From: **Phyllis Farrell**

Email (if provided): phyllisfarrell681@hotmail.com

Message:

I am writing to urge you to consider these comments for the Thurston County Draft Shoreline Master Program 7.2018 Update (SMP).

I am concerned about the county's trend of converting shoreline to other uses.

The SMP guidelines (WAC 173-26-186(8)) provide for development standards and use regulations designed to achieve no net loss of shoreline ecological functions, which is necessary to sustain a shoreline's environment; management of shoreline aquatic systems is critical for the health and safety of the public. Shoreline buffers provide many benefits for water bodies, including protecting habitat and water quality.

I specifically request you consider and support the following:

Buffers – Do not allow standard SMP buffer widths or setbacks to be modified or reduced; not for Shoreline Environmental Designations, vegetation conservation, or other areas.

Mitigation – Encourage long-term net gains in both programmatic (planning-level decisions) and project (site-specific design detail) bases, particularly when conducting mitigation sequencing (avoiding, then minimizing, finally compensating for impacts). Require compensatory mitigation to occur in the same, or a related, habitat area for gain in the same ecological functions and ecosystem-wide processes.

Aquaculture – Aquaculture's use of shorelines must be consistent with the regulations of the Shoreline Management Act, the shoreline master program, and Best Available Science. A water-dependent use, aquaculture is polluting western coastlines, sounds, and estuaries with plastics. The use of plastic by the aquaculture industry is pervasive, and will increase with industry expansion. Geoduck aquaculture mitigation practices, when based on Best Available Science, are known to reduce risks to birds and other wildlife. Use mitigation practices to reduce these and other risks.

I urge you to take the necessary steps to protect the county's natural resources and habitats, so the marine and freshwater shorelines and shorelands of our county will flourish into the future.

Sincerely,

Phyllis Farrell

Revised 1/22/2017

Ian Lefcourte

From: Phyllis Farrell <phyllisfarrell681@hotmail.com>
Sent: Tuesday, October 9, 2018 2:23 PM
To: Brad Murphy; Patrick.townsend@townsendsecurity.com; jimsvision@gmail.com; Erin Hall; Audrey Lamb; doug.karman@comcast.net; John H Woodford; Anne Van Sweringen; meredith.raff@gmail.com; 'Eric Casino'; Kathryn Townsend; Cassal, Sarah (ECY); Tris Carlson; Nation, Theresa K (DFW)
Cc: Cynthia Wilson; Polly Stoker; SMP
Subject: Re: CANCELLED--Tonight's Planning Commission meeting Cancelled 10.3.18

Categories: Orange category

Thanks Brad, but I will be unable to attend due to a conflict with the regularly scheduled meeting of the South Sound Group Sierra Club. I have previously made public comments to the BOCC advocating for the inclusion of public comments in the draft plan and to extend the time period to allow for more public participation.

Thanks

Phyllis

Sent from Outlook

From: Brad Murphy <brad.murphy@co.thurston.wa.us>
Sent: Tuesday, October 9, 2018 9:05 AM
To: Patrick.townsend@townsendsecurity.com; jimsvision@gmail.com; Erin Hall; Audrey Lamb; doug.karman@comcast.net; John H Woodford; Anne Van Sweringen; meredith.raff@gmail.com; 'Eric Casino'; Kathryn Townsend; Phyllis Farrell; Cassal, Sarah (ECY); Tris Carlson; Nation, Theresa K (DFW)
Cc: Cynthia Wilson; Polly Stoker; SMP
Subject: RE: CANCELLED--Tonight's Planning Commission meeting Cancelled 10.3.18

Hi All,

Last week's Planning Commission meeting has been rescheduled for tomorrow **October 10th at 6:30pm in Room 152** here at the County Courthouse Complex, Building #1.

A meeting agenda and meeting materials can be found at the following website:
https://www.thurstoncountywa.gov/planning/Pages/pc-meetings.aspx

Sincerely,

Brad Murphy

Senior Planner
Long Range Planning
Thurston County Community Planning
and Economic Development
2000 Lakeridge Dr. SW

Olympia, WA 98502
360-754-4465
murphyb@co.thurston.wa.us

From: Brad Murphy
Sent: Wednesday, October 03, 2018 12:31 PM
To: 'Patrick.townsend@townsendsecurity.com' <Patrick.townsend@townsendsecurity.com>; 'jimsvision@gmail.com' <jimsvision@gmail.com>; 'Erin Hall' <erin@omb.org>; 'Audrey Lamb' <audreyl@taylorshellfish.com>; 'doug.karman@comcast.net' <doug.karman@comcast.net>; 'John H Woodford' <jwoodford.aia@gmail.com>; 'Anne Van Sweringen' <avansw2@gmail.com>; 'meredith.raff@gmail.com' <meredith.raff@gmail.com>; 'Eric Casino' <casino.eric@yahoo.com>; 'Kathryn Townsend' <kath.townsend@gmail.com>; 'Phyllis Farrell' <phyllisfarrell681@hotmail.com>; 'Cassal, Sarah (ECY)' <salu461@ECY.WA.GOV>; 'Tris Carlson' <trcarlson@earthlink.net>; 'Nation, Theresa K (DFW)' <Theresa.Nation@dfw.wa.gov>
Cc: Cynthia Wilson <cynthia.wilson@co.thurston.wa.us>; Polly Stoker <polly.stoker@co.thurston.wa.us>; SMP <SMP@co.thurston.wa.us>
Subject: CANCELLED--Tonight's Planning Commission meeting Cancelled 10.3.18

Hi All,

Tonight's scheduled Planning Commission meeting has been **CANCELLED**. The Courthouse Campus is currently without power and it's unknown when power will be restored. There is a request in to Planning Commission to reschedule tonight's meeting with a special meeting for next **Wednesday, October 10th**. More information on that will follow as well as a webmail to update meeting status. Thanks for your continued interest in the SMP update process.

Sincerely,

Brad Murphy

Senior Planner
Long Range Planning
Thurston County Community Planning
and Economic Development
2000 Lakeridge Dr. SW
Olympia, WA 98502
360-754-4465
murphyb@co.thurston.wa.us

Ian Lefcourte

From: profbuzzy@netzero.net
Sent: Tuesday, May 29, 2018 11:24 PM
To: SMP
Subject: Shoreline Master Plan

Categories: Blue category

I have been trying to download and print a copy of the draft on line with appendices.
The draft alone is 130 pages and I am somewhere in the 40's. With home machines rather than your commercial quality computers, this is a daunting task, without even getting to the appendices. I printed a couple of them at 8 1/2 by 11 inch size and that is near unreadable. I do not have the time or money to print large format maps.

I am most interested in the shorelines of Lake St Clair and Eaton Creek plus other creeks and rivers of state significance, rather than the salt water shorelines. I tried to figure out what would be on your master plan and that was too cumbersome a task for such huge maps on a small screen. Magnification just does not give one the whole picture enough.

However, I did note that over the last 20 years plus or minus, the Eaton Creek Map area has not been updated. You still have it connected to Spurgeon Creek and thence to the Deschutes River and Budd Inlet. That is an error. The two creeks flow from the same swamp. One does not flow into the other. I went to previous meetings of commissioners, both planning and the whole county commissioners and they would swear that the map showed Lake St. Clair running into Eaton Creek which ran into Spurgeon, then the Deschutes and then Budd Inlet. They totally did not understand that water does not generally flow uphill and that Lake St. Clair was thus landlocked from Budd Inlet. They could see it right there on the map and all us taxpayers at those hearings must be wrong. So it would help if you put a few key elevations and/or water direction arrows on your maps.

There are probably other areas like this as well. Such as the swamp that Indian Creek runs out of to Budd Inlet, but another creek runs north into a different part of Puget Sound out of the same swamp.

Keep me posted and if a whole copy is available that can be purchased or given away, let me know.

David LIndeblom

Ian Lefcourte

From: Paula Rudberg Lowe <pmrlowe@comcast.net>
Sent: Tuesday, May 29, 2018 2:41 PM
To: SMP
Subject: Include me on email list

Categories: Orange category

Hello,

Please include me on the email list about SMP; I am a resident living on Pattison Lake. Thank you.

Paula R. Lowe

Ian Lefcourte

From: marty-olson@comcast.net <donotreply@wordpress.com>
Sent: Monday, October 15, 2018 7:41 AM
To: SMP
Subject: Incoming SMP Comment

Categories: Blue category

Your Name (Optional): Martin W Olson

Your email address: marty-olson@comcast.net

Comment: October 12, 2018
Hello Fellow Concerned Citizens for our Shoreline Master Program,

My name is Marty Olson, I currently live on Long Lake and have spent my 60 year life on Puget Sound or on lakes all over Washington State. I love watersports and the beauty of lakes, rivers and our precious Puget Sound. I enjoy the fruits of our waters, Fish, Crab, clams, and so many great products that come from our clean and beautiful waters including swimming.

I attended the Thurston County Planning Commission meeting (10/10/2018) at the County Court House. I arrived late, but, I heard many of the citizens had great comments.

I watched the planning commission meeting for the first time in my life. I have many observations and really don't know what to do with these thoughts, but feel I need to share with someone. I also apologize, I do not know names of the people who spoke, the intent of this note is to not hide behind any veal of secrecy.

1. I was shocked at the poor quality of the sound system. (background noise, or no sound at all). How is it the County Commissioners main room, does not have a sound system that works?
2. The presentation on the power point was interesting but lacked any backing of truth. Many statements were made, about buffers and safe distances from water but where did the information come from?
a. Many of the pictures looked to be from "stock google photos" In fact when questioned about one of the Before and After photos the presenter had no idea where the picture was taken, or any of the reasons for adding buffers on the property.
b. A picture was shown with healthy fish of good size and compared to other fish of a small size and I presume "not as heathy". The presenter stated these fish of good size came from a body of water with good buffer zones and adequate shade and natural habitat. No proof of these bold statements was offered, just a picture.
c. Comments were made about "water quality" Where is the documentation that our water quality has been improving or getting worse.
3. The presenter talked about healthy bodies of water needing large buffers, I would ask everyone to look at the lake below the County Court House, or lake Lois off of Carpenter Road. These lakes have nothing but buffers and acres of property and they are dying bodies of water, soon to be swamps.
a. If a statement is made about buffers and healthy water, it seems we should look at THURSTON COUNTY LAKES, for example my property and many of my neighbors had drain fields on the lake side our homes. Mine and most are now "designed systems" far away from the water front.
b. The Lakes in Thurston County are better managed because of the residents living on the lakes, (they are the ones who care)
c. The presenter did not provide where any data came from, other than some comparisons to other counties concerning buffer zones.

d. The Rivers and Puget Sound in Thurston County are Healthy and thriving with native fish and wildlife.
i. Some will argue; the south sound is polluted. Then why does the south sound produce so much of the worlds oysters, clams and mussels?
4. The best part of the night (sarcastic) was when a women on the planning commission proclaimed that because of global warming we in the northwest (insinuated), (Thurston County) have experienced much more rainfall and stronger storms causing more damage to our waterfront properties. She believes because of this “global warming” the set-backs are good for protecting property owners homes.
a. Please tell me of one home that has been lost to a storm in the Thurston County area because of the increase in magnitude of storms since global warming has started?

I really don’t understand why Thurston County is even looking at the Shoreline Mater Program. Who are they trying to protect, and who is benefitting?
Why is this project taking so long? What are the goals? And where is the data to back up the claims?

I apologize for my lack of knowledge and not knowing the name and positions of the presenters. I was invited to attend the meeting because, I was told the decisions coming from this SMP will affect my property with projects in the future. (setbacks, more permits, more county control). After attending, I am concerned about the years of work being poured into this project without any real substantial facts.

Concerned Citizen
Martin W Olson
7445 Homes Island Road
Olympia WA. 98503

Time: October 15, 2018 at 2:40 pm
IP Address: 73.239.127.216
Contact Form URL: https://thurstoncomments.org/comment-on-the-proposed-shoreline-code-update/

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July 27, 2018

Joshua Cummings
Community Planning & Economic Development
Thurston County Courthouse
2000 Lakeridge Drive SE
Olympia, WA 98502

Re: Proposed Amendments to the Shoreline Master Program of Thurston County

Dear Mr. Cummings:

Olympia Master Builders ("OMB") is a trade organization that represents home builders across five counties. OMB frequently engages as an active participant in local public policy discussions, such as the current update to Thurston County's Shoreline Master Program ("SMP"). Over the last several years, we have been active stakeholder participants in the amendment of Shoreline Master Programs in many of our region's local jurisdictions.

We are eager to see Thurston County's update to the SMP provide consideration to both the need prevent harm from uncoordinated and piecemeal development of the county's shorelines, as well as the inherent rights of property owners to exercise self-determination over their assets. OMB has identified two policy areas that directly impact safeguards to the reasonable use of property: No-Net Loss Standards and Legally Existing Uses and Development.

A. Considerations for No-Net Loss Standards

Shoreline Management Act handbooks issued by Department of Ecology emphasizes the importance of incentives for homeowners to improve nearshore ecological functions. We heartily concur; emphasizing the importance of voluntary incentives as opposed to static mandates as the best way to ensure quality conservation. To not accidentally disincentivize these proactive measures, OMB suggests that voluntary improvements to ecological function of a property should be credited toward future potential development mitigation. We understand that the goals of the Department of Ecology are to mitigate and recover concurrently. As such, this mitigation might occur at less than a 1:1 ratio to achieve recovery while allowing homeowners to benefit from participating in voluntary compliance when they seek to redevelop or remodel.

When assessing the no-net loss standard at the project level, it is our hope that the County will be mindful of the impact of outside actors of the ecological function of shoreline beyond the scope of what a private property owner can compensate for (e.g., existing county stormwater drains in proximity to shoreline properties, where insufficient drainage often causes down-hill stormwater run-off). We recommend that, in addition to the mitigation options available to an individual, the county partner with its citizens to offer additional mitigation options for homeowners who have such county owned or administered impacts to shoreline ecology.

The Shoreline Management Act required cumulative impact analysis mandates that variables are accounted for at the site-specific level as well as programmatically. Therefore, it is only reasonable that the County examine the mechanism of that analysis at both levels and provide the broadest range of policies that minimize the challenges for property owners to be in compliance with the SMP.

B. Legally Existing Uses and Development

While the majority of the SMP focuses on the form and use of future development, the importance of addressing legally existing structures and uses is critical in Thurston County. We recommend that the County address existing development with an eye to providing clarity and protection for property owners.

RCW 90.58.620 states that new or amended SMPs approved by Ecology after September 1, 2011 may include provisions that allow:

a. Legally established residential structures and appurtenant structures that are used for a conforming use to be considered a conforming structure even though they do not meet SMP standards for setbacks, buffers, yards, area, bulk, height or density;
b. Redevelopment, expansion, change with the class of occupancy, or replacement of the residential structure if consistent with the SMP, including the provisions for no net loss of shoreline ecological functions.

RCW 90.58.620 and its subsequent interpretations in various SMPs across the state provide an underpinning, from which we recommend the following:

- That all legally established existing structures, inclusive of appurtenances, uses and lots are conforming and that provisions that change of ownership, tenancy or management does not affect the structure, use or lot's nonconforming status.
- That 'remodeling' be included as an allowed activity in addition to "redevelopment, expansion, change with the class of occupancy, or replacement of the residential structure" in order to provide homeowners with the ability to update their property to current design standards and as new, ecologically sound materials and technologies emerge on the market.
- That limited expansion of a nonconforming structure be permissible if it is tied to other actions to bring the overall use into conformity (e.g., upgrade of nonconforming septic system).
- That non-conforming structures with conforming uses within commercial or mixed-use developments may be expanded or enlarged within the existing building footprint as a conditional use.
- That in pre-existing shoreline lots that are vacant but too small to meet the buffer requirements for new development, the SMP should allow for use-conforming development if a building area appropriately sized for the use exists and is not located in a hazard area.
- That residences destroyed by catastrophe may be reconstructed to the size, density and location that existed prior to the catastrophe with allowances for additional expansion, as otherwise defined within the master program.
- That as a conditional use, a non-conforming dock may be modified, reoriented or altered within the same general location to be more consistent with the provisions of the SMP. This provision allows structures to be maintained, and minor location adjustments of dock/float structures, to improve consistency with the SMP without defaulting to the current standards.
- That property owners, in specific circumstances, be allowed to make environmental improvements to non-conforming structures (i.e. docks) through an administrative conditional use rather than tearing the entire structure out and applying for a shoreline variance.
- That new single-family development on non-conforming lots consisting of property under contiguous ownership less than 20,000 square feet in size and not subject to landslide hazard areas, alluvial fan hazard areas, or riverine and coastal erosion hazard areas or associated

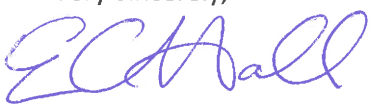
buffers as provided in Thurston County Code may be allowed without a variance in accordance with the following criteria:

a. Non-conforming lots with a building area of 3,000 square feet or more available for a single-family residence and normal appurtenances and unrestricted by setbacks or buffers from shorelines or critical areas shall comply with the provisions of this Program. The building area means the entire area that will be disturbed to construct the home, normal appurtenances (except drainfields), and landscaping.
b. Non-conforming lots that do not meet the requirement of subsection 1 above shall provide the maximum setback and buffer dimension feasible while providing for a building area of not more than 3,000 square feet on the portion of the lot farthest from the required setback or buffer; provided that consideration be given to view impacts and all single-family residences approved under this section shall not extend waterward of the common-line setback.
c. Facilities such as a conventional drainfield system may be allowed within critical areas or their buffers, except wetlands and buffers, outside of the building area specified above.

We hope that the staff at Community Planning and Economic Development will review the above recommendations and consider their inclusion in the SMP draft scheduled to be presented to the Board of County Commissioners on August 30, 2018. As that draft becomes available to the public, we will have to work with county staff to identify additional areas of improvement.

Thank you for the opportunity to provide these comments. If you wish to correspond with us further on this issue, please feel free to contact Executive Officer, Angela White at angela@omb.org or 360-754-0912.

Very Sincerely,



Erin Hall
Government Affair Director

Cc: Bud Blake
Gary Edwards
John Hutchings

Ian Lefcourte

From: peterpessiki@gmail.com <donotreply@wordpress.com>
Sent: Thursday, August 30, 2018 12:36 PM
To: SMP
Subject: Incoming SMP Comment

Your Name (Optional): Dr. Peter J Pessiki

Your email address: peterpessiki@gmail.com

Comment: My neighbor is developing his shoreline with housing shacks, a crude septic system and more. These are very close to the beach. I have tried to ask if what he is doing is legal but do not seam to be able to reach anyone that cares. His address is 4820 sunset dr nw 98502.

I will do the same if you do not stop him since I will assume what he is doing is legal.

I guess my point is this: stop making rules that you do not enforce. Suckers like me who obey the law get screwed while my neighbor develops like crazy. This is not fair!!!!

Time: August 30, 2018 at 7:36 pm
IP Address: 97.113.86.84
Contact Form URL: https://thurstoncomments.org/comment-on-the-proposed-shoreline-code-update/

Sent by an unverified visitor to your site.

Written comment received during public comment

A Washington State Chapter of the National Audubon Society
P.O. Box 2524, Olympia, WA 98507
(360) 352-7299 www.blackhills-audubon.org

Black Hills Audubon Society is a volunteer, non-profit organization of more than 1,300 members in Thurston, Mason, and Lewis Counties whose goals are to promote environmental education and protect our ecosystems for future generations.

Testimony before the Thurston County Planning Commission October 10, 2018 Comments concerning the proposed Shoreline Master Program Update

Sam Merrill, Chair of the Conservation Committee of Black Hills Audubon Society, the chapter of the National Audubon Society covering Thurston, Mason, and Lewis Counties

The Thurston County Shoreline Master Plan states that Thurston County's shorelines provide valuable habitat for fish and wildlife, economic opportunities derived from shoreline natural resources, and recreational opportunities used by residents of all ages. Shorelines play an important role in enhancing the quality of life for our County's citizens.

We are concerned about the trend in Thurston County of converting shorelines to other uses.

We support management designed to achieve *no net loss* of shoreline ecological functions; this follows the SMP guidelines (WAC 173-26-186(8)). Management of shoreline aquatic systems is critical for the health and safety of the public.

Specifically, we support:

- **Buffers: Maintain the 2017 (not 7/2018) draft SMP standard buffer widths or setbacks, without modification. Buffers protect, not only habitats, but people from future sea level rise.**

- **Mitigation: Developers should AVOID adverse effects to habitats first. If not possible, require compensatory mitigation to occur in the same or related habitat area.**

- **Aquaculture: We recommend avoiding plastics, particularly those that break down into microplastics, such as bags and netting. If not possible, minimize and restrict their use. Do not use biodegradable plastics, which can break down and release toxins. Mandate what is necessary to keep birds, fish, whales, and wildlife from ingesting micro-plastics, which cause starvation. Limit changes in the ocean floor communities by using little or no scraping or dredging. To reduce the risk of birds being trapped, limit the use of predator control area netting.**

We urge you to take the necessary steps to protect the county's natural environment, habitats, and shoreline ecological functions, so the marine and freshwater shorelines of our county will flourish into the future.

Heavy Metal: The New Toxic Danger Posed by Ocean Plastic Trash

Plastics entering coastal waters both absorb and release cadmium, lead and other toxic metals. Scientists are now trying to determine the impact of metal-contaminated plastic on marine life and ocean ecosystems.

WRITTEN BY
Danielle Beurteaux

PUBLISHED ON
April 3, 2018

READ TIME
Approx. 4 minutes

Metals can accumulate on the surface of plastic trash, researchers have found. Sutanta Aditya/Barcroft Images/Barcroft Media via Getty Images

WE KNOW THAT plastic waste is overwhelming the ocean, sea life is dying from ingesting it and some even ends up in seafood. But scientists also now worry that plastic trash is coming with a side helping of toxic metals that latch onto plastic surfaces and enter the marine environment and food chain – and eventually, what people eat.

Metals, such as cadmium and lead, are often used in manufacturing plastic and over time can enter coastal waters. Once floating in the ocean or discarded on a beach and washed by the tides, plastics can also attract and concentrate a variety of metals already present in the environment that attach themselves, or "sorb," to the surface. In both cases, the worry is that these metals – often toxic ones such as cadmium that are health concerns for both wildlife and humans – can

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contaminate waters or harm wildlife that ingest plastics, especially those that live in intertidal zones near sources of plastic pollution.

Researchers, however, are only just starting to understand how metal-tainted plastics interact in coastal environments, said Leah Bendell, professor of marine ecology and ecotoxicology at Simon Fraser University in British Columbia.

Bendell led one recent study, published in February in the journal PLOS ONE, that examined how four metals – cadmium, lead, zinc and copper – both attach onto and are released from plastics found on Canada's beaches. She said her results show how a whole host of metals can enter the marine food chain or coastal waters.

"Not only were these plastics serving as a way of metal getting into these lower trophic levels, but also they were a source of the metal into the water column and they can be acutely toxic," said Bendell. "It was a little bit of an eye-opener to the multifaceted role the plastics played."

For the study, Bendell's graduate student, Bertrand Munier, picked up every bit of plastic waste from transects on nine Vancouver-area beaches, gathering 144 unique plastic items, mostly food packaging and takeout containers. They sorted the plastics into 11 types and then used a weak acid to extract and separate the four metals – this kind of analysis is often used to

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estimate levels of toxins that could enter the tissues of wildlife if eaten. As a point of comparison, they also did the same for newly manufactured plastic samples. The goal was to distinguish metals that came from the plastic itself and those that had sorbed to the surface of the beach debris from the environment.

Of the collected items, five samples released what the study said were "extreme" high levels of metals – including a plastic tampon applicator tested for high levels of zinc – and all had at least trace amounts of the four metals tested. Different kinds of plastic also released different levels of metals. For example, PVC, the most commonly found plastic, had high levels of lead and copper attached to its surface. The comparison of the new and debris plastic also showed how some of the chemicals used in plastic production may release over time – including cadmium, which is used to make plastic rigid and resistant to UV light. The researchers found that new PVC releases zinc and cadmium.

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Plastic is accumulating on beaches and in oceans all over the world. (THOMAS WATKINS/AFP/Getty Images)

A previous study examining metals sorbing onto plastics have found that the age of the material also matters. Chelsea Rochman, an assistant professor at the University of Toronto's department of ecology and evolutionary biology, led a study when she was at San Diego State University in which her team dropped mesh bags of various kinds of plastic pellets into three areas around San Diego Bay in California. They measured how much aluminum, chromium, manganese, iron, cobalt, nickel, zinc, cadmium and lead from the environment sorbed onto their samples.

The year-long study, also published in PLOS ONE, found that metal levels increased the longer the plastic samples were in the water. That's probably because surface area increases as the plastics degrade over time and biofilms form, Rochman said.

Biofilms are collections of unattached microorganisms that put down roots on surfaces and can act as a surface for metals to latch onto. Fungi are a type of biofilm, as are bacteria. "Basically, over time there's more space for these metals to bind to," said Rochman.

There's still a lot scientists don't know. For example, it's unclear how big a role biofilms play in the concentration of metals on plastics and the ultimate effects of the metals on wildlife that ingest plastics. It's possible, for example, they may digest the biofilm, metals or chemicals – even if they ultimately expel the plastic itself. "If the metals are bound on the biofilm, the question is are they even more bioavailable than we think?" asked Rochman.

The presence of a toxic metals-saturated biofilm on plastics could be both an ecological and human health problem, said Bendell. The bacterial growth on the biofilm could potentially pick up pathogens in and around coastal areas. And as these plastics break down into smaller and smaller pieces, they're more easily ingested by marine life, and now it looks like they're bringing dangerous metals along for the ride. While the studies were conducted in North America, the environmental risks may be far greater in regions like Southeast Asia that lack waste management infrastructure and where more plastic pollution makes its way to the coast.

The actual risk of metals associated with plastics to human health is unknown, said Bendell. But as plastic pollution grows, it's concerning to scientists like Bendell. "We need to change from thinking everything can be thrown away to you are accountable and responsible for every piece of plastic that comes into your house," she said. ■

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About the Author

Danielle Beurteaux

Danielle Beurteaux is a New York-based freelance journalist who writes about science, technology and food.

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PLOS ONE

Macro and micro plastics sorb and desorb metals and act as a point source of trace metals to coastal ecosystems

B. Munier , L. I. Bendell

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Abstract

Nine urban intertidal regions in Burrard Inlet, Vancouver, British Columbia, Canada, were sampled for plastic debris. Debris included macro and micro plastics and originated from a wide diversity of uses ranging from personal hygiene to solar cells. Debris was characterized for its polymer through standard physiochemical characteristics, then subject to a weak acid extraction to remove the metals, zinc, copper, cadmium and lead from the polymer. Recently manufactured low density polyethylene (LDPE), nylon, polyethylene terephthalate (PET), polypropylene (PP), polystyrene (PS) and polyvinyl chloride (PVC) were subject to the same extraction. Data was statistically analyzed by appropriate parametric and non-parametric tests when needed with significance set at $P < 0.05$. Polymers identified in field samples in order of abundance were; PVC (39), LDPE (28), PS (18), polyethylene (PE, 9), PP (8), nylon (8), high density polyethylene (HDPE, 7), polycarbonate (PC, 6), PET (6), polyurethane (PUR, 3) and polyoxymethylene (POM, 2). PVC and LDPE accounted for 46% of all samples. Field samples of PVC, HDPE and LDPE had significantly greater amounts of acid extracted copper and HDPE, LDPE and PUR significantly greater amounts of acid extracted zinc. PVC and LDPE had significantly greater amounts of acid extracted cadmium and PVC tended to have greater levels of acid extracted lead, significantly so for HDPE. Five of the collected items demonstrated extreme levels of acid extracted metal; greatest concentrations were 188, 6667, 698,000 and 930 $\mu g g^{-1}$ of copper, zinc, lead and cadmium respectively recovered from an unidentified object comprised of PVC. Comparison of recently manufactured versus field samples indicated that recently manufactured samples had significantly greater amounts of acid extracted cadmium and zinc and field samples significantly greater amounts of acid extracted copper and lead which was primarily attributed to metal extracted from field samples of PVC. Plastic debris will affect metals within coastal ecosystems by; 1) providing a sorption site (copper and lead), notably for PVC 2) desorption from the plastic i.e., the "inherent" load (cadmium and zinc) and 3) serving as a point source of acute trace metal exposure to coastal ecosystems. All three mechanisms will put coastal ecosystems at risk to the toxic effects of these metals.

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Introduction

Rates of plastic production have increased 20 fold since 1964 which has resulted in an estimated 311 million tonnes of plastics within the ocean as of 2014 [1]. Further estimates are that at current rates of plastic production, by 2050, the total mass of plastics will outweigh the biomass of fish[1]. The occurrence of plastics within our environment has become so pervasive that for geologists it has defined the Anthropocene, an epoch of time where humans are the main forcing agents of geological and biological change [2]. When discovered, plastic materials became integrated into all aspects of a modern human lifestyle. However, the very nature of the plastic which provides all of its multiple uses also leads to their permanent nature and hence accumulation within ocean ecosystems. Further, of the plastics now being generated, by some estimates, only 9% is recycled[3]. The result is possibly one of the greatest environmental challenges we as a society have been presented with; what are the impacts of plastics on ocean ecosystems and once identified, can we reverse or mitigate these negative impacts?

Plastic materials are polymers whose chemical structure allows them to be shaped at elevated temperatures and pressures i.e., the long-chain polymers exhibit "plastic flow" when heated. The plastic polymer can be modified with other materials (e.g., plasticizers, fillers and stabilizers), prior to being processed in a molten state [4]. Plastics have been conveniently described based on size with

macroplastics being all plastics greater than 5 mm and microplastics, those particles originating from macroplastics less than 5 mm in size. Microplastics also include plastics that are manufactured less than 5 mm in size (e.g. microbeads) [5].

Vethaak and Leslie [6] have outlined three mechanisms by which persistent plastic waste present significant risks to aquatic ecosystems and humans who rely on these ecosystems; 1) Direct toxicity of the plastic particles themselves e.g., oxidative stress, cell damage, inflammation and impairment of energy allocation functions. 2) Chemical toxicity of the plastic debris. These can include heat stabilizers, UV stabilizers, and plasticizers, processing aids, impact modifiers, thermal modifiers fillers, flame retardants, biocides and smoke suppressors. Heat stabilizers and slip agents are of particular concern as they contain the trace metals, cadmium, zinc and lead and can comprise up to 3% of the polymers composition [7] PVCs also contain phthalate plasticizers to improve performance. PVC objects such as piping can be mechanically broken down into increasingly smaller pieces. By doing so, the chemical toxicity of the tubing becomes increasingly of concern as the smaller particles can be ingested by marine organisms. 3) By acting as substratum, plastic particles provide the vector for pathogenic micro-organisms and parasites (e.g., *Escherichia coli*, *Bacillus cereus* and *Stenotrophomonas maltophila*).

A fourth mechanism and one of equal concern to the direct effects of plastics within aquatic ecosystems is the role they play in the sorption of priority pollutants [8,9] thus providing an alternate means of introducing pollutants into freshwater and marine food webs. Recent studies that have addressed the ability of microplastics to sorb trace metals from aquatic and sedimentary environments have indicated that plastic debris can act both as a sorption site for trace metals [10–12], thus allowing for accumulation, or provide an "inherent" load that could also present a source of toxic metal to aquatic ecosystems [13]. Ashton et al.[10] determined the association of metals with plastic production pellets (PPP), sampled from four beaches in SW England and noted that pellets were enriched with cadmium and lead with PPP's able to accumulate metals to concentrations approaching those of sediment and algal fragments. Holmes et al. [11] assessed the interactions between trace metals and PPP's, virgin and aged, under estuarine conditions and concluded that plastic pellets effectively sorb trace metals; short term attributed to adsorption of organic matter and long-term which incorporated the aging of the pellet. Rochman et al.[12] compared the long-term sorption of metals among plastic types in seawater and found that in general all types of plastic tended to accumulate similar concentrations of metals and that over a 12 month study period the concentrations of all metals increased over time and did not reach saturation. Wang et al. [13] however, concludes that toxic metals associated with plastic debris are "inherent" rather than accumulated, with this inherent load presenting toxicology threats to the receiving environments.

Hence, our primary objective was to determine the potential role of both macro and micro plastics in providing a source of the trace metals, zinc, copper, cadmium and lead into intertidal foodwebs. To meet our objective we sampled 9 urban intertidal regions within Burrard Inlet, Vancouver, B.C., Canada for plastic debris. Debris was identified for polymer type and subject to a weak acid extraction. Recovered metal was compared among polymers to identify which polymer had the greatest amounts of extracted metal and thus would pose the greatest risk for introducing toxic metals into intertidal food webs. Our hope is to add to the increasing knowledge base on how plastic debris is impacting our marine environment, in this case by providing another vector for the entry of contaminants into marine ecosystems.

Methods

Study site and sample collection

Nine beaches within Burrard Inlet (Fig 1) were sampled for plastics. Sampling occurred at low tide such that at least 10 meters of intertidal was exposed. At each site, a 1–5 km line was drawn parallel to the shoreline and a 10 meter line drawn perpendicular to the shoreline and tideline. Within this defined area, every piece of plastic debris that was observed was photographed and placed into a zip lock bag. Twenty six km of beach was surveyed and 150 samples collected. Each item was categorized based on where sampled and object type. No specific permissions were required for the collection of debris from public beaches located in Burrard Inlet, Vancouver BC, Canada. Field studies did not involve endangered or protected species.

Fig 1. Location of the 9 urban intertidal regions sampled for plastics within Burrard Inlet, Vancouver, B.C. Insert in upper left hand corner indicates location relative to the rest of the Salish Sea, Canada.
https://doi.org/10.1371/journal.pone.0191759.g001

Polymer identification

Each collected plastic was identified for its polymer based on physical tests which included density, flame color and emission characteristics [14–16]

Trace metal analysis

Field collected samples were weighed and those greater than 1 gram were cut to meet the ca. 1 gram requirement for trace metal extraction. Final sample weights ranged from 0.012 grams to 1.5 grams. Also included in our analyses were six recently manufactured known polymers purchased from a local hardware store. It was assumed that purchased polymers had not been in an environment where exposure to trace metals could have occurred. As we wanted to determine only those metals associated with the surface of the plastics and not those associated with compounds within the plastics, we used a dilute acid extraction. Preliminary extraction experiments where test samples were extracted for one, two and three hours indicated that optimum removal of the metal occurred at 2 hours when gently washed in 10 mL of 10% nitric acid at 30°C. It is important to note that this extraction procedure cannot identify inherit versus sorbed metal associated with the polymer, but rather will the sum of both sources of metal from the plastics. All samples were first rinsed with distilled, deionized water to remove attached materials (e.g., sand) prior to extraction. Once extraction was complete, the 10 mLs was recovered from the digestion flask, tightly covered and stored at 4°C in 15 mL Falcon ™ tubes until analysis. Acid extractions were analyzed for copper, zinc, cadmium and lead via atomic absorption spectroscopy (PinAAcle 500, Perkin Elmer). Standards and blanks were run with each set of analyses to ensure quality assurance and quality control. Blanks were always below limits of detection which were 1 μgL^{-1} for all four metals with precision of the analysis between 3–5%.

Statistical methods

Statistical analysis was performed using Sigma Plot 12 (SYSTAT Software, Chicago IL). Shapiro-Wilk tests for normality and equal variance tests were applied to ensure that data met the assumptions of the parametric tests. One-way and two ANOVA's were applied to determine significant differences in trace metal concentrations among polymer types. Where significant differences occurred a Holm-Sidak method was applied to determine where the differences were. If data were not normally distributed, even after transformation, then data was ranked and analyzed by one-way or two-way ANOVA's on ranks using a Kruskall-Wallace test to determine significance. T-tests on ranked data were applied to determine differences in polymer (all polymer types pooled) metal concentrations between field and recently manufactured samples using a Mann-Whitney Sum test to determine where significant differences occurred. Level of significance was set at 0.05, with 0.1 used to indicate "trends".

We applied the following statistical analysis;

1. One-way ANOVA for differences in acid extracted metal among recently manufactured polymer samples (nylon, PET, PP, PS and PVC)
2. One-way ANOVA for differences in acid extracted metal among field polymer samples (HDPE, LDPE, nylon, PC, PE, PET, PP, PS, PUR and PVC)
3. Two-way ANOVA for differences in acid extracted metal with field versus recently manufactured and polymer type as the two factors (nylon, PET, PP, PS and PVC).
4. T-tests to determine differences in acid extracted metal between field and recently manufactured polymers.
5. We also where possible tested for differences in color within polymer type. Each field collected polymer was identified by color (i.e. from transparent to black) and differences in acid extracted metal within a polymer type determined by one-way ANOVA. There were only enough samples for PVC and PET for this analysis.
6. Simple linear regressions were applied to determine if amounts of acid extracted metal from field collected samples were dependent on sample weight.

Results

All data is available in supporting information S1 File.

Field collection-item identification

An incredibly diverse number of items were recovered from the urban beaches. One hundred and fifty items were collected of which 144 were plastics. Of the 144, we were able to identify the original use of 85 (Fig 2). These recovered plastics fell into 7 major user groups; bags, car/bike parts, everyday items (e.g., ear buds, glasses), food associated (cup, straw, forks), packaging, functional use (ties, nylon, gloves), and children's toys (e.g., miniature bicycle). The majority of plastics were wastes associated with food consumption and packaging. Unlike other shore line clean up initiatives [17] that find that the main items collected are cigarette butts, food wrappers and plastic bottle caps, the majority of collected items only occurred once. An important aspect of our collection was that items were both greater and less than 5 mm with some just at the 5 mm limit that distinguished macro from micro plastics. Hence, collected samples represented the transition of macro plastics to micro plastics.

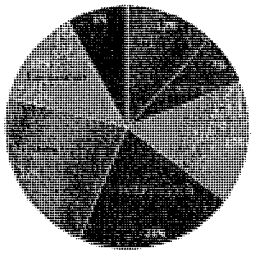

Fig 2. Classification of collected plastics based on original use.
https://doi.org/10.1371/journal.pone.0191759.g002

Polymer Type; field samples

Of the 144 items, 12 polymers were identified. Polymers in order of abundance were; polyvinyl chloride (PVC, 39), low density polyethylene (LDPE, 28), polystyrene (PS, 18), polyethylene (PE, 9), polypropylene (PP, 8), nylon (8), high density polyethylene (HDPE, 7), polycarbonate (PC, 6), polyethylene terephthalate (PET, 6), polyurethane (PUR, 3) and polyoxymethylene (POM, 2). Also identified were rubber (2), amino plastics (1), and nitrile rubber (NBR 1) with 6 unknowns. Not surprisingly, six of the eight most common types of synthetic organic polymers commonly found in households include LDPE, HDPE, PP, PVC, PS and nylon with these polymers accounting for 81% of all samples collected.

Acid extracted metals from polymers; recently manufactured samples

Polymers purchased from a local hardware store included PVC, nylon, PP, PET, PS and LDPE. Amounts of metal extracted from recently manufactured polymers, PVC, nylon, PP, PET, PS and LDPE are presented in Table 1.

Table 1. Concentrations ($\mu g g^{-1}$ dry weight of polymer) of cadmium, copper, zinc and lead recovered by a weak acid extraction from "recently manufactured" polymers.
Values are means of 3 with standard deviations.
https://doi.org/10.1371/journal.pone.0191759.t001

One-way ANOVAs indicated that for cadmium, copper and lead, amounts of metal recovered from the polymers were not different ($P > 0.05$; LDPE was excluded due to the very high values of acid extracted metal). The exception was for zinc, with nylon and PET both having greater amounts of extracted metal as compared to PVC, but not for PP and PS ($F = 4.88$; $P = 0.019$).

Acid extracted metals from polymers; field samples

One-way ANOVA among polymer types for copper indicated a significant difference ($F = 2.448$; $P = 0.014$), with PVC having greater copper concentrations as compared to nylon and PC ($F = 1.3$; $P < 0.05$) (Fig 3A). Zinc also differed among polymers ($F = 7.183$; $P < 0.001$) with LDPE having greater concentrations as compared to PC, PS, nylon, PP, PET and PVC. PC had the lowest amounts of acid extracted zinc as compared to PE, PUR and PVC (Holm-Sidak, $P < 0.05$, Fig 3B). One-way ANOVA's for cadmium and lead among polymer type indicated that except for PVC which was greater than PP for cadmium ($F = 2.84$, $P = 0.005$, Fig 3C) and greater than HDPE and PC for lead ($F = 2.51$, $P = 0.012$, Fig 3D) amounts of acid extracted metal were similar among polymers.

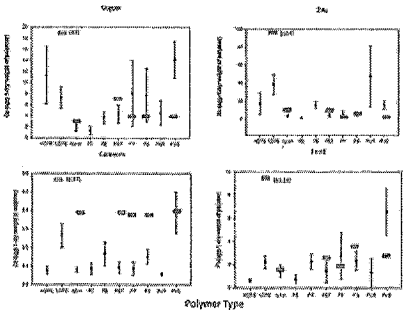

Fig 3.
a, b, c and d. Amounts of metal extracted from 10 polymers collected from 9 urban intertidal regions, Burrard Inlet, Vancouver, B.C. Canada; a) copper, b) zinc, c) cadmium and d) lead. Values are in $\mu g g^{-1}$ dry weight of polymer and are means with 1 standard deviation. Metals extracted from recently manufactured polymers are over-laid with blue bars for comparison. Two additional polymers were identified however; the number of samples was less than 3 so they were not included in the statistical analyses.
https://doi.org/10.1371/journal.pone.0191759.g003

Differences in acid extracted metal; recently manufactured versus field polymers

When entered into a two-way ANOVA with ID (field versus recently manufactured) and polymer type as the two factors, metal concentrations among polymers were not different, however, amounts of extracted metal was source dependent i.e., either field or recently manufactured (Table 2). (Only those polymers which included both recently manufactured and field samples, nylon, PET, PP, PS and PCV were entered into the two- way ANOVA. Due to the high amounts of sorbed metal recovered from the LDPE, this polymer was excluded from the two-way ANOVA).

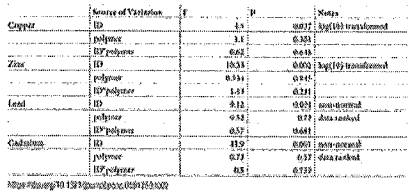

Table 2. Results of the two-way ANOVA with ID and polymer type as the two factors.
F and P are provided for each factor and their interactions. ID is the source of the polymer, either field or recently manufactured.
https://doi.org/10.1371/journal.pone.0191759.t002

When all polymer types were pooled for recently manufactured and field samples, a Mann-Whitney Sum test indicated that field polymers contained greater amounts of copper and lead, whereas recently manufactured polymers had greater amounts of zinc and cadmium (Table 3). Differences in field and recently manufactured polymers for copper and lead were driven primarily by amounts of metal extracted from PVC (Fig 3A and 3D).

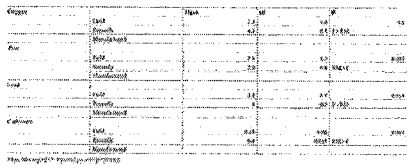

Table 3. Results of the T-test between recently manufactured and field collected polymers.
As data was non-normal, a Mann-Whitney Sum test on ranks is presented. Means with SE values are provided although data was ranked for statistical analysis.
https://doi.org/10.1371/journal.pone.0191759.t003

Differences in metal desorption, color and weight

Because metals such as cadmium and zinc are used extensively in paint pigments [18], especially for the color red, we determined if color affected amounts of metal recovered from two polymers, PET and PVC. Colors entered into the ANOVA were; transparent, pink red, orange, green, white, yellow, blue, grey and black. One-way ANOVA's with color as the dependent factor indicated that amounts of extracted metal were not color dependent ($F = 0.6$; $P > 0.05$). Simple regression also indicated that the size of the sample did not influence amounts of metal recovered for zinc, copper or lead ($R^2 < 0.2$; $P > 0.05$). However, cadmium did show a slight relationship ($R^2 = 0.6$; $P < 0.05$) with the two smallest samples desorbing the greatest amounts of metal and likely related to the surface area to volume ratio of the sample. This could be of importance for cadmium in that as compared to lead, copper and zinc, cadmium is an important additive during polymer formation. Of the four metals it could be more liable, thereby presenting a greater risk to aquatic environments.

Collected samples with acutely toxic amounts of acid extracted metal

Perhaps the finding of most concern was the number of debris items, n = 5, that contained extremely high concentrations of metal Fig 4A, 4B and 4C, Table 4). One sample in particular, #47 (Fig 4A), contained over three orders of magnitude the concentrations of extracted metal as compared to all other samples.

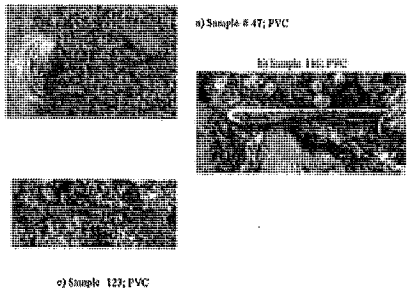

Fig 4.
a, b and c. Items collected from intertidal regions of Burrard Inlet, Vancouver B.C., Canada with high concentrations of extracted metal. 4a) unknown, 4b) unknown, 4c) tampon applicator.
https://doi.org/10.1371/journal.pone.0191759.g004

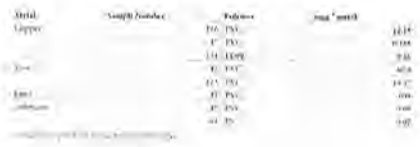

Table 4. High metal concentrations recovered from 5 field samples collected from the intertidal regions of Burrard Inlet, Vancouver B.C. Canada. Note units are in mgg^{-1}.
https://doi.org/10.1371/journal.pone.0191759.t004

The green color of sample 116 (Fig 4B) suggests a copper compound of some sort although its exact origin is unknown. Sample 123 (Fig 4C) was identified as a tampon applicator. Sample # 47 (Fig 4A) is unknown but the high concentrations of metals especially lead could suggest an item related to munitions or explosives.

Discussion

A random collection of plastics both macro and micro collected from 9 urban intertidal regions revealed an astonishing range in diversity of items reflecting our human culture. Items included children's toys, bicycle parts, personnel hygiene items and food packaging. Despite the diversity of items, of the 12 polymers identified, ca. 50% of the collected samples were PVC and LDPE.

Using a weak acid extraction our objectives were to determine of the polymers identified, which would pose the greatest risk with respect to the introduction of trace metals into benthic food webs. We assumed that the extraction would remove only those metals loosely associated or surface sorbed to the polymer. Based on a comparison of amount of metal extracted from field collected versus recently manufactured polymers, plastics debris notably PVC, will be sites of sorption for copper and lead, and by contrast an inherent source of zinc and cadmium. PVC was the most abundant polymer recovered from the intertidal amplifying its role in providing a vector for the entry of metals into marine food webs. Also found were 5 samples which contained extremely high concentrations of trace metals.

The greater amounts of extracted cadmium and zinc found for the recently manufactured samples are likely related to the polymer manufacturing process. The International Cadmium Association[19] report that cadmium-bearing stabilizers are used to retard the degradation processes which occur in PVC and related polymers on exposure to heat and sunlight. Cadmium in the form of stearate or laurate is incorporated into the polymer before processing and can account for 0.5–2.5% of the final polymer compounds. Similarly and as noted previously zinc as zinc stearate at amounts up to 3% is commonly used as a plastics stabilizer. This equates to 300 μgg^{-1} of zinc and cadmium being introduced into marine ecosystems by polymers such as PVC.

Of note were the order of magnitude greater concentrations of metals extracted from the recently manufactured LDPE as compared to all other polymers. We used recycled new plastic bags as our source of LDPE, without any coloring. Imhof et al. [18] reports for recently manufactured plastic bags of which two were comprised of PET, both non pigmented and pigmented concentrations ranges of 0.15–373, 1.42–80 and ND to 43 μgg^{-1} for copper, zinc and lead respectively. Cadmium was not detected. We found for recently manufactured white plastic bags concentrations of 47, 604, 52 and 1.7 μgg^{-1} for copper, zinc, lead and cadmium respectively. With the exception of cadmium, concentrations of recovered metal are similar from the two sources of polymers, that is, values were equally as great. This poses an interesting finding in that it could be that inherent metals within recycled materials and associated paints are much more liable as compared to non-recycled materials and this finding warrants further study.

The studies of Rochman et al.[12] have found that the long-term sorption of metals is similar among plastic types. Using recently manufactured samples of PET, HDPE, PVC, LDPE and PP, these authors measured the accumulation of metal over a 12 month period at three locations in San Diego Bay, USA. The final average concentrations for all polymers at the end of the 12 months were 4.16, 3.8 and 0.8 μgg^{-1} for zinc, cadmium and lead respectively. Copper was not determined. Values for zinc, cadmium and lead are within the range of what we found in our study. By contrast, Wang et al.[13] have recently concluded that the majority of metals associated with plastics debris are derived from an "inherent load". Their conclusions were based on data from the long-term sorption of metals by microplastics and a comparison of metal burden among microplastics, macro-litters and fresh plastic products.

We used a weak acid extraction of 10% nitric acid, similar in concentration to extractions that are used to estimate metal bioavailability from sediment components such as iron oxides and organic matter [20]. Amounts of metal extracted from the polymers were similar to or greater than that recovered from the bioavailable fraction sediments [20]. It is feasible then that amounts of metal recovered from the plastics will be bioavailable and hence a source of metal to those organism that ingest plastic debris as food items. Our findings suggest then, that plastic debris can be both source (inherent load) and sink (sorption) for trace metals, providing two chronic routes for the entry of trace metals into aquatic food webs; via water for zinc and cadmium and through ingestion for copper and lead. Of great concern was the discovery of plastic items, some less than 5 mm that contained very high concentrations of metals. These items contained copper, lead, zinc and cadmium at levels that would be considered point sources of contaminants into intertidal ecosystems.

In sum, depending on the metal and the type of polymer, plastics will have three modes of action affecting trace metals in intertidal ecosystems, 1) direct release into the overlying water column as a consequence of leaching from the plastic itself, i.e. for cadmium and zinc, 2) entry into benthic food webs through ingestion of plastic particles, notably for PVC, that have accumulated metal i.e., copper and lead and 3) as a point source of toxic metal. All three mechanisms will present toxicological threats to our coastal ecosystems.

Supporting information

S1 File. Metal concentrations for all plastics collected from 9 intertidal regions in Burrard Inlet, BC, Canada.

https://doi.org/10.1371/journal.pone.0191759.s001
(XLSX)

Acknowledgments

The authors gratefully acknowledge Dr. Tamara Kazmiruk for her scientific rigor and technical advice throughout the study. We also thank Ross Kukard for equipment technical support. This study was in part support by an NSERC Discovery grant, 31–611307 to LB.

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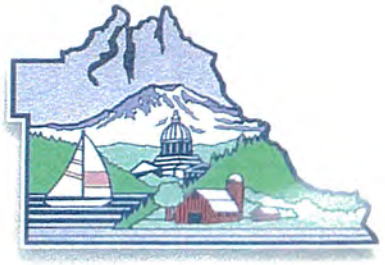
OUR VISION



Thurston County is a vibrant community ensuring the health, safety, and wellbeing of generations to live, work, and play.

OUR MISSION

To create a community that promotes health, commerce, and environmental protection with transparency and accountability.

Department of Ecology Shoreline Master Program Handbook, Chapter 6 "Public Participation"

(http://www.ecy.wa.gov/programs/sea/shorelines/smp/handbook/Chapter6.pdf)

Stakeholders

Local governments should seek out all shoreline users and stakeholders and encourage their participation. An adequate public participation process ensures that everyone is well-informed and provided convenient and meaningful ways to participate.

Identifying stakeholders

Stakeholders are those parties who have an interest in the outcome of the SMP process. They range from the occasional beach walker or visitor to the container-shipping industry to regulatory agencies, as well as residents and local officials. SMP policies and regulations may affect all of them, so they have a "stake" in the development of the SMP. The list below provides examples of stakeholders and likely does not include all shoreline stakeholders.

Shoreline property owners

Home and residential property owners
Homeowners associations
Business and industry owners
Port districts
Railroads
Public property owners (park districts, municipalities, state agencies)
Public and private utilities, water districts Individual shoreline users

Shoreline area residents

Shoreline users – those who fish, swim, paddle, boat and walk
Residents generally interested in local planning
Non-English speaking populations
Tourists and visitors
Shoreline user groups
Boating and paddling organizations
Swimming clubs
Fishing groups
Beach watcher organizations
Research, academic and educational institutions

Local and regional organizations

Business groups such as the Chamber of Commerce
Environmental organizations
Restoration and enhancement organizations
Land use organizations
Property rights organizations
Ethnic organizations
Neighborhood associations
Real estate associations
Tourism agencies

State agencies

Department of Ecology
Department of Fish and Wildlife
Department of Natural Resources
Department of Commerce
Puget Sound Partnership
Department of Health

Tribes

Tribes with local or nearby reservations
Tribes with local hunting and fishing rights
Northwest Indian Fisheries Commission

Federal agencies

Fish and Wildlife Service
National Marine Fisheries Service
Army Corps of Engineers
Federal Emergency Management Agency
Elected officials

Local officials

Neighborhood planning advisory groups
Planning Commission
SMP advisory groups
Elected officials

Others

Neighboring jurisdictions
Shoreline contractors (bulkheads and homes, for example)

Thurston County Shoreline Stakeholders Coalition

4108 Kyro Rd SE. Lacey, WA 98503

October 10, 2018

JOHN H. WOODFORD
AIA
ARCHITECT

JOHN WOODFORD
PRINCIPAL

7541 HOLMES ISLAND RD SE
OLYMPIA, WA 98503-4026

OFFICE/MOBILE: 415-308-1606
HOME: 360-491-2253
jwoodford.aia@gmail.com

TO: Thurston County Planning Commissioners

From: John Woodford, Chairman
Doug Karman, Vice-Chairman
Thurston County Shoreline Stakeholders Coalition

Re: Draft Update of the Shoreline Master Program (SMP)

As shoreline home owners in unincorporated Thurston County, we continue to have issues with not only the draft SMP but also the process of updating. Following are some of our specific issues:

- The current draft has very minor changes from when it was first written. It has now been two months since the appendices to the SMP were available for review.
    - **SMP TIMELINE**: We have received the timeline which will be presented to you at tonight's meeting. Up until now we have been told that "Staff is awaiting additional feedback from the BoCC on the scheduling/timeline."
    - **NO LINE OUT OR TRACK CHANGES VERSION HAS BEEN DONE:** There are hundreds of pages of comments on the draft SMP from stakeholders. However, we do not see a timeline or process to bring these comments to the surface and to negotiate with stakeholders so well thought out revisions can be presented to the Planning Commission to evaluate, discuss and make decisions. **When will a "redline" draft be available?**
    - **NOVEMBER 14 SPECIAL MEETING TO SCHEDULE A PUBLIC HEARING:** If scheduled, according to law, no changes can be made to the draft for 20 days. Therefore, the **redline draft must be available prior to the Nov 14 special meeting.**

- Work Sessions are required to help the Planning Commissioners and the BoCC to understand, comment, question and give direction on the draft SMP.
    - **DOCUMENTED WORK SESSIONS, LIKE TONIGHT'S, DO NOT MEET THE DEFINITION**: Work sessions on the SMP have been nothing more than an inadequate power point made by the Planning Department. This meets no definition of a "work session" that we have ever been a part of or seen. The impression we get is that the Planning Commissioners are expected to just rubber stamp whatever the Planning Department presents. Work sessions should deal with the major issues/comments made by stakeholders so the Commissioners can give direction.

- The BoCC has instructed the Planning Department to draft the new SMP with the least restrictive criteria allowed by Ecology. **The current draft does not meet this direction**. The designations of Rural Conservancy and Natural represents 95.1% of the shorelines in Thurston County and are not supposed to be developed. Shoreline Residential represents only 3.5%. Why is Shoreline Residential expected to carry the disproportionately high burden for shoreline restoration?

- **PEOPLE NEED TO BE ABLE TO CONSTRUCT A 600 SQ FT ADDITION TO THE SIDE OF THEIR EXISTING HOME.** In the current SMP people can add 500 sq ft to the side of their home within the buffer without a Substantial Development permit. The current draft only allows this landward of the home. There are many reasons to expand laterally. Perhaps to accommodate stairways to the second floor, an elevator needed for the aging homeowner, or just that your living space needs to be expanded to accommodate your family members growing in size and the only way is laterally. This should not require a Substantial Development permit and mitigation.
- **BUFFER/SETBACK NEEDS TO BE MODIFIED:** The current SMP has a 50 ft buffer. The draft has a 50 ft buffer plus a 15 ft setback. This needs to be changed to a total of 50 ft buffer/setback. So, either a 35 ft buffer with a 15 ft setback or a 50 ft buffer with no setback.
- **LEGALLY CONSTRUCTED RESIDENCES THAT ARE NOW IN THE BUFFER SHOULD BE DECLARED "LEGALLY CONFORMING" OR "CONFORMING" NOT "NONCONFORMING":** The Planning Dept says that they need to use the term "Nonconforming" for consistency with other regulations/codes. This is not correct. There are many instances where you are conforming in one regulation/code and nonconforming in another. Nonconforming is not just a word. It has consequences.
- **MITIGATION CREDIT SHOULD BE GIVEN FOR PRIOR IMPROVEMENTS TO SHORELINE ECOLOGICAL FUNCTION:** If a homeowner voluntarily takes action to improve the shoreline function without being required through mitigation, this should count towards any future required mitigation. Without this provision the homeowner is motivated to wait to take this action until they have to.

There are many more areas that need to be discussed in order to get a workable document that doesn't overly restrict and regulate Shoreline Residential which is the preferred use.

Respectfully submitted,

John Woodford, Chairman

Doug Karman, Vice-Chairman

Submitted 10/17

October 17, 2018

RE: Draft Update of Thurston County Shoreline Master Program
By: Meredith Rafferty, resident and homeowner
Comments to Planning Commission regarding "Shorelines of Statewide Significance"

On the State Department of Ecology's website (see the long link in blue below), it says the Puget Sound shoreline areas for statewide significance are defined by state law as ***waterward and are not the shorelands*** as excerpted below*:*

"Shorelines of statewide significance" (per Dept. of Ecology website)

"The state **Shoreline Management Act (SMA)** defines a special category of shorelines where statewide interests take priority and specific uses are preferred. These "shorelines of statewide significance" include certain marine areas and larger streams, rivers, and lakes in Washington.

"Marine areas"
There are three different types of marine areas considered to be shorelines of statewide significance:

- **Pacific Ocean coastline,** from Cape Disappointment to Cape Flattery — including all the harbors, bays, estuaries, and inlets seaward from the ordinary high water mark and all associated shorelands.
- **Specific estuarine areas,** including Birch Bay, Hood Canal, Nisqually River delta, Padilla Bay and Skagit Bay situated between the ordinary high water mark and the extreme low tide line and associated shorelands.
- All other areas of **Puget Sound, Strait of Juan de Fuca,** and **adjacent saltwater areas** lying waterward of the extreme low tide, excluding adjacent tidelands and shorelands."

https://ecology.wa.gov/Water-Shorelines/Shoreline-coastal-management/Shoreline-coastal-planning/Shoreline-Management-Act-SMA/Shoreline-Management-Act-jurisdiction/Shorelines-of-statewide-significance

However, the County's draft SMP continues to expand the definition by the way item E. is worded in its definition (pg. 17):

(per draft Thurston County SMP, pg. 19)

"19.150.740 Shorelines of Statewide Significance:
shorelines in Thurston County designated as shorelines of statewide significance are:

A. Nisqually Delta – from DeWolf Bight to Tatsolo Point, between the ordinary high water mark and the line of extreme low tide, together with shorelands associated therewith per RCW 90.58.030(2)(f)(vi).
B. Puget Sound – seaward from the line of extreme low tide.
C. Lakes, whether natural or artificial, or a combination thereof, with a surface acreage of one thousand acres or more measured at the ordinary high water mark.
D. Natural rivers or segments thereof downstream of a point where the mean annual flow is measured at one thousand cubic feet per second or more.
E. Shorelands and wetlands associated with A through D above"

Three-minute comment provided by Meredith Rafferty on October 17, 2018:

Planning Commissioners, thank you for being our citizen representatives.
My name is Meredith Rafferty, my husband and I are home owners on salt water property in unincorporated Thurston County.
I have been a homeowner in Thurston County for some 50 years; you could say that I grew up in my home ownership with the Shoreline Management Act and the Growth Management Act.
I am supportive of these Acts and stay involved so I can figure out what's expected of me.
Now, for the first time in some 30 years, the SMP is open for planning the next decades of shoreline use.
From the beginning of reviewing this draft update, you and residents have been asking to focus on what's needed and what the problems are and therefore come up with options on what to do and what to correct.
So I draw your attention to a dramatic change in oversight presented in this draft. And I respectfully request asking staff for their rationale.

The change is on page 19 in the definition of "Statewide Significance". This change would move consideration of what will be allowed on upland salt water properties from local to statewide priorities.
Moreover, Thurston County will be unilaterally taking this stance in opposition to a state law which expressly states that the State Legislature is the only entity authorized to designate the coverage of this definition.
Neighboring counties and cities on the same Puget Sound have not made this change.
What is going on?
This issue has repeatedly been brought to the attention of staff in filed correspondence.
The key words are "shorelands" and exclusions for Puget Sound tidelands and shorelands.

I am providing you a document with the specifics of this definition change and a copy of prior correspondence submitted as comment.

Thurston County Shoreline Stakeholders Coalition
4108 Kyro Rd SE. Lacey, WA 98503

January 31, 2018

TO: Thurston County Planning Commissioners

Thru: Brad Murphy
Senior Planner, Long Range Planning
Thurston County Resource Stewardship

From: John Woodford, Chairman
Thurston County Shoreline Stakeholders Coalition

Re: Shoreline Master Program Update – Shorelines of Statewide Significance

We draw your attention to Section 19.300.100 of the draft Shoreline Master Program update. The proposed wording broadens the definition of "Shorelines of Statewide Significance" to include all uplands and tidelands of Puget Sound. This is in conflict with state law of RCW 90.58.310 which states "Additional shorelines of the state shall be designated shorelines of statewide significance only by affirmative action of the legislature."

The draft wording then continues to apply the more restrictive, priority-ordered goals of the Shorelines of Statewide Significance to all shorelines throughout the County.

This draft wording reads as an attempt to increase shoreline regulations throughout the County by subjecting all properties to the more stringent requirements of the Shorelines of Statewide Significance, over and beyond the County's current regulations. This proposed expansion of regulation would be unilateral; it is not undertaken by any of our neighboring counties.

On November 14, 2017, Senior Planner Brad Murphy reported to the Thurston County Board of Commissioners that "We are following the Board's direction wanting to move forward as quickly as possible with the least restrictive possible shoreline regulations..." This regulatory expansion contradicts that purpose. We request that the draft's definition of Shorelines of Statewide Significance be corrected to the precise wording assigned in the state law.

We also request that the format of the draft section's " County-wide Policies" be returned to those of the current SMP (i.e., 1990 version) and continued input and consideration be given to the policies.

Thank you for your consideration.

John Woodford, Chairman
Thurston County Shoreline Stakeholder Coalition
4108 Kyro Rd SE, Lacey WA 98503

Cumulative Impacts Analysis for 2017 Nationwide Permit 48

Table of Contents

1. Introduction

The U.S. Army Corps of Engineers (Corps) issues nationwide permits (NWPs) to authorize activities under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act of 1899 that will result in no more than minimal individual and cumulative adverse environmental effects. There are currently 50 NWPs. These NWPs were published in the February 21, 2012, issue of the Federal Register (77 FR 10184) and expire on March 18, 2017.

The Corps conducts a NEPA and 404(b)(1) analysis for each NWP at a national level and produces a decision document summarizing the results. The decision document for NWP 48 concludes that there will be no individual or cumulative adverse impacts and that regional analysis will be conducted to ensure impacts will be minimal. Identified adverse impacts will be minimized through the use of regional conditions if necessary.

The decision document also indicates that:

"An important aspect for the NWPs is the emphasis on regional conditions to address differences in aquatic resource functions, services, and values across the nation. All Corps divisions and districts are expected to add regional conditions to the NWPs to enhance protection of the aquatic environment and address local concerns. Division engineers can also revoke an NWP if the use of that NWP results in more than minimal individual and cumulative adverse environmental effects, especially in high value or rare wetlands and other waters. When an NWP is issued or reissued by the Corps, division engineers issue supplemental decision documents that evaluate potential impacts of the NWP at a regional level, and include regional cumulative effects assessments.

Corps divisions and districts also monitor and analyze the cumulative adverse effects of the NWPs, and if warranted, further restrict or prohibit the use of the NWPs to ensure that the NWPs do not authorize activities that result in more than minimal individual and cumulative adverse environmental effects. To the extent practicable, division and district engineers will use regulatory automated information systems and institutional knowledge about the typical adverse effects of activities authorized by NWPs, as well as substantive public comments, to assess the individual and cumulative adverse effects on the aquatic environment resulting from regulated activities."

The purpose of this analysis is to assess the cumulative effects associated with authorizing activities under the 2017 NWP 48 in the state of Washington. The analysis assumes only limited general conditions on work conducted under the permit as described below. The purpose of conducting the analysis in this manner is to determine whether or not additional regional conditions may be necessary to ensure that only minimal cumulative adverse environmental impacts occur consistent with requirements of the permit and the national Corps decision document referenced above. The cumulative effects analysis is structured consistent with NEPA and 404(b)(1) requirements per Corps regulations. The CEQ (40 C.F.R. § 1508.7) provides the following definition of cumulative effects: "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions." The CEQ guidance document "Considering Cumulative Effects Under the National Environmental Policy Act" provides the basis for the structure and preparation of the analysis (CEQ 1997).

2. Proposed Action

2.1. Nationwide permit 48

The proposed action is the administration and implementation of the 2017 version NWP 48 in Washington State. The time period for the action is March 19, 2017 until March 18, 2022 which is the time period 2017 NWP 48 will be in effect.

The text of 2017 NWP 48 is as follows:

Commercial Shellfish Aquaculture Activities. Discharges of dredged or fill material into waters of the United States or structures or work in navigable waters of the United States necessary for new and continuing commercial shellfish aquaculture operations in authorized project areas. For the purposes of this NWP, the project area is the area in which the operator is authorized to conduct commercial shellfish aquaculture activities, as identified through a lease or permit issued by an appropriate state or local government agency, a treaty, or any easement, lease, deed, contract, or other legally binding agreement that establishes an enforceable property interest for the operator. A "new commercial shellfish aquaculture operation" is an operation in a project area where commercial shellfish aquaculture activities have not been conducted during the past 100 years.

This NWP authorizes the installation of buoys, floats, racks, trays, nets, lines, tubes, containers, and other structures into navigable waters of the United States. This NWP also authorizes discharges of dredged or fill material into waters of the United States necessary for shellfish seeding, rearing, cultivating, transplanting, and harvesting activities. Rafts and other floating structures must be securely anchored and clearly marked.

This NWP does not authorize:

(a) The cultivation of a nonindigenous species unless that species has been previously cultivated in the waterbody;

(b) The cultivation of an aquatic nuisance species as defined in the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990;

(c) Attendant features such as docks, piers, boat ramps, stockpiles, or staging areas, or the deposition of shell material back into waters of the United States as waste; or

(d) Activities that directly affect more than 1/2-acre of submerged aquatic vegetation beds in project areas that have not been used for commercial shellfish aquaculture activities during the past 100 years.

Notification: The permittee must submit a pre-construction notification to the district engineer if: (1) the activity will include a species that has never been cultivated in the waterbody; or (2) the activity occurs in a project area that has not been used for commercial shellfish aquaculture activities during the past 100 years. If the operator will be conducting commercial shellfish aquaculture activities in multiple contiguous project areas, he or she can either submit one PCN for those contiguous project areas or submit a separate PCN for each project area. (See general condition 32.)

In addition to the information required by paragraph (b) of general condition 32, the preconstruction notification must also include the following information: (1) a map showing the boundaries of the project area(s), with latitude and longitude coordinates for each corner of each project area; (2) the name(s) of the species that will be cultivated during the period this NWP is in effect; (3) whether canopy predator nets will be used; (4) whether suspended cultivation techniques will be used; and (5) general water depths in the project area(s) (a detailed survey is not required). No more than one pre-construction notification per project area or group of contiguous project areas should be submitted for the commercial shellfish operation during the effective period of this NWP. The pre-construction notification should describe all species and culture activities the operator expects to undertake in the project area or group of contiguous project areas during the effective period of this NWP. If an operator intends to undertake unanticipated changes to the commercial shellfish aquaculture operation during the effective period of this NWP, and those changes require Department of the Army authorization, the operator must contact the district engineer to request a modification of the NWP verification; a new pre-construction notification does not need to be submitted. (Authorities: Sections 10 and 404)

Note 1: The permittee should notify the applicable U.S. Coast Guard office regarding the project.

Note 2: To prevent introduction of aquatic nuisance species, no material that has been taken from a different waterbody may be reused in the current project area, unless it has been treated in accordance with the applicable regional aquatic nuisance species management plan.

Note 3: The Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 defines "aquatic nuisance species" as "a nonindigenous species that threatens the diversity or abundance of native species or the ecological stability of infested waters, or commercial, agricultural, aquacultural, or recreational activities dependent on such waters."

2.2. General Conditions

To qualify for NWP authorization, the prospective permittee must comply with 32 general conditions, as applicable, in addition to any regional or case specific conditions imposed by the division engineer or district engineer.

The general conditions allow for discretion with respect to their applicability (e.g., 'to the maximum extent practicable') in most cases or defer to other agencies for additional requirements. In practice it is uncertain whether any of the general conditions would minimize effects of the action. Historically, these conditions have not been invoked to restrict activities under NWP 48. In all cases but one, the cumulative effects analysis assumes no additional requirements placed on the work beyond that described in the action description above. This results in a worst-case environmental effects analysis.

General condition 11 is the one exception whereby it is assumed that all heavy equipment will be transported to work sites by vessel at high tide so as not to impact aquatic areas through the creation of roads in the mudflat or to otherwise disturb the nearshore habitat beyond the project area.

2.3. Regional Conditions

For the purpose of this analysis, it is assumed no regional conditions will be applied to the work conducted under the 2017 NWP 48.

2.4. Description of Work and Activities

This section describes the range of work and activities that are included within the 2017 NWP 48. The information was gathered from multiple sources including PCSGA (2011; 2013a; 2013b), WDNR (2008; 2013), Corps (2014a) and from knowledge of the professional Corps staff that have been involved in regulating shellfish activities. There is wide variation in the manner in which individual shellfish activities are conducted and the equipment/materials used. The descriptions below are considered generally representative of the individual activities but variability inherent within individual activities is not necessarily captured. The work and activities are summarized in Section 2.4.6. Section 2.5.1 describes the acreage of the work and activities by geographic region. These two components (general description and acreage) together describe the work that would be authorized by the Corps under the proposed action.

2.4.1. Mussel Activities

There are two species of mussels cultured in Washington State marine waters. These include *Mytilus trossulus*, commonly known as the blue mussel and *Mytilus galloprovincialis*, commonly known as the Mediterranean or Gallo mussel. The blue mussel is native to Washington State. The mussel activities described below may be performed at any time of day and at any time of year. They are not dependent on season or tides.

2.4.1.1. Rafts, Floats, other Structures, and Surface Longlines

Mussels are typically grown suspended from rafts or surface longlines anchored in subtidal waters, but they can be grown from any structure (e.g., pier) where there is adequate water depth at low tide. A raft is considered an open-framed floating structure with cross beams. Raft platforms are constructed of lumber, aluminum, galvanized steel, and plywood with some form of flotation. Lines with attached mussels are suspended from the raft. There may be multiple rafts for one activity footprint (Figure 2-1).

A float is a floating platform structure, typically rectangular, that is either anchored or attached to a pier or dock. Floats are used as working platforms, storage or for mooring boats. A float can be towed into place for anchoring.

Other structures the Corps would permit under the proposed action are discharge and intake pipes associated with upland wet-storage tanks. These tanks are placed in upland areas and used for holding shellfish species for some period of time. Water is circulated through the tanks via pipes that extend from the tanks to the nearby marine waters. There would typically be pipes for both intake and discharge. The activity must be compliant with Section 402 of the Clean Water Act (National Pollutant Discharge Elimination System (NPDES)) and have an NPDES permit, if necessary, before the Corps would issue a permit or verification under the proposed action. The upland wet-storage tanks themselves and their associated discharge are not within the regulatory jurisdiction of the Corps so would not be permitted under the proposed action.

Figure 2-1. Penn Cove Shellfish mussel rafts and harvest barge (Everett Herald 2013)

Surface or floating longlines are typically made of heavy polypropylene or nylon rope suspended by floats or buoys or they could be suspended from a structure such as a pier. They can consist of a single buoy and rope with attached cultured species extending below the buoy and anchored to the substrate. They can consist of multiple buoys connected by rope extending horizontally across the water surface for hundreds of feet. Rope with cultured species would be hung at intervals along this horizontal line. Large anchors to the substrate may also be placed at intervals along the line and at each end.

Seeding and Planting

Naturally-spawned mussel seed are set on lines or metal screen frames in net cages that are suspended in the water during the late spring spawning season. Hatchery seed, when used, is already set on lines or screen frames at the nursery, and then transported to the mussel farm for planting. Once the seed reaches 6 to 12 millimeters long, which can take several months in winter or several weeks in summer, it is scraped from the frames or stripped from the lines and sluiced into polyethylene net sausage-like tubes, called "socks," each with a strand of line threaded down the length of the sock for strength. A mussel disc may be inserted into the socks at intervals to support the weight of the mussels growing above it. Concrete weights with stainless steel wire hooks are hung on the bottom end of each mussel sock for tension. The socks are then attached to the raft or surface longline (Figure 2-2).

Maintenance and Grow-out

When the mussels reach about 1 inch in length, the weights are often removed from the socks and saved for reuse. Predator exclusion nets are hung around the perimeter of the rafts. Nets may be in place all year or may be used seasonally. If the predator exclusion nets become excessively fouled (e.g., with barnacles, algae, other aquatic vegetation or biological growth), they may be cleaned in place by hand or by mechanical methods. They may also be removed and then cleaned. Fouling organisms may also be removed from the raft structure itself.

Figure 2-2. Commercial mussel raft in south Puget Sound (Corps site visit 2013)

Harvest

When cultured mussels reach market size, about 12 to14 months of age, socks or lines of mussels are removed from the longline or raft for cleaning and grading. Biofouling is typically removed from mussels during harvest as the mussels are cleaned. The waste material is commonly returned to the water or put into a shell pile on shore. The mussels are stripped from the socks and bulk-bagged and tagged for transport to shore. Mussels that fall from the lines onto the predator nets or the bottom substrate may be harvested by hand or by suction dredge. Weights are reclaimed for re-use, and used socking and lines are recycled or disposed of at an appropriate waste facility. Harvesting occurs year round as mussels mature.

2.4.1.2. Mussel Bottom Culture

Mussel bottom culture entails growing mussels directly on the bottom substrate or in/on a container that is supported on the substrate. This may include growing mussels in bags or on trays supported on the substrate as described in the following sections for oyster and clams. Bottom culture could entail harvesting natural set mussels on stakes placed into the substrate or recruited to the substrate directly. The culture and harvest activities are similar to oyster stake and rack and bag culture methods. The reader is referred to the oyster stake and rack and bag sections for more detail on how this activity would be conducted.

2.4.2. Oyster Activities

Several species of oysters are cultured on the West Coast including the Pacific oyster (*Crassostrea gigas*), Kumamoto oyster (*Crassostrea sikamea*), Eastern oyster (also known as American oyster) (*Crassostrea virginica*), European flat oyster (*Ostrea edulis*), and the Olympia oyster (*Ostrea conchaphila*). Only the Olympia oyster is native to Washington State.

Oyster ground is often classified or referred to by its use, such as seed ground, grow-out ground, or fattening ground. There are four general strategies for oyster culture which depend on target markets, beach characteristics, and environmental conditions. These strategies include stake culture, rack-and-bag culture, bottom culture, and longline culture.

Many oyster activities are performed by workers on foot during low tides that expose the culture bed. The lowest tides occur for a period of several days each lunar month (29 days). During these low tides, workers may be present on the bed for 3 to 6 hours. In this document, work performed during these monthly low tides is described as occurring "during low tide." Work can occur at any time of the year; although, traditionally, December through January has been a strong market for commercially harvested oysters. Oysters are typically harvested between 18 months and 4 years of age (Corps 2014a).

Oyster activities may also be performed at high tides or in the subtidal zone. These work activities would not be dependent on tides and could occur at any time of the year. Harvest activities may occur at any time.

The oyster activities discussed below all generally use oyster cultch as a basis for the culture. Oyster cultch is oyster shell with attached oyster seed (or spat). Cultch is prepared by bundling washed and aged Pacific oyster shells ("mother shells") in plastic mesh bags which are then placed in the intertidal zone prior to spawning season. Up to thousands of cultch bags may be required for a single oyster

operation. Naturalized seed then collects on the bags of shell which creates the oyster cultch. Stakes with attached shell or 'hummocks' of shell placed in intertidal areas may also be used to collect naturalized seed. Alternatively, seeding of the mother shells may occur in an upland hatchery. The cultch bags remain in the intertidal zone, either loose or on pallets, until the seed is large enough or "hard" enough (i.e., firmly cemented onto the mother shell and able to resist predation and desiccation) to withstand being moved onto the culture beds (Figure 2-3).

Figure 2-3. Oyster cultch shell with spat stacked on pallets (Corps site visit 2013)

2.4.2.1. Rafts, Floats, FLUPSYs, and other Structures

Oyster activities do not use structures to the same extent as mussel activities. Rafts/floats may be used as work platforms while oyster activities are occurring at a site. These rafts/floats may be anchored to the substrate or attached to a vessel. Rafts and FLUPSY floats may also be used to grow-out seed. A FLUPSY is a type of float structure specifically used for growing out seed to a larger size (Figure 2-4). Because it requires a power connection, FLUPSYs may be placed in the intertidal zone adjacent to power sources, such as attached to a pier. The floating structure continuously draws seawater through the system. Juvenile shellfish, one to two millimeters in length, are transported to a FLUPSY from a shellfish hatchery. The seed is placed in bins with screened bottoms that are lowered into openings in a floating frame and suspended in the seawater. Several bins are placed in a row on either side of a central enclosed channel that ends at a paddlewheel or pump. The wheel or pump draws water out of the central channel creating an inflow of seawater through the bottom of the seed bins, continuously feeding the juvenile shellfish. The outflow from the bins is through a dropped section on one side of the bin facing the central channel. Typically, the FLUPSY platform is equipped with overhead hoists so the bins can be cleaned and moved. Once seed have reached a suitable size, they are removed from the FLUPSY and transplanted to a grow-out site

Trays or bins elevated above the substrate may be used for additional seed grow-out or nursery seed boosting. Trays or bins are affixed to racks set on the substrate. Racks have typically been made of

rebar, angle iron, and in rare cases, wood and or plywood. Trays are typically made of plastic. Racks may be deployed for a few months or longer. There may also be use of what are termed "stackable nester trays" for boosting seed. Tidal depths for elevated trays on racks vary from a +3 feet to -15 feet Mean Lower Low Water. Trays or bins may also be placed directly on the substrate (PCSGA 2013a).

Figure 2-4. A FLUPSY (Fisher Island Oysters 2007 in PCSGA 2011)

Upland wet-storage tanks, as described above for mussel activities, could also be used for oyster activities. The Corps would permit the pipes (for both discharge and intake) associated with these tanks under the proposed action.

2.4.2.2. Oyster Floating Culture

Oyster floating culture occurs using lantern nets, bags, trays, cages, or vertical ropes or wires suspended from surface longlines or rafts similar to that described above for mussels. Floating culture occurs in the subtidal zone. Surface longlines are heavy lines suspended by floats or buoys attached at intervals along the lines, anchored in place at each end. Lantern nets, adopted from Japanese shellfish culture, are stacks of round mesh-covered wire trays enclosed in tough plastic netting. The nets, bags, trays, cages, or vertical ropes or wires are hung from the surface longlines or rafts.

Seeding

Single set oyster seed is placed on the trays or in the bags and suspended in the water. Oyster cultch may be attached directly to the vertical ropes or wires.

Maintenance and Grow-out

Single oysters are regularly sorted and graded throughout the growth cycle. Every three or four months trays are pulled, the stacks taken apart, and oysters are put through a hand or mechanical grading process. The trays are then restocked, stacks rebuilt, de-fouled by removing species such as barnacles, algae and other aquatic vegetation, and returned to the water. Oysters grown directly on vertical lines are in clusters and receive little attention between seeding and harvesting.

Harvest

A vessel equipped with davits and winches works along the lines, and the trays, nets or bags are detached from the line one by one and lifted into the vessel. The gear is typically washed as it is pulled aboard. Oysters are removed and placed into tubs where they may be cleaned and sorted.

Oysters grown using floating culture may be transplanted to an intertidal bed for two to four weeks to "harden". Hardening extends the shelf-life of floating cultured oysters by literally hardening the shell making it less prone to chipping, breakage, and mortality during transport and conditioning them to close their shells tightly when out of the water to retain body fluids. Oysters are re-harvested from the transplanted areas using bottom culture harvest methods. Alternatively, oysters grown by floating culture may be hung from docks at a tidal elevation that results in hardening them.

2.4.2.3. Oyster Bottom Culture

Bottom culture entails growing oysters directly on the substrate in intertidal or shallow subtidal areas (Figure 2-5).

Seeding and Planting

Prior to planting, oyster beds are prepared by removing debris such as driftwood, rocks, and predators (e.g., starfish, oyster drills) by hand or mechanically by dragging a chain or net bag. Any oysters that remain on site from the previous growing cycle may be removed or thinned. In some areas the substrate may occasionally be enhanced with crushed oyster shells often mixed with washed gravel to harden the ground (see discussion of graveling in Section 2.4.3).

Seeding occurs by spraying oyster cultch from the deck of a barge or casting it by hand. In some cases, farms rely solely on the natural set of oyster seed. Oyster hummocks may be created by mounds of oyster shell which provide a substrate more conducive to attracting natural seed (Figure 2-5).

Maintenance and Grow-out

Oysters may be transplanted from one site to another at some point during grow-out. For example, oysters may be moved from an initial growing area to "fattening" grounds with higher levels of nutrients allowing the oysters to grow more rapidly. Oysters may be removed for transplant either by hand or by dredge.

Oysters may sink into the mud in areas where the substrate is soft. When this happens, the oysters are harrowed to pull them up out of the mud. The harrow is a skidder with many tines, towed along the substrate by a boat. The harrow penetrates the substrate by a few inches, breaking up the oyster clusters, and moves the oysters back to the surface. This method is also referred to as "dragging". Dragging is typically performed during the second or third year of growth. Oyster dredge-harvest vessels are used for dragging by substituting the dredge baskets with drag tools which they hang on the outrigger cables. About five acres can typically be harrowed in one day (Corps 2014a).

Harvest

Harvest typically occurs either by hand during low tide or by dredge. During hand harvest, workers use hand tools or hand-pick oysters and place them into various sized containers placed on the bed (Figure 2-6). Larger containers may be equipped with ropes and buoys that can be lifted with a boom crane

onto the deck of a barge at high tide. Smaller containers are sometimes placed or dumped on decks of scows for retrieval at high tide or are carried off the beach at low tide.

Mechanical or dredge harvest occurs by use of a harvest bag that is lowered from a barge or boat by boom crane or hydraulic winch at high tide and pulled along the bottom to scoop up or 'dredge' the oysters. The dredge bags have a leading edge (blade) consisting of a steel frame with teeth and a steel mesh collection bag attached to the frame. As the dredge bags are towed across the substrate, the oysters are loosened and guided into the bags. The bag is then hoisted onto the boat deck, emptied, and then redeployed. Two dredge bags may be towed simultaneously off each side of the boat. The boats, such as the one shown in Figure 2-7, can haul large volumes that can weigh over twenty tons. Dredge equipment can typically be adjusted so that the correct depth is dredged as tide levels change. A given area may be dredged twice in succession to ensure recovery of the maximum number of oysters (Corps 2014a). Harrowing may occur between the two successive dredge events in order to increase recovery of oysters. Alternatively, the area may be hand harvested at low tide after initial dredging to obtain any remaining oysters.

Figure 2-5. Oyster bottom culture (top) and hummocks (bottom), Willapa Bay (UW 2015)

Figure 2-6. Hand harvest of oysters, South Puget Sound (Taylor Shellfish 2013)

One crop of oysters is typically dredged twice before actually being harvested. In some case, oysters may be dredged at about one year and then transplanted to a grow-out bed. In other cases, the oysters may not be transplanted to a finishing (fattening) bed until they are closer to harvest size. Dredging can be accomplished at a rate of one acre harvested every two days depending on the time of year and

density of oysters (Corps 2014a). In summary, an individual oyster bed may commonly be dredged a total of three times over the plant to harvest cycle.

Figure 2-7. Oyster dredge in Willapa Bay (Bay Center Farms 2015)

2.4.2.4. Oyster Longline Culture

In longline culture, oysters are grown in clusters on rope lines suspended off the bottom (typically 3 feet or less) between upright stakes made of PVC or metal pipe. This method keeps the oysters from sinking into soft substrates and minimizes their exposure to predators. Since the activity is supported by structures placed on the substrate, it is considered a ground-based culture method in this document to differentiate it from the floating or surface longlines discussed previously.

Seeding and Planting

Bed preparation activities are similar to those described above under bottom culture with the following additions. Residual oysters ("drop offs") dislodged from the lines during the previous growing cycle are typically harvested using bottom culture methods. The substrate may be leveled either manually or by mechanical means to address accumulations of sediment that have occurred since the previous planting cycle. If the PVC or metal stakes were removed after the previous harvest they are replaced by hand. When bed preparation is complete, long polypropylene or nylon lines with a piece of seeded oyster cultch attached approximately every foot are suspended above the ground between the stakes.

Maintenance and Grow-out

The oysters grow in clusters supported by the longlines over a period of 2 to 4 years (Figure 2-8). The longlines are checked periodically during low tides to ensure that they remain secured to the pipe and that the pipe remains in place. Periodic control of fouling organisms (e.g., mussels, barnacles, algae and other aquatic vegetation) and predator species may take place.

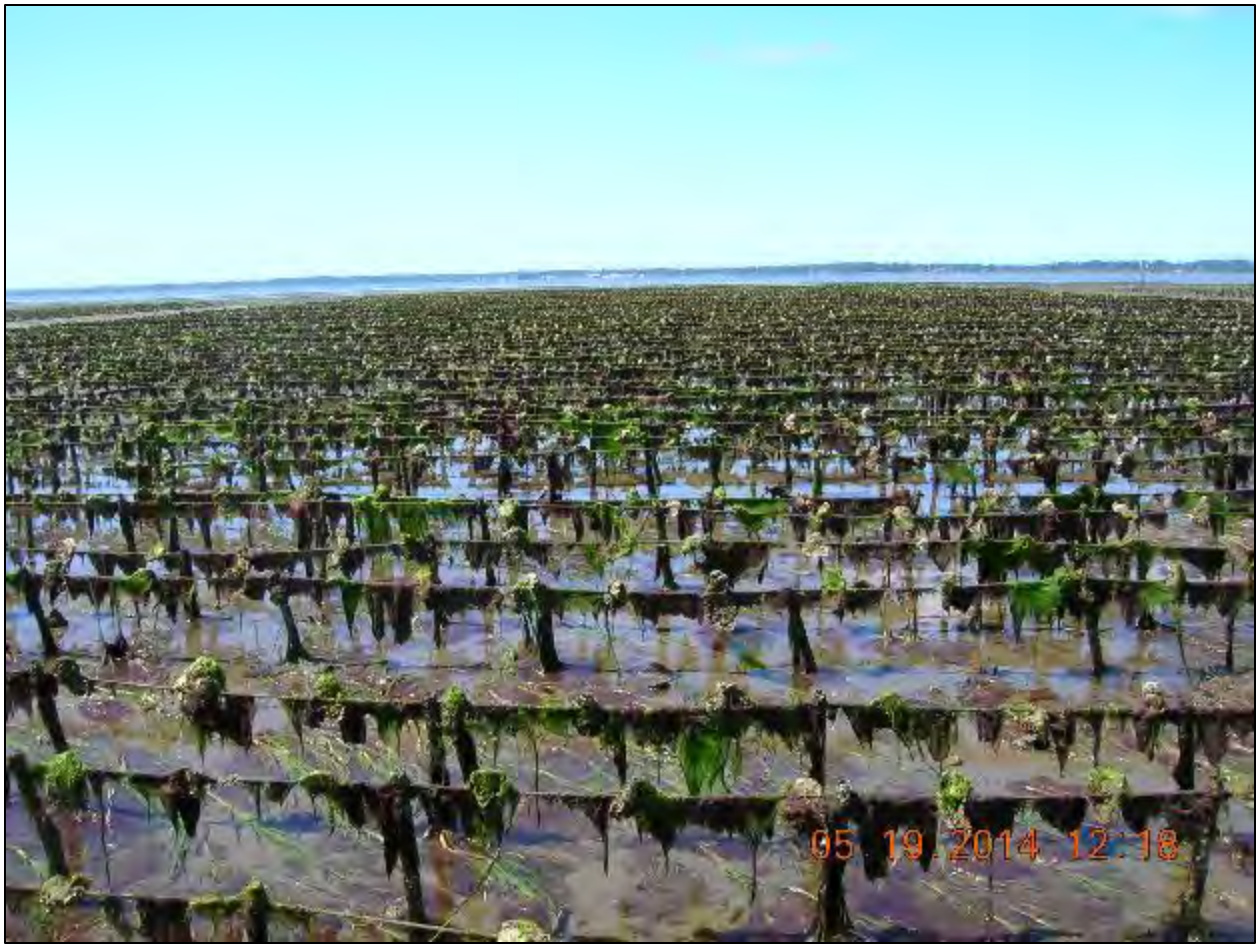


Figure 2-8. Oyster longline culture, Willapa Bay (Corps site visit 2014).

Harvest

Longline oysters may be harvested by hand or by machine. Hand harvest entails cutting oyster clusters off lines by hand at low tide and placing the clusters in harvest tubs equipped with buoys for retrieval by a vessel with a boom crane or hydraulic hoist at a higher tide. The oysters are then barged to shore. Some smaller operations carry the tubs off the beach by hand.

With mechanical harvesting, buoys are attached at intervals along the lines at low tide. During high tide the buoys are attached to a reel mounted on a vessel that pulls the lines off the stakes and reels them onto the boat. The oyster clusters are cut from the lines and then transported to processing plants or market. Some attached biological material (e.g., barnacles, algae) may incidentally fall off the lines during harvest. The oysters are removed from the lines at the processing facility and the line disposed of as waste material. Barnacles and mussels that remain on the lines are removed and may be re-used for their shell material.

About 5,000 to 7,500 sq. ft. (1/8 acre) can be harvested in one day (Corps 2014a). Pipes are often pulled after harvest and the area then harrowed and dredged to collect the remaining oysters. The ground could then be dragged with a chain or net bag to level it and remove debris before replacing stakes for

the next cycle. Alternatively, stakes may remain in place depending on the environmental and substrate conditions.

2.4.2.5. Oyster Stake Culture

Oyster stake culture consists of metal or PVC stakes regularly spaced across the growing site with oysters attached directly to the stakes.

Seeding and Planting

Bed preparation methods are similar to those described above under bottom and longline culture. During low tides, stakes made of hard-surfaced material such as metal or PVC pipe are driven into the ground approximately two feet apart to allow water circulation and easy access at harvest. Stakes are limited to two feet in height to minimize obstruction to boaters.

Stakes can be seeded in upland hatchery setting tanks before being planted in the beds or transported to the site as bare stakes where there is a reliable natural seed set. Bare stakes might be planted during the prior winter to allow barnacles and other organisms to attach to the stakes, increasing the surface area available for setting oyster spat. An alternative method of seeding is to attach one to several pieces of seeded oyster cultch to each stake.

Maintenance and Grow-out

Stakes are left in place throughout a two to four year growing cycle. In areas where natural spawning occurs, multiple year classes of oysters grow on the stakes, with smaller, younger oysters growing on top of older oysters. The area is maintained by periodically checking stakes to ensure they remain upright and by removing fouling organisms (e.g., mussels, barnacles, algae and other aquatic vegetation) and predators. Stakes may be repositioned or replaced as needed. Some oysters may be periodically removed to relieve overcrowding. Oysters that fall from or are knocked off the stakes are harvested periodically by hand. They may be transplanted to firmer ground to improve their condition for harvest at a later time.

Harvest

Oysters are selectively hand harvested during low tide by prying clusters of market-sized oysters from the stakes or removing the stakes entirely. They are placed in containers and either hand carried off the beach or loaded on a boat for transport to shore. Undersized single oysters from the clusters may be transplanted to a special bed for grow-out since they cannot reattach to the stakes. They would then be harvested using bottom culture methods when they reach market size. Market-sized drop-offs that have not settled into the mud are harvested along with those pried from the stakes.

Fouling organisms would typically be dislodged during harvest. Stakes that are removed for reuse would be allowed to dry in an upland location to remove biofouling. Shell material may be stored for reuse.

2.4.2.6. Oyster Rack and/or Bag Culture

Rack and bag or bag culture entails growing oysters within plastic bags or other containers that are placed either directly on the substrate or on racks or lines that suspend the bags above the substrate.

Seeding and Planting

Bed preparation methods are similar to those described above for the other oyster culture methods. During low tide, longlines and PVC/metal stakes may be installed on the bed to secure the bags. Wood or metal racks could also be installed to keep the bags off the ground. Racks with legs may be placed directly on the substrate, or supports may be driven into the substrate. Single-set seed or oyster cultch is placed in reusable plastic net bags closed with plastic ties or galvanized metal rings. Bags are attached to the racks, stakes, or lines using reusable plastic or wire ties.

Figure 2-9. Oyster bag culture, south Puget Sound (NOAA Photo as reported in InsideBainbridge 2015)

In some cases, oysters are cultivated using a tumble bag system (Figure 2-10). Oyster tumbling involves attaching a buoy and securing the bags to a single horizontal stainless steel rod held in place by rebar stakes driven into the substrate. The oyster-seed filled bags pivot on the rod and float with the tide. The ebb and flow of the tide agitates the oysters or "tumbles" them.

Figure 2-10. Oyster rack and bag tumbling system, South Puget Sound (Corps site visit 2013)

Maintenance and Grow-out

Oysters are left to grow in the bags. The operation is checked periodically during low tides to ensure that the bags remain secure and to remove fouling organisms (e.g., mussels, barnacles, algae and other aquatic vegetation) and predators. Bags may be turned as often as every two weeks to control fouling organisms. Oysters may be periodically redistributed between bags to reduce densities. Oysters may be placed in progressively larger mesh size bags as the oysters grow.

Harvest

Oysters are harvested at low tide by removing the bags from their supports and transferring them to a boat, wheelbarrow, or vehicle for transport to shore. Bags may also be loaded on a boat at higher tides. Biofouling is common on the bags with barnacles and mussels the primary fouling organisms. To removal biofouling, bags are typically placed in upland areas where they are allowed to dry which allows for easier removal of fouling organisms prior to re-use. The activity to 'dry' bags typically occurs during the summer months.

2.4.3. Clam Activities

Several species of clams are cultured or harvested in Washington State including the littleneck clam (*Leukoma staminea*), Manila clam (*Venerupis philippinarum*), butter clam (*Saxidomus gigantea*), Eastern soft shell clam (*Mya arenaria*), horse clam (*Tresus nuttallii* and *Tresus capax*), razor clam (*Siliqua patula*), and the cockle (*Clinocardium nuttallii*). The most commonly cultured clam, the Manila clam, is not native to Washington State.

The following clam activities could occur any time of the year.

2.4.3.1. Rafts, Floats, FLUPSYs, and other Structures

Rafts, floats and FLUPSYs are used less in clam activities than they are in oyster and mussel activities. Their use for clam culture would be similar to that described above in the mussel and oyster sections. Upland wet-storage tanks, as described above for mussel activities, could be used for clam activities. The Corps would permit the pipes (for both discharge and intake) associated with these tanks under the proposed action.

2.4.3.2. Clam Bottom Culture

Bottom culture entails growing clams directly on the substrate of intertidal areas.

Seeding and planting

Prior to planting clam seed on the tidelands, beds are prepared in a number of ways depending on the location. Bed preparation activities are similar to those described above for oyster bottom culture. The substrate may be prepared by removing aquatic vegetation, mussels, and other undesired species. Any shellfish present on site may be harvested to reduce competition. These activities could be conducted by hand or by mechanical means (e.g., water jet, harrowing).

Graveling (also called frosting) is a common activity employed for clam culture. This consists of adding gravel and/or shell when the tide is high enough to float a barge. Graveling by vessel often occurs during about a two hour window at slack tide. Applying at the slack tide allows for a more accurate placement of the graveling material. In a 1-2 hour period, about 1 acre can be graveled to a depth of up to 1 inch (Corps 2014a). Several thin layers of material may be placed over a period of days (Figure 2-12). To place a single 0.5-inch layer requires about 70 cubic yards of washed gravel or shell per acre. An individual site would not be graveled more frequently than once per year. Many sites are graveled annually whereas other may be graveled at a lesser frequency.

Clam seed is typically acquired from hatcheries and planted in the spring and early summer. Intertidal trays or bags may be used as nursery systems until seed is of sufficient size to plant. The trays are typically two-foot by two-foot with ¼ inch diameter openings that permit water to flow through. They are employed in stacks of six or seven, and placed in the lower intertidal areas secured with rebar or anchored with sand bags. Clam bags as described in the section on bag culture can also be used to hold clams in a nursery system. Natural spawning and setting of clams also occurs. Clam seed sizes and methods of seeding vary, depending on site-specific factors such as predation and weather conditions. Planting methods include hand-spreading seed at low tide upon bare, exposed substrate; hand-spreading seed on an incoming tide when the water is approximately four inches deep; hand-spreading

seed on an outgoing tide when the water is approximately two to three feet deep; or spreading seed at high tide from a boat.

Figure 2-11. Adding gravel to a clam bed (i.e., graveling) (PCSGA 2011)

Immediately after seeding, cover nets may be placed over the seeded areas to protect clams from predators such as crabs and ducks. Cover nets are typically made from plastic such as polypropylene (Figure 2-12). The net edges are typically buried in a trench or weighed with a lead line and secured with rebar stakes. Predator cover netting typically remains on site until harvest.

Maintenance and Grow-out

After each growing season, surveys may be conducted during low tide to assess seed survival and distribution, and to estimate potential yield. Based on survey results, additional seeding activity may occur. Netting used to protect clams from predation can become fouled with barnacles, mussels, aquatic vegetation (e.g., algae, eelgrass) or other organisms. The nets usually remain on site throughout the growing period. Fouling organisms may be removed by hand or by mechanical means while the nets are in place. Depending on local conditions, net cleaning may occur as often as monthly or not at all. Biofouling occurs most frequently during the late spring and summer months.

Harvest

Before harvest begins, bed boundaries may be staked and any predator netting folded back during a low tide. Hand harvesters dig clams during low tides using a clam rake (Figure 2-13). Shovels or other hand operated tools may also be used. Market-size clams (typically about 3 years of age) are selectively harvested, placed in buckets, bagged, tagged, and removed. Undersized clams are returned to beds for future harvests. Since a given clam bed may contain multiple year classes of clams, it may be harvested on a regular schedule (such as annually) to harvest individual year classes of clams. Clams harvested for sale are generally left in net bags in wet storage. Clams are typically maintained in wet storage either directly in marine waters or in upland tanks filled with seawater for at least 24 hours in order to purge

sand. Upland tanks are connected to the marine waters through intake and outfall structures (pipes) that are compliant with the NPDES.

Figure 2-12. Clam cover nets in South Puget Sound (Corps site visit 2014).

Harvesting of clams also occurs with mechanical equipment (Figure 2-14). This equipment is driven on the substrate when the tide is out and excavates the substrate to a depth of about 4-6 inches in order to extract the clams. Clams are harvested after 3 years. About 0.8 acres per day of clams can be mechanically harvested which results in about 12 to 15 days of work for each acre (Corps 2014a). The use of a 'hydraulic escalator harvester' equipment is not included among the proposed action activities.

Figure 2-13. Hand harvest of Manila clams (top, Willapa Oysters 2007 in PCSGA 2011; bottom, South Puget Sound, Corps site visit 2013).

Figure 2-14. Mechanical harvest, low tide in North Puget Sound (GoogleEarth 2015; PSI 2015)

2.4.3.3. Clam Bag Culture

Clam bag culture is similar to the bag culture described previously for oysters. Clams are typically grown in plastic mesh bags placed directly on the substrate.

Seeding and Planting

Bed preparation activities are similar to those described above. Prior to setting bags on the tidelands, shallow (typically 2 to 4 inches) trenches may be dug during low tide with rakes or hoes to provide a more secure foundation for setting down the clam bags (Figure 2-13).

Clam seed (typically 5-8 millimeters) is placed in reusable plastic net bags closed with plastic ties or galvanized metal rings. Gravel and/or shell fragments may be added to the bags. Bags may be placed in shallow trenches during low tide and allowed to "silt-in" (i.e., become buried in the substrate). In high current or wind areas, bags may be held in place with 4 to 6 inch metal stakes.

Figure 2-15. Manila clam bags set into, on the substrate (Corps site visit 2013)

Maintenance and Grow-out

Bags are monitored during low tide throughout the grow-out cycle to make sure they remain secured. They may be turned occasionally to optimize growth. Fouling organisms (e.g., mussels, barnacles, algae and other aquatic vegetation) and predators may be periodically removed.

Harvest

When the clams reach market size, the bags are removed from the growing area. Harvesting may occur when there is one to two feet of water, so that sand and mud that accumulated in the bags during grow-out can be sieved from the bags in place. Bags are transported to a processing site where any added substrate is separated for later reuse.

2.4.4. Geoduck Activities

Geoduck (*Panopea abrupta*) is native to Washington State and is the largest known burrowing clam. Geoduck is a relatively new species for culture. Washington is the principal state in the United States actively farming geoducks. Cultivation under the proposed action would occur between elevation +7 ft to -4.5 ft MLLW. Naturally seeded or wild geoduck could occur from about +1 ft to deeper than -100 ft MLLW.

2.4.4.1. Rafts, Floats, FLUPSYs, and other Structures

The proposed action includes reauthorization and maintenance of currently serviceable rafts, floats, and FLUPSYs that qualify as continuing activities. New rafts, floats, and FLUPSYs or the relocation or expansion of continuing rafts and floats are also included in the action. All of these types of structures have been described above in the mussel, oyster and clam sections.

2.4.4.2. Geoduck Culture

Seeding and Planting

Bed preparation activities are similar to those described above. Bed preparation can also include a "pre-harvest" to remove all current shellfish on the bed including naturally seeded geoduck already present on the site. Undesired species such as sea stars and sand dollars (*Clypeasterioda*) may be removed by hand. Some growers may attempt to re-locate sand dollars to nearby suitable habitat; other growers remove them permanently from the marine environment.

The most common method of culture currently in use consists of placing a 6-inch diameter, 9-inch long PVC pipe (pipe sizes may vary among growers) by hand into the substrate during low tide, usually leaving the top section of pipe (also called a tube) exposed. Two to four seed clams (usually from hatcheries) are placed in each tube where they burrow into the substrate. Tubes are typically installed into the substrate at a density of about 1 tube per square foot or about 42,000 tubes per acre. The top of each pipe is covered with a plastic mesh net and secured with a rubber band to exclude predators (Figure 2-16). Additional cover netting may be placed over the tube field on beaches with heavy wind and wave action to guard against the tubes becoming dislodged in storms (Figure 2-17). Some growers do not use the individual pipe net covering but use the cover netting to cover the whole field of tubes. Some growers use flexible net tubes (Vexar®) instead of the PVC pipe, which eliminates the need for the additional cover netting. Intertidal geoduck culture typically ranges between the +5.0 and the -4.5 feet tidal elevation (MLLW). Geoduck seed can also be directly set into the substrate without the use of any structure.

Another method being used to exclude predators is net tunnels (Figure 2-18). The tunnels are made from 4-foot wide rolls of polyethylene net placed over a rebar frame to hold the net a couple of inches above the substrate with the net edges buried by the substrate. They are currently being used in the intertidal area. The mesh opening of the net is either 1/4-inch or 3/8-inch. A 24-inch wide net without a rebar frame may also be used.

Maintenance and Grow-out

Fouling organisms including mussels, cockle clams, and sand dollars often accumulate inside the tubes. Aquatic vegetation (e.g., algae and eelgrass) may also accumulate on or over the tubes. When this occurs, which could be throughout the year, these fouling organisms are removed.

Figure 2-16. Geoduck cultivation using individual tube nets for predator control, South Puget Sound (top, OPB 2012) and Discovery Bay (bottom, Kitsap Sun 2015)

Figure 2-17. Cover netting placed over geoduck tubes, South Puget Sound (Corps site visit 2014)


Figure 2-18. Geoduck tunnel net over rebar frame (Dewey 2013)

Tubes and netting are typically removed after 18 months to 2 years when the young clams have buried themselves to a depth sufficient to evade predators (about 14 inches). After tube removal, large area nets may be redeployed over the bed for several months. The tubes and nets are often taken to upland

locations and allowed to dry in order to easily remove fouling organisms. They are then typically reused. As the clams grow, they may gradually dislodge the tubes from the substrate before they can be removed. The dislodged tubes could potentially be swept away from the site by the tides.

Harvest

Naturally produced geoducks can live for more than 100 years and may be harvested at any age or size. Cultivated geoducks are typically harvested 4 to 7 years after planting or when they reach about 2 pounds. A site seeded at 160,000 per acre might be expected to produce 32,000 to 40,000 marketable geoduck per acre. The geoducks are harvested in the intertidal zone at low tide (Figure 2-19) or by divers at high tide in the intertidal or subtidal zone. In either case, the geoducks are typically harvested using hand-operated water jet probes. For water jet harvest, the probe is a pipe about 18 to 24 inches long with a nozzle on the end that releases surface-supplied seawater from a 1-inch internal diameter hose at a pressure of about 40 pounds per square inch (about the same pressure as that from a standard garden hose) and a flow of up to 20 gallons per minute.

This harvest method allows the hand extraction of geoducks, which burrow as deep as 3 feet. The harvester inserts the probe in the substrate next to an exposed geoduck siphon or the hole left when the siphon is retracted. By discharging pressurized water around the geoduck, the sediment is loosened and the clam is removed by hand. For the dive harvester, this entire process takes 5 to 10 seconds (Figure 2-20). Each diver carries a mesh bag to collect the harvested geoducks. Divers periodically surface to unload their bags. One diver can harvest 500 to 1,000 geoducks per day. Multiple divers may work in an area at one time. Dive harvesters work no more than 3 to 4 hours per day.

Geoduck harvesting occurs year-round and is not limited by tidal height. However, dive harvesting tends to be the dominant method during winter months (November through February) due to the prevalence of high daytime tides, the absence of suitable low tides for daytime beach harvest, and generally favorable market conditions during that period. Both low-tide and dive harvests may occur on the same sites. It is estimated that the dive harvest is used about 75% of the time compared to the non-dive harvest method (Cheney 2007 referenced in Anchor 2010). Harvest occurs until all harvestable-sized geoduck are removed from the harvest area. Harvesters make several sweeps of a tract to ensure all harvestable-sized geoduck are removed. Because of differences in geoduck growth rates with a mix of harvest-sized and under-sized clams, only a portion of a project area may be harvested, with the remainder set aside for later dive or beach harvest. Additionally, a dive harvest is typically supplemented with beach harvest when clam densities are reduced in the project area. Harvest may also be constrained by tide and current conditions with slow or slack water conditions reducing or restricting the ability to effectively harvest with divers.

Figure 2-19. Harvesting geoduck at low tide (PCSGA 2011, CPPSH 2015)

Dive harvest is the typical method used for harvesting subtidal geoducks. Dive harvesters work within an approximate 100-foot range from the harvest vessel, or to the maximum lengths of their air and water lines. Intakes for supplying water to the onboard pumps are positioned several feet below the water surface. Intakes will be screened per Conservation Measure.

2.4.5. Vessel and Vehicle Support

Various types of vessels and vehicles could be used to support activities for all shellfish species. Vessels could include offshore rafts, small open crafts with outboard motors, and larger barges (Table 2-1). Land vehicles (e.g., trucks, ATV) could also be used to support the various activities. Use of support vessels would be within the immediate shellfish activity area or the immediate vicinity.

Vessels could be used to mechanically harvest, tow harrow, prepare or maintain the substrate (e.g., graveling). Vehicles may be used on the culture beds as a base of operations and to transport equipment and shellfish. Vehicles can also be used to mechanically harvest or prepare the substrate for harvest (Figure 2-14). This could include tractors harrowing/tilling the substrate.

Geoduck dive harvesters work from small surface vessels or dive platforms that contain machinery for surface-supplied diver air and water jets, diver communication equipment, and on-deck storage for harvested geoducks. Dive boats used to harvest cultivated geoduck may be anchored over the harvest sites and moved to deeper water during low tides. Dive boats used to harvest subtidal geoduck typically move over the harvest area as needed to adjust the divers' position relative to geoduck density.

Information on vessel sizes have has been provided by PCSGA which is expected to be representative of the range of support vessels that would be used for the various types of activities described above.

Figure 2-20. Geoduck dive harvest sequence (Anchor 2010)

Table 2-1. Types of support vessels and equipment used while conducting work and activities under NWP 48 and estimated in-air noise (PCSGA 2013b).

Equipment	Purpose	Estimated dBA
5hp motor with propeller	FLUPSY	65@100 yards
10hp engine	skiffs, water pumps, hatchery intake	65 @ 100 yards
40-330hp engine	boat inboard/outboard	65-90 @ 0.5 m
air compressor	diving	77-85 @ 7m
power washer (4000 psi)	nursery raft/FLUPSY	<100 @ operator ear (~3 feet)
electric hoist	lifting nursery raft/FLUPSY	75-85 @ 50 ft
crane	lifting nursery raft/FLUPSY	81 @ 50 ft
harvester (6 cylinder Chevy Vortec engine)	harvesting clams	60-90 @ 15 m

2.4.6. Summary of Activities

The activities are summarized below in Table 2-2. This summary may not necessarily list all the activities described in the previous sections.

Table 2-2. Summary of shellfish activities included within the proposed action.

Species	2017 NWP 48 Work and Activities	
Mussel *Blue, Gallo*	Seeding/ Planting	• Raft, floats, and their associated maintenance • Set lines or metal screen frames in net cages suspended in water to naturally set seed. • Install socks weighted and lashed to rafts, lines, or stakes and suspended in water for hatchery-raised seed. • Place buoys or anchors used to mark and secure structures
	Maintenance / Grow-out	• Placement/maintenance of predator exclusion nets • Replace and maintain stakes and lines • Remove biofouling and weights • Monitor growth
	Harvest/ Processing	• Strip mussels from the lines or socks • Bag mussels for transport • Intake or outfall structures (pipes) (discharge compliant with NPDES) to connect upland wet storage holding tanks
Oyster	Seeding/ Planting	• Raft, floats, and FLUPSYs and associated maintenance • Prepare substrate by removal of debris (rocks/large wood)

Species	2017 NWP 48 Work and Activities	
Pacific, Olympia, Kumamoto, Eastern, European flat		• Remove/relocate undesired aquatic species • Application of gravel/shell to firm substrate (sprayed from vessel, or delivered with land vehicle and mechanically or hand deposited). • Mechanically level substrate • Use of 'continuing' seed floats • Use of work floats • Use of racks/elevated trays or bins • Create oyster hummocks (oyster shell mounds) • Install bags of cultch material onto stakes, lines, racks, trays or secured directly onto substrate • Suspend lantern nets, bags, cages, vertical ropes or wires from surface longlines, or 'continuing' rafts
	Maintenance / Grow-out	• Continued removal of debris/aquatic species, as necessary • Flip/turn bags • Re-position stakes • Remove excess biofouling • Harrow to lift excess mud or sand/re-level substrate • Pull and restack trays
	Harvest/ Processing	• Hand harvest into containers for transport • Mechanical shallow depth dredging from barges • Collection and transport of oysters to 'fattening' beds to harden (2nd harvest then occurs) • Wet storage (in-water) • Use of work platforms • Intake or outfall structures (pipes) (discharge compliant with NPDES) to connect upland wet storage holding tanks
Clam *Manila, littleneck, butter, eastern soft shell, horse, razor, cockle*	Seeding/ Planting	• Raft, floats, and FLUPSYs and associated maintenance • Use of seed grow-out trays and bins • Prepare substrate by removal of debris (rocks/large wood) • Remove/re-locate other aquatic species (starfish, vegetation) • Application of gravel/shell to firm substrate (sprayed from vessel, or delivered with land vehicle and mechanically or hand deposited). • Placing secured nets on the substrate • Applying seed from vessel/vehicle or from foot • Place secured or trenched-in net bags

Species	2017 NWP 48 Work and Activities	
	Maintenance / Grow-out	• Continued removal of debris/aquatic species, as necessary • Repositioning/cleaning nets to remove debris/biofouling • Turning bags
	Harvest/ Processing	• Hand digging/bag removal • Mechanical harvest
Geoduck	Seeding/ Planting	• Raft, floats, and FLUPSYs and associated maintenance • Use of seed grow-out trays and bins • Prepare substrate by removal of debris (rocks/large wood) • Remove/re-locate undesired aquatic species • Install PVC tubes with individual net covers or flexible net tubes • Install secured area net covers • Install secured net tunnels
	Maintenance / Grow-out	• Clean tubes to remove debris/biofouling • Remove tubes/nets (area nets may be reset after tubes removed)
	Harvest/ Processing	• Harvest by hand (low tide, high tide, and subtidal by divers) • Use of pressured water to liquefy substrate
All species		• Use of work platforms • Vessel support (grounding/anchoring) • Land vehicle/foot support to and from uplands to transport equipment, material, shellfish, and people

2.4.7. Activities Specifically Excluded

Certain shellfish activities (Table 2-3) are excluded from the proposed action for various reasons including:

- Activity extends sufficiently beyond the jurisdiction of the Corps regulatory program and/or is regulated by another Federal agency (e.g., upland hatcheries, NPDES discharge, pesticide use).
- Any unauthorized activity (e.g., not permitted) is not included in the action.

Table 2-3. List of NWP 48 excluded work and activities

Excluded Work and Activities
Vertical fencing/vertical nets or drift fences (includes oyster corrals; does not apply to raft nets)

New berms or dikes or the expansion or maintenance of current, authorized berms or dikes
Pile driving
Installation and maintenance of mooring buoys
Construction, maintenance, and operation of upland hatcheries
Cultivation of invasive species
Construction, maintenance, and operation of attendant features, such as docks, piers, boat ramps, stockpiles, or staging areas
Deposition of shell material back into waters of the United States as waste
Dredging or creating channels (e.g., placing sand bags) so as to redirect fresh water flow
Any form of chemical application to control undesired species (e.g., non-native eelgrass *Zostera japonica*, burrowing shrimp)
The use of materials that lack structural integrity in the marine environment (e.g. plastic children's wading pools, unencapsulated Styrofoam®).
Unauthorized activities

2.5. Geographic area

The geographic area of the action is the nearshore coastal and inland marine waters of Washington State. This includes Washington coastal beaches, coastal embayments (e.g. Willapa Bay and Grays Harbor), the Strait of Juan de Fuca, and the Puget Sound/Salish Sea (see Figure 1). Work is only expected to occur in the shallow nearshore marine and brackish waters. No work is anticipated in freshwater. Negligible use of NWP 48 is expected in the Columbia River and along the Washington coastal beaches due to the lack of historical shellfish aquaculture in these locations, and the anticipated continued lack of aquaculture in the future. Since work under NWP 48 is not anticipated in the Columbia River estuary, coastal beaches, or in freshwater or upland areas, these geographic areas are not analyzed or discussed in the context of cumulative effects.

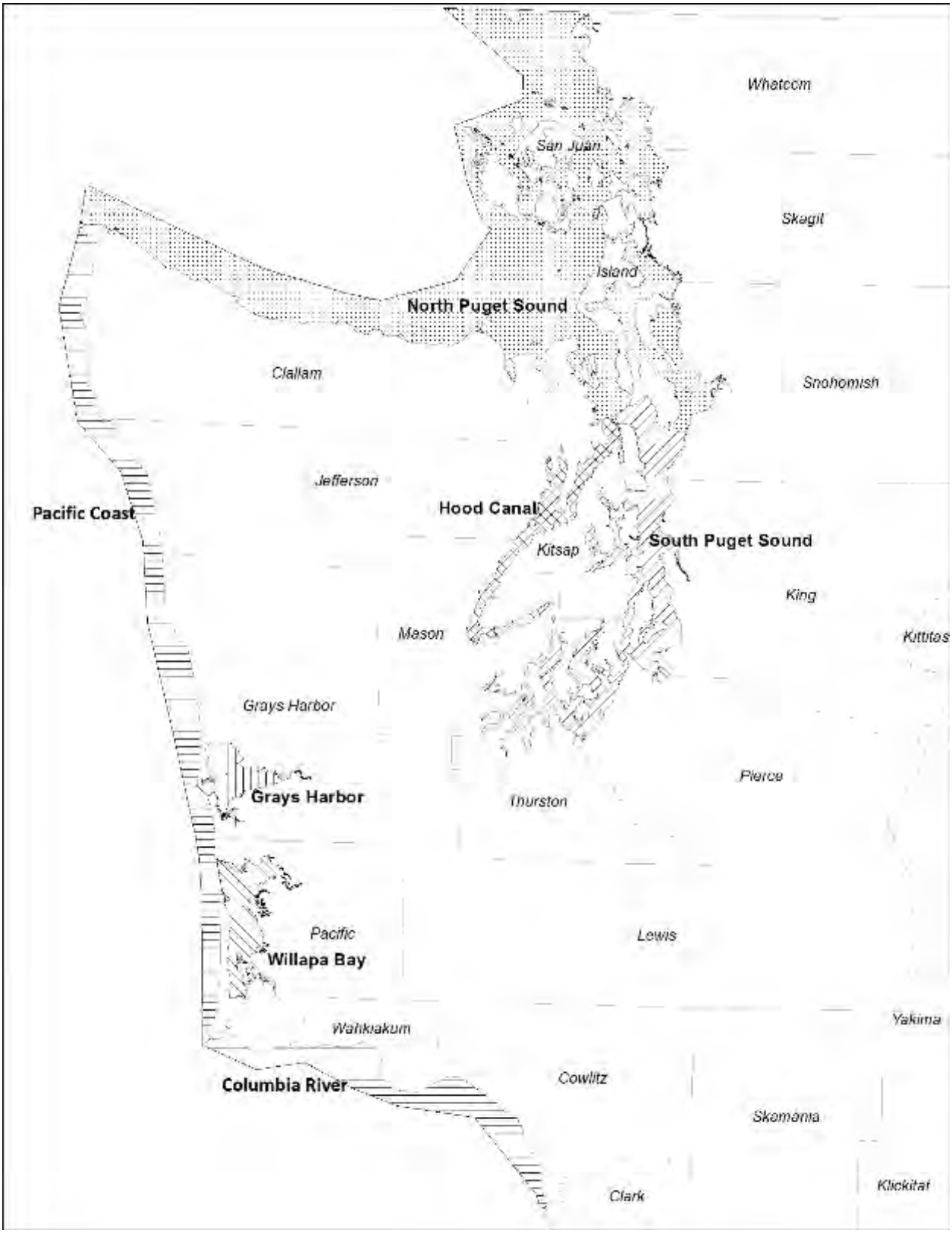


Figure 2-21. Geographic area and sub-regions of action

2.5.1. Acreage

The 2017 NWP 48 authorizes project areas for shellfish aquaculture. In the state of Washington project areas can be privately owned real estate parcels with the area delineated by a deed or a leased area that is delineated by the lease. A project area need not necessarily be entirely engaged in aquaculture but may include active culture areas, fallow areas, or areas that have never or will never be engaged in aquaculture. Project areas can be either continuing/ongoing if there has been aquaculture somewhere within the project area during the last 100 years or a project area can be new to aquaculture. Table 2-5 summarizes the anticipated total acreage that will be permitted under 2017 NWP 48 for continuing and new project areas by geographic area. This includes all project area acreage that was permitted under 2012 NWP 48 which is expected to be reauthorized under 2017 NWP 48 and anticipated new project area acreage. Continuing acreage includes all acreage that has been permitted to date under the 2012 NWP 48 and all known pending acreage. Since not all permit applications for 2012 NWP 48 have been received and some pending applications have not identified acreage, not all continuing acreage is known. The continuing acreage in Table 2-5 was therefore rounded up to account for this unknown acreage.

In order to determine the scale of shellfish activity conducted under the proposed action, the Corps developed an estimate for the total project area acreage that is expected to be authorized by 2017 NWP 48. Estimates for the amount of acreage that could be authorized under the proposed action are provided by geographic region.

The acreage estimates are based on many factors including historical Corps permit applications, estimates provided by commercial shellfish growers for future aquaculture production, coordination with the Washington Department of Natural Resources (WDNR) and their potential shellfish activities, and the general knowledge and expertise of the Corps professional staff that have processed shellfish related permit applications.

For the purpose of categorizing acreages, the activities have been subdivided into floating culture (i.e., with floating lines or rafts) and ground-based culture which includes all other activities including oyster longline culture. Based on analysis of permit applications, there are a total of 934 ongoing/existing project areas. Of these, a total of 927 include ground-based activities conducted in the intertidal or adjacent shallow subtidal areas. The remaining seven activity footprints are for floating culture with rafts exclusively. Five of the continuing activities include both raft and ground-based culture.

Floating aquaculture

Analysis of historical permit applications indicates that floating aquaculture activities occur in Willapa Bay, Hood Canal, South Puget Sound and North Puget Sound. There are a total of twelve continuing active footprints with rafts that cover 87 acres. It is estimated that an additional 100 acres of new floating acreage could be authorized under the 2017 NWP 48. New surface or floating longlines would be authorized under the proposed action. There are a total of 22 continuing active and 32 continuing fallow acres with surface longlines. New floating acres are estimates based on coordination with the shellfish industry and Corps professional judgment.

Ground-based aquaculture

Ground-based commercial aquaculture encompasses all of the activities discussed in Section 2 except for the floating activities using rafts. The anticipated acreage for these activities includes both continuing and new activities (**Error! Reference source not found.**). The acreage for the continuing activities was collected from permit applications that are maintained by the Corps. The geographic locations for each of the continuing activity footprints are illustrated in Appendix D.

The total acreage for new activities is estimated based on projections provided to the Corps by the aquaculture industry, the historical rate of permit applications, and the experience of Corps professional staff.

The vast majority of the ground-based commercial aquaculture and all new activities would occur at tidal elevations between - 4.5 ft and +7 ft MLLW. It is probable that some percentage of this total acreage would be authorized (or reauthorized) at subtidal elevations (i.e., deeper than - 4.5 ft MLLW). This would typically be shallow subtidal lands immediately adjacent to intertidal shellfish activity areas. Based on an analysis of historical permit applications, 22 acres of subtidal lands were previously authorized as continuing shellfish activities. Because permit applicants have not historically been required to delineate their project footprints by tidal elevation, this total likely underestimates the subtidal acreage of continuing shellfish activity. This conclusion is supported by Corps professional staff knowledge of many of the continuing shellfish activity areas. Analysis of aquatic parcel maps and the Corps geographic database also indicates that greater than 22 acres of subtidal lands have likely been previously authorized. WDNR has indicated all but 1,085 acres of marine bedlands (i.e., deeper than extreme low tide) in the State of Washington are owned by WDNR, and WDNR does not lease these lands for ground-based aquaculture currently (WDNR 2013a). WDNR does lease subtidal lands for floating raft aquaculture activities. Because public subtidal lands would not be used for ground-based aquaculture, these 1,085 acres would be considered the maximum amount of subtidal acreage available for ground-based commercial aquaculture. This would constitute less than 3% of the total continuing commercial acreage. These unknown subtidal acres are included in the totals for ground-based activities.

The vast majority of acreage for commercial aquaculture is for activities that are ongoing. Since these activities represent the majority of all shellfish activity potentially authorized under the proposed action, an evaluation of this information is useful for understanding the action and its effects. It is anticipated that all of the ongoing activities would be reauthorized by the Corps under the 2017 NWP 48. A detailed summary of the shellfish activities proposed by historical permit applicants can be found in Appendix B. A summary of the species cultivated by ground based methods can be found in Table 2-4. The table does not include a small amount of mussel bottom culture. The predominant species cultured varies by geographic region. On an acreage basis, the most commonly cultured species appears to be oyster followed by non-geoduck clams.

Table 2-4. Distribution of ground-based commercial aquaculture continuing footprints and acreage by species cultivated

Grays Harbor

Total	Oyster Only	Clam Only	Geoduck Only	Oyster, Clam, & Geoduck	Oyster & Clam	Oyster & Geoduck	Clam & Geoduck
Continuing footprints	23	0	0	0	5	0	0
Continuing acres active	801	0	0	0	343	0	0
Continuing acres fallow	1,813	0	0	0	7	0	0
Total acres	2,614	0	0	0	350	0	0

Willapa Bay

Total	Oyster Only	Clam Only	Geoduck Only	Oyster, Clam, & Geoduck	Oyster & Clam	Oyster & Geoduck	Clam & Geoduck
Continuing footprints	117	30	0	2	102	0	0
Continuing acres active	4,493	404	0	680	10,818	0	0
Continuing acres fallow	2,047	379	0	67	6,949	0	0
Total acres	6,540	782	0	747	17,767	0	0

Hood Canal

Total	Oyster Only	Clam Only	Geoduck Only	Oyster, Clam, & Geoduck	Oyster & Clam	Oyster & Geoduck	Clam & Geoduck
Continuing footprints	14	0	3	9	179	1	0
Continuing acres active	24	0	8	444	440	1	0
Continuing acres fallow	8	0	2	108	279	0	0
Total acres	33	0	10	552	719	1	0

South Puget Sound

Total	Oyster Only	Clam Only	Geoduck Only	Oyster, Clam, & Geoduck	Oyster & Clam	Oyster & Geoduck	Clam & Geoduck
Continuing footprints	3	18	142	56	89	15	34
Continuing acres active	46	36	121	635	1,310	34	140
Continuing acres fallow	2	8	45	454	222	5	14
Total acres	48	44	166	1,089	1,532	39	154

North Puget Sound

Total	Oyster Only	Clam Only	Geoduck Only	Oyster, Clam, & Geoduck	Oyster & Clam	Oyster & Geoduck	Clam & Geoduck
Continuing footprints	12	7	0	7	40	2	2
Continuing acres active	51	43	0	323	834	16	30
Continuing acres fallow	74	29	0	2,107	122	1	0
Total acres	125	72	0	2,430	956	17	30

Summary of NWP 48 acreage

The total potential commercial aquaculture acreage that would be authorized by geographic region is illustrated in Table 2-5.

Table 2-5. Total acreage by project area authorized under 2017 NWP 48 (2017 to 2022)

Project area acreage	Grays Harbor	Willapa Bay	Hood Canal	South Puget Sound	North Puget Sound	Total
Continuing/ongoing	3,846	36,315	1,820	3,648	3,946	49,576
New	24	19	105	106	78	332
Total (estimated)	4,000	40,000	2,000	4,000	5,000	55,000

Many project areas include fallow acreage or acreage that has never been engaged in aquaculture. This acreage is summarized in Table 2-6. For the purpose of this analysis it is assumed this acreage will be put into aquaculture because it will be authorized for that purpose. In this respect it is similar to a new project area but is not encumbered by the restrictions that come with a new project area (e.g., maximum of ½ acre aquatic vegetation impact).

Table 2-6. Existing project area acreage that is known to be fallow (as of 2012) or was never engaged in aquaculture.

	Grays Harbor	Willapa Bay	Hood Canal	South Puget Sound	North Puget Sound	Total
Fallow	1,820	9,441	410	787	2,333	14,792
Never in culture	333	272	53	326	280	1,265

Oyster culture methods vary by region. The ground culture method is by far the dominant method used for clams in all regions. A summary of primary culture methods and an estimate for the relative distribution of species cultured by region is illustrated in Table 2-7. The estimate is based on the information in Appendix B and Table 2-4.

This estimate is consistent with the PCSGA estimate of 300 acres currently used for geoduck culture in the Puget Sound and Hood Canal regions (PCSGA 2013a).

In order to evaluate effects of the action, the acreage for specific categories of activities and their geographic locations are described. This includes discussion of the prevalence of the various culture methods.

Table 2-7. Distribution of species cultivated and primary cultivation methods

	Grays Harbor	Willapa Bay	Hood Canal	South Puget Sound	North Puget Sound
continuing acres - cultured species distribution and methods					
oyster	95%	80-95%	40-60%	30-50%	50-60%
clam	1-5%	5-15%	20-40%	30-50%	30-40%
geoduck	0%	1%	10-20%	15-30%	1-10%
mussel	0%	1%	1%	1%	1%
oyster culture methods	bottom culture primary; longlines common	bottom culture primary; some longlines; limited rack & bag	bottom culture primary; some longlines; limited rack & bag	bottom culture dominant; limited rack & bag, longlines	bottom culture primary; longlines common; some rack & bag
clam culture methods	bottom	bottom	bottom	bottom	bottom
mussel culture methods	NA	surface longlines	rafts & surface longlines	rafts & surface longlines	rafts & surface longlines
new acres – anticipated cultured species distribution					
oyster & clam	95%	25%	78%	62%	79%
geoduck	0%	50%	18%	33%	19%
mussel	5%	25%	4%	5%	2%

2.6. Indirect Activities

2.6.1. Vessel and Vehicle Traffic

Vessel (boat/barge), vehicle (e.g., trucks, ATV), or foot traffic related to the transportation of people and materials to and from activity areas occurs in many, if not all, cases. Vessels could land on the shoreline and load or unload items to waiting vehicles or to individual persons who could then carry these items to an upland destination. Vehicle traffic could occur to and from shellfish activity areas directly along shorelines without any dock or pier. Vehicles could be traveling directly on the substrate (i.e., mudflats) to a proximate upland destination. The distinction between the interdependent vessel and vehicle traffic and the support activity described in Section 2.4.5 is the proximity to the shellfish activity area. In most cases, vessel traffic is anticipated to occur from the shellfish activity areas to a local pier, dock, or to the shoreline directly such as to a local beach. In some cases vessel traffic could occur from activity areas to a more distant destination (e.g., to deliver product to market).

2.6.2. Upland Storage Sites

Upland locations used for storing equipment, materials (e.g., shell), or maintaining live product in tanks (e.g., wet storage) could occur in close proximity to shellfish activity areas. These upland locations are in many cases interdependent with the shellfish activity area. The use and management of upland storage locations in close proximity to shellfish activity areas are considered to be interdependent with the proposed action. Disturbance (e.g., of native riparian vegetation) in such upland areas shall be minimized consistent with the Conservation Measures.

2.6.3. Shore Facilities

Shore facilities such as hatcheries and processing plants are typically used in coordination shellfish activities but are not regulated by the Corps.

2.6.4. Pesticide Application

The application of the pesticide carbaryl to aquatic lands in Willapa Bay and Grays Harbor has occurred since the 1960s to control burrowing shrimp species (ghost shrimp *Neotrypaea californiensis* and mud shrimp *Upogebia pugettensis*). Pesticide use is not universal to all applicants. It is dependent on environmental conditions and other factors associated with individual project areas and applicants. Pesticides are regulated under section 402 of the CWA which is administered by the Washington State Department of Ecology with EPA oversight. In recent years this activity has received significant scrutiny due to its environmental effects. In 2015 WDOE approved the application of Imidacloprid on 2000 acres in Willapa Bay and Grays Harbor. The applicants subsequently requested WDOE cancel the permit in response to public concerns. A new permit application was received by WDOE in 2016 to apply imidacloprid, a neonicotinoid pesticide, on 485 acres in Willapa Bay and 15 acres in Grays Harbor. The earliest this work could occur is 2018. No pesticides would be applied in 2017. WDOE has preliminarily determined that the proposal will have significant adverse environmental impacts under the State Environmental Policy Act. At this time it is uncertain whether the application will be approved (Rockett 2017 pers comm).

3. Effects of the Action

Aquaculture consists of a collection of individual activities that each have their own effects. These effects may be relatively short-term or longer lasting. The effects of these individual activities are discussed below. Of equal or more relevance to ESA listed species are the effects of the collective activities, their frequency, duration, timing, geographic location, and general scale across the landscape. The frequency and geographic scale of the activities are discussed Section 3.2.

3.1. Effects of Individual Activities

The effects described below are written from the perspective of a worst-case effects scenario relative to issues such as work timing and husbandry practices. The purpose of this approach is to ensure the full range of possible effects is discussed. A brief summary of these effects is provided in Table 3-1 for the culture methods and many of the individual activities.

3.1.1. Water Quality

Bivalves themselves remove phytoplankton and suspended particles from the water column. High densities of bivalves that occur with aquaculture can locally decrease phytoplankton, nutrients, and suspended material increasing water clarity (WDNR 2014b; Straus et al. 2013; Heffernan 1999; Newel 2004). Wastes from the cultured species are excreted into the water column and ultimately settle to nearby sediments.

Many of the shellfish activities (e.g., dredging, dive harvest) physically disturb the substrate which results in localized turbidity, increases in suspended sediment, and potentially changes in other water quality parameters such as lower dissolved oxygen (Mercaldo-Allen and Goldberg 2011, Heffernan 1999). These water quality effects may be delayed for activities conducted at low tide 'in the dry' until the tide floods the area. There may be a turbidity plume emanating from the actively worked area at low tide for some activities such as intertidal geoduck harvest. In-water activities such as dredging and dive harvest may affect water quality during the period of activity and a short period afterwards. These effects on water quality are temporary and not expected to persist longer than a period of hours or days (Mercaldo-Allen and Goldberg 2011).

3.1.2. Substrate and Sediments

Physical disturbance of the substrate can occur as a result of anchors placed for rafts or surface longlines, from bed preparation activities (e.g., tilling, harrowing, substrate leveling), planting activities (e.g., installation of nets), harvest (e.g., raking, dredge, hydraulic harvest), the grounding of vessels and support structures, and the general traffic of personnel and equipment. Sediment compaction can occur from vessel grounding, vehicle and personnel traffic. Topographic variation and natural debris such as large wood and boulders are often removed. In some cases this can result in filling of tidal channels in order to level a bed. Bed preparation techniques vary widely as do their effects depending on the specific cultured species and individual grower practices. Bed preparation and harvest activities such as dredging, tilling, raking, and hydraulic harvest result in turning over the sediments may temporarily alter the physical composition and chemistry of the sediment (Mercaldo-Allen and Goldberg

2011, Bendell-Young 2006, WDNR 2014b). Hydraulic harvest in geoduck culture areas results in liquefaction of the substrate.

Subtidal geoduck harvest temporarily leaves behind a series of depressions, or holes where the clams are extracted. The number of depressions created across a harvested area in a tract depends on the density of geoducks. The fate of these depressions, in terms of the time to refill, depends on the substrate composition and tidal currents. The time for them to refill can range from several days up to 7 months (Goodwin 1978).

Many activities result in a change to the composition of the native substrate which is often mud or sandflats. Graveling results in a generally firmer substrate with a larger grain size. Oyster bottom culture results in a substrate that is predominantly or entirely oysters that are periodically removed during harvest. Longline and stake culture result in an altered substrate that is partially shaded/occupied by oysters and stakes. Culture techniques that use racks, bags, nets, and PVC tubes result in an altered substrate that is intermittently or more broadly surfaced with plastic. There can be wide variability in the coverage of the plastic structure across the substrate depending on the practices of individual growers. Bag culture could be sufficiently dense to completely cover an existing substrate over a relatively broad area (Figure 2-9). Similarly plastic nets placed for clam or geoduck culture could extend over multiple acres (Figure 2-17). Alternatively, structures may be placed in rows that result in alternating plastic versus native substrate (Figure 2-10, Figure 2-18). Where the profile of the artificial structure is low, for example with bags resting on the substrate or area nets, sediment may gradually accumulate on top of the structure resulting in a return, at least in part, to a substrate similar to what existed before the activities were initiated. Periodic maintenance of the nets may remove this accumulated sediment. The artificial structure can be present for multiple years in a particular location (e.g., geoduck tubes) or can remain almost continuously over time as new crops are quickly planted after harvest (e.g., clam bags, area nets for clam culture).

Activities that involve placement of structure such as rafts, floating longlines, oyster longline, and rack and bag culture can affect water currents and circulation patterns, can lead to changes in rates of erosion and sedimentation, and altered tidal channels (WDNR 2014b, Wisehart 2007). An evaluation of aerial photographs indicates that tidal channels are generally less prevalent in aquaculture areas which may be due to gradual filling and/or grading that occurs as part of the work. Sedimentation and nutrient enrichment may occur from the settling of wastes to the substrate from the cultured species (Heffernan 1999, WDNR 2013a). Culture using rafts and longlines in particular often experience nutrient enrichment of the local sediments due to accumulation of biological waste and shell material from the cultured species. Anoxic sediments from nutrient enrichment have been documented below rafts (Hargrave et al. 2008; Heffernan 1999). Man-made debris such as metal and plastic can also accumulate beneath rafts.

3.1.3. Vegetation

Aquaculture activities classified as continuing active and fallow would occur in areas containing eelgrass. New project areas could disturb as much as ½ acre of submerged vegetation.

Effects on aquatic vegetation can occur where shellfish activities are co-located with aquatic vegetation including eelgrass and kelp. Rafts shade the underlying substrate limiting the growth of aquatic

vegetation. They are typically sited in waters too deep for eelgrass. Macroalgae such as kelp could be negatively affected or excluded from areas beneath rafts (WDNR 2014b). Floating culture using lines suspended from buoys would typically have a smaller footprint than a raft so substrate shading may be limited depending on spacing of the lines.

Ground-based culture activities are often conducted in the same tidal zone occupied by eelgrass. In Puget Sound, WDNR inventoried eelgrass (*Z. marina*) at a minimum elevation of -41 ft MLLW at a site in central Puget Sound and a maximum elevation of +7.5 ft MLLW at a site in Hood Canal (WDNR 2011). The average minimum and maximum elevations throughout Puget Sound were +0.3 to +3.0 ft MLLW. This range encompasses the elevations where ground-based shellfish activities would occur. When shellfish activities are co-located in areas with eelgrass, a net loss in eelgrass is typically the result either as a result of bed preparation activities, competition for space with the culture species or equipment, or harvest (Tallis et al. 2009, Wagner et al. 2012, Wisehart 2007; Dumbauld et al. 2009, Ruisink et al. 2012, NMFS 2009, NMFS 2005, Rumrill and Poulton 2004). This is the case for all forms of ground-based culture. Eelgrass is replaced by oysters, culture bags, and geoduck tubes. Eelgrass often coexists within the culture area albeit at a reduced density. Bed preparation and harvest activities physically remove eelgrass (Ruesink and Rowell 2012; Tallis et al. 2009; Boese 2002, Simenstad and Fresh 1995). Use of vessels and floats can smother and cause physical disturbance to eelgrass due to grounding of the vessels (NMFS 2005). Longline and suspended bag culture may shade eelgrass and preclude it underneath the structure (Skinner et al. 2014; WDNR 2014b). Biofouling on cover nets can reduce light availability for eelgrass (WDNR 2013a). The magnitude and duration of effect may vary depending on culture method and individual grower practices. For example, dense, mature bottom oyster culture may totally preclude eelgrass during certain parts of the aquaculture cycle while lesser densities of oyster may allow eelgrass to coexist within the culture area.

Eelgrass recovery times after disturbance vary depending on the type of disturbance, environmental conditions, and the availability of local seed sources. Timeframes can range from less than two to greater than five years (Dumbauld et al. 2009; Tallis et al. 2009; Wisehart; 2007, Boese 2002).

3.1.4. Benthic Community

Most shellfish activities affect the existing benthic community to some degree due to the physical disturbance of the substrate. Each phase of the aquaculture cycle of activity which is characterized by bed preparation (e.g., tilling), planting (e.g., net installation), maintenance (e.g., cleaning area nets), and harvest results in physical disturbance of the benthic community and often a temporary decrease in abundance of many infaunal and epifaunal species (Vanblaricom et al. 2015; Mercaldo-Allen and Goldberg 2011; WDNR 2014b; Straus et al. 2013; Dumbauld 2008; Heffernan 1999; Bendell-Young 2006; Simenstad and Fresh 1995). Bed preparation activities often directly remove many species including bivalve predator species, bivalve competitor species, and commercial species such as bivalves/burrowing shrimp. Bag culture techniques result in bags with bivalves placed directly on the substrate smothering the existing benthic community. The magnitude and duration of the effect is variable depending on the activity, individual husbandry practices, and environmental conditions. The benthic community typically recovers in a period of weeks or months depending on the activity (Vanblaricom et al. 2015; WDNR 2014b; Mercaldo-Allen and Goldberg 2011; WDNR 2008).

Benthic community diversity and/or composition may be altered as a result of physical changes to the substrate depending on the specific culture method and activity. Oyster bottom culture results in a shift in the composition of the benthic community to an oyster dominated community. This may have positive, negative or neutral effects on individual species. Areas with mature oyster bottom culture may have a comparable level of species diversity and abundance to an eelgrass based habitat (Ferraro and Cole 2007). Once oysters are harvested, the benthic community may begin transition back to the pre-oyster based community that existed previously. Regular graveling can result in shifts in the composition of the benthic community due to the change in substrate composition over time (Simenstad and Fresh 1995, Simenstad et al. 1991). When activities result in removal of eelgrass, a corresponding change in the benthic community occurs (Carvalho et al. 2006, Simenstad and Fresh 1995). Changes in sediment chemistry from nutrient enrichment can result in decreased benthic community abundance and diversity for some culture methods (Heffernan 1999; Stenton-Dozey 2001). Shifts in benthic community composition diversity are less clear for other culture methods and the subject of active study. Chemical changes to the benthic habitat can also occur as a result of aquaculture, particularly under floating rafts, where nutrients and aquaculture debris can accumulate.

Activities that include installation of artificial structure such as geoduck tubes, nets, bags, or longlines may result in shifts in benthic macrofauna. In a study of geoduck tubes, increased numbers of transient fish and macro invertebrate species were found when the structure was in place (McDonald et al. 2015). Effects ended when the structure was removed. Tubes and nets are typically in place for 2 to 3 years before harvest at 4 to 7 years. A study of rack and bag culture also suggested habitat benefits of the structure to certain fish and invertebrate species (Dealteris et al. 2004). Studies with area nets have been variable with no changes in species composition and diversity in some cases (Vanblaricom et al. 2015; Simenstad et al. 1993) and altered species diversity and composition measured in others (Bendell-Young 2006).

3.1.5. Fish and Birds

In-water activity, noise, and increases in suspended sediment would displace many fish species and birds from localized work areas. Temporary decreases in benthic community abundance would locally decrease available prey for fish. Eelgrass provides important habitat and prey for many fish and bird species including juvenile salmon. In areas where eelgrass is removed, the fish community may be negatively affected (NMFS 2005).

Forage fish are an important prey resource for many species including Chinook salmon, steelhead, bull trout and marbled murrelet. Several forage fish including Pacific herring, surf smelt, and Pacific sand lance spawn throughout the action area. Spawning and egg incubation could potentially be affected by shellfish activities. In the Puget Sound region, herring spawn in the lower half of the intertidal or shallow subtidal zone down to a depth of -10 ft MLLW depending on water clarity (Penttila 2007). Native eelgrass, *Z. marina*, is of primary importance as a herring spawning substrate. Spawning also occurs on other aquatic vegetation and rocks. The removal of vegetation, which may occur as a result of some of the shellfish activities could decrease available spawning habitat for herring. Spawning has occurred on shellfish gear such as racks or tubes (Pentilla 2007). Work in areas with spawn may kill the eggs.

Sand lance deposit their eggs in substrate that is predominantly sand in the high intertidal above +5 ft MLLW. Surf smelt tend to spawn in substrates with a mix of sand and gravel above +7 ft MLLW (Penttila 2007). Shellfish activities conducted when spawning is occurring or after eggs have been deposited could potentially disturb these species or destroy eggs. Culture and harvest activities would not typically occur above +7 ft MLLW but would occur below that elevation in the zone where sand lance may deposit eggs. Above +7 ft, shellfish activities would still occur including general travel to and from shellfish activity areas, temporary storage/staging of equipment, and grounding of floats which all could result in trampling, smothering, or loss of eggs.

Area nets used for clam and geoduck culture could potentially entrap fish, birds, or other aquatic species if they become loose or dislodged (Bendell 2015, Corps 2014b, Smith et al. 2006). This could occur due to variable husbandry practices with respect to net installation and maintenance, the high energy of the marine environment which makes securing nets difficult, and large wood debris strikes that create holes in the nets. Rack and/or bag culture could also entrap fish species by creating a physical barrier across the tidelands (Figure 2-10). This barrier could temporarily impound water and/or prevent fish from returning to deeper water during a receding tide which would result in stranding fish on the tidelands. The density and orientation of the structure relative to water drainage patterns would be particularly important in determining the risk of this occurring. Finally, nets associated with floating rafts would exclude fish from habitat under the rafts. Net deployment may occasionally capture fish depending on the depth of the nets.

3.1.6. Contaminants

The use of vessels and vehicles could result in accidental discharges of fuel, lubricants, and hydraulic fluids. The effect on water quality depends on the type of contaminant spilled, time of year, spill volume, and success of containment efforts.

Plastic debris such as nets and tubes may break free from project sites and be released to the environment. These materials eventually breakdown in the environment into small plastic particles called microplastics which can be ingested by organisms and accumulate up the food web (Wright et al 2013). Microplastics have been found in numerous species including fish and shellfish species and documented to have adverse effects (Lönnstedt and Eklöv 2016). Microplastics have been found in Puget Sound (Davis and Murphy 2015). It is uncertain to what degree aquaculture contributes to this debris.

3.1.7. Noise

Noise from equipment operation could temporarily disturb and displace both aquatic and upland species from the local area. The types of vessels commonly used for shellfish activities are listed in Table 2-1. To estimate noise produced by shellfish activities, an analysis was conducted using data from Wyatt (2008) for a commonly used vessel, a 21-foot Boston Whaler with a 250 horsepower Johnson 2-cycle outboard motor. Operating this vessel at full speed produced a sound measured at 147.2 decibels (dB) root mean square (RMS) re 1 microPascal at 1 meter[1]. Assuming a background underwater sound level

[1] In this document, underwater sound pressure levels given in units of dB RMS and dB peak are referenced to a pressure of 1 microPascal and sound pressure levels given in dB SEL (sound exposure level) are referenced to 1 microPascal^2 second unless otherwise noted.

of 120 dB RMS, which is the threshold established by NMFS for behavioral effects to marine mammals, and using the practical spreading loss model preferred by NMFS and USFWS, sound produced by this vessel would attenuate to 120 dB RMS within 65 meters (213 feet). Larger vessels could also be used on occasion which could potentially generate greater underwater sound levels.

The intermittent use of power equipment is likely to produce in air noise of up to 81 dBA for dive harvesting and 82 dBA for shoreline work. Over marine water, the 81 dBA value would attenuate to the background level (57 dBA) within 792 feet and over a terrestrial habitat the 82 dBA would attenuate to the background noise level of a rural environment (35 dBA) within 3793 feet (0.71 mile). Maximum surface noise levels from boat operations and dive support equipment for subtidal geoduck harvest was measured at 61 to 58 dBA at a distance of 100 feet where auxiliary equipment was housed on deck and 55 to 53 dBA where equipment was housed below deck (WDNR 2008).

3.1.8. Summary

Effects of the various shellfish activities on habitat are summarized in Table 3-1. It is a summary of worst-case effects that would not necessarily occur in all locations where the activity is occurring. Substantial local variability would be expected due to individual grower practices (e.g., densities, scale, techniques) and environmental conditions.

Table 3-1. Summary of shellfish activity effects on habitat

Shellfish Activity	Cultured/ Harvested Species	Primary Effects on Habitat
floating culture and harvest methods		
floating culture with rafts, anti-predator nets	mussel	• altered benthic substrate dominated by shell/barnacle debris • nutrient enrichment of sediments; potential anoxia • decreased benthic species diversity and abundance • shaded substrate limiting or preventing aquatic vegetation • potentially trap fish, bird species within nets • contributes plastic debris to the aquatic environment (e.g., disks, nets)
surface longlines	mussel, oyster, clam	• limited shading of substrate, minor effects on aquatic vegetation
FLUPSYs	oyster, clam, geoduck	• shades substrate preventing or limiting growth of aquatic vegetation
ground-based culture and harvest methods		
oyster bottom culture	oyster	• altered benthic habitat and species composition • aquatic vegetation replaced by oyster habitat
longline, stake culture	oyster	• altered benthic habitat, nutrient enrichment; potential effect on benthic community composition • reduction of aquatic vegetation • increased sedimentation • potential disruption of fish travel patterns, foraging

Shellfish Activity	Cultured/ Harvested Species	Primary Effects on Habitat
rack and bag culture	oyster	• altered benthic habitat; potential effect on benthic community composition • aquatic vegetation removed • creates barriers to tidal flow; altered sedimentation/erosion patterns • contributes plastic debris to the aquatic environment • potential migration barrier and stranding of fish and other species • loss of forage fish spawning habitat (e.g., sand lance)
clam ground culture	clam	• altered substrate due to graveling, artificial structure (e.g., nets); shift in benthic community composition over time due to regular graveling • aquatic vegetation removed, reduced due to artificial structure, activities • loss of forage fish spawning habitat (e.g., sand lance)
bag culture (bags directly on substrate)	clam, oyster	• altered benthic habitat; potential effect on benthic community composition • aquatic vegetation removed, reduced due to artificial structure, activities • contributes plastic debris to the aquatic environment • loss of forage fish spawning habitat (e.g., sand lance)
geoduck culture	geoduck	• altered benthic habitat; potential effect on benthic community composition • aquatic vegetation removed, reduced due to artificial structure, activities • contributes plastic debris (e.g., PVC tubes, nets) to the aquatic environment
low tide activities		
install and maintenance of area nets	clam, geoduck	• altered benthic habitat; temporary decrease in benthic community abundance • lost and unsecured nets lead to fish and wildlife entanglement
'hand' harvest (rakes, shovels, containers)	clam, oyster	• substrate disturbance, temporary decrease in benthic community abundance, aquatic vegetation (e.g., eelgrass) • short-term increase in suspended sediments • potential loss of forage fish eggs (e.g., sand lance)
bed preparation (mechanized tilling, leveling substrate, hydraulic pre-harvest)	oyster, clam, geoduck	• substrate disturbance, temporary decrease in benthic community abundance, • aquatic vegetation removed, reduced • short-term increase in suspended sediments • altered, filled tidal channels
low tide hydraulic harvest	geoduck	• substrate disturbance, temporary decreases in benthic community abundance, • aquatic vegetation removed, reduced • short-term increase in suspended sediments
longline harvest	oyster	• substrate disturbance, temporary decreases in benthic community abundance, • aquatic vegetation removed, reduced
vehicle and vessel traffic on tidelands	oyster, clam, geoduck, mussel	• localized compaction of substrate , smothering of benthic community, aquatic vegetation • compaction, smothering of incubating surf smelt and sand lance eggs
temporary equipment storage on tidelands; use	oyster, clam, geoduck, mussel	• localized compaction of substrate , smothering of benthic community, aquatic vegetation • compaction, smothering of incubating surf smelt and sand lance eggs • shades substrate limiting or precluding vegetation

Shellfish Activity	Cultured/ Harvested Species	Primary Effects on Habitat
of floats, work platforms		
in-water activities		
dredging, harrowing, longline harvest	oyster, clam	• in-water disturbance, noise, increased suspended sediments • substrate disturbance, temporary decreases in benthic community abundance • aquatic vegetation (e.g., eelgrass) removed • potential loss of forage fish eggs (e.g., herring)
graveling	oyster, clam	• gradually alters substrate from mud/sand to firmer, gravelly substrate; altered benthic community over time • in-water disturbance, noise, increased suspended sediments
hydraulic dive harvest	geoduck	• in-water disturbance, noise, increased suspended sediments • substrate disturbance, temporary decreases in benthic community abundance • aquatic vegetation (e.g., eelgrass) removed • potential loss of forage fish eggs (e.g., herring) • disruption of fish travel patterns, foraging

3.2. Spatial Extent and Frequency of Effects

The following section discusses the scale and frequency of activities and effects resulting from the proposed action.

3.2.1. Extent of Floating Activities

Floating aquaculture occurs in all of the geographic regions except for Grays Harbor. In all cases the acreages involved are negligible in the context of each region. Activities are concentrated in a few embayments (e.g., Quilcene Bay, Penn Cove) where the acreage covers a larger percent of the embayment area (see figures in Appendix D). Effects would be limited to the immediate proximity of the work areas and would continue for the duration of the permit authorization and likely beyond.

3.2.2. Extent of Tideland Activities

The vast majority of the ground-based continuing active and fallow/new activities would occur in the intertidal zone as would all of the new aquaculture, restoration, and recreation activities. An unknown but likely insignificant percentage of the ground-based continuing aquaculture activities (both active and fallow) would occur in the shallow subtidal zone. For these reasons and to simplify the analysis, the entire ground-based acreage is considered intertidal. The percentage of the total intertidal acreage that would be devoted to shellfish activities within each geographic region is summarized in Table 3-2. The total tideland acres are based on the area classified as marine tideland in the Washington State aquatic parcel GIS database (WDNR 2014a). Marine tidelands extend from ordinary high tide down to extreme

low tide (WDNR 2013a). This analysis indicates proportionally how much of the intertidal habitat would be affected by the proposed action.

Table 3-2. Project area acreage relative to total tideland acreage

	Grays Harbor		Willapa Bay		Hood Canal		South Puget Sound		North Puget Sound		Total	
	acres	% of tidelands	acres	% of tidelands	acres	% of tidelands	acres	% of tidelands	acres	% of tidelands	acres	% of tidelands
Total marine tideland acres	41,115		49,194		11,378		30,075		84,283		216,045	
Total continuing	4,000	10%	40,000	81%	2,000	18%	4,000	13%	5,000	6%	55,000	25%
continuing fallow	1,820	4%	9,468	19%	402	4%	780	3%	2,333	3%	14,803	7%
new	24	0.1%	19	0.0%	105	0.9%	106	0.4%	78	0.1%	332	0.2%
cumulative total (continuing + new)	4,024	10%	40,019	81%	2,105	19%	4,106	14%	5,078	6%	55,332	26%

For all regions combined, the continuing fallow and new shellfish activity would occur on 8% of the combined tidelands. This varies between a low of 3% in South Puget Sound to a high of 19% in Willapa Bay. Continuing active aquaculture activities occur on 10% of the combined tidelands across all the regions although there is quite a bit of variability ranging from a low of 2% in North Puget Sound to a high of 33% in Willapa Bay. The cumulative total percentage of tidelands with some form of shellfish activity is 18% across all the regions. This coarse scale analysis illustrates the geographic magnitude of the action. Comparatively higher percentages of tidelands may be affected in individual embayments within each region. For example, in South Puget Sound, shellfish activities are concentrated in the far south and west corner of the region (see Appendix D). In north Puget Sound, shellfish activities are concentrated in several smaller embayments including Samish Bay, Discovery Bay, and Kilisut Harbor.

The acreages classified as fallow and new contain relatively undisturbed habitat currently. The action would result in a change from this undisturbed habitat to an aquaculture farm. Activities with effects similar to those described in Section 3.1 would occur on this acreage over the period of the permit authorization.

3.2.3. Frequency of Disturbance

Some of the proposed shellfish activities may only be conducted once in that footprint over the anticipated 5 year period of the permit authorization and thus would have a very limited period of effects. In other cases, multiple activities may occur on a given footprint annually or potentially more

frequently. For example active maintenance of cover nets for clams could occur monthly. Active oyster bottom culture on a given footprint could include two successive dredges, harrowing, and graveling each year. The frequency of activities on most acreage would fall somewhere in between these extremes. The variability in activity frequency among shellfish growers is also high. Table 3-3 lists frequencies of occurrence for a number of the activities. The information was gathered from individuals engaged in aquaculture in the State of Washington (Corps 2014a, Corps 2011).

Table 3-3. Shellfish activity frequency of occurrence and acres completed per day

Activity	Acres completed per day	Frequency of occurrence
mussel harvest	--	12-14 months
graveling	1	1 year
harrowing/tilling	5	1 - 4 years
dredge harvest (includes for transplanting)	0.5	1 - 4 years
longline mechanical harvest	0.125	3 years
geoduck harvest (in cultured areas)	.01 - .06	4 - 7 years
clam raking	0.05 - 0.1	3 yrs
clam mechanical harvest	0.8	3 years
net install, removal (clam, geoduck)	--	2 - 3 yrs

Note: This information does not necessarily encompass the full range of activity rates and frequencies for the activities. There is wide variability. The information is considered representative but is based on a limited sampling of aquaculture growers (sources Corps 2014a, Corps 2011).

For some areas, particularly larger aquaculture acreages, there is a progression of activity from one end of the acreage to the other that may occur over a series of days, weeks, or longer. Certain effects, such as increases in suspended sediment, from one part of the acreage may drift over locations where the activity had previously been completed thereby extending the duration of effects in that location. This is most applicable to those activities that take comparatively longer to conduct (see Table 3-3). For example, harvest of cultured geoduck is a comparatively time consuming activity that could occur for months at a particular location as it slowly progresses across the acreage.

Most of the activities occur at a frequency of only once every year, or once every few years on given acreage. In the context of the temporary impacts that occur with the activities, the relevance of this frequency is dependent on recovery from the impact. Effects that diminish quickly such as increases in suspended sediment are minor in the context of a once per year frequency. The collective activities conducted on a particular acreage may increase this to 3 or 4 times per year. Collectively the total period of effects is still minor and on the order of days. For impacts that require a slightly longer period for recovery such as the benthic community (weeks to months) following bed preparation or harvest activities, the period for effects would be comparatively longer. For impacts where recovery times are on the order of years, such as disturbance to eelgrass, an annual or every few year repeat disturbance

may never allow a full recovery of the eelgrass from the impact or the impact would be repeated shortly after recovery is achieved.

In-water Disturbance

Activities conducted in-water include graveling, harrowing, dredging, mechanical longline harvest, and geoduck dive harvest where there is potential to directly affect fish species. To determine the frequency and extent of these in-water activities at a regional scale, estimates were made for the total acres per day worked and total activity days for each region. 'Acres worked per day' is an estimate of the number of acres that would be worked every day for one year to complete the tasks in one year. The analysis assumes the activity effort is equally spread across the entire year which may be unrealistic but does provide some indication of the relative scale of the collective activity level. 'Activity days per year' is an estimate of the number of days that are required to be worked in order to complete the task on the activity acres during one year. It is analogous to 'man-days'. More detail including the methodology used to develop the estimates can be found in Appendix C. The locations of the specific in-water activities can be found in Appendix F. This analysis is for work that occurs in the intertidal zone, so it does not include subtidal geoduck dive harvest.

The analysis suggests work is regularly occurring, perhaps on a daily basis, at the regional scale. This is consistent with the idea that shellfish product must be delivered to market on a regular and perhaps daily basis. Willapa Bay is by far the region with the most work occurring. There are an estimated 139 acres that would be worked each work day to accomplish all the tasks in one year. Relative to the total tideland acreage per region, the acres worked per day estimate is negligible (0.3% in Willapa Bay). If assume work only occurs once per month, this increases to 6% of the tidelands worked in Willapa Bay on that one day per month. In some small embayments where shellfish activities are more concentrated, this percentage of activity relative to the total tidelands in that one embayment would be higher.

Table 3-4. Estimated frequency in-water activities would be conducted in the intertidal zone (see Appendix C for details)

		acres engaged in in-water activities	in-water activity acres worked/day	in-water activity days/year
Grays Harbor	Continuing active	2,018	5.9	4,003
	Cont. fallow & new	2,885	9.5	5,579
	Subtotal	4,903	15.4	9,582
Willapa Bay	Continuing active	25,113	86.0	42,542
	Cont. fallow & new	15,164	53.2	25,340
	Subtotal	40,277	139.1	67,882
Hood Canal	Continuing active	645	1.6	1,408
	Cont. fallow & new	1,609	4.9	2,719
	Subtotal	2,254	6.6	4,127
South Puget Sound	Continuing active	2,283	7.9	3,959
	Cont. fallow & new	1,939	6.1	3,551

	Subtotal	4,222	14.0	7,510
North Puget Sound	Continuing active	1,649	6.0	2,531
	Cont. fallow & new	3,162	11.3	3,912
	Subtotal	4,811	17.3	6,443
Total	Continuing active	31,708	107.4	54,442
	Cont. fallow & new	24,759	85.0	41,101
	Grand Total	56,467	192.4	95,543

Note: acres worked/day assumes work occurs each work day throughout the year (260 work days/yr)

3.2.4. Cover Nets and Artificial Structure

Culture methods that result in a change to the substrate (e.g., bag culture, cover nets) would result in impacts that may be more or less continuous for the period of the permit authorization because there is no recovery or return to the prior substrate and habitat conditions. A new crop of bags would be placed shortly after the previous crop is harvested. Geoduck culture would result in periods with and without structure. Depending on individual grower practices, structure to support geoduck culture is expected to occur between 30 and 100% of the time.

The placement of artificial structure for growing shellfish occurs in all the geographic regions. The number of acres potentially with artificial structure is summarized by region in Table 3-5. These acreages are best interpreted as a maximum for each culture method which, if implemented, would result in a less than equivalent decrease in acreage for another activity in the region (see discussion in Appendix B). The geographic locations where cover nets would occur for the continuing active and fallow acres are illustrated in Appendix G. It is assumed that all new aquaculture activities will also employ methods using artificial structure. Restoration and recreation related activities are generally not expected to employ artificial structure although there may some exceptions.

Table 3-5. Artificial structure by region

		Grays Harbor	Willapa Bay	Hood Canal	South Puget Sound	North Puget
oyster longline/stake	active	732	4,377	268	171	719
	fallow	533	1,913	77	51	2,081
rack and/or bags (clam and oyster)	active	29	829	115	189	328
	fallow	6	72	23	51	2,050
geoduck tubes	active	0	1	453	931	369
	fallow	0	67	110	518	2,108
cover nets	active	0	3,380	538	2,011	637
	fallow	0	2,637	337	724	2,204
new aquaculture		100	100	438	448	315
total	active	861	8,687	1,812	3,750	2,368

	fallow & new	639	4,789	985	1,792	8,758
total (plastic structure only)	active	129	4,310	1,544	3,579	1,649
	fallow & new	106	2,876	908	1,741	6,677

Notes:

1. Acreages are likely overstated by some unknown amount due to double or triple counting associated with limited detail on permit applications (See App. B). Acreages are best interpreted as a maximum for each activity which, if implemented, would result in a less than equivalent decrease in acreage for another activity in the region.
2. All new acres assumed to potentially contain plastic structure or longline/stake.

3.2.5. Eelgrass

The continuing active and fallow aquaculture acres could potentially occur in areas with eelgrass. A geographic analysis was conducted to estimate the aquaculture acreage potentially co-located with eelgrass. A description of the analysis, detailed results, and figures illustrating geographic locations where aquaculture and eelgrass are co-located can be found in Appendix D. The results provide a conservative estimate of aquaculture co-located with eelgrass appropriate for this analysis. The results are summarized in Table 3-6. They suggest there is substantial overlap between eelgrass and much of the continuing active and fallow aquaculture acreage. This pattern occurs in all the geographic regions. An estimated 14,803 acres of continuing active aquaculture is potentially co-located with eelgrass across all the geographic regions. This results in reduced productivity and habitat function for this eelgrass as discussed in Section 7.1. This is an ongoing effect under the environmental baseline that will continue under the proposed action. An estimated 11,227 acres of continuing fallow acreage would be co-located with eelgrass under the proposed action. Effects to eelgrass in the fallow areas would be considered new effects relative to the environmental baseline. The magnitude of effect would be dependent on the type of culture method employed and the activities conducted as described in Section 7.1.

Willapa Bay has by far the most overlap between eelgrass and the continuing active and fallow acres. This is followed by the North Puget Sound and Grays Harbor regions where over 1,000 acres of eelgrass are estimated to overlap with the fallow acreage. Aquaculture activities (active and fallow) are more often than not co-located with eelgrass in Willapa Bay, Grays Harbor, and the North Puget Sound Region. In the Hood Canal region, aquaculture acreage is equally split between areas with and without eelgrass. The South Puget Sound region appears to be the notable exception where a minority of the acreage is co-located with eelgrass. Continuing aquaculture activities would occur in 49% of the total mapped eelgrass acreage in Willapa Bay and 21% of the mapped eelgrass in Hood Canal. These percentages are less in the other regions.

Table 3-6. Summary of shellfish activities potentially co-located with eelgrass

	Grays Harbor	Willapa Bay	Hood Canal	South Puget Sound	North Puget Sound	Total
# continuing active footprints	17	161	34	2	21	235
continuing active acres	766	12,170	392	180	1,131	14,803

# continuing fallow footprints	13	81	42	1	13	150
continuing fallow acres	1,152	7,448	294	95	2,239	11,227
Total acres (active & fallow):	1,918	19,618	685	275	3,370	25,866
% of continuing active acreage potentially co-located with eelgrass	67%	74%	41%	8%	84%	66%
% of continuing fallow acreage potentially co-located with eelgrass	63%	79%	73%	12%	96%	76%
% of eelgrass in region potentially co-located with aquaculture (active & fallow)	5%	49%	21%	9%	7%	20%

Note: See Appendix D for more detail, summary of methodology, and geographic locations

3.2.6. Forage Fish

The continuing active and fallow acreages could be co-located with forage fish spawning areas and thus affect spawning success as discussed previously in Section 7.1. A geographic analysis was conducted to estimate the aquaculture acreage potentially co-located with forage fish spawning areas. A description of the analysis, detailed results, and figures illustrating geographic locations where aquaculture and forage fish spawning are co-located can be found in Appendix E. The analysis is summarized in Table 3-7 and suggests there is substantial overlap between forage fish spawning locations and aquaculture activities. There are an estimated total of 3,297 fallow acres across all regions co-located with forage fish spawning areas. In the two Puget Sound regions and in Hood Canal, active and fallow acreage is co-located with mapped spawning habitat for all three forage fish species analyzed. In Grays Harbor and Willapa Bay, aquaculture acreage appears co-located only with herring spawning areas.

Table 3-7. Summary of continuing active and fallow acreage potentially co-located with WDFW mapped forage fish spawning areas

	Grays Harbor	Willapa Bay	Hood Canal	South Puget Sound	North Puget Sound	Total
Herring						
continuing active acres	73	2,200	211	79	486	3,049
continuing fallow acres	0	510	58	14	2,184	2,766
Surf smelt						
continuing active acres	0	0	130	532	59	721
continuing fallow acres	0	0	67	359	15	441
Sand lance						
continuing active acres	0	0	169	78	79	326
continuing fallow acres	0	0	28	20	42	90
total *active* acres co-located with spawning areas	73	2,200	510	688	623	4,094

% of total active acres co-located with spawning areas	6%	13%	54%	29%	46%	18%
total *fallow* acres co-located with spawning areas	0	510	153	394	2,241	3,297
% of total fallow acres co-located with spawning areas	0%	5%	37%	50%	96%	22%
cumulative total (active + fallow):	73	2,710	663	1082	2,864	7,391
% of cumulative total co-located with spawning areas	2%	10%	49%	34%	78%	20%

Note: See Appendix E for more detail, summary of methodology, and maps.

The analysis suggests that Willapa Bay and North Puget Sound are the regions where the most overlap may occur on an acreage basis. Relative to the total mapped herring spawning area in each region, activities in Willapa Bay tend to occur in well over half of the mapped spawning area, by far the largest proportion of any of the regions. Most of this overlap is with ongoing aquaculture activities. The North Puget Sound region contains the most fallow acres (2,241 acres) potentially co-located with forage fish spawning areas. Much of this is overlap with the herring spawning area in Samish Bay. The South Puget Sound region active and fallow acres are co-located more with surf smelt spawning areas relative to the other two species.

Table 3-8. Percent of total mapped herring spawning area potentially affected by continuing activities in active and fallow areas

	Grays Harbor	Willapa Bay	Hood Canal	South Puget Sound	North Puget [illegible]
Total WDFW mapped herring spawning acres	462	4,691	5,179	4,740	33,730
% of total mapped herring acres that potentially overlap with continuing active acres	16%	47%	4%	2%	1%
% of total mapped herring acres that potentially overlap with continuing fallow acres	0%	11%	1%	0.3%	6%

3.3. Summary of Primary Effects by Region

This section summarizes the future expected activities and habitat effects for each of the geographic regions.

3.3.1. Grays Harbor

Oyster bottom culture and its related activities predominate in Grays Harbor with longline culture also common. In-water activities common to the region include dredging, harrowing, and longline harvest.

This is expected to continue in the future. Fallow and new acreage is also anticipated to be predominantly for oyster culture using the same methods. The mechanical clam harvester and cover nets are being introduced to Grays Harbor on 363 acres of existing project area. It is assumed that all anticipated new activities could contain cover nets or bags for clam culture.

A total of 5% of the total tidelands in the region would be altered from the current relatively undisturbed condition to an aquaculture farm with corresponding effects on the habitat and species. Effects from activities conducted on this acreage would persist for the duration of the permit authorization and likely longer assuming the farm remains in business. Cumulatively, effects from all shellfish activities including on acreage classified as continuing active would occur on 7.5% of the tidelands in Grays Harbor. Effects would be concentrated in the North and South lobes of the embayment on the extensive tidelands in these areas (see Figure D-1).

There are an estimated 1,152 fallow acres co-located with eelgrass in Grays Harbor. The action assumes oyster bottom and longline culture methods would occur in these areas in the future. This would substantially reduce or eliminate the eelgrass in these areas at least during significant portions of the culture and harvest cycle. It does not appear that any fallow acreage is co-located with forage fish spawning areas so no impact to these species is anticipated.

Temporary habitat effects of the activities include short-term degradation of water quality, noise and general activity disturbance, and temporary decreases in benthic community abundance. These activities would be expected to displace fish and other species in the immediate vicinity of the activity. The frequency of in-water work is conservatively estimated to be 10 acres worked per day averaged over one year for activities on fallow and new acres and 15 acres per day for all shellfish activities, which is 0.04% of the total tideland area in the Grays Harbor region.

3.3.2. Willapa Bay

Oyster bottom culture is the primary culture method in Willapa Bay with a lesser amount of longline culture, limited oyster rack and bag culture and some clam culture. There does appear to be substantial acreage with cover nets. In-water activities common to the region include dredging, harrowing, graveling, and longline harvest. This relative distribution of culture methods and individual activities is expected to continue in the future on both continuing active and fallow acres. New activities are expected to be focused on geoduck culture with lesser amounts of clam, oyster, and mussel culture. No restoration, recreation, or subtidal geoduck activities are expected to occur in Grays Harbor.

A total of 19% of the total tidelands in the region would be altered from the current relatively undisturbed condition to an aquaculture farm with corresponding effects on the habitat and species. Effects from activities conducted on this acreage would persist for as long as the permit authorization or the work occurs/farm remains in business. Cumulatively, effects from all shellfish activities including on acreage classified as continuing active would occur on 53% of the tidelands in Willapa Bay. Effects would occur throughout the region on the extensive tidelands that characterize the embayment.

There are an estimated 7,448 fallow acres co-located with eelgrass in Willapa Bay. The action assumes oyster bottom and the other activities listed above would occur in these areas in the future. This would substantially reduce or eliminate the eelgrass in these areas at least during significant portions of the culture and harvest cycle. There are an estimated 510 fallow acres co-located with herring spawning

areas. Spawning in these areas would be negatively affected primarily by the loss of eelgrass spawning substrate.

Temporary habitat effects of the activities include short-term degradation of water quality, noise and general activity disturbance, and temporary decreases in benthic community abundance. These activities would be expected to displace fish and other species in the immediate vicinity of the activity. The frequency of in-water work is conservatively estimated to be 53 acres worked per day averaged over one year for activities on fallow and new acres and 139 acres per day for all shellfish activities, which is 0.3% of the total tideland area in the Willapa Bay region.

3.3.3. Hood Canal

Oyster and clam culture are both common in Hood Canal with a smaller amount of geoduck. Bottom culture is the primary method for growing all species. There are lesser amounts of longline and rack and/or bag culture. An estimated 538 active and 337 fallow acres are estimated to use cover nets which is about 10% of the total acreage in Hood Canal. In-water activities that occur include graveling, dive harvest, and longline harvest. This relative distribution of culture methods and individual activities is expected to continue in the future on both continuing active, fallow, and new aquaculture acres.

A total of 8% of the total tidelands in the region would be altered from the current relatively undisturbed condition to an aquaculture farm with corresponding effects on the habitat and species. Effects from activities conducted on this acreage would persist for as long as the permit authorization or the work occurs/farm remains in business. Cumulatively, effects from all shellfish activities including on acreage classified as continuing active would occur on 16% of the tidelands. Hood Canal is a deep fiord like embayment characterized by narrow ribbons of tidelands along the shoreline interrupted by small estuaries at river mouths that have a somewhat greater tideland area depending on the size of the river. Activities and their effects would be focused along these shoreline areas and estuaries throughout the region.

There are an estimated 257 fallow acres co-located with eelgrass in Hood Canal. The action assumes oyster and clam bottom and the other activities listed above would occur in these areas in the future. This would substantially reduce or eliminate the eelgrass in these areas at least during significant portions of the culture and harvest cycle. There are an estimated 153 fallow acres co-located with forage fish spawning areas. Spawning in these areas would be negatively affected primarily by the loss of aquatic vegetation spawning substrate and smothering of eggs.

Temporary habitat effects of the activities include short-term degradation of water quality, noise and general activity disturbance, and temporary decreases in benthic community abundance. These activities would be expected to displace fish and other species in the immediate vicinity of the activity. The frequency of in-water work is conservatively estimated to be 5 acres worked per day averaged over one year for activities on fallow and new acres and 7 acres per day for all shellfish activities, which is 0.05% of the total tideland area in the Hood Canal region.

3.3.4. South Puget Sound

Oyster and clam culture are both common in South Puget Sound followed closely by geoduck. Bottom culture is the primary method for growing all species with some longline and rack and/or bag culture.

Cover nets are common and occur on about 75% of the continuing footprints. An estimated 2,011 active and 724 fallow acres are estimated to use cover nets. In-water activities that occur include dredging, graveling, dive harvest, and longline harvest. This relative distribution of culture methods and individual activities is expected to continue in the future on both continuing active, fallow, and new aquaculture acres.

A total of 5% of the total tidelands in the region would be altered from the current relatively undisturbed condition to an aquaculture farm with corresponding effects on the habitat and species. Effects from activities conducted on this acreage would persist for as long as the permit authorization or the work occurs/farm remains in business. Cumulatively, effects from all shellfish activities including on acreage classified as continuing active would occur on 12% of the tidelands. Activities and effects in the South Puget Sound region would be focused in the south and east part of the region along shoreline areas and in small embayments although new activities could occur throughout the region. Most of the acreage in some of these smaller estuaries may be engaged aquaculture.

There are an estimated 115 fallow acres co-located with eelgrass in South Puget Sound. The action assumes the shellfish activities listed above would occur in these areas in the future. This would substantially reduce or eliminate the eelgrass in these areas at least during significant portions of the culture and harvest cycle. There are an estimated 394 fallow acres co-located with forage fish spawning areas, primarily for surf smelt. Spawning in these areas would be negatively affected primarily by the smothering of eggs.

Temporary habitat effects of the activities include short-term degradation of water quality, noise and general activity disturbance, and temporary decreases in benthic community abundance. These activities would be expected to displace fish and other species in the immediate vicinity of the activity. The frequency of in-water work is conservatively estimated to be 6 acres worked per day averaged over one year for activities on fallow and new acres and 14 acres per day for all shellfish activities, which is 0.05% of the total tideland area in the South Puget Sound region. Given the concentration of activity acreage in the south and east corner of the region, the frequency of activity in this area would be quite a bit higher than this average.

3.3.5. North Puget Sound

Oyster and clam culture are both common in North Puget Sound with a very small amount of geoduck. Bottom culture is the primary method for growing all species with some longline, stake, and rack and bag culture. Cover nets are common and occur on about 46% of the continuing footprints. An estimated 637 active and 2,204 fallow acres are estimated to use cover nets. In-water activities that occur include graveling, harrowing, dive harvest, and longline harvest. This relative distribution of culture methods and individual activities is expected to continue in the future on both continuing active, fallow, and new aquaculture acres.

A total of 3% of the total tidelands in the region would be altered from the current relatively undisturbed condition to an aquaculture farm with corresponding effects on the habitat and species. Effects from activities conducted on this acreage would persist for as long as the permit authorization or the work occurs/farm remains in business. Cumulatively, effects from all shellfish activities including on acreage classified as continuing active would occur on 5% of the tidelands. Activities and effects in the

North Puget Sound region would be focused in a handful of embayments including Samish Bay, Discovery Bay, Sequim Bay, Kilisut Harbor and in the vicinity of Skagit Bay. The percent of tidelands engaged in shellfish activities in these embayments would be significantly higher than this regional average. For example, 50% of the tidelands in Samish Bay contain continuing active or fallow acreage. New activities could occur throughout the region.

There are an estimated 2,194 fallow acres co-located with eelgrass in North Puget Sound. The action assumes the shellfish activities listed above would occur in these areas in the future. This would substantially reduce or eliminate the eelgrass in these areas at least during significant portions of the culture and harvest cycle. There are an estimated 2,241 fallow acres co-located with forage fish spawning areas, primarily for herring. Spawning in these areas would be negatively affected by the loss of eelgrass spawning substrate.

Temporary habitat effects of the activities include short-term degradation of water quality, noise and general activity disturbance, and temporary decreases in benthic community abundance. These activities would be expected to displace fish and other species in the immediate vicinity of the activity. The frequency of in-water work is conservatively estimated to be 11 acres worked per day averaged over one year for activities on fallow and new acres and 18 acres per day for all shellfish activities, which is 0.02% of the total tideland area in the region. The frequency of activity in the embayments where activities are concentrated would be significantly higher than this regional average.

4. Cumulative Impacts

This analysis assesses cumulative impacts of the proposed action as defined under the National Environmental Policy Act (NEPA) and the CWA Section 404(b)(1) regulations. Under NEPA, a cumulative impact as defined as follows:

> *Cumulative impact is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time* (40 CFR 1508.7).

A determination of significance under NEPA requires considerations of both context and intensity. Context "means that the significance of an action must be analyzed in several contexts such as society as a whole (human, national), the affected region, the affected interests, and the locality. Significance varies with the setting of the proposed action. For instance, in the case of a site-specific action, significance would usually depend upon the effects in the locale rather than in the world as a whole. Both short- and long-term effects are relevant (40 CFR 1508.27(a)). Intensity "refers to the severity of impact" (40 CFR 1508.27(b)). According to the CFR, the following should be considered when evaluating intensity:

> (1) Impacts that may be both beneficial and adverse. A significant effect may exist even if the Federal agency believes that on balance the effect will be beneficial.
>
> (2) The degree to which the proposed action affects public health or safety.
>
> (3) Unique characteristics of the geographic area such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas.
>
> (4) The degree to which the effects on the quality of the human environment are likely to be highly controversial.
>
> (5) The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks.
>
> (6) The degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration.
>
> (7) Whether the action is related to other actions with individually insignificant but cumulatively significant impacts. Significance exists if it is reasonable to anticipate a cumulatively significant impact on the environment. Significance cannot be avoided by terming an action temporary or by breaking it down into small component parts.
>
> (8) The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources.

(9) The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973.

(10) Whether the action threatens a violation of Federal, State, or local law or requirements imposed for the protection of the environment.

The CEQ guidance document "Considering Cumulative Effects under the National Environmental Policy Act" (1997) and the 2005 memo from CEQ (CEQ 2005) provides guidance on how to structure cumulative effects analysis. The steps are summarized in Table 4-1.

Table 4-1. Steps in cumulative effects analysis to be addressed in each component of environmental impact assessment (from CEQ 1997).

Table 1-5. Steps in cumulative effects analysis (CEA) to be addressed in each component of environmental impact assessment (EIA)

EIA Components	CEA Steps
Scoping	1. Identify the significant cumulative effects issues associated with the proposed action and define the assessment goals. 2. Establish the geographic scope for the analysis. 3. Establish the time frame for the analysis. 4. Identify other actions affecting the resources, ecosystems, and human communities of concern.
Describing the Affected Environment	5. Characterize the resources, ecosystems, and human communities identified in scoping in terms of their response to change and capacity to withstand stresses. 6. Characterize the stresses affecting these resources, ecosystems, and human communities and their relation to regulatory thresholds. 7. Define a baseline condition for the resources, ecosystems, and human communities.
Determining the Environmental Consequences	8. Identify the important cause-and-effect relationships between human activities and resources, ecosystems, and human communities. 9. Determine the magnitude and significance of cumulative effects. 10. Modify or add alternatives to avoid, minimize, or mitigate significant cumulative effects. 11. Monitor the cumulative effects of the selected alternative and adapt management.

Under CWA Section 404(b)(1) cumulative impacts are defined as follows:

Determination of cumulative effects on the aquatic ecosystem (40 CFR 230.11(g)).

(1) Cumulative impacts are the changes in an aquatic ecosystem that are attributable to the collective effect of a number of individual discharges of dredged or fill material. Although the

impact of a particular discharge may constitute a minor change in itself, the cumulative effect of numerous such piecemeal changes can result in a major impairment of the water resources and interfere with the productivity and water quality of existing aquatic ecosystems.

(2) Cumulative effects attributable to the discharge of dredged or fill material in waters of the United States should be predicted to the extent reasonable and practical. The permitting authority shall collect information and solicit information from other sources about the cumulative impacts on the aquatic ecosystem. This information shall be documented and considered during the decision-making process concerning the evaluation of individual permit applications, the issuance of a General permit, and monitoring and enforcement of existing permits.

The 404(b)(1) guidelines further state:

To predict cumulative effects, the evaluation shall include the number of individual discharge activities likely to be regulated under a General permit until its expiration, including repetitions of individual discharge activities at a single location (40 CFR 230.7b3).

The 404(b)(1) guidelines outlined in 40 CFR 230 guide how the analysis is conducted. This analysis only evaluates the proposal against 230.10 (c), determination of significant degradation, which is only one of the compliance requirements. Evaluation of the proposal against Subparts C thru F for cumulative effects are discussed below.

4.1. Scope of Analysis

CEQ guidance recommends that cumulative effects analysis focus on effects to the resources affected by the proposed action as opposed to the traditional focus on effects based on the perspective of the action (CEQ 2005, CEQ 1997). A focus on the resource helps ensure all effects to the resource itself are discussed in the context of the action. This approach has been adopted for the 2017 NWP 48 cumulative effects analysis. An important component of the analysis is identifying other unrelated actions, past, present, and reasonably foreseeable in the future, that have or could potentially affect the resources affected by the proposed action.

The 404(b)(1) guidelines require cumulative effects analysis evaluate effects of all potential activity conducted under the General permit (e.g., each permit verification). Effects to resources from other activities or a reissuance of the permit are beyond the scope. The CEQ guidelines for the NEPA analysis thus are broader in identifying and evaluating effects to resources. The analysis below is thus focused on this broader evaluation under NEPA. Cumulative effects under CWA would fall within the effects envelope described for NEPA.

4.1.1. Resources Affected

For practical purposes, the geographic footprint of the proposed action is Willapa Bay, Grays Harbor, and the greater Puget Sound or Salish Sea. This is where all of the historical NWP 48 authorized work has occurred in the past and where it is expected to occur for the 2017 version of the NWP 48. Effects

to resources could thus occur in these regions. Due to the broad geographic area encompassed by the proposed action, the resources affected vary depending on the region.

In addition to being potentially affected by the proposed action, the following screening criteria were used to identify important affected resources for the analysis:

1. listed under the ESA, MSA or designated critical habitat in area;
2. provides a key ecological role (e.g., important component of the food web);
3. important to commercial or recreational fisheries;
4. is the focus of significant regional or national restoration or planning initiatives;
5. managed with some degree of regional or national protected status;

Resources that meet the above criteria have been categorized according to the three primary geographic areas in Table 4-2.

Table 4-2. Important resources affected by the proposed action

Grays Harbor	Willapa Bay	Puget Sound
Eelgrass (*Z. marina*)	Eelgrass (*Z. marina*)	Eelgrass (*Z. marina*)
Benthic invertebrate community	Benthic invertebrate community	Benthic invertebrate community
Salmon species (Chinook, coho, chum)	Salmon species (Chinook, coho, chum)	Salmon species (Chinook, coho, chum)
Pacific herring	Pacific herring	Pacific herring, sand lance, surf smelt
Dungeness crab	Dungeness crab	Dungeness crab
Green sturgeon	Green sturgeon	Canary rockfish, bocaccio
Pacific groundfishes (E. sole)	Ground fish (E. sole)	
Bull trout		Bull trout
Snowy plover	Snowy plover	

Consistent with CEQ guidance the cumulative effects analysis is not an exhaustive analysis on all species and resources affected. Rather the analysis is focused on those resources that are measurably affected by the action in an important way and that could be further impacted by other actions past, present, or reasonably foreseeable so that a more comprehensive review can be conducted on a smaller number of resources.

The effects analysis is focused on eelgrass, sand lance/surf smelt and the benthic community. The other species listed in Table 4-2 are not discussed.

The effects on some species, such as Dungeness crab and eelgrass, are directly related to effects on eelgrass. Other species such as salmon, rockfish and bull trout, while affected by the proposed action and other cumulative actions, can be evaluated through a surrogate species such as surf smelt. While not a perfect surrogate, this approach allows for a more comprehensive analysis as discussed above.

While snowy plover may be affected by the placement of new aquaculture in breeding areas or designated critical habitat for this species, activities currently do not occur within these areas and it is expected that they will be precluded in the future.

4.1.2. Geographic Scope of Cumulative Effects Analysis

The geographic area for the proposed action includes the Puget Sound/Salish Sea, Willapa Bay, and Grays Harbor. The Columbia River and coastal beaches are also included but no work is expected to be authorized here under NWP 48. Within this broad area, activities expected to be authorized by NWP 48 are concentrated geographically in Willapa Bay, certain areas of Grays Harbor, southeast Puget Sound, Hood Canal, and several embayments in north Puget Sound including.

The resources identified above extend broadly across the landscape. The geographic focus of the analysis is the State of Washington. Analysis is generally conducted at the watershed scale although effects to some species may extend beyond this scale due to the migratory range of the species. This is discussed in more detail in the sections discussing the individual resources.

The broad geographic area necessarily means that there are potentially many past, present, and future actions that could have some effect on the resources. Consistent with CEQ guidance for conducting cumulative effects analysis, the analysis is focused only on those actions with the greatest potential for meaningfully affecting the identified resources.

4.1.3. Temporal Scope of Cumulative Effects Analysis

The timeframe for cumulative effects analysis typically first considers the timeframe for the proposed action, which in this case is five years (CEQ 1997). Under the 404(b)(1) guidelines, the period of analysis is specifically defined as the expiration date of the General permit (40 CFR 230.7b3). This permit will expire in 2022. Effects of the action would then begin to dissipate after 2022. However, while the timeframe of the permit itself is five years, the work itself and more importantly its effects are expected to continue well beyond 2022. As was the case with the 2012 NWP 48 that preceded it, the 2017 NWP 48 is likely to be reissued in 2022 which means most if not all of the activities authorized under the previous permit along with additional new project area will be reauthorized in the future. Thus while the activities authorized under the 2017 NWP 48 permit will cease to be authorized in 2022, the activities themselves will most assuredly continue and be subsequently authorized by the next version of NWP 48 in 2022. Prior permittees typically have a one year grace period to apply for and be authorized under the reissued permit. It would be the unusual case for aquaculture acreage to decrease in this currently expanding industry.

As discussed above, the focus of cumulative effects analysis is on the resource itself. Effects to resources would continue with the reissuance of the NWP 48 in 2022. An analysis of cumulative effects under NEPA must therefore consider this additional work because it results in continued if not expanded impacts on the resource. The reissuance of NWP 48 in 2022 represents a set of potential future cumulative impacts, much the way climate change could result in cumulative impacts.

Whether a 2022 version of the NWP 48 is considered part of the proposed action or a separate action unto itself, its cumulative effects must still be evaluated according to eth CEQ guidelines (CEQ 1997). While there may be modifications to the reissued permit in 2022, these are anticipated to be minor and

all activities permitted in 2017 would also likely be eligible for the 2022 NWP 48, and subsequent versions of NWP 48. Selecting an appropriate timeframe for the analysis is somewhat arbitrary given that the aquaculture work is not expected to end but is instead expected to continue and become a more or less permanent feature of the environment. Aquaculture has been occurring on the landscape for over 100 years. The analysis therefore assumes that the work will continue and not end in 2022 upon the expiration of the 2017 NWP 48.

4.2. Eelgrass

The following summary of eelgrass and its ecosystem value is from WDNR 2015:

Eelgrass (*Zostera marina*) is an aquatic flowering plant found in fine grained intertidal and subtidal habitats. It provides numerous high-value regional ecosystem services within the coastal ecosystem. It creates structural complexity and supports high levels of biodiversity. Eelgrass serves as a focal habitat for perhaps hundreds of species in the Sound (Thom et al. 2011). It provides nursery habitat for economically important Dungeness crab and Pacific salmon (Fernandez et al. 1993, Phillips 1984, Simenstad 1994); spawning substrate for Pacific herring (Penttila 2007); and foraging habitat for numerous water birds including black brant. Eelgrass improves water quality by trapping and storing particulates and nutrients (Short and Short 1984, Gacia et al. 1999, Asmus & Asmus 2000); enhance productivity and alter nutrient cycling (Hemminga and Duarte 2000); mitigate wave energy and increase shoreline stabilization (Koch et al. 2006); and serve as a globally significant carbon sink (Fourqurean et al. 2012). Given the significance and diversity of the ecosystem functions and services provided by seagrass, Costanza et al. (1997) determined seagrass ecosystems to be one of Earth's most valuable.

Natural conditions (especially water quality) play a significant role in controlling the distribution of eelgrass. Eelgrass meadows in Puget Sound are characterized by substantial interannual variability that appear to be related to the occurrence of El Niño climate events (Shafer 2015). Eelgrass areas on the Pacific coast can expand by as much as 5 meters (m) and contract by as much as 4 m annually (WDNR 2012).

4.2.1. Eelgrass status

Eelgrass (Z. marina) is protected by a number of Federal and State regulations as discussed below.

- Under the Magnuson-Stevens Fishery Conservation and Management Act (MSA), seagrasses, specifically native eelgrass, are designated as an essential fish habitat (EFH) habitat area of particular concern (HAPC) for Pacific Coast groundfishes and Pacific salmon (Chinook, coho, and pink) in Willapa Bay, Grays Harbor, and Puget Sound. HAPC designations are used to provide additional focus for conservation efforts. This indicates NOAA may have conservation recommendations to ensure projects do not harm bottom-dwelling fish if seagrasses are adversely affected by proposed actions.

- Aquatic vegetation, which includes eelgrass, is a primary constituent element for designated critical habitat for several species listed under the Endangered Species Act including Puget Sound Chinook salmon (70 FR 52630), Hood Canal summer run chum salmon (70 FR 52630), and Puget Sound steelhead (78 FR 2726). A programmatic ESA consultation for shellfish activities

including aquaculture concluded that terms and conditions restricting aquaculture in fallow areas were required to protect eelgrass (NOAA 2016).

- Eelgrass is considered a "special aquatic site" under the Clean Water Act (40 CFR 230.43). Special aquatic sites are "geographic areas, large or small, possessing special ecological characteristics of productivity, habitat, wildlife protection, or other important and easily disrupted ecological values. These areas are generally recognized as significantly influencing or positively contributing to the general overall environmental health or vitality of the entire ecosystem of a region" (40 CFR 230.3 (q-1)). "From a national perspective, the degradation or destruction of special aquatic sites, such as filling operations in wetlands, is considered to be among the most severe environmental impacts covered by these Guidelines. The guiding principle should be that degradation or destruction of special sites may represent an irreversible loss of valuable aquatic resources." (40 CFR 230.1(d))

- According to EPA (2016): The objective of the CWA is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters. Toward achievement of this goal, the CWA prohibits the discharge of dredged or fill material into waters of the United States unless a permit issued by the Army Corps of Engineers or approved State under CWA Section 404 authorizes such a discharge. For every authorized discharge, the adverse impacts to wetlands, streams and other aquatic resources must be avoided and minimized to the extent practicable. For unavoidable impacts, compensatory mitigation is required to replace the loss of wetland and aquatic resource functions in the watershed. Compensatory mitigation refers to the restoration, establishment, enhancement, or in certain circumstances preservation of wetlands, streams or other aquatic resources for the purpose of offsetting unavoidable adverse impacts. Zostera marina is listed on the 2016 Wetland Plant List for the State of Washington (Lichvar et al. 2016).

- Native eelgrass is considered a 'saltwater habitat of special concern' by the State of Washington (WAC 220-660-320). In administering the Hydraulic Project Approval (HPA) process, the Washington Department of Fish and Wildlife (WDFW) requires applicants to: 1) avoid impacting eelgrass, 2) minimize unavoidable impacts, and 3) mitigate for any impacts (WAC 220-660-350) (WDFW 2008, WDNR 2015).

- WDNR's aquatic leasing program recognizes the regional ecosystem services provided by eelgrass beds and emphasizes impact avoidance during authorization of uses of state-owned aquatic lands to protect the sensitive aquatic habitat from disturbance (WDNR 2015).

Under the Washington State Shoreline Management Act, which implements the Coastal Zone Management Act on 1972, the state is requiring updates of all local Shoreline Master Programs (SMPs). They developed guidelines for the development of the SMPs the local jurisdictions must follow in order for their SMP to be approved by the State. These guidelines have specific protections for eelgrass as described below.

- WAC 172-32-186(8) directs SMPs to "include policies and regulations designed to achieve no net loss of those ecological functions". WDOE (2010) indicates that "the no net loss standard is designed to halt the introduction of new impacts to shoreline ecological functions resulting from new development. Both protection and restoration are needed to achieve no net loss."

- Protecting critical saltwater habitats is important to achieving no net loss of ecological functions. The SMP Guidelines state, "Critical saltwater habitats require a higher level of protection due to the important ecological functions they provide" [WAC 173-26-221(2)(c)(iii)(A)]. Critical saltwater habitats include "…all kelp beds, eelgrass beds, spawning and holding areas for forage fish, such as herring, smelt and sandlance; subsistence, commercial and recreational shellfish beds; mudflats, intertidal habitats with vascular plants, and areas with which priority species have a primary association" (WAC 173-26-221(2)(c)(iii)(A)).

The SMP guidelines include specific provisions for aquaculture including:

- The SMP Guidelines state that aquaculture "should not be permitted where it would adversely impact eelgrass … Impacts to ecological functions shall be mitigated according to the mitigation sequence described in WAC 173-26-201 (2)(e)" .(WAC 173-26-241(3)(b)(i)(C)).

- Local governments should require buffers in order to avoid impacts to eelgrass and require monitoring to ensure the buffers are adequate (WDOE 2015).

- WDNR will establish eelgrass buffers on state managed aquatic lands based on individual site assessments in order to ensure environmental protection of state-owned aquatic resources (WDOE 2015).

The Puget Sound Partnership (PSP), a state agency leading the region's collective effort to restore and protect Puget Sound, identified eelgrass as an indicator of the health of Puget Sound in recognition of the regional ecosystem services it provides and its sensitivity to changes in environmental conditions. PSP established a goal to increase eelgrass area by 20 percent relative to the 2000-2008 baseline of approximately 53,300 acres by 2020.

4.2.2. Historical context and past effects

The historical distribution of eelgrass in Puget Sound, Willapa Bay, and Grays Harbor is unknown. Available information on past effects is discussed below for each region.

The global literature strongly points to the overriding influence of human population driven land use changes and management practices in causing the loss of seagrasses (Thom et al. 2011). Surveys of local stakeholders identified dredging/filling, shoreline development, water quality, and commercial aquaculture as the most significant stressors on eelgrass (Thom et al. 2014). In Puget Sound, substantial losses are believed to be due to physical changes in shorelines, periodic physical disturbances, and degradation in water quality (Thom and Hallum 1990; Thom 1995; Dowty et al. 2010; Thom et al. 2011).

Eelgrass requires certain environmental conditions including appropriate tidal elevation, light, temperature, salinity, substrata, nutrients, waves, and current velocities (Philips 1984, Thom 2003, Koch 2001).

The WDNR contracted with Pacific Northwest National Laboratory to summarize and rank known stressors to eelgrass in Puget Sound. The summary of stressors on native eelgrass in Figure 4-1 is reproduced from the final report (Thom et al. 2011). The focus of the review was Puget Sound but the analysis is relevant to Willapa Bay and Grays Harbor to the extent the identified stressors occur. The results have been used to develop an eelgrass recovery strategy in Puget Sound (WDNR 2015).

	Characteristics of Stressor									
Stressor	Controlling Factor	Magnitude	Spatial Extent	Temporal Extent	Reversibility	Trend	Case Study Evidence	Global Studies	Threat Score	Knowledge Score
Invasive species	Competition	Low **	Med **	Med **	Med *	Increase **	Direct *	O	2.00	1.80
Nutrient-driven harmful algal blooms	Competition, light	Med **	Med *	Med *	Med **	Increase *	Direct *	SW, W, D, O	2.20	1.40
Suspended sediment	Light	Med ***	Med *	High *	Med **	Increase *	Direct *	SW, D, O	2.40	1.60
Sea level rise	Light	Med **	High *	High *	Low ***	Increase *	None	SN, D, O	2.80	1.60
Overwater structures	Light	High ***	Low ***	High ***	Low ***	Increase **	Direct ***		2.60	2.80
Aquaculture	Light, substrate	Med **	Low **	Med *	Med *	Increase **	Direct ***		2.00	1.60
Bioturbation	Substrate	Low *	Low *	Low *	Med *	Same *	Direct, spec. **		1.40	1.00
Storms	Energy	High *	Med *	Low *	High **	Increase *	None		2.00	1.20
Construction	Substrate, direct	High ***	Med ***	Med *	Med **	Increase *	Direct ***		2.40	2.00
Boat grounding /anchoring	Direct	High **	Low *	Low *	High *	Increase *	Direct *	W	1.80	1.20
Shoreline armoring	Substrate, energy	Low *	High ***	High *	Med *	Increase *	Ambiguous *		2.40	1.40
Dredging/ filling	Substrate, direct	High ***	Med **	High ***	Med **	Increase *	Direct **		2.60	2.20
Propeller wash/ boat wake	Energy	Med **	Low *	Med *	High *	Increase *	Direct/Ambiguous *		1.80	1.20
Anthropogenic contaminants	Direct	Low *	High **	Low *	Low *	Increase **	None	SW	2.20	1.40
Disease	Direct	Low *	High *	Med *	Med **	Increase *	None *		2.20	1.20
Organic matter discharge/sulfides	Direct	High **	Low *	Med *	Med *	Same *	Direct *		2.00	1.20
Sea temperature rise	Temperature	Med *	High *	Med *	Low **	Increase *	None	SN, O	2.60	1.20
Freshwater input	Salinity	Med **	High **	Med *	Med *	Same *	None *		2.20	1.40
Overfishing	Herbivory	Low *	Med *	Med *	Med *	Same *	None *		1.80	1.00

Figure 4-1. Eelgrass stressor ranking table (from Thom et al. 2011). The stressor score is determined by assigned point values to stressor characteristic values. For most categories, High = 3, Medium = 2, and Low = 1, with the exception of the Reversibility category, in which High = 1 and Low = 3 (because high reversibility reduces the threat presented by a stressor). The final stressor score is the mean of all of the points for each stressor, with a value of 3 (red) indicating the highest possible threat to eelgrass and 1 (green) the lowest. All columns included are currently weighted equally in the calculations. The knowledge score is the mean number of asterisks assigned to each stressor (not including case studies). A high knowledge score (3, green) indicates the most information is available about the stressor, while a low score (1, red) indicates very little information is available.

Puget Sound

The following impacts to eelgrass have occurred in Puget Sound:

- Over the last 150 years river deltas have experienced a large loss in area and shoreline, tidal wetlands decreased by 56%, several small embayments have been eliminated and many beaches and bluffs have been modified as a result of shoreline armoring (Simenstad et al. 2011, Fresh et al. 2011). These have all contributed to losses of eelgrass. Eelgrass meadows have been lost due to diking, filling and dredging, but overall changes in Puget Sound have not been assessed due to a lack of comprehensive early records (Thom and Hallum 1990, WDNR 2015, Shelton et al. 2016).

- Historical information that does exists indicates that there have been eelgrass losses in Bellingham Bay (34 ha or 30% of the original mapped total) and the Snohomish River delta (70 ha, minimum of 15% lost) due primarily to filling and dredging (Thom and Hallum 1990). Padilla Bay eelgrass increased from 598 to 1541 ha possibly due to the diversion of the Skagit River away from the Bay (Thom and Hallum 1990). A survey of local stakeholders resulted in Figure 4-2 which illustrates areas with historical eelgrass but that were now absent of eelgrass (Thom et al. 2014).

- Though Olympia oysters currently are found throughout their historic distribution, less than 4 percent of historic core populations remain in Puget Sound. Approximately 155 acres remain, compared to 4,000-5,000 acres that historically supported dense assemblages of oysters (NOAA 2011). It is uncertain if the loss of oyster reefs provided an opportunity for eelgrass to expand as has been suggested in Willapa Bay (Blake and Ermgassen 2015), but this is certainly possible.

- Anecdotal accounts indicate widespread declines in eelgrass in certain areas over the last 30-40 years (Thom and Hallum 1990). In these cases, changes in water quality are suggested as the reason for the decreases.

- The invasion of Z. japonica has probably affected the native Zostera at the upper limits of its distribution. These species co-occur at the +0.3 to 1.0 m MLLW elevation on flats, and competition for space has been demonstrated (Harrison 1976). In addition, Z.japonica can invade newly created bare patches within native Zostera meadows, and hold this space for a considerable amount of time (Michele Nielsen, University of British Columbia, conversation, 5 May 1990, in Thom and Hallum 1990). The WDNR sampling program has sampled 378 sites in the greater Puget Sound and Z. japonica has been identified at 68 of those sites (Mach et al. 2010). The author indicates this likely underestimates the presence of Japonica because the sampling is not comprehensive.

- There has been a decadal decline in eelgrass at the Skagit River delta, which has been identified as a priority for future restoration. Research has shown that most of the fluvial sediment delivered to the delta is currently exported offshore by channelized dike complexes. This has led to fragmentation of the eelgrass beds and degradation of other valued nearshore components (Grossman 2013, in WDNR 2015).

- Aquaculture has occurred in Puget Sound for many years. The effects of oyster culture on eelgrass have been discussed previously. In addition to these effects, West (1997) indicated that eelgrass was considered a nuisance species and was routinely removed by oyster growers in Puget Sound.

- In the more recent past Shelton (et al. 2016) indicates that over the past 40 years, eelgrass in Puget Sound has proven resilient to large-scale climatic and anthropogenic change. They indicate that substantial changes to eelgrass populations occur at the site and subsite level with no large scale trends and emphasize the role of local site specific drivers on eelgrass changes.

- Notable increases in eelgrass area occurred at two river deltas following major restoration projects: the Skokomish River delta (200 acres) in southern Hood Canal and the Nisqually River

delta in southern Puget Sound. Eelgrass gains at these deltas contrast sharply with nearby sites (WDNR 2015).

WDNR has conducted annual surveys of eelgrass in Puget Sound. These data indicate that Puget Sound native eelgrass area has been stable over the 2002-2013 monitoring record (WDNR 2015). There are no significant 11 year trends although there is some evidence of a general increase in eelgrass area between 2010 and 2013. Localized areas have seen both increases and decreases in eelgrass area. WDNR estimates the long term average (2000-2013) eelgrass acreage is 22,000 ha (54,000 acres) (WDNR 2015). In 2013, WDNR estimated 22,610 ha (55,870 acres).

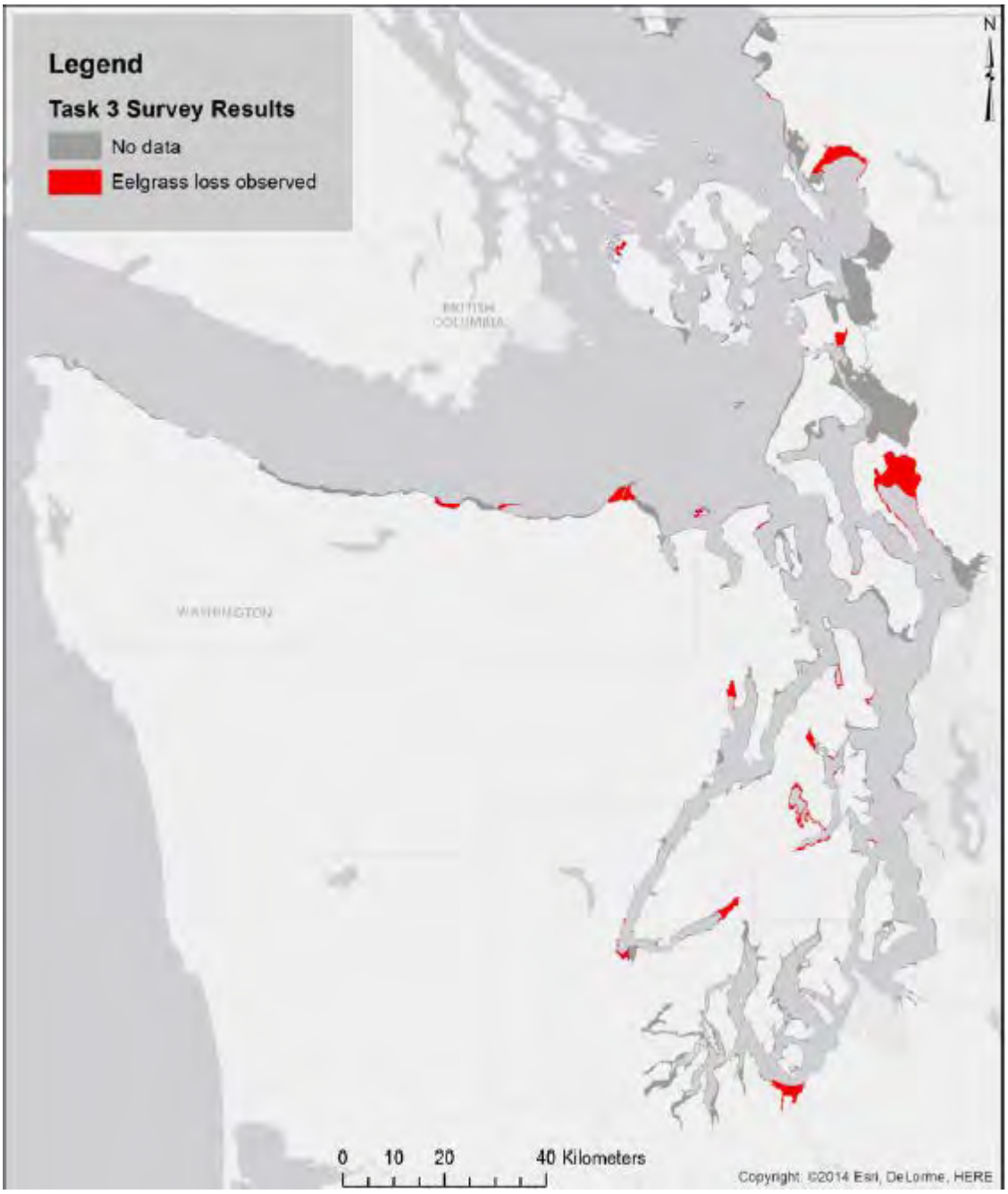


Figure 4-2. Areas identified as having previously contained eelgrass but currently is absent (from Thom et al 2014).

Willapa Bay

The historical coverage of eelgrass in Willapa Bay is unknown. However, the nearshore habitat in all three areas has been substantially altered since the mid-1800s.

Historical impacts to eelgrass include:

- Willapa's shoreline has been modified by filling and diking (Fish and Wildlife Service (1970, cited in Philips 1984, Ruisink et al. 2006). An estimated 64% of estuarine wetlands have been lost from Willapa Bay (CRA 2007). Borde (2003) estimates that Willapa Bay tidal marsh decreased 36% between 1905 and 1974. It is unknown how much former eelgrass habitat has been lost. Fish and Wildlife Service (1970, cited in Philips 1984) indicate that deteriorating water quality from draining of fresh water marshes and construction of lagoon housing also impacted eelgrass.

- The impacts of diking and sediment loading from logging peaked by the mid-20th century and have since been constant or declined (Fish and Wildlife Service 1970, cited in Philips 1984, Ruisink et al. 2006)

- Historically, the Corps maintained dredged channels at the mouth of Willapa Bay, from the Bay entrance to Raymond, to Bay Center, and mooring areas in Tokeland and Nahcotta. Dikes and breakwaters were constructed. Channel deepening likely resulted in erosion of tidelflats/shallow subtidal areas along the margins of the dredged channel making them less habitable for eelgrass. This was observed in Grays Harbor (Borde et al 2003).

- Historical dredging has impacted eelgrass (Fish and Wildlife Service 1970, cited in Philips 1984). Prior to 1977, the Corps dredged 300,000 cy per year in Willapa Bay (Philips and Watson 1984). Historically, dredged spoils were disposed upland and in open water. The cumulative volume discharged to all the Willapa Bay open water disposal sites from 1996 to 2015 was 539,572 cy (Corps-DMMP 2016).

- construction of bulkhead, pier, and shoreline facilities., (Fish and Wildlife Service (1970, cited in Philips 1984)

- pollution from domestic waters, agricultural runoff, debris from log storage, wood chips (Fish and Wildlife Service (1970, cited in Philips 1984)

- invasion of non-native eelgrass (*Z. Japonica*) in the 1930s (Borde 2003). It generally occurs at higher tidal elevations but competes for space with *Z. marina* at the upper end of the *Z. marina* tidal range (refs). This species is currently the subject of control efforts that are discussed below. Harrison and Bigley (1982) estimated 17,000 ha of Z. japonica on intertidal flats in Willapa Bay. Ruesink et al. (2010) reported that, as of 1997, Z. marina occupied 9.6% of Willapa Bay and Z. japonica occupied 7.7%. Ten years later, in a 2006/2007 survey of Willapa Bay, Dr. Dumbauld with the U.S. Department of Agriculture (USDA) estimated that there were approximately 13,762 acres of Z. marina (15.6% of Willapa Bay) and 12,183 acres of Z. japonica (13.8% of Willapa Bay) (Dumbauld and McCoy 2006/2007). This did not include any acres with thinly populated Z. japonica. To illustrate that Z. japonica distribution in Willapa Bay is thought by some to be expanding, an estimation of Z. japonica distribution was conducted in 2012 using anecdotal data to estimate that 18,000 acres of Z. japonica occurred in Willapa Bay (WDOE 2014).

- Invasion of non-native cordgrass (*Spartina alterniflora*) which traps sediment and converts mudflat to salt grass.

- Damming and regulation of the Columbia River has greatly decreased sediment and freshwater inputs to the estuary (Borde et al 2003). Land use changes including forestry and agriculture increased siltation.

- Oyster culture began in the late 1800s in Willapa Bay to replace the overharvested native Olympia oyster population and continues to the present time. The effects of oyster culture on eelgrass have been discussed previously.

- In Willapa Bay, significant intertidal and shallow subtidal habitat was covered by Olympia oysters which likely competed with eelgrass for space although they also were reported to grow together (Blake and Zu Ermgassen 2015). Historical estimates for the area covered by oyster reef range up to 6,225 ha (15,382 acres) (ermgassen 2012 in Blake) and 9,774 ha (24,152 acres) or 27% of the bay bottom, to 3,141 ha (7,762 acres) (Dumbauld 2011) and 2,600 ha (6,425 acres) or 10% of bay bottom (Ruisink 2006). It is estimated that as much as 27% of the bay bottom could have been oyster bed (Blake and Zu Ermgassen 2015). These oyster beds were subsequently harvested creating an opportunity for eelgrass to expand its range (Dumbauld 2011, Blake). Areas historically set aside as oyster reserves, that historically contained native oysters, now contain extensive areas of eelgrass (Dumbauld 2011). Dumbauld indicates of the 3995 ha of area historically set aside as oyster reserves, 1393 ha currently contain eelgrass (77% is native eelgrass) (Dumbauld 2015).

Willapa Bay and Grays Harbor are not annually monitored for eelgrass like Puget Sound. Recent trends in eelgrass coverage are not known. Current estimates of eelgrass (*Z. marina*) in Willapa Bay range from 39,861 acres for *Z. marina* and *Z. japonica* combined by WDNR (2001) to 17,000 acres for *Z. marina* and 9,000 acres for *Z. japonica* (Dumbauld and McCoy 2015) and 8,461 acres of *Z. marina* with a similar coverage area for *Z. japonica* (Ruesick et al. 2006). Borde et al. 2003 indicates that potential eelgrass habitat has increased by 1706 ha based on changes in bathymetry of Willapa Bay.

Grays Harbor

Similar to Willapa Bay and Puget Sound, historical eelgrass area is unknown but Grays Harbor has experienced extensive changes in the nearshore habitat due to diking, filling, and dredging (Borde et al, 2003). Anecdotal observations (Thom) indicated that some flats in the outer (South Bay) area of Grays Harbor were eroded shortly after the navigation channel was deepened in the early 1990s (Borde et al. 2003). Many of the other factors affecting eelgrass including invasion of Z. japonica, declines in water quality, and shoreline construction have also occurred in Grays Harbor. Miller (1977, in Mach et al. 2010) measured a 518% increase in Z. japonica in Grays Harbor from 680 to 4210 acres, though there is little information about its density and abundance across this area.

In recent years WDNR (2001) estimated 36,415 acres of *Z. marina* and *Z. japonica* combined in Grays Harbor. Estimates for *Z. marina* alone in Grays Harbor ranged from 11,700 acres (Wyllie-Echeverria and Ackerman 2003), and 10,990 acres (Gatto 1978). Borde et al. 2003 indicates that potential eelgrass habitat increased by 1793 ha to 3099 ha based on changes in bathymetry of Grays Harbor between 1883 and 1956 (e.g., from a general deepening of the bay). It is unknown whether this translated to an actual increase in eelgrass. It is suggested that the change in bathymetry may be due to decreases in sediment supply from the Columbia River and dredging within the Bay.

4.2.3. Effects of the proposed action

The effects of the proposed action are discussed above in Section 3. In general the action will result in continued degradation/loss of eelgrass in areas that have been engaged in ongoing aquaculture, and new eelgrass degradation/loss in areas currently classified as fallow or project are that is not currently engaged in aquaculture but is expected to be put into aquaculture during the next five years. These project areas have no conditions or restrictions on conducting work in eelgrass. New project area, area that has never had historical aquaculture or is not part of holdings by an existing aquaculture farm, can impact up to a half acre of eelgrass. It is uncertain what degree this condition would affect shellfish activities in Washington State because of the many areas have been engaged in some form of aquaculture historically (including tribes) and the many existing growers/farms would likely not be restricted by this because any new areas they obtained could be absorbed into their larger project area. For purposes of this analysis it is assumed the half acre eelgrass impact restriction would have negligible relevance and offer negligible protection to eelgrass resources for the reasons stated above.

The current known distribution of eelgrass within the geographic area is illustrated in Appendix A.

Table 4-3. Estimated acres of eelgrass affected by the proposed action

	Grays Harbor	Willapa Bay	Hood Canal	South Puget Sound	North Puget Sound	Total
continuing active acres	766	12,170	392	180	1,131	14,803
continuing fallow acres	1,152	7,448	294	95	2,239	11,227
Total acres (active & fallow):	1,918	19,618	685	275	3,370	25,866
% of continuing active acreage potentially co-located with eelgrass	67%	74%	41%	8%	84%	66%
% of continuing fallow acreage potentially co-located with eelgrass	63%	79%	73%	12%	96%	76%
% of eelgrass in region potentially co-located with aquaculture (active & fallow)	5%	49%	21%	9%	7%	20%

Note: Eelgrass coverage estimates for Willapa Bay and Grays Harbor are likely high by a factor of 3 due to dated WDNR surveys using less accurate methods and that include *Z. japonica*.

4.2.4. Effects of other present day actions

Development and urbanization

Commercial and residential development produce a number of stressors to eelgrass including construction such as dredging and filling that physically removes eelgrass, overwater structures that shade eelgrass, and water quality impacts that negatively affected eelgrass. Current population density (Figure 4-3) identifies where many of these stressors are concentrated currently. Visual analysis of Figure 4-3 illustrates the impact of urbanization of eelgrass. While eelgrass generally exists throughout the geographic area, there are noticeably less areas in along the urbanized east side of Puget Sound and

Kitsap County. Eelgrass is noticeably deficient in the southern reaches of Puget Sound. This is likely due to the low tides that occur during mid-day during the summer which desiccates eelgrass decreasing its productivity and survival (ref).

Figure 4-3. 2010 population density in western Washington State and mapped eelgrass

Outfalls and Nutrients

In Puget Sound, it is estimated the average annual dissolved inorganic nitrogen (DIN) loading from anthropogenic sources is 2.7 times the natural loading conditions (Mohamedali et al. 2011). Annual DIN loads were greatest in the main basin of Puget Sound and almost entirely a result of discharge from residential wastewater treatment facilities (Mohamedali et al. 2011). The DIN loads between Edmonds and the Tacoma Narrows bridge, an area with the greatest concentration of outfalls (Carmichael et al. 2009), were 3.6 times the average for greater Puget Sound, an area not including the Straits (Mohamedali et al. 2011). The continued addition of DIN in excess of natural conditions will likely shift the carbon and nutrient balance in Puget Sound and develop conditions (e.g., eutrophication) less suitable for eelgrass (Gaeckle 2012). It has been shown that the construction of outfalls and the discharged effluent affect marine organisms and processes, and specifically eelgrass. The impacts to eelgrass range from physical effects on the environment where it grows to physiological effects on the plants. But little is known about these impacts in Puget Sound (Gaeckle 2012).

The areas within Puget Sound where eelgrass is most at risk include locations along the eastern side of the Sound where population density is highest (e.g., urban growth areas), near outfall discharge points, and at the mouths of major rivers. However, the major outfall discharge points that would be a direct source of contamination for eelgrass typically discharge deeper than the extent of existing eelgrass beds in Puget Sound (e.g., West Point Wastewater Treatment Plant, Brightwater Treatment Plant). Most other treatment facilities in Puget Sound discharge at or beyond the deepest extent of eelgrass (Gaeckel et al. 2015).

Other discharge points of concern include CSO and stormwater outlets. These sources typically discharge near eelgrass beds and tend to contain high concentrations of nutrients, metals, and contaminants. CSOs are mostly contained in areas of high population density near major cities most of which have eelgrass growing along the waterfront.

Another area of concern where eelgrass may be affected includes major river deltas that have high flow and sediment discharge and contain inputs from sewage treatment facilities among other upland sources. Eelgrass is currently growing at most of the major river deltas but restoring historical flow volumes, drainage patterns and filtration potential may enhance eelgrass across deltaic fronts (Grossman 2013, Grossman et al. 2011). In addition, improvements in sewage treatment will only enhance riverine water quality and provide a range of benefits downstream and into the Sound.

The potential effect on eelgrass from the quantity of outfalls (and associated loading) in the Central Puget Sound and Saratoga-Whidbey basins could be detrimental to eelgrass considering the anticipated population growth over the next decade (Gaeckel et al. 2015).

Outfall impacts to eelgrass range from physical effects on the environment where it grows, such as the installation of an outfall pipe, to physiological effects on the plants caused by shading due to nutrient triggered plankton blooms or compromised photosynthetic potential because of metal or contaminant toxicity (Lewis and Devereux 2009). Effects of anthropogenic containments in general are uncertain as limited study has occurred to date (Gaeckle 2016).

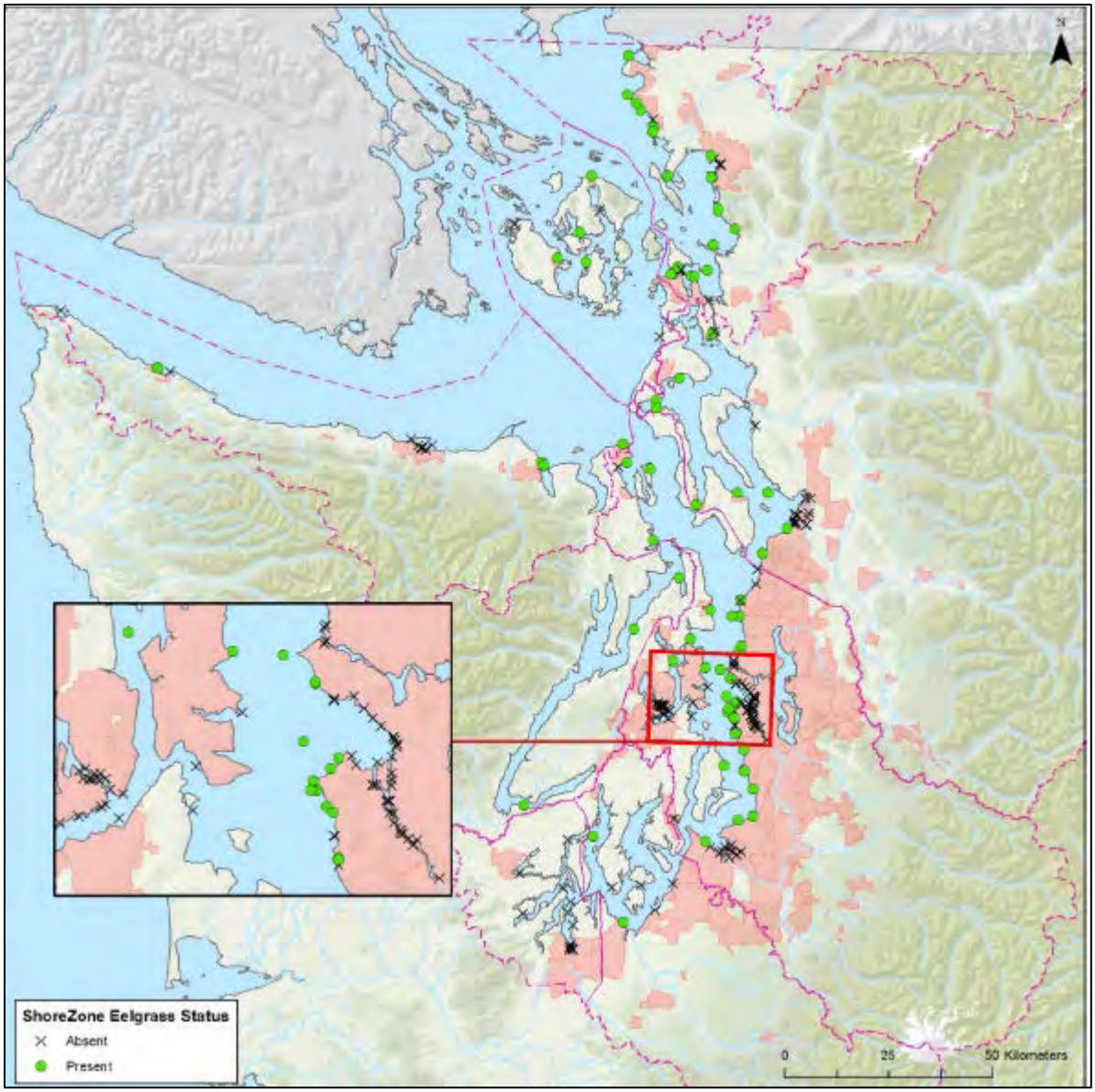
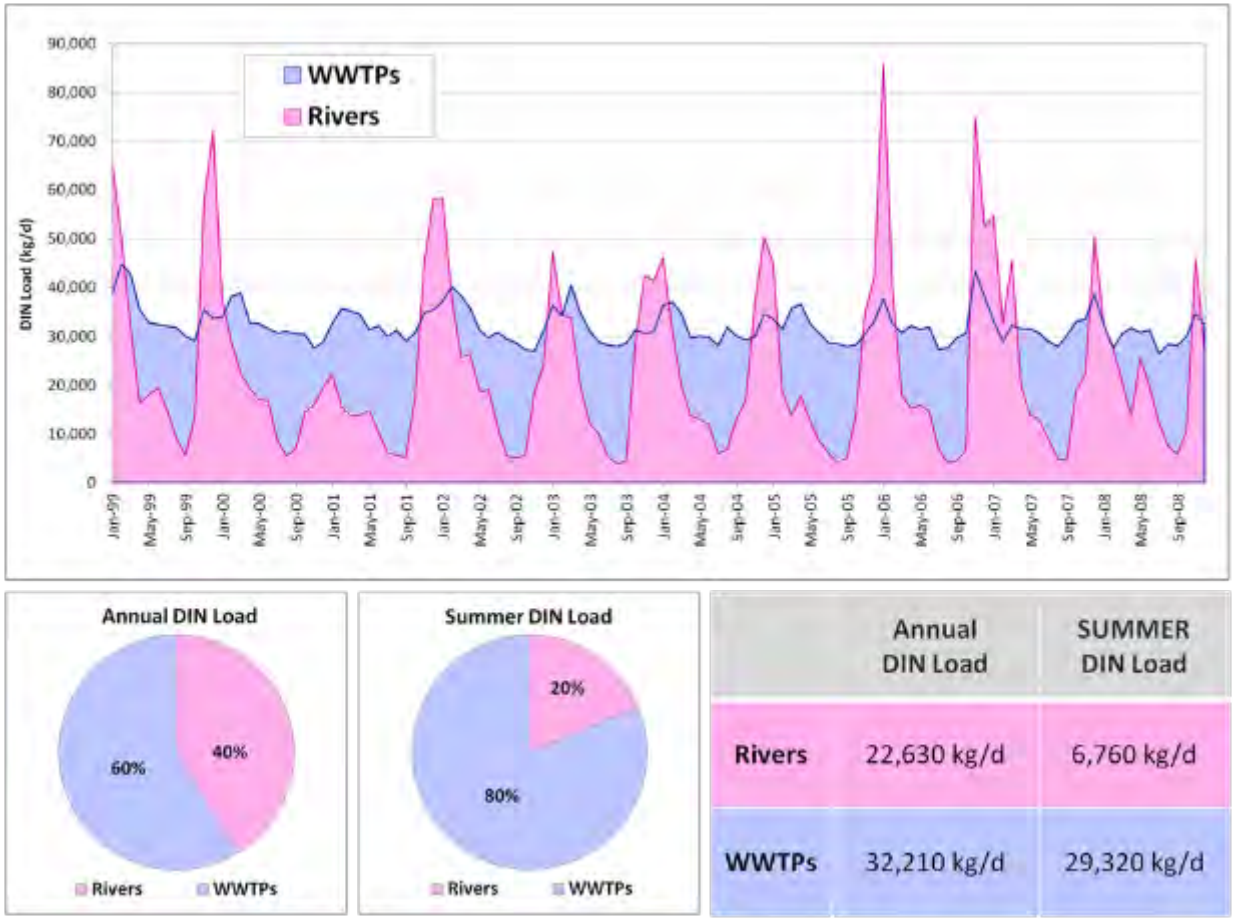


Figure 4-4. NPDES permitted outfalls in Puget Sound and eelgrass presence in adjacent shoreline segment from WDNR Shoreline inventory (2001). Figure reproduced from Geackel et al. 2015.

Nutrient (nitrogen and phosphate) concentrations have been increasing in Puget Sound. The reasons for this are uncertain but WDOE hypothesizes that human derived nutrients due to summer inputs by waste water treatment plants increases nitrogen in the summer when natural inputs from rivers typically decrease (Figure 4-5). This affects the nutrient balance of the food web and may be causing algal blooms (Roberts et al 2013). The presence of macroalgal blooms in particular is identified as a stressor for eelgrass due to deposition of masses of macrolgae directly on eelgrass. The role of phytoplankton blooms is less certain but could increase turbidity and reduce eelgrass health and growth (Thom et al. 2011). The quantitative effect on eelgrass is not known.



	Annual DIN Load	SUMMER DIN Load
Rivers	22,630 kg/d	6,760 kg/d
WWTPs	32,210 kg/d	29,320 kg/d

Figure 4-5. Dissolved inorganic nitrogen (DIN) input to Puget Sound from local rivers and water water treatment plants (WWTPs).

Herrera (2011) found that during storm events, median total nitrogen concentrations were higher in residential and agricultural subbasins (1.3 and 1.8 mg/L, respectively) relative to commercial/industrial and forested basins (0.3 and 0.4 mg/L, respectively). Increased development relative to forested basins is likely to increase nitrogen loads.

The deposition of organic matter in the nearshore if thick enough can result in sediment porewater becoming anaerobic. This produces hydrogen sulfide which is toxic to eelgrass (Thom et al. 2011). This can from storm water, log rafting, tree debris, and macroalgae piles. The extent of this in Puget Sound is expected to be low (Thom et al, 2011).

Disease

Wasting disease has been observed in eelgrass populations throughout most of Puget Sound (Thom et al 2011). It appears to not have a detrimental effect on survival of these populations, but there is limited information. Thom et al. 2011 suggests the disease may increase with expected changes in sea temperature and salinity.

Overwater structures

Overwater structures such as docks and piers cause loss of eelgrass by shading, altered wave energy pattern, altered substrate characteristics (Jones and Stokes 2006, Nightingale and Simenstad 2001). An inventory of overwater structures was conducted by WDNR (WDNR 2007). While the inventory is dated, it provides an indication of the magnitude of the impact. The number of overwater structures and total acres affected are illustrated in Table 4-4.

Table 4-4. Overwater structure inventoried by WDNR from 2002-2006 orthophotos.

	Grays Harbor	Willapa Bay	Hood Canal	South Puget Sound	North Puget Sound
Number of structures	133	111	1156	4350	2481
Total acres	53	22	174	975	560

Simenstad et al. (2011) estimated that overwater structures cover approximately 6.5 km2 of the Puget Sound intertidal. Thom e al. 2011 estimated an average of 4 ft2 of overwater structure per linear foot of shoreline across Puget Sound, with over 1,400 acres of overwater structures. Central Puget Sound contains the largest area covered by overwater structures and the greatest ratio of overwater structure to linear feet shoreline present. The San Juan region has the lowest density of overwater structures. It was estimated that 40% of the overwater structure area (560 acres) was collocated with eelgrass and thus would be affected (Thom et al. 2011).

Nightingale and Simenstad (2001) concluded that their empirical findings indicate that the cumulative impacts of overwater structures can have significant impacts on ambient wave energy patterns and substrate types. While this conclusion is not specific to eelgrass, these impacts directly affect eelgrass present at these locations.

Effects may be reduced due to increased knowledge of effects leading to care in placement location so as not to disturb eelgrass and/or installation of grating to allow light penetration which reduces the impact (Jones and Stokes 2006). Eelgrasses losses are minimized by WDFW hydraulic code rules that require overwater structures be designed or located to avoid shading or other impacts that could result in the loss of eelgrass (WAC 220-110-300(3) and (4)).

Corps permitting of overwater structures between 2007 and 2016 is illustrated in Figure 4-6 and includes both new structures and maintenance/repair of existing structures.

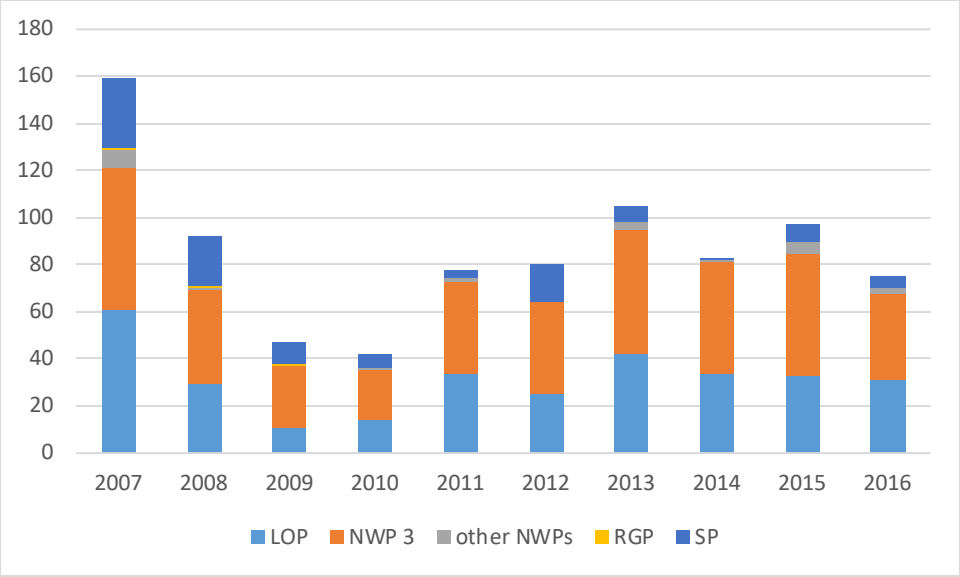


Figure 4-6. Overwater structure permitting 2007-2016

Mooring buoys, anchors, and barge grounding

Improperly sited or designed mooring buoys and vessel anchoring can scour, shade, fragment, and increase eelgrass bed vulnerability to disturbances. Localized impacts are frequently concentrated within embayments with high densities of moored vessels (WDNR 2015). Barge groundings have damaged eelgrass at the Clinton ferry terminal and at Hood Canal Bridge, as well as smaller scale impacts near marinas (Thom et al 2011). These effects are generally small in scale, but there spatial extent is unknown. Effects are likely to increase as boat traffic increases (Thom et al. 2011). Recent Corps permitting of mooring buoys is illustrated in Figure 4-7.

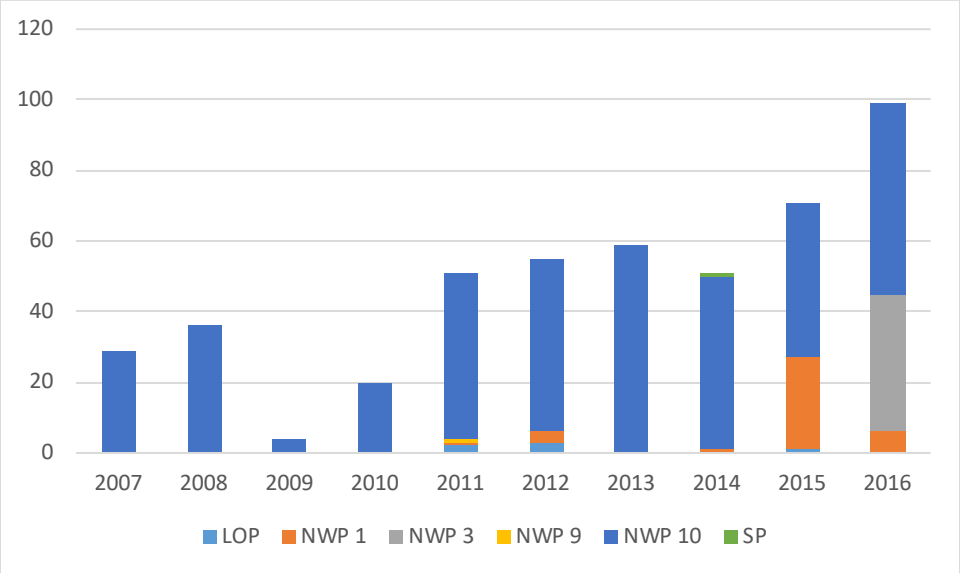


Figure 4-7. Recent Corps permits issued for mooring buoys in Washington State

Dredging projects

Construction projects that affect the substrate or that result in dredging or filling can adversely affect eelgrass. In most cases, project effects to eelgrass are mitigated. A summary of permits issued for non-Corps dredging and maintenance dredging activities conducted under NWPs are summarized in Figure 4-8. Corps maintenance dredging occurs regularly at many locations throughout Puget Sound and in Grays Harbor. Annual dredging in Puget Sound is 100,000 – 200,000 cy which is typically maintenance dredging of the Snohomish or Duwamish Rivers. An average of 1.7 million cubic yards is dredged annually from the Grays Harbor deep draft channel. The dredged material is disposed of at various approved disposal sites, including open-water disposal at the Point Chehalis, South Beach, South Jetty, and Southwest disposal sites, as well as beneficial use for beach nourishment at Half Moon Bay. The Westport Marina and the entrance channel require infrequent maintenance dredging. Annual maintenance dredging by the Corps is likely to continue for the foreseeable future. In addition, the Port of Grays Harbor (Port) conducts maintenance dredging of its marine terminal facilities adjacent to the Federal Navigation Channel (Corps 2012 – GH EA). The Corps is currently deepening the federal navigation deep-draft channel in Grays Harbor from the currently maintained depth of -36 feet MLLW to the fully authorized depth of -38 feet MLLW. The project is deepening approximately 14.5 miles of the 27.5-mile channel. The Port of Grays Harbor requested deepening the channel the additional two feet to better accommodate current vessel traffic for existing Port tenants and commodities. Maintenance dredging in Willapa Bay is currently managed by the Port of Willapa Bay. Maintenance dredging would be expected to have only negligible impacts to eelgrass associated with turbidity during dredging. The primary eelgrass impact would have occurred during the initial dredging of the project. The Port plans to dredge six locations at varying frequencies ranging from annually to every 20 years. The average annualized dredge volume they estimate is 14,000 cy (Shepsis and Chaffee 2012).

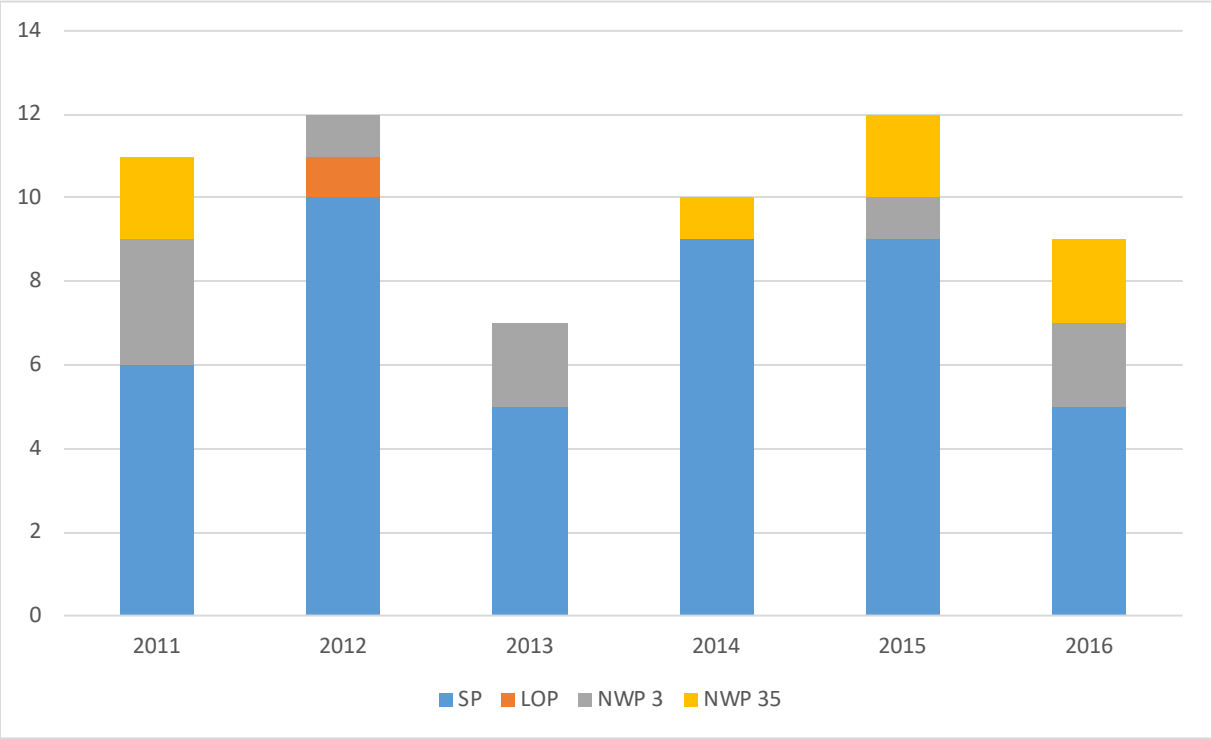


Figure 4-8. Dredge related Corps permitting 2011-2016

Invasive species and control efforts

As described two invasive species, *Z. japonica* and *S. alterniflora*, may adversely affect native eelgrass. *Z. japonica* occurs throughout Puget Sound, Willapa Bay, and Grays Harbor and competes for space with the native eelgrass (*Z. marina*). Spartina can also displace eelgrass (Zostera spp.) on mudflats although it typically occurs at higher elevations than the native eelgrass (DOI et al. 1997). Efforts to control both species with herbicides and mechanical methods are ongoing. Herbicides in particular can adversely affect the native eelgrass. These non-target effects are minimized to the degree possible.

The herbicide imazapyr and glyphosate have been used to control *S. alterniflora*. In Puget Sound, approximately 11.3 solid acres of *S. alterniflora*, including over 30,000 occurrence points, was treated in Puget Sound. This represents a seven percent increase from the 10.5 solid acres treated in 2014. It is anticipated that treatment efforts will increase in coming years (WSDA 2015). In Willapa Bay over 8,000 solid acres have been eradicated as of 2015. Affected acres in Pacific County have declined to 1,075 representing a 96 percent reduction from the peak of 25,430 affected acres recorded in 2009 (WSDA 2015). The reported amount of imazapyr discharged for Spartina control in Willapa Bay for 2012 was approximately 0.75 pound of active ingredient. In Grays Harbor *S. alterniflora* has been reduced to 0.0032 solid acre from a high of over ten solid acres in 2005. WSDA projects that less than 0.006 solid acre of *S. alterniflora* will be present in Grays Harbor County during the 2016 treatment season WSDA 2015).

In 2014, WDOE issued an NPDES permit for shellfish growers to apply imazamox to *Z. japonica* on clam culture beds only (not authorized for geoduck or oysters) in Willapa Bay. WDOE indicates that mixed beds of *Z. marina* and *Z. japonica* will be removed (WDOE 2014). Ecology expected that *Z. marina* growing off of the treatment site will not be significantly impacted if effective mitigation was employed. Follow-up monitoring indicated that effects to off-site non-target *Z. marina* were within the acceptable limits (WDOE 2016).

Eelgrass restoration

The Puget Sound Partnership (PSP), a state agency leading the region's collective effort to restore and protect Puget Sound, identified eelgrass as an indicator of the health of Puget Sound in recognition of the regional ecosystem services it provides and its sensitivity to changes in environmental conditions. PSP established a goal to increase eelgrass area in Puget Sound by 20 percent relative to the 2000-2008 baseline of approximately 53,300 acres by 2020. The WDNR was subsequently tasked, in collaboration with the PSP, to develop a comprehensive recovery strategy for eelgrass. An interdisciplinary workgroup of local, state, and federal government, tribes, non-governmental organizations, and business groups defined overarching goals and prioritized implementation measures to address critical stressors and support conservation and recovery. The eelgrass recovery strategy including the following goals:

- Conserve existing eelgrass habitats and enforce the "no net loss" standard established by the SMP guidelines;

- Reduce environmental stressors to support natural expansion, key stressors identified included overwater structures & in-water construction, vessel mooring & anchoring, anthropogenic nitrogen and sediment loading;
- Restore and enhance degraded or declining eelgrass beds;

Successful eelgrass restoration has been difficult to achieve in Puget Sound (WDFW 2010, Thom et al. 2001, Thom et al 2014). New eelgrass beds can be established where conditions that prevent eelgrass from growing (e.g., shade, depth, substrate, or current velocity) are remedied (Thom et al. 2001, Thom et al 2014). An analysis of candidate areas for restoration was produced to support the PSP goal of increasing eelgrass area by 20%. These areas are identified in Figure 4-9.

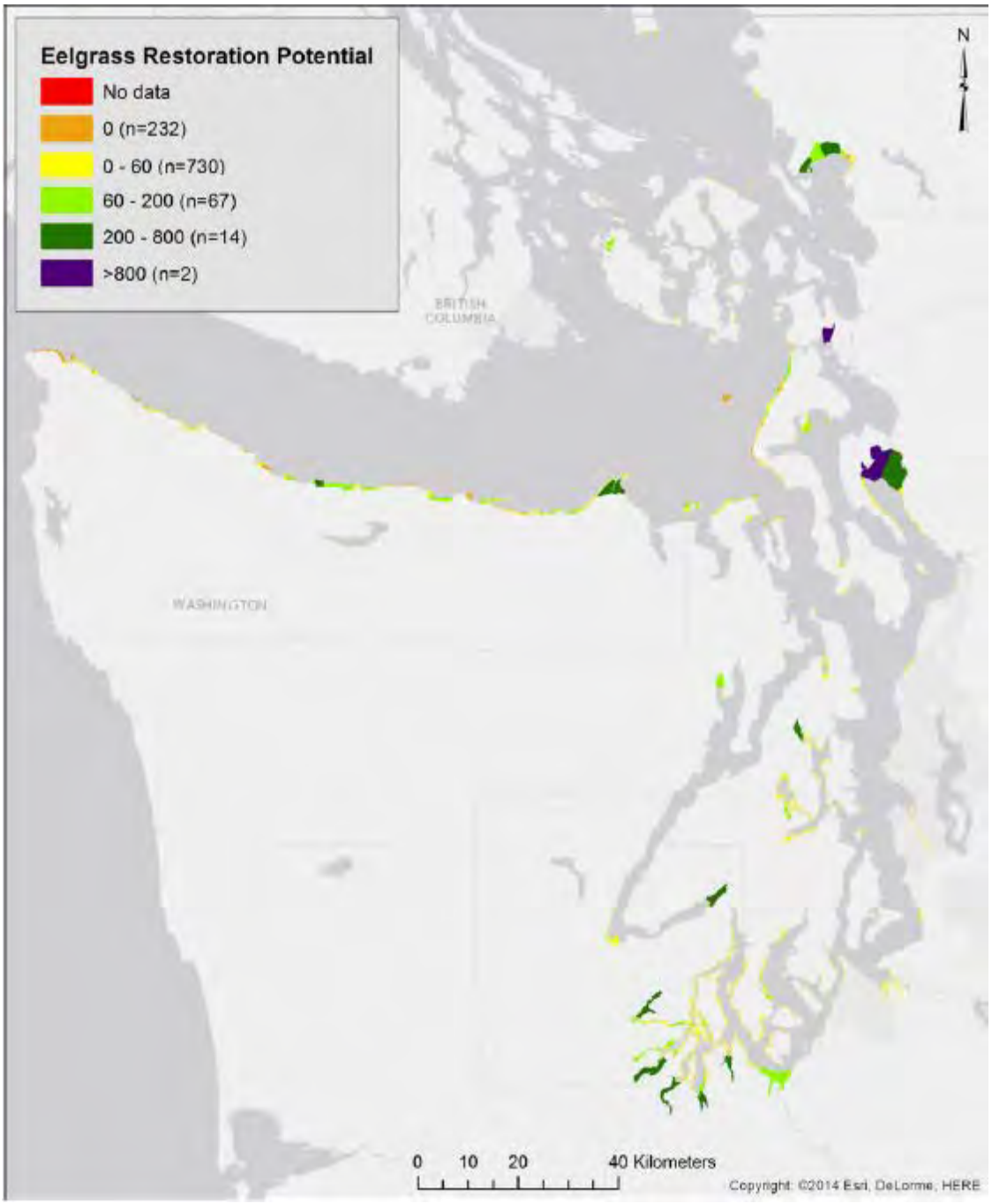


Figure 4-9. Areas identified with eelgrass restoration potential that are currently devoid of eelgrass. Higher eelgrass restoration potential score indicates greater potential (from Thom et al. 2014).

4.2.5. Effects of future actions

The population growth in Puget Sound counties combined is estimated to increase 25% between 2015 and 2040 with growth being fairly equal spread among the counties ranging from 10% in San Juan County to 36% in Whatcom County (WOFM 2012). In general the more urban areas are predicted to

have greater population increases than the more rural counties (Figure 4-10). The population growth in Grays Harbor County is estimated to increase 5% between 2015 and 2040 (WOFM 2012). More recent demographic data indicates that Pacific County lost population in 2015 compared to the previous year. The population growth in Pacific County is estimated to increase 6% between 2015 and 2040 (WOFM 2012). More recent demographic data indicates that Pacific County lost population in 2015.

Presently, Willapa Bay remains a rural economy will reliance on marine and resource extraction jobs. This is expected to continue. There is unlikely to be significant habitat restoration actions in the region because there are limited numbers of ESA listed species which traditionally attract restoration dollars (CRS 2007). The aquaculture industry is expected to continue to be a driving influence on the ecology of the bay.

Figure 4-10. Expected population growth in the counties surrounding the inland marine waters

Future actions were determined in part by examination of local shoreline plan updates which estimate future growth/development and other activities over a planning horizon Table 4-5. Local governments are on different update schedules. Some local governments have completed their comprehensive updates. Others are under way or have not begun.

Table 4-5. Anticipated future actions for county shoreline master plan updates

	Anticipated future activities	Source
Grays Harbor County	support expansion of agriculture, encourage expansion of aquaculture, Encourage new water-oriented commercial development, encouirage recreation development	Preliminary Draft Grays Harbor County Shoreline Master Program August 2016
Pacific County	future development is expected to follow the slow pace of development experienced in recent years : Tourism, recreation, residential, aquaculture, and fishing	DRAFT Cumulative Impacts Analysis Pacific County's Shoreline Master Program 2015
Whatcom County		
Skagit County	residential development-significant in some locations; large amount of industrial property is available for potential future redevelopment	Cumulative Impacts Analysis of Skagit County's Shoreline Master Program 2016
Island County	residential development, aquaculture, docks/piers limited to areas where currently clustered	SMP update Cumulative Impacts Analysis 2013
Snohomish County	residential infill; dock, pier, or ramp construction, bulkhead development associated with residential use; expanded agricultural use; creation of more parks/public water access sites	Exhibit A, Amended Ordinance No. 12-025 Snohomish County Shoreline Management Program: Shoreline Environment Designations, Policies and Regulations 2012. Appendix C – Summary of Potential Development Impacts and Proposed Regulatory and Non-Regulatory Offsets
King County	limited residential development	King County Shoreline Cumulative Impacts Assessment September 2010
Pierce County	residential development, new and reconstruction of docks/piers, limited recreational development; aquaculture	SMP update Cumulative Impacts Analysis 2014
Thurston County	residential development	Final Draft Thurston County Shoreline Master Program Update Inventory and Characterization Report SMA Grant Agreements: G0800104 and G1300026 June 30, 2013 Prepared By: Thurston County Planning Department

Mason County	residential development	Mason County SMP Cumulative Impacts Analysis: February 2016
Kitsap County	residential development; limited commercial development	Revised DRAFT Cumulative Impacts Analysis for Kitsap County's Shoreline Master Program 2013
Jefferson County	"residential development, master planned Resorts, marinas, co	

Increased development is expected to lead to increases in the impacts discussed under the previous section including increases in nutrients degrading water quality conditions for eelgrass, increases in overwater structures, increased damage from boating and anchoring. Residential development along shorelines typically involves installation of septic systems which results in nutrient addition to marine waters (Pierce CIA, Island CIA). Human-induced disturbances are expected to increase, and may exacerbate, eelgrass loss in Puget Sound (Thom et al. 2014). Efforts by the State to minimize these future impacts are likely to have some beneficial effects at reducing the rate of impact.

Aquaculture

Aquaculture is an important industry in Puget Sound, Willapa Bay, and Grays Harbor accounting for significant percentage of the nation's shellfish production. The industry is growing and expected to continue well beyond the expiration of the 2017 NWP 48. As the industry expands, more tidelands with and without eelgrass are expected to be put into production. The effects of aquaculture on eelgrass are expected to continue into the future and would not likely cease upon the expiration of the 2017 NWP 48. One geoduck plant-to-harvest cycle can take 7 years which is beyond the 5 year timeframe of a NWP. All active and fallow acreage collocated with eelgrass would continue to impact the eelgrass or remove it entirely at least for periods of time. New areas that are put into culture may or may not be subject to restrictions on eelgrass as discussed previously.

The impacts to eelgrass from aquaculture can be temporary, depending on the activity, because the habitat conditions themselves (elevation, water quality, etc) are not permanently altered which allows eelgrass to eventually recover given sufficient time. The timeframe for recovery has been documented to be 2 to 5 years depending on the activity and other factors. This recovery timeframe may or may not allow for a full recovery of eelgrass before the next aquaculture disturbance. Even for disturbances spaced sufficiently apart, for example on a geoduck farm where geoducks are planted and covered with nets for 2 years before a 5 year period when eelgrass recovery can occur. After 5 years, geoduck harvest disturbs/removes the eelgrass once more. While this process allows for eelgrass recovery at the site, the frequency of disturbance and relatively long recovery times result in a local habitat condition where eelgrass more often than not is either not present or present at a much reduced functional state. This is the future condition of eelgrass on tidelands that are engaged in aquaculture. This effect would persist as long as aquaculture is occurring at the site. In some cases such as when nets are placed over planted clam beds, any eelgrass is likely to be permanently smothered and not recover because of the permanence of the nets which are only removed between harvest and the next planting cycle which may only be a matter of weeks or months. This is insufficient time for eelgrass to recover.

Construction Projects

Water clarity in nearshore areas is often reduced by the presence of suspended sediments, which can reduce the light input to eelgrass beds below that required for eelgrass growth. Studies in Puget Sound and elsewhere document that suspended sediments from land use actions can increase nearshore turbidity for extended periods (Thom et al. 2011).

A summary of all RHA Section 10 and CWA Section 404 activity permitted by the Corps in recent years is illustrated in Figure 4-11. This level of permit activity is expected to continue in the future. In most cases effects to eelgrass from these activities would avoided, minimized, or mitigated consistent with Washington State regulations.

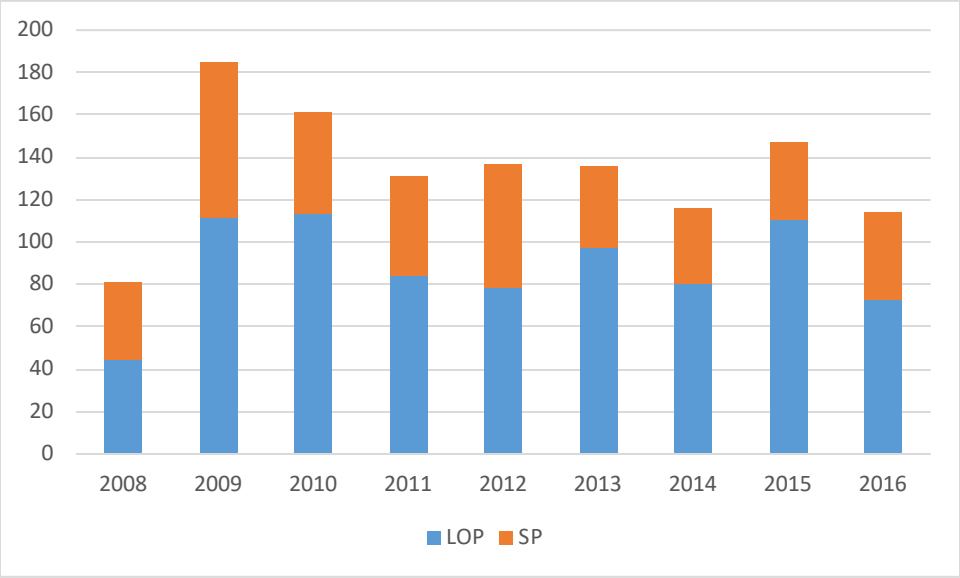


Figure 4-11. RHA Section 10 and CWA Section 404 standard permits and LOPs for all activities 2008-2016

Proposed new construction projects include:

- Shell Anacortes Rail Unloading Facility. Equilon Enterprises, LLC, dba Shell (the Applicant), is proposing to construct and operate a crude-by-rail unloading facility at the existing Shell Puget Sound Refinery (PSR) in Anacortes, Washington. Each unit train arriving at the rail unloading facility would carry approximately 60,000 to 70,000 barrels of crude oil. The facility would receive six unit trains per week, with each train having up to 102 tank cars. The proposed project would not result in a change in refining capacity of the Shell PSR (EIS _Wdoes website). The project is currently being revised.

- Westway proposes expanding its existing bulk liquid storage terminal to allow for the receipt of crude oil unit trains, storage of crude oil from these trains, and shipment of crude oil and other materials by vessel and/or barge from Port of Grays Harbor Terminal 1. According to the project proposal, the Westway expansion project would be done in two phases. The information below

includes the proposed construction and operations for both phases. First phase would increase rail line traffic by 730 rail trips (loaded and unloaded) per year and vessel traffic in Grays Harbor by approximately 400 vessel trips per year. The second phase would increase PS&P rail line traffic by 365 rail trips (loaded and unloaded) per year and vessel traffic in Grays Harbor by approximately 120 vessel trips per year (City of Hoquiam and WDOE 2016). The proposed action is currently being revised. EIS identified potential impacts to eelgrass as a result of changes to grain size and turbidity. Increased vessel traffic may impact eelgrass on the margins of the channel

Climate change

Both sea level rise and warmer water temperatures are predicted to occur in the future as a result of climate change in Washington State (WDOE 2012). Sea level rise would result in increased depth and light attenuation may contribute to vulnerability of eelgrass and/or result in eelgrass decline at the lower edges of beds. The response of eelgrass may be to move upslope if there are suitable areas available. Although a higher sea level will probably affect eelgrass, the actual effect is very uncertain, and will interact with stressors that act upon water clarity (Thom et al. 2011). Predicted effects to eelgrass include loss of two-thirds of the low tidal areas in Grays Harbor and Willapa Bay, and increased sediment from beach erosion could impact eelgrass (WDOE 2012).

Extended periods of high temperatures reduce eelgrass growth and survival (Thom et al. 2011, WDNR 2010). In places where the water warms substantially in the summer (e.g., poorly flushed shallow bays) small increases in the temperature would result in loss of the plants. Increasing or consistently warm water temperatures in conjunction with low oxygen conditions or anoxic events may preclude growth and survival of Z. marina (WDNR 2010).

4.2.6. Summary and Conclusion

Eelgrass (*Z. marina*) is included in this analysis because it plays a key role in the aquatic ecosystem, is considered a protected species by the Federal government and the State of Washington, is the focus of significant restoration, monitoring, and planning initiatives, and the proposed action has substantial adverse impacts on this species.

The cumulative impacts on eelgrass are summarized in Table 4-6 for the geographic regions analyzed.

Table 4-6. Summary of stressors and primary cumulative effects on native eelgrass (*Z. marina*)

stressor	Puget Sound	Willapa Bay	Grays Harbor
Invasive species	Z. japonica is widespread (acreage unknown); acreage impact on Z. marina is unknown but considered limited	Z. japonica is widespread (18,000 acres); herbicide currently used to control which has adverse effects on Z. marina where the two are collocated	Z. japonica is widespread (4,210 acres);
Nutrient driven harmful algal blooms	nutrients and algal blooms are increasing; further increases are expected due to increased population and development; acreage impact	significant increasing nitrate trend; effect uncertain	no significant nutrient trends

Suspended sediment	historical effects likely from logging and development; increasing nearshore development may increase future suspended sediment	historical effects likely from logging and development; some current high sediment loads documented, uncertain effects	historical effects likely from logging and development; limited future effects
Climate change	Sea level rise may cause shifts in eelgrass up slope provided habitat is available - net effect uncertain; future increases in water temperature may reduce productivity and survival		
Overwater structures	numerous and increasing; new standards for light penetration decrease future effects; estimated 560 eelgrass acres affected	limited in extent	limited to few developed locations
Historical oyster harvest	4-5,000 acres of Olympia oyster reef lost, eelgrass may have replaced to some degree although this is unknown	6-24,000 acres of Olympia oyster reefs lost, eelgrass has colonized many of these former oyster reef areas	Unknown
Aquaculture	widespread historical impacts; large acreages (> 4,000) potentially impacted by proposed action, and by future expected aquaculture	widespread historical impacts; large acreages (20,000) potentially impacted by proposed action and by future expected aquaculture	widespread historical impacts; large acreages (2,000) potentially impacted by proposed action, and by future expected aquaculture
Storms	can have large impact; eelgrass typically recovers quickly because the underlying conditions that created the habitat conditions in the first place remain the same; negligible long term impact		
Construction projects	historical impacts; future impacts likely to be mitigated based on current regulations	historical impacts; future impacts likely to be mitigated based on current regulations	historical impacts; future impacts likely to be mitigated based on current regulations
Boat grounding/ anchoring	Large boating population that is increasing which suggests continued impacts; spatial extent likely limited	Limited effects	Limited effects
Propeller wash/ boat wake	Likely to be limited in extent		
Shoreline armoring	Historical and likely continuing impacts although not clearly documented	Some limited historical impacts likely	Some limited historical impacts likely
Dredging/ filling	large unknown acreages lost due to historical filling and dredging; future effects likely mitigated		
Anthropogenic contaminants	Contaminants present but effects uncertain	No effects expected	Contaminants present but effects uncertain
Disease	wasting disease present in Puget Sound, effects uncertain	no known effects	no known effects
Organic matter discharge/ sulfides	Likely historical effects due logging; uncertain effects currently but expected to be limited in extent	Likely historical effects due to logging; future effects not anticipated	Likely historical effects due to logging; future effects not anticipated

There are historical impacts to eelgrass that are both negative and positive. Substantial losses have occurred due diking, filling, dredging, development, and pollution/nutrients. Historical aquaculture has also negatively impacted eelgrass in all of the regions. In Willapa Bay, the historical harvest and removal of the native Olympia oysters from as much as 25% of the bay allowed eelgrass to expand into this area. The extent of this change is unknown but may be in the 1,000s of acres. This likely occurred in Puget Sound and Grays Harbor as well but at a lesser scale.

Currently the primary adverse effects to eelgrass occur from urbanization/development activities and its associated pollution (primarily in Puget Sound) and aquaculture. Anticipated future impacts include urbanization/development, aquaculture, and climate change related effects. Current less developed areas in north Puget Sound and Hood Canal are expected to see some of the fastest population growth. This is also where the most extensive eelgrass beds occur in the Puget Sound.

Significance

Significance is determined by context and intensity which are defined below. With respect cumulative impacts, 40 CFR 1508.27(b)(7) states, "The following should be considered in evaluating intensity: Whether the action is related to other actions with individually insignificant but cumulatively significant impacts. Significance exists if it is reasonable to anticipate a cumulatively significant impact on the environment. Significance cannot be avoided by terming an action temporary or by breaking it down into small component parts."

Context

A determination of significance requires consideration of both context and intensity (40 CFR 1508.27(a)). Context means that the significance of an action must be analyzed in several contexts such as society as a whole (human, national), the affected region, the affected interests, and the locality.

Nationally eelgrass has declined dramatically with 90% declines documented both along California and the Atlantic coast (NOAA 2017). It is considered a special aquatic site with protections under the CWA. Regionally eelgrass is protected by the State of Washington under the Shoreline Management Act and HPA regulations, and there is stated objective to increase its abundance in Puget Sound by 20% by 2020. Locally, eelgrass conditions differ among the three geographic areas analyzed as discussed in Table 4-7. Puget Sound has more stressors acting on eelgrass and the State has identified recovery goals for the species. In Willapa Bay, the number of stressors may be less but the relative effect of individual stressors such as competition with the non-native eelgrass and aquaculture may be greater than the effect of those stressors in Puget Sound. Moreover, eelgrass in Willapa Bay may be more extensive today than it was historically, although this is uncertain, due to the large accumulations of Olympia oysters that were present and subsequently harvested. The role of eelgrass locally is also relevant as its importance may be greater if it is located at river mouths where it can provide greater benefits to certain species such as juvenile Chinook salmon. Eelgrass further from river mouths may be less valuable to this species as a rearing habitat simply due to its distance from the salmon migration pattern.

There are a number of affected interests including shellfish growers, fishing interests, salmon recovery interests, tribal communities, NGO's, natural resource agencies, and development interests. Today shellfish growers are unique in that they are in direct competition with eelgrass and directly affect it. Historically, dredging and other construction projects also directly affected eelgrass but today these

types of projects are typically avoided or mitigated. Aquaculture is unique in that its impacts are not mitigated. Indirect effects of development and urbanization and degraded water quality, while likely substantial, are not yet well understood. As knowledge is gained additional restrictions may be imposed to prevent impacts. This has been the case with overwater structures which now typically are required to allow light to penetrate through the structure so as to minimize impacts to eelgrass. The other affected interests mentioned above generally support protection and restoration of eelgrass.

Intensity

The following factors should be considered when evaluating intensity (40 CFR 1508.27). These factors are discussed in the context of cumulative impacts.

(1) Impacts that may be both beneficial and adverse. A significant effect may exist even if the Federal agency believes that on balance the effect will be beneficial.

Beneficial effects to eelgrass have occurred in Puget Sound through restoration projects.

(2) The degree to which the proposed action affects public health or safety.

No public health or safety issues are identified.

(3) Unique characteristics of the geographic area such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas.

Eelgrass itself is considered an ecologically critical area by the CWA and the State of Washington.

(4) The degree to which the effects on the quality of the human environment are likely to be highly controversial.

The concerns surrounding eelgrass have been extremely controversial in the State of Washington as evidenced by recent court cases specifically involving eelgrass affected by aquaculture, interest in public meetings and concerns/comment letters submitted to the Corps expressing concerns for eelgrass. Impacts associated with development also can generate controversy.

(5) The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks.

There is uncertainty with respect to all elements of the issue including the population of eelgrass itself, past, present, and future effects, and effects of the proposed action. The uncertainty is primarily about the magnitude of effect, however, as there is little debate among the scientific community about the stressors on eelgrass and effects of aquaculture in particular.

(6) The degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration.

It is uncertain whether the proposed action will set precedent for future actions; however, there is strong potential for this to occur. The 2017 NWP 48 has been issued twice previously and is likely to be issued again in 2022. Each iteration of the permit has been updated based on experiences with the previous version.

(7) Whether the action is related to other actions with individually insignificant but cumulatively significant impacts. Significance exists if it is reasonable to anticipate a cumulatively significant impact on the environment. Significance cannot be avoided by terming an action temporary or by breaking it down into small component parts.

Aquaculture represents a substantial impact to eelgrass based simply on the acreages involved. While impacts are temporary if it is assumed all aquaculture activities cease with the expiration of the 2017 NWP 48, the likely reissuance of the permit and nearly certain continuation of aquaculture beyond the permit expiration date guarantee these impacts, temporary or not, will continue well in to the future. This is further discussed below.

(8) The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources.

No impacts to these resources is anticipated.

(9) The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973.

The proposed action is likely to adversely affect designated critical habitat for several species listed under the ESA including Puget Sound Chinook salmon, Hood Canal summer run chum salmon, and Puget Sound steelhead. Adverse effects are due in part to impacts on eelgrass (NMFS 2015). Recent programmatic ESA consultation concluded terms and conditions were required to protect eelgrass from aquaculture.

(10) Whether the action threatens a violation of Federal, State, or local law or requirements imposed for the protection of the environment.

The action does threaten a violation of State requirements under the Shoreline Management Act to achieve no net loss of eelgrass and Federal requirements to protect eelgrass imposed under the ESA for aquaculture activities. The proposed action is not consistent with either of these requirements.

Significance threshold

The cumulative impacts of past and present activities on eelgrass on an acreage basis is unknown. What is known is that eelgrass has been lost in Puget Sound. Also known is that native eelgrass is under threat in all three regions by various stressors. In Willapa Bay and Grays Harbor this is principally from invasion of non-native eelgrass, which is believed to provide many of the functions of native eelgrass, potential changes in the water temperature and sea level from climate change, and from aquaculture. In Puget Sound the list of stressors includes those just listed and also water quality and habitat changes from urbanization and development which manifest themselves in a number of ways (degraded water quality, overwater structures, mooring anchors, boat traffic).

Estimates exist for the current distribution of the species in each region. Recent trends only exist for Puget Sound and while these trends are subsamples of the total population, they are considered to reflect the status of the population as a whole. The recent trend indicates eelgrass areas have been stable. On a smaller scale, eelgrass trends are variable with some areas showing declines and others increases. The eelgrass estimates from Willapa Bay and Grays Harbor cannot be meaningfully used to examine trends because of the different methodologies used.

The determination of a significance threshold, a threshold that if reached is indicative of significant effects, is desirable in cumulative effects analysis (CEQ 1997). In the State of Washington it is evident based on the establishment of a 'no net loss' requirement for eelgrass that a threshold of significance has already been established in this region and that it has been reached. This is supported by WDFW (2010) which stated the following regarding eelgrass status, "The broad patterns of development and shoreline modification around the Puget Sound basin have caused small, incremental effects that have

become cumulatively significant". In Puget Sound this is further supported by 1) the designation of eelgrass as critical habitat for multiple endangered species, and 2) the establishment of a goal to increase eelgrass by 20% for Puget Sound ecosystem recovery generally. Additional losses beyond this threshold would therefore be considered significant. The loss and/or degradation of potentially 1,000s of acres of eelgrass in Puget Sound alone, which is anticipated to occur under the proposed action, would thus be considered a significant cumulative impact under NEPA. There is more uncertainty with respect to losses in Willapa Bay and Grays Harbor. While the state requirement extends to these two embayments, there is substantially more eelgrass present as a percentage of estuary area, and it is possible eelgrass populations in these embayments have not experienced declines relative to historical populations. There are Federal protections including designation of eelgrass as EFH and an HAPC under the MSA and the general CWA protection of eelgrass as a special aquatic site. Given this background, it is likely that eelgrass populations in Grays Harbor and Willapa Bay can sustain losses without triggering a significance threshold. However, the loss and/or degradation of potentially 1,000s of acres of eelgrass in Willapa Bay and Grays Harbor is considerable and is likely to have ramifications for many additional species in these areas. These losses combined with the State and Federal protections, and the NEPA regulations which specifically states that significance cannot be avoid by breaking down the action into smaller parts (40 CFR 1508.27 (b)(7)), these impacts would also be considered significant.

The 2013 estimated eelgrass area is 55,870 acres in Puget Sound. The proposed action is anticipated to degrade or remove over 4,000 acres which represents 7% of this total. Over 2,600 of these acres are undisturbed by aquaculture on fallow lands. This is a large magnitude impact that is certain to occur. The magnitude of future impacts from development and climate change are unknown and less certain. In some cases the eelgrass will be replaced with oysters which provide comparable levels of productivity and function for some species such as salmon and Dungeness crab. For some species, such as herring, important functions of the habitat (i.e., spawning substrate) will be lost. In other cases, eelgrass habitat would be replaced with cover nets which provide relatively low habitat value compared to the eelgrass. Furthermore the benefits provided by oyster habitat are ephemeral because of the disturbance cycle associated with aquaculture. The eelgrass populations also decline seasonally so this may be comparable to disturbances from oyster aquaculture. The timing of aquaculture impacts are not seasonal but occur year around.

Impacts to eelgrass from aquaculture are on their surface temporary because the underlying habitat conditions (substrate, elevation, and water quality) remain the same allowing eelgrass to recover once the disturbance is removed. However, the regular disturbance associated with aquaculture both under the 2017 NWP 48 and under future permits results in a condition where eelgrass rarely recovers to its predisturbance condition. Even if full recovery is achieved, there is a substantial period of time where temporary losses of eelgrass will occur for periods of years. This temporary impact will undoubtedly have adverse effects on the species that depend on eelgrass habitat such as Dungeness crab, herring, and salmon. Loss of several years of eelgrass function at the mouth of a salmon stream for example will reduce the available rearing habitat for this species and result in fewer of that species surviving to adulthood. This would affect several year classes of that species and any fisheries on that species. In cases where the species is listed under the ESA, decreased survival of several year classes may have long term ramifications for the recovery of that species. NEPA defines significant effects as being both short- and long-term (40 CFR 1508.27(a)). The fact that effects may be temporary does not by itself exclude them from a determination of significance.

Given the magnitude of the impacts in acreage, the importance of eelgrass to the marine ecosystem, and the scale of the aquaculture impacts relative to other stressors, the impacts are considered significant.

4.3. Pacific sand lance and surf smelt

These species are analyzed together due to their similar life history and the similar list of stressors to the species.

The Pacific sand lance, is found from southern California around the north Pacific Ocean to the Sea of Japan, and across Arctic Canada. It is generally acknowledged to be of great ecological importance in local marine food webs (Bargmann 1998). The relative abundance of Puget Sound surf smelt, sand lance are unknown (Pentilla 2007). Greene et al. (2015) found evidence that suggested surf smelt populations in the south and central Puget Sound area have declined up to 100 fold in the last 40 years while sand lance populations have increased throughout all areas of Puget Sound during that same timeframe.

The following summaries of surf smelt and sand lance biology is from Pentilla (2007):

The surf smelt is a common and widespread nearshore forage fish throughout Washington marine waters. Spawning activity occurs in a wide variety of wave-exposure regimes, from very sheltered beaches in southernmost Puget Sound and Hood Canal to fully-exposed pebble beaches on the outer coast of the Olympic Peninsula. Spawning activity is distributed throughout the Puget Sound Basin, and stock boundaries cannot be defined geographically. Currently, about 10 percent of the shoreline of the Puget Sound Basin is documented to be surf smelt spawning habitat. Spawning regions are commonly occupied during the summer (May-August), fall-winter (September-March), or yearround (spawning every month, perhaps with a seasonal peak).

The life history of the surf smelt is intimately linked to nearshore geophysical processes. The critical element of surf smelt spawning habitat is the availability of a suitable amount of appropriately textured spawning substrate at a certain tidal elevation along the shoreline. Their potential spawning/spawn incubation zone spans the uppermost onethird of the tidal range, from approximately +7 feet up to extreme high water in central Puget Sound or the local equivalent. Spawning substrate grain size is generally a sand-gravel mix, with the bulk of the material in the 1-7 mm diameter range (Schaefer 1936, Penttila 1978).

WDFW surveys have documented surf smelt spawning habitat along 195 lineal statute miles in Puget Sound (Bargmann 1998). Their life history is unknown. There is no evidence of widespread migrations to and from the outer coast.

Sand lance, colloquially referred to as candlefish by local anglers, are also a common and widespread forage fish of the nearshore marine waters of Washington, including all of the greater Puget Sound Basin. Very little species-specific biological data are available (Field 1988). Sand lance spawning habitat has been documented in the Puget Sound Basin only since late 1989, when a protocol for detecting eggs in suitable substrate was developed (Penttila 1995a, b). Currently, about 10 percent of the basin's shoreline has been documented as sand lance spawning habitat (Figure 6). Additional sand lance spawning beaches continue to be found during ongoing habitat survey projects (WDFW unpub. data). In

many instances, the spawning beaches of fall-winter surf smelt and sand lance populations overlap geographically.

Although the species are taxonomically unrelated, the spawning habitat of the Pacific sand lance generally resembles that of the surf smelt: upper intertidal beaches consisting of sand and gravel (Penttila 1995b). Their spawning sites are also similarly scattered evenly over the landscape of the Puget Sound Basin, to such a degree that hypothetical geographical stock boundaries are not apparent. Co-occurrence of eggs of the two species in the substrates is common during the winter, when the spawning seasons of Puget Sound sand lance and winter-spawning surf smelt populations overlap. The eggs of both species can be found incubating in the same substrate at the same time (Penttila 1995b). Sand lance spawning habitat attributes derive from physical forces acting on sediment in the upper third of the intertidal zone, generally between mean higher high water (MHHW) and about +5 feet in tidal elevation in central Puget Sound or local equivalent. The grain-size spectrum of typical sand lance spawning substrate can be characterized as sand, finer-grained than that of surf smelt, with the bulk of the material in the range of .2-.4 mm in diameter (Penttila 1995b; WDFW unpub. data).

Bargmann 1998: The actual spawning habitat of the Pacific sand lance was virtually unknown prior to the discovery of their spawn deposits in the upper intertidal zone of Port Gamble Bay in 1989. Systematic surveys have documented sand lance spawning habitat on 129 lineal statute miles of Puget Sound shoreline (Pentilla 1995a, 1995b, 1997). The sand lance spawning habitat survey was estimated to be about 75% complete for the Puget Sound basin prior to being reduced by budget reductions in 1997. Sand lance spawning populations on Washington's outer coast and coastal estuaries have not been surveyed, although the occurrence of yolk sac sand lance larvae in those areas in the winter months indicates their presence.

Status

Washington State has protections in place for forage fish species as discussed below.

- The language of Washington Administrative Code (WAC) 220-110, the Hydraulic Code Rules governing hydraulic permit approvals by the WDFW, lists herring, surf smelt and sand lance spawning habitats as “marine habitats of special concern.” A “no net loss” approach is applied to these habitats.
- The WDFW Hydraulic Code Rules stipulate that the construction of bulkheads and other bank protection must not result in a permanent loss of forage fish spawning beds (WAC 220-110-280(4)).
- Permissible in-water development activities are also subject to seasonal work-closure periods during local forage fish spawning seasons (WAC 220-110-271(1)). WDFW hydraulic permits granted for in-water development actions may stipulate certain measures to mitigate unavoidable forage fish habitat losses and address interruptions to beach sediment sources and movements (Pentilla 2007).
- Grounding of floats and rafts is prohibited on surf smelt, Pacific herring, and sand lance spawning beds by WDF per WAC 220-110-300 (1).

- The state Growth Management Act includes herring and surf smelt spawning areas as examples of priority fish and wildlife habitat conservation "critical areas", for which there is an expectation of mapping and protective designations. This species group's ecological importance and critical habitat vulnerability have led to their inclusion in the species and habitat lists of the WDFW's Priority Habitats and Species Program.

- The PSP has identified a goal to remove more shoreline armoring in Puget Sound than is constructed between 2011 and 2020.

Similar to the discussion above for eelgrass, SMP guidelines under the Shoreline Management Act contain protections for forage species including sand lance and surf smelt:

- WAC 172-32-186(8) directs SMPs to "include policies and regulations designed to achieve no net loss of those ecological functions". WDOE (2010) indicates that "the no net loss standard is designed to halt the introduction of new impacts to shoreline ecological functions resulting from new development. Both protection and restoration are needed to achieve no net loss."

- Protecting critical saltwater habitats is important to achieving no net loss of ecological functions. The SMP Guidelines state, "Critical saltwater habitats require a higher level of protection due to the important ecological functions they provide" [WAC 173-26-221(2)(c)(iii)(A)]. Critical saltwater habitats include "…all kelp beds, eelgrass beds, spawning and holding areas for forage fish, such as herring, smelt and sandlance; subsistence, commercial and recreational shellfish beds; mudflats, intertidal habitats with vascular plants, and areas with which priority species have a primary association" (WAC 173-26-221(2)(c)(iii)(A)).

- The shoreline vegetation conservation section [WAC 173-26-221(5)] defines vegetation conservation as "activities to protect and restore vegetation along or near marine and freshwater shorelines that contribute to the ecological functions of shoreline areas." These activities include "the prevention or restriction of plant clearing and earth grading, vegetation restoration, and the control of invasive weeds and nonnative species (WDOE 2011).

The SMP guidelines (WDOE 2015) include specific provisions for aquaculture including:

- Forage fish spawning habitat (Figure 16-5) is a critical saltwater habitat requiring protection. All aquaculture should be sited outside known forage fish (such as Pacific herring and sand lance) spawning habitat, if possible. If not possible, operating during certain work windows and conducting surveys and monitoring for forage fish activity can be used to avoid and mitigate impacts.

- SMPs should require forage fish spawning baseline surveys for new intertidal aquaculture that will occur at or near documented forage fish spawning habitat. The surveys should be conducted by trained personnel using appropriate protocols approved by WDFW. Other aquaculture permits may require a survey and Ecology recommends that proponents be allowed to submit these to meet local requirements.

- Ecology recommends that shellfish culturing be restricted to below the +5 feet Mean Lower Low Water tidal elevation if the area is documented as Pacific sand lance spawning habitat by WDFW or a site specific survey. Also, shellfish culturing should be restricted to below the +7 feet Mean

Lower Low Water tidal elevation if the area is documented surf smelt spawning habitat by WDFW or a site specific survey.

4.3.1. Past and present effects

Shoreline armoring

Shoreline modifications and development often negatively affect spawning sites of forage fish. A significant proportion of productive forage fish spawning habitat probably was lost in the Puget Sound basin prior to 1973 when shoreline armoring was largely unregulated (Pentilla 2007). Shoreline armoring and pollution were suggested as reasons for declining smelt population in Puget Sound by Greene et al. (2015).

Williams and Thom (2001) reviewed the potential impacts of various forms of shoreline armoring on nearshore environmental factors and resources in the Puget Sound region. Shoreline armoring may be the primary threat to surf smelt and sand lance spawning habitat (Thom et al. 1994). Armoring affects spawning habitat by physical burial of the upper intertidal zone during the course of creating or protecting human infrastructure and activities. Armoring alters the grain size making it potentially unsuitable for forage fish spawning (Dethier et al. 2016).

The sheltered bays of the inland waters so important to spawning forage fish have also been the shorelines of highest interest for commercial and residential development. Armoring also blocks, delays or eliminates the natural erosion of material onto the beach and its subsequent transport (Johannessen and MacLennan 2007). These processes maintain forage fish spawning substrate on the upper beach (Williams and Thom 2001). Although beaches may appear to be stable, their sediment is in constant motion, driven by prevailing wind and waves. The sand and gravel making up forage fish spawning substrate moves along the shoreline and eventually off into deep water, and must be replaced by new material entering the shoreline sediment transport system. A lack of a constant supply of new sand and gravel, primarily derived from eroding shoreline bluffs, may lead to coarsening, lowering of the beach elevation, and thus longterm degradation of spawning habitat.

Results of the PSNERP Change Analysis indicate that shoreline armoring occurred along 27 percent of Puget Sound (Myers 2010). The percent of armored shoreline varied considerably (9.8–62.8 percent) depending on the sub-basin. The different types of shoreline armoring and density are illustrated in Figure 4-12. Relevant to surf smelt and sand lance spawning, 27% of barrier beaches and 33% of bluff backed beaches were armored or 392 out of 1,224 miles (Myers 2010).

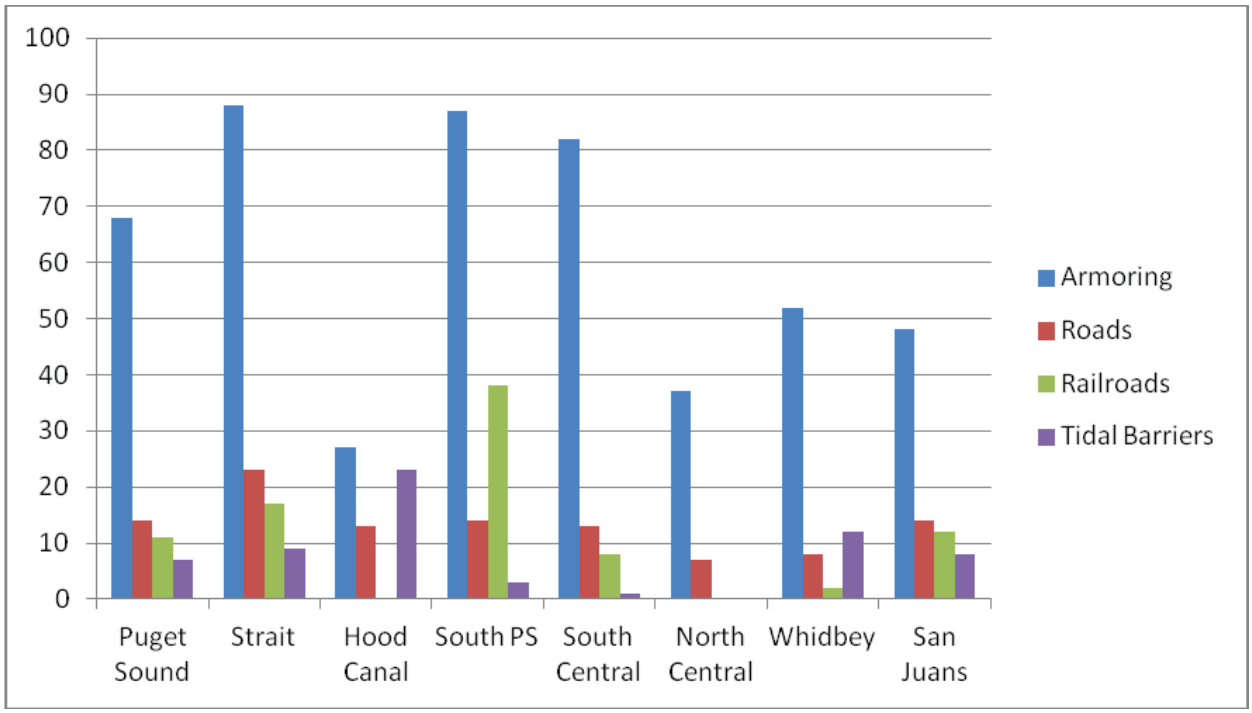


Figure 4-12. Presence of different stressors along mapped fill shoreline for Puget Sound and subbasins, expressed as a percentage (%) of fill length that stressors occupied (for example, Armoring was present along 68 percent of filled shoreline length in Puget Sound as a whole) (Strait, Strait of Juan de Fuca; PS, Puget Sound; Whidbey, Whidbey Basin) (from Myers 2010).

Recent data from Hydraulic Project Approvals (permits issued for in-water work and shoreline construction activities) indicate more armoring was gained than lost cumulatively since 2011, resulting in a net cumulative length of 1.1 miles (6,000 feet). However, in 2014, more armoring was removed than was added, a ratio that aligns well with the 2020 PSP target of no net change in armoring relative to the baseline year of 2011 (Hamel et al. 2015).

Overwater structures

Nightingale and Simenstad (2001) reviewed the potential impacts of various forms of overwater structure (e.g., docks, ramps, floats, boathouses) on nearshore environmental factors and biological resources in the Puget Sound region. The impacts on forage fishes and their critical habitats vary with the species and the size and configuration of the structure. Surf smelt and sand lance spawning habitats may persist beneath overwater structures if the structures span the spawning habitat zone, and pilings have minimal displacement of beach area, so that upper intertidal sediment distribution and movement are not affected (WDFW unpub. Data, in Pentilla 2007).

Marine Riparian Vegetation

A significant attribute of surf smelt spawning habitat may be the overhead shading provided by the canopies of mature trees rooted in the backshore zone bordering the spawning beaches. Studies have strongly suggested that the presence of shading terrestrial vegetation in the marine riparian corridor has

a positive effect on the survival of surf smelt spawn incubating in sand-gravel beaches in the upper intertidal zone during the summer months within the Puget Sound Basin (Penttila 2002).

Fishing

Surf smelt are recreationally and commercially important harvests for human consumption at scattered locations throughout the Puget Sound Basin. Commercial and recreational Surf Smelt fisheries each estimated at 100,000 pounds annually. The population size in Puget Sound is unknown.

Pacific sand lance have never been harvested commercially in the Puget Sound Basin, and commercial exploitation of the species has recently been banned by the Washington Department of Fish and Wildlife (WDFW), given their important ecological role. Incidental catches of sand lances are dip-netted from "bird-balls" or "bait balls" by recreational anglers during local salmon fishing seasons as a preferred sport-bait for Chinook salmon (Pentilla 2007).

4.3.2. Effects of the proposed action

The effects of the proposed action are discussed above in Section 3. They include removing spawning habitat by placement of nets, floats, barges, or other structures on spawning beaches, smothering eggs by trampling by foot or vehicle or grounding of vessels on beaches, and direct mortality of adults due to capture in aquaculture cover nets. There are no timing restrictions or monitoring associated with the proposed action that could minimize these effects.

Surf smelt and sand lance would be particularly vulnerable to cover nets installed along the shorelines because of their spawning behavior. If not dissuaded from spawning by the nets, they could be captured and killed by the nets. If they are persuaded from spawning, this habitat no longer provides the spawning function for these species.

There are currently an estimated 1,162 aquaculture acres collocated with mapped smelt and 416 acres collocated with mapped sand lance spawning habitat. GIS analysis indicates that aquaculture project areas collocated with spawning habitat extend waterward from the shoreline about 150-600 ft. Conservatively assuming each aquaculture project area extends out 400 ft waterward of the shoreline results in an estimated 109 ft of lineal shoreline per acre. This translates to totals of 24 miles (126,658 lineal ft) of surf smelt and 9 miles (45,344 lineal ft) of sand lance spawning habitat affected by aquaculture. Note this does not account for impacts that may occur to adult fish migrating along the shoreline to spawning areas that may encounter nets outside of the spawning area.

4.3.3. Effects of future actions

Development

Urbanization and development are expected continue in Puget Sound as discussed above. This results in continued shoreline armoring, overwater structures, and loss of marine vegetation.

New armoring continues to be constructed at an average pace of 0.7 miles (3,700 feet) per year (mean of 2011 – 2014), but the pace has slowed progressively since 2012. In contrast, shoreline armoring is removed at an average rate of 0.4 miles (2,200 feet) per year (Hamel et al. 2015).

Recent Corps permitting for overwater structures is illustrated in Figure 4-6.

State regulation administered under SMPs may minimize these effects to some degree but this is uncertain.

Aquaculture

Similar to the above discussion for eelgrass, aquaculture is certain to continue beyond the expiration of the 2017 NWP 48. The impacts described for the proposed action would thus continue into the future and likely increase as additional area is put into aquaculture production.

Fishing

Fishing for surf smelt is expected to continue.

Climate Change

Urban communities are likely to respond to sea level rise with an increase in armoring to delay the natural erosion of shorelines. This response will "squeeze" forage fish spawning beaches between rising water levels and armoring structures. USGS researchers are using models to understand the effects the "squeeze" will have on fish that rely on beaches for their survival (Liedtke 2012).

4.3.4. Summary and conclusion

The cumulative impacts on eelgrass are summarized in Table 4-7.

Table 4-7. Summary of Cumulative Effects on Pacific herring

stressor	Puget Sound	Willapa Bay	Grays Harbor
Shoreline armoring	Likely caused the greatest historical impact; shoreline armoring expected to continue, new state regulations may limit to impacts to some degree	Limited in extent; limited future armoring	Concentrated in certain areas; limited future armoring
Overwater structures	numerous and increasing;	overwater structures limited to a few areas;	overwater structures limited to few developed locations
Aquaculture	Historical impacts likely; currently an estimated 1,162 aquaculture acres collocated with mapped smelt and 416 acres collocated with mapped sand lance spawning habitat; present impacts will continue into the future	Unknown historical impacts; no mapped spawning habitat currently	Unknown historical impacts; very limited spawning habitat currently that is not collocated with aquaculture
Fishing/ overfishing	200,000 lbs surf smelt harvested annually; uncertain effects on population	No known effects	No known effects

Climate change	Sea level rise is may eliminate forage fish spawning habitat as beaches become compressed against the shore

Significance

Context

A determination of significance requires consideration of both context and intensity (40 CFR 1508.27(a)). Context means that the significance of an action must be analyzed in several contexts such as society as a whole (human, national), the affected region, the affected interests, and the locality.

Surf smelt and sand lance are both broadly distributed in Washington's marine waters but very limited is known about their life history. Their population size and structure is unknown but there is concern they are declining, at least in Puget Sound, in part due to losses of spawning habitat. Very limited study suggests surf smelt may have declined in Puget Sound, perhaps dramatically, while sand lance populations may have increased. There is virtually no information on these species in Grays Harbor and Willapa Bay. These species play an important role in the marine food web as highly nutritious prey for many predators including species listed under the ESA such as marbled murrelet and salmon species. Regionally spawning habitat is protected by the State of Washington affords some protection to spawning habitat under the Shoreline Management Act and HPA regulations.

The primary impact to these species both historically and presently is considered to be loss of beach spawning habitat due to shoreline armoring. Other activities and structures that are occur along the nearshore beach habitat such as docks and piers and aquaculture are also likely to have some impact. These impacts are expected to continue into the future. Sea level rise associated with climate change may exacerbate these impacts.

There are a number of affected interests including shellfish growers, fishing interests, salmon recovery interests, tribal communities, NGO's, natural resource agencies, and development interests. Development and aquaculture interests generally are competing with resource agency interests over habitat protections.

Intensity

The following factors should be considered when evaluating intensity (40 CFR 1508.27). These factors are discussed in the context of cumulative impacts.

(1) Impacts that may be both beneficial and adverse. A significant effect may exist even if the Federal agency believes that on balance the effect will be beneficial.

Limited beneficial impacts have occurred in the form of bulkhead removal and beach restoration in Puget Sound.

(2) The degree to which the proposed action affects public health or safety.

No public health or safety issues are identified. Shoreline armoring provides certain protections for personal property.

(3) Unique characteristics of the geographic area such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas.

Forage fish spawning habitat is identified as an ecologically critical area.

(4) The degree to which the effects on the quality of the human environment are likely to be highly controversial.

Impacts to forage fish spawning habitat from various impacts including development activities and aquaculture have generated much recent concern as evidenced by regulations promulgated by the state for their protection.

(5) The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks.

There is high uncertainty with respect to impacts on forage fish due simply to the very limited current understanding of the ecology and population of the species.

(6) The degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration.

It is uncertain whether the proposed action will set precedent for future actions; however, there is strong potential for this to occur. The 2017 NWP 48 has been issued twice previously and is likely to be issued again in 2022. Each iteration of the permit has been updated based on experiences with the previous version.

(7) Whether the action is related to other actions with individually insignificant but cumulatively significant impacts. Significance exists if it is reasonable to anticipate a cumulatively significant impact on the environment. Significance cannot be avoided by terming an action temporary or by breaking it down into small component parts.

Aquaculture and the other identified stressors represents a largely unknown impact to forage fish. These stressors do represent known impacts to habitat that is an important part of the species life history. The cumulative impacts to this habitat are substantial at present and they are expected to increase in the future. This is further discussed below.

(8) The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources.

No impacts to these resources is anticipated.

(9) The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973.

The proposed action is likely to adversely affect designated critical habitat for several species listed under the ESA including Puget Sound Chinook salmon, Hood Canal summer run chum salmon, and Puget Sound steelhead. Adverse effects are due in part to impacts on eelgrass (NMFS 2015). Recent programmatic ESA consultation concluded terms and conditions were required to protect eelgrass from aquaculture.

(10) Whether the action threatens a violation of Federal, State, or local law or requirements imposed for the protection of the environment.

The proposed action is inconsistent with State requirements under the SMA to protect forage fish spawning habitat. The development related stressors would also be inconsistent with these requirements, although there are competing SMA requirements related to property safety that are relevant to shoreline armoring projects.

Significance threshold

The cumulative impacts of past and present activities on surf smelt and sand lance are unknown due to the lack of any population data. The determination of a significance threshold relevant to the species

itself is therefore not possible. Knowledge is limited to known impacts to the species spawning habitat but even here there is a fair amount of uncertainty. The geographic locations of spawning habitat are not entirely known with even less known about the species activities in Willapa Bay and Grays Harbor.

Despite this a significance threshold can be established for the known spawning habitat for the 75% of Puget Sound that has been inventoried. The State of Washington has determined that a 'no net loss' policy is justified for forage fish spawning habitat. The PSP has further identified a goal of removing more shoreline armoring than is placed. These actions the contention that the significance threshold has already been reached from the cumulative impacts that have occurred to date meaning that any additional impacts would be considered significant.

Currently there are 195 mapped miles of surf smelt and 129 mapped miles of sand lance spawning habitat in Puget Sound. Shoreline armoring in Puget Sound occurs on 392 out of the 1,124 miles of the beach type habitat used for spawning by these species in Puget Sound. There is substantial overlap between the mapped spawning habitat and armoring.

Aquaculture in Puget Sound affects an estimated 24 miles or 12% of the total surf smelt spawning habitat and 9 miles or 7% of the total sand lance spawning habitat. These are certainly not insignificant percentages. Coupled with likely direct mortality of adults associated with the extensive placement of cover nets throughout Puget Sound (potentially 6,000 acres), the potential for significant effects certainly exists. However, the degree to which aquaculture activities are actually collocated with spawning habitat is unknown because the culture activities typically occur lower on the beach than spawning. The exception is clam culture above the +5 ft MLLW spawning zone for sand lance. The degree to which this exception occurs is unknown. In many cases aquaculture operations could be conducted with negligible impacts on forage fish spawning that occurs on beaches immediately upslope of the culture. These farms would rarely if ever conduct activities in the upper slopes of the adjacent beach where spawning occurs. On the other hand, it is just as likely that many operations would conduct substantial activities in these upslope areas including driving vehicles, storing materials, and even culturing itself (as discussed previously in the case of sand lance). In these cases, substantial harm to spawning fish can occur or spawning areas could be removed from use by the population. The issue is really about individual husbandry practices of which there is a wide range. It is unknown if one the scenarios described above predominates. May be more important is the fact that there are no restrictions in this regard for the proposed action. It must therefore be assumed that these types of impacts will occur. The conservative approach would assume common occurrence. Given the potential for significant impacts due simply to the large acreages involved and the fact any impacts will continue well into the future, it is prudent to default to the consensus of the state scientific experts who have determined that an important threshold of cumulative effects has already been reached as described above. The conclusion therefore is that significant cumulative effects to surf smelt and sand lance spawning habitat would occur due to the proposed action.

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AQUACULTURE CUMULIATIVE EFFECTS ANALYSIS REVIEW SCHEDULE (February 2017)

REVIEWER and WRITER	First Draft issued for review	Reviewers response to comments	Comments meeting (if needed)	Second draft issued for review	Reviewers response to comments	Comments meeting (If needed)	Finalize Document
	1 Feb	6 Feb	7 Feb	9 Feb	13 Feb	14 Feb	17 Feb
Pozarycki	X		X	X		X	X
Harrington		X	X	X		X	
Sanguinetti		X	X		X	X	
Tillinger		X	X		X	X	
Bennett		X	X		X	X	
Walker		X	X		X	X	
McGowan		X	X		X	X	
Gesl?							
Derosa?							

COALITION
To Protect Puget Sound

P.O. Box 233
Burley, WA 98322
coalitiontoprotectpugetsound.org

Dear Regulators and Parties Interested in the Future of Our Iconic Marine Species:

Our Coalition and consulting scientists were right! We know today from the attached Army Corps document that there **are** Cumulative Impacts expected from the industrial scale aquaculture that we see happening around us. This is not, of course, what the Corps told the public when it adopted the aquaculture permit, Nation Wide Permit (NWP48). It is also not what the industry often claims at the county hearings, in their promotional materials, legislative road shows or in their written comments on projects at the local, state and Federal level.

However, we now know that the Corps actually wrote - back in 2017 – a 117 page draft Cumulative Impact Analysis. That analysis concluded that there **would be significant cumulative impacts** from the adoption of NWP 48 in 2017.

For reasons about which we can only speculate, the Corps has never published or finalized this analysis. Nor did - or do - they acknowledge these well-articulated and scientifically based conclusions in the current NWP 48 permitting. We only recently found this document, buried deep in an obscure file in the Administrative Record that was filed with the Court, in the lawsuit we have pending against the Corps for improperly adopting and administering NWP 48.

This draft Cumulative Impact Analysis (CIA) is an astonishingly frank assessment of what the science shows will likely happen if this industrial scale aquaculture is allowed to continue. For example, with regard to eelgrass, a critical habitat for Salmon and other listed fish, the Corps concluded:

> "The proposed action **is likely** to adversely affect designated critical habitat for several species listed under the ESA including Puget Sound Chinook salmon, Hood Canal summer run chum salmon, and Puget Sound steelhead."[1]

The Corps went on to conclude that:

> "Given the magnitude of the impacts in acreage, the importance of eelgrass to the marine ecosystem, and the scale of the aquaculture impacts relative to other stressors, the impacts **are considered significant.**"[2]

For those who care about State and Federal law, the Corps also noted that in their view:

> "The action does threaten a violation of State requirements under the Shoreline Management Act to achieve no net loss of eelgrass and Federal

[1] Draft CIA p.101, emphasis added.

[2] Draft CIA p.103, emphasis added.

> requirements to protect eelgrass imposed under the ESA for aquaculture activities. **The proposed action is not consistent with either of these requirements**."[3]

Similarly, for key forage fish species such as Pacific Sand Lance (sometimes called Candlefish) and Surf Smelt, on which salmon and Orca rely, the Corps concluded in the analysis that:

> "The conclusion therefore is that significant cumulative effects to surf smelt and sand lance spawning habitat **would occur** due to the proposed action."[4]

And with regard to compliance with State law related to these forage fish, the Corps concluded:

> "The proposed action is inconsistent with State requirements under the SMA to protect forage fish spawning habitat."[5]

We hope that now that this analysis is public, the decision makers at all levels of government will take into account the fact that these industrial scale operations are not the old Mom & Pop oyster shops that folks recall nostalgically. These are industrial scale operations with industrial scale impacts that are cumulatively causing significant harm to key resources upon which all of us depend. We are not saying no aquaculture operations should be allowed, ever. We are simply saying that these operations should be subject to the same restrictions as everyone else. They need to comply with the ESA, the SMA and both the State and National Environmental Policy Act restrictions and obtain HPA permits.

All of the permitting agencies involved need to take a hard look at what they are doing and disregard the Shellfish Initiative lobbying push. They cannot and should not continue to allow the siting of these industrial scale operations where they can - and as the Corps draft analysis shows likely will - have **significant** unacceptable cumulative effects. The law precludes that, and so does common sense.

The link to this Army Corps Draft Cumulative Impacts Analysis is:
http://users.neo.registeredsite.com/3/7/5/12218573/assets/2017_NWP48_Draft_Cumulative_Imapct_Analysis.pdf

If you have any questions, please feel free to contact me.
Sincerely,
Laura Hendricks
Director
(253) 509-4987

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[3] Draft CIA p.101, emphasis added.

[4] Draft CIA p.112, emphasis added.

[5] Draft CIA p.111.
Corps 7 Person Review staff listed on page 117.

COALITION
To Protect Puget Sound

P.O. Box 233
Burley, WA 98322
coalitiontoprotectpugetsound.org

Scientific Evidence that Industrial Shellfish Aquaculture Adversely Affects Washington Marine Life

Introduction
Washington State's iconic aquatic species are suffering even as Governor Inslee's new Executive Order[1] to protect salmon and orca is signed. Despite the widely recognized urgency, regulators continue to ignore the significant adverse impacts from industrial shellfish aquaculture that continues to convert natural habitat to industrial uses. The following scientific findings document the need to limit further expansion and to monitor the existing adverse impacts of roughly 50,000 acres of industrial shellfish aquaculture.

Section I - Scientific Studies Documenting Adverse Impacts

Summary of Recent Science:
Shellfish aquaculture adversely affects marine life, including Chinook salmon which are essential to Southern Resident Killer Whale (Orca) survival.

1a. 2017 Army Corps Draft Cumulative Impacts Analysis (CIA):
This 117 page detailed draft Cumulative Impact Analysis (CIA) is an astonishingly frank assessment of what the science shows will likely happen if this industrial scale aquaculture is allowed to continue. The Corps concluded:

"The proposed action (shellfish aquaculture permitting) is likely to adversely affect designated critical habitat for several species listed under the ESA including Puget Sound Chinook salmon, Hood Canal summer run chum salmon, and Puget Sound steelhead." Page 101

"Given the magnitude of the impacts in acreage, the importance of eelgrass to the marine ecosystem, and the scale of the aquaculture impacts relative to other stressors, the impacts are considered **significant** (emphasis added)." Page 103

[1] Governor Inslee's New 2018 Salmon and Orca Protection Executive Order
https://www.governor.wa.gov/sites/default/files/exe_order/eo_18-02_1.pdf

For those who care about State and Federal law, the Corps also noted that in their view: "The action (shellfish aquaculture permitting) does threaten a violation of State requirements under the Shoreline Management Act to achieve no net loss of eelgrass and Federal requirements to protect eelgrass imposed under the ESA for aquaculture activities. The proposed action is not consistent with either of these requirements." Page 101

Similarly, for key forage fish species such as Pacific Sand Lance (sometimes called Candlefish) and Surf Smelt, on which salmon and Orca rely, the Corps concluded in the analysis that:

"The conclusion therefore is that **significant** (emphasis added) cumulative effects to surf smelt and sand lance spawning habitat would occur due to the proposed action (shellfish aquaculture permitting)." Page 112

And with regard to compliance with State law related to these forage fish, the Corps concluded:
"The proposed action (shellfish aquaculture permitting) is inconsistent with State requirements under the SMA to protect forage fish spawning habitat." Page 111

Link: Army Corps Draft Cumulative Impacts Analysis:
http://users.neo.registeredsite.com/3/7/5/12218573/assets/2017_NWP48_Draft_Cumulative_Impact_Analysis.pdf

1b. 2015: Army Corps of Engineers Latest Biological Assessment:

Per the Assessment: "Determination that shellfish aquaculture: **"may affect, likely to adversely affect."**

"8.1.3. Effect Determination The proposed action (shellfish aquaculture permitting) may affect, likely to adversely affect Puget Sound Chinook salmon and Puget Sound Chinook salmon designated critical habitat." [Page 106]
"8.3.3. Effect Determination The proposed action may affect, likely to adversely affect Hood Canal summer chum salmon and Hood Canal summer chum salmon designated critical habitat". [Page 109]
"8.6.3. Effect Determination The proposed action may affect, likely to adversely affect bull trout and bull trout designated critical habitat." [Page 112]
"8.7.3. Effect Determination The proposed action may affect, likely to adversely affect green sturgeon and may affect, not likely to adversely affect green sturgeon designated critical habitat." [Page 115]

Important Study Findings:

1c. Even with mitigation, shellfish aquaculture still results in adverse impacts. See below
"9.2. Conclusion As discussed in the PBA and summarized above, the activities authorized under the proposed action would affect EFH (Essential Fish Habitat). While these effects would be minimized by the implementation of the many Conservation

Measures, the proposed action would result in adverse effects to EFH for groundfish, coastal pelagic, and Pacific salmon species." [Page 126]

1d. Summary of Active and Fallow Shellfish Aquaculture Co-located with eelgrass and forage fish spawning

	Eelgrass Beds-Table D-1	Forage Fish Spawning-E-9, E-10	
	Active and Fallow Areas	Active Areas	Fallow Areas (but allowed)
Grays Harbor	65%	6%	0%
Willapa Bay	76	13	5
Hood Canal	51	54	37
South Puget Sound	9	29	50
North Puget Sound	91	46	96

Link: Army Corps October 2015 Biological Assessment:
http://www.nws.usace.army.mil/Portals/27/docs/regulatory/160907/Shellfish%20PBA_%20Oct30_2015_final.pdf

2. **2016**: National Marine Fisheries Service (NMFS) Latest Biological Opinion: Stated in the Biological Opinion: NMFS Shellfish Aquaculture Determination shellfish aquaculture is: "Likely to Adversely Affect" various species. [Page 1]

"NMFS also concludes that "the proposed action [shellfish aquaculture permitting] is likely to adversely affect Puget Sound (PS) Chinook salmon (*Onchorhynchus tshawytscha*), Hood Canal summer-run chum salmon (*O. keta*), North American green sturgeon (*Acipenser medirostris*) and their designated critical habitat, but is not likely to jeopardize the continued existence of these species or to adversely modify their critical habitat." Page 1

Link: NMFS 2016 Opinion:
http://www.nws.usace.army.mil/Portals/27/docs/regulatory/160907/NMFS_2016_09-02_WA%20Shellfish%20Aquaculture_WCR-2014-1502.pdf

Note: This 2016 NMFS Biological Opinion is Elevated from the 2009 NMFS Opinion which failed to recognize any harm at that time, stating that shellfish aquaculture was "not likely to jeopardize the continued existence of the . . . marine and anadromous species listed under the ESA:"

3. **2015**: "Evaluating Trophic and Non-Trophic Effects of Shellfish Aquaculture in a Coastal Estuarine Foodweb". Ferriss et al., ICES Journal of Marine Science, October 13, 2015.

Data from the study:

a. Geoduck Aquaculture decreases Aquatic Life: [Pages 8-9]
   Herons (-23%)
   Resident Birds (-17%)
   Juvenile Wild Salmon (-7%)
   Flatfish (no number given)
b. Recognizes "Habitat Modification" from geoduck aquaculture which industry denies. [Page 9]
c. States “Understanding these relationships can inform management decisions by clarifying trade-offs in ecosystem functions and services in Puget Sound and facilitates estimation of direct and cumulative effects of bivalve aquaculture at a food web scale.” [Page 1]
d. We note that Central Puget Sound, where the study was conducted, has only one geoduck operation at 1.79% of total geoduck production, which is not a representative sample of geoduck operations in Puget Sound. Most geoduck industrial sites are located in South Puget Sound covering over extensive acres of habitat. Increases in additional acreage would create significantly greater impacts.

Link: Sea Grant Ferriss et al. study::
https://www.dropbox.com/sh/ptotz2w4jj36bia/AAAxd5GSV7mnZqmvCLZ-aTEha?amp%3Bpreview=(17)+Charles+Moore+Algalita+Power+point.pdf&dl=0&preview=(62)+SeaGrant+%26+Ferriss+2015+-+Evaluating+birds+%26+puget+geoducks+effects+shellfish+aquaculture+coastal+estuarine+foodweb..pdf

4. **2007**: Puget Sound Salmon Recovery Plan, adopted by NMFS

“Shellfish Aquaculture Cultivating shellfish in the South Sound results in the loss of shallow nearshore habitat and habitat diversity that is important to salmon. These impacts can be potentially positive or negative depending on the type of aquaculture practice.” [Page 299]

Comment from Puget Sound Nearshore and Restoration Biologist: In the Summary of Aquaculture: “They did not include the full “model” provided in the draft, but the conclusion is the same, albeit a bit watered down. But the model could be included by reference, since it was used to help make that determination. Regardless, they clearly identify aquaculture as a key stressor, stating it will affect juvenile salmon habitat and survivability.”

Link: Chinook and Bull Trout Shellfish Aquaculture Chart
http://users.neo.registeredsite.com/3/7/5/12218573/assets/2005_South_Sound_Puget_Sound_Salmon_Recovery_Group_Chinook_and_Bull_Trout_Shellfish_Aquaculture_Chart.pdf

Comment: It should be noted that the only "improved" category on the Aquaculture Model [water quality] has not been scientifically proven as per the following US

Geological Services (USGS) study, however the shellfish industry incorrectly states that shellfish in Washington State "clean the water/improve water quality" in support of their efforts to be permitted to expand aquaculture

Link: Puget Sound Salmon Recovery Plan:
http://www.westcoast.fisheries.noaa.gov/publications/recovery_planning/salmon_steelhead/domains/puget_sound/chinook/pugetsoundchinookrecoveryplan.pdf

Comment: At the December 8, 2014 Department of Ecology seminar on aquaculture, USGS presented "Approaches for evaluating the effects of bivalve filter feeding on nutrient dynamics in Puget Sound Washington." The USGS presenter publicly confirmed that they found no science that supports the shellfish industry claim that shellfish improve water quality. According to the presentation: "The water quality effects of bivalves are not understood in much of Puget Sound." [Page 4]

Link: USGS-Approaches for Evaluating the Effects of Bivalve Filter Feeding:
https://www.dropbox.com/sh/ptotz2w4jj36bia/AAAxd5GSV7mnZqmvCLZ-aTEha?dl=0&preview=(12)+Approaches+for+evaluating+the+effects+of+bivalve+filter+feeding+on+nutrient+dynamics+in+Puget+Sound%2C+Washington.pdf

5. **2008** Regarding Non-Native Invasive Species-Pacific Oysters "Assessing the Global Threat of Invasive Species to Marine Biodiversity" Jennifer Molnar et al., Front Ecol Environ 2008: 6 (9): 485-492

"For example, oysters have been deliberately introduced into coastal waters worldwide, to be cultured for food. One species in particular, *Crassostrea gigas*, (Pacific Oyster), has been introduced in at least 45 ecoregions (Figure 4). Its high ecological impact score should cause decision makers and regulators to reconsider plans for introduction of this oyster into new areas. While its harvest brings economic gains, the ecological impact of introductions of this species are potentially dramatic. Oysters play a role in many estuarine ecosystem processes; altering their abundance or distribution causes complex changes." [Page 491]

Link: Assessing the Global Threat of Invasive Species
http://users.neo.registeredsite.com/3/7/5/12218573/assets/2008_Molnar_EcologySoc_Assessing_Global_Threat_Invasive_Species.pdf

6. 2013 Adverse Impacts to Forage Fish explained by Dan Penttila, Washington State's foremost forage fish expert before Shoreline Hearings Board (Testimony under oath) [Pages 20-21]

- "From the published scientific literature, it is clear that all bivalve species tested were found to consume zooplankton of a wide variety of forms during feeding/respiration of activities. "
- "While published data on the diet of Salish Sea geoducks seems to be lacking, it can only be assumed, at present, that they will readily consume zooplankton as

well. Given the concerns raised, in the absence of data, to assume that they do not would be unwise."

- Published data also suggest that zooplankton filtration rates and prey sizes can increase with increasing body size of the filtering animals.
- "Thus, it should be assumed that geoducks reported to be among the largest clams in the region, may be capable of ingesting significant amounts and relatively large sizes of organisms from the nearshore zooplankton community."
- According to the USF&W NWP48 Consultation: "Since it is plausible that geoducks will compete for prey resources (particularly in sheltered bays and coves and when they are planted in high densities) and dominate as a consumer of the local food web, and then you must assume that juvenile salmonids and forage fish will have less to eat which will lower their growth and survival…" Page 25. According to Mr. Penttila, "I think it would be prudent to alleviate this uncertainty prior to the Corps allowing more widespread geoduck culture given the tenuous condition of salmonids and bull trout populations in Puget Sound."

Link: Penttila SHB Presentation
https://www.dropbox.com/sh/ptotz2w4jj36bia/AAAxd5GSV7mnZqmvCLZ-aTEha?dl=0&preview=(30)+Daniel+E.+Penttila%2C+Salish+Sea+Biological%2C+Anacortes%2C+WA.+A+Review+of+Effects+on+Forage+Fishes%2C+Zooplankton+and+Marine+Vegetation+from+Three+Geoduck-Clam+Farm+Proposals+in+Henderson+Inlet+and+One+Proposal+in+Eld+Inlet.pdf

Section II - Aquaculture Gear and Toxic Plastic Pollution

Summary of Recent Science
Since the late 1990's, Washington State has allowed unlimited toxic, polluting plastics used in over 40,000 acres for geoduck, oysters and clams. PVC tubes, High Density Polyethylene (HDPE) canopy nets, HDPE oyster bags, HDPE zipties, HDPE oyster purses, HDPE mesh tubes and Polypropylene blue oyster ropes are routinely used. These materials have been scientifically examined and are a major threat to our marine life as documented in the studies cited below.

1. **2018** "Abundance and Distribution of Microplastics within Surface Sediments of Key Shellfish Growing Regions of Canada" Bendell et al., PLOS One, May 23, 2018.

Associated news article: "Alarmingly High Amounts of Plastic Microbeads Found in BC Shellfish Farming Areas" "Researcher says better standards needed for shellfish industry." "We found microbeads in the smallest bits of sediment and in a concentration equal to the amounts of silt and organic matter," Leah Bendell, Professor of Marine Ecology and Ecotoxicology at Simon Fraser University (SFU), said in the statement.

Study states: " . . the industry also makes extensive use of High Density Polyethylene (HDPE), in the form of netting, oyster bags, trays, cages and fences (e.g., vexar) [37]. Each year, 3–4 tonnes of debris, comprised primarily of these plastic materials is recovered from the intertidal regions of Baynes Sound [38]. Sites where the greatest number of microfragments and microfibers were found also coincide with regions of extensive shellfish aquaculture equipment."

Link: New Article: Abundance and Distribution of Microplastics - Bendell Article: 'Alarmingly high' amount of plastic microbeads found in B.C. shellfish farming areas: http://www.cbc.ca/news/canada/british-columbia/shellfish-microplastics-bc-aquaculture-1.4675672

Link: PLOS Journal Study: http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0196005

2. **2018** "Macro and Micro Plastics Sorb and Desorb Metals and Act As A Point Source of Trace Metals To Coastal Ecosystems." Bendell et al., PLOS One published February 14, 2018.

Associated news article: "Heavy Metals: The New Toxic Danger Posed by Ocean Plastic Trash" "For example, PVC, the most commonly found plastic, had high levels of lead and copper attached to its surface. The comparison of the new and debris plastic also showed how some of the chemicals used in plastic production may release over time – including cadmium, which is used to make plastic rigid and resistant to UV light. The researchers found that new PVC releases zinc and cadmium. "

The study found: "Field samples of PVC, HDPE and LDPE had significantly greater amounts of acid extracted copper and HDPE, LDPE and PUR significantly greater amounts of acid extracted zinc. PVC and LDPE had significantly greater amounts of acid extracted cadmium and PVC tended to have greater levels of acid extracted lead, significantly so for HDPE… Plastic debris will affect metals within coastal ecosystems by; 1) providing a sorption site (copper and lead), notably for PVC; 2) desorption from the plastic i.e., the "inherent" load (cadmium and zinc) and 3) serving as a point source of acute trace metal exposure to coastal ecosystems. All three mechanisms will put coastal ecosystems at risk to the toxic effects of these metals."

Link: Macro and Micro Plastics. Bendel Article: https://www.newsdeeply.com/oceans/articles/2018/04/03/heavy-metal-the-new-toxic-danger-posed-by-ocean-plastic-trash

Link: PLOS Journal Study:
http://journals..org/plosone/article?id=10.1371/journal.pone.0191759

3. **2017** KCTS 9 Interview with Dudas: "How Much Plastic Do You Want In Your Oysters and Clams?"

   "Others note that the world consumes hundreds of millions of tons of plastic annually -- like food packaging and straws. Dudas said that, while she is finding that farmed shellfish don't contain any more plastic than non-farmed shellfish, she has no doubt that nets and ropes from shellfish aquaculture sites also shed fibers into the ocean."

Link: Dudas KCTS 9 Story:
https://kcts9.org/programs/earthfix-local-stories/how-much-plastic-do-you-want-in-your-oysters-and-clams

4. **2016** Microplastic Ingestion by Wild and Cultured Manila Clams from Baynes Sound, BC. Katie Davidson, Sarah Dudas.

   Aquaculture Gear Microplastics:
   "The most commonly observed fibers in our study were colourless (36 %), followed by dark gray (26 %); in contrast with Desforges et al. (2014), blue, red, and purple fibers were considerably lower in abundance. Of the gray fibers recorded, 87 % were from farmed clams. It is possible the source of these dark gray fibers is the black anti-predator netting (APN) located directly above the clams, although without spectroscopic analysis (e.g., FT-IR) this cannot be verified. It has been suggested that clams might have highest concentrations of blue fibers due to the widespread use of blue polypropylene rope used on oyster farms located near clam farms throughout Baynes Sound. (Bendell 2015)." [Page 153, Last Paragraph].

Link: Microplastic Ingestion by Wild and Cultured Manilla Clams
http://users.neo.registeredsite.com/3/7/5/12218573/assets/2016_Davidson_Dudas_Microplastic_Ingestion_by_Wild_and_Cultured_Manila_Clams.pdf

5. **2014** "Rapidly Increasing Plastic Pollution from Aquaculture Threatens Marine Life". Moore, Charles. 27 Tulane Env Law Journal 205

   "CONCLUSION: Unmonitored and unregulated aquaculture activities around the world are poisoning and choking the marine environment with their lost and derelict plastic gear…. At the present time, it does not appear possible to introduce any conventional plastic into the marine environment without harmful consequences."

Link: Charles Moore Tulane Environmental Law Journal:
http://users.neo.registeredsite.com/3/7/5/12218573/assets/2014_CharlesMoore_Tulane_Plastic_Pollution_Threatens_Marine_Life.pdf

6. **2015** Bivalve Aquaculture Associated Plastic Pollution in South Puget Sound. Charles Moore, Renowned Marine Plastic Expert, Washington State Shorelines Hearings Board Presentation.

   Mr. Moore tested the PVC, HDPE and Polypropylene blue oyster rope gear used by Taylor Shellfish which are the standard plastics used by the aquaculture industry throughout the world. At the hearing, under oath, he stated: "The plastic gear used on the 11-acre site and the gear and parts of gear that leave the site are a significant adverse impact. No baseline is available to determine current levels of aquaculture debris in the subject inlets or South Sound aquaculture sites. The mitigation of beach cleanups is only a very partial solution to the impact problem and ignores microplastic pollution."

Link: Charles Moore Presentation:
https://www.dropbox.com/sh/ptotz2w4jj36bia/AAAxd5GSV7mnZqmvCLZ-aTEha?dl=0&preview=(17)+Charles+Moore+Algalita+Power+point.pdf

7. **2015** Confluence Shellfish Industry Report Documents Birds Foraging on Harmful HDPE Plastic Oyster Bags-

   "Foraging in Shellfish Beds – in the photos note least sandpipers on oyster bags, dunlins on oyster bags, and godwits around and on oyster bags."

Link: Confluence Report
https://www.dropbox.com/sh/ptotz2w4jj36bia/AAAxd5GSV7mnZqmvCLZ-aTEha?dl=0&preview=(18)+Confluence+Report%2C+Bird+Interactions+with+Shellfish+Aquaculture+Gear+and+Operations.pdf

8. **2014** Calculation of Per Acre Plastic Pollution From Geoduck Aquaculture. Note: This calculation does not include the tons of plastics from oyster and clam aquaculture.

   "The geoduck aquaculture industry embeds approximately 8 miles of PVC pipe per acre in pristine intertidal habitat areas of Puget Sound, mostly in South Sound. Based on the approximate weight per acre calculations provided by the geoduck industry, 4 inch schedule 10 PVC tubes, the smallest size used, weigh about 32,000 pounds, or 16 tons per acre of PVC. The best current estimate according to the Shellfish Aquaculture Regulatory Commission, as of June 1, 2010, suggests there are currently 364 acres of active geoduck farms in Puget Sound. This represents nearly 3 thousand miles, 12 million pounds or 6 thousand

tons of PVC in Puget Sound from geoduck aquaculture. If one assumes that at any given time only one-third of all geoduck farms have PVC tubes installed in the tidelands, then this would yield about 1 thousand miles, 4 million pounds or 2 thousand tons of PVC." 1.

Link: Calculation of Geoduck Plastic Pollution: Link
http://www.caseinlet.org/uploads/PVC.pdf

Section III – 2010 Shellfish Industry Pest Management Plan

Introduction
In order to protect the introduced shellfish species planted by industry, current practice calls for the removal of all other flora and fauna on the sites owned or leased by the industry. Many of these identified "pest" species play an important role in the nearshore ecosystem and in some cases, have an economic value independent of the shellfish industry.

1. The Pest Management Plan documents the shellfish industry's known practice of removing Washington marine life including Dungeness and red rock crabs, shrimp, sea stars, moon snails, horse clams, sand dollars and eelgrass which are vital to Puget Sound marine life. [Summary Page 27]

Link: Pest Management Strategic Plan for Bivalves in Oregon and Washington
https://www.dropbox.com/sh/ptotz2w4jj36bia/AAAxd5GSV7mnZqmvCLZ-aTEha?dl=0&preview=(51)+Pest+Management+Integrated+Plan+for+Bivalves+in+Oregon+and+Washington.pdf

2. The 2018 Salmon Study documents the importance of the shrimp larvae, shrimp, crab larvae, crab, polychaetes and eelgrass to the survival of Chinook salmon. [Page 38]

Link: Nisqually Reach Reserve Salmon Study
http://users.neo.registeredsite.com/3/7/5/12218573/assets/2017_Nisqually_Reach_Reserve_Salmon_Study_Ellings_NRAR.pdf

Section IV – Washington's Shellfish Initiative Industry Lobbying Effort

Introduction
The state's shellfish initiative is not state law; rather it is the result of lobbying by the shellfish industry to attempt to encourage support for the expansion of the industrial use of the state's tidelands and public waters.

The Shellfish Initiative – A Law Review Article

2014 "The Legal and Environmental Implications of the Washington Shellfish Initiative: Is it Sustainable?" Ward, Lindsey, 4 Seattle Journal of Environmental Law 1, 162.

"VIII. CONCLUSION: According to a 2009 State of the Sound Report, Puget Sound is in danger of losing many of its most valuable plant and animal species and the unique ecological functions they serve during our lifetimes. Given this risk, protecting our shorelines is of paramount interest to ensure that future generations may enjoy the same natural splendor, abundant resources, and scientific opportunity. The Washington Shellfish Initiative seeks to capitalize economically on an already harmful industry, thereby further jeopardizing delicate ecosystems and making it difficult, if not impossible, for them to ever recover. In order to protect our precious coastal resources, community lawmakers must enforce existing laws: the Shoreline Management Act, Endangered Species Act, the Clean Water Act, and local policies and statutes. While the Washington Shellfish Initiative purports to comply with these critical doctrines, its policies and recommendations actually run counter to them in many areas because the underlying objectives are economical rather than environmental. In order to ensure a sustainable shellfish industry for years to come and preserve our State's unique shoreline habitat, the Washington Shellfish Initiative must be revised so that it complies with federal, state, and local regulations. "

Link: Shellfish Initiative Law Review:
http://digitalcommons.law.seattleu.edu/cgi/viewcontent.cgi?article=1034&context=sjel

Section V – Need for Current Research to Evaluate Industrial Shellfish Industry Harm to Washington's Marine Life

Introduction
For a number of years, the studies conducted on the environmental impacts of industrial aquaculture were very limited in scope and in breadth of the study. In the past few years, the gap has been filled as researchers not affiliated with the federal and state agencies promoting this industry have published scientific studies. Some of the studies relied upon by the Washington state agencies regulating industrial-scale aquaculture are now out-of-date and need to be replaced by more recent scientific information.

1. Washington State Sea Grant issued their final geoduck research report in November 2013, documenting the studies that were done prior to 2013. Many of the studies listed in the material above, especially regarding plastics, have been published after the Sea Grant report.
2. Sea Grant studied only a few small nearshore geoduck plots based on planting or harvesting impacts but did not evaluate the total clearing, planting, netting and harvesting practices or the impacts from industrial-scale growing of other species. No repeat long-term studies were done.

3. Sea Grant studies considered geoduck aquaculture as only a “periodic disturbance” which is not consistent with the forever permits issued for industrial aquaculture with concomitant permanent adverse impacts.
4. No peer-reviewed studies have been conducted in Washington State to evaluate the impacts on orcas, salmon or forage fish, despite the co-locations.
5. No peer-reviewed studies have been conducted in Washington State to evaluate the impacts of aquaculture plastic gear and shed microplastics from operations on the shorelines as well as extent and impacts of derelict gear. Massive amounts of toxic PVC and HDPE aquaculture plastic gear are intentionally placed in the sensitive nearshore area even as there are worldwide efforts to eliminate plastic bags and single use plastics that unintentionally end up in marine waters.
6. No peer-reviewed cumulative impact studies have been conducted in Washington State to assess the cumulative impacts of the forever aquaculture permits or the cumulative impacts from roughly 50,000 acres of industrial aquaculture in Washington State.

October 26, 2018

April 26, 2018

To: Brad Murphy - Thurston County
From: Steve Schulte

Subject: Thurston County - Draft Shorelines Management Plan

Thank you for this opportunity to comment on the draft Shorelines Management Plan (SMP) for Thurston County. I have two comments - the first one is seeking some additional clarification in the draft language. And the second one is to request that a measuring concept used in the 1990 language be utilized in the 2017 SMP.

My wife and I own property on Eld Inlet, that we are planning to build on, in the near future. The property is located within a proposed “Shoreline Residential” designation area, and I believe it’s development is considered to be an “infill” situation. Past approved variances for the site have allowed a 30 foot setback from the ordinary high water mark, based on an averaging calculation of all other waterfront setbacks within 300 feet of our lot.

My first comment pertains to Section 19.400.120 (C) - Constrained Lot and Infill Provisions. The proposed reduced standard buffer for the Shoreline Residential designation is 60 feet. Additionally, the “Infill Provision” section allows an additional 10% reduction based on the View Blockage (Section 19.400.135) language. This would then result in, no less than a 54 foot setback requirement for our property. Based on my reading of the draft language, this appears to be the minimum setback for infill situations.

However, discussions with County staff have indicated that this is not the intent of the proposed language. Instead, the intent for infill situations like ours, is that additional setback reductions may be allowed, such as that described in the “Constrained Lot Provisions” section. For example, language such as “or any amount of buffer reduction within the Shoreline Residential designation, a Type II Administrative Variance shall be required” would be available for use with infill situations. The problem is that, from my perspective, the “Infill Provision” section, is not tied in any way, to the “Constrained Lot Provisions” section, such that there is no way to use that language for infill situations. I am requesting that the written language in these two sections of the draft SMP be clarified, thus providing for what I believe is County staff’s intent.

My second comment has to do with Section 19.400.135 - View Blockage. We previously had an approved Shoreline Administrative Variance for our property, which was granted on March 4, 2008. Our Tax Parcel Number is 13801221800 and the Variance had a Project Number 2008100154. Due to financial reasons, we have had to let our variance lapse and have not been able to build, but are planning on doing so in the next few years.

The approved variance only required a 30 foot setback from the ordinary high water mark. The basis for this 30 foot setback, was an averaging calculation of the actual setbacks of all built waterfront structures within 300 feet of our property. Four properties had already been built to the northeast (within the 300 foot distance) and had setbacks of 12, 21, 50, and 27 feet. To the southwest, the first and possibly the second properties, appear largely unbuildable, due to steep slopes. Additionally, those two lots are under common ownership with the third property, which contains the primary residential structure for the three lot complex (no setback was required for that residence). The first two lots themselves, appear to be used only for a driveway and parking area, garden, and beachfront cabana - all located outside of the steep slope areas. Further southwest, but within the 300 foot averaging distance, is a fourth property with a residence (30 feet setback).

Moving forward, I am requesting that the County move away from using the proposed simplified averaging calculation, that would look at only the two lots abutting our property. At one time, it was important to look out 300 feet in each direction - why now is that not important?

From my perspective, the proposed setback averaging calculation is very problematic and unfair - when using only two data points. For our site, the abutting property to the northwest is easy - it's already been measured at 12 feet of setback. But to the southwest, how is the calculation done? How do you calculate a setback for an abuting lot, if the slopes are too steep to build on? How do you account for the cabana in the calculations? How do you account for 2-3 lots that make up a residential complex (under one ownership) with only a single primary residence. Given those uncertainties, I have no idea what amount of setback we would be required to provide on our property, under the proposed SMP language. My guess is that it is 54 feet, based on a detailed reading of the proposed language in Section 19.400.135 (A) (2) - View Blockage. This would dramatically impact our ability to build on our property.

It brings up the question - why on a 700 foot stretch of waterfront that is (1) designated as Shoreline Residential, (2) nearly fully built-out with 6 existing structures, and (3) with these structures having an average setback of 23 feet (12+21+50+27+0+30=140/6=23.3) - does the last lot need a 54 foot setback?

Instead, I suggest for infill areas, that the County take a more comprehensive look at the overall waterfront character, the extent of already disturbed areas, and just how a new residence would adversely affect the shoreline, if at all. My specific recommendation would be that the County continue with the past SMP language providing for a 300 foot averaging calculation in each direction, for the property under development.

I think it's somewhat ironic that our shoreline is now proposed to go from a rural designation to a residential shoreline designation, largely because it's acknowledged that the waterfront is largely built on and already impacted - and yet our setback requirement could be dramatically increased. I would have thought that it would have gone the opposite way,

Thank you in advance for considering these comments and requests, and please don't hesitate to contact me at (971) 222-4465 or at schultescs@gmail.com with any questions.

Ian Lefcourte

From: PlanningCommission
Sent: Wednesday, October 31, 2018 4:30 PM
To: Brad Murphy; Ian Lefcourte
Subject: FW: Propsed Shoreline Management Act

From: Thurston County | Send Email [mailto:spout@co.thurston.wa.us]
Sent: Wednesday, March 07, 2018 11:39 AM
To: PlanningCommission <PlanningCommission@co.thurston.wa.us>
Subject: Propsed Shoreline Management Act

This email was created by the County Internet web server from the email masking system. Someone from the Public has requested to contact you with the following information:

To: **Planning Commission**

Subject: **Propsed Shoreline Management Act**

From: **Gerald Sheehan**

Email (if provided): gwsheehan@comcast.net

Message:
Thank you for sending out the documents for the proposed changes to the Shoreline Management Act. What I couldn't find among all those documents was one that summarized or showed the proposes changes compared directly to the current document. Did I miss anything like that in the email? A direct comparison of just the things that are being proposed as changes (showing old and new) would really be useful. Thank you.

Revised 1/22/2017

THURSTON COUNTY SHORELINE MASTER PROGRAM

PREPARED FOR:

Thurston County Board of County Commissioners

PREPARED BY:

Thurston County Resource Stewardship

THURSTON COUNTY
WASHINGTON
SINCE 1852

_____ , 2017

Chapters:

Acknowledgements:

Chapter 19.100 Introduction

19.100.105 Title

The goals, policies and regulations herein shall be known as the Thurston County Shoreline Master Program, and may be referred to as the "Master Program", "Program", or the "SMP".

19.100.110 Purpose and Intent

The Thurston County Comprehensive Plan explains that Thurston County's shorelines provide valuable habitat for fish and wildlife, economic diversity, and recreational opportunities used by residents of all ages. Shorelines play an important role in enhancing the quality of life for our County's citizens. Therefore, the purpose of the Master Program is to guide the future development of the shorelines in Thurston County in a manner consistent with the Shoreline Management Act of 1971, hereinafter the "Act." The Act and this Program comprise the basic state and county law regulating use of shorelines in the county and is the regulating document for critical areas within shoreline jurisdiction.

Thurston County utilizes a variety of other regulations, policies, plans, and programs to supplement the goals and regulations contained within the Shoreline Master Program, and to manage shoreline resources and regulate development near the shoreline. All development projects are reviewed for compliance with the Thurston County Code (TCC) including but not limited to: Thurston County Comprehensive Plan, Zoning Ordinance (TCC 20, 21, 22, and 23); Critical Areas Ordinance (TCC 24); Thurston County Stormwater Standards (TCC 15.05); Platting and Subdivisions (TCC 18); and the State Environmental Policy Act (SEPA) Ordinance (TCC 17.09.). The County works with other entities such as the Thurston Conservation District, Stream Team, South Sound Salmon Recovery Group and watershed lead entities to promote awareness of shoreline issues. In addition, the County has developed Shellfish Protection Districts, Basin Plans, and Capital Facilities Plans to further the goals and the policies of the Shoreline Master Program and promote wise shoreline usage.

Although critical areas in shoreline jurisdiction are identified and designated under the Growth Management Act (GMA), they must also be protected under the Shoreline Management Act (SMA). The Washington State Legislature has determined that local governments must adopt Programs that protect critical areas within shorelines at a level that assures no net loss of shoreline ecological functions (ESHB 1653 Sec. 2(4)). Although Washington's shorelines may contain critical areas, the shorelines themselves are not critical areas by default as defined by GMA.

The provisions of this title for regulating critical areas shall apply to all land, all water areas and all structures, and all uses irrespective of lot lines in the unincorporated territory of Thurston County, Washington, except for existing and on-going agricultural activities. Agricultural activities meeting the requirements of TCC Section 17.15.110 shall be regulated by Chapter 17.15 TCC (as updated) or by the Voluntary Stewardship Program (VSP) once a VSP Workplan is adopted.

19.100.115 Adoption Authority

This Master Program is adopted pursuant to the authority granted under the Shoreline Management Act of 1971, Chapter 90.58 Revised Code of Washington (RCW) and Chapter 173-26 of the Washington Administrative Code (WAC).

19.100.120 Applicability

A. Unless specifically exempted by statute, all proposed uses and development occurring within shoreline jurisdiction must conform to Chapter 90.58 RCW, the Act, this Master Program and Thurston County Code (TCC), whether or not a permit is required. This Master Program applies to every person, firm, corporation, government agency, or department who or which:

1. Proposes any new use, activity, development or structure within the unincorporated area of Thurston County subject to the Act, as now or hereafter amended; or
2. Proposes a change, modification, addition or alteration to a legally existing use, activity, development or structure within the unincorporated area of Thurston County subject to the Act, as now or hereafter amended.

B. Direct federal agency activities affecting the uses or resources subject to the Act must be consistent to the maximum extent practicable with the enforceable provisions of the Act and with this Master Program as required by WAC 173-27-060.

C. The Act and this Program, including the permit system, shall apply to all non-federal developments and uses undertaken on federal lands and on lands subject to non-federal ownership, lease or agreement, even though such lands may fall within the external boundaries of a federal ownership.

D. This Master Program shall apply to all unincorporated rural and urban lands until such time as a city incorporates land into their city boundaries through annexation.

19.100.125 Relationship to Other Plans and Regulations

A. Uses, developments, and activities regulated by the Master Program may be independently subject to the Thurston County Comprehensive Plan, the Washington State Environmental Policy Act, the Thurston County Code (TCC) Zoning (Title 20, 21, 22, and 23), Platting and Subdivisions (Title 18), Environment (Title 17), the Critical Areas Ordinance (Title 24), and various other provisions of federal, state, and county laws. The applicant must comply with all applicable laws prior to commencing any use, development, or activity.

B. Should a conflict occur between the provisions of this Program or between this Program and the laws, regulations, codes or rules promulgated by any other authority having jurisdiction within Thurston County, the more restrictive requirements shall apply, except when constrained by federal or state law, or where specifically provided otherwise in this Program.

C. When achieved in accordance with Title 20, 21, 22, or 23 TCC (Zoning), building and lot dimension flexibility may be allowed on shorelines within Urban areas or Limited Areas of More Intensive Rural Development (LAMIRDs) when consistent with the Act and all other applicable

requirements of this Program, including the requirement to achieve no net loss of shoreline ecological functions.

Further, in order to preclude fragmentation of review and the necessity for individual shoreline permits, a combined shoreline permit is encouraged for proposed activities within the shoreline jurisdiction where feasible.

D. Consistent with RCW 36.70A.480, the goals and policies of this Master Program approved under Chapter 90.58 RCW shall be considered an element of the County's comprehensive plan, including Chapter 19.300 (General Goals and Policies). All regulatory elements of this Program, including, but not limited to Chapter 19.100 (Introduction), Chapter 19.150 (Definitions), Chapter 19.200 (Shoreline Jurisdiction and Environment Designations), Chapter 19.400 (General Regulations), Chapter 19.500 (Permit Provisions, Review and Enforcement), Chapter 19.600 (Shoreline Use and Modification Development Standards), Chapter 19.700 (Special Reports), Appendix A (Shoreline Environment Designations Map), Appendix B (Mitigation Options to Achieve No Net Loss for New or Re-Development Activities), and Appendix D (Channel Migration Zone Maps) shall be considered a part of the County's development regulations. Certain non-regulatory elements of this Master Program, including, but not limited to Appendix C (Shoreline Restoration Plan), may be updated and amended at any time without requiring a formal Master Program amendment.

E. Where this Program makes reference to RCW, WAC, or other state or federal law or regulation, the most recent amendment or version shall apply.

F. This Program will be applied consistent with all applicable federal, state and local laws affecting tribal rights.

G. Coastal Zone Management Act Consistency reviews for sites within federal jurisdiction shall apply the Environment Designation criteria in Chapter 19.200 that most closely correspond to the project site in order to determine applicable Program policies.

19.100.130 Governing Principles

The following governing principals, along with the policy statement of RCW 90.58.020, the principles of WAC 173-26, and purpose statements in Title 24.01.010 & 24.01.015 TCC, establish the basic concepts of this Program.

A. Any inconsistencies between this Program and the Act must be resolved in accordance with the Act.

B. The policies of this Program may be achieved by diverse means, one of which is regulation. Other means authorized by the Act include, but are not limited to: acquisition of lands and/or easements by purchase or gift, incentive programs, and implementation of capital facility and/or non-structural programs.

C. Protecting the shoreline environment is an essential statewide policy goal. Permitted and/or exempt development, actions taken prior to the Act's adoption, and/or unregulated activities can impair shoreline ecological processes and functions. This Program protects shoreline ecology from such impairments in the following ways:

1. By using a process that identifies, inventories, and ensures meaningful understanding of current and potential ecological functions provided by shorelines.
2. By including policies and regulations that require mitigation of all adverse impacts in a manner that ensures no net loss of shoreline ecological functions. The required mitigation shall include avoidance, minimization, and compensation of impacts in accordance with the policies and regulations for mitigation sequencing. This Program and any future amendment hereto shall ensure no net loss of shoreline ecological functions and processes on a programmatic basis in accordance with the baseline functions present as of the date of adoption of this Program.
3. By including policies and regulations that ensure that the cumulative effect of exempt development will not cause a net loss of shoreline ecological functions, and by fairly allocating the burden of addressing such impacts among development opportunities.
4. By including regulations and regulatory incentives designed to protect shoreline ecological functions, and restore impaired ecological functions where such opportunities have been identified, consistent with the Shoreline Restoration Plan (Appendix C) developed by Thurston County.

D. Regulation of private property to implement Program goals, such as public access and protection of ecological functions and processes, must be consistent with all relevant constitutional and other legal limitations. These include, but are not limited to the protections afforded by the federal and state constitutions, and federal, state and local laws.

E. Regulatory or administrative actions contained herein must be implemented with consideration to the Public Trust Doctrine, regulatory takings, and other applicable legal principles as appropriate.

F. Regulatory provisions of this Program are limited to Shorelines of the State, whereas the planning functions of this Program may extend beyond the designated shoreline boundaries.

G. Consistent with the policy and use preferences of RCW 90.58.020, Thurston County should balance the various policy goals of this Program along with giving consideration to other relevant local, state, and federal regulatory and non-regulatory programs.

19.100.135 Liberal Construction

As provided for in RCW 90.58.900, the Act is exempted from the rule of strict construction. Therefore, the Act and this Program shall be liberally construed to give full effect to the purposes, goals, objectives, and policies for which the Act and this Program were enacted and adopted, respectively.

19.100.140 Severability

Should any section or provision of this Program be declared invalid, such decision shall not affect the validity of this Program as a whole.

Chapter 19.150 Definitions

Where terms, phrases and words are not defined, they shall have their ordinary accepted meanings within the context with which they are used. The most current version of the English Webster's Dictionary shall be considered as providing ordinary accepted meanings. In addition, where available, the definitions provided in WAC 173-26-020, WAC 173-27-030, Chapter 90.58 RCW, TCC 20.03, or TCC Title 24.03 shall be applied in the interpretation and administration of this Program. The definition of various terms as presented in this section does not necessarily represent the same definitions as may be found for the same terms in other chapters of the Thurston County Code.

19.150.100 Abandonment: cessation or vacation of a permitted use or structure through non-action for a period of one year or longer**.**

19.150.105Accessory use or accessory structure - any use or structure customarily incidental and accessory to the principal use of a site or a building or other structure located upon the same lot.

19.150.110 Accessory Structure -View Blockage: as it relates to view blockage, buildings and other structures encompassing less than 200 square feet and less than twelve feet in height from grade level, and fences which are six feet, or less in height from grade level do not constitute view blockage.

19.150.115 Accretion: the growth of a beach by the addition of material transported by wind and/or water. Included are such shoreforms as barrier beaches, points, spits, and hooks.

19.150.120 Adaptive Management: a process of evaluating data acquired through project monitoring relative to a developed plan with goals or benchmarks, and taking action based on the results in order to reduce uncertainty with regard to adverse ecological impacts and improve outcomes over time.

19.150.125 Adjacent Principle Building: a principle building on a lot abutting the applicant's lot.

19.150.130 Agriculture: uses and practices, primarily commercial in nature, which are in support of agricultural activities, agricultural products, agricultural equipment and facilities, and agricultural land, as defined in WAC 173-26-020(3). This excludes activities typically associated with single-family residences, such as gardening activities primarily for on-site consumption. Such uses may still be subject to other provisions of this Program, Title 24 TCC, or Title 17.15 TCC.

19.150.135 Amendment: a revision, update, addition, deletion, and/or reenactment to an existing shoreline master program.

19.150.140 Anchor: a device used to secure a vessel

19.150.145 Appurtenance: structures and development necessarily connected to the use of a single family residence, and located within contiguous ownership of the primary residential use: Common appurtenances include a garage, deck, driveway, fences, utilities, septic tanks and drain-fields, officially registered historic structures, and grading which does not exceed two hundred fifty cubic yards and which does not involve placement of fill in any wetland or waterward of the OHWM. Appurtenances do not include bulkheads and other shoreline modifications or over-water structures, including tower stairs with landings at or below the ordinary high water line.

19.150.150 Aquaculture: the culture or farming of fish, shellfish, or other aquatic plants and animals. Aquaculture does not include the harvest of wild geoduck associated with the state and tribal co-managed wild-stock geoduck fishery.

19.150.155 Aquatic Lands: the bed-lands (submerged at all times) and tidelands (submerged lands and beaches that are exposed and submerged with the ebb and flow of the tides) beneath the waters of lakes, rivers and marine waters and along their shores.

19.150.160 Associated Wetlands: those wetlands which are in proximity to and either influence or are influenced by tidal waters or a lake or stream subject to the Act.

19.150.165 Barrier Structure: any shoreline or in-water structure that has the primary purpose of diverting, capturing or altering the natural flow or transport of water or sediment. These include breakwaters, jetties, groins and weirs.

19.150.170 Best Management Practices: those practices determined to be the most efficient, practical and cost-effective measures identified to reduce or control impacts to water bodies from a particular activity, most commonly by reducing the loading of pollutants from such sources into stormwater and water bodies.

19.150.175 Boat House: a structure built for and with a continued primary purpose to store aquatic vessels and usually associated with a single-family residence.

19.150.180 Boat Launch or Ramp: a solid ramp, usually made of concrete, used for the purpose of placing watercraft in and out of the water.

19.150.185 Boating Facilities: public and private mooring structures and related services serving five or more boats, including piers, docks, buoys, floats, marinas, and facilities for the use of boat launching, boat storage, or for the service and maintenance of pleasure or commercial craft.

19.150.190 Breakwater: a protective structure usually built off-shore to protect beaches, bluffs, or harbor areas from wave action.

19.150.195 Buffer: a non-clearing area established to protect the integrity, functions and values of the affected critical area or shoreline, so that no net loss of critical area or shoreline ecological functions occurs. Under optimal conditions, buffers are composed of intact native vegetation. Buffer widths are measured horizontally.

19.150.200 Building: any structure used or intended for supporting or sheltering any use or occupancy.

19.150.205 Building Line: the perimeter or that portion of a building closest to the ordinary high water mark (OHWM), including (but not limited to) decks, balconies, open steps, architectural features (such as cornices), utilities, and roof overhangs.

19.150.210 Bulkhead: a “normal protective” bulkhead includes those structural and nonstructural developments installed at or near, and parallel to, the OHWM for the sole purpose of protecting an existing single-family residence and appurtenant structures from loss or damage by erosion.

19.150.215 Buoy: an anchoring device with a float used to secure a vessel. For the purposes of this program, the term “buoy field” refers to more than one buoy per parcel.

19.150.220 Census-defined Urban Areas: Territories that consist of areas of high population density and urban land use resulting in a representation of "urban footprint". The territories include residential, commercial and other non-residential urban land uses. Defined by U.S. Department of Commerce and the U.S. Census Bureau Tigerline Shapefile 2012: *http://www.census.gov/geo/www/ua/2010urbanruralclass.html*.

19.150.225 Certified Local Government: a local government that establishes a historic preservation program meeting federal and state standards, and is eligible to apply to the State Historic Preservation Officer (SHPO) and the National Park Service for certification.

19.150.230 Clearing: the destruction, removal, or disposal of vegetation by manual, mechanical, or chemical methods. Clearing includes logging, even when the understory of vegetation is not being removed.

19.150.235 Commercial, Commercial Development: a use that involves wholesale or retail trade, or the provision of services.

19.150.240 Compensatory Mitigation: compensatory mitigation is the stage of mitigation sequencing where unavoidable impacts to shoreline ecological functions are offset by restoring, creating, enhancing, or preserving critical habitat within a specific watershed or geographic area.

19.150.245 Conditional Use Permit (CUP): a permit for a use, development, or substantial development that is classified as a conditional use or is not a listed use in the Use and Modifications Matrix in Chapter 19.600.

19.150.250 Critical Areas: As defined in Title 24 (Critical Areas) of the Thurston County Code which is adopted by reference as though set forth herein in full, (as amended) provided that the reasonable use provisions set forth in TCC 24.45, and 24.17, shall not be available within the shoreline jurisdiction. Instead, applicants may apply for a shoreline variance when seeking relief from critical areas regulations within shorelines.

19.150.255 Critical Habitat: Habitat areas within which endangered, threatened, sensitive or monitored plant, fish, or wildlife species have a primary association (e.g., feeding, breeding, rearing of young, migrating). Such areas are identified herein with reference to lists, categories, and definitions promulgated by the Washington Department of Fish and Wildlife as identified in WAC 232-12-011 or WAC 232-12-014; in the Priority Habitat and Species (PHS) program by the Department of Fish and Wildlife; or by rules and regulations adopted by the U.S. Fish and Wildlife Service, National Marine Fisheries Service, or other agency with jurisdiction for such designations.

19.150.260 Critical Freshwater Habitats: includes those portions of streams, rivers, wetlands, lakes and their associated channel migration zones and flood plains that provide habitat for priority species at any stage in their life cycles, and provide critical ecosystem-wide processes, as established in WAC 173-26-221(2)(c)(iv). This is distinguished from the term "Critical Habitat" as utilized in relation to the Endangered Species Act.

19.150.265 Critical Saltwater Habitats: as defined in WAC 173-26-221(2)(c)(iii), include all kelp beds; eelgrass beds; spawning and holding areas for forage fish, such as herring, smelt and sand lance; subsistence, commercial and recreational shellfish beds; mudflats; intertidal habitats with vascular plants; and areas with which priority species have a primary association. See this chapter for definitions of each type of critical saltwater habitat. This is distinguished from the term "Critical Habitat" as utilized in relation to the Endangered Species Act.

19.150.270 Cumulative impacts or cumulative effects: the impact on the environment or other shoreline functions or uses which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a long period of time. See WAC 173-26-186(8)(d).

19.150.275 Department: for the purposes of this program, means the Thurston County Resource Stewardship Department (or as amended).

19.150.280 Development: means any human-made change to improved or unimproved real estate, including but not limited to buildings or other structures, mining, dredging, filling, grading, clearing, paving, excavation or drilling operations, storage of equipment or materials, bulkheading, driving of piling, placing of obstructions, or any project of a permanent or temporary nature which interferes with the normal public use of the surface waters overlying lands subject to the Act at any stage of water level.

19.150.285 Development Regulation Standards: controls placed on development or land uses, including, but not limited to, zoning ordinances, critical areas ordinances, all portions of a shoreline master program other than goals and policies approved or adopted under Chapter 90.58 RCW, planned unit development ordinances, subdivision ordinances, and binding site plan ordinances together with any amendments thereto.

19.150.290 Dock: the collective term for a moorage structure that typically consists of a nearshore fixed-pile pier, a ramp (or gangway), and a float that is used as a landing place for marine transport or for recreational purposes. It does not include recreational decks, storage facilities or other accessory structures.

19.150.295 Dredge: the removal of earth, gravel, sand or other mineral substances from the bottom of a stream, river, lake, bay, or other waterbody, including wetlands.

19.150.300 Ecological Functions: the work performed or role played by the physical, chemical, and biological processes that contribute to the maintenance of the aquatic and terrestrial environments that constitute the shoreline's natural ecosystem.

19.150.305 Ecologically Intact: those shoreline areas that retain the majority of their natural shoreline functions, as evidenced by the shoreline configuration and the presence of native vegetation. Generally, but not necessarily, ecologically intact shorelines are free of structural shoreline modifications, structures, and intensive human uses. In forested areas, they generally include native vegetation with diverse plant communities, multiple canopy layers, and the presence of large woody debris available for recruitment to adjacent water bodies. Recognizing that there is a continuum of ecological conditions ranging from near natural conditions to totally degraded and contaminated sites, this term is intended to delineate those shoreline areas that provide valuable functions for the larger aquatic and terrestrial environments which could be lost or significantly reduced by human development. Whether or not a shoreline is ecologically intact is determined on a case-by-case basis.

19.150.310 Eelgrass: a flowering plant adapted to the marine environment that roots in sand or mud in shallow waters where waves and currents are not too severe. Eelgrass beds require high ambient light levels. Where eelgrass beds are disputed as a critical saltwater habitat, appropriate state agencies and co-managing tribes shall be consulted in order to assist with the determination.

19.150.315 Emergency: an unanticipated and imminent threat to public health, safety, or the environment which requires immediate action within a time too short to allow full compliance with this program. All

emergency construction is construed narrowly and shall be consistent with the SMA and this Program (RCW 90.58.030 (3eiii)). See also emergency exemption procedures in WAC 173-27-040(2)(d).

19.150.320 Endangered Species Act (ESA) - a federal law intended to protect any fish or wildlife species that are threatened with extinction throughout all or a significant portion of its range.

19.150.325 Enhancement: to improve the ecological functions at the site or landscape scale. This includes physical, biological and chemical processes which contribute to the maintenance of the aquatic and terrestrial environments.

19.150.330 Environmental Limitations: limiting factors to new modifications or development, such as floodplains or unstable slopes.

19.150.335 Excavation: the mechanical removal of earthen material.

19.150.340 Exemptions: uses and development, set forth in WAC 173-27-040 and RCW 90.58.030 (3)(e), 90.58.140(9), 90.58.147, 90.58.355, and 90.58.515, that are not required to obtain a Substantial Development Permit, but which must otherwise comply with applicable provisions of the Act and this Program. Certain exemption developments must obtain a letter of exemption (see Section 19.500.100(C)(4)).

19.150.345 Existing Lots: lots, tracts, parcels, sites or other fractional part of divided land that was legally established in accordance with local and state subdivision requirements prior to the effective date of this Program.

19.150.350 Existing Structures: structures that were legally constructed prior to the effective date of this Program in accordance with the requirements in effect at the time of construction.

19.150.355 Existing Uses: uses that were legally established prior to the effective date of this Program in accordance with the applicable regulations at the time established.

19.150.360 Facilities: defined per 19.600.115(3)

19.150.365 Feasible: an action, such as a development project, mitigation, or preservation requirement, that meets all of the following conditions:

A. The action can be accomplished with technologies and methods that have been used in the past in similar circumstances, or studies or tests have demonstrated in similar circumstances that such approaches are currently available and likely to achieve the intended results;

B. The action provides a reasonable likelihood of achieving its intended purpose; and

C. The action does not physically preclude achieving the project's primary intended legal use.

The burden of proving infeasibility is on the applicant. In determining infeasibility, the reviewing agency may weigh the action's relative public costs and public benefits, considered in the short- and long-term time frames.

19.150.370 Fill: the addition or redistribution of soil, sand, rock, gravel, sediment, earth retaining structure, or other material to an area waterward of the OHWM, within a one-hundred year floodplain; or within an important habitat, lake, pond, stream, wetlands, or shorelands (and their associated buffers) in a

manner that changes the elevation or creates dry land. Large woody debris or other native materials approved as a part of a habitat restoration project shall not be considered fill.

19.150.375 Float: an anchored (not directly to the shore) floating platform that is free to rise and fall with water levels and is used for water-dependent recreational activities such as boat mooring, swimming or diving. Floats may stand alone with no over-water connection to shore or may be located at the end of a pier or ramp.

19.150.380 Forage Fish: small, schooling fishes that are key prey items for larger predatory fish and wildlife in a marine food web. Puget Sound species include, but are not limited to, Pacific herring, surf smelt, Pacific sand lance and northern anchovy. Each species has specific habitat requirements for spawning, such as sediment grain size, tidal heights, or vegetation types. Known spawning and holding areas have been mapped by the Department of Fish and Wildlife.

19.150.385 Forest Practices: any activity conducted on or directly pertaining to forestland and relating to growing, harvesting or processing timber, including, but not limited to:

A. Road and trail construction;

B. Harvesting, final and intermediate;

C. Pre-commercial thinning;

D. Reforestation;

E. Fertilization;

F. Prevention and suppression of diseases and insects;

G. Salvage of trees; and

H. Brush control.

Forest practices shall not include preparatory work such as tree marking, surveying and road flagging; or removal or harvest of incidental vegetation from forest lands such as berries, ferns, greenery, mistletoe, herbs, mushrooms and other products which cannot normally be expected to result in damage to forest soils, timber or public resources.

19.150.390 Groin: barrier-type structures extending waterward from the back shore across the beach to interrupt and trap sand movement.

19.150.395 Guidelines (WAC): those standards adopted by the Department of Ecology pursuant to RCW 90.58.200 to assist in the implementation of Chapter 90.58 RCW for the regulation of shorelines of the state. The standards may be referenced at WAC 173-26 and 173-27.

19.150.400 Hard Surface: An impervious surface, a permeable pavement, or a vegetated roof.

19.150.405 Impervious Surface: A non-vegetated surface area which either prevents or retards the entry of water into the soil mantle as under natural conditions prior to development. A non-vegetated surface area which causes water to run off the surface in greater quantities or at an increased rate of flow from the

flow present under natural conditions prior to development. Common impervious surfaces include, but are not limited to, roof tops, walkways, patios, driveways, parking lots or storage areas, concrete or asphalt paving, gravel roads, packed earthen materials, and oiled, macadam or other surfaces which similarly impede the natural infiltration of stormwater.

19.150.410 Industrial, Industrial Development: facilities for processing, manufacturing, and storing finished or partially finished goods; heavy vehicle dispatch and maintenance facilities; and similar facilities.

19.150.415 In-lieu Fee (Fee In-Lieu): a fee paid to a sponsor (e.g., Thurston County,) to satisfy compensatory mitigation requirements when mitigation is precluded from being completed on-site due to site development or physical constraints, is part of a habitat conservation plan, or when the permitting agencies determine that ILF is more environmentally preferable over proposed permittee responsible mitigation.

19.150.420 Invasive exotics/non-native vegetation: see Chapters 17.10.010 RCW and WAC 16-750-003

19.150.425 In-stream Structure: structure placed by humans within a stream or river waterward of the ordinary high water mark that either causes or has the potential to cause water impoundment or the diversion, obstruction, or modification of water flow. In-stream structures may include those for hydroelectric generation, irrigation, water supply, flood control, transportation, utility service transmission, fish habitat enhancement, or other purpose.

19.150.430 Jetty: barrier-type structures designed to modify or control sand movement and usually placed at inlets to improve a navigable channel.

19.150.435 Kelp: a plant generally attaching to bedrock or cobbles in shallow waters, especially in areas with moderate to high waves or currents. Kelp beds generally require high ambient light levels. Kelp includes both floating and non-floating species. Where kelp beds are disputed as a critical saltwater habitat, appropriate state agencies and co-managing tribes shall be consulted in order to assist with the determination.

19.150.440 Landscaping/Landscape materials:

19.150.445 Land-disturbing Activity: Any activity that results in a change in the existing soil cover (both vegetative and non-vegetative) and/or the existing soil topography. Land disturbing activities include, but are not limited to clearing, grading, filling, and excavation. Compaction that is associated with stabilization of structures and road construction shall also be considered a land disturbing activity. Vegetation maintenance practices, including landscape maintenance and gardening, are not considered land-disturbing activity. Stormwater facility maintenance is not considered land disturbing activity if conducted according to established standards and procedures.

19.150.505 Limited Area of More Intense Rural Development (LAMIRD): locally designated rural areas authorized to accept more intense, urban-like development under RCW 36.70A.070(5)(d) and Title 20 TCC.

19.150.510 Live Aboard: use of a vessel as a residence, meaning full time occupancy in a single location, for an uninterrupted period exceeding 60 days in any calendar year.

19.150.515 Lot: a fractional part of divided lands having fixed boundaries, being of sufficient area and dimension to meet minimum zoning requirements for width and area. The term shall include tracts, or parcels. Where the context so indicates, lots, tracts or parcels may refer to subdivided lands not conforming to, or in violation of, zoning or subdivision regulations.

19.150.520 Lot Coverage: the percent or square footage of a lot that will be covered by a modification to impervious or hardened surfaces.

19.150.525 Low Impact Development (LID): a stormwater management strategy that that strives to mimic pre-disturbance hydrologic processes of infiltration, filtration, storage, evaporation, and transpiration by emphasizing conservation, use of on-site natural features, site planning, and distributed stormwater management practices that are integrated into a project design.

19.150.530 Low-intensity: activities which do not adversely alter natural ecosystem functions.

19.150.535 Macroalgae: Marine algae visible to the naked eye, such as kelp or other seaweeds.

19.150.540 Marina: a public or private water dependent wet moorage and/or dry boat storage facility for 10 or more pleasure craft and/or 10 or more commercial craft, and generally including goods or services related to boating. Marinas also include wet moorage facilities where boat moorage slips may be leased or rented to individuals who are not a member owner of an associated residential development. Launching facilities may also be provided. Marinas may be open to the general public or restricted on the basis of property ownership or membership.

19.150.545 Marine rail system: a pair of sloping tracks which extends into the tidelands, used for the purpose of placing watercraft in and out of the water.

19.150.550 May: a permissive term that means the action is acceptable, provided it satisfies all other provisions of this Program.

19.150.555 Mining: the removal of sand, soil, minerals, and other naturally occurring materials from the earth for commercial or economic use.

19.150.560 Mitigation Sequencing: Mitigation actions associated with development proposals impacting critical areas shall adhere to the following mitigation sequence:

A. Avoiding the impact altogether by not taking a certain action or parts of an action;

B. Minimizing impacts by limiting the degree or magnitude of the action and its implementation, by using appropriate technology, or by taking affirmative steps to avoid or reduce impacts;

C. Rectifying the impact by repairing, rehabilitating, or restoring the affected environment;

D. Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action;

E. Compensating for the impact by replacing, enhancing, or providing substitute resources or environments; and/or

F. Monitoring the impact and taking appropriate corrective measures.

19.150.565 Modification: those actions that modify the physical configuration or qualities of the shoreline area, usually through the construction of a physical element such as a dike, breakwater, pier, weir, dredged basin, fill, bulkhead, or other structure. They can include other actions, such as clearing, grading, or application of chemicals.

19.150.570 Mooring Structures: includes piers, docks, floats and buoys and their associated pilings, ramps, lifts and railways, as well as modifications that support boating facilities and marinas. Any mooring structure or grouping of structures that provide docking space for 10 or more boats is considered a marina.

19.150.575 Mudflats: a low-lying land of fine sediments and silt that is exposed at low tide and covered at high tide.

19.150.580 Must: a mandatory term that means an action is required.

19.150.585 Natural hydrographic conditions: the natural conditions for a particular time of year of water delivery and movement through a system.

19.150.590 No Net Loss: the maintenance of the aggregate total of the County's shoreline ecological functions. The no net loss standard requires that the impacts of shoreline development and/or use, whether permitted or exempt, be identified and prevented or mitigated such that there are no resulting adverse impacts on ecological functions or processes. Each project shall be evaluated based on its ability to meet the no net loss requirement. The no net loss standard applies at multiple scales, starting at the project site. Compensatory mitigation standards include sequencing guidelines to ensure the most appropriate mitigation type and site are selected, as close to the impacted location as possible.

19.150.595 Normal Maintenance: those usual acts necessary to prevent a decline, lapse or cessation from a lawfully established condition.

19.150.600 Normal Repair: to restore a development to a state comparable to its original condition, including, but not limited to, its size, shape, configuration, location and external appearance, within a reasonable period after decay or partial destruction, except where repair causes substantial adverse effects to a shoreline resource or environment. Replacement of a structure or development may be authorized as repair where such replacement is the common method of repair for the type of structure or development and the replacement structure or development is comparable to the original structure or development including but not limited to its size, shape, configuration, location and external appearance and the replacement does not cause substantial adverse effects to shoreline resources or environment.

19.150.605 Noxious Weeds: see Chapters 17.10.010 RCW and WAC 16-750-003.

19.150.610 Ordinary High Water Mark (OHWM): the mark that will be found by examining the bed and banks and ascertaining where the presence and action of waters are so common and usual, and so long continued in all ordinary years, as to mark upon the soil a character distinct from that of the abutting upland, in respect to vegetation as that condition existed on June 1, 1971, as it may naturally change thereafter, or as it may change thereafter in accordance with permits issued by the County or Ecology provided, that in any area where the OHWM cannot be found, the OHWM adjoining salt water shall be the line of mean higher high tide and the OHWM adjoining fresh water shall be the line of mean high water.

19.150.615 Pervious Surface: Any surface material that allows stormwater to infiltrate into the ground. Examples include lawn, landscape, pasture, native vegetation areas, and permeable pavements.

19.150.620 Pier: a rigid structure built over the water and typically constructed on piles, attached to the shore and used as a landing place for marine transport or for recreational purposes.

19.150.625 Platted: land that has been divided following the applicable laws for divisions of land under Title 18 TCC, including land subject to a current application for such division.

19.150.630 Predator Exclusion: an object or activity used to implement pest management in aquaculture practices with the intent of deterring or excluding predators such as moon snails, sea star, crabs, diving ducks, burrowing shrimp or sand dollars. Common methods include, but are not limited to, large canopy nets, mesh, PVC tubes with net caps, flexar plastic tunnels, oyster bags and suspended culture systems.

19.150.635 Principle Building: the primary structure on a lot closest to the ordinary high water mark excluding accessory structures.

19.150.640 Priority Species: species requiring protective measures and/or management guidelines to ensure their persistence at genetically viable population levels. Priority species are those that meet any of the criteria listed below.

A. State-listed or state proposed species. State-listed species are those native fish and wildlife species legally designated as endangered (WAC 232-12-014), threatened [WAC 232-12-011(1)], or sensitive (WAC 232-12-011). State proposed species are those fish and wildlife species that will be reviewed by the Washington Department of Fish and Wildlife (POL-M 6001) for possible listing as endangered, threatened, or sensitive according to the process and criteria defined in WAC 232-12-297.

B. Vulnerable aggregations. Vulnerable aggregations include those species or groups of animals susceptible to significant population declines, within a specific area or statewide, by virtue of their inclination to congregate. Examples include heron colonies, seabird concentrations, and marine mammal congregations.

C. Species of recreational, commercial, and/or tribal importance. Native and nonnative fish, shellfish, and wildlife species of recreational or commercial importance and recognized species used for tribal ceremonial and subsistence purposes that are vulnerable to habitat loss or degradation.

D. Species listed by the National Marine Fisheries Service or the U.S. Fish and Wildlife Service under the federal Endangered Species Act as either proposed, threatened, or endangered.

19.150.645 Prohibited: not permitted to occur in a particular designation.

19.150.650 Public Access: the ability of the general public or, in some cases, a specific community, to reach, touch, and enjoy the water's edge, to travel on the waters of the state, and to view the water and the shoreline from adjacent locations.

19.150.655 Qualified Professional or Qualified Consultant: in accordance with WAC 365-195-905(4), a qualified professional must have obtained a B.S. or B.A. or equivalent degree in biology, soil science,

engineering, environmental studies, fisheries, geology, geomorphology or related and relevant field to the subject in question, have related work experience and meet the following criteria:

A. A qualified professional for wetlands must have a degree in biology, ecology, soil science, botany, or a closely related field and a minimum of five years of professional experience in wetland identification and assessment associated with wetland ecology in the Pacific Northwest or comparable systems.

B. A qualified professional for habitat management plans or shoreline mitigation plans must have a degree in wildlife biology, ecology, fisheries, or closely related field and a minimum of five years professional experience related to the subject species/habitat type.

C. A qualified professional for geologically hazardous areas, geotechnical and hydrogeological reports must be a professional engineering geologist or geotechnical engineer, licensed in the state of Washington. In designing soft armoring techniques, a qualified professional may also have similar qualifications as that required for habitat management plans.

D. A qualified professional for critical aquifer recharge areas means a Washington State licensed hydrogeologist, geologist, or an engineer qualified in experience and training in aquifer recharge.

19.150.660 Ramp (or gangway): a structure between a pier and float which adjusts its angle based on the tidal elevation, allowing access to the float at all times.

19.150.665 Recreation: the use and enjoyment of the shoreline by the public, including but not limited to fishing, hiking, swimming and viewing.

19.150.670 Recreational Development: development that provides opportunities for the use and enjoyment of the shoreline by the public, including but not limited to fishing, hiking, swimming and viewing. This includes both commercial and public recreational facilities.

19.150.675 Residential Development: development for the purpose of human habitation. Residential development includes the construction or modification of one- and two-family detached structures, multi-family structures, condominiums, townhouses, mobile home parks, and other similar group housing, together with accessory dwelling units, accessory uses and structures common to residential uses. Residential development also includes the creation of new residential lots through the subdivision of land. Residential development does not include hotels, motels, bed and breakfasts, or any other type of overnight or transient housing or camping facilities.

19.150.680 Resource-based Uses: low-intensity uses, which may include agriculture, aquaculture, forestry, recreation and designated open-space.

19.150.685 Restoration: the reestablishment or upgrading of impaired ecological shoreline processes and functions. This may be accomplished through measures including, but not limited to, revegetation, removal of intrusive shoreline structures and removal or treatment of toxic materials. Restoration does not imply a requirement for returning the shoreline area to aboriginal or pre-European settlement conditions.

19.150.690 Revision: the modification or change to a permit authorized under this Program.

19.150.695 Setback: the distance a use or development must be from the edge of a buffer to prevent construction and other activities from intruding into the buffer.

19.150.700 Shall: a mandatory term that means an action is required.

19.150.705 Shellfish Beds: a general area of shoreline, both intertidal and subtidal, where shellfish congregate. This includes natural subsistence, recreational and commercial beds. Shellfish include, but are not limited to, abalone, hardshell clam, subtidal clam, dungeness crab, geoduck clam, manila clam, oysters, razor clam, pandalid shrimp and red urchin. Where disputed as a critical saltwater habitat, appropriate state agencies and affected tribes shall be consulted in order to assist with the determination.

19.150.710 Shorelands: those lands extending landward for two hundred feet in all directions as measured on a horizontal plane from the ordinary high water mark; floodways and contiguous floodplain areas landward two hundred feet from such floodways; and all wetlands and river deltas associated with the streams, lakes, and tidal waters which are subject to the provisions of this chapter; the same to be designated as to location by the department of ecology.

19.150.715 Shoreline Management Act (Act): the Washington State Shoreline Management Act, Chapter 90.58 RCW.

19.150.720 Shoreline Stabilization: actions taken to address erosion impacts to property and dwellings, businesses, or structures caused by natural processes, such as current, flood, tides, wind or wave action.

These actions include structural and nonstructural methods. Nonstructural methods, for example, include approaches such as building setbacks, structure relocation, groundwater management, and land use planning. Structural methods can be “hard” or “soft”. "Hard" structural stabilization measures refer to those with solid, hard surfaces, such as concrete bulkheads, while "soft" structural measures rely on less rigid materials, such as bioengineering vegetation measures or beach enhancement. “Hybrid” structures are a composite of both soft and hard elements along the length of the armoring. Generally, the harder the construction measure, the greater the impact on shoreline processes including sediment transport, geomorphology, and biological functions.

There are a range of measures for shoreline stabilization, varying from soft to hard that include, but are not limited to:

A. Soft
1. Vegetation enhancement;
2. Beach enhancement;
3. Bioengineering measures;
4. Anchor logs and stumps; and
5. Gravel placement/beach nourishment.

B. Hard
1. Rock revetments;
2. Gabions;
3. Groins;
4. Bulkheads; and
5. Seawalls.

19.150.725 Shoreline Structure Setback Line: the closest distance measured on a horizontal plane between the ordinary high water mark and the building line.

19.150.730 Shorelines of the State: includes all “shorelines” and “shorelines of statewide significance” within the state, as defined in RCW 90.58.030.

19.150.735 Shorelines: means all of the water areas of the state, including reservoirs, and their associated shorelands, together with the lands underlying them; except (i) shorelines of statewide significance; (ii) shorelines on segments of streams upstream of a point where the mean annual flow is twenty cubic feet per second or less and the wetlands associated with such upstream segments; and (iii) shorelines on lakes less than twenty acres in size and wetlands associated with such small lakes**;**

19.150.740 Shorelines of Statewide Significance: shorelines in Thurston County designated as shorelines of statewide significance are:

A. Nisqually Delta – from DeWolf Bight to Tatsolo Point, between the ordinary high water mark and the line of extreme low tide, together with shorelands associated therewith per RCW 90.58.030(2)(f)(vi).

B. Puget Sound – seaward from the line of extreme low tide.

C. Lakes, whether natural or artificial, or a combination thereof, with a surface acreage of one thousand acres or more measured at the ordinary high water mark.

D. Natural rivers or segments thereof downstream of a point where the mean annual flow is measured at one thousand cubic feet per second or more.

E. Shorelands and wetlands associated with A through D above.

19.150.745 Should: a term that means a particular action is required unless there is a demonstrated, sufficient reason, based on a policy of the Act or this Program, for not taking the action.

19.150.750 State Environmental Policy Act (SEPA): An environmental review process designed to work with other regulations to provide a comprehensive review of a proposal. Most regulations focus on particular aspects of a proposal, while SEPA requires the identification and evaluation of probable impacts for all elements of the environment. See Chapter 197-11WAC.

19.150.755 Streams: means those areas of Thurston County where surface waters flow sufficiently to produce a defined channel or bed. A "defined channel or bed" is an area which demonstrates clear evidence of the passage of water and includes but is not limited to bedrock channels, gravel beds, sand and silt beds and defined-channel swales. The channel or bed need not contain water year-round. This definition is not meant to include irrigation ditches, canals, storm or surface water runoff devices or other entirely artificial watercourses unless they are used by salmon or used to convey streams naturally occurring prior to construction.

"Stream and water body types" means as follows:

1. **Type S waters** include all aquatic areas inventoried as "shorelines of the state," in accordance with Chapter 90.58 RCW, including segments of streams where the mean annual flow is more than twenty cubic feet per second, marine shorelines and lakes twenty acres in size or greater.

2. **Type F waters** include all segments of aquatic areas that are not type S waters and that contain fish or fish habitat including waters diverted for use by a federal, state or tribal fish hatchery from the

point of diversion for one thousand five-hundred feet or the entire tributary if the tributary is highly significant for protection of downstream water quality.

3. **Type N waters** include all segments of aquatic areas that are not type S or F waters and that are physically connected by an above-ground channel system, stream or wetland to type S or F waters.

19.150.760 Stormwater Facility: A constructed component of a stormwater drainage system designed or constructed to perform a particular function, or multiple functions. Stormwater facilities include, but are not limited to, pipes, swales, ditches, culverts, street gutters, detention ponds, retention ponds, constructed wetlands, infiltration devices, catch basins, oil/water separators, and biofiltration swales. An engineered or natural dispersion area that is dedicated to strormwater use is also considered a stormwater facility for purposes of this Program.

19.150.765 Structure: a permanent or temporary edifice or building, or any piece of work artificially built or composed of parts joined together in some definite manner, whether installed on, above, or below the surface of the ground or water, except vessels.

19.150.770 Substantial Development: any development of which the total cost or fair market value exceeds five thousand dollars, or any development which materially interferes with the normal public use of the water or shorelines of the state. The dollar threshold must be adjusted for inflation every five years, as defined in WAC 173-27-040(2). On September 15, 2012, the amount was increased to six thousand four hundred and sixteen dollars ($6,416).

19.150.775 Substantial Development Permit: a permit for any substantial development.

19.150.780Transportation: systems for automobiles, public transportation, pedestrians, and bicycles. This includes, but is not limited to, roads, parking facilities, bridges, sidewalks and railroads.

19.150.785 Urban Growth Area (UGA): those areas designated by Thurston County pursuant to RCW 36.70A.110 for urban development.

19.150.790 Use: the end to which a land or water area is ultimately employed.

19.150.795 Utilities: services and facilities that produce, convey, store or process electric power, gas, sewage, water, communications, oil, stormwater, and waste. This includes drainage conveyances and swales.

19.150.800 Variance: granting relief from specific bulk, dimensional or performance standards set forth in this Master Program and not a means to vary a use of a shoreline.

19.150.805 Vascular Plants: all seed-bearing plants that have vascular tissue (xylem and phloem).

19.150.810 Vegetation, Native: Vegetation comprised of plant species, other than noxious weeds, that are indigenous to the coastal region of the Pacific Northwest and which reasonably could have been expected to naturally occur on the site. Examples include, but are not limited to, trees such as Douglas Fir, western hemlock, western red cedar, alder, big-leaf maple, and vine maple; shrubs such as willow, elderberry, salmonberry, and salal; and herbaceous plants such as sword fern, foam flower, and fireweed.

19.150.815 WAC: Washington Administrative Code.

19.150.820 Water-Dependent Use: a use or portion of a use that cannot exist in a location that is not adjacent to the water and that is dependent on the water by reason of the intrinsic nature of its operations.

19.150.825 Water-Enjoyment Use: a recreational use or other use that facilitates public access to the shoreline as a primary characteristic of the use; or a use that provides for recreational use or aesthetic enjoyment of the shoreline for a substantial number of people as a general characteristic of the use and which through location, design, and operation ensures the public's ability to enjoy the physical and aesthetic qualities of the shoreline. In order to qualify as a water-enjoyment use, the use must be open to the general public and the shoreline-oriented space within the project must be devoted to the specific aspects of the use that fosters shoreline enjoyment.

19.150.830 Water-Oriented Use: a use that is water dependent, water-related, or water-enjoyment, or a combination of such uses.

19.150.835 Water-Related Use: a use or portion of a use that is not intrinsically dependent on a waterfront location, but whose economic viability is dependent upon a waterfront location because:

A. The use has a functional requirement for a waterfront location such as the arrival or shipment of materials by water or the need for large quantities of water; or

B. The use provides a necessary service supportive of the water-dependent uses and the proximity of the use to its customers makes its services less expensive and/or more convenient.

19.150.840 Weir: a structure that impounds, diverts or uses water for hydraulic generation and transmission, flood control, irrigation, water supply, recreational or fisheries enhancement.

19.150.845 Wetlands: areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas. Wetlands do not include those artificial wetlands intentionally created from non-wetland sites, including, but not limited to, irrigation and drainage ditches, grass-lined swales, canals, detention facilities, wastewater treatment facilities, farm ponds, and landscape amenities, or those wetlands created after July 1, 1990, that were unintentionally created as a result of the construction of a road, street, or highway. Wetlands may include those artificial wetlands intentionally created from non-wetland areas to mitigate the conversion of wetlands.

Chapter 19.200 Shoreline Jurisdiction and Environment Designation

19.200.100 Shoreline Jurisdiction

A. The Shoreline Master Program jurisdiction applies to all shorelines of the state in Thurston County and their associated shorelands. This includes:

1. All marine waters;
2. Rivers and streams with more than 20 cubic feet per second (cfs) mean annual flow;
3. Lakes and reservoirs 20 acres and greater in area;
4. Associated wetlands;
5. Shorelands adjacent to these waterbodies, typically within 200 feet of the ordinary high water mark (OHWM);
6. Buffers necessary to protect critical areas that are located within shoreline jurisdiction as described in this program.*

*- *optional jurisdiction*

B. Associated estuarine wetlands: the jurisdictional boundary shall extend 200 feet landward of the delineated edge of the wetland.

C. Associated wetlands that extend greater than 200 feet landward of the OHWM of the shoreline: the jurisdictional boundary shall extend to the delineated edge of the wetland.

D. Critical areas designated pursuant to Chapter 36.70A RCW and located within shoreline jurisdiction shall be subject to the regulations of this Program.

19.200.105 Shoreline Environment Designations

In order to plan and manage shoreline resources effectively and to provide a uniform basis for applying policies and regulations within distinctively different shoreline areas, a system of categorizing shoreline areas is necessary. Under the following system, shoreline environment designations are given to specific areas based on the existing development pattern, the biophysical capabilities and limitations of the shoreline being considered for development, the provisions of WAC 173-26-211 and the goals and aspirations of the citizens of Thurston County as expressed in the Comprehensive Plan. The existing development pattern and the biophysical information of the shoreline was compiled in a *Thurston County Shoreline Master Program Update Inventory and Characterization Report* (Thurston County 2013) and was included as the basis for the environment designations.

Environment designation assignment to shoreline reaches must assure the protection of existing shoreline ecological functions with the proposed pattern and intensity of development as well as be consistent with policies for restoration of degraded shorelines [WAC 173-26-211 (4) (b)].

Thurston County is using five of the six Ecology recommended Shoreline Environment Designations (SED's) and criteria consistent with Ecology's provided criteria for each of the environment designations: Aquatic, Natural, Urban Conservancy, Rural Conservancy, and Shoreline Residential [WAC 173-26-211(5)]. Thurston County does not have any "High Intensity" shorelines within its jurisdiction. In

addition to the five Ecology recommended SEDs, Thurston County is proposing to use one additional SED: Mining (*Shoreline and Environmental Designations Report*, Thurston County 2013). A map of the environment designations can be found in Appendix A.

This Program is designed to encourage, in each environment, uses which enhance the character of that environment. At the same time, the Program imposes reasonable standards and restrictions on development so that such development does not disrupt or destroy the character of the environment or result in a net loss of shoreline ecosystem functions.

The shoreline environment designations are not intended to be land use designations. They do not imply development densities, nor are they intended to mirror the Comprehensive Plan designations. The system of categorizing shoreline environment designations is derived from Chapter 173-26 WAC.

The basic intent of this system is to utilize performance standards that regulate activities in accordance with goals and objectives defined locally rather than to exclude any use from any one environment. Thus, the particular use or type of developments placed in each environment must be designed and located so that there are no effects detrimental to achieving the objectives of the shoreline environment designations and local development criteria.

This approach provides an "umbrella" environment class over local planning and zoning on the shorelines. Since every area is endowed with different resources, has different intensities of development and attaches different social values to these physical and economic characteristics, the environment designations should not be regarded as a substitute for local planning and land-use regulations.

19.200.110 Mining

A. Purpose. To protect shoreline ecological functions in areas with mining activities within shoreline jurisdiction. To provide sustained resource use, and protect the economic base of those lands and limit incompatible uses.

B. Designation Criteria.

1. Outside incorporated municipalities and outside urban growth areas, AND:
2. Contains shorelines created from mining activity in areas where no previous naturally occurring SMA shoreline existed.

C. Management Policies.

1. First priority should be given to water-dependent uses. Second priority should be given to water-related and water-enjoyment uses.
2. Non-water-oriented uses should not be allowed except:
    a. As part of mixed used development;
    b. In limited situations where they do not conflict with or limit opportunities for water-oriented uses; or
    c. On sites where there is no direct access to the shoreline.
3. Policies and regulations shall assure no net loss of shoreline ecological functions as a result of new development. Where applicable, new development shall include environmental cleanup and restoration of the shoreline to comply with any relevant state and federal law.
4. Where feasible, visual and physical public access should be required.

5. Aesthetic objectives should be implemented by means such as sign control regulations, appropriate development siting, screening and architectural standards, and maintenance of natural vegetative buffers.
6. Full utilization of existing urban areas should be achieved before further expansion of intensive development is allowed. Consideration should be given to the potential for displacement of non-water-oriented uses with water-oriented uses when analyzing full utilization of urban waterfronts and before considering expansion of such areas.

19.200.115 Shoreline Residential

A. Purpose. To accommodate residential development and appurtenant structures that are consistent with this Program, and to provide appropriate public access and recreational uses.

B. Designation Criteria.

1. Does not meet the criteria for the Natural or Rural Conservancy Environments.
2. Predominantly single-family or multifamily residential development or are planned and platted for residential development.
3. Majority of the lot area is within the shoreline jurisdiction.
4. Ecological functions have been impacted by more intense modification and use.

C. Management Policies.

1. Standards for buffers, shoreline stabilization, vegetation conservation, critical area protection, and water quality should be set to assure no net loss of shoreline ecological functions.
2. Multi-family and multi-lot residential and recreational developments should provide public access and joint use for community recreational facilities. If public access is not feasible on site, off-site options such as an in-lieu fee may be recommended.
3. Access, utilities, and public services should be available and adequate to serve existing needs and/or planned future development.
4. Commercial development should be limited to water-oriented uses. Water-oriented includes water-dependent, water-related and water-enjoyment uses.

19.200.120 Urban Conservancy

A. Purpose. To protect and restore ecological functions of open space, floodplain and other sensitive lands where they exist in urban and developed settings, while allowing a variety of compatible uses.

B. Designation Criteria. Shoreline areas within UGAs or LAMIRDs that are appropriate and planned for development that is compatible with maintaining or restoring of the ecological functions of the area and generally are not suitable for water-dependent uses. Such areas must also have any of the following characteristics:

1. Area suitable for low-intensity water-related or water-enjoyment uses without significant adverse impacts to shoreline functions or processes;
2. Open space, flood plain or other sensitive areas that should not be more intensively developed or supporting resource-based uses;
3. Potential for ecological restoration;

4. Retained important ecological functions, even though partially developed; or
5. Potential for development that is compatible with ecological restoration or Low Impact Development techniques.
6. Does not meet the designation criteria for the Natural Environment.
7. Land having any of the above characteristics and currently supporting residential development may be Urban Conservancy, as may those areas into which a UGA boundary is expanded and thus has any of the above characteristics.

C. Management Policies.

1. Uses that preserve the natural character of the area or promote preservation of open space, floodplain or other sensitive lands either directly or over the long term should be the primary allowed uses. Uses that result in restoration or preservation of ecological functions should be allowed if the use is otherwise compatible with the purpose of the environment and the setting.
2. Standards for shoreline stabilization measures, vegetation conservation, water quality, and shoreline modifications shall ensure that new development does not result in a net loss of shoreline ecological functions, or further degrade other shoreline values.
3. Public access and public recreation objectives should be implemented whenever feasible and ecological impacts can be mitigated.
4. Water-oriented uses should be given priority over non-water oriented uses. For shoreline areas adjacent to commercially navigable waters, water-dependent uses should be given highest priority.
5. Any development in the Urban Conservancy designation should implement Low Impact Development techniques, as much as is feasible, in order to maintain ecological functions.

19.200.125 Rural Conservancy

A. Purpose. Provide for sustained resource use, public access, and recreational opportunities while protecting ecological functions, and conserving existing ecological, historical, and cultural resources.

B. Designation Criteria. Shorelines outside the UGA or LAMIRD that have any of the following characteristics:

1. Currently support lesser-intensity resource-based uses, such as agriculture, aquaculture, forestry, or recreational uses, or are designated agriculture or forest lands;
2. Currently accommodate residential uses but are subject to environmental limitations, such as properties that include or are adjacent to steep banks, feeder bluffs, or flood plains or other flood-prone areas;
3. Can support low-intensity water-dependent uses without significant adverse impacts to shoreline functions or processes;
4. Private and/or publically owned lands (upland areas landward of OHWM) of high recreational value or with valuable historic or cultural resources or potential for public access;
5. Does not meet the designation criteria for the Natural environment;
6. Land designated Urban Conservancy and from which a UGA boundary is retracted may be designated as Rural Conservancy, if any of the above characteristics are present.

C. Management Policies.

1. Uses should be limited to those which sustain the shoreline area's physical and biological resources, and those of a non-permanent nature that do not substantially degrade ecological functions or the rural or natural character of the shoreline area. Developments or uses that would substantially degrade or permanently deplete the physical and biological resources of the area should not be allowed.
2. New development should be designed and located to preclude the need for shoreline stabilization. New shoreline stabilization or flood control measures should only be allowed where there is a documented need to protect an existing structure or ecological functions and mitigation is applied.
3. Residential development standards shall ensure no net loss of shoreline ecological functions and should preserve the existing character of the shoreline consistent with the purpose of the "Rural Conservancy" environment.
4. Low-intensity, water-oriented commercial uses may be permitted in the limited instances where those uses have been located in the past or at unique sites in rural communities that possess shoreline conditions and services to support the development.
5. Water-dependent and water-enjoyment recreation facilities that do not deplete the resource over time, such as boating facilities, angling, hunting, wildlife viewing trails and swimming beaches, are preferred uses, provided significant adverse impacts to the shoreline area are mitigated.
6. Agriculture, commercial forestry and aquaculture, when consistent with the Program, may be allowed.

19.200.130 Natural

A. Purpose. To protect those shoreline areas that are relatively free of human influence, and/or that include intact or minimally degraded shoreline functions intolerant of human use. Only very low intensity uses are allowed in order to maintain the ecological functions and ecosystem-wide processes. Restoration of degraded shorelines should be planned within this environment.

B. Designation Criteria. Shorelines having a unique asset or feature considered valuable for its natural or original condition that is relatively intolerant of intensive human use. This includes shorelines both in and out of the UGA or LAMIRD when any of the following characteristics apply:

1. The shoreline is ecologically intact and currently performing an important, irreplaceable function or ecosystem-wide process that would be damaged by human activity; or
2. The shoreline is considered to represent ecosystems and geologic types that are of scientific and educational interest;
3. The shoreline is unable to support new development or uses without adverse impacts to ecological functions or risk to human safety.
4. The shoreline includes largely undisturbed portions of shoreline areas such as wetlands, estuaries, unstable bluffs, coastal dunes, spits, and ecologically intact shoreline habitats.
5. Retain the majority of their natural shoreline functions, as evidenced by shoreline configuration and the presence of native vegetation.
6. Generally free of structural shoreline modifications, structures, and intensive human uses.

C. Management Policies.

1. Any use that would substantially degrade or result in a net loss of ecological functions or natural character of the shoreline area should not be allowed. The following new uses should not be allowed: commercial, industrial and non-water-oriented recreation.

2. Any alteration should be designed with low impact development methods, or be capable of restoration to the natural condition, where feasible. New development or significant vegetation removal that would reduce the capability of vegetation to perform normal ecological functions should not be allowed.
3. Single-family residences, roads, parking areas and utility corridors may be allowed as a conditional use only if they cannot be located outside the Natural Designation or shoreline jurisdiction, provided that the density and intensity of such use is limited to protect ecological functions and is consistent with the purpose of the designation.
4. Low-intensity, water-oriented recreational access, scientific, historical, cultural, educational research uses may be allowed provided that no significant ecological impact on the area will result.

19.200.135 Aquatic

A. Purpose. To protect, restore, and manage the unique characteristics and resources of the areas waterward of the ordinary high-water mark (OHWM).

B. Designation Criteria. Lands waterward of the OHWM, which include tidelands, bedlands, and lands beneath freshwater shorelines of the state (may also include wetlands).

C. Management Policies.

1. New over-water structures and development on navigable waters and their beds should be allowed only for water-dependent uses, public access or ecological restoration, and when:
   a. They do not preclude attainment of ecological restoration; and
   b. The size of the new over-water structure is limited to the minimum necessary to support the structure's intended use; and
   c. Multiple use of the over-water facility has been encouraged; and
   d. The structure or use is located and designed to minimize interference with surface navigation, to consider impacts to public views, to allow for the safe, unobstructed passage of fish and wildlife, particularly those species dependent on migration and to ensure that the project does not conflict with existing water dependent uses; and
   e. The use or modification is designed and managed to prevent degradation of water quality and alteration of natural hydrographic conditions.
2. When new over-water structures are proposed for residential development of two or more dwellings, joint use or community dock facilities should be utilized rather than single-use facilities.
3. Development should be compatible with the adjoining upland designation.
4. Existing over-water residences may continue through normal maintenance and repair, but should not be enlarged or expanded. New over-water residences should be prohibited.
5. Applicants for any use or modification should schedule a staff consult to review the site conditions, and potential habitats and species. This consult should result in a general understanding of applicable development standards for the proposal.
6. Development over or in critical freshwater or saltwater habitats should be limited to those which mitigate impacts according to mitigation sequencing, and development standards for that development activity.

19.200.140 Official Shoreline Map

A. As part of this Program, there is one official Thurston County Shoreline Environment Designations Map, which shall be in the custody of the Department of Resource Stewardship and available for public inspection during normal business hours and on the Thurston County website. Unofficial copies of the official map or portions thereof may be included or distributed with copies of this Program (see Appendix A).

B. The purpose of the official Shoreline Environment Designations Map is to depict graphically those areas of Thurston County falling under the jurisdiction of this Program, and the shoreline environment designations of those areas.

19.200.145 Map Boundaries and Errors

A. Mapping Boundaries. Where the exact location of a jurisdiction or environment designation boundary line is uncertain, the official Shoreline Environment Designations Map will be used to determine the location of such line. When resorting to the Shoreline Environment Designations Map does not resolve the conflict, the following rules will apply:

1. Boundaries indicated as approximately following the center lines of streets, highways, alleys or other roadways shall be construed to follow such center lines;
2. Boundaries indicated as approximately following lot, fractional section or other subdivision lines shall be construed as following such subdivision lines;
3. Boundaries indicated as approximately following any lines of corporate limits or other local government jurisdictional lines shall be construed as following such lines;
4. Boundaries indicated as following railroad lines shall be construed as following the center line of the railroad right-of-way;
5. Boundaries indicated as parallel to or extensions of features identified in subsections 1. through 4. above shall be so construed;
6. Boundaries between parallel environment designations shall be construed as the top of the bluff or vegetation line that distinguishes existing development from the critical area abutting the shoreline;
7. When not specifically indicated on the Shoreline Environment Designations Map, distances shall be determined by the scale of the map;
8. Where existing physical or cultural features are at variance with those shown on the Shoreline Environment Designations Map and cannot be determined with certainty by applying subsections one through six above, the Director shall determine the location or existence of such feature utilizing the provisions of WAC 173-27-211, the policies of RCW 90.58.020, TCC 24.01.040, and the corresponding Master Program provisions herein; and
9. Where a parcel within the shoreline jurisdiction is separated from the water by an existing developed road or an additional parcel that serves to create a distinct break in connectivity to the shoreline, the parcel on the landward side may not be required to meet certain development regulations for that designation (such as public access, water-oriented use, or vegetation conservation standards), provided all other applicable provisions of this Program are met, including no net loss of shoreline ecological functions.

B. Mapping Errors. Some mapping errors may be adjusted prior to a Master Program amendment to assign the appropriate designation to that area by the following methods:

1. The common boundary descriptions and the criteria in RCW 90.58.030(2) and Chapter 173-22 WAC supersede the map when there are mapping error conflicts, other than those with a solution provided in this section.
2. In the event that a jurisdictional area is not mapped, it will automatically be assigned a "Rural Conservancy" or "Urban Conservancy" designation depending on its location outside or inside of a UGA or LAMIRD. Such designation will apply until a Master Program amendment is approved that assigns the appropriate designation to the subject area.
3. In the event that a parcel was inadvertently assigned more than one designation, the more restrictive designation shall apply.
4. In the event that a parcel on the boundary between two designations appears to be a mapping error based on the criteria in this section, the County shall apply the most appropriate of the two designations, until such time as the map can be formally corrected consistent with WAC 173-26-100 and Section 19.500.105(I) (Shoreline Master Program Amendment).
5. In the event of an environment designation mapping error where the Master Program update or amendment record, including the public hearing process, is unclear in term of the correct environment designation to apply to a property, the County shall apply the environment designation approved through the Master Program Update or Amendment process and correct the map.
6. If the environment designation criteria were misapplied, but the update or amendment record, including the public hearing process, does not clearly show that a different designation was intended to be shown on the map, a Master Program amendment may be obtained consistent with WAC 173-26-100 and Section 19.500.105(I) (Shoreline Master Program Amendment). This process is intended to allow for reasonable corrections to the Shoreline Environment Designation process. Such process shall include early consultation with the Department of Ecology and other agencies with jurisdiction, affected tribes, and appropriate public notification prior to local approval. Current designations are reflected in the Shoreline Environment Designations Map (Appendix A).

Chapter 19.300 General Goals and Policies

19.300.050 Applicability

A. The general goals and policies of this chapter apply to all use and development activities within the Program's jurisdiction, regardless of environment designation. As provided in WAC 173-26-191, these policies are the basis for regulations that govern use and development along the shoreline. Some Program policies may not be fully achievable by regulatory means, but may be pursued by other means as provided in RCW 90.58.240.

B. Regulation of administrative actions contained herein must be implemented with consideration to the Public Trust Doctrine, regulatory takings, and other applicable legal principles as appropriate.

19.300.100 Shorelines of Statewide Significance

A. Designation

The Shoreline Management Act designated certain shoreline areas as shorelines of statewide significance. Shorelines thus designated are important to the entire state. Because these shorelines are major resources from which all people of the state derive benefit, the statewide interest should be recognized and protected over the local interest.

Those areas that have been designated as shorelines of statewide significance (RCW 90.58.030) in Thurston County are:

1. *Puget Sound* - those areas lying seaward from the line of extreme low tide.

2. *Nisqually Delta* - From DeWolf Bight to Thurston County line, from the line of extreme low tide to the OHWM.

3. *Chehalis River* - From Lewis-Thurston County line downstream to the Thurston-Grays Harbor County line, excluding all federal lands. The flow exceeds 1,000 cubic feet per second (cfs) mean annual flow (MAF) at Lewis County line.

4. *Nisqually River* - From the Pierce-Thurston County line in Alder Reservoir downstream along left shore only, (exclude area from LaGrande Dam downstream to powerhouse due to use of aqueduct; also exclude all federal lands) to the Nisqually Indian Reservation boundary. The flow exceeds 1,000 cfs MAF at Pierce County line in Alder Reservoir.

5. *Alder Lake* – That portion of the lake from the Pierce County line up to the OHWM.

6. Shorelands and wetlands associated with 1 through 5 above.

Goal: To ensure that the statewide interest is recognized and protected over the local interest in shorelines of statewide significance, the County shall review all development proposals within shorelines of statewide significance for consistency with RCW 90.58.020 and the following policies (in order of preference):

B. County-wide Policies

1. Policy SH-1 Recognize and protect the statewide interest over local interest.

    a. The Washington Departments of Fish and Wildlife and Ecology, affected tribes, other resources agencies, and interest groups should be consulted for development proposals that could affect anadromous fisheries or other priority species or habitats.
    b. Recognize and take into account state agencies' policies, programs and recommendations in developing and administering use regulations.

2. Policy SH-2 Preserve the natural character of the shoreline.

    a. Administer shoreline environments and regulations to minimize damage to the unique character and ecology of shorelines of statewide significance.
    b. Where natural resources of statewide importance are being diminished over time by human activities, restoration of those resources should be facilitated.
    c. In order to reduce adverse impacts to the environment while accommodating future growth, new intensive development activities should upgrade and redevelop those areas where intensive development already occurs, rather than allowing high intensity uses to extend into low intensity use or underdeveloped areas.

3. Policy SH-3 Result in the long term over short term benefit.

    a. Preserve sufficient shorelands and submerged lands to accommodate current and projected demand for economic resources, such as shellfish beds and navigable harbors.
    b. Actions that would convert resources into irreversible uses or detrimentally alter natural conditions that are characteristic of shorelines of statewide significance should be severely limited.
    c. Evaluate the short-term economic gain or convenience of developments in relationship to long-term and potentially costly impairments to the natural environment.
    d. Actively promote aesthetic considerations when contemplating new development, redevelopment of existing facilities, or for the general enhancement of shoreline areas.

4. Policy SH-4 Protect the resources and ecology of the shoreline.

    a. Projects shall be required to consider incremental and cumulative impacts while ensuring no net loss of shoreline ecosystem processes and functions.
    b. In order to ensure the long-term protection of ecological resources of statewide importance, activities impacting anadromous fish habitats, forage fish spawning and rearing areas, shellfish beds and other unique environments should be severely limited.
    c. Limit public access where improvements would result in a loss of shoreline ecological functions, such as in priority or sensitive habitats.

5. Policy SH-5 Increase public access to publicly owned areas of the shorelines.

a. Preserve and encourage public access with special scenic or cultural qualities.
b. Give priority to developing paths and trails to shoreline areas and linear access along the shorelines, where appropriate.
c. Locate development, including parking, as far inland from the OHWM as is feasible so that access is enhanced.

6. Policy SH-6 Increase recreational opportunities for the public in the shoreline.

a. Public access and recreation requirements should take into account the activities of state agencies and the interests of the citizens of the state to visit public shorelines.

b. Plan for and encourage development of facilities for recreational use of the shorelines, but reserve areas for lodging and related facilities on uplands well away from the shoreline, with provisions for non-motorized access to the shorelines.

19.300.105 Critical Areas and Ecological Protection

Goal: Protect and conserve shoreline natural resources, including protection of critical areas (Title 24 TCC), while accommodating reasonable and appropriate uses which will assure, at a minimum, no net loss to shoreline ecological functions and processes.

A. Policy SH-7 Protect and conserve shoreline areas that are ecologically intact and minimally developed or degraded. Develop incentives and regulations for privately owned shorelines that will protect and conserve these areas while allowing reasonable and appropriate development.

B. Policy SH-8 Recognize that nearly all shorelines, even substantially developed or degraded areas, retain important ecological functions.

C. Policy SH-9 Utilize transfer of development rights as allowed by Chapter 20.62 TCC, or as now or hereafter amended, as an option to protect ecological functions.

D. Policy SH-10 Permitted uses and developments should be designed and conducted in a manner that protects the current ecological condition, and prevents or mitigates adverse impacts. Mitigation measures shall be applied in the following sequence of steps listed in order of priority:

1. Avoid the impact altogether by not taking a certain action or parts of an action;
2. Minimize impacts by limiting the degree or magnitude of the action and its implementation by using appropriate technology or by taking affirmative steps to avoid or reduce impacts;
3. Rectify the impact by repairing, rehabilitating or restoring the affected environment;
4. Reduce or eliminate the impact over time by preservation and maintenance operations;
5. Compensate for the impact by replacing, enhancing, or providing substitute resources or environments, including utilization of the in-lieu-fee process where appropriate; and

6. Monitor the impact and the mitigation projects and take appropriate corrective measures.

E. Policy SH-11 Shoreline ecological functions that should be protected include, but are not limited to:

1. Habitat (space or conditions for reproduction; resting, hiding and migration; and food production and delivery);
2. Water quality maintenance; and
3. Water quantity maintenance.

F. Policy SH-12 Shoreline processes, both freshwater and marine, that should be protected to support the above functions include, but are not limited to the delivery, loss and movement of:

1. Sediment,
2. Water,
3. Nutrients,
4. Toxins,
5. Pathogens, and
6. Large woody material.

G. Policy SH-13 In assessing the potential for new uses and developments to impact ecological functions and processes, the following should be taken into account:

1. On-site and off-site impacts;
2. Immediate and long-term impacts;
3. Cumulative impacts, from both current and reasonably foreseeable future actions, resulting from the project; and
4. Any mitigation measures or beneficial effects of established regulatory programs to offset impacts.

H. Policy SH-14 Critical areas in the shoreline jurisdiction shall be protected in a manner that results in no net loss to shoreline ecological functions. Pursuant to RCW 36.70A.030(5) and 24.01.020 TCC, critical areas include:

1. Critical Aquifer Recharge Areas
2. Fish and Wildlife Habitat Conservation Areas
3. Frequently Flooded Areas
4. Geologically Hazardous Areas
5. Wetlands

19.300.110 Vegetation Conservation

Goal: Conserve, protect and restore native shoreline vegetation to provide for ecological and habitat functions as well as human health and safety. These functions include, but are not limited to, variable shading of the nearshore, food and shelter for terrestrial and aquatic organisms, and slope/soil stabilization.

A. Policy SH-15 Preserve native plant communities on marine, river, lake and wetland shorelines. In order to maintain shoreline ecological functions and processes, development along the shoreline should result in minimal direct, indirect, or cumulative impacts. This includes:

1. Keeping overhanging vegetation intact along the shoreline edge to provide shading and other ecological functions;
2. Preserving established areas of native plants and minimizing clearing and grading near bluff edges and other erosion or landslide-prone areas in order to maintain slope stability and prevent excess surface erosion and stormwater runoff; and
3. Designing and placing structures and associated development in areas that avoid disturbance of established native plants, especially trees and shrubs; and
4. Removal of noxious weeds in accordance with WAC 16-750-020.

B. Policy SH-16 Shoreline landowners are encouraged to preserve and enhance native woody vegetation and native groundcovers to stabilize soils and provide habitat. When shoreline uses or modifications require a planting plan, maintaining native plant communities, replacing noxious weeds and avoiding installation of ornamental plants are preferred. Unless approved by the Director or their designee, non-native vegetation is prohibited.

C. Policy SH-17 Maintaining native or ecologically functional vegetation is preferred over clearing to provide views or lawns. Limited and selective clearing may be allowed when slope stability and ecological functions are not compromised. Limited trimming and pruning is preferred over removal of native vegetation.

19.300.115 Water Quality and Quantity

Goal: Provide regulations and voluntary incentives to encourage practices which protect water quality and reduce stormwater runoff and erosion in order to protect against adverse impacts to the public health, to the land and its vegetation and wildlife, and to the waters of the state and its aquatic life.

A. Policy SH-18 Shoreline use and development should minimize impacts that contaminate surface or ground water, cause adverse effects on shoreline ecological functions, or impact aesthetic qualities and recreational opportunities, including healthy shellfish harvest.

B. Policy SH-19 Ensure mutual consistency with other regulations that address water quality and stormwater quantity, including standards as provided for in TCCTitle 15.05 (Thurston County Storm Water Standards) and Chapter 173-201A WAC (Water Quality Standards).

C. Policy SH-20 Utilize pervious materials and other appropriate low impact development techniques where soils and geologic conditions are suitable and where such practices could reduce stormwater runoff.

D. Policy SH-21 All shoreline use and development shall be conducted in accordance with Chapter 24.20 TCC (Frequently Flooded Areas). The subdivision of land should not be established when it would be reasonably foreseeable that the development or use would require structural flood hazard reduction measures within the channel migration zone or floodway. When

evaluating alternate flood control measures or floodplain restoration opportunities, consider the removal or relocation of structures in flood-prone areas.

19.300.120 Economic Development

Goal: Provide for the location and design of industries, transportation, port and tourist facilities, commerce and other developments that are particularly dependent upon a shoreline location and/or use, when the shoreline can accommodate such development.

A. Policy SH-22 Accommodate and promote, in priority order, water-dependent, water-related and water-enjoyment economic development. Such development should occur in those areas already partially developed with similar uses consistent with this Program, areas already zoned for such uses consistent with the Thurston County Comprehensive Plan, or areas appropriate for water-oriented recreation.

B. Policy SH-23 Water-oriented economic development, such as those aquaculture activities encouraged under the Washington Shellfish Initiative, should be encouraged and shall be carried out in such a way as to minimize adverse effects and mitigate unavoidable adverse impacts to achieve no net loss of shoreline ecological functions.

19.300.125 Historic, Archeological, Cultural, Scientific and Educational Resources

Goal: Protect shoreline features of historic, archaeological, cultural, scientific and educational value or significance through coordination and consultation with the appropriate local, state and federal authorities, affected Indian tribes, and property owners.

A. Policy SH-24 Prevent damage or destruction of historic, archaeological, cultural, scientific and educational (HASCE) sites through coordinated identification, protection and management with the appropriate local, state and federal authorities and registrars, affected Indian tribes, and property owners.

B. Policy SH-25 Provide opportunities for education and appreciation related to HASCE features where appropriate and where maximum protection of the resource can be achieved.

19.300.130 Shoreline Use and Site Planning

Goal: Preserve and develop shorelines in a manner that allows for an orderly balance of uses by considering the public and private use, along with the development of shorelines and adjacent land areas with respect to the general distribution, location and extent of such uses and development.

A. Policy SH-26 For shoreline use and development activities, including plats and subdivisions at full build-out, employ innovative development features to achieve no net loss of ecological functions, such as sustainable and low impact development practices where appropriate.

B. Policy SH-27 Give preference to water-dependent uses and single-family residential uses that are consistent with preservation of shoreline ecological functions and processes. Secondary preference should be given to water-related and water-enjoyment uses. Non-water-oriented uses should be limited to those locations where the above-described uses are inappropriate or where non-water-oriented uses demonstrably contribute to the objectives of the Act. For use preference within shorelines of statewide significance, see Section 19.300.100(B) above.

C. Policy SH-28 Designate and maintain appropriate areas for protecting and restoring shoreline ecological functions and processes to control pollution and prevent damage to the shoreline environment and/or public health.

D. Policy SH-29 Through appropriate site planning and use of the most current, accurate and complete scientific and technical information available, shoreline use and development shall be located and designed to avoid the need for shoreline stabilization or actions that would result in a net loss of shoreline ecological functions.

E. Policy SH-30 Aquaculture is of statewide interest. Properly managed, it can result in long-term, over short-term, benefit and can protect the resources and ecology of the shoreline. Aquaculture is dependent on the use of the water area and, when consistent with the control of pollution and prevention of damage to the environment, is a preferred use of the water area.

F. Policy SH-31 Potential locations for aquaculture activities are relatively restricted by water quality, temperature, dissolved oxygen content, currents, adjacent land use, wind protection, commercial navigation, and salinity. The technology associated with some forms of aquaculture is still experimental and in formative states. Therefore, some latitude should be given when implementing the regulations of this section, provided that potential impacts on existing uses and shoreline ecological functions and processes should be given due consideration. However, experimental aquaculture projects in water bodies should include conditions for adaptive management. Experimental aquaculture means an aquaculture activity that uses methods or technologies that are unprecedented or unproven in Washington.

G. Policy SH-32 Aquaculture activities should be located, designed and operated in a manner that supports long-term beneficial use of the shoreline and protects and maintains shoreline ecological functions and processes.

H. Policy SH-33 Aquaculture should not be permitted where it would result in a net loss of shoreline ecological functions and processes, adversely impact eelgrass and macroalgae, or significantly conflict with navigation and other water-dependent uses. Aquaculture is not required to protect state-listed noxious weed species when control methods are conducted within applicable agency standards. In general, the following preferences apply when considering new aquaculture activities:

1. Projects that are not likely to negatively impact critical saltwater habitats.

2. Projects that involve little or no substrate modification.

3. Projects that involve little or no supplemental food sources, pesticides, herbicides or antibiotic application.

I. Policy SH-34 Aquaculture facilities should be designed and located to avoid:

A. the spread of disease to native aquatic life;
B. the establishment of new non-native species, which cause significant ecological impacts; and
C. significant impact to the aesthetic qualities of the shoreline.

J. Policy SH-35 Upland uses and modifications should be properly managed to avoid degradation of water quality of existing shellfish areas.

K. Policy SH-36 Planting and harvesting by boat shall be preferred over low-tide harvest methods where feasible.

L. Policy SH-37 Non-commercial and small scale aquaculture projects should be encouraged through the shoreline exemption process [Section 19.500.100(C)].

M. Policy SH-38 In order to facilitate more conforming uses in the shoreline environment provide an administrative Type I permit option to permit reconstruction or remodels of non-conforming structures that propose to make the structures and uses more conforming using innovative design techniques and/or by moving structures further landward of critical areas, their buffers and setbacks or, to the maximum extent possible, remove the structures completely from critical areas, their buffers, and setbacks.

19.300.135 Public Access and Recreation

Goal: Provide physical and visual public access opportunities and space for diverse forms of water-oriented recreation in such a way that private property rights, public safety, and shoreline ecological functions and processes are protected in accordance with existing laws and statutes.

A. Policy SH-39 Protect the public's opportunity to enjoy the physical and visual qualities of the shoreline by balancing shoreline use and development in such a way that minimizes interference with the public's use or enjoyment of the water. This may be achieved through regulatory provisions, incentives or other cooperative agreements.

B. Policy SH-40 Evaluate site-appropriate types and methods of required public access when reviewing all public shoreline development projects and private subdivision of land into more than four parcels. Based on project-specific circumstances, this may include physical or visual access on or off site.

C. Policy SH-41 Acquire, maintain and improve diverse physical and visual shoreline access through public and private efforts. This should be accomplished in a comprehensive and prioritized manner through the use of existing plans and programs, including those that address population growth and shoreline access demands such as the Thurston County Comprehensive Plan, the Thurston County Parks, Recreation, Trails and Natural Resource Preserve Plan (2013) Plan, and other port and state park plans.

D. Policy SH- 42 Publically owned, undeveloped road-ends, tax-title lands and right-of-ways adjacent to salt and freshwater shorelines should be evaluated for use as public access points. These lands may be developed for access by a community organization, consistent with Chapter 13.56 TCC as now or hereafter amended.

E. Policy SH-43 Use shoreline public access points to enhance the public's understanding and appreciation of shoreline ecology, cultural history, maritime heritage, and location specific rules and boundaries by incorporating educational and interpretive signage and other tools into public access facilities.

19.300.140 Restoration and Enhancement

Goal: Re-establish, rehabilitate and/or otherwise improve impaired shoreline ecological functions and processes through voluntary and incentive-based public and private programs and actions that are consistent with the *Shoreline Restoration Plan* (Appendix C). (Note: this section does not address required mitigation sequencing related to specific development proposals; see Section 19.400.110(A) for mitigation standards.)

A. Policy SH-44 Integrate and facilitate voluntary and incentive-based cooperative restoration and enhancement programs between local, state, and federal public agencies, tribes, non-profit organizations, and landowners to address shorelines with impaired ecological functions and/or processes.

B. Policy SH-45 Identify restoration opportunities through sources such as the *Thurston County Shoreline Master Program Update Inventory and Characterization Report*, salmon recovery plans, local watershed plans, Puget Sound Nearshore Ecosystem Restoration Project (PSNERP), and the Salmon Recovery Lead Entity Habitat Work Schedule, and authorize, coordinate and facilitate appropriate publicly and privately initiated restoration projects. This shall be accomplished through the *Shoreline Restoration Plan* (Appendix C), which addresses the following:

1. Identification of degraded areas and sites with potential for ecological restoration;
2. Restoration goals and priorities;
3. Existing and on-going projects and programs;
4. Additional projects and programs to achieve the restoration goals;
5. Funding sources, timelines and benchmarks for implementation; and
6. Monitoring effectiveness of restoration projects.

C. Policy SH-46 Encourage and facilitate restoration and enhancement projects for Priority Habitats and Species (Washington Department of Fish and Wildlife, PHS Program).

D. Policy SH-47 Shoreline ecosystem protection and restoration projects shall be prioritized, located and designed utilizing the most current, accurate and complete scientific and technical information available to promote resiliency of habitats and species.

19.300.145 Transportation and Utilities

Goal: Plan, locate and design transportation systems and essential utility facilities in shoreline areas where they will have the least possible adverse effect on shoreline ecological functions and/or processes and existing or planned water-dependent uses.

A. Policy SH-48 Plan, locate and design proposed transportation, parking facilities, and utility facilities where routes will avoid a net loss of shoreline ecological functions or will not adversely impact existing or planned water-dependent uses.

B. Policy SH-49 Parking facilities in shorelines are not a preferred use. Such facilities shall only be allowed as necessary to support an authorized use and only when environmental and visual impacts are avoided and minimized.

C. Policy SH-50 New or expanded transportation routes and essential utility facilities shall, to the extent feasible:

1. Be located in areas that do not require shoreline stabilization, dredging, extensive cut/fill and other forms of shoreline alteration;
2. Be limited to local access and public shoreline access routes;
3. Be located in existing rights of way and corridors; and
4. Not be built within shoreline jurisdiction when other options are available.

D. Policy SH-51 Transportation and utility projects shall be consistent with the public access policies and plans of this Program.

E. Policy SH-52 Provide for alternate modes of travel, including pedestrian, bicycle and public transportation, where appropriate.

F. Policy SH-53 Maintenance of existing transportation corridors and utility facilities shall be carried out in a manner that:

1. will avoid a net loss of shoreline ecological functions; and
2. where feasible and appropriate, improve shoreline ecological functions.

Unavoidable adverse impacts shall be mitigated.

C. South Puget Sound Policies

1. Policy SH-54 Thurston County recognizes that South Puget Sound is a unique and significant marine resource. As such, Thurston County should work to minimize use conflicts, exercise responsibility toward the South Sound's resources, and require commitment to water-quality preservation.

2. Policy SH-55 In planning for the future development of South Puget Sound, the statewide interest should be protected over the local interest.

3. Policy SH-56 The Alliance for a Health South Sound (AHSS) is a regional organization comprised of Thurston, Kitsap, Pierce and Mason County governments, and the Squaxin Island, Nisqually, and Puyallup tribes. The AHSS has been recognized by the State, including the Puget Sound Partnership, and the counties as having an important role in protecting, enhancing, and restoring the resources of South Puget Sound. As such, the AHSS has developed the South Sound Strategy, incorporated herein by reference, which should be consulted for guidance when reviewing new shoreline projects in South Puget Sound.

Policy SH-57 The public interest in South Puget Sound concerns the natural character and the future development. The scope of the public interest concerning the future development of South Puget Sound includes all residents of the state, tribes, the four county governments, and federal- and State-owned lands.

Don Hoch
Director

STATE OF WASHINGTON
WASHINGTON STATE PARKS AND RECREATION COMMISSION
1111 Israel Road S.W. • P.O. Box 42650 • Olympia, WA 98504-2650 • (360) 902-8500
TDD Telecommunications Device for the Deaf: 800-833-6388
www.parks.state.wa.us

August 27, 2018

Brad Murphy
Shoreline Code Update
Thurston County Long Range Planning Dept.
2000 Lakeridge Dr. SW
Olympia, WA 98502

Dear Mr. Murphy:

The Washington State Parks and Recreation Commission (State Parks) appreciates the opportunity to provide comments on Thurston County's proposed shoreline code update.

State Parks owns and manages two developed state parks (Millersylvania and Tolmie) and one undeveloped property (Elbow Lake) totaling approximately 1,267 acres within Thurston County. Additionally, approximately 140 acres (Tribal Management Area) of the 1,230-acre Nisqually-Mashel State Park falls within the County's jurisdiction. Millersylvania State Park is an 842-acre camping park with 3,300 feet of freshwater shoreline on Deep Lake. The park provides camping, miles of trails, kitchen shelters, two swimming beaches, non-motorized watercraft rentals (kayaks, paddleboards, and pedal boats), 100 feet of dock and one boat ramp for hand-type launch of small craft only. State Parks completed a Classification and Management Plan (CAMP) for Millersylvania in December 2002.

Tolmie State Park is a 105-acre marine day-use park with 1,800 feet of saltwater shoreline on Puget Sound. The park offers a variety of activities, including hiking, swimming, fishing, clamming and crabbing, and an underwater park that contains an artificial reef built in cooperation with scuba divers. The park has no boat launch, but does provide five mooring buoys. Tolmie provides the only public saltwater shoreline access in the City of Lacey, and the number of park visitors is increasing in this rapidly growing area of Thurston County.

State Parks is currently working on a project at Tolmie that will provide additional parking and site improvements necessary to improve public access, and address safety and management issues resulting from high visitation rates. The project is being funded through a Recreation and Conservation Office (RCO) grant and is supported by Thurston County, the City of Lacey, South Sound Estuary Association, South Sound Green and park neighbors.

In reviewing the draft documents, State Parks is generally encouraged by the dedication to balancing the ecological protection of the shoreline with the need for public access and

recreational development. As a state agency with expertise in recreation, and as a landowner with both freshwater and saltwater public shoreline in Thurston County, State Parks is uniquely qualified to speak to this balancing act.

When proposing development in the shoreline, State Parks looks to several internal policies for guidance on balancing development needs with ecological protection. State Parks Stewardship policies for Critical Areas, Natural Resources Management, and Sustainability provide the basis for evaluating, avoiding, minimizing and/or mitigating environmental impacts for all State Park developments. Internal agency planning, including development of CAMP and Master Plans for State Park properties, further extends these Stewardship policies by providing site-specific recommendations for ecological protection and recreation planning. The CAMP process includes extensive public outreach and a comprehensive inventory and analysis of each park site resulting in management recommendations and internal land classifications that guide future development.

While the proposed shoreline code updates are generally supportive of public access and public recreational development, State Parks finds that there are some proposed elements which contradict these overarching themes. When finalizing the policies and regulations of the Shoreline Master Program (SMP), State Parks strongly encourages the County to consider the public and ecological benefits that arise from well maintained and managed public recreational developments.

State Parks staff provides the following preliminary comments and recommended changes to the SMP. Please note: excerpts from the SMP are in *italics* and ***bolded*** where necessary.

1. ***Proposed Updates to the Shoreline Environment Designations, Maps 2 and 3:***

   State Parks disagrees with the proposed "Natural" shoreline designation at Tolmie State Park and formally requests that it be designated "Rural Conservancy" consistent with the designations of the adjacent properties and Millersylvania State Park. The park's shoreline does not meet the "Natural" designation criteria and the stated purpose[1] of the designation does not align with or support the existing and future recreational use of this popular and highly visited park.

   The shoreline within Tolmie State Park does not meet the definition of "Ecologically Intact" as this area has been developed for recreational use over the years to include a kitchen/restroom, road and associated culvert, parking area, two picnic areas, a footbridge and paved trails leading to the beach. The park also provides many other upland features. Additionally, the proposed "Natural" designation does not allow for currently existing shoreline uses at the Park including public mooring and other non-water oriented recreation, and requires a conditional use permit for other water-oriented uses.

[1] Per the proposed SMP, the purpose of the "Natural" designation is "To protect those shorelines that are relatively free of human influence, and/or that include intact or minimally degraded shoreline functions intolerant of human use. Only very low intensity uses are allowed in order to maintain the ecological functions and ecosystem-wide processes."

2. ***Page 20, Section 19.200.100 Shoreline Jurisdiction****: The Shoreline Master Program jurisdiction applies to all shorelines of the state in Thurston County and their associated shorelands. This includes:*

   *A.6 Buffers necessary to protect critical areas that are located within shoreline jurisdiction as described in this program.**

   -optional jurisdiction

   While it is understood that the RCW allows for expansion of jurisdiction to include critical areas buffers, if adopted, the area of shoreline jurisdiction would increase and additional areas of properties would be subject to the SMP and its additional layer of permitting requirements. There are inconsistencies between the proposed SMP and the existing Thurston County Critical Areas Ordinance (e.g., Special Reports requirements), which can be confusing. The SMP should clearly state which regulations (SMP or Thurston County Code) take precedence in cases where there may be "dual coverage" of critical areas and/or buffers.

3. ***Page 40, Section 19.400.110(B) Mitigation Options:***

   5. When compensatory mitigation becomes necessary on a site where documented restoration activities have occurred within the previous three years, but after the effective date of this Program, such documented restoration may be utilized as mitigation to offset new development impacts, provided the restoration was voluntary and not required as mitigation for prior development impacts. Mitigation credit for prior restoration activities shall be determined upon application for the impacting project, and shall, at a minimum, be commensurate with the proposed level of impact unless additional compensatory mitigation is provided.

   State Parks is supportive of this mitigation option as it allows for flexibility and more timely restoration efforts. Please clarify what type of documentation will be required to qualify previous restoration activities for mitigation.

4. ***Page 41, Section 19.400.110(C) Mitigation Compliance:***

   1. Unless otherwise specified, mitigation shall take place prior to final project inspection to provide assurance that it will be completed and to mitigate for temporal loss of shoreline functions.

   Requiring that mitigation take place prior to final project inspection has the potential to unnecessarily increase project timelines and costs. This is particularly true for projects that propose revegetation as mitigation, which requires planting during specific times of the year to ensure success, or for projects that have limited work windows. It is recommended that this be revised to require mitigation be completed within a specified timeframe (e.g., up to a year or 18 months) to allow for flexibility and unforeseen natural events.

5. ***Page 42, Section 19.400.115(A) Incorporation of Title 24 TCC:*** *The following sections of Title 24 TCC, Critical Areas Ordinance, dated July 24, 2012, are incorporated herein by this reference…except as supplemented or modified under Sections 19.400.115(B) – 19.400.115(G):*

   To avoid confusion, it is recommended that Sections 19.400.115(B) – 19.400.115(G) clearly specify how they supplement or modify the pertinent sections of Title 24 TCC.

6. ***Page 45, Section 19.400.120(B) Buffer Widths:***

   State Parks is concerned about the proposed standard buffer widths of up to 250 feet for shoreline jurisdictional freshwater streams and rivers. This buffer goes beyond the 200-foot SMP jurisdiction and exceeds the general recommendations for buffer width provided in Ecology's Shoreline Master Programs Handbook. Not only does the new standard buffer requirement unfairly impact State Parks, but it also seemingly contradicts SMP Policies SH-5, SH-6, and SH-41, which promote increased public access and recreational opportunities in the shoreline.

   A buffer of 250-feet effectively requires all development within the shoreline to provide mitigation in order to reduce the standard buffer, and deems many existing State Parks recreational/public access facilities "non-conforming." While alternatives and considerations are provided for water-dependent uses (Section C), and other uses (Section D), these do not consider the full range of recreational/public access facilities within State Parks.

   Existing State Park facilities with potential to fall within the proposed standard freshwater buffer include: concessions, restrooms/showers, kitchen shelters, a footbridge, parking, camping, and an Environmental Learning Center. As such, any improvements to recreation and public access within Millersylvania and Tolmie would be severely limited and require additional mitigation resulting in increased permitting requirements and costs.

7. ***Page 57, Section 19.400.145(J) Public Access:*** *Public access provisions shall run with the land and be recorded via a legal instrument such as an easement, or as a dedication on the face of a plat or short plat. Such legal instruments shall be recorded with the County Auditor's Office prior to the time of building permit approval, occupancy or plat approval, whichever comes first (RCW 58.17.110).*

   RCW 58.17.110 applies to the establishment of subdivisions. This language should be revised to clarify that it does not pertain to State Parks, which is a public agency that provides access to public lands. As such, State Parks does not record easements for public access provisions.

8. ***Page 68, Section 19.500.105(A) Permit Process Summary:***
    5. *If the application involves state owned land, a pre-application conference with the Washington Department of Natural Resources land manager shall be held prior to submittal of the application. Confirmation of pre-application conference shall be submitted as a requirement of the County's application process.*

    State Parks is not required to consult with a Department of Natural Resources land manager for development on State Parks owned land. This language should be revised to clarify that it does not pertain to State Parks.

9. ***Page 94, Section 19.600.145(C) Development Standards:***
    9. *Hazard tree removal or view tree limbing: Where a threat to human life or property is demonstrated… the Department may allow removal or trimming of hazard trees or limbing of view trees within shoreline jurisdiction. Requests for tree removal shall be reviewed by the Department in accordance with the following criteria:*
        b. *The critical area or shoreline buffer shall be replanted as determined by the Department. Except where determined otherwise, a replanting ratio of 3:1 (planted: removed) shall be a standard requirement.*

    Because State Parks provides public access and recreational opportunities within the shoreline, public safety is of primary concern. As such, requiring replanting at a 3:1 ratio for removal of hazard trees is not always practical or feasible. It is recommended that additional considerations for mitigation be allowed for removal of trees that provide a safety hazard to the public (e.g., use the removed tree as a snag for habitat).

10. ***Page 114, Chapter 19.700 Special Reports:***

    There are inconsistences between the special reports requirements in the proposed SMP and referenced Chapter 24.35 TCC. To avoid confusion, the SMP should clearly state which regulations (SMP or Thurston County Code) take precedence in cases where there may be "dual coverage" of critical areas and/or buffers. Additionally, it is recommended that each special report section clearly indicate when the report is required.

11. ***Page 115, Section 19.700.105(A) Minimum Wetland Delineation Report Contents:***
    6. *General site conditions including topography, acreage, and surface areas of all wetlands identified in the Thurston County Wetland Inventory Map and water bodies within one quarter mile of the subject wetland(s).*

    The requirement to include information on all wetlands and waterbodies within one quarter mile of the subject wetland is not currently required by TCC 24.35.370 and this information may not be readily available if these areas are located on private property. It is recommended that this requirement be removed from the wetland delineation report.

12. ***Page 116, Section 19.700.110 Wetland Mitigation Plan/Report:*** *As required by TCC 24.30.070 (Wetland Mitigation), a mitigation plan shall be prepared. A detailed mitigation plan shall contain the following:*
    3.C Description of any known cultural resources on the site.

    The requirement to include information on cultural resources is not currently required by TCC 24.35.380 and much of this information is highly sensitive. Cultural resources are protected by a variety of state and federal laws, including Executive Order 05-05 and Section 106 of the National Historic Preservation Act. Additionally, per RCW 42.56.300, records, maps, or other information identifying the location of archaeological sites are exempt from disclosure to prevent looting or depredation. It is recommended that this requirement be removed from the wetland mitigation plan/report and that cultural resource information be addressed in a separate cultural resources report.

13. ***Page 118, Section 19.700.110 Wetland Mitigation Plan/Report:***
    C. Performance Bonds and Demonstration of Competence. A demonstration of financial resources, administrative, supervisory, and technical competence and scientific expertise of sufficient standing to successfully execute the compensation project shall be provided…A performance bond, assignment of savings, or other like security will be required by the Department in an amount necessary to provide for future site monitoring, and possible corrective action required for compensatory mitigation projects.

    This requirement should be waived for State Parks and other public agencies. When proposing development in the shoreline, State Parks looks to several internal policies for guidance on balancing development needs with ecological protection. State Parks Stewardship policies for Critical Areas, Natural Resources Management, and Sustainability provide the basis for evaluating, avoiding, minimizing and/or mitigating environmental impacts for all State Park developments. Additional assurances should not be required for public agencies that have existing policies and experienced staff with a proven record of successfully executing mitigation projects.

14. ***Page 119, Section 19.700.115(B) Habitat Management Plan:*** *The HMP shall contain a map prepared at an easily readable scale, showing:*
    2. The relationship of the site to surrounding topographic, water features, and cultural features.

    The requirement to include location information of cultural resource features is not currently required by TCC 24.35.290 and much of this information is highly sensitive. As indicated above, it is recommended that locations of cultural resource features not be shown in a habitat management plan, but instead be addressed in a separate cultural resources report.

15. ***Page C-16, Appendix C, Table C.5-1. Existing and Potential Restoration Partners and Roles:*** *Washington State Parks Mission and Scope – To be premier destinations of*

uncommon quality, including state and regionally significant natural, cultural, historical and recreational resources that are outstanding for the experience, health, enjoyment and learning of all people.

The language provided in the table is the vision statement from the outdated State Parks Centennial 2013 Plan. This section should be revised to correctly reflect the current State Parks mission: "The Washington State Parks and Recreation Commission cares for Washington's most treasured lands, waters, and historic places. State parks connect all Washingtonians to their diverse natural and cultural heritage and provide memorable recreational and educational experiences that enhance their lives."

16. ***Page C-16, Appendix C, Table C.5-1. Existing and Potential Restoration Partners and Roles:*** *Washington State Parks Role in Future Restoration Efforts – Provide public lands as demonstration sites for LID, bulkhead removal or alternative restoration or mitigation techniques for overwater structures. Implement restoration and conservation measures as outlined in Park Plans.*

    State Parks does not generally provide demonstration sites for alternative restoration or mitigation techniques. Please delete the first sentence so that this section reads as follows: "Implement restoration and conservation measures as outlined in Park Plans."

State Parks formally requests the opportunity to review and comment on any revisions or changes to the proposed SMP prior to final approval by the County.

Sincerely,

Brian Yearout
Capital Program Manager, Parks Development

Patrick and Kathryn Townsend
7700 Earling Street NE
Olympia, WA 98506

Rec'd by 4C
9/2018
Fwd to Brad/Cindy

September 12, 2018

John Hutchings
Gary Edwards
Bud Blake
Thurston County Commissioners
2000 Lakeridge Drive SW
Building 1, Room 269
Olympia, WA 98502-6045

Subject: Participation of Thurston County Citizens in SMP Update Process

Dear Mr. Hutchings, Mr. Edwards and Mr. Blake,

Attached please find the ***Department of Ecology Shoreline Master Program (SMP) Handbook. Chapter 6--Public Participation.*** This describes in detail the level of public participation required for the SMP update process. The introduction states:

> Public participation is essential when developing a Shoreline Master Program (SMP) that will be accepted by the local community and Ecology. Both the Shoreline Management Act (SMA) and the SMP procedural rules and Guidelines require public participation to ensure all interested parties have an opportunity to shape shoreline policies and regulations.

Chapter 6 goes on to detail both the major elements of public participation and the legal basis for public participation.

We suggest that these guidelines from the Department of Ecology were not followed from the beginning. There was a belated attempt to include the public, but in the end, for whatever reason, even this was abandoned.

We request that you reset the process and do it the right way. You've bypassed a critical part of the process.

Sincerely,

Patrick and Kathryn Townsend

Attach: Chapter 6, Department of Ecology Shoreline Master Program Handbook