



Coalition to Protect Puget Sound Habitat

3110 Judson St., PMB 209, Gig Harbor, WA 98335
laura.l.hendricks@gmail.com
(253) 509-4987

*Henderson Bay Shoreline Association
Protect Our Shoreline
Mayo Cove Shoreline Association
Case Inlet Shoreline Association
Case Beach Shoreline Association
APHETI
Citizens of Harstine Island, Stretch
Island, Anderson Island, Vashon Island
and Jefferson County/Shine Beach*

Regulations Are Needed For Aquaculture Industry Expansion To Protect Puget Sound Habitat, Salmon And Other Native Species

We are asking county, state, federal officials, legislators and Puget Sound Partnership to require and support stringent environmental regulations for industrial tideland development just as are required for upland development and to take the following actions:

- Be consistent with the Puget Sound Partnership objective to protect nearshore habitat. Aquaculture should be listed in the action agenda as a threat to natural habitat and the natural ecosystem process.
- Identify by parcel number the total number of existing acres of industry/DNR aquaculture in the nearshore and adjacent waters by county and species. This information is necessary to make informed decisions on scale and cumulative impacts.
- Determine environmental impacts on selected existing aquaculture sites by setting up monitoring as recommended by the scientists at the Sea Grant Bivalve workshop (September 2007).
- Review and update critical area mapping for forage fish, critical salmon habitat, ESA listed species, marine birds and marine vegetation. Industrial aquaculture expansion should not be allowed in these areas and buffers should be established for sites adjacent to these critical areas in pocket estuaries, bays and coves.
- Identify appropriate sites for large scale industrial aquaculture expansion by county with the assistance of WDFW. County officials, not industry, should implement long term aquaculture regulations including environmental, social and economic considerations by forming a stakeholders group composed of citizens, industry and environmental groups. Site selection regulations should be consistent with the no net loss of habitat statewide goal. See Pierce County Interim Regulations as an example.¹
- Institute and fund monitoring and enforcement guidelines.
- Terminate the DNR intertidal geoduck farming program as the majority of proposed sites are in critical forage fish areas, scale has not been evaluated and selected sites have been the most popular beaches in the targeted communities. An estimated 10% of the tidelands of South Puget Sound are state owned, so why take these from the public?

This position paper contains the following sections:

- 1. Coalitions concerns about shellfish industry practices***
- 2. Environmental impacts that cannot be ignored***
- 3. Social/land use concerns of aquaculture expansion that must be addressed***

¹ Pierce County Proposed Interim Regulations

<http://www.co.pierce.wa.us/xml/Abtus/ourorg/council/2007-34s2%20final%20exa.pdf>

1. Our coalition's concerns about shellfish industry practices

Large scale industrial expansion means the permanent conversion of nearshore habitat to intensive aquaculture use with multiple continuous activities, which alter the tidelands on an ongoing basis. Single science studies will answer some questions but will not document the numerous long term and cumulative impact concerns that have been pointed out by citizens and validated by scientists.

The shellfish industry states that "shellfish cleaning the water" should be ample reason to justify unlimited expansion of the aquaculture industry in Puget Sound nearshore and deeper waters. Shellfish do "filter the water" of phytoplankton, but industry fails to point out that phytoplankton is the foundation of the food web essential for most other aquatic species. Total nearshore area ecology must be considered for all species, not just the carrying capacity needs of the shellfish industry's intensive bivalve density. The average South Sound subtidal wild geoduck density is .19 per square foot while industry harvests approximately 2-3 planted geoducks per square foot in the intertidal beaches (10.52 times the subtidal average). Ecological carrying capacity must be addressed to insure that the preferential treatment given to large scale industrial bivalves does not diminish the survival of native species.

Sheltered pocket estuaries, bays and coves that contain Puget Sound's richest habitats have been preferred by industry/DNR for intensive aquaculture operations. Increased production goals result in covering the majority of the nearshore area where suitable with geoduck plantings, oyster bags and clams (-4.5 feet to +7 feet in tide level). Totten Inlet and Hood Canal, low flushing areas, have over the years converted a significant portion of their nearshore areas to industrial aquaculture and officials state these areas are still in serious environmental decline. In Thurston and Mason Counties, there has been no environmental oversight or restrictions as industry has expanded into critical areas for forage fish, salmon habitat, marine birds and marine vegetation. Sand lance forage fish provide up to 65% of the juvenile Chinook salmon diet and are known to bury themselves in lower intertidal substrate. Rock fish depend on the nearshore for survival and are essential to the salmon diet. Scientists who specialize in fish biology and habitat have pointed out that all native fish species are essential to the Puget Sound food web and a healthy ecosystem. "Because nine of the ten Puget Sound species identified as endangered or threatened rely on nearshore environments, the declines are, at least in part, likely related to problems in nearshore ecosystems of Puget Sound."² Further impacts to the nearshore must be avoided.

Aquaculture expansion is expected to increase in Puget Sound and our coastal waters with NOAA's listing of Washington State as an area of growth for both cultured shellfish and farmed finfish species.

The following outlines the standard industry practices that convert the natural tideland ecosystems to intensive agricultural use and our concerns for the changes to the native species balance:

Preparing the nearshore for planting like a pasture: Scraping off the woody debris, rocks, sand dollar beds and essential marine vegetation, harvesting all native commercial species; Oyster Operations—contouring, channeling streams, graveling, rototilling, aeration of soils, dragging to remove silt, diking, burying geotech fabric.

Major Concerns:

- Elimination of natural fish habitat
- Clearing off of essential marine vegetation critical for food, shelter and rearing habitat
- Clearing off of all native sand dollar beds
- Harvesting all native geoducks and other species such as horse clams
- Habitat disturbance

Planting: Geoduck--stomping in 43,000 PVC tubes **per acre**; Approx. 2-3 geoducks survive per tube for up to

² Coastal Habitats in Puget Sound: A Research Plan in Support of the Puget Sound Nearshore Partnership, 11/06
http://www.pugetsoundnearshore.org/technical_papers/coastal_habitats.pdf

100,000 geoducks per acre; installing “kiddie pools” on beach. Oysters—tying Vexar oyster bags directly onto long lines on the beach.

Major Concerns:

- Density, scale, layering of multiple species
- Intrusion into forage fish spawning/rearing areas
- Depletion of food supply; adequacy of ecological carrying capacity for other native species in area competing with triploid geoducks with voracious filtering ability (geoducks on a geoduck farm filter 13-14 million liters of water per acre per day—Per Pierce County Administrative Foss/Taylor appeal)
- Bivalve consumption of copepods, crab zoeas and fish eggs in nearshore (see 2.b under study section)
- Habitat fragmentation
- Impact on migratory fish corridor activity, habitat disturbance for ESA listed species, elimination of sand lance buried in lower intertidal substrate
- Natural nearshore wave action altered by tubes, nets
- Accumulation of bivalve biodeposits/feces in low flushing South Puget Sound from industrial densities.

Predator/Pest Controls: Covering multiple acres of beach with canopy nets and rebar stakes, using Vexar tunnels, “Deterring, excluding, destruction” of predators such as moon snails, starfish, crabs, diving Ducks, burrowing shrimp and sand dollars

Major Concerns:

- Reduction in biodiversity and/or alternation of native species balance from preferential treatment of bivalve species
- Excluding native species and birds’ food supply
- Entanglement of aquatic life and birds in nets
- Rebar stakes in marine environment contributing iron oxide nutrients
- Replacing natural native habitat with large canopy nets or small individual nets that easily come off the tubes and float onto other beaches
- Continuous alteration and disruption of the habitat for aquatic species

Harvesting: Altering sediment structure. Geoduck—up to 50 gallon per minute high volume water hoses liquefy entire acre to three foot depths for geoduck harvest, dredging; Clams—raking, mechanical dredging.

Major Concerns:

- Sediment disturbance allowing species to re-colonize in unnatural populations
- Turbidity from siltation and siltation of fish habitat
- Disturbance and/or elimination of organisms essential to the food web
- Re-suspension of sediments releasing pollutants from past industrial activities and organic matter
- Agitation dredging (water jet harvest) liquefying large areas of the nearshore

Ongoing operations: workers on beach, boats and vehicles on beach, lack of sanitary facilities

Major concerns:

- Limited days per year of low tides available creating disturbance from workers for native species whose survival depends on these nearshore areas

Aquaculture debris: utilizing non marine grade PVC plastic, individual small nets/rubber bands, large canopy nets, rebar, clips, vexar bags, tunnels for geoduck; oyster and clam debris from operations

Major concerns:

- Aquatic life entanglement in nets
- Ingestion of plastic by birds and aquatic life
- Derelict gear sinking into deeper water and washing up on adjacent beaches

Chemical Pollution: spraying ghost shrimp and mud shrimp beds with up to three tons of carbaryl pesticide (Sevin) directly on up to 800 intertidal acres in Willapa Bay/Grays Harbor for over 40 years; killing all organisms, fish, crabs in direct contact, unknown indirect contact and long term impacts on fish, crabs, birds; reported serious health problems of nearby Shoalwater Indians.

Major concern:

- Potential use of chemicals in Puget Sound because the natural ecosystem is out of balance and industry economics are the primary consideration.

The Sea Grant September 2007 Shellfish Aquaculture Workshop expert scientists recommended:

- Monitoring existing sites for environmental impacts
- Collecting baseline studies, mapping, looking at regions and habitat slated for development
- Developing ecological carrying capacity models to assess the influence on ecosystem processes.
- Consideration of social carrying capacity before industry expansion. Review the extensive list of recommendations at the following Sea Grant site:
http://www.wsg.washington.edu/research/geoduck/shellfish_workshop.html

The shellfish industry and DNR continue to ignore the expert scientists' recommendations while touting their best management practices. We strongly disagree that BMP's will protect Puget Sound. A long term siting policy must be established coupled with appropriate long term regulations if Puget Sound habitat is going to be saved for salmon and other native species in critical pocket estuaries, bays and coves. The state Shellfish Aquaculture Regulatory Committee is evaluating this industry, but is encouraging best management practices and adaptive management which we feel will not provide adequate protections.

2. Environmental impacts that cannot be ignored—studies that support our concerns

Industrial aquaculture impacts habitat. Concerns for birds, salmon, forage fish, aquatic vegetation, intertidal organisms and beach life are discussed below in detailed studies and technical reports:

1) Effects on birds related to disturbance, restricted food supply, change in migratory pattern (Industry and certain native species compete for the limited number of low tides during the year)

a. *A Review of the Ecological Implications of Mariculture and Intertidal Harvesting in Ireland*, M. L. Heffernan, 1999

http://www.protectourshoreline.org/studies/Review_Mariculture_Ireland.pdf

Outlines the impacts of clam and oyster culture on marine birds in particular, Pages 75-92 are most relevant.

b. *Potential impacts of mechanical cockle harvesting on shorebirds in Golden and Tasman Bays, New Zealand*, DOC SCIENCE INTERNAL SERIES 19, Frances Schmechel, 2001

<http://www.doc.govt.nz/upload/documents/science-and-technical/DSIS19.pdf>

States: " there are two main types of impacts likely from harvesting-direct, through removal of cockle biomass and thereby a direct food source of shorebirds and indirect, through impacts on non target species which

provide food, or from disturbance to birds of the harvest activity" -page 17. There are many more notable observations contained in this study.

2) Impacts on salmon, forage fish and aquatic vegetation related to disturbance and alteration of nearshore area, modification of forage fish spawning and rearing areas, removal of essential macrophytes (algae), accumulation of bivalve feces in low flushing areas

a. *Review of the environmental impacts of intertidal shellfish aquaculture in Baynes Sound*, G. S. Jamieson, 2001

<http://govdocs.aquake.org/cgi/reprint/2004/410/4100110.pdf>

"Habitat modification and the covering of the substrate with predator exclusion nets may thus adversely impact the production of harpacticoid copepods and other important epibenthic organisms, and hence adversely impact the feeding of salmon rearing in the area." Page 44.

The following quote should be noted: "A shift to a system dominated by a cultured species is expected. What proportion of the natural ecosystem might be shifted to one of farmed bivalves without a significant disruption in natural ecosystem processes?" Page 41. This document

should be reviewed in its entirety for a thorough overview of the aquaculture process from planting to harvesting.

b. *Effects of Shellfish Aquaculture on Fish Habitat*, C. W. McKindsey, 2006

http://www.dfo-mpo.gc.ca/csas/Csas/Publications/ResDocs-DocRech/2006/2006_011_e.htm

Detailed information from cumulative reduction of feeding grounds, competition for phytoplankton, bivalve consumption of essential copepods & larvae, accumulation of bivalve feces.

“...showed that mussels consumed organisms up to 3 mm in length and that cockles and scallops are also capable of consuming considerable quantities of zooplankton, both when suspended in the water column and when on the bottom. The size classes of organisms consumed in these studies suggest that the larvae of most commercial species may be at risk from this type of predation.” Pages 25-26.

c. *Marine Forage Fishes in Puget Sound*, Dan Penttila, 2007

http://pugetsoundnearshore.org/technical_papers/marine_fish.pdf

"Adjacent habitats are used as nursery grounds by all three (forage) fish species." Page v.
"Standard aquaculture practices may have profound effects on the benthic ecology of Washington State's tidelands and the conservation of forage fish spawning areas, especially for herring. In many areas, herring spawning grounds are now coincident with shellfish culture areas, particularly on tideflats occupied by beds of the native eelgrass.....(WDA) has regulatory authority over aquaculture activities that occur in intertidal areas of state waters. The Washington Department of Natural Resources (WDNR) has authority over state aquatic bottomlands and marine vegetation management. These agencies together with WDFW should seek a coordinated approach to the management of the growing aquaculture industry, with an eye toward modification of habitat-damaging culture practices and the mitigation of existing habitat degradation for which the industry has been responsible." Page 16.

According to State Aquaculture Regulatory Committee March 2008 notes: Dan Penttila stated "The intrusion of nearshore/intertidal aquaculture practices into these types of sensitive habitats would be of "concern," since the industry has not paid particular attention to minimizing negative impacts in the past, in my opinion."³

d. *Protecting Nearshore Habitat and Functions in Puget Sound - An Interim Guide*, 2007

http://wdfw.wa.gov/hab/nearshore_guidelines/nearshore_interim_guide_october_2007_final_draft.pdf

"Because all forage fish species rely on nearshore habitats during at least some part of their life history, the protection of these habitats is critically important to the long term sustainability. In addition, because forage fish are a critical prey resource for a number of species including ESA listed salmon and marine mammals, the protection of forage fish habitat is important to these ESA species as well." Page II-17.

"Kelp and eelgrass are marine aquatic plants that thrive in the nearshore." Page II-29.

"Kelp and eelgrass play a critical role in the marine ecosystem as primary producers, generating nutrients and substrate that form the base of the food chain." Page II-30.

³ SARC Meeting Notes, March 10, 2008,

http://www.ecy.wa.gov/programs/sea/shellfishcommittee/pdf/draft_MeetingNotes_03-10-08.pdf

e. Salmon Studies describing critical elements for salmon restoration
"Disruption of sediment and prey inputs, changes in hydrology and other processes results in a chain reaction, ultimately leading to lost or dysfunctional habitat for salmon."
<http://www.kingcounty.gov/environment/watersheds/central-puget-sound/nearshore-environments/juvenile-salmonid-report.aspx>

f. Juvenile salmon use the nearshore most of the year, and peaks in abundance extend well past the June 15 end point used by managers for decades;
<http://www.pers-erf.org/SalmonNearshoreFinal.pdf>

g. *South Sound Salmon Recovery Group-Chinook & Bull Trout Recovery Approach for Puget Sound*

<http://www.sharedsalmonstrategy.org/plan/index.htm>

Aquaculture Stressor Chart--"Shellfish aquaculture in South Sound alters plant and animal assemblages and results in the loss of shallow nearshore habitat diversity important to salmon resources. These impacts may be potentially positive or negative depending on the type of aquaculture practice. We hypothesize that shellfish aquaculture reduces productivity, abundance, spatial structure, and diversity of salmon populations."

Chapter 4, p. IV-13.

3) Changes to natural organisms in the beach sediments

Contrasting the community structure and select geochemical characteristics of three intertidal regions in relation to shellfish farming. L.I. Bendell-Young, 2006

<http://www.protectourshoreline.org/articles/07BendellShellfishCommunityStructure.pdf>

"The intertidal regions that had been used for farming for 3-5 years had lower species richness, different bivalve composition, abundance and distribution and a foreshore community dominated by bivalves as compared to the intertidal region where no active farming occurred. Beaches that were actively farmed also had a greater accumulation of organic matter and silt."

4) Ongoing industry treatment of beach life designated as "predators" or "pests"

According to the Pacific Shellfish Institute Goals and Priorities 2015 (<http://www.pacshell.org/>), PCSGA has the goal of conducting research on:

Integrated Pest Management (IPM) of burrowing shrimp, European green crab, red rock crab, Dungeness crab, shore crab, diving ducks, starfish, oyster drills, gulls, crows and moon snails by use of deterrents, exclusion or destruction

Our concern for the beach life

Many species named above, identified by PCSGA as "pests," are indigenous to Puget Sound and are key elements to the natural ecosystem. Puget Sound citizens believe they should be protected and do not want them eliminated by any method. Surf scoters have already declined more than 50% in the last 25 years.

5) Concerns and Questions Relevant to Infaunal and Epibenthic Impacts of Geoduck

Aquaculture, Dethier, Leitman and Mathews: "Seeding of young geoducks in netted PVC tubes on the beach is likely to alter local physical and biological conditions, both those on the surface of the sediment and those in the sediment."

<http://www.protectourshoreline.org/070314GeoduckAquacultureDataGapAnalysis.pdf>

There are many other studies available on our website that document the many impacts that aquaculture can have on the environment.

http://protectourshoreline.org/articles/Studies_IntensiveShellfishAquaculture.pdf

Organizations that have called for aquaculture regulation include:

*Vashon Island Community Council -- Moratorium
Anderson Island Park & Recreation District and Quality of Life Committee -- Moratorium
Tahoma Audubon Society -- Geoduck Moratorium Policy Paper
Washington Council of Trout Unlimited -- Environmental Impact Study
People for Puget Sound -- Intertidal Geoduck Policy*

Ministry of Agriculture and Lands of British Columbia states on its website: Note "Applications for new intertidal geoduck aquaculture are not being accepted due to gaps in understanding of geoduck aquaculture techniques on fish habitat."

The Puget Sound Partnership has added aquaculture in the top six threats to Puget Sound regarding impacts on habitat and biodiversity. Threats include:
Habitat--"Aquaculture. Depends on type. Impacts can include increased nutrient loading and pollution, changes to physical beach structure, substrate and food web and species assemblage impacts." July 11, 2008 Discussion Paper, page 8.
Biodiversity--"Aquaculture methods, pervasive in some areas of Puget Sound, modify beaches and the lower intertidal zone....In addition, many species grown for aquaculture in Puget Sound are invasive species such as Manila Clams, Mediterranean mussels, Pacific oysters and Atlantic salmon.
....intensive shellfish aquaculture may divert materials to benthic food web, alter coastal nutrient dynamic and have cascading effects on estuarine and coastal food webs." July 11, 2008 Discussion paper, pages 13-14.

3. Social/Land Use Concerns of Aquaculture Expansion That Must Be Addressed

Community concerns -- industrial operations moving into residential neighborhoods

- Increased siltation, erosion, organic matter, increased shellfish feces, industrial petrochemical-metals pollution and harvesting sediment plumes drifting to adjacent properties
- Re-suspension of sediments containing pollutants from past industrial activities
- Harvesting disturbance on nearby shoreline owners, birds and beach life from diesel motor noise and workers in the middle of the night during winter month low tides--" Industry stated that restrictions on hours and days of operation are not negotiable at the State Aquaculture Regulatory Committee"
- Industry workers patrolling adjacent properties for debris
- Industry demands on use of private roads for vehicles and equipment
- Limiting navigation rights of adjacent landowners in public waters for recreation
- Baseline studies costing adjacent landowners thousands of dollars to document existing habitat and existing beach life for their tidelands; tideland surveys
- Disclosure issues on real estate contracts for property owners near residential aquaculture expansion
- Industry/DNR high intensity operations in residential neighborhoods are expected to decrease property values and tax base
- Creates multi user conflicts thru introduction of non historic use and environmentally unsound practices

Public concerns with DNR leasing state aquatic lands in residential communities

- Degradation and access restriction of state tidelands by leasing state aquatic lands to one industry
- Limiting navigation rights of the public waters for fishermen, boaters, kayakers, windsurfers
- Recovering derelict aquaculture gear at taxpayer expense for industry and DNR operations
- 180 foot buffers from subtidal eelgrass and herring spawning, but only 10 feet buffers from intertidal eelgrass
- 10 year leases that do not require/allow for industry changes for harmful environmental practices
- Harvesting of all wild geoducks along with other clam species from the areas where they establish intensive geoduck operations
- The inappropriate use of research by shellfish industry scientists. For example, industry cites a study by Dr. Chris Pierce of British Columbia on geoduck harvesting. Dr. Pierce himself states: "I think we want to be careful and monitor the potential impact of commercial-scale aquaculture development. What we've

been doing in the past — what these studies that I have reviewed for you have done — is conducting research on typically smaller-scale plots, not really commercial sized. So we do want to be careful and monitor potential impact of larger harvesting practices.” from the Legislative Assembly of British Columbia Minutes – Special Committee on Sustainable Aquaculture - Monday, February 19, 2007.

- Use of arguments by DNR and industry that are contradictory or erroneous. Examples:
 - a) DNR and industry say that planting commercial geoduck farms on the intertidal zone is important to the health of Puget Sound because geoducks “clean the water.” On the other hand they say that removing four million of pounds of geoducks from subtidal areas every year does not matter because their filtration is insignificant.
http://www.dnr.wa.gov/Publications/aqr_geo_program_fact_sheet.pdf
http://www.protectourshoreline.org/DNR/2007_DNR_HCP_Geoduck_Fishery.pdf
 - b) Subtidal harvest must be done below the –18 tidal elevation in order to protect forage fish.⁴ The intertidal planting and harvesting under both DNR and industry requires no such restriction.⁵
 - c) Industry says that the Army Corps of Engineers NWP 48 is “robust” and is the only permit needed for shellfish aquaculture. Yet the ACOE cannot adequately define what is “new” or “existing” and has so far not taken action on a geoduck farm that was installed after the publication of NWP 48 and acknowledged by ACOE to be “new,” thus requiring an individual permit. The ACOE NWP 48 does not provide adequate regulation for shellfish aquaculture and does not monitor or provide enforcement.
 - d) Industry uses a quote from the Environmental Defense Fund to support claims of benefits of commercial geoduck farming. The Environmental Defense says “the report did not discuss geoduck farming.”⁶

The Coalition to Protect Puget Sound Habitat is an alliance of shoreline property owners, divers, environmentalists, recreational users, and interested citizens who are concerned about unregulated impacts to our Nearshore environment. Thank you for taking a moment to review the information we have included with our requests to officials and our statement of concern. For further information please visit the Protect Our Shoreline website for current news and documents as well as our other community websites.

Henderson Bay Shoreline Association, Protect Our Shoreline, APHETI (Association for Protection of Hammersley, Eld and Totten Inlets), Mayo Cove Assoc., Case Beach Association, Case Inlet Shoreline Association and citizens from Anderson Island, Harstine Island, Stretch Island, Vashon Island and Jefferson County-Shine Beach.

Questions/Comments? Contact Laura Hendricks at Laura.L.Hendricks@gmail.com (253) 509-4987

⁴ Commercial Geoduck Fishery Management Plan, 5/23/01,
http://www.dnr.wa.gov/Publications/aqr_geo_lowres2001_mgmtplan.pdf

⁵ DNR Geoduck Aquaculture Best Management Practices, 2007,
http://www.dnr.wa.gov/Publications/aqr_aqua_2007bmp.pdf

⁶ Email from Dr. Rebecca Goldberg, Environmental Defense, 5/7/08