

Industrial Shellfish Aquaculture is Converting Puget Sound Aquatic Habitat to Agricultural Use



How much expansion is good for Puget Sound?

Geoduck farm, Nisqually Reach, 6/30/07

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Our concerns are:

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Habitat degradation and fragmentation

The trend of converting natural ecosystems to agricultural use

The extent of expansion

Environmental impacts: unknown

Invasive species and disease

Interference with recreational and residential uses

Marine debris

Zangle Cove, 4/29/06

Approximately 43,500 tubes planted per acre (about 8 miles of PVC pipe) with either individual net tops or canopy nets that cover the entire installation;



Geoduck and oyster bag operation – Totten Inlet

Geoducks are not an essential food.

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“...geoduck is a super luxury item which only the rich can afford. The product’s price in the Chinese market can reach \$60 to \$100 per pound. If the price of the product were to fall by 50 percent, it will still be out of the price range of most of the population.”

--The World Geoduck Market and the Potential for Geoduck Aquaculture on Washington State Lands, prepared for DNR by Northern Economics, Inc. 2004

Shellfish Industry 'working waterfront'

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New intensive methods are converting natural beaches into single use agricultural zones. How does this square with the requirement of the Shoreline Management Act to achieve "no net loss" in ecological function?



To the average person, it is common sense that this is a disturbance to both people and wildlife.

"We believe the environmental impacts are at worst benign and at best they're beneficial."
--Shellfish Industry,
Seattle Times,
10/5/06

Totten Inlet 6/26/06

**When did the shift to new
intensive techniques appear in
Totten Inlet?**

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(as reported by Totten Inlet residents)

**Prior to about 1992, no conflict with
shellfish farmers.**

**1992 – mussel rafts brought into
Gallagher Cove**

**1997 – first geoduck farm with PVC
tubes**

**Approx 1998 – heavy duty black
plastic oyster bags introduced**

**Approx 2000 – huge canopy nets laid
over manila clam beds**

**30 of 33 miles of shoreline in Totten
Inlet are being farmed according to
residents.**

Totten Inlet – geoduck farm and oyster bags, 7/30/07



In the last 10 years the shellfish industry has moved out of traditional shellfish growing areas into new territory in Thurston County, using non-traditional high intensity methods on fragile tidelands.

Industry is now targeting areas in Case and Carr Inlets in Pierce County and further north, along with subtidal lands.



Another new geoduck farm, Pickering Passage 7/07, in surf smelt and rock sole spawning area. Close to sand lance and herring spawning areas.
--WDFW Surf Smelt, Sand Lance, Rock Sole and Herring Map, 2007



Where are these farms being installed?

In a variety of locations and sediment types.

DOH states that 137,000 acres of tidelands are approved for shellfish harvest in Puget Sound.

New geoduck planting on Zangle Cove, an area rich in intertidal marine life. 6/2006



**Sandy low bank beaches,
Nisqually Reach, 6/30/07**



**Mud/sand beaches, Henderson
Inlet, 6/01/07**

**All types of
beaches are
being
targeted for
shellfish
aquaculture.**



**Rocky beaches, Totten Inlet,
7/30/07**



**High bank beaches, Hartstene Island,
6/30/07**



On all levels of the beach, multiple species, Eld Inlet, 7/29/07



In residential areas, Eld Inlet, 7/29/07



Filling up protected coves, Hammersley Inlet, 6/17/07



On beaches with strong currents. Case Inlet, 2006.

Industry has advocated for subtidal geoduck aquaculture in legislative hearings and community geoduck forums.

DNR is leasing 570 acres of intertidal and subtidal aquatic lands for shellfish and net fish pen culture in Puget Sound, Hood Canal and the Strait of Juan de Fuca as of 8/07.

Multiple parcel installations degrade and fragment habitat.

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Migratory shore birds and all Puget Sound salmon depend on the nearshore habitat, including Endangered Species Act listed Puget Sound Chinook Salmon.

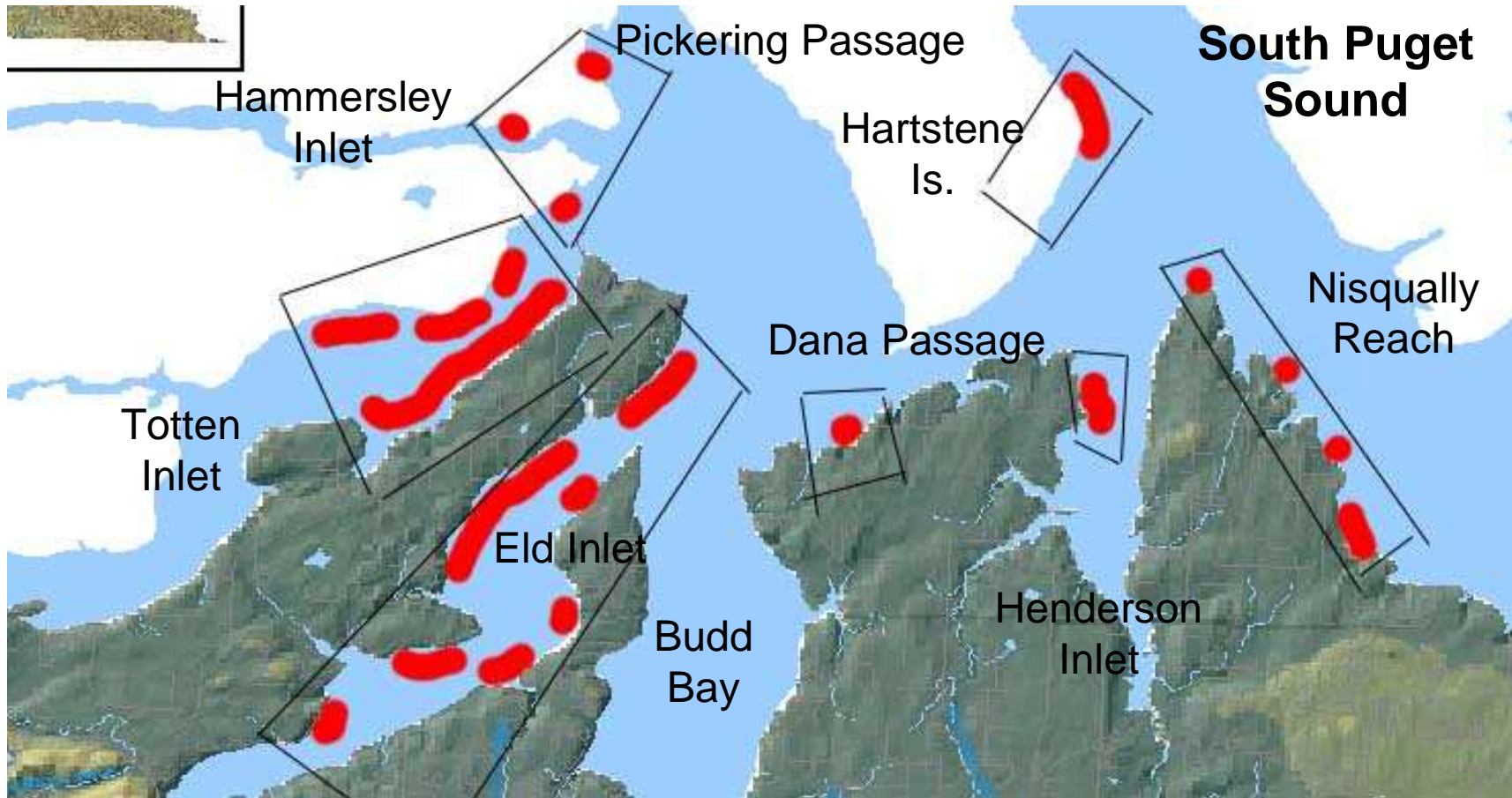


DOH, WDFW and Army Corps records show geoducks planted here on a large swath of beach stretching hundreds of feet along the shoreline:

34 parcels

64 acres

**Nisqually Reach
6/30/07**



Limited visual survey of geoduck operations in South Puget Sound as of 7/30/07.

Blocked areas are where visual surveys of existing geoduck aquaculture have been done by boat at low tide in South Puget Sound. Red marks show geoduck operations that have been seen in those blocked areas. Some areas in Totten and Eld Inlet have multiple types of culture—geoduck, oyster bags, oysters on racks, manila clam netting.

How much habitat loss is acceptable?



PVC tubes, Nisqually Reach, new planting, 6/30/07



Vexar tunnels, Nisqually Reach, 6/30/07

The South Puget Sound Salmon Recovery Group identifies shellfish aquaculture as one of the twelve major human-induced stressors on natural processes specific to South Puget Sound.

--The Development of Nearshore Stressor Conceptual Models for Chinook Recovery Planning in South Puget Sound. 2005



**Henderson Inlet canopy net,
6/01/07**



**Eld Inlet, newly install netting over
geoduck tubes, 7/29/07**



**Newly installed canopy net,
Totten Inlet, 7/30/07**



**Canopy net over new planting,
Case Inlet, 6/07**

**Predator
exclusion
netting
changes the
ecological
character of
the
shoreline.**



Rubber band around otter's waist.
Case Inlet, 2/06



Crab "excluded from habitat"
Case Inlet, 2006



Crab caught under the
predator exclusion net. Case
Inlet, 2006



Juvenile bald eagle caught in
geoduck net. Hartstene Island,
2006

Predator
exclusion
netting both
excludes and
entrap
wildlife.

There have
now been
three
documented
instances of
eagles
trapped in
geoduck
netting.



Zangle Cove, 1/07



Wilson Point, Hartstene Island, 6/30/07



Eld Inlet, 7/29/07



Nisqually Reach, 6/30/07

Activity, once established, is ongoing.

Citizens in Mason, Thurston and Pierce Counties are reporting that shellfish growers leave barges such as these for prolonged periods of time in front of shoreline properties



Expert scientists at the September 2007 Sea Grant Shellfish Aquaculture workshop stated that comparing 150 acres to all Puget Sound tidelands is not meaningful.

The scale of comparison must be relevant.

New planting, Totten Inlet, 7/30/07

Aggregation of shellfish farms using new methods is becoming the norm in South Puget Sound inlets.

There is currently an expansion of this trend into Carr and Case Inlets.

The shellfish industry claims that there are only 150 acres of geoduck culture in Puget Sound. Most of this acreage appears to be clustered in the low flushing inlets and coves of South Puget Sound. It is important to quantify linear feet of aquaculture in these inlets and coves to determine cumulative impact to habitat for endangered species.

Is industry's claim of 150 acres of commercial geoduck culture as 1/1000 of all tideland acres in Puget Sound meaningful?
Is it even accurate?

1595 acres claimed for existing geoduck farms



10% of the total tideland acreage in South Puget Sound Basin

South Puget Sound Basin - 15,725 tideland acres (south of Tacoma Narrows)

--The Shape and Form of Puget Sound, Robert Burns, a Washington Sea Grant Publication, 1985

1595--the number of acres claimed as existing geoduck farms in South Puget Sound.

- Mason County: 800 acres**
- Thurston County: 750 acres**
- Pierce County: 45 acres**
- Taylor Shellfish: 491 acres**
- Seattle Shellfish: 309 acres**
- Other Growers: 795 acres**

--Preliminary totals of Army Corps of Engineers NWP 48 Report Forms 6/2007 received as a FOIA request.

With planned expansion in Pierce County, the numbers will increase.

Meaningful comparison of shellfish aquaculture installation to an inlet – Totten Inlet

Totten Inlet – 90% of shoreline miles in shellfish aquaculture.

30 miles of farmed tidelands in Totten Inlet per Taylor Powerpoint Presentation.

33 Miles of shoreline in Totten Inlet per APHETI.

How many of these miles use canopy nets, oyster bags, PVC geoduck tubes, and/or water jet harvesting?

According to APHETI, streambeds channels have been altered.



Shellfish industry claims 10,629 acres as existing geoduck aquaculture in Puget Sound and Willapa Bay.

Taylor Shellfish – 90% of claimed geoduck acres

10,629 acres claimed as existing geoduck aquaculture.*

9,475 acres claimed by Taylor Shellfish.*

**6000 acres Willapa Bay --Taylor
2300 acres Samish Bay -- Taylor
1175 acres Puget Sound -- Taylor
1154 acres Puget Sound -- Other growers**

***Per Department of Ecology list of Army Corps of Engineers NWP 48 Report Forms, dated 6/29/07**



**Geoduck harvester 'in the hole,'
Case Inlet 8/14/07**



To what extent does shellfish aquaculture, as a human induced stressor, disrupt the function of natural beach processes?

Eld Inlet, 7/29/07

One hypothesis is that “shellfish aquaculture reduces productivity, abundance, spatial structure, and diversity of salmon populations” in South Sound.

--Chinook and Bull Trout Recovery Approach for the South Puget Sound Nearshore, Draft, 2004.

Complex ecological functions/interactions in the intertidal zone are disturbed or destroyed.

Almost all DNR lease sites for geoduck farming occur in the vicinity of documented forage fish spawning habitat, so we can assume that commercial operations do as well.

The shellfish industry says growers like to plant geoducks on “barren” beaches that have only sand. –Key Peninsula Geoduck Forum, 4/5/07.

Applicant for DNR lease in Pierce County states he clears sand dollars and rocks using his utility vehicle before planting geoducks.

‘Nine of the 10 species listed as endangered or threatened within the Puget Sound region inhabit the nearshore.’ --Puget Sound Nearshore Project, 10/02



This fragile anemone colony living in sand between two geoduck farms on Zangle Cove will be destroyed if a geoduck farm is installed here.

5/13/06

Beaches are permanently converted to commercial aquaculture use.

Areas under shellfish aquaculture lose their unique characteristics. –*Bendell-Young study on intertidal shellfish farming from Simon Fraser Univ. 2006*

Densities of harvestable cultured geoducks are approximately 19-23 per square meter based on industry statistics.

Natural densities of wild geoducks average 2 per square meter in South Puget Sound. --*“Comprehensive Literature Review of Issues Relating to Geoduck Ecology” 2004*

Shellfish filter large particles and can consume zooplankton as well as copepods (the biggest source of protein in the ocean), crab larvae, fish eggs and crustacean larvae. – *CSAS, 2006*



Totten Inlet, siltation on geoduck nets, 2006

Shellfish do not magically “clean the water” of all bad things.

If shellfish consume fecal coliform, toxic bacteria or contaminants they cannot be harvested or eaten.

Growers say “clean” to mean filtering phytoplankton out of the water. Phytoplankton is the basic food source for other aquatic species as well as shellfish.

In agricultural densities, excessive shellfish feces and pseudofeces can contribute to toxic conditions. (See Studies, slide 48).

Do filtration benefits outweigh these impacts?

- Habitat degradation and fragmentation**
- Liquefaction of tideland using water jets**
- Plastics and canopy nets covering beaches**
- Increased shellfish waste in low flushing inlets**
- Industrialization of shoreline**



Totten Inlet, 2006

Are geoducks good for filtering Puget Sound...or not?

Shellfish growers claim that the filtering capabilities of their commercial geoduck will mitigate for nutrients coming into Puget Sound from upland development. *--Taylor Shellfish Presentation 2007.*

But DNR claims (with the help of industry) that filtering capacity of native geoducks harvested from subtidal areas is insignificant. *--DNR Habitat Conservation Plan, July, 2007*

Yearly harvest of native subtidal geoducks is up to 4 million pounds. *--DNR website*

So its OK to remove the native geoducks from the Sound (some live over 165 years), but we have to convert our tidelands to industrial geoduck farms to filter the water and save Puget Sound? Illogical at best.



Nisqually Reach geoduck harvest on privately leased tideland, 6/30/07



**Eelgrass in Zangle Cove,
5/13/07**

Destruction of eelgrass habitat.

Eelgrass is an important habitat for herring spawning and it provides protection for small fin fish, including juvenile salmonids.

Annual progress report of a UW study on the interaction of filter feeders and eelgrass observes “direct negative effects of disturbance and of geoducks on eelgrass” and “little evidence of indirect positive effects of geoducks” on eelgrass. --Sally Hacker, OSU and Jennifer Ruesink, UW 2005

Is geoduck waste really good for eelgrass...or not?

A Pacific Coast Shellfish Growers Association brochure states that:

“As digested algae is expelled into the beach sediment, the remaining nutrients become more readily used by eelgrass, essentially providing a fertilizing function.”

The ongoing OSU/UW study on eelgrass and geoducks says: “‘fertilizer’ effect does not result in enhanced growth rates of eelgrass. “



Industry says:

“So long as the geoduck farming does not substantially disturb eelgrass (i.e., geoduck are not planted in the eelgrass), geoduck culture has little effect on eelgrass.” –Taylor Shellfish Presentation 2007.

Eelgrass in Zangle Cove, 6/2006

Is industry data reliable and unbiased?

Pacific Coast Shellfish Growers Association promotional literature, states that “a recently conducted comprehensive biological assessment found that geoduck farming practices are not likely to adversely affect any listed threatened or endangered species or essential fish habitat.” –DRAFT Programmatic Biological Evaluation of Potential Impacts of Intertidal Geoduck Culture Facilities to Endangered Species and Essential Fish Habitat, prepared for Taylor Shellfish, Seattle Shellfish and Chelsea Farms by Entrix, Inc. 10/27/04



A principal author of the Entrix draft document signed a lease with a property owner on Totten Inlet to conduct commercial geoduck farming on June 5, 2004, just before the Biological Evaluation was published. -- per recently obtained Army Corps of Engineers NWP 48 Report Forms.

Chinook Salmon, moving up the Nisqually. -Photo USFW

Is shellfish aquaculture gear really mostly invisible as industry claims?

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An analysis of daylight hours between Memorial Day and Labor Day, when the beach is most often used, shows geoduck gear visibility:

**Planted at +2 beach elevation:
Visible an average of 19% daylight hours
Visible 76% of the days.**

**Planted at +3 beach elevation:
Visible an average of 23% daylight hours
Visible 87% of the days.**



Almost all Army Corps NWP 48 Report Forms we reviewed for existing geoduck aquaculture included multiple species, some planted up to +10 tidal elevation.

Oyster bags and Manila clam canopy nets are visible most days for long time periods during the summer.

Geoduck farm (after tubes pulled) and oyster bags at higher beach elevation.
Eld Inlet 7/29/07

Fact or fiction: water jet harvesting is the same as boat wake or wind storm.

Pacific Coast Shellfish Growers Association states in relation to hydraulic water jet harvesting of geoducks that impacts *'are temporary and well within the range of disturbance caused by boat wakes or a winter storm.'* --Letter from PCSGA to Pierce County 10/5/07



Ordinary citizens view with disbelief a comparison of boat wakes or wind storms with water jet harvesting of geoducks.

Any boat wake, wind storm or other climate event that would cause liquefaction of entire acres of tideland sediment up to three feet in depth would rightly be viewed as an extraordinary event, not an ordinary one.

Totten Inlet geoduck harvester, 2006



Hunter Point, Eld Inlet 6/17/07



Nisqually Reach, 6/30/07



Cliff Point, Henderson Inlet,
6/30/07



Eld Inlet, 7/29/07

How does hydraulic water jet harvest change the beach?

Geoduck growers ECOP's state that "the beach will be lowered about 1-2 inches by the harvest."

(This is the equivalent of 13-26 dump trucks of material per acre.)

The Geoduck Growers Environmental Codes of Practice (ECOP) state that the “harvester will not harvest geoduck one at a time producing single holes but will systematically emulsify the substrate with the water jet.”

Commentary from *Dirty Jobs* Geoduck Segment with Mike Rowe, describing geoduck harvest:

You’re going to take the pressure hose and shove it in here and turn the sand to liquid... and you’re going to be “in the hole.” Just dig around your feet and you go down.

I take this hose and I squirt it on my feet liquefying the sand around me and slowly sink into the beach.

Work down (with water jet)...reach down and feel the neck of the geoduck...then pull it up when it loosens up.

The *Dirty Jobs* segment clearly shows workers kneeling or sitting up to hip or waist in the hole created by the water jet.

Photo from Totten Inlet harvest 2006 (not Dirty Jobs)



What happens when sediments are emulsified up to three feet deep in large areas on the tidelands?



For example: “Little research has been conducted on geoduck toxicity induced by the ingestion of *Alexandrium catenella* cysts” which “overwinter in surface sediments where they are buried.” Toxic “cysts are reintroduced to the water column by currents or other types of disturbance such as dredging or harvesting.”

--Comprehensive Literature Review of Issues Relating to Geoduck Ecology and Aquaculture Production. Prepared by DNR by UW and the Pacific Shellfish Institute. This is one of the primary documents used by industry to support their expansion plans.

Henderson Inlet, 6/30/07

When the beach is liquefied, where do the sediment plumes go?





After geoduck
harvest,
Case Inlet,
2007

“At the end of harvest the ‘beach will have been turned upside down--a moonscape yielding hundreds of pounds of high-grade geoducks and a by catch of any worm or clam that was living in the sand.” –*Cashing in on Geoducks, Seattle PI, 8/21/04*



**Loose tubes, Henderson Inlet,
6/1/07**



**Loose tubes, Pickering
Passage, 6/17/07**

**Marine
debris
around
geoduck
farms.**



Loose tubes, Eld Inlet 7/30/07



**Loose tubes, Zangle Cove,
4/12/07**

WA Dept Fish & Wildlife staff estimate PVC tube and net debris in deep water areas of South Puget Sound 36



100" x 24" Vexar plastic net identified as belonging to shellfish company found on beach in Case Inlet 5/20/07.

Net tops found on beach opposite geoduck farm, Zangle Cove 2006

2005 Washington State Fish & Wildlife bottom fish survey trawl finds aquaculture debris in South Puget Sound from 30-120' depth. Biologists extrapolate to 21,600 tubes and 61,600 nets for a total of 83,200 estimated items.



Mussel rafts in low flushing inlets.

Bivalves can be stocked at such high intensities that “anaerobic microbial pathways dominate, and sulfur reducing bacteria produce high levels of hydrogen sulfide that are toxic to benthic...species.”

--Dr. Roger Newell, University of Maryland, on possible impacts from shellfish aquaculture.

Mussel rafts--Gallagher Cove, Totten Inlet

Is there independent monitoring of shellfish farms?

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APHETI commissioned a dive under the mussel rafts in Gallagher Cove, Photos taken during 11/3/06 dive.



APHETI states that both invasive tunicates and *Beggiatoa* bacterial mats were found under the mussel rafts. The lab tested sample was full of *Beggiatoa* strands and had a high hydrogen sulfide content.

PhD Marine Biologist recommends: independent scientific study of the bottom below the mussel farm that incorporates random sampling of the bottom, video surveys, and sediment analyses for porewater chemistry and benthic species diversity in relation to control sites outside mussel farm.

Info provided by Association for Protection of Hammersley, Eld and Totten Inlets (APHETI). Claims by industry that only 50 microns of *Beggiatoa* were in sample are incorrect. The 50 microns refers to the diameter of the bacterial filament, not the amount in the sample.

Mussel rafts propagate non-native species.



**Non-native (Gallo) Mediterranean mussel has hybridized with native mussel.
Totten Inlet, 6/2006**

An Environmental Impact Study regarding mussel raft installations in Totten Inlet, mandated by Thurston County in 1999, is still ongoing.

***Mytilus galloprovincialis*, the Mediterranean mussel, is listed in the *100 of the World's Worst Invasive Alien Species* list. www.issg.org, www.conservationinstitute.org, nas.er.usgs.gov**

'The proposed mussel farms will have a probable significant adverse environmental impact to the Totten Inlet and to the waters of Puget Sound' relating to "the establishment of the Gallo mussel as a common form of mussel within Puget Sound waters and impacts related to said introduction.' From Hearings Examiner's conclusions, Thurston County, 1999

With EIS still pending, why is the industry allowed to sell the gallo mussels to the public?

Mussel rafts a congregation point for invasive tunicates.



**Congregation of tunicate 'didemnum.'
on mussel rafts in Gallagher Cove,
Totten Inlet.**

--Photo from USGS website.

'The invasive colonial tunicate, *Didemnum sp.*, is native to Europe and probably came to this region in ballast water discharged from ships, as hitchhikers on recreational boats, or on shellfish and/or shellfish equipment brought to the region from other locations.' --Washington State's Response to an Invasion of Non-Native Tunicates, Accomplishments, Challenges and Next Steps, Report to the Legislature. February 2007.

***Dirty Jobs* segment on the Gallagher Cove mussel farm shows extent of tunicates on mussels and on gear.**

What steps is industry taking to remove tunicate infestation?



Henderson Inlet, 6/30/07



Hammersley Inlet, 6/17/07

Plastic “kiddie” pools are used as nurseries for geoduck seed. Clam and oyster seed is transported to and from Hawaii and geoduck seed from Washington and Oregon hatcheries “under strict regulations governing control of invasive species” according to Taylor Shellfish.

How does industry ensure compliance so that disease, parasites and non-native species are not introduced into Puget Sound?

There is currently no siting criteria to take into account habitat preservation related to large swaths of shellfish aquaculture installations and cumulative impact.



This large geoduck farm is just south of a proposed DNR 2006 geoduck lease site.

Another large farm is in the distance.

Henderson
Inlet, 6/1/07

DNR and commercial growers are siting geoduck farm leases in forage fish spawning areas. Forage fish are important critical prey species for predators such as salmon.



‘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.’ --Marine Forage Fishes in Puget Sound, WDFW, 2007

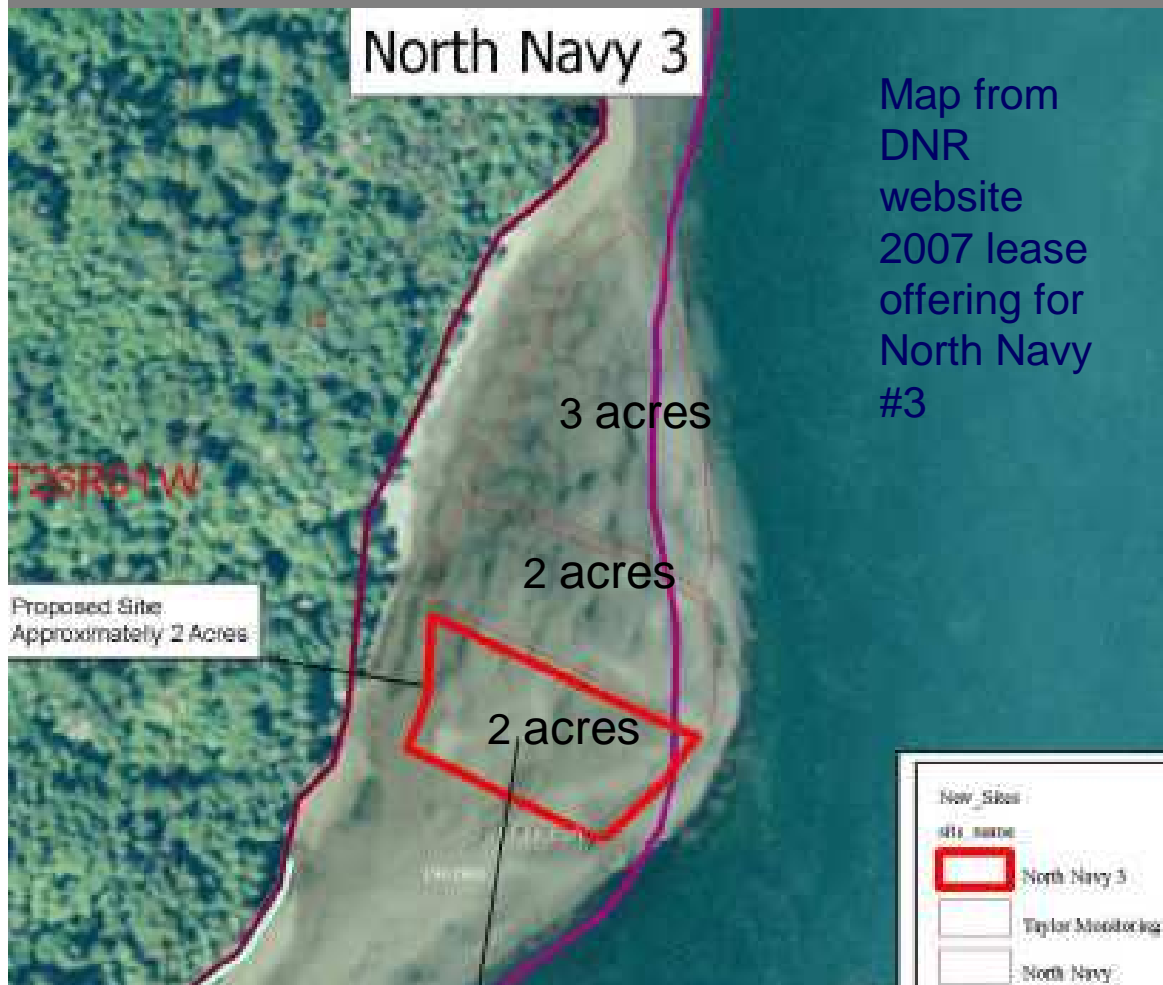


A 2 acre DNR lease parcel is not much, right? Think again.

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The total DNR geoduck acreage for this parcel in Hood Canal is now 7 acres. Will another two acres be added at North Navy in 2008? This plan of incrementally increasing acreage fits well with the geoduck grower strategy of rotational planting.

<http://www.dnr.wa.gov/htdocs/aqr/aquaculture/index.htm>



This map shows three DNR geoduck lease parcels at North Navy:

2006 North Navy #1 lease, 3 acres

2006 Taylor Shellfish monitoring site, North Navy #2 lease, 2 acres.

2007 North Navy #3 lease, 2 acres.

Multiple parcels are also in Taylor Bay (Pierce County) and Stretch Island (Mason County)

Expansion of shellfish aquaculture into traditionally residential areas represents a major land use conflict for adjacent property owners and other citizens who have the goal of protecting the tidelands for natural habitat and traditional recreational use.



The issue is *not* that tubes or nets remain in place for only 1-2 years.

The issue is that there is no siting criteria for these operations and once put into aquaculture use, the shellfish industry states the tideland is intended for “a perpetual cycle of planting, cultivation and harvesting.”

--Taylor Shellfish Notice of Appeal of Administrative Determination, 8/22/07

Zangle Cove, 4/29/06

Shellfish aquaculture operations bring an industrial zone to quiet residential neighborhoods. Conflicts include:

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- Day and night time noise disturbance to both wildlife and adjacent property owners and intense smell during harvest
- Aquaculture debris, utility vehicles and workers on the beach
- Barges left directly in front of residential properties for prolonged periods
- Demand for use of neighborhood roads for access and parking
- Access to the water eliminated for some adjacent property owners at low tide
- Permanent alteration of the character of the beach with rotational plantings and multiple species.



“...the interests of all stakeholders need to be addressed...in order to assess the social carrying capacity of the management area.”
—Review of recent carrying capacity models for bivalve culture and recommendations for research and management. McKindsey, 2006

Zangle Cove, 2006-2007

Current shellfish industry practices.

Heavy equipment on tidelands is not consistent with telling school children and adults to walk carefully on the beach.

Heavy equipment and modification of tidelands are not consistent with the objective of the Puget Sound Partnership to protect habitat.

Industry is demanding upland access to the beach for operations in Pierce County.

The industry is legally challenging rules and conditions.

Oakland Bay, Mason County. 8/07





Dutcher's Cove is an example of what it at risk from expanding shellfish aquaculture.

New application in Pierce County for a 26 acre shellfish farm with at least 21 acres for geoducks.

Residents who have resided in this cove for 50 to 100 years or more now face the prospect of a cove converted to single agriculture use on a perpetual and permanent basis.

Industry says citizens just have to "get used to it."

Dutcher Cove application for massive geoduck farm submitted 7/19/07 in Pierce County

Operation in Hammersley Inlet is another example of current shellfish industry practices.

Small cove in Hammersley Inlet with a geoduck farm and plastic “kiddie pool” seed nurseries. August 26, 2007. These tidelands are owned by the shellfish company, not the shoreline residents. It is a documented herring and surf smelt spawning area.
--WDFW Surf Smelt, Sand Lance, Rock Sole and Herring Map, 2007



Examples of High density raft leases in Baynes Sound, British Columbia

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Photo courtesy of Association for Responsible Shellfish Farming
www.responsibleshellfishfarming.ca



Examples of long-line culture in British Columbia.



High density beach lease in Baynes Sound, BC

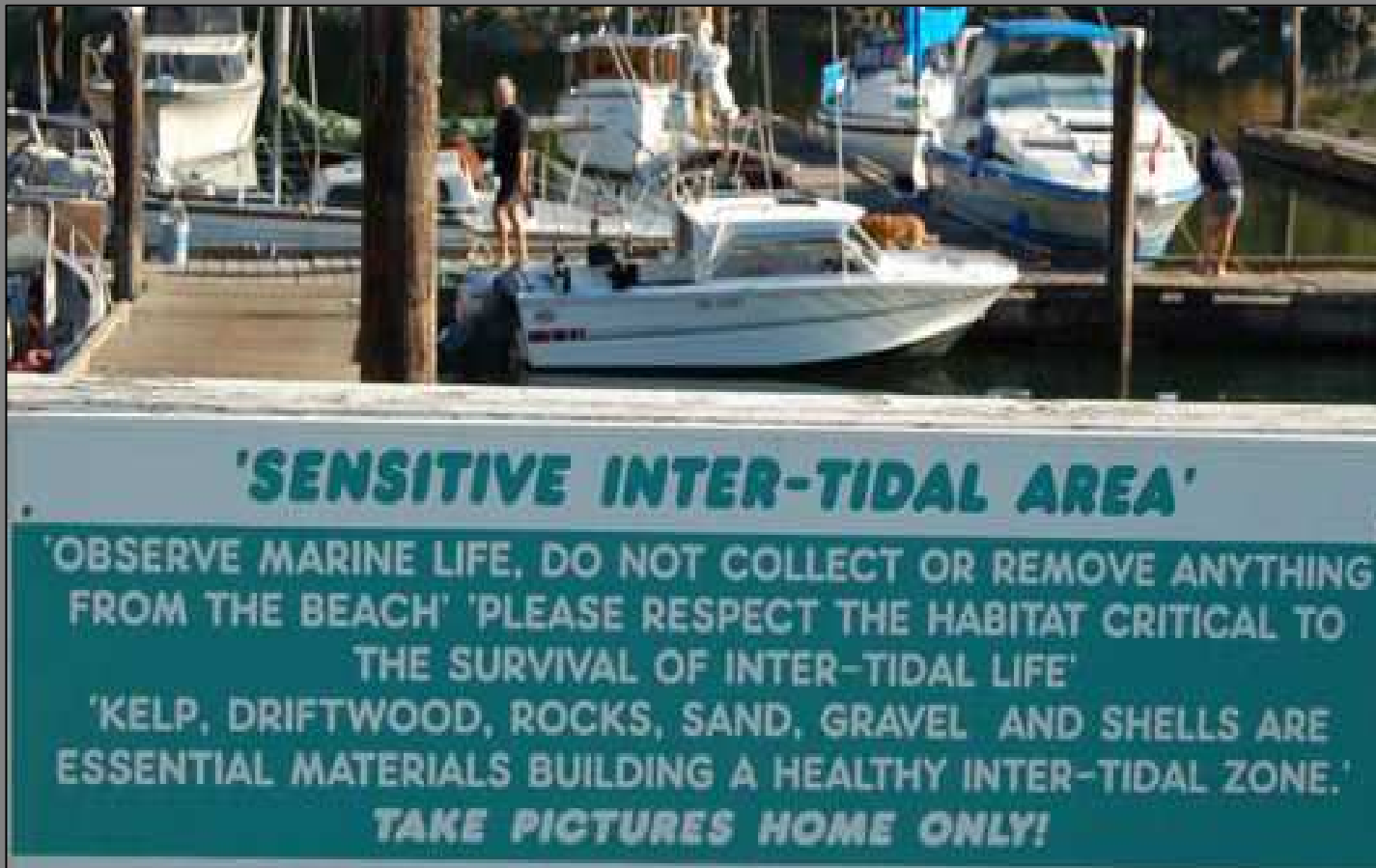
**Photos courtesy of Association for Responsible Shellfish Farming
www.responsibleshellfishfarming.ca**

Canadians suspend applications for intertidal geoduck farming

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‘Applications for new intertidal geoduck aquaculture are currently not being accepted due to gaps in understanding of geoduck aquaculture techniques on fish habitat.’

<http://www.agf.gov.bc.ca/fisheries/Shellfish/geoduck/main.htm>



Sign on a dock in British Columbia, September 2006.

Long term goals of the shellfish industry are indicated by industry 'Goals and Research Priorities for 2015.' We have received no response to our written request for clarification of these goals.

“Explore options under the Endangered Species Act (ESA) Sections 7 and 10, to develop a regional general permit in cooperation with the Army Corp to provide growers with protection from prosecution under the ESA, Clean Water Act, Rivers and Harbors Act and Marine Mammal Protection Act.”

“3.3.2. (H) Identify gaps in current understanding of shellfish ecology specific to West Coast ecosystems and pursue research to fill those gaps. The final goal is to gain a clear understanding of the ecological impacts associated with:

- Oyster culture - bottom, rack and bag, bag, intertidal longline, stake, suspended (longline, tray, lantern net, bag), mechanical dredge harvesting as well as culture of native *Olympia* and assorted non-native species.
- Clam (Manila & native) culture - bottom and bag, hand and mechanical harvesting.
- Mussel culture - suspended raft & long line, *Mytilus galloprovincialis* and *M. trossulus*.
- Geoduck culture - intertidal, subtidal, hydraulic harvesting (intertidal geoduck), predator exclusion.
- Other species not yet commonly grown for aquaculture purposes.
- 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 the use of deterrents, exclusion or destruction.
- Substrate modification (cultching, graveling, tilling, harrowing, mowing).
- Carrying capacity - modeling of intensively cultured estuaries and an understanding of key phytoplankton species affecting growth, health and survival of shellfish (look at models developed in France, New Zealand, and Maine).”

--Excerpts from Pacific Shellfish Institute West Coast Shellfish Research and Education 2015 Goals and Priorities. For full document go to: <http://www.pacshell.org/>

Long term goals of Federal agencies and national environmental groups are to promote shellfish and finfish aquaculture in the waters of Puget Sound and the Straits of Juan de Fuca

NOAA Aquaculture Program

Washington Aquaculture Opportunities for Growth

Shellfish production, including oysters, mussels, Manila clams, and geoduck clams

New finfish species such as black cod

Culture of salmon and steelhead

Open ocean aquaculture in the Strait of Juan de Fuca

Production of submersible offshore fish cages

www.aquaculture.noaa.gov

9/12/07

World Wildlife Fund

Draft Goals of the World Wildlife Fund Molluscan Dialog:

Develop and implement performance-based, measurable standards that will minimize the potential negative effects of mollusc aquaculture, while permitting the shellfish farming industry to remain economically viable.

Continue to promote the beneficial environmental and social aspects of shellfish cultivations.

www.worldwildlife.org/cc/dialogues/mollusc.cfm

10/15/07

When Puget Sound is turned over to the aquaculture industry, will citizens have a say?



Worldwide studies document environmental impacts of intensive shellfish aquaculture.

Totten Inlet 2006

Manila nets, oyster bags, geoduck tubes all on same tidal area.

Click on this link for a list of summaries of worldwide studies on the impacts of intensive shellfish aquaculture.

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

Click on this link to read a “Data Gap Analysis” related to geoduck aquaculture from Puget Sound biologists.

<http://ProtectOurShoreline.org/070314GeoduckAquacultureDataGapAnalysis.pdf>

Comments from the “Bivalve Experts” at the Washington Sea Grant Shellfish Aquaculture Workshop 56

- **Baseline and ecological mapping of shoreline habitat is necessary to making informed decisions.**
- **Spatial scale of effects should be related to meaningful regional scales, such as drift cells (not to the entire Puget Sound)**
- **Environmental conditions should be monitored at aquaculture site.**
- **Practices are cumulative and have the potential to adversely affect foreshore ecology.**
- **The precautionary principal should be followed when there is lack of data.**
- **Both ecological and social carrying capacity must be considered in siting of shellfish aquaculture, not just production carrying capacity**
- **Shellfish farms will cause increase in some species and decrease in others.**

Sea Grant Shellfish Aquaculture Workshop final recommendations

http://www.wsg.washington.edu/research/geoduck/WSGBivalveWorkshop_Recommendations.pdf



**Shellfish farm rebar,
Totten Inlet 7/30/07**

We share all of the eight objectives of our Governor for the Puget Sound Partnership initiative and especially the objective to protect habitat.

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We welcome the Sea Grant Shellfish Aquaculture Workshop Scientist recommendations.

We support the following:

- **Identification and documentation of all existing shellfish farms in every Puget Sound County;**
- **Assessment of current and future expansion of shellfish farming as to cumulative impacts;**
- **Baseline and environmental impact studies before additional plantings using new shellfish farming techniques are allowed.**
- **A substantial development permitting process for shellfish aquaculture on a site specific basis.**

For more information go to:

Coalition to Preserve Puget Sound Habitat

<http://www.ProtectOurShoreline.org>

<http://www.APHETI.com>

<http://www.HendersonBayShorelineAssociation.com>

<http://www.NoGeoduckFarm.com>

<http://www.CaseInlet.org>

Coalition Contact: lhendricks@comcast.net

Canadian partners:

<http://www.responsibleshellfishfarming.ca>

Supporting organizations:

The Washington Council of Trout Unlimited

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