

Thurston County Hearing Examiner

Taylor Shellfish Henderson Bay Geoduck Farm

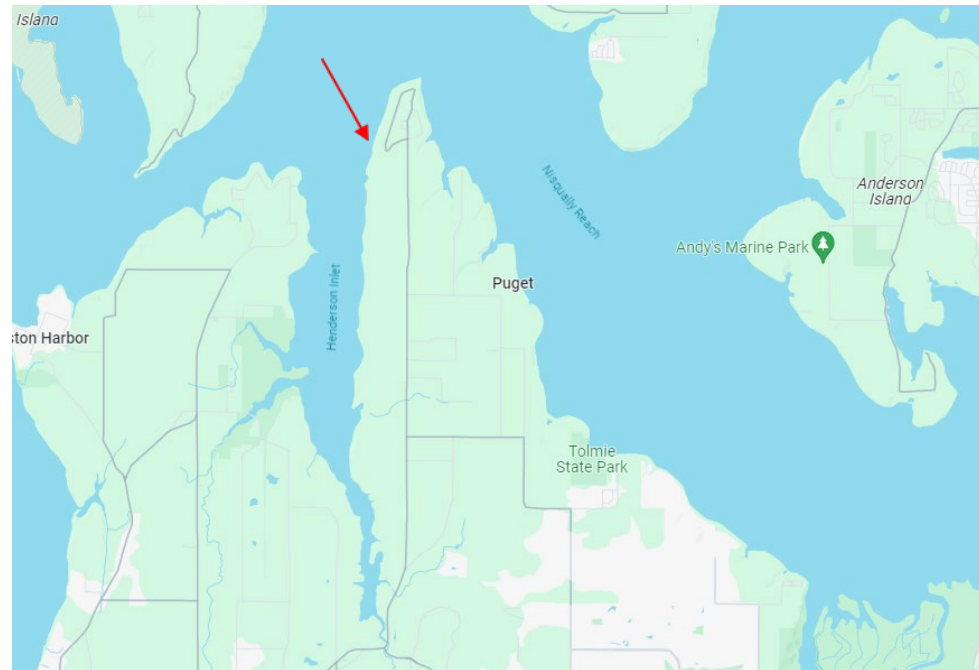
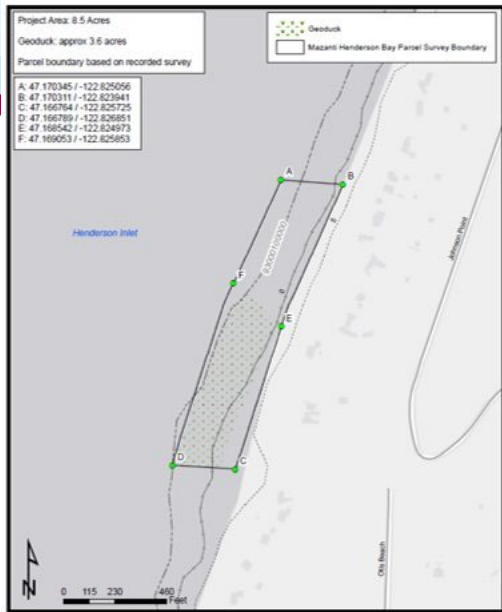
January 9, 2024

Presentation Overview

The presentation will cover the following:

- Proposed project location
- Existing site conditions
- Potential impacts and benefits of the proposed project
- Seagrass Geoduck research results
- Summary

Project Location



- Location = Henderson Bay, Thurston County
 - South Sound bay
 - 5 miles long and 0.5 miles wide
 - Water depths averaging 10-35 feet
 - Located at the northern end of Bay, good circulation and open water, relatively protected
- Culture area = 3.6 acres of intertidal geoduck aquaculture
- Culture elevation = intertidal between +1 ft MLLW and -4.5 MLLW

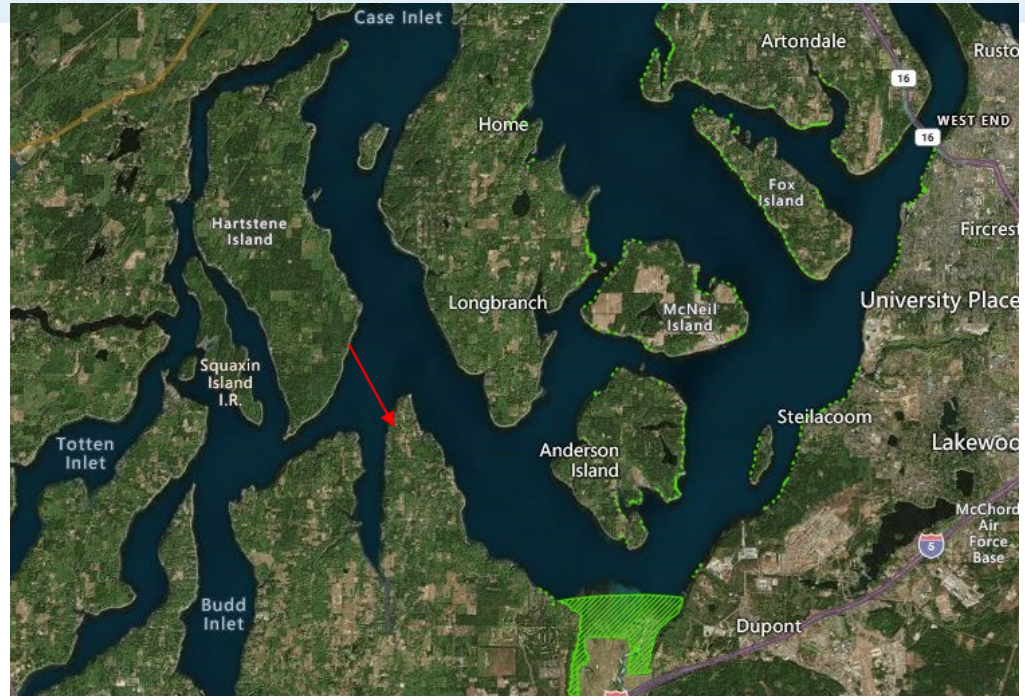
Existing Site Conditions

- Project area is primarily cobble, gravel transitioning to sand and finer material substrate
- No eelgrass present
- Macroalgae limited to *Ulva* spp.
- No regulated kelp species (brown kelp, canopy forming kelp beds)
- Upper intertidal has surf smelt spawning habitat (above +7 ft MLLW)
- Adjacent upland includes vegetation and residential dwellings



Existing Site Conditions

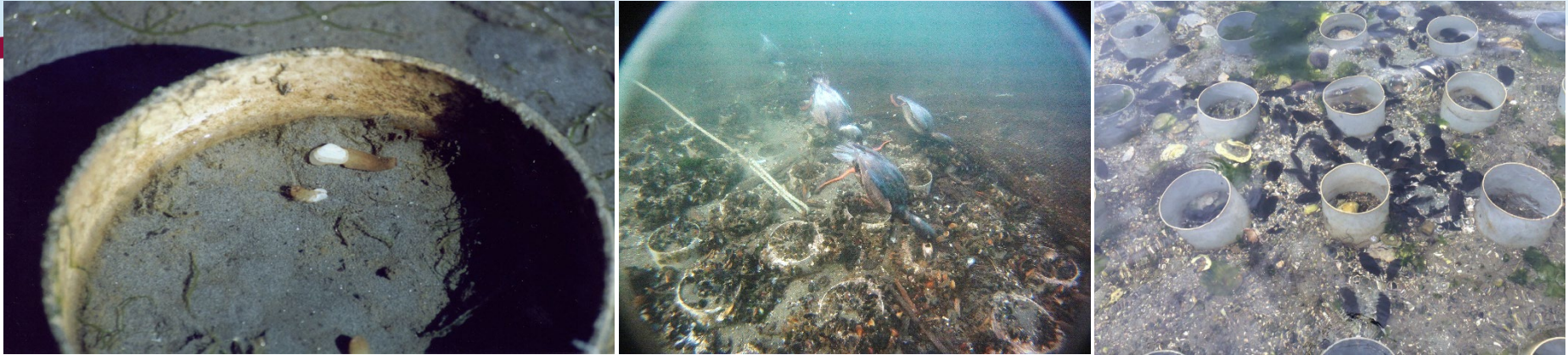
Forage fish (WDFW data)



Eelgrass (Ecology Coastal Atlas)

Potential Impacts and Benefits:

Presence of Gear



Physical Effects:

- Predator tubes have little effect on waves and currents, and accumulate minimal amounts of sediment
- Sediment accumulation and scouring effects return to baseline conditions upon removal of tubes

Species Effects:

- Creates hard substrate, resulting in temporary increased habitat diversity, which augments foraging opportunities
- May attract certain species (e.g., bay pipefish) and reduce use by others (e.g., starry flounder)
- No indication of difference in use by juvenile salmonids

Visual Effects:

- Farm visibility limited to daylight hours and low-tides when tubes are in place and workers are present. Tubes and nets will only be in place for 18 months out of a 5 to 7-year culture cycle.

Potential Impacts and Benefits:

Water Quality/Clarity and Bioextraction

- During the Grow-Out Phase:
 - Presence of shellfish can improve water quality by removing anthropogenic nutrient contributions through filtration of phytoplankton
 - Shellfish feeding can modulate phytoplankton blooms and associated nutrient cycling
- Bioextraction:
 - Geoduck despite their body size, filter water at low rates.
 - Geoduck harvest removes large amounts of nitrogen from culture areas
 - The harvest of a geoduck farm can offset the nitrogen pollution of 100's of coastal residents (a coastal resident inputs about 8.4 pounds of N per person per year)
 - Shellfish harvesting is one of the only methods available that removes nitrogen after it has entered a system, increasing system resiliency to nutrient loading

Geoduck Filter Feeding

- Geoduck have two siphons, one to pull water in, the other to expel water
- They feed by generating a current using cilia on their gill complex that extend through the inhalant side of their siphon
- Geoduck feed on microscopic particles
- Have strong control over what they feed on, known as “selective filter feeders”
- They selectively control what goes into their digestive system based on size and other biochemical properties
- In general, bivalves feed on very small particles in the range of 1-15 micron
- While hypothetically possible, many zooplankton types and larval fish are either larger or at the upper end of this range, making ingestion of larval fish uncommon
- Water pulled into the siphons comes from only a few centimeters around the siphon, so the vast majority of the water column is not directly filtered
- There is substantial separation between where forage fish spawning occurs and where geoduck will be present. Note surf smelt spawn at + 7 and above meaning >6ft of water column above the geoducks
- During winter, when forage fish spawning occurs, geoduck are relatively dormant and are feeding less

Potential Impacts and Benefits:

Harvest Activities

Turbidity/Suspended Sediments:

- Similar to natural disturbance (e.g., wind, storm)
- Turbidity effects comply with water quality standards
- Fish and wildlife have been shown to take advantage of feeding opportunities after harvest

Potential Physical Changes:

- Effects (e.g., visual evidence of harvest activity) are highly **localized** and **limited** in duration (extend for about 2-3 tidal cycles), indicating rapid recovery

Benthic Infauna:

- Research has shown rapid recovery after harvest activities (recovery occurs during planting and grow out)
- A harvest event leaves organisms in the same general area, supporting quick recovery
- No effects to the food web (based on staghorn sculpin diet studies and food-web model study)

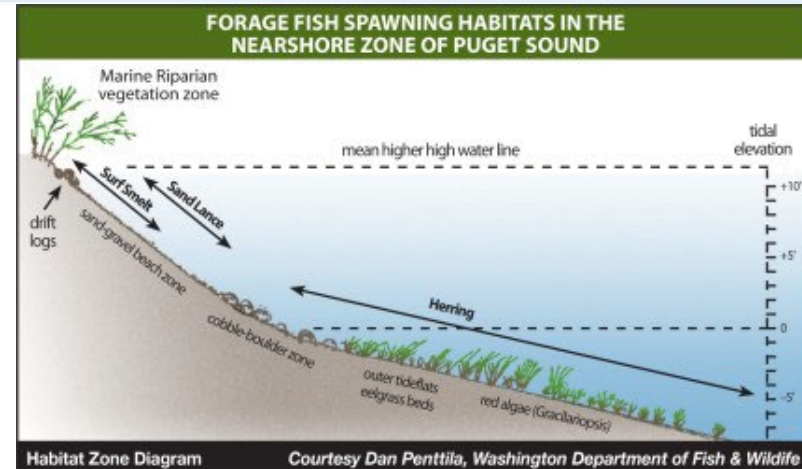
Overall:

- Variance associated with harvest activities are consistently lower than natural variability
- Effects from harvest activities are short-term with a quick recovery period
- More discussion of this later

Potential Impacts and Benefits:

Forage Fish Spawning

- No Effect:
 - Farm activities occur outside of documented and potential spawning areas
 - Sand Lance Spawning = +5 feet MLLW to mean higher high water (*no documented spawning near site*)
 - Surf Smelt Spawning = +7 feet MLLW to extreme high water (well away from culture activities)
- Conservation measures protect forage fish spawning:
 - Consistent with shellfish culture conservation measures identified in the Programmatic Biological Opinion, NMFS (2015) and Programmatic Biological Opinion for Shellfish Activities in Washington State Marine Waters, USFWS (2016)
 - Avoidance of potential effects, where possible, is the first priority
 - No effect from project on forage fish habitat.



Potential Impacts and Benefits:

ESA, MMPA, EFH Species, and Critical Habitat

Fish:

- Juvenile salmon migrate along nearshore and are unimpeded
- Some minor shifts in species abundance when predator protection is present, some have higher abundance, some lower (related to structure).
- May provide good habitat and prey resources for other fish species



Birds:

- Potential impact would be limited to short-term avoidance during activities
- Resident/common migrants have been shown to increase feeding



Marine Mammals:

- There would be no impact to marine mammals, and the addition of structure could increase foraging opportunities



Critical Habitat:

- Not expected to alter structure and function of habitats; impacts are minimal given the short duration, localization, and infrequency of the proposed actions
- The proposed disturbance is within the range of natural disturbances



Programmatic Consultation

ESA, EFH Species, and Critical Habitat

- NMFS and USFWS completed a Programmatic Consultation for the Endangered Species Act
 - It analyzed all current and well as future expansion of aquaculture in Washington State
 - This project fall under the amount of future expansion of aquaculture considered
 - Analyses included:
 - Potential effects to listed species (salmonids, birds, etc.)
 - Prey for listed species
 - Habitat for listed species
 - Indirect, interdependent, interrelated, and cumulative effects
 - Conclusions were that ongoing and future aquaculture resulted in minimal effects to listed species and did not jeopardize the continued existence of the species
 - The one area of concern related to impacts to eelgrass.
 - Eelgrass does not occur at or near this project site
 - The project will comply with all conservation measures identified in the Programmatic Consultation



Sea Grant and Ferris et al. studies

- Several commentor speculated on the interpretation of results from the Sea Grant geoduck studies
- Its conclusions indicate:
 - Harvest disturbance similar to natural wind and storm events
 - Rapid recovery of habitat and species after harvest
 - Limited changes to species communities with slight increase in structure oriented species(bay pipe fish) and slight decrease in bare substrate oriented species (starry flounder)
 - None of these changes were found for “Sensitive” or “listed” species)
 - It is extremely rare to have such extensive locally specific research available to inform decisions on impacts
- Several commentators raised the Ferris et al. study (2015)
 - Study was reviewed when it came out and met with study authors to discuss applicability of modelling results to actual aquaculture farms and potential impacts
 - Study purpose was to set a conceptual framework to help guide future research
 - Study author confirmed the model was intended to be a qualitative tool and not be used for regulatory decisions.
 - Author stated “the model will be used to identify a short list of species that would be prime candidates for additional monitoring and study.”

Seagrant results infauna

- BACI (before-after-control-impact) experimental design
- Three different study locations
- Infauna samples at monthly intervals before, during, and after harvest of clams
- Also sampled at transects outside of culture plots to assess adjacent unculture habitat
- Multivariate statistical approach
 - Strong seasonal patterns were found
 - Scant evidence of effects on community structure from harvest
 - No indication of “spillover” effects
- Of the 10 common taxa analyzed
 - 3 showed minor evidence of reduced density
 - 7 showed neutral or increased abundance
- Concluded that harvest is similar to natural disturbance (small and large scale), however at lower frequency (once every 4-6 years [harvest] versus multiple time per year [natural events])
- A study by Lui et al. (2015) had similar conclusions.

Seagrant results infauna

- Effects of season and within-site location were significant. Thus, most of the variation in the data were linked to changes in infaunal abundance by season and in space, in the latter case often over relatively small distances.
- There was no support for a statistically significant effect of harvest disturbance on infaunal abundance data from the study sites, either for cores or excavation samples.
- Similarly, there was no support for a statistically significant effect of harvest disturbance on infaunal biodiversity data from the study sites, either for cores or excavation samples.
- With a single exception, there was no statistically significant variation of infaunal abundance data from cores with distance from the edges of cultured plots, which led the investigators to reject the hypothesis of a “spillover effect” of harvest on infaunal assemblages adjacent to but outside of cultured plots.

Seagrant results resident and transient macrofauna (fish and invertebrates)

- Three different study locations
- Sampled at monthly intervals pre-gear, gear present, and post gear
- Sampled with sediment cores, shoreline and scuba transects
- Residents and transients respond differently to structures
 - No consistent difference in community structure of resident macrofauna
 - Total abundance of transient fish and macroinvertebrates were more than two times greater at culture plots than reference areas when structures were in place
- Concluded that habitat complexity associated with aquaculture gear may attract some structure oriented transient species (e.g. bay pipefish) and may displace some species that typically occur in areas lacking structure (starry flounder)
- Additional study looked at sculpin. No change in diet of sculpin observed between culture and reference plots. This study was an attempt to determine if there were changes in the surrounding food web resulting from the geoduck aquaculture
- Additional study in Samish Bay looked at interactions of geoduck aquaculture in eelgrass beds. These results are not applicable to the project site which completely lacks eelgrass.

Summary

- Farm is avoiding sensitive habitats and species (e.g., eelgrass, forage fish, kelp).
- Farm is not projected to affect the viability, persistence, or distribution of regulated species potentially present at the project site.
- Farm is employing BMPs and conservation measures to avoid and minimize any potential impacts to species and habitats.
- Farm would contribute to improved water quality via filtration and removal of excess nutrients.
- Effects of proposed activities have been found to be localized and limited, and consistently similar or less than the natural disturbance regime.

Questions

