From: BrownScott, Jennifer
To: Ralph Riccio
Subject: Shoreline Permit Comments
Date: Wednesday, April 4, 2018 12:40:38 PM
Attachments: FWS Comments_JSKT Shoreline Permit_Final040418.pdf
FWS Attachments_JSKT Shoreline Permit_Final 040418.pdf

Ralph, I wanted to share our comments that we will be sending to the County later today. Hope your spring season is going well.

-jennifer

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~~Dungeness NWR~Protection Island NWR~San Juan Islands NWR~~
~~Copalis NWR~Flattery Rocks NWR~Quillayute Needles NWR~~

United States Department of the Interior

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San Juan Islands NWR - Flattery Rocks NWR - Copalis NWR - Quillayute Needles NWR
Dungeness NWR - Protection Island NWR

In Reply Refer To:
FWS/R1/NWRS/FF01RWMT00

April 4, 2018

Steve Gray
Deputy Director/Planning Manager
223 East 4th Street, Suite 5
Port Angeles, Washington 98362

Dear Mr. Gray:

We appreciate this opportunity to provide comments on a proposed oyster farm in the northeast corner of Dungeness Harbor that requires a Shoreline Conditional Use and Substantial Development Permit SHR 2017-00011 as part of SEPA process SEP 2017-00027.

We recognize Jamestown S'Klallam Tribe's efforts to improve water quality in Dungeness Bay and support them in pursuing economically viable commercial enterprises. Their collaboration on restoration, invasive species reduction, and habitat preservation projects impacting Washington Maritime National Wildlife Refuge Complex (NWR; Complex) has been invaluable. We also recognize and acknowledge the efforts that have been made to reduce impacts to habitat and wildlife (e.g., no dredging, netting or fencing, and providing a 25' eelgrass buffer) from the proposed operation.

The current application proposes up to 150,000 on-bottom oyster bags within the boundary of Dungeness NWR (NWR, Refuge). The shores and tidelands in this area provide some of the most important wildlife habitat and supports the highest density of waterfowl and shorebirds within the Refuge (Complex, Unpublished Data 2013-2015). The Complex manages the tidelands within the Refuge boundary under a Use Easement Deed provided by Washington Department of Natural Resources (DNR) for the purposes of management within the National Wildlife Refuge System. DNR retains the right to manage uses that do not preclude Refuge management for this purpose and DNR has historically provided the proposed permit area for commercial aquaculture operations. The most recent lease allowed activity in a 100ft^2 area, including up to 60 aqua purses (DNR 2005). Because of their importance to wildlife and the ecosystem, shorelines and tidelands within the project "action area", as defined by the USFWS,

2016 Biological Opinion on Programmatic Consultation for Shellfish Activities in Washington State Inland Marine Waters (Biol Op; USFWS 2016), have also been provided the following State, County and National designations: *Clallam County Shoreline Master Program Natural Environment* (SMP; Clallam County 1976), *Graveyard Spit Research Natural Area, Washington State Imperiled Habitats* (i.e., Temperate Pacific Low Salt Marsh and North Pacific Maritime Coastal Sand Dune and Strand), and a *National Audubon Important Bird Area.*

We recognize and appreciate the County's efforts to implement conditions in the staff report to reduce impacts to these important habitats and their wildlife, and assess impacts using appropriate County policies. Since the staff report to the Hearing Examiner dated March 29, 2018, identifies that structures will be placed in tidelands defined as Natural Environment (i.e., S.28, T31N, R4W to east line of USFWS ownership on Dungeness Spit) it may be appropriate to also assess the application using the Commercial Development policies and regulations. The staff report also states that the Army Corps of Engineers Biological Assessment (Corps 2015) and the Biol Op both specifically address the use of mesh oyster bags within Dungeness Bay. If an assessment of impacts to the local environment is appropriate, then it would be important to understand that these documents assessed the area as part of the North Puget Sound (i.e., they did not address impacts specific to the local environment or the Refuge). Because of this broader assessment, some conservation measures provided by both documents could negatively impact Refuge resources.

Some additional information is needed to fully understand the potential impacts of the proposed operation on the local environment and the Refuge. The application states that on-bottom oysters will be allowed to grow freely on the substrate, however, it does not specify if mechanical harrowing and gravelling or frosting will occur as part of the operations. These techniques are commonly associated with on-bottom oyster culture and both can have significant impacts on habitat and wildlife species. Also, given the number, height, and tidal elevation of bags it is also unclear how they will only be seen from a range of <100 yards during minus tides. This information would assist with identification of potential impacts to aesthetics, public use, and nearshore transport of sediment.

It is also difficult to identify the scope of impacts from human disturbance without additional information describing amount, timing, and seasonality of access. For example, it is unclear if the applicant plans access the site between sunset and sunrise. If so, impacts from this use should be evaluated and addressed. The applicant anticipates 4-15 employees would access the site 50 to 90 days/yr. Impacts from this access would differ depending on what time of the year the use occurred, what type of use was occurring, the length of each occurrence and how often 4 vs 15 people engaged in the use. Since these ranges are described as "anticipated" it is also unclear if these are maximum amounts of access allowed, or if access might increase greatly. It is also unclear from the application if the term "day" is referring to one low-tide cycle, 2 low-tide cycles or a 12 or 24 hour period. This additional information would assist with identification of potential impacts to wildlife from human disturbance.

We have continuing concerns about the operation's size and location and potential impacts to the Refuge, wildlife, habitat and public use of the surrounding areas. We have attempted to identify impacted habitats and species, describe the impacts (Attachment A), and provide

recommendations for Refuge specific conservation measures to reduce these impacts (Attachment B).

We greatly appreciate the opportunity to comment on this application and we are committed to assisting with finding the least impactful approaches to this potential use. Please feel free to contact us with any questions at jennifer_brownscott@fws.gov or (360) 457-8451.

Sincerely,

Jennifer Brown-Scott
Project Leader

Attachments:
A: Impacts to Wildlife, Habitats and the Public
B. Recommended Refuge Specific Conservation Measures
C. Restricted Actions and Conservation Measures
D. Status of Effected Species and Habitats
D. References

Cc: Jamestown S'Klallam Tribe

Attachments:
A. Impacts to Wildlife, Habitats and the Public
B. Restricted Actions and Conservation Measures from the Biol Op
C. Recommended Refuge Specific Conservation Measures to Reduce Impacts to Wildlife, Habitats, and the Public
D. Status of Effected Species and Habitats
E. References

Attachment A: Impacts to Wildlife, Habitats and the Public

Shorebirds and Waterfowl

Species Affected: The action area is located within the highest use area of the Refuge by migratory birds (up to 87 birds/acre; Complex, Unpublished Data 2013-2015). Waterfowl abundance significantly increases from Nov – Feb. Daily high counts include 3,000 Brant, 5,000 Northern Pintail, 6,000 Mallard, 5,000 American Wigeon; with smaller numbers (20-100) of molluscivorous ducks (i.e., scoters, Harlequin Duck and goldeneyes; Complex, Unpublished Data 2010-2018). These shorelines also support one of the largest Brant haul out sites in the state of Washington. Dungeness Bay and Harbor support the largest concentration of molting scoters during fall in Washington and serve as a migration nexus for a much broader spectrum of the Pacific Brant population than any other estuary within the Salish Sea (J. Evenson and K. Spragens, pers comm). Dabbling ducks and Brant forage on eelgrass and Ulva species while sea ducks feed on mollusks and herring spawn when available.

We observe daily high counts of up to 4,000 shorebirds in the area during spring migration and 2-3,000 during the winter months (Complex, Unpublished Data 2010-2018). Given stopover rates of 1-3 days on migration, this accounts for approximately 15-20,000 shorebirds using the Refuge during spring migration alone (Warnock and Bishop 1998). The North Pacific Coast Regional Shorebird Management Plan identifies Dungeness Bay as a site that qualifies as a Western Hemisphere Shorebird Reserve Network site of Regional Importance (Drut and Buchanan 2000). Given recent numbers, this criteria still applies. Shorebird densities are highest within the action area and the adjacent lagoon on Graveyard Spit. They prefer substrates composed of fine silt virtually devoid of vegetation where they forage on micro-invertebrates in the substrate (Warnock and Gill 1996). Dunlin are the most abundant species during the winter months while key migrants include Western and Least Sandpipers. Up to three pairs of Black Oystercatchers are residents of the refuge. They forage for limpets, clams and oysters on the Refuge.

Impacts: Human-caused wildlife disturbance and habitat loss are two of the most pervasive threats to shorebird and waterfowl use of the Salish Sea. Human disturbance during the overwintering and spring staging periods can result in reduced productivity or survival for high arctic breeders such as shorebirds and Brant (Buchanan 2006, Lewis et al 2013). Given the high abundance of waterfowl and shorebirds found in the action area, scheduling activities to coincide during periods of least impact is important. The most recent lease for this site extending from 2005 -2017 provided for access to a 100ft^2 area and recognized the importance of Dungeness Bay for brant and other waterfowl by limiting most work to May 15 - July 30 (DNR 2005). It is likely that birds will be found in the action area and that roosting on aquaculture structures

and/or depredation of oysters will occur. Active hazing, particularly if scheduled to coincide with times when birds are most likely to be present would cause significant impacts to Refuge wildlife and wildlife-dependent recreation.

Throughout the state, very little information is available on entrapment resulting from aquaculture structures. As identified by the Corps (2015), routine inspections for and reporting of fish or wildlife found entangled in nets or other shellfish equipment is an important conservation measure.

Many species are drawn to the action area and surrounding Dungeness Harbor due to the abundant supply of forage resources including forage fish and eelgrass. Reductions in forage resources (i.e., eelgrass, forage fish, micro-invertebrates) can limit annual reproductive success or populations of shorebirds and waterfowl. In 2016, a die-off of approximately 1,000 Rhinoceros Auklets on Protection Island coincided with a significant reduction in the abundance of sand lance in the Strait of Juan de Fuca. These birds rely on sand lance for 51% of their diet during the breeding season (Pearson pers comm). Protection Island is only 10 miles from the action area and supports the third largest Rhinoceros Auklet colony in the lower 48. Similarly, scoters have undergone significant population declines of up to 50% in the Salish Sea, due in part to a reduction in foraging sites and resources (predominantly herring spawn; Buchanan 2006, WDFW 2015). They rely heavily on Dungeness Bay with the largest concentration of scoters found in the area during the fall molt (J. Evenson, pers. Comm.). Habitat loss and degradation resulting from changes in deposition of sediment and nutrients, can also pose threats to shorebirds. For instance, Kelly et al (1996) found that Dunlin and Western Sandpiper significantly avoided areas used for aquaculture in Tomales Bay. Loss of habitat can result in reduced foraging efficiency and overwintering survival due to increased density at remaining sites. Those species that prey on forage fish may indirectly ingest plastics and adsorbed contamination through bioaccumulation in food webs resulting in reproductive disorders or death (Derraik 2002, Teuten et al. 2009, Rochman et al 2013).

Finally, Graveyard Spit is the location of the highest infestation of European Green Crab within the Salish Sea. Oyster bags resting on the shoreline may also provide habitat for green crab. If these bags are then carried to another area by the tide, or removed during a marine debris cleanup, crabs may be transported to a non-infested location. The state of Washington has not yet created a European Green Crab management plan for the Salish Sea.

Forage Fish

Species Affected: Nearshore habitats within Dungeness Harbor provide vital habitat for forage fish (see Figure 1; Penttila 2007) as well as species that prey on them including juvenile Chinook salmon; Marbled Murrelets and Rhinoceros Auklets; scoters and Harlequin Duck; and Bull Trout and Lingcod (Duffy et al 2010, S. Pearson, pers comm, LaCroix et al 2005, Beaudreau and Essington 2007).

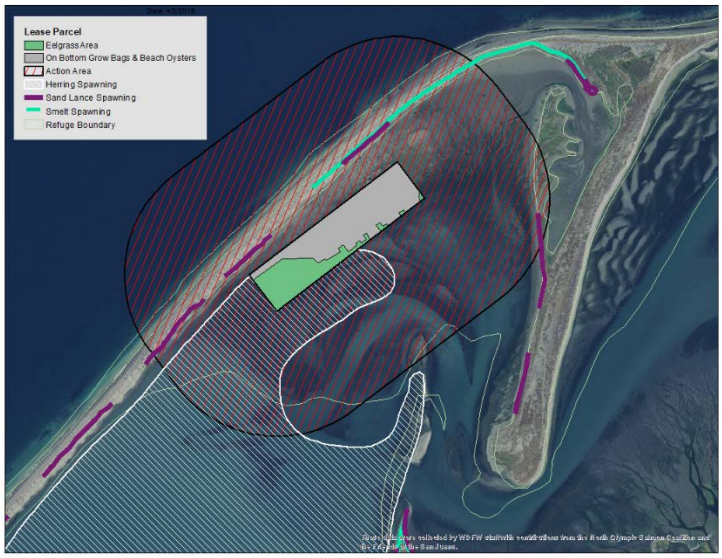

Figure 1. Action area and forage fish spawning habitat.

A portion of the Dungeness/Sequim Bay Pacific Herring stock spawning grounds are located in the west end of Dungeness Harbor and can occur within the action and lease areas (the extent depicted in the map reflects the cumulative documented spawning grounds since 1975; Stick et al 2014). Because of the importance of herring in the Puget Sound ecosystem, the spawning biomass of Puget Sound herring was selected as a vital sign indicator of the health of the Sound by the Puget Sound Partnership (Stick et al 2014). This stock is listed as moderately healthy; however, it may be the same as the Strait of Juan de Fuca regional stock, which is listed as critical (Stick et al 2014). Herring typically spawn within Dungeness Bay from mid-January through March. Pacific Herring spawning habitat is the most important life history component that can be managed and is reliant on the presence of marine vegetation, primarily eelgrass for egg deposition (Penttila 2007). A vital period in the life cycle of Pacific Herring occurs during the first week after hatching when the larvae drift in the water column. If they do not encounter sufficient plankton to survive, the entire year class of that stock may be at risk (Stick and Lindquist 2009). Herring are generally found in deep water during the day and shallow at night; with juvenile Pacific Herring commonly rearing in shallow depths (a few ft.), even in the daytime (USFWS 2016).

Pacific sand lance and surf smelt spawning beaches can be found on the northern shore of Dungeness Harbor within the action area. Pacific sand lance are predominantly found in Dungeness Harbor and Bay from November through February, while surf smelt spawn May through February. Both require beaches and have specific sand and gravel grain size requirements for spawning (Penttila 2007). They are considered Washington Species of Greatest Conservation Need within the State Wildlife Action Plan (WDFW 2015). Surf smelt and young Pacific sand lance will remain close to the shoreline and feed on macro zooplankton. During spring and summer months, Pacific sand lance forage in the water column during the day and burrowing in the benthic substrate at night (Penttila 2007, USFWS 2016).

Impacts: There will be measurable, temporal losses of marine forage fish spawning habitat and production resulting from shellfish aquaculture (USFWS 2016). However, the Corps identifies

conservation measures necessary to minimize or mitigate those effects (Corps 2015). Yet competition for forage resources (e.g. phytoplankton; Asmus and Asmus 1991) between filter-feeding bivalves and herring larva during their first week or two of life was not addressed by the Biol Op conservation measures. If larva do not encounter sufficient plankton to survive, the entire year class of that stock may be at risk (Stick and Lindquist 2009).We do not know of any conservation measures, short of reducing the size and scope of aquaculture projects that could reduce this impact. In addition, Pacific Herring are susceptible to any limitations in eelgrass beds as they are essential to providing a rich mix of prey species and cover. This is particularly significant considering that Pacific Herring typically live for only 8 years (Stick and Lindquist 2009).

Marine forage fish also ingest plastics, chemical plastic additives, and adsorb contamination (Rochman et al. 2013). These persistent, toxic substances are found on recovered plastic debris that can bioaccumulate in food webs (e.g. forage fish and higher predators such as seabirds and anadromous fish) leading to several adverse effects including reproductive disorders, endocrine disruption or death (Derraik 2002, Teuten et al 2009, Rochman et al 2013). Reducing the amount of plastic containing aquaculture equipment may reduce these impacts.

Important Habitat for Affected Species

Habitats Affected: Clallam County Natural Environment designation provides that activities on shorelines of a Natural Environment should be confined to those which conserve the features and characteristics which are an integral part of this environment, and that it should be limited to those activities which preserve the natural features unchanged (Clallam County 1976). As mentioned previously, State Imperiled Habitats, a Research Natural Area, a National Wildlife Refuge, and an Important Bird Area are found within the action area. Other important natural habitats within this area include mudflats, a barrier lagoon and eelgrass beds adjacent to the project area.

Eelgrass Beds -Many species forage on eelgrass including Brant and macroinvertebrates, while others are tied to it as important habitat including anadromous and forage fish. In recognition of this, the Puget Sound Partnership established eelgrass as an indicator – or "vital sign" – of the health of Puget Sound in recognition of the regional ecosystem services it provides and its sensitivity to changes in environmental conditions. In 2011, the Puget Sound Partnership adopted a 2020 target to increase eelgrass extent by 20%. The 2014/2015 Puget Sound Action Agenda tasked DNR, in collaboration with the Puget Sound Partnership, to develop a comprehensive recovery strategy to advance eelgrass recovery (DNR 2015).

Common eelgrass can be found within Dungeness Bay and Harbor within and adjacent to the application area. Although we have a general understanding of eelgrass presence within the lease area, we are not aware of any surveys within the action or lease areas that meet protocols adopted by the US Army Corps of Engineers Seattle District (Corps 2016). A general presence absence survey was completed in July 2016 and two surveys using remote sensing equipment (e.g., photography, video, sonar) were completed in 1993 and 2009, but they do not meet protocol requirements.

Water temperature, quality (nutrient and contamination levels), and light penetration (clarity) affect eelgrass growth patterns and densities. As conditions and other environmental factors

stress the plants, their coverage becomes patchier. A key factor in growth includes the absence of ground disturbing activities from May through early September.

Techniques utilized by previous aquaculture operations (e.g., dredging) historically impacted eelgrass within the lease area. In 2005, the active aquaculture area was reduced to a 100ft^2 area and dredging was no longer permitted on the site. During the 2016 presence/absence survey, observers noted revegetation of eelgrass within the lease area and thicker areas of eelgrass within the action area. It is likely that eelgrass will continue to expand into fallow areas.

Barrier Lagoons and Mudflats -Barrier lagoons and mudflats consist of a substrate primarily composed of fine silt with a shallow-gradient benthic layer and minimal to no vegetation. This type of benthic layer is key for migratory and overwintering shorebirds as it is more conducive to marine invertebrate productivity and survival and preserves sightlines necessary for shorebirds to monitor the approach of predators or other perceived threats. Barrier lagoons and mudflats provide foraging habitat for Dunlin, Western and Least Sandpiper, Sanderling, Black-bellied Plover, Black Oystercatcher and Glaucous-winged Gulls. Brant, American Wigeon, Northern Pintail, Mallard, and Green-winged Teal forage and loaf in this habitat type especially during migration and the winter months. Dungeness crab, anadromous and forage fish can be found within this habitat type throughout the year.

Impacts: The applicant's willingness to provide a 25" buffer from eelgrass beds and the Activities Excluded from Programmatic Coverage and Conservation Measures (Corps 2015, USFWS 2016) will largely avoid and effectively reduce impacts to submerged aquatic vegetation that might otherwise result from this proposal. However a recent eelgrass survey in the action area will be necessary to avoid impacts from activities occurring outside of the lease area (e.g., landing small craft to collect marine debris and to assess changes to eelgrass over time.

The aquaculture application highlights the potential for cultivated oysters to increase recruitment and growth of oysters for recreational harvest outside of the lease area. Increased growth of non-native oysters outside the lease has potential to reduce available substrate for eelgrass growth and native shellfish. The introduction of a non-native species to areas outside of the lease would also not meet the goals and objectives for managing this habitat for Refuge purposes. Clallam County Natural Environment Policy also encourages efforts to restore natural shorelines to their original conditions (Clallam County 1976). The use of triploid oysters or the production of native shellfish could reduce/eliminate expansion of non-native oysters outside of the lease area.

The most damaging impacts to mudflats would be seen if harrowing, frosting, and or graveling were utilized. These techniques will most likely result in measurable long-term and persistent effects to substrates and sediment (USFWS 2016). Mechanical leveling and harrowing turn over the surficial substrates and shallow subsurface. This has measurable effects on particle size, sediment chemistry, nutrient status, and aspects of benthic-water column dynamics (Rhoads and Germano 1986, Newell 2004, Forchino 2010, Gutierrez et al. 2011). Mechanical leveling and harrowing also disturbs, physically alters, and can damage or kill benthic infauna and microalgae, sessile epibenthic invertebrates, and attached submerged aquatic vegetation.

The Biol. Op. notes that many of the existing farms are managed in a more or less permanently (or chronically) disturbed state (USFWS 2016). Impacts to eelgrass and mudflat sediment can cascade and affect production of other estuarine, marine, and anadromous populations

(Simenstad and Fresh 1995). For instance, when feeding in estuarine habitats, particularly in eelgrass meadows and mud flats, migratory waterfowl, shorebirds, juvenile chum and Chinook salmon, smelt, sand lance, and stickleback each prey extensively on only a few types of benthic organisms or micro-invertebrates (Simenstad and Fresh 1995; Healey 1979; Simenstad et al. 1982, 1988; D'Amours 1987; Dunford 1975; Levy and Northcote 1982). The ability for an individual species to find adequate forage would be impacted if sediment disturbance greatly reduced the availability of even one or two species of micro-invertebrates. Frosting, graveling pre-harvesting and conducting predator control can all shift the composition of important micro-invertebrate and benthic forage species and reduce abundance, biomass, and diversity (WDFW 1988; Thompson and Cooke 1991; Thompson, 1995; WDFW and Fisheries Research Institute, University of Washington unpublished data). Placement of up to 150,000 oyster bags also has the potential to change water flow and nearshore transport of sediment along the spit. This may result in changes to sediment deposition and a shift in grain size on forage fish spawning areas, removing spawning from these areas.

Federally Listed Species

Biological opinions written by the USFWS and NOAA – NMFS provide thorough assessments of the impacts and conservation measures to listed species. Below is a list of those species that occur within the action area. Further information regarding the effects and conservation measures can be found within the two Biological Opinions (USFWS 2016, NOAA 2016).

- Bull Trout
- Marbled Murrelet
- Puget Sound Chinook
- Hood Canal Summer Chum

State Listed Habitats

Temperate Pacific Low Salt Marsh and North Pacific Maritime Coastal Sand Dune and Strand are listed by the State of Washington as Imperiled habitats. These wetland habitats can be found within and directly adjacent to the action area. Concerns for these habitats stem from marine debris, which can build up on shore and leach contaminants into the sediment as well as damage key plant assemblages leaving space for colonization by non-native species.

Impacts: Marine debris associated with aquaculture practices is regularly found on the shores of Protection Island, Graveyard Spit, and Dungeness Spit. On Graveyard Spit, oyster bags are often found entangled in the saltmarsh vegetation and cannot be removed without damaging this important habitat. As mentioned previously, the type of saltmarsh found on Graveyard Spit is listed as a State Imperiled Habitat. The addition of an aquaculture operation using a maximum of 75,000-150,000 oyster bags will increase the amount of micro- and macro-plastic on Salish Sea shorelines, especially within these habitats. The cumulative impacts of this increase in addition to the large amount of debris already released by local operations should be assessed and addressed. Removal of marine debris is difficult, because the removal process itself can damage vegetation and increase disturbance to sediments and high use wildlife areas.

Public Access, Recreation & Aesthetics

Dungeness NWR receives approximately 95,000 - 100,000 visitors/yr. In 2011, Refuge visitors were estimated to spend over $1.9 million in Clallam County communities, with non-residents accounting for $1.5 million of expenditures (Carver and Caudill 2013). Most Refuge visitors engage in non-consumptive uses on the Refuge.

Impacts: A commercial aquaculture operation of this size has the potential to negatively impact the public in several ways. In order to assess the impacts of the proposed operation on aesthetic qualities important to the visiting public and outlined in Clallam County Natural Environment Policy which states, "scenic vistas and aesthetic qualities should be preserved without alteration" (Clallam County 1976), it is important to understand the conditions under which structures associated with the operation will be seen. The application describes the operation's structures as 2' wide x 3' long oyster bags attached together and anchored with line, with 6' aisles between rows of bags. If bags meeting these criteria are mapped in GIS, it appears that the bags would have to be overlapped to fit 150,000 bags within a 34 acre area. Different portions of the application package also describe the vertical height of these bags as <0.5', <1', and 2', making it unclear how far the bags will project from the substrate. Given that some of the bags will be placed between 0 and +3 tidal elevation, and that the height of the bags are somewhere between 0.5' and 2', it is unclear how they will only be seen during a minus tide. Visitors to Dungeness NWR view this location from two spotting scopes affixed to overlooks on the Refuge's Main Trail. Many local residents and visitors also view shorebirds and waterfowl on and adjacent to this area throughout the year from other elevated shoreline areas that surround this site, including Marine Drive and the spine of Dungeness Spit. Given the elevated nature of these viewing locations and the fact that most wildlife observers utilize binoculars, spotting scopes and/or cameras with zoom lenses, it is unclear how 75,000-150,000 oyster bags will only be seen at a range of <100 yards.

Tidelands associated with this application are only open to public use from May 15 - September 30, to reduce disturbance to wintering waterfowl and migrating shorebirds. A private lease reduces public access to a portion of the tidelands during the open period. Visitors to the tidelands can participate in boating, kayaking, wildlife viewing, photography and shell fishing. A private lease eliminates the opportunity for visitors to shellfish within the lease area, and 0.5' - 2' tall oyster bags (or higher if overlapping) placed at -3 - +3 tidal elevation have the potential to restrict access for kayakers and other shallow water boaters. At lower tides, rows of touching or overlapping bags will create the same effect as a low berm or wall impeding access. Increased human activity within the area will also reduce the ability for local residents and visitors to view waterfowl and shorebirds.

The application highlights the potential for cultivated oysters to increase recruitment and growth of oysters for recreational harvest outside of the lease area. As noted in the discussion on impacts to eelgrass, the introduction or enhancement of non-native oysters on the Use Easement Deed for the purposes of recreational harvest would negatively impact the management of these lands for refuge purposes. Restoration of native Olympia oysters, or management to increase populations of other native shellfish would be the appropriate action to provide additional recreational shellfish opportunities consistent with Refuge and County policies. In order to decrease the recruitment of non-native oysters outside of the lease area onto Refuge and Natural Environment tidelands, it would be beneficial for the applicant to use triploid oysters.

Increased activity in this high use waterfowl area could cause waterfowl to fly further from hunting areas to find refuge during the hunt season. Waterfowl that are chased too far from hunting areas might choose to move to another area, reducing hunting opportunities adjacent to the Refuge (six private and public hunt areas are located within approximately 2 miles of the Refuge).

Attachment B: Restricted Actions and Conservation Measures from the Biol Op

The Biol Op lists restricted activities and conservation measures designed to address the impacts of activities conducted under the Programmatic. Listed below are restrictions that will also benefit non-listed wildlife and habitats (Corps 2015, p. 39):

1. Vertical fencing/vertical nets or drift fences (includes oyster corrals).
2. New berms or dikes or the expansion or maintenance of current, authorized berms or dikes.
3. Use of a hopper-type barge or other method that results in material (i.e. gravel or shell) placed during graveling or frosting activities that is thicker than 1 inch in depth even for short periods.
4. Pile driving.
5. Installation and maintenance of mooring buoys.
6. Construction, maintenance, and operation of upland hatcheries.
7. Cultivation of shellfish species not previously cultivated in the action area.
8. Construction, maintenance, and operation of attendant features, such as docks, piers, boat ramps, stockpiles, or staging areas.
9. Deposition of shell material back into waters of the United States as waste.
10. Dredging or creating channels to redirect fresh water flow.
11. Installation of new rafts, floats, or FLUPSYs, or the relocation or expansion of continuing rafts, floats, or FLUPSYs.
12. Any form of chemical application to control undesired species (e.g., non-native eelgrass, Zostera japonica; ghost shrimp, Neotrypaea californiensis; mud shrimp, Upogebia pugettensis).
13. Use of materials that lack structural integrity in the marine environment (e.g. plastic children's wading pools, unencapsulated Styrofoam®).
14. Unauthorized activities.

In addition, the Corps and USFWS developed Conservation Measures designed to mitigate effects to listed species (Corps 2015, pp. 49-53). The measures provided by the Complex in Attachment C differ from the following measures because they provide mitigation measures for site-specific impacts to refuge wildlife and habitats that may not have been assessed by the Biol Op. In addition, several of the Conservation Measures identified by the Biol Op will cause increased impacts to Refuge visitation, wildlife and habitats (e.g. marine debris removal) and may require separate permitting to assure that it meets Refuge regulations (e.g. Compatibility Determinations and Special Use Permits). Where conservation measures differ, we request that site-specific conservation measures be used (e.g. timing). The following are most relevant to Refuge wildlife and habitats:

1. Gravel and shell shall be washed prior to use for substrate enhancement (e.g., frosting, shellfish bed restoration) and applied in a way that results in less than 1 inch depth on the substrate annually. Shells shall be cleaned or left on dry land for a minimum of one month, or both, before placement in the marine environment. Shells from the local area shall be used whenever possible. Shell or gravel material shall not be placed so that it

creates piles on the substrate. Use of a split-hull (e.g., hopper-type) barge to place material is prohibited.

2. The placement of gravel or shell directly into the water column (i.e., graveling or frosting) shall not be conducted between February 1 and March 15 in designated critical habitat for Hood Canal summer chum salmon.
3. For 'new' activities only, gravel or shell material shall not be applied to enhance substrate for shellfish activities where native eelgrass* or kelp is present. [*Note: Where the conservation measures refer to native eelgrass, they refer to and use the definition, description, and methods of delineation that have been endorsed and adopted by the Corps' Seattle District (Corps 2016).]
4. For 'new' activities only, shellfish shall not occur within 16 horizontal ft. of native eelgrass (Zostera marina). If eelgrass is present in the vicinity of an area new to shellfish activities, the eelgrass shall be delineated and a map or sketch prepared and submitted to the Corps.
5. For 'new' activities only, activities shall not occur above the tidal elevation of +7 ft. MLLW if the area is listed as documented surf smelt spawning habitat by WDFW.
6. For 'new' activities only, activities shall not occur above the tidal elevation of +5 ft. MLLW if the area is listed as documented Pacific sand lance spawning habitat by WDFW.
7. If conducting shellfish farming activities within a documented or potential spawning area for Pacific herring outside the approved work window (see Seattle District Corps website), the work area shall be surveyed for the presence of herring spawn prior to the activity occurring. If herring spawn is present, these activities are prohibited in the areas where spawning has occurred until the eggs have hatched and herring spawn is no longer present.
8. For 'new' activities only, activities occurring in or adjacent to potential spawning habitat for sand lance or surf smelt shall have a spawn survey completed in the work area by an approved biologist prior to undertaking bed preparation, maintenance, and harvest activities if work will occur outside approved work windows for these species. If eggs are present, these activities are prohibited in the areas where spawning has occurred until the eggs have hatched and spawn is no longer present.
9. All tubes, mesh bags, and area nets shall be clearly, indelibly, and permanently marked to identify the permittee name and contact information (e.g., telephone number, email address, mailing address).
10. All equipment and gear shall be tightly secured to prevent them from breaking free.
11. At least once every three months, beaches in the project vicinity will be patrolled by crews who will retrieve debris that escapes from the project area.
12. When performing other activities on-site, the grower shall routinely inspect for and document any fish or wildlife found entangled in nets or other shellfish equipment.
13. Vessels shall not ground or anchor in native eelgrass (Zostera marina) and paths through native eelgrass or kelp shall not be established.
14. Native salt marsh vegetation shall not be removed and disturbance shall be limited to the minimum necessary to access or engage in shellfish activities.

Attachment C: Recommended Refuge Specific Conservation Measures to Reduce Impacts to Wildlife, Habitats, and the Public

The following recommendations are provided to reduce impacts to Refuge wildlife, habitats, public access recreation and aesthetics in addition to those provided in the Biol Op, the DCD Staff Report and the Jamestown S'Klallam Tribe's application:

1. No hazing or lethal control of depredating birds.
2. Notify Dungeness NWR staff as well as WDFW of any stranding or entanglement within 24 hours. Photograph and record the event.
3. Limit human activity within the action area to March 15-April 15, June, July, and October 15 - November 15.
4. Limit ground disturbing activities in the lease area to the work windows supplied by the Corp (2015) to reduce impacts to forage fish.
5. Marine debris related to *past* aquaculture activities, within areas of eelgrass and saltmarsh vegetation should be recorded and reported to the Complex, but not removed.
6. To reduce disturbance to wildlife, damage to sensitive habitats and potential spread of European Green Crab, observe and record marine debris from waters outside of the Refuge boundary October 1 - May 14 or from waters outside of the 100-yard buffer and eelgrass (during lower tides) May 15 - September 30. Report amounts and locations to Complex staff.
7. Allow on-beach oyster methods only, or reduce the number of oyster bags to reduce plastics in the environment and impacts to public access, recreation and aesthetics.
8. No harrowing
9. No gravelling or frosting
10. Do not remove of native species that prey on oysters (e.g. Dungeness Crab).
11. Do not used antifouling or antibiotics unless proven to be benign to macro-invertebrates (Dungeness Crab) and micro-invertebrates.
12. Cultivate only Olympia oysters or triploid Pacific oysters.
13. Survey baseline eelgrass levels in the lease area to meet the protocol adopted by the US Army Corps of Engineers Seattle District (Corps 2016)
14. Provide a baseline beach profile and sediment grain size survey within the action area. Resurvey every year and restructure, or reduce oyster bags if sediment profiles and/or grain sizes begin shifting away from preferred forage fish spawning criteria.
15. If operations are discontinued, all marine debris must be removed from the site before abandonment.

Attachment D: Status of Affected Species and Habitats

Species or Habitat	Federal Status	State Status (highest rank listed)	Critical Habitat
Marbled Murrelet	Threatened	Threatened	
Bull Trout	Threatened	Candidate	X
Puget Sound Chinook	Threatened	Candidate	X
Hood Canal Summer Chum	Threatened	Candidate	X
Southern Resident Killer Whale	Endangered	Endangered	X
Harlequin Duck	Concern	Sp Greatest Cons Need (SGCN)	
Black Oystercatcher	FWS Focal Species		
Temperate Pacific Low Salt Marsh		Imperiled	
North Pacific Maritime Coastal Sand Dune and Strand		Imperiled	
Pacific Herring		Candidate	
Common Loon		Candidate	
Western High Arctic Brant		SGCN	
Surf Smelt		SGCN	
Sand Lance		SGCN	
Surf Scoter		SGCN	
Black Scoter		SGCN	
White-winged Scoter		SGCN	
Bald Eagle		SGCN	
Barrows Goldeneye		SGCN	

Attachment E: References

Asmus, R.M. and H. Asmus. 1991. Mussel beds: limiting or promoting phytoplankton? Journal of Experimental Marine Biology and Ecology 148(2): 215-232.

Beaudreau, A.H. and T.E. Essington. 2007. Spatial, Temporal, and Ontogenetic Patterns of Predation on Rockfishes by Lingcod.
Transactions of the American Fisheries Society 136(5): 1438-1452.

Buchanan, J.B. 2006. Nearshore birds in Puget Sound. Puget Sound Nearshore Partnership Report number 2006-05. Seattle District, U.S. Army Corps of Engineers. Seattle, WA. 17 pgs.

Carver, E. and J. Caudill. 2013. Banking on Nature 2013: The Economic Benefits to Local Communities of National Wildlife Refuge Visitation. US Fish and Wildlife Service.

Clallam County. 1976. Clallam County Shoreline Master Program. Clallam County, WA 10 pgs.

D'Amours, D. 1987. Trophic phasing of juvenile chum salmon (Oncorhynchus keta Walbaum) and harpacticoid copepods in the Fraser River estuary, British Columbia. Ph.D. Dissertation, University of British Columbia, Vancouver, British Columbia, Canada.

Department of Ecology (DOE). 2009. Shoreline master programs handbook. Olympia, WA. 626 pgs. Available online at
https://fortress.wa.gov/ecy/publications/summarypages/1106010.html

Department of Natural Resources (DNR). 2015. Puget Sound Eelgrass (Zostera marina) Recovery Strategy. Aquatic Resources Division, Olympia, Washington. 47pg.

Department of Natural Resources (DNR). 2005. Aquatic lands oyster and geoduck aquaculture lease No. 20-Al3012. WA Department of Natural Resources, Aquatic Lands Division, Sedro Woolley, WA, 40 pgs.

Derraik, José G.B. 2002. The pollution of the marine environment by plastic debris: a review. Marine Pollution Bulletin 44 (9): 842-852.

Drut, M. and J.B. Buchanan. 2000. U.S. shorebird conservation plan: Northern Pacific Coast regional shorebird management plan. U.S. Fish and Wildlife Service, Portland, OR. 31 pgs.

Duffy, E.J., D. A. Beauchamp, U. RUSTON, M. Sweeting and R. J. Beamish, J.S. Brennan. 2010. Juvenile Chinook Salmon in Nearshore and Offshore Habitats of Puget Sound. Transactions of the American Fisheries Society 139:803–823,

Dunford, W. E. 1975. Space and food utilization by salmonids in marsh habitats of the Fraser River estuary. M.S. Thesis, University of British Columbia, Vancouver, British Columbia, Canada.

Forchino, A.A. 2010. Development and application of a marine biotic index for the evaluation of the influence of aquaculture activities on the benthic ecosystem in Mediterranean coastal areas. University of Insubria, Varese, Department of Biotechnology and Molecular Sciences. December 2010. 143pp.

Gutierrez, J.L., C.G. Jones, J.E. Byers, K.K. Arkema, K. Berkenbusch, J.A. Commito, C.M. Duarte, S.D. Hacker, I.E. Hendriks, P.J. Hogarth, J.G. Lambrinos, M.G. Palomo and C. Wild. 2011. Physical ecosystem engineers and the functioning of estuaries and coasts. 113pp. In Heip, C.H.R., C.J.M. Philippart, and J.J. Middelburg, eds. (Volume 7) Functioning of estuaries and coastal ecosystems. Treatise on Estuarine and Coastal Science, Elsevier.

Healey, M.C. 1979. Detritus and juvenile salmon production in the Nanaimo estuary: I. Production and feeding rates of juvenile chum salmon (Oncorhynchus keta). Journal of the Fisheries Research Board of Canada 36:488-496.

Kelly, J.P., J.G. Evens, R.W. Stallcup and D. Wimpfheimer. 1996. The effects of aquaculture on habitat use by wintering shorebirds. California Fish and Game. 82(4): 160-174.

LaCroix, D.L., S. Boyd, D. Esler, M. Kirk, T. Lewis and S. Lipovsky. 2005. Surf Scoters Melanitta perspicillata aggregate in association with ephemerally abundant polycheates. Marine Ornithology 33: 61-63.

Levy, D. A. and T .G. Northcote. 1982. Juvenile salmon residency in a marsh area of the Fraser River estuary. Canadian Journal of Fisheries and Aquatic Sciences 44:1233-1246.

Lewis, T. L., D. H. Ward, J. S. Sedinger, A. Reed and D. V. Derksen. 2013. Brant (Branta bernicla), version 2.0. In The Birds of North America (A. F. Poole, Editor). Cornell Lab of Ornithology, Ithaca, NY, USA. https://doi.org/10.2173/bna.337

National Oceanic and Atmospheric Administration – National Marine Fisheries Service. 2016. Endangered Species Act Section 7 Formal Biological Programmatic Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for Shellfish Aquaculture Activities in Washington State (COE Reference Number NWS-2014-12). Prepared by NOAA National Marine Fisheries Service, West Coast Division, Seattle, Washington. September 2016.

Newell, R.I.E. 2004. Ecosystem influences of natural and cultivated populations of suspension-feeding bivalve molluscs: a review. Journal of Shellfish Research 23(1):51-61.

Northcote, T. G., N. T. Johnson and K. Tsumura. 1979. Feeding relationships and food web structure of lower Fraser River fishes. Westwater Research Centre Technical Report 16. University of British Columbia, Vancouver, British Columbia, Canada.

Penttila, D. 2007. Marine forage fishes in Puget Sound. Prepared in support of the Puget Sound Nearshore Partnership. Published by Seattle District, U.S. Army Corps of Engineers, Seattle, Washington. Technical Report 2007-03. 30pp.

Rhoads, D.C. and J.D. Germano. 1986. Interpreting long-term changes in benthic community structure: a new protocol. Hydrobiologia 142:291-308.

Rochman, C.M., E. Hoh, T. Kurobe and S.J. Teh. 2013. Ingested plastic transfers hazardous chemicals to fish and induces hepatic stress. Scientific Reports 3(3263):1-7.

Simenstad, C.A., K.L. Fresh, and E.O. Salo. 1982. The role of Puget Sound and Washington coastal estuaries in the life history of Pacific salmon: An unappreciated function. pp. 343-364 in V.S. Kennedy (ed.) Estuarine Comparisons. Academic Press, New York. 709 pgs.

Simenstad, C.A., J.R. Cordell, R.C. Wissmar, K.L. Fresh, S.L. Schroder, M. Carr, G. Sanborn and M. Burg. 1988. Assemblage structure, microhabitat distribution and food web linkages of epibenthic crustaceans in Padilla Bay national Estuarine Research Reserve, Washington. NOAA Technical Report Series OCRM/MEMD NA86AA-D-CZ027. FRI-UW-8813, School Fisheries, Univ. Washington. Seattle. WA.

Simenstad, C.A. and K.L. Fresh. 1995. Influence of intertidal aquaculture on benthic communities in Pacific Northwest estuaries: scales of disturbance. Estuaries 18(1A):43-70.

Stick, K.C, and A. Lindquist. 2009. 2008 Washington State herring stock status report. Stock Status Report No. FPA 09-05 (November 2009). Washington Department of Fish and Wildlife, Fish Program, Fish Management Division, Olympia, Washington. 111pp.

Stick, K.C, A. Lindquist and D. Lowry. 2014. 2012 Washington State herring stock status report. Stock Status Report No. FPA 14-09 (July 2014). Washington Department of Fish and Wildlife, Fish Program, Fish Management Division, Olympia, Washington. 106pp.

Teuten, E.L., J.M. Saquing, D.R.U. Knappe, M.A. Barlaz, S. Jonsson, A. Bjorn, S.J. Rowland, R.C. Thompson, T.S. Galloway, R. Yamashita, D. Ochi, Y. Watanuki, C. Moore, P.H. Viet, T.S. Tana, M. Prudente, R. Boonyatumanond, M.P. Zakaria, K. Akkhavong, Y. Ogata, H. Hirai, S. Iwasa, K. Mizukawa, Y. Hagino, A. Imamura, M. Saha and H. Takada. 2009. Transport and release of chemicals from plastics to the environment and to wildlife. Philosophical Transactions of the Royal Society B: Biological Sciences 364:2027-2045.

Thompson, D.S. 1995. Substrate additive studies for the development of hardshell clam habitat in waters of Puget Sound in Washington state: An analysis of effects on recruitment, growth, and survival of the Manila clam, Tapes philippinarum, and on the species diversity and abundance of existing benthic organisms. Estuaries 18:91-107.

Thompson, D. and W. Cooke. 1991. Enhancement of hardshell clam habitat by beach graveling, p. 521-527. In Proceedings Puget Sound Research '91, Puget Sound Water Quality Authority.

U.S. Army Corps of Engineers (Corps). 2015. Programmatic Biological Assessment Shellfish Activities in Washington State Inland Marine Waters. U.S. Army Corps of Engineers Regulatory Program, Seattle, WA.

U.S. Army Corps of Engineers (Corps). 2016. Components of a Complete Eelgrass Delineation and Characterization Report. Seattle, WA http://www.nws.usace.army.mil/Portals/27/docs/regulartory/Forms/Components%20of%20Eelgrass%20Delineation%205-27-16?ver=2016-05-27-131522-740

U.S. Fish and Wildlife Service (USFWS). 2016. Biological Opinion - Programmatic Consultation for Shellfish Activities in Washington State Inland Marine Waters - Clallam, Grays Harbor, Island, Jefferson, King, Kitsap, Mason, Pacific, Pierce, San Juan, Skagit, Snohomish, Thurston, and Whatcom Counties, Washington (Ref. No. OlEWFW00-2016-F-0121). Prepared by the Western Washington Fish and Wildlife Office, Lacey, Washington. August 2016.

Vanblaricom, G.R., J.L. Eccles, J.D. Olden and P.S. McDonald. 2015. Ecological effects of the harvest phase of geoduck (Panopea generosa Gould,1850) aquaculture on infaunal communities in southern Puget Sound, Washington. Journal of Shellfish Research, 34(1):171-187.

Warnock, N.D. and M.A. Bishop. 1998. Spring stopover ecology of migrant western sandpipers. Condor 100:456-467.

Warnock, N.D. and R.E. Gill. 1996. Dunlin (Calidris alpina), The Birds of North America Online (A. Poole, Ed.). Ithica: Cornell Lab of Ornithology.

Washington Department of Fish and Wildlife. 1988. The enhancement of hardshell clam production by beach graveling. Final Environmental Impact Statement. Washington Department of Fish and Wildlife, Olympia, Washington.

Washington Department of Fish and Wildlife. 2015. Washington's State Wildlife Action Plan: 2015 Update. Washington Department of Fish and Wildlife, Olympia, Washington, USA.