EXHIBIT 8

CONFLUENCE
ENVIRONMENTAL COMPANY

Oakland Bay Floating Culture
HABITAT MANAGEMENT PLAN

Prepared for:

Taylor Shellfish Farms
September 2022

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Oakland Bay Floating Culture

HABITAT MANAGEMENT PLAN

Prepared for:

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ACRONYM LIST

Acronym	Definition
BMP(s)	best management practice(s)
Corps	U.S. Army Corps of Engineers
DNR	Washington Department of Natural Resources
DPS	distinct population segment
Ecology	Washington State Department of Ecology
ESA	Endangered Species Act
ESU	evolutionarily significant unit
FLUPSY	Floating Upweller System
FWHCA(s)	fish and wildlife habitat conservation area(s)
HDPE	high density polyethylene
HMP	Habitat Management Plan
MCC	Mason County Code
MLLW	mean lower low water
NMFS	National Marine Fisheries Service
OBCWD	Oakland Bay Clean Water District
PHS	Priority Habitats and Species
SAV	submerged aquatic vegetation
Services	NMFS and USFWS, collectively
SMP	Shoreline Management Program
SRKW	southern resident killer whale
Taylor Shellfish	Taylor Shellfish Farms
The Project	Oakland Bay Floating Culture Project
USFWS	U.S. Fish and Wildlife Service
UV	ultraviolet
WDFW	Washington Department of Fish and Wildlife
WDOH	Washington State Department of Health
WRIA 14a	Watershed Resource Inventory Area 14a

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1.0 INTRODUCTION

This Habitat Management Plan (HMP) has been prepared for the Taylor Shellfish Farms (Taylor Shellfish) Oakland Bay Floating Culture Project (the Project), located in Mason County, Washington (Figure 1), per the Mason County Resource Ordinance (Mason County Code [MCC] Chapter 8.52) and Shoreline Management Program (SMP) (MCC Chapter 17.50). The purpose of the Project is to grow oysters in subtidal waters from seed. The proposed Project involves installation, maintenance, and operation of a floating oyster bag system in Oakland Bay. Oyster bags will be stocked with seed oysters to increase capacity and relieve pressure on the nearby Oakland Bay Floating Upweller System (FLUPSY) installation and will also be used for full grow-out of oysters.

According to MCC 17.50.110(a), the policy of ecological protection, critical areas, and no net loss includes preventing to the greatest extent practicable, cumulative impacts from individual developments, when permitted in accordance with the Mason County SMP. This code also includes, "Ensuring that all uses and developments regulated under the Act [Shoreline Management Act], including preferred uses and uses that are exempt from a shoreline substantial development permit, will not cause a net loss of shoreline ecological functions."

In compliance with MCC, this report shall:

1. Demonstrate that the submitted proposal is consistent with the purposes and specific standards of the Mason County Resource Ordinance and SMP.

2. Describe all relevant aspects of the development proposal and critical areas or shorelines affected by the proposal, including an assessment of potential impacts from activities and uses proposed.

3. Consider the cumulative impacts of the proposed action that includes past, present, and reasonably foreseeable future actions to facilitate the goal of no net loss of critical areas or shoreline ecological functions. Such impacts considered shall include those to wildlife, habitat, and migration corridors; water quality and quantity; and other watershed processes that relate to critical area condition, process, and/or service.

4. Identify proposed mitigation and protective measures, if applicable, as required by the Mason County Resource Ordinance and SMP.

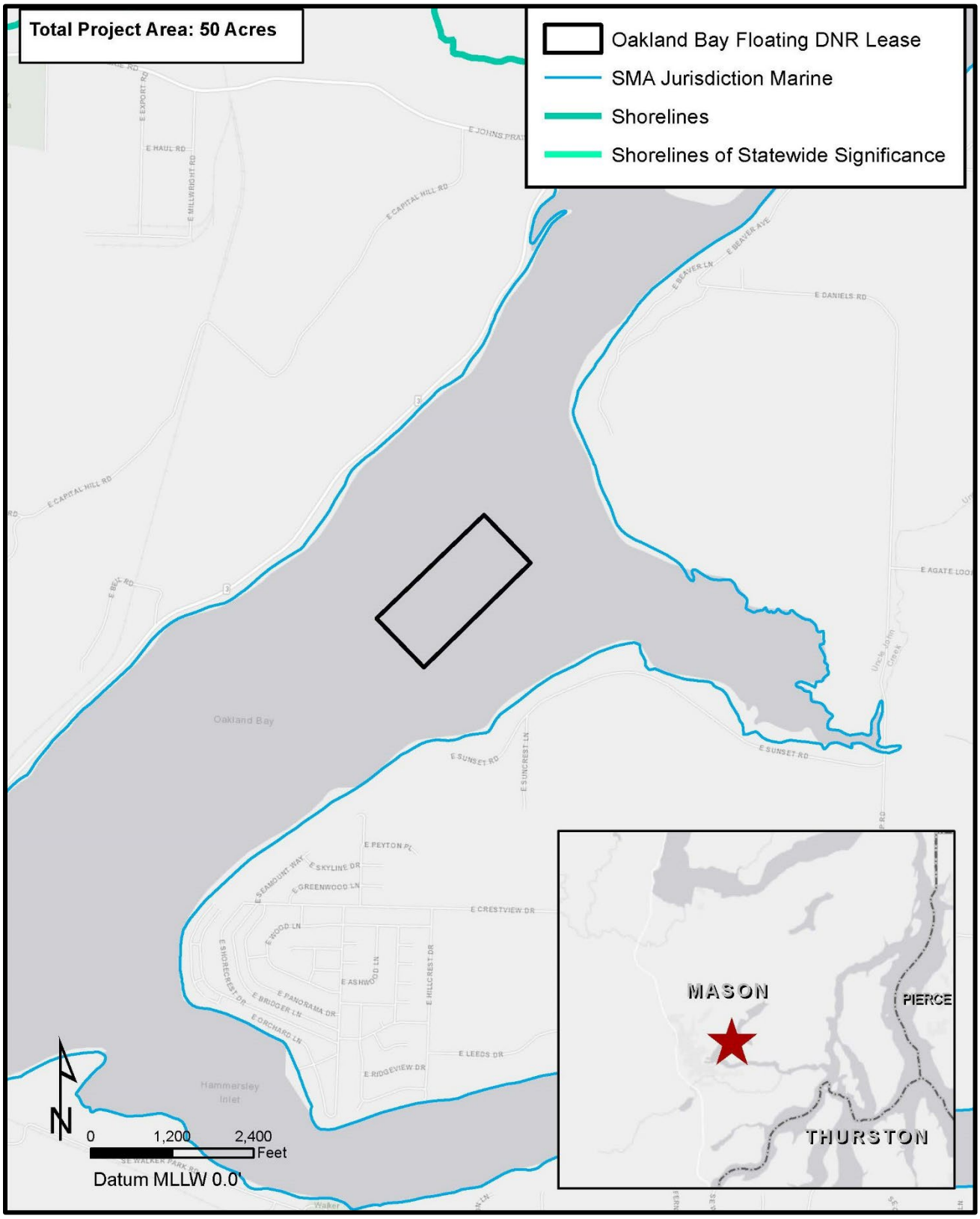

Figure 1. Project Location
Source: Taylor Shellfish (2022)

2.0 SPECIES AND HABITATS ANALYZED

The proposed Project site consists of marine portions of Mason County (USGS 5th HUC 17110019 – for Puget Sound subbasin; Lat: 47.227071 ° N, Long: -123.054634 ° W). The Endangered Species Act (ESA)-listed species under the purview of the National Marine Fisheries Service (NMFS) and United States Fish and Wildlife Service (USFWS) – collectively called "the Services" – that may occur in the area are provided in Table 1. This information is compiled from the NMFS (2022) and USFWS (2022), which is provided as Appendix A. Note that critical habitat has been designated for all of these species, but critical habitat does not occur for all species in the Project site or vicinity (Table 1).

Mason County also considers fish and wildlife habitat conservation areas (FWHCAs) under MCC Chapter 8.52. As defined by the code, FWHCAs are "areas that serve a critical role in sustaining needed habitats and species for the functional integrity of the ecosystem, and which, if altered, may reduce the likelihood that the species will persist over the long term" (MCC 8.52.030). Relevant species that are supported by these FWHCAs are also included in Table 1, as cited by Washington Department of Fish and Wildlife (WDFW) (2022a) or listed in MCC Table 8.52.170(A). Effects of the Project are assessed below relative to these FWHCAs, rather than the species itself.

A number of west coast ESA-listed species are not known to occur in Oakland Bay, and so were not included in this analysis: streaked horned lark (*Eremophila alpestris strigata*), yellow-billed cuckoo (*Coccyzus americanus*), leatherback sea turtle (*Dermochelys coriacea*), North Pacific distinct population segment (DPS) of loggerhead sea turtle (*Caretta caretta*), olive Ridley sea turtle (*Lepidochelys olivacea*), green turtle (*Chelonia mydas*), black abalone (*Haliotis cracherodii*), white abalone (*Haliotis sorenseni*), green sturgeon (*Acipenser medirostris*), blue whales (*Balaenoptera musculus*), fin whales (*Balaenoptera physalus*), gray whales (*Eschrichtius robustus*), Guadalupe fur seals (*Arctocephalus townsendi*), Northern Pacific right whales (*Eubalaena japonica*), sei whales (*Balaenoptera borealis borealis*), and sperm whales (*Physeter macrocephalus*). Due to the lack of documented occurrence and the lack of suitable habitat in the area, the proposed action will have no effect on these species, and they will not be assessed further in this document.

Table 1. Species Considered in this Habitat Management Plan

Common Name	Scientific Name	State Status	Federal Status	PHS	Critical Habitat	Potential Habitat Use
ESA-Listed Fish						
Bull trout (PS/Coastal DPS)	*Salvelinus confluentus*	C	T	X	Yes*	Migration and foraging, but unlikely
Chinook salmon (PS ESU)	*Oncorhynchus tshawytscha*	C	T	X	Yes	Migration, juvenile rearing, foraging
Steelhead (PS ESU)	*O. mykiss*	None	T	X	Yes	Migration, smolt rearing, foraging
Bocaccio rockfish (PS/GB DPS)	*Sebastes paucispinis*	C	E	X	Yes	Foraging, but unlikely (deepwater)
Yelloweye rockfish (PS/GB DPS)	*S. ruberrimus*	C	T	X	Yes	Foraging, but unlikely (deepwater)
Forage Fish						
Surf smelt	*Hypomesus pretiosus)*	None	None	X	N/A	Spawning, foraging
Pacific Sand Lance	*Ammodytes hexapterus*	None	None	X	N/A	Spawning, foraging
Other Marine Fish						
Coastal cutthroat trout	*O. clarki clarki*	None	None	X	N/A	Migration, rearing, foraging
Coho salmon	*O. kisutch*	C	C	X	N/A	Migration, rearing, foraging
Fall/summer chum salmon	*O. keta*	None	None	X	N/A	Migration, rearing, foraging
Fall Chinook salmon	*O. tshawytscha*	None	None	X	N/A	Migration, rearing, foraging
Winter steelhead	*O. mykiss*	None	None	X	N/A	Migration, rearing, foraging
Canary rockfish (PS/GB DPS)	*Sebastes pinniger*	C	None	X	N/A	Foraging, but unlikely (deepwater)
Various rockfish**	*Sebastes* spp.	C	None		N/A	Foraging, but unlikely (deepwater)
Birds						
Marbled murrelet (CA/OR/WA)	*Brachyramphus marmoratus*	E	T	X	Yes*	Foraging
Great blue heron**	*Ardea herodias*	M	None	X	N/A	Foraging
Various seabird species**	Various	N/A	N/A		N/A	Foraging
Marine Mammals						
Southern resident killer whale	*Orcinus orca*	E	E	X	Yes	Foraging, but highly unlikely
Harbor seal	*Phoca vitulina*	None	None	X	N/A	Foraging
Other pinnipeds**	Various	None	None		N/A	Foraging
Invertebrates						
Hardshell clams	Various	None	None	X	N/A	Spawning, foraging
Oyster beds	Various	None	None	X	N/A	Spawning, foraging

PHS - Priority Habitats and Species; DPS - Distinct population segment; ESU - Evolutionarily Significant Unit; Endangered; T - Threatened; C - Candidate; Co - Concern; M – Monitor; S - Sensitive; CA - California; GB - Georgia Basin; OR - Oregon; PS - Puget Sound; WA – Washington

*Critical habitat has been identified but does not occur within the proposed Project site.

**Species of local importance may include, but are not limited to, state candidate and monitor species, as identified in Table 8.52.170(A): Species of Importance that May Occur in Mason County

3.0 EXISTING SETTING AND SURROUNDING LAND USE

The proposed Project is within Oakland Bay located near Shelton, Mason County, Washington, at Township 20N, Range 3W, and Section 10, 15, and 16. Oakland Bay is part of the marine shorelines of Watershed Resource Inventory Area 14a (WRIA 14a) or the Kennedy-Goldsborough watershed. Approximately 26% (1,110 acres) of Oakland Bay and Hammersley Inlet is in the intertidal zone and 74% (3,093 acres) in the subtidal zone, of which the Project site is 50 acres of subtidal area and a smaller portion that has culture gear (refer to Section 4.0 below). Oakland Bay is hydraulically connected to Hammersley Inlet in south Puget Sound and is considered the head of a major bay in a lower energy environment (CGS et al. 2012).

Oakland Bay is identified as the only major industrial area in Mason County, which includes the City of Shelton (CGS et al. 2012). The bay is wider than 0.5 mile in places and shoreline modifications increase along the southwest corner where Oakland Bay connects to Hammersley Inlet. The downtown of the Shelton waterfront on the south end of Oakland Bay is highly industrialized. The east side of the bay includes a mix of deciduous, evergreen, and mixed forest landscape. The entire west side of Oakland Bay is bordered by State Route 3 and patches of low-density residential development. The north end of the bay includes the 133-acre Twin Rivers Ranch Preserve owned by Capital Land Trust, which encompasses the entire shoreline and the Deer Creek watershed.

Oakland Bay County Park, Walker Park, Sunset Bluff County Park, Oakland Bay Recreational Area, and Bayshore Preserve provides public access to the shoreline. Oakland Bay Marina, Port of Shelton, Shorecrest County Park, and Arcadia Point provide public boat launches. There are also several private docks and piers located along the shoreline of Oakland Bay (Ecology 2022). The bay is largely characterized by calm waters and soft sedimented bottoms. Campbell Creek enters Oakland Bay to the east of the Project site, which provides freshwater and sediment input. Shoreline to the north, south, and west is designated as residential and the eastern side of Oakland Bay is designated as conservancy (Mason County 2022).

There are approximately 1,000 acres (originally 4,500 acres) of oyster reserves across 19 sites in south Puget Sound (Westley et al. 1985). These areas are used almost exclusively in recent years for tribal (Squaxin Island Tribe) shellfish harvest. The most productive of these is Oakland Bay and North Bay, which have been used to support native Olympia oyster (*Ostrea lurida*) production. Other uses within Oakland Bay and Hammersley Inlet for shellfish include farms – both active and fallow culture beds – within approximately 33% of the intertidal zone. There are subtidal aquaculture areas, although these locations represent a minor portion of the subtidal zone (~0.6%).

4.0 PROJECT OVERVIEW

The purpose of the Project is to grow Pacific (*Crassostrea gigas*) and Kumamoto (*C. sikamea*) oysters in subtidal waters. The development proposal involves installation, maintenance, and operation of a floating oyster bag system in Oakland Bay (refer to Figure 1). The Project site is within Washington State Department of Natural Resources (DNR) state-owned aquatic land and is approximately 50 acres (Figure 2). The floating oyster bags will occupy a total surface area of approximately 9.1 acres within the 50-acre site. Oyster bags will be stocked with seed oysters to increase capacity and relieve pressure on the nearby Oakland Bay FLUPSY installation and will also be used for grow-out of oysters.

4.1 Project Description

This section describes technical details of gear installation and regular shellfish aquaculture operations associated with the proposed Project.

4.1.1 Project Timeline and Sequencing

Proposed installation of anchors and main float lines is anticipated within a 6-month period. Floats and bags will be deployed and installed by boat. The gear is anticipated to remain continuously but can be removed for a few weeks for fishing access when coordinated with the Squaxin Island Tribe. Following installation of culture gear, ongoing operations will include maintenance of equipment, harvest and transfer of oysters, and addition of new oyster seed to floating bags. All work will be done from boats.

4.1.2 Gear Installation

The floating culture system will be supported by anchors. The anchors will be installed by cranes and hydraulic machinery from a vessel with minimum substrate disturbance. The floating gear will be installed with double lines and bags separated by 20 to 30 feet (Figure 3). Each double line will consist of 2,000 feet of synthetic line attached to anchors at each end. There is a 25-foot section of rope at each end to allow for flipper access, which is a device that tips the bags over. Each double line will have surface buoys at each end and 2 midline floats if there is a chance that the line will drag on the seabed. Each end of the double line will be attached to one 2,000-pound wedge anchor. A total of 30 double lines and 60 anchors will be installed. There could also be a screw anchor in the center of each line, depending on need. Therefore, a conservative estimate of 30 screw anchors was also calculated for potential impact purposes.

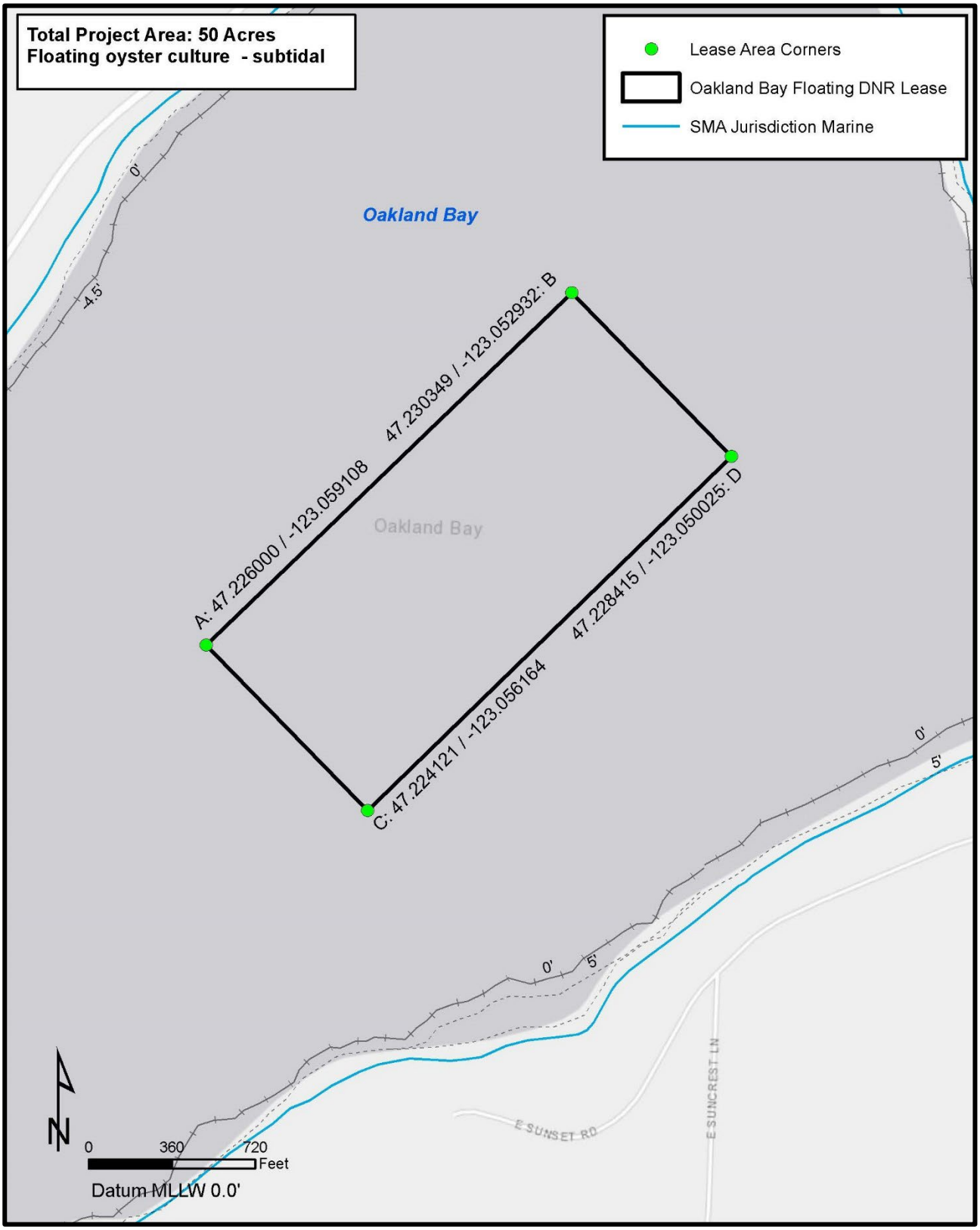

Figure 2. Project Site Layout

Source: Taylor Shellfish (2022)

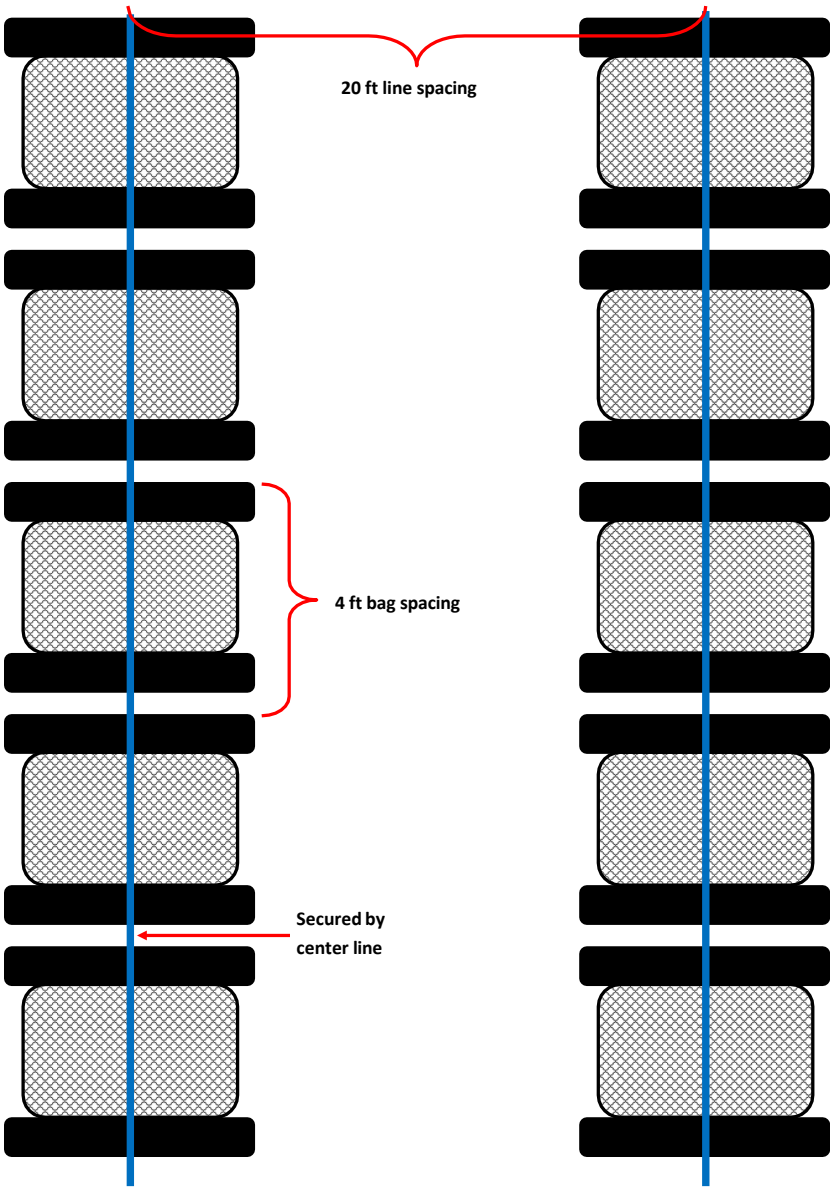

Figure 3. Floating Bag Culture Location in Oakland Bay and Schematic

Source: Taylor Shellfish (2022)

The double lines are in 3 stacked systems, rafted side by side. Bags are made from ultraviolet (UV)-resistant, high-density polyethylene (HDPE) mesh and measure a maximum of 37 inches by 43 inches, including the buoys on each end of the bag. There are 2 styles of bags and buoys proposed to be used, and the second style is smaller (36 inches by 18 inches). Each bag will be stocked with 200 to 5,000 oysters depending on oyster size (i.e., seed vs. adult). At full installation, an estimated 9.1 acres of water surface will be used for floating culture gear or 18.3% of the 50-acre Project site.

4.1.3 Operations and Maintenance

Boat-based workers will perform operations and maintenance. Regular maintenance activities will include removal of fouling organisms (e.g., barnacles, mussels, other invertebrates, and algae) from bags and lines, and minor repair work. Operation activities will include seeding of immature oysters, sorting and grading of growing oysters, redistribution of oysters to achieve desired density, and harvest of market-size oysters.

Seed is grown in the FLUPSY also located in Oakland Bay or in Taylor Shellfish's onshore nursery facility and transported to the floating culture system via Taylor Shellfish's work vessel. Each bag is labeled with the farm identification and contact information. Floats and bags are periodically flipped to expose bags and oysters to air for drying and to control fouling organisms. Immature oysters will be evenly distributed among bags to achieve optimal growing conditions. As they grow, oysters are sorted and redistributed according to size. This may involve hand or mechanical sorting and re-stocking of bags with sorted oysters.

Oysters are harvested when they reach market size or are harvested and planted in intertidal areas for final grow-out, which may represent between 9 months and 6 years of growth between harvest cycles. A vessel or work platform equipped with a hoist system works along the lines, and the bags are processed on a work vessel or platform. Lines are loaded directly into a harvest container in the water. A harvest container may also be placed underneath lines to capture any fall-off as lines are loaded onto a work platform. Harvested shellfish are then loaded onto a work platform or vessel where they are cleaned and sorted. Alternatively, an entire group of bags may be harvested by releasing the anchor lines, securing the longlines to the back of the vessel, and towing the entire group to a dock. At the dock, bags are emptied onto a vessel deck or work platform and the shellfish are sorted and transported to a processing facility from the dock. Shellfish that are not yet market size may be put back into bags and returned to the bay to grow out to full size.

4.1.4 Avoidance and Minimization Measures

Best management practices (BMPs) for floating culture, including siting and configuration, will be employed to maintain water quality. Relevant shellfish culture conservation measures adopted by the U.S. Army Corps of Engineers (Corps) from its programmatic consultation with

the NMFS (2016) and USFWS (2016) for shellfish aquaculture operations in Washington State will be used for the proposed Project (Corps 2015). Avoidance of potential effects, where possible, is the first priority.

Avoidance, conservation, and minimization measures are focused on the following activities/interactions:

- Gear Installation and Siting of the Floating Bags
- Maintenance, Repair, and Work
- Species-Specific Activities
- Farm Plan Record-Keeping Log

Gear Installation and Siting of the Floating Bags

- Floating bags will be sited approximately 1,300 feet from the shoreline.
- Floating bags will be constructed of material that will not have a negative effect on the aquatic environment. Gear includes synthetic and nylon lines, UV-resistant HDPE floating bags, wedge anchors, and screw anchors, all which would have no negative effect on water quality.
- The floating bags are designed to have a shallow draft (i.e., less than 24 inches when fully stocked with oysters). By design, the shallow draft will have little effect on circulation and flow patterns in Oakland Bay.
- No native eelgrass (*Zostera marina*) is present in Oakland Bay, the closest kelp beds are along the shoreline to the west (Taylor Shellfish 2019; DNR 2022a; Ecology 2022).
- The floating bags have been planned and configured to minimize effects on benthic organisms by placing them in deep water (greater than -5 feet mean lower low water [MLLW]). There is no submerged aquatic vegetation (SAV) underneath the proposed Project site and the soft substrate is not appropriate attachment habitat for kelp.
- Each line is separated by approximately 20 to 30 feet. The lines are anchored on each end and will move approximately 100 feet beyond the centerline with each tide change, producing little effective shading.
- All gear installation activities will be restricted to daylight hours.

Maintenance, Repair, and Work

- Damage to substrates from boats or barges will be avoided using the following BMPs:
  - Moor and operate boats and barges in deeper water to prevent potential impacts from propeller scour.
  - Store materials such as tools, bags, marker stakes, rebar, or nets in upland areas when not in use.

- Operators of vehicles or machinery will reduce contamination from vehicles and equipment through the following practices:
  - Unsuitable material (e.g., trash, debris, asphalt, or tires) will not be discharged or used as fill (e.g., used to secure nets, create berms, or provide nurseries).
  - Taylor Shellfish's equipment (vessels, vehicles, pumps, hydraulic motors, graders) operated within 150 feet of any stream, waterbody, or wetland will be inspected daily for fluid leaks before beginning operations. Any leaks detected will be repaired before resuming operation.
  - No petroleum products will be stored at the proposed Project site.

- Approximately twice annually, a diver will evaluate the site and moorings. The diver will manually remove debris (e.g., pieces of rope, dropped tools) from bottom sediments at that time.

- Taylor Shellfish will engage in quarterly patrol of all nearby beaches for debris, including any lines or other pieces of equipment associated with its operations. Any debris collected will be recorded.

- Equipment (e.g., work vessels) will be inspected daily to ensure there are no leaks of hydraulic fluids, fuel, lubricants, or other petroleum products. Should a leak be detected, the equipment shall be immediately removed from the area and not used again until adequately repaired.

- Employees are trained in meeting environmental objectives.

Species-Specific Activities

- The Project will comply with all terms, conditions, and conservation measures of the programmatic consultation to avoid and minimize impacts to listed species, critical habitat, and essential fish habitat.

- The floating bags will be sited and configured to minimize effects on marine mammals. During maintenance and harvest operations, due care would be taken to avoid disturbance of marine mammals, particularly seals and sea lions, in compliance with the federal Marine Mammal Protection Act.

Farm Plan Record-Keeping Log

- Oyster survivorship and growth data by year-class will be collected from farm inspections during harvest and sorting.
- Dive surveys conducted below the floating culture to retrieve any gear, equipment, or other debris that may have fallen or naturally pushed into the area will be recorded.
- Spills or cleanups conducted on the beach will be recorded and the appropriate agencies notified.

4.2 Project Site

Project activities will be confined to the 50-acre Project site bounded by the corners described in Table 2 (refer to Figure 2).

Table 2. Latitude and Longitude of Project Site Corners

Location	Latitude	Longitude
NW Corner (A)	47.226000 N	-123.059108 W
NE Corner (B)	47.230349 N	-123.052932 W
SW Corner (C)	47.224121 N	-123.056164 W
SE Corner (D)	47.228415 N	-123.050025 W

5.0 EXISTING ENVIRONMENTAL CONDITIONS

The Project site is in the Pacific Northwest Region 17 (USGS 5th HUC 17110019 – for Puget Sound subbasin) and WRIA 14b (Kennedy-Goldsborough) watershed. Floating culture operations are proposed in Oakland Bay at a depth of approximately -5 feet to -10 feet MLLW.

This section summarizes existing environmental attributes and habitat qualities important to fish and wildlife species found in Oakland Bay that may be affected by the Project. The existing environmental conditions will then be compared against potential Project impacts discussed in the Effects Analysis (Section 6.0). The following topics are covered:

- Water quality
- Sediment quality
- Fish and wildlife presence
- Invertebrates
- Submerged aquatic vegetation

5.1 Water Quality

Oakland Bay has a long history of water quality concerns, centered around the growth of Shelton and the original commercial shellfish production in the area. By the 1880s, commercial oyster production became an important local commodity to the Oakland Bay area. In 1927, a pulp and paper mill begin operation on the Shelton waterfront and released a waste product called sulfite liquor into Oakland Bay. By 1930, local oyster growers sued the pulp and paper mill for damages to their harvest, which led to improved industrial practices (MCPH 2007). In 1955, Oakland Bay was approved for commercial shellfish harvest through Washington State Department of Health (WDOH), and in 1957 the pulp and paper mill closed (MCPH 2007).

WDOH collects monthly samples in areas where there is shellfish harvesting for human consumption (WDOH 2022a). Based on these measurements, WDOH classifies shellfish growing areas as Approved, Conditional, Restricted, and Prohibited for commercial shellfish harvest. WDOH downgraded 820 acres of shellfish beds in southern Oakland Bay from Conditionally Approved to Restricted after fecal coliform bacteria was found in 1987. This led to the development of the Oakland Bay Watershed Management Plan with support from local, state, and tribal participation. The downgrade of the 820 acres was reversed in 1989 after improvements had been made to identify, prevent, and eliminate sources of shellfish bed contamination.

The Project site currently lies within an Approved area (Figure 4), although there is a Prohibited area further south close to Shelton. No part of the Project site is listed under the Washington State Department of Ecology (Ecology) 303(d) list, but the north, northeast, and southwestern shorelines of Oakland Bay are listed for bacteria and/or temperature (WDOH 2022b).

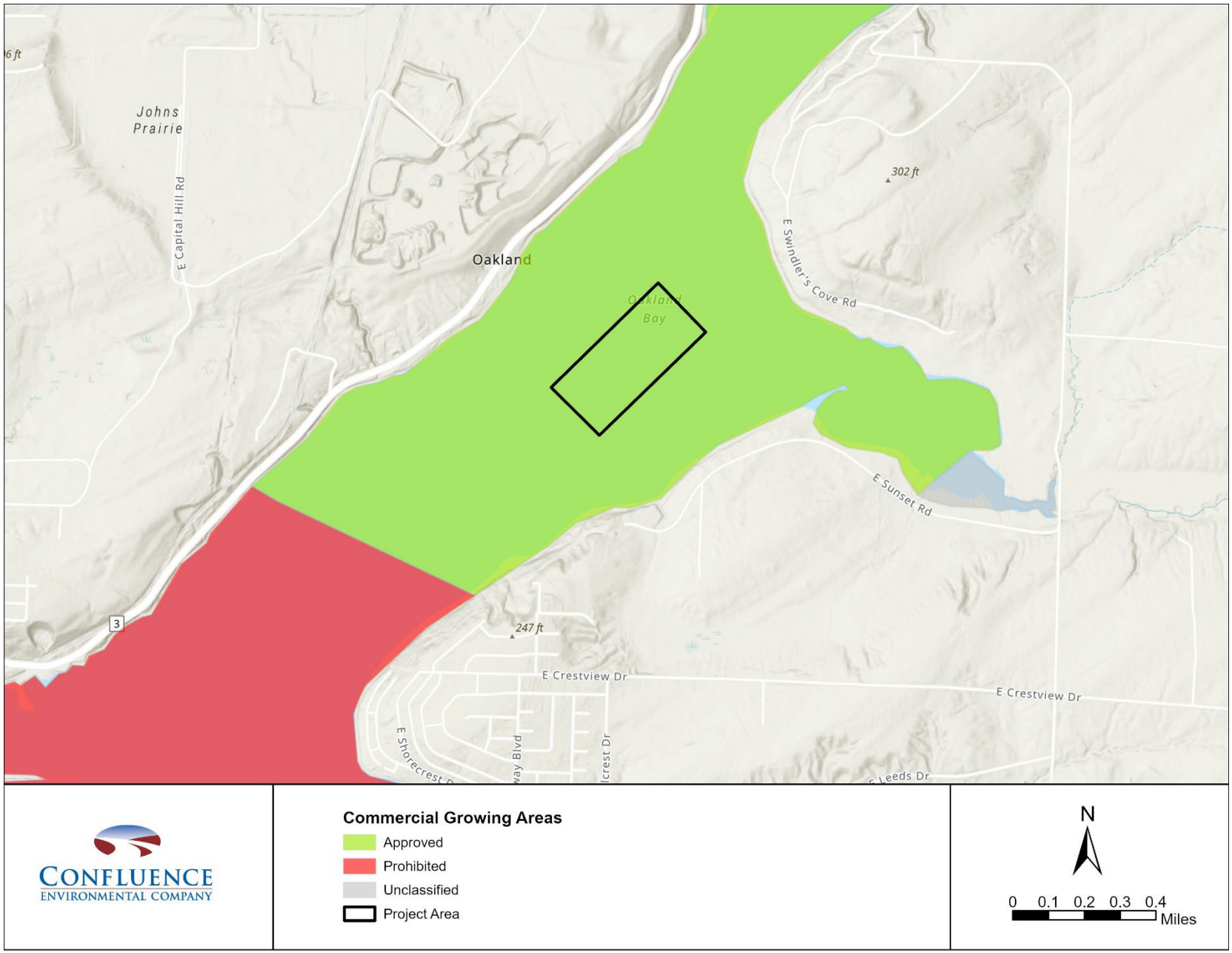

Figure 4. State Department of Health Shellfish Growing Areas in Oakland Bay
Source: WDOH (2022a)

The Oakland Bay Clean Water District (OBCWD) was developed in November 2006, in response to WDOH restricting 55 acres in the north end of Oakland Bay for shellfish harvesting (MCPH 2007). In compliance with RCW 90.72.045, Mason County developed an action plan so that the County and its citizens could provide leadership in improving the water quality of Oakland Bay. Additional threats to shellfish harvest areas are identified by WDOH, although efforts since 2006 have resulted in improvements.

Water quality is also affected by water circulation and resident time (or estuary flushing time). Residence time provides a measure of how quickly water quality changes in response to forces that move water (e.g., tidal exchange, creek inputs, recycling of old water). Oakland Bay is a shallow estuary approximately 4 miles long and 0.75 mile wide with water depths averaging 10 feet to 35 feet (MCPH 2007). Due to the long narrow waterbody of Hammersley Inlet that links Oakland Bay to the Puget Sound Basin, the bay has high refluxing, low flushing, and high retention rates (Khangaonkar et al. 2017).

5.2 Sediment Quality

According to Mason County Shoreline and Characterization Report (CGS et al. 2012), Oakland Bay has a 9% landslide hazard area and 13% erosion hazard area along its shoreline. Additionally, 50% of its shoreline landform is bluff-back beaches (Figure 5). The presence of this landform is an important indicator on the value of suitability for shoreline development and supporting nearshore processes like sediment transport. In general, the shorelines adjacent to the Project include sediment transport zones that are modified by shoreline development (Figure 5 and Figure 6).

Historic and present-day wood product manufacturing industry along the waterfront in Shelton has impacted sediment quality in Oakland Bay. Wood related manufactures included sawmills, plywood manufacturing, pulp and paper products, and insulation board and fiberboard manufacturing plants (CGS et al. 2012). Chemicals and wastewater have been released (due to a spill) or discharged through on-site industrial stormwater systems or process wastewater discharges to Shelton Harbor or nearby creeks (e.g., Goldsborough and Shelton creeks).

Sediment samples collected during the Oakland Bay Sediment Investigation by Herrera and E&E (2008) indicated that no chemicals on the state Sediment Management Standards list had concentrations above sediment quality standards. However, dioxins/furans, which are not included in the Sediment Management Standards, were found at high concentrations in 65% of samples collected with Shelton Harbor and Oakland Bay (CGS et al. 2012). Most of the higher concentrations of dioxin/furan were found within the substrate in Shelton Harbor, indicating that Shelton waterfront was most likely where these chemicals originated. Surface samples within Shelton Harbor resulted in high dioxin concentrations, indicating that there is a continued source of sediments with higher concentrations being redistributed to areas by tidal currents, human or natural process (Herrera and E&E 2008).

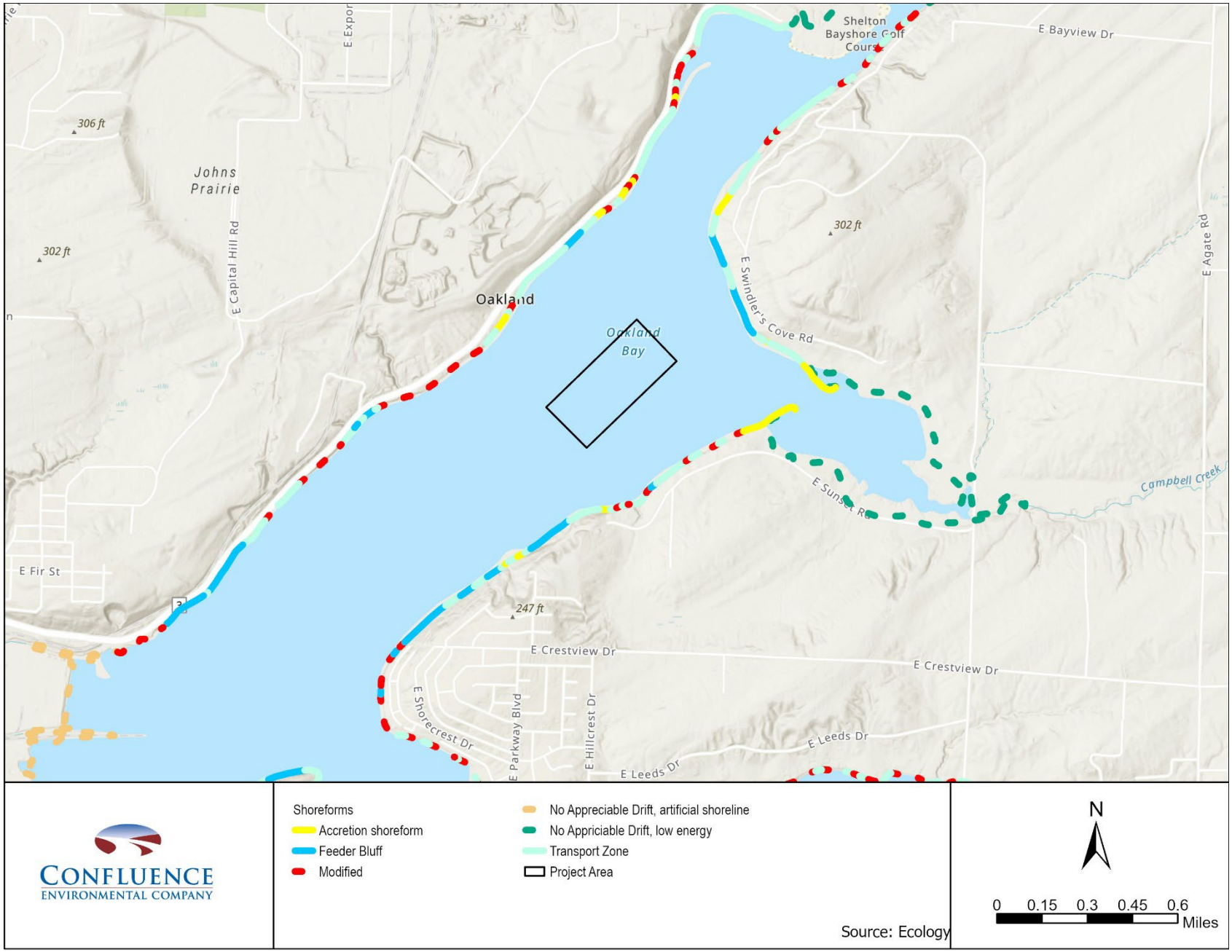

Figure 5. Shoreforms in Oakland Bay
Source: Ecology (2022)

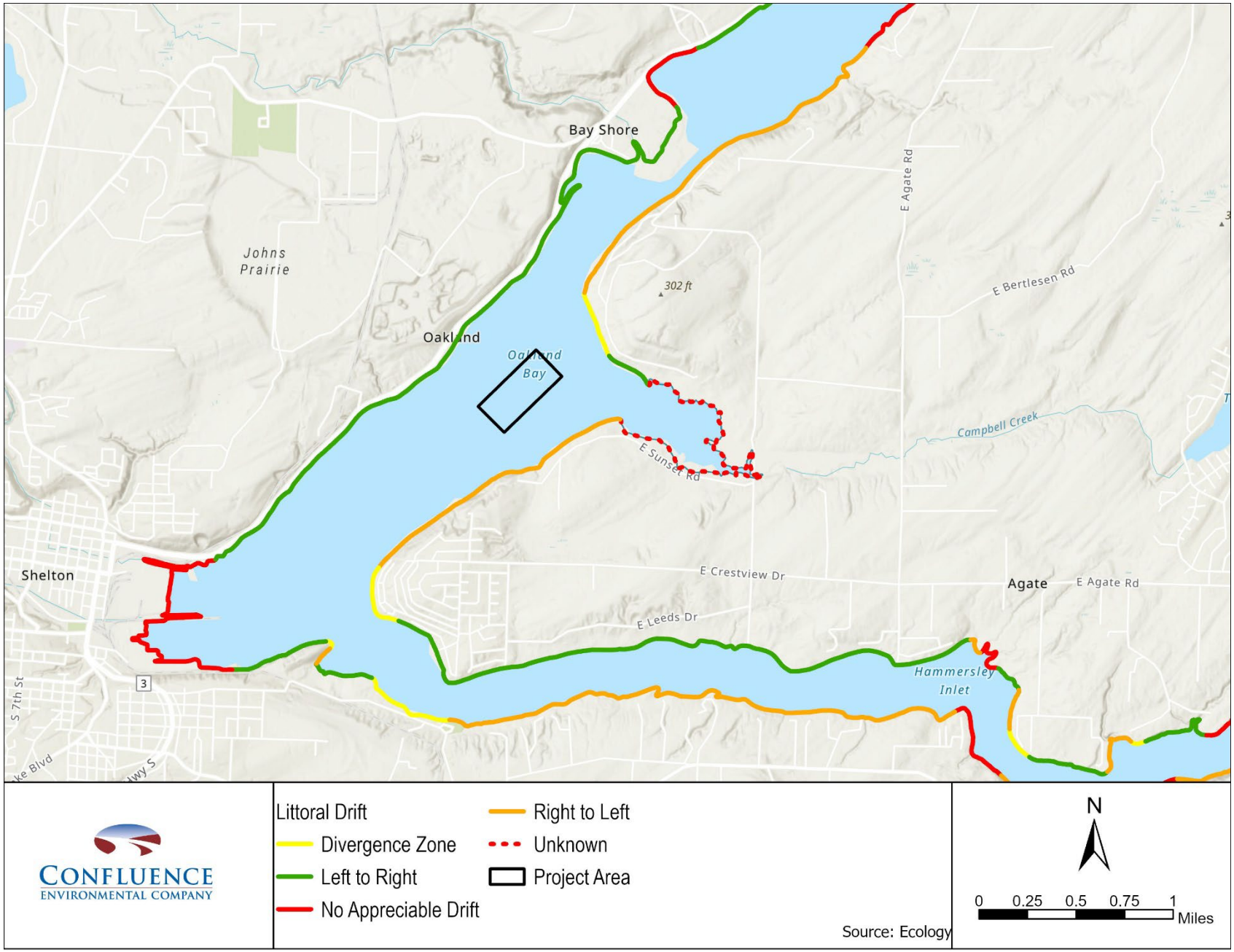

Figure 6. Coastal Drift in Oakland Bay
Source: Ecology (2022)

Sulfide and ammonia concentrations were found at elevated concentrations throughout Oakland Bay and Shelton Harbor when compared to sediment samples collected from nearby Carr Inlet (Herrera and E&E 2008). Although high dioxin concentrations are present in Oakland Bay, it does not pose a serious threat for producers and consumers of shellfish. It was concluded that dioxin in shellfish poses a very low human health risk from consuming them because shellfish, due to their low-fat content, do not accumulate dioxin (WDOH 2010). The proposed floating culture methods for the Project also avoid risk of interacting with contaminated sediments, as discussed below.

5.3 Fish and Wildlife Presence

The intertidal, benthic, and pelagic habitats of Oakland Bay have the potential to support a diverse community of terrestrial and aquatic species. This section discusses potential occurrence and habitat use of ESA-listed and other protected species within Oakland Bay.

5.3.1 Fish

Common species known to occur in the vicinity of Oakland Bay include salmonids (family Salmonidae), several species of rockfish (family Sebastidae), several species of forage fish (Pacific sand lance [*Ammodytes hexapterus*], surf smelt [*Hypomesus pretiosus*]), various species of sculpin (family Cottidae), various species of flatfish (English sole [*Parophrys vetulus*], starry flounder [*Platichthys stellatus*], Pacific sanddab [*Citharichthys sordidus*]), and various species of surfperch (family Embiotocidae), among others (Miller et al. 1980; Bulthuis 2010; WSDOT 2019).

The following information provides an understanding of how various fish species or groups of fish use Oakland Bay.

Rockfish

Habitat utilized by adult stages of the 2 ESA-listed rockfish species (yelloweye rockfish [*Sebastes ruberrimus*] and bocaccio [*S. paucispinis*]) primarily includes deep-water (>151 feet) rocky substrates and/or shallower eelgrass and kelp beds (BRT 2009). Both species have been observed utilizing shallower depths and non-rocky substrates such as sand, mud, and other unconsolidated sediments (Borton and Miller 1980). Juvenile bocaccio and yelloweye rockfish are recognized as utilizing nearshore habitat during early rearing stages (Love et al. 1991). Use of nearshore habitat is primarily in areas with rock or cobble composition and/or kelp species. Rockfish larvae are pelagic and are found in Puget Sound, Hood Canal, and the Strait of Juan de Fuca from August through October (Greene and Godersky 2012).

The Puget Sound/Georgia Basin DPS of canary rockfish (*Sebastes pinniger*) was previously listed under the ESA but was delisted in 2017. The species is still considered a candidate for listing within Washington State by the WDFW (2020). Similar to bocaccio and yelloweye rockfish,

canary rockfish primarily utilize highly complex habitats as adults and rely on nearshore habitat as juveniles for rearing.

The Project site within Oakland Bay lacks the highly complex hard-bottom habitat typically utilized by adult rockfish and also lacks the complex vegetative communities (e.g., kelp beds and/or eelgrass beds) and hard-bottom habitat preferred by juvenile rockfishes for early rearing to adulthood. Given the lack of suitable habitat, use of the underwater portion of the Project site by rockfish is highly unlikely.

Anadromous Fish

Anadromous fish that have the potential to occur within Oakland Bay include salmonid species that spawn in freshwater and migrate out to saltwater as adults. Species that are listed at the federal or state levels, or are considered locally important, are discussed here.

Chinook Salmon

The Puget Sound evolutionarily significant unit (ESU) of Chinook salmon (*Oncorhynchus tshawytscha*) was listed as threatened under the ESA on March 24, 1999 (64 FR 14308). This listing was most recently upheld on April 14, 2014 (79 FR 20802). The Puget Sound ESU includes naturally spawned Chinook salmon originating from rivers of the Puget Sound, along with 25 artificial propagation programs.

Chinook salmon are commonly classified as "stream-type" or "ocean-type" depending on the length of freshwater rearing. Stream-type Chinook salmon typically rear for a year in rivers and spend little time rearing in estuaries during outmigration. By contrast, ocean-type Chinook salmon migrate downstream as subyearlings and spend extensive time rearing in estuarine habitats prior to migrating out into ocean waters. Thus, juveniles of ocean-type Chinook salmon are more likely to utilize the intertidal habitats within Oakland Bay. Most Puget Sound Chinook salmon would be considered ocean-type and make extensive use of estuarine and nearshore habitats (Shared Strategy for Puget Sound 2007).

Chinook salmon require substantial cover, high water quality, abundant foraging opportunities, and cool water temperatures. Because of this use of nearshore areas, ESA-listed Chinook salmon could be present in the Project site on a limited basis during the spawning migration and juvenile outmigration phase of their life-history (i.e., primarily mid to late summer and spring, respectively). Chinook salmon can also exhibit a wide range of alternative migration patterns, including juveniles that migrate right away to the ocean, fish that remain as residents in protected river estuaries, and fish that are considered transients and return to river estuaries after migration to the ocean but before typical freshwater migration timing (Kagley et al. 2017). This diversity of migration patterns can create some resiliency in the population.

According to Miller et al. (1980), Chinook salmon are facultative planktivores. Principal prey items include calanoid copepods, larvaceans, crustacean and fish larvae, hyperiid amphipods, shrimp, ostracods, harpacticoid copepods, and mysid shrimp.

Fall Chinook salmon, not necessarily the ESA-listed species, have been documented in Deer, Cranberry, and John creeks (WDFW 2022b).

Steelhead

The Puget Sound DPS of steelhead (*Oncorhynchus mykiss*) was listed as threatened under the ESA on May 11, 2007 (72 FR 26722). This DPS includes all naturally spawned anadromous winter-run and summer-run populations in streams of the Strait of Juan de Fuca, Puget Sound, and Hood Canal, along with steelhead from 5 artificial propagation programs.

Steelhead are the anadromous form of the species *O. mykiss*, migrating from freshwater to saltwater habitats and then returning to freshwater habitat to spawn. Unlike other Pacific salmonids, steelhead can be iteroparous, meaning they can spawn more than once. Steelhead generally out-migrate after 2 years in freshwater and then return to spawn following 2 years at sea (Busby et al. 1996).

Steelhead do not typically frequent nearshore areas, although they may come into shallower locations for foraging (Shreffler and Moursund 1999). Adult winter-run steelhead migrate to spawning grounds typically in the fall or winter and summer-run migrate from late spring and summer (Busby et al. 1996; NMFS 2019). Steelhead fry tend to emigrate quickly to deeper waters (Moore et al. 2015). Although migration through Puget Sound is rapid, research indicates that mortality rates of steelhead during adult migration is high.

The population of Puget Sound steelhead is primarily composed of winter-run fish, with a few stocks of summer-run steelhead, and has generally been in decline for more than a hundred years. Historic catch data suggests return sizes of 409,000 to 930,000 adult steelhead each year in the Puget Sound towards the end of the 19th century (NMFS 2019). The current run size is less than 5% to 10% of these historic numbers.

Due to the extended rearing period in freshwater, steelhead to not rely extensively on estuaries or nearshore habitats. Steelhead present within the action area would likely be migrating and are unlikely to occur in the area for an extended period.

Deer, John, and Cranberry creeks have documented presence of winter steelhead (WDFW 2022b).

Bull Trout

The Puget Sound/Coastal DPS of bull trout (*Salvelinus confluentus*) was listed as threatened under the ESA on June 10, 1998 (64 FR 58910). This DPS includes individuals in Idaho, Montana, Nevada, Oregon, and Washington. Critical habitat was subsequently designated in 2005 (70 FR 56212). The most recent version of critical habitat for bull trout was designated on September 30, 2010 (75 FR 63898). It includes approximately 18,795 miles of streams and 488,252 acres of lakes and reservoirs in Idaho, Oregon, Washington, Montana, and Nevada, along with 754 miles of marine shoreline in Washington.

Bull trout have very specific habitat requirements, often referred to as "the 4 Cs": Cold, Clean, Complex, and Connected habitat (Rieman and McIntyre 1993). Water temperatures typically need to be less than 54°F and habitat should include complex elements like deep pools, overhanging banks, and large woody debris. Suitable habitat must also be connected to spawning and rearing areas.

Bull trout are opportunistic feeders, relying on a variety of terrestrial and aquatic insects, macro-zooplankton, and small fish. Their food habits primarily depend on their life stage and size. Within the Puget Sound, bull trout often feed on forage fish, like Pacific herring, Pacific sand lance, and surf smelt (USFWS 2015).

Although there is no documented spawning in rivers and streams flowing into Oakland Bay, bull trout may use the area as foraging, migration, or overwintering habitat.

Coastal Cutthroat Trout

Coastal cutthroat trout (*Oncorhynchus clarki clarki*) are not listed at the federal or state levels but are considered a species of concern (MCC Table 8.52.170(A)). Coastal cutthroat trout are distinct from other trout in their abundance of small- to medium-sized spots of irregular shapes (WNTI 2022). Coastal cutthroat trout generally have 1 of 3 life history strategies: (1) non-migratory, (2) freshwater-migratory, or (3) saltwater-migratory. It is fish employing this third life history strategy that could potentially interact with the Project. Saltwater-migratory coastal cutthroat trout are anadromous, starting out in freshwater habitats and migrating to marine environments. Migration typically starts in the late winter and spring so that they can feed in estuarine and nearshore habitats during the summer. They then return to freshwater habitats in the winter to feed, seek refuge, or spawn (WNTI 2022).

Coastal cutthroat trout rely on a wide variety of habitats within freshwater and marine systems. Unlike most other anadromous salmonids, coastal cutthroat trout do not remain in the ocean over the winter and do not typically make long migrations (WNTI 2022). They spend much longer in freshwater habitats than other salmonids (usually 2-5 years).

Coastal cutthroat trout are well-distributed throughout Puget Sound and are likely to utilize habitats within Oakland Bay. Documented presence within Oakland Bay included Campbell, Uncle John, and Johns creeks (WDFW 2022a).

Coho Salmon

Coho salmon (*Oncorhynchus kisutch*) are not currently listed at the federal or state levels but are considered a species of concern. The Puget Sound population is considered to be distinct population and has been noted for its depressed status in recent years.

The life history of coho salmon is similar to other Pacific salmonid species. However, coho salmon tend to use a wider array of habitats than other native anadromous species, including headwater streams, small coastal creeks, and tributaries to major rivers (Meehan and Bjorn 1991). Adult coho salmon are typically divided into 2 main categories based on habitat use: ocean type and coastal type (Groot and Margolis 1991). Ocean type fish rely on offshore waters, while coastal type fish rely on nearshore waters. Juvenile coho salmon spend the first 1 to 2 years of life in freshwater, relying on structured habitat for protection from high flow environments. They feed primarily on aquatic insects (e.g., mayflies, caddisflies, and chironomids), but also eat terrestrial insects and worms. As they grow larger, they feed on larger invertebrates and some smaller fish (Groot and Margolis 1991; Wydoski and Whitney 2003). During outmigration, coho salmon often make use of estuarine habitats for several weeks for feeding and rearing (Miller and Sadro 2003).

Although the distribution of coho salmon within Puget Sound is not well understood, there is potential for coho salmon to utilize habitats within Oakland Bay during migration. Cranberry, Johns, and Deer creeks that enter Oakland Bay are documented as having spawning for coho salmon (WDFW 2022b). Therefore, coho salmon may occur as juveniles during outmigration or as adults when returning to spawn.

5.3.2 Birds

Birds that are listed at the federal or state level, or are considered locally important, are discussed here with regards to their potential occurrence and use of Oakland Bay. These include marbled murrelet (*Brachyramphus marmoratus*), great blue heron (*Ardea herodias*), and seabirds.

Marbled Murrelet

Marbled murrelets are small marine birds in the Alcidae family. They spend most of their time foraging at sea and use only old-growth forest areas for nesting. In the critical nesting areas, fragmentation and loss of old-growth forest has a significant impact on the survival and conservation of the species (Huff et al. 2006). Adult birds are found within or adjacent to the marine environment where they dive for sand lance, sea perch, Pacific herring, surf smelt, other small schooling fish and invertebrates.

Marbled murrelets are year-round residents in coastal marine waters and embayments. Murrelets feed near the surface or dive in pursuit of small fish and invertebrates in relatively shallow marine waters (generally less than 98 feet deep) typically within 5 miles from the shore (Huff et al. 2006; Raphael et al. 2007). Murrelets forage both during the day and at night, and may exhibit bi-modal foraging behavior, which means that they follow the daily vertical migrations of prey, which are at shallower depths at night and deeper during the day.

According to the USFWS (1997), the diet of the marbled murrelet varies based on prey availability, but typically includes the 3 main forage fish species found in the Puget Sound (i.e., sand lance, surf smelt, herring), as well as northern anchovy (*Engraulis mordax*), capelin (*Mallotus villosus*), Pacific sardine (*Sardinops sagax*), and juvenile rockfishes (*Sebastes* spp.). The main invertebrate prey includes squid (*Loligo* sp.), euphausiids, mysid shrimp, and large pelagic amphipods. Becker et al. (2007) reported that reproductive success in California populations was strongly correlated with the abundance of mid-trophic-level prey (e.g., sand lance, juvenile rockfish) during the breeding and post-breeding seasons.

There is no critical habitat within close range of the action area and there is no nesting habitat (e.g., old-growth forest) near the action area. Murrelets could conceivably forage within the action area near the Oakland Bay farm.

Great Blue Heron

Great blue herons occur year-round throughout Puget Sound, including foraging in the intertidal of Oakland Bay. Herons prey upon fish, reptiles, invertebrates, small mammals, and amphibians throughout western Washington. Herons are frequently observed resting and hunting atop floating artificial structures in nearshore waters.

The breeding season extends from January to March and lasts for approximately 6 months (July-September). Great blue herons do not typically occupy nests or colony sites (i.e., rookeries) year-round, although individual or small aggregations may use these areas for roosting and loafing (Eissinger 2007). The closest heron rookery to Oakland Bay is located approximately 13 miles southeast in the Nisqually Delta. Great blue herons are known as indicator species of environmental health because they concentrate contaminants through biomagnification of locally derived toxins found in small prey.

Seabirds

Seabirds are a group of birds that are typically found floating in congregations within marine habitats and include Brandt's cormorant (*Phalacrocorax penicillatus*), common loon (*Gavia immer*), common murre (*Uria aalge*), and Western grebe (*Aechmophorus occidentalis*). There are many other species of seabirds, but these are the ones identified in MCC Table 8.52.170(A) for species of local importance in Mason County.

Brandt's cormorant are common coastal residents (Seattle Audubon Society 2022). The general trend of birds indicates that they are probably stable. Populations are connected to the California current, which provides nutrient-rich waters from upwelling. Changes due to El Niño and La Niña events can affect food availability for this species.

Common loon is a winter migratory species (Seattle Audubon Society 2022). They can be found on marine bays and inlets along the coast and are sometimes observed in freshwater areas. The common loon has nested recently on lakes and reservoirs in Ferry, Okanogan, Douglas, Chelan, Whatcom, and King counties (Seattle Audubon Society 2022). Non-breeding adult common loons can be found in the north Puget Sound area, on the outer coast, and on lakes and reservoirs of central Washington in summer.

Common murre breed along the Pacific coast of Washington but may be found foraging in Puget Sound during periods of the year (September to April; Seattle Audubon Society 2022). Common murre nests are densely packed colonies with up to 28 to 34 birds per square meter. They spend most of their time on the open ocean and in large bays and, during the breeding season, they are found closer to rocky shorelines (Seattle Audubon Society 2022). Washington's breeding population of common murres does not appear to migrate. The common murre population crashed during the 1983 El Niño event, leaving the population at about one-third the former level. In 2017, a common murre mortality event occurred in central Puget Sound, with several carcasses washing ashore in Seattle and on Bainbridge Island (Burgess et al. 2017).

Western grebes generally occupy nearshore marine waters (for foraging) in the winter and inland freshwater lakes (for breeding) in the summer (WDFW 2013). Wintering western grebes have declined by almost 95% in Washington's inner marine waters since the late 1970s (PSAT 2007), although more recent data from 1998 to 2008 indicate that the population has stabilized (WDFW 2013). Trends in the Salish Sea for western grebes show a decline in the population, although coastal California populations have experienced a dramatic increase, potentially resulting from a shift in western grebe distribution (Environment and Climate Change Canada 2021).

The closest important bird area to Oakland Bay is Totten Inlet to the south (Audubon Society 2022). Totten Inlet supports the largest estuarine flocks of shorebirds in south and central Puget Sound during the fall, winter, and spring. Seabirds have also been observed within Case Inlet close to the Oakland Bay area. Based on the information from Audubon (2018), seabirds are most diverse during the January to March time period, with an average of approximately 21 species observed. The October to December monitoring period reported an average of 16 species. The lowest species richness occurs during April when just 6 species were observed on average. While abundances of each species vary from year to year, there are no discernable patterns either in the total number of birds observed or the number of birds per species across

years. Sample sizes may limit the ability for this data to detect trends; however, no obvious species abundance trends were noted.

5.3.3 Mammals

Marine mammals are protected under the Marine Mammal Protection Act. There are 2 types of marine mammals identified in the vicinity of Oakland Bay: (1) cetaceans, and (2) pinnipeds (refer to Table 1).

Cetaceans

The only ESA-listed cetacean species is the southern resident killer whale (SRKW; *Orcinus orca*), which were listed as endangered under the ESA in November 2005 (70 FR 69903). SRKW are primarily found in the Salish Sea during spring, summer, and fall months but occur off the coast from Monterey, California, to southeast Alaska during the winter. Their range shifts based on the availability of salmon, which is their main food source.

Olson et al. (2018) compiled SRKW sighting data in the Salish Sea from 1976 through 2014. The report provided data on a total of 82,447 sightings. Sightings primarily occurred within north Puget Sound. The highest number of sightings occurring during the late fall and winter months.

While there have been sightings of killer whales in the vicinity of Oakland Bay, these have primarily been of the transient population (which are not ESA-listed) (Orca Network 2022). The shallow waters of Oakland Bay are not considered preferred habitat for SRKW, which are typically found in the deeper waters around the San Juan Islands. An individual within the action area would be considered to be occupying the area temporarily and would be unlikely to remain in the action area for an extended period of time.

Other whales have occasionally been observed in Oakland Bay but highly unlikely based on typical migration distribution and the lack of suitable habitat available in the shallow estuary. For example, on June 14, 2022, a minke whale (*Balaenoptera acutorostrata*) was observed off the south end of Vashon/Point Defiance/Gig Harbor area and near the entrance of Hammersley Inlet (Orca Network 2022), but did not stay in the area long.

Aggregations of gray whales (*Eschrichtius robustus*) occur off the Washington coast during winter and spring migrations but are uncommon in Puget Sound (Calambokidis et al. 2002). A small group of gray whales was observed returning to waters around Whidbey Island in the spring of 2013 to feed, and this is the typical southern extent of gray whale sightings in Puget Sound (Orca Network 2022). There was gray whale sighting in south Puget Sound near the southern finger inlets (e.g., Totten Inlet, Budd Inlet, Henderson Inlet) on May 1, 2019 (Orca Network 2022). When spotted within south Puget Sound, gray whales are often sick or injured. For example, on June 21, 2013, a gray whale was found in Burley Lagoon at the north end of Carr Inlet (Cascadia Research 2013). This particular whale appeared emaciated and infected

with whale lice. It was spotted at south Puget Sound locations over the course of a week before it was believed to have migrated back to the open ocean.

Humpback whales (*Megaptera novaeangliae*) occur in Puget Sound, but the ESA-listed species are located further off the coast. South Puget Sound is not recognized as a calving or migration area for humpback whales, although in recent years they have been observed in greater numbers in the Salish Sea and likely still use portions of south Puget Sound for feeding where stocks of prey fish are sufficient (Falcone et al. 2015).

Pinnipeds

Harbor seals (*Phoca vitulina*) are present in Puget Sound year-round, and California sea lions (*Zalophus californianus*) are present in Puget Sound between late summer and late spring (NMFS 1997; Gustafson et al. 2000). Pinniped populations have increased 7- to 10-fold in Washington with the passage of the Marine Mammal Protection Act (Jeffries et al. 2000, 2003) and may have significant population effects on their prey base. Steller sea lions (*Eumetopias jubatus*) more typically occur in the Columbia River estuary and along the coasts of California, Oregon, Washington, British Columbia, and Southeast Alaska (NMFS 2008). There is a haulout on the docks at the Shelton Log Rafts, approximately 0.27 miles southeast of the proposed Project site where harbor seals were observed in 1997 (WDFW 2022a). Additional seal and sea lion haulouts have been documented nearby at the log blooms near Shelton Bay and log booms in Chapman Cove (Jeffries et al. 2000).

Other marine mammals, such as the harbor porpoise (*Phocoena phocoena*), Dall's porpoise (*Phocoenoides dalli*), and northern elephant seal (*Mirounga angustirostris*) typically occur in north Puget Sound and in the western Strait of Juan de Fuca or San Juan Island area (Gustafson et al. 2000; Palazzi and Bloch 2006), although there have been sightings of these species in south Puget Sound. Both species of porpoise are consistently sighted in south Puget Sound (Orca Network 2022).

Seals and sea lions are likely to use the proposed floating oyster culture area for foraging. An analysis completed by Lance and Jeffries (2009) on harbor seal diets in south Puget Sound indicated that 99% of samples collected contained gadids, including Pacific tomcod (43%) and Pacific hake (34%). Other dominant prey species included clupeids (69%), plainfin midshipman (47%), and flatfish (33%). There were no large seasonal differences in the primary diet preferences, although there was some variability for minor diet preferences (species composing 5% of samples). These patterns included fluctuations of species that were more common during the following seasons: (1) cephalopods in the fall and spring, (2) shiner surfperch in the spring, (3) juvenile salmonids in the spring and summer, and (4) rockfish in the summer. These data are based on analysis of scat collected at long-term monitoring locations on Gertrude and Eagle islands in Case Inlet.

5.3.4 Invertebrates

The benthic environment in the subtidal portions of the Project site is dominated by a soft-bottom assemblage of organisms, including mobile scavengers and predators and burrowing filter feeding invertebrates. The intertidal portions of Oakland Bay are primarily fine sand and silt, which include a wide variety of shellfish species that support tribal harvest, recreational harvest, commercial harvest, and restoration activities.

Species that are commonly harvested in Oakland Bay within intertidal locations include red rock crab (*C. productus*), Manila clams (*Venerupis philippinarum*), littleneck clams (*Mercenaria mercenaria*), and butter clams (*Saxidomus gigantea*) (WDFW 2022a). Other benthic or infaunal taxa include various worms, other echinoderms (e.g., sea cucumbers, urchins, and sand dollars), and other bivalves.

Over a mile of the beach within Oakland Bay are reserved for tribal, recreational, and subsistence harvest activities (WDOH 2022c). Public tidelands available occur within the northwest half of the bay and most of the clam harvest occurs in the north end of this area. Recreational harvest in this area is dependent on approval from the WDOH. The proposed Project site is located more than 1,000 feet from public tidelands.

5.4 Submerged Aquatic Vegetation

Native eelgrass (*Zostera marina*) and other SAV is generally limited in south Puget Sound. DNR conducted eelgrass surveys in 2008 within the greater Puget Sound region (DNR 2022a). No data indicated that either native or non-native eelgrass was present within Oakland Bay. Underwater surveys conducted in the Project site recorded no concentrations of SAV (Taylor Shellfish 2019). This is consistent with data from the shorezone, which indicate that the only aquatic vegetation along the shoreline is salt marsh, low marsh, and dunegrass located approximately 1,300 feet from the Project site (Ecology 2022).

6.0 EFFECTS ANALYSIS

This section addresses the potential effect mechanisms of the Project to ESA-listed species, Mason County FWHCAs, and/or the environmental attributes and habitat qualities important to listed species (i.e., physical and biological features) that may be present in the Project vicinity. This section includes the direct and indirect Project-related impacts to ESA-listed species, critical habitat, or critical areas.

Presented below are discussions of the direct and indirect effects of the Project, including:

- Water quality
- Sediment quality
- Fish and wildlife habitat
- Invertebrates
- Submerged aquatic vegetation

Note that much of the literature discussed below relates to floating structures, including longlines in intertidal areas and mussel rafts in subtidal areas. While these studies do provide information using best available science, there are important differences compared to the proposed Project using floating culture methods. Compared to intertidal longlines, floating culture can be sited in deeper waters that avoid SAV. Compared to mussel rafts, which extend into the water 3 to 4 feet, floating culture is a shallow draft system located near the water's surface. These differences will be identified below when discussing effects of shellfish culture methods that are related but may not result in the same effects.

6.1 Water Quality

It is recognized both regionally and federally that shellfish aquaculture can have both positive and negative effects on water quality (Tallis et al. 2009; Dumbauld et al. 2009; National Research Council and Ocean Studies Board 2010). For the most part, negative effects are short-term and result in what Dumbauld et al. (2009) defines as "pulse disturbances." A pulse disturbance is a short, discrete event such as harvest of shellfish products or gear placement, compared to a "press disturbance" that is a longer-lasting chronic event that results in a loss of estuarine habitat such as the installation of roadways, bulkheads, groins, or dikes.

The shellfish aquaculture industry is reliant on the maintenance of good water quality conditions to ensure the safety and survival of their product. Numerous actions have already been taken in the Oakland Bay area to improve water quality with the goal of supporting shellfish harvesting (refer to Section 5.1 and references therein).

The following information is a discussion on potential impacts to water quality from the proposed Project, including (1) water circulation, (2) contaminants, and (3) suspended particulates/turbidity.

6.1.1 Water Circulation

As noted above, in Section 5.1, Oakland Bay is a shallow estuary approximately 4 miles long and 0.75 mile wide with water depths averaging 10 feet to 35 feet (MCPH 2007). Water circulation influences sediment distribution and dissolved oxygen concentrations. The proposed Project can potentially influence water circulation by adding culture gear. Turner et al. (2019) measured current speed and water quality variables within and adjacent to 4 oyster farms in Chesapeake Bay associated with floating (i.e., caged grow-out areas) and on-bottom culture. The authors reported statistically significant differences in current speeds within the oyster gear. However, the magnitude of change to water quality variables were minor. The authors indicated that differences based on natural seasonal changes were far greater in magnitude compared to inside and outside of the farm footprint. These results are consistent with studies associated with the Gallagher Cove mussel rafts in Totten Inlet, where differences in current speeds were measured inside the subtidal rafts (i.e., floating culture gear) compared to the surrounding environment but the rafts had little influence on surrounding water quality parameters such as dissolved oxygen (NewFields 2009). As discussed above, the proposed floating culture would have even less influence on water circulation because the floating culture is a shallow draft system on the water's surface compared to mussel rafts that extend 3 to 4 feet below the water's surface.

6.1.2 Contaminants

Oakland Bay is an important shellfish production area, but has a history of closures in portions of the bay from high fecal coliform levels (WDOH 2022a). Contamination is likely a result of poor water quality from the many creeks connected to Oakland Bay as well as urban and industrial run-off or historical discharge from the City of Shelton. A growing body of existing literature indicates that shellfish aquaculture, or the presence of a bivalve community, may provide some control of human nutrient loading to waterbodies (Shumway et al. 2003; Newell 2004; Newell et al. 2005; National Research Council and Ocean Studies Board 2010; Burkholder and Shumway 2011; Kellogg et al. 2013; Banas and Cheng 2015). Bivalves remove more nutrients from the water column than they input as feces or pseudofeces[1] (also known as biodeposits), which can have a net benefit to water quality.

1 Pseudofeces are biodeposits resulting from a specialized method of expelling materials by filter-feeding bivalves that enables them to excrete suspended particles that cannot be used as food (e.g., particles of silt). The rejected particles are wrapped in mucus and expelled without having passed through the digestive tract.

Bivalves filter large quantities of organic matter from the water column and assimilate nitrogen and phosphorus into their shells and tissue (Newell et al. 2005). When shellfish are harvested, the sequestered nutrients are permanently removed from the system, also known as bioextraction. According to Newell (2004), bioextraction is one of the only methods available that removes nutrients after they have entered a system, which can then make that system more resilient to nutrient loading and ultimately decreases in dissolved oxygen. Kellogg et al. (2013) concluded that oyster reef restoration could be considered a "safety net" to reduce additional downstream impacts to water quality.

In a more recent study by Kellogg et al. (2018), the authors quantified the ecological benefits and impacts of oyster aquaculture in Chesapeake Bay. Water quality was 1 of the main measurements to understand effects associated with shellfish culture in the bay. The results indicated that there were few impacts, positive or negative, detected from the oyster aquaculture operations. However, the authors calculated a removal of 21 to 372 pounds of nitrogen and 3 to 49 pounds of phosphorus per farm per year. As stated by the Corps (2020), "Oyster mariculture [aquaculture] activities may not provide identical ecological functions and services and functions as natural oyster reefs, but cultivated oysters do provide some of these functions and services without substantial investment of public funds (Kellogg et al. 2018) that may be needed for restoration activities." In addition, having a commercial shellfish operation in Oakland Bay provides incentives to improving water quality conditions bay-wide.

6.1.3 Suspended Sediments/Turbidity

The Project actions include the installation of anchors, floating lines, and oyster bags. The effect to water quality during gear installation from these actions is the generation of suspended sediments or turbidity. As discussed in Section 5.1 above, the proposed Project site is within an Approved location and not associated with bacteria problems created along the shorelines or from the City of Shelton (WDOH 2022a). The placement of anchors is not likely to generate enough sediment disturbance to release any potential contaminants from sediments. Therefore, disturbance of sediments is unlikely to result in the release of contaminated sediments during gear installation.

Short-term increases in suspended sediment may occur during anchor installation, but these impacts are expected to be negligible compared to existing movement of sediments. Although protected, this area is an estuarine environment that has regular short-term increases in suspended sediment from wind-wave action, creek inputs, and longshore sediment transport (Ecology 2022).

6.1.4 Summary of Water Quality Effects

The need for good water quality conditions is inherent in shellfish aquaculture operations. Presence of the proposed Project and a water quality advocate by Taylor Shellfish are the

impetus behind monitoring and maintaining water quality such that it meets National Shellfish Sanitation Program criteria. The benefits of this can be observed through the work of multiple groups in Washington State that track and work to improve water quality conditions, including: (1) the creation of the OBCWD, (2) tracking of pollution that affect shellfish farms by WDOH (2022a), and (3) state-wide goals to improve the amount of harvestable shellfish beds (PSEMP Marine Waters Workgroup 2021).

Potential impacts to water quality associated with the proposed Project include water circulation, contaminants, and suspended particulates/turbidity. Overall, shellfish aquaculture is recognized for both positive and negative effects on water quality. Negative effects are seen as pulse disturbances that do not have lasting impacts on water quality. These negative effects are considered to be negligible in relation to the proposed Project and well within the natural variability in water quality parameters. In contrast, positive effects with a well-managed farm can have lasting improvements to water quality and is seen as a way to reduce the potential for eutrophication within an estuary. This is because shellfish harvest removes excess nutrients from a system and can make that system more resilient to nutrient contamination concerns.

6.2 Sediment Quality

The potential mechanisms for the proposed Project to affect sediment quality include disturbances of substrate during gear installation and the contribution of biodeposits to the surrounding sediment. Note that changes in the benthic invertebrate community due to the introduction of biodeposits or presence of gear is discussed in Section 6.4 below.

6.2.1 Gear Installation

The Project site is a uniform mixture of fine/clay/mud habitat (Taylor Shellfish 2019). The floating culture will use anchors, including a 20- to 30-foot spacing between headlines. Midline floats will prevent the anchor lines from contacting the sea floor. The anchors – a combination of both wedge and screw anchors – themselves represent a small amount of surface area (approximately 0.02 acre).

Dumbauld et al. (2009) suggested that shellfish aquaculture creates short-term "pulse" disturbances that may alter the benthic substrate temporarily in a manner consistent with storm events and that the magnitude of these temporary effects is within a range where natural recovery is anticipated to occur. Although this is more the case for intertidal operations compared to subtidal culture methods. While sediment dynamics respond to a variety of influences over time, existing data suggests that sediment changes due to shellfish aquaculture are likely minor in relationship to natural sediment dynamics that drive the geophysical structure and functions of nearshore habitats (Forrest and Creese 2006; Forrest et al. 2009). The main disturbance to the substrate would only be during initial installation of anchors.

6.2.2 Biodeposition in the Sediment

Shellfish aquaculture has been reported to result in increased biodeposition that may lead to changes in sediment characteristics (Cranford et al. 2009). For example, sedimentation rates under floating mussel farms in Quebec, Canada, were measured as 2 to 5 times those observed at reference sites (Weise et al. 2009). Cranford et al. (2009) also reported a significant increase in changes to sediment organic enrichment from mussel farms in Prince Edward Island coastal embayments. The degree of environmental impact is related to site-specific conditions, such as water depth, current velocity, and sediment movement, and intensity of culture practices. More importantly, the proposed Project is a shallow draft system compared to mussel rafts, and the amount and life stage of animals that release biodeposits from this proposed floating oyster culture system would be much lower compared to mussel rafts.

Oakland Bay is a protected embayment that results in a lower energy environment (CGS et al. 2012). While there are identified sediment quality concerns, especially along the shoreline and associated with the City of Shelton, there are also improvements and positive contributions over time (MCPH 2007). In addition, shellfish aquaculture operations are a relatively minor portion of Oakland Bay. For example, the proposed Project adds approximately 0.3% of culture and the combined amount of existing and proposed culture in the subtidal zone in Oakland Bay and Hammersley Inlet would result in less than 1%. According to Cranford et al. (2009), conditions that result in increased sedimented organic enrichment include weak currents, shallow water depths, and intense culture operations. Compared to the low amount of culture in Oakland Bay, the mussel farms in Prince Edward Island occupied approximately 7% of the embayments (D'Amours et al. 2008). Overall, the proposed Project is unlikely to result in increased sediment organic enrichment.

6.2.3 Summary of Sediment Quality Effects

The Project site is dominated by fine/clay/mud substrate. The shallow environment in Oakland Bay is not a static system; there is ongoing erosion, transport, and deposition of sediments. While the floating culture gear may cause short-term impacts to the substrate, it is a limited effect over a short period of time. Suspended culture results in the transfer of organic matter to sediment, which can increase organic sediment content in areas with low flushing rates. Floating oyster culture would result in a much lower amount of sediment enrichment compared to floating mussel culture. Both the low amount of added shellfish aquaculture to this area (0.3%) and the limited influence of a floating culture system makes this potential impact minor to negligible.

6.3 Fish and Wildlife Habitat

There are various fish and wildlife species identified in Section 5.3 above. These species use Oakland Bay in a variety of ways. Per MCC 8.52.170, the focus of this section is on potential effects to habitat or FWHCAs.

6.3.1 Fish Habitat

Shellfish aquaculture operations have been present in Oakland Bay for over 100 years. Although shellfish aquaculture activities can be described as a pulse disturbance – or a short, discrete event – the overall impact to FWHCAs varies on the type of fish, location in the water column, and habitat changes that result from the addition of shellfish aquaculture gear or products. The response associated with shellfish aquaculture operations from the majority of fish species includes increased abundance and diversity, although there are exceptions and trade-offs. Potential adverse impacts are managed through avoidance measures and monitoring.

Migration along the shoreline is a major component of management concerns associated with ESA-listed fish (Schlenger et al. 2011; USFWS 2016; NMFS 2016). This is primarily due to shoreline development. Access to mid-sized and smaller streams have often been compromised by various human activities such as roads, railroad crossings, dikes, and shoreline armoring. Culverts under roads and railroads, among other human caused changes, are often a passage barrier to anadromous fish (Schlenger et al. 2011).

The proposed Project does not constitute a barrier to fish during their migration, or impacts to spawning areas, foraging areas, or rearing habitat. This is based on several reasons:

- The proposed Project is sited away from the shoreline and outside of migration channels. Documented impacts to migratory fish are associated with structures that extend out from upland into intertidal areas – such as docks and piers (Ward et al. 1994; Burdick and Short 1999) – rather than gear that is floating in subtidal areas that does not significantly change the ultimate functions of the area.

- Surf smelt and Pacific sand lance spawn in sand to pea-gravel-sized sediments. Surf smelt primarily spawn at elevations of +7 feet MLLW and up to mean higher high water (MHHW). Pacific sand lance primarily spawn at elevations of +5 feet MLLW and up to MHHW. The proposed Project is subtidal and will avoid these spawning areas.

- Benthic foraging species, such as flatfish, crabs and sea stars, will congregate below floating culture due to the addition of organic material or additional structured habitat (D'Amours et al. 2008). One of the ancillary benefits of a higher abundance of crabs in farm areas is the presence of crab larvae, which is an important prey resource for salmonids (Wild and Tasto 1983; Brodeur et al. 2007; Bollens et al. 2010; Duffy et al. 2010). For example, Bollens et al. (2010) reported that crab larvae become especially important for juvenile Chinook salmon in nearshore areas in the summer.

- The Project site is a shallow subtidal location with fine substrate that does not contain habitat likely to support ESA-listed rockfish (e.g., rocky, deep water). For example, Grove and Shull (2008) identified rockfish around Lummi Island in areas with vertical

walls and steeper slopes (i.e., 70 degrees). Observed rockfish densities dropped to zero where bottom slopes flattened out and the substrate was primarily gravel and sand.

- Habitats with SAV support the greatest number of juvenile rockfish (Matthews 1990; Carr 1991; Carr and Syms 2006; Hayden-Spear 2006; Springer et al. 2010). The larval stages of rockfish are often observed floating under detached algae, seagrass, and kelp within the water column (Love et al. 2002; Palsson et al. 2009). However, there is no overlap between SAV and the proposed Project.

- A diet analysis of rockfish concluded that their diet preference is similar to salmonids, which includes gammarid amphipods, hyperiid amphipods, crab larvae, and copepods (Baird 2010; Tonnes 2012; NMFS 2017). This indicates that the salmonid prey resources supported by shellfish aquaculture gear would also support rockfish.

The available evidence suggests that fish will encounter, and may feed, in the proposed Project site in Oakland Bay. However, interactions are largely avoided because of where the proposed Project is located (i.e., subtidal areas). While there may be some short-term disturbances (i.e., pulse disturbances) associated with human presence, ultimately the areas have similar functions compared to the same habitats without shellfish aquaculture. Overall, the effects to habitats associated with fish are considered minor.

6.3.2 Bird Habitat

Although marine birds feed at shellfish aquaculture farms, the farms themselves do not necessarily attract larger numbers of birds compared to non-cultured areas (Hilgerloh et al. 2001). For birds that tend to avoid areas with humans, the presence of staff tending a farm would be expected to temporarily reduce marine bird use of the farm due to the presence of humans. These interactions would be seasonal when birds are present (i.e., during winter and early spring), short-term, and limited. Culture gear may also provide perching and resting areas for local birds (especially cormorants and gulls) when not occupied by personnel performing shellfish aquaculture activities.

The following information is a discussion on potential impacts to habitat for specific bird species and habitat areas, including: (1) marbled murrelet, (2) great blue heron, and (3) seabird habitat areas.

Marbled Murrelet

Marbled murrelets forage in shallow marine waters, and had an at-sea density in south Puget Sound during the 2020 winter aerial seabird survey of 0.06 birds/km^2 (WDFW 2022c). Higher densities of birds (09-0.41 birds/km^2) were observed closer to the City of Shelton and Hammersley Inlet compared to the proposed Project site. Noise associated with human presence and boat motors during shellfish operations could result in temporary displacement of

marbled murrelet. Strachan et al. (1995) commented that marbled murrelets that are found around heavy boat traffic do not appear to be adversely affected by the ambient noise of an urban area, suggesting that birds acclimate to the noises in their vicinity. Given that a shellfish farm does not represent heavy boat traffic, murrelets are not likely to be affected by farming activities. Therefore, effects on foraging and communication for marbled murrelets would be temporary and minimal, especially considering the low density of birds.

Great Blue Heron

Great blue heron generally feed in shallow intertidal areas, which would naturally avoid interactions between these birds and the proposed Project. Herons had an at-sea density in south Puget Sound during the 2020 winter aerial seabird survey of 1.06 birds/km^2 (WDFW 2022c). Distances from potential nests and the proposed Project also provide adequate separation. For example, Carney and Sydeman (1999) reported that a distance of 164 feet from great blue heron rookeries provided enough protection from negative interactions with humans. The closest heron colony is located approximately 14 miles from the Project site in the Nisqually Delta area (Eissinger 2007). The Nisqually Delta includes the Nisqually National Wildlife Refuge, Nisqually State Wildlife Area, and some private and tribal land, most of which are managed for wildlife conservation.

Seabird Habitat Areas

Shallow intertidal areas and fish or invertebrates found in areas with SAV provide foraging habitat for seabirds such as loons, cormorants, and grebes. The at-sea density in south Puget Sound during the 2020 winter aerial seabird survey for Brandt's cormorant, common loon, and common murre was 0.02 to 0.04 birds/km^2 (WDFW 2022c). However, the database did indicate that marine birds are more common in some of the dead-end inlets and bays, such as Oakland Bay. Most interactions are avoided because the proposed Project is located outside of SAV and shallow intertidal areas. Many marine bird species have shown behavioral changes in response to noise, or presence of people, but not to the extent that would cause population-level effects as long as distances of approximately 164 to 328 feet are maintained from nesting habitats (Carney and Sydeman 1999; Borgmann 2010). The proposed Project is 1,300 feet from the shoreline and much more from potential nesting locations.

Overall, effects on foraging for seabirds would largely be avoided based on the location of the proposed Project. In addition, potential disturbance from noise would be temporary and minimal because of the long distances from nesting or foraging locations. Therefore, the Project would have minor to negligible impacts on seabird habitat areas.

6.3.3 Marine Mammal Habitat

The primary potential impact mechanism identified by the Corps (85 FR 57332) of existing shellfish aquaculture activities or future similar actions on marine mammals is entanglement.

The following information is a discussion on potential impacts to habitat for specific marine mammal habitat areas, including: (1) southern resident killer whale, and (2) other marine mammals.

Southern Resident Killer Whale

Effects from the proposed Project to SRKW are expected to be minimal to negligible due to the infrequent use of shallow areas, the restricted bay, low abundance observed, and low potential for entanglement. This is consistent with the review of potential impacts from NMFS (2016) during the programmatic consultation effort, especially when considering conservation measures to maintain and monitor gear on a regular basis. Waters with depths less than 20 feet based on extreme low tide are excluded from critical habitat for SRKW due to the lack of use and access to such shallow areas (71 FR 69054). While the proposed Project overlaps with depths greater than 20 feet relative to extreme low tide, it is still within a relatively shallow location and accessed through Hammersley Inlet.

Research presented by the Corps in the recent proposal to reissue and modify NWPs (85 FR 57298) identified entanglement in suspended or floating culture, specifically lines or nets, as the main potential impact. However, evidence suggests that the potential for entanglement in gear is low for the proposed project, especially considering the shallow draft of floating culture gear. A review of entanglements within aquaculture gear (specifically gear for longline mussel culture) found just 19 occurrences globally since 1982 (Price et al. 2016). It is notable that these examples were associated with offshore longline operations in deep water habitat. By contrast, global annual entanglements and bycatch of marine mammals within fishery gear (e.g., gill nets, trawl nets) numbers in the hundreds of thousands (Read et al. 2006). Given the low potential for both occurrence and entanglement, the expected effects to SRKW by the proposed Project is considered to be minimal to negligible.

Other Marine Mammals

Potential for entanglement impacts of other marine mammals is consistent with the analysis provided above for SRKW. While some species more commonly use shallow waters (e.g., harbor seals, sea lions), the potential for entanglement is still considered to be low. The few documented occurrences of entanglement within shellfish aquaculture gear are limited to offshore, longline operations within deep waters (Price et al. 2016). Shallow subtidal shellfish aquaculture gear located primarily at the water's surface does not pose an entanglement risk to marine mammals. The proposed Project will not affect the haulout area.

6.3.4 Summary of Effects to Fish and Wildlife Habitat

The proposed Project is located away from the shoreline and outside of channels where fish primarily rear, forage, or migrate. Taylor Shellfish uses conservation measures and BMPs to avoid and minimize impacts to fish such as maintaining gear. If there are interactions, the

literature supports a conclusion that shellfish activities would result in a minor negative effect (i.e., likely avoidance) but also positive effects from the potential to increase prey items that are important to fish.

Birds use semi-protected habitats, like Oakland Bay, but the proposed location of the Project largely avoids birds that forage in nearshore locations. Based on existing literature, there is the potential for minor adverse behavior impacts to foraging through disturbance (e.g., noise) related to farm activities. However, these short-term disturbances are within the range that birds can handle, are well away from sensitive areas such as nesting habitat, and do not exceed behavioral thresholds that would result in adverse impacts to bird populations.

The primary impact mechanism identified by the Corps (85 FR 57332) of shellfish aquaculture activities on marine mammals is entanglement. However, this is unlikely in the shallow subtidal areas of Oakland Bay with gear that has a shallow draft. Potential occurrences of entanglement of marine mammals within shellfish aquaculture gear are rare and limited to deep water, longline operations in offshore areas of the West Coast.

6.4 Invertebrates

Based on full build-out, the floating culture will use 60 wedge anchors, which would result in approximately 0.02 acre of loss to the benthic areas. The additional screw anchors would not result in loss of benthic habitat because the metal plate will be buried in the substrate. This amount of loss, especially considering the increased area in potential attachment points that would increase benthic diversity (refer to Section 6.4.1), is a minor amount of benthic habitat loss. Section 6.2 also discussed the potential to add nutrients to the sediment from deposition of organic materials. Finally, shellfish filter water, and can affect food resources for other filter feeding organisms (refer to Section 6.4.2), which can lead to impacts if the carrying capacity of a system is exceeded (i.e., the ability of an area to support the number of filtering organisms).

The following information is a discussion on potential impacts to commercial and recreational shellfish areas associated with FWHCAs, including: (1) effects to invertebrate communities, and (2) carrying capacity.

6.4.1 Invertebrate Communities

Shellfish aquaculture operations affect invertebrate communities in both negative and positive ways. For example, a study in Chesapeake Bay, Virginia, looked at benthic invertebrates as an indication of ecological health associated with floating and on-bottom culture gear (Kellogg et al. 2018). The study found no significant negative impacts on the benthic invertebrate community structure from the presence of gear or oysters, and number of invertebrates inside the farm sites were higher compared to outside. As reported above, studies from mussel culture indicated an increase in mobile invertebrates such crabs and sea stars (D'Amours et al. 2008). Conversely, enrichment of sediments through deposition of biodeposits may have a negative

impact on benthic organisms directly below floating culture gear. However, local studies have failed to find a relationship between sediment organic enrichment and changes to macroinvertebrate communities (Miron et al. 2005). This could be related to water circulation and sediment movement, as described above. In addition, the amount of deposits from this proposed floating oyster culture system would be much lower compared to a mussel raft culture. Overall, the effects to the invertebrate community under the proposed Project are expected to be minor.

6.4.2 Carrying Capacity

Conclusions on carrying capacity were reached in the NMFS (2016) Biological Opinion using information from the North Totten Inlet Mussel Farm (NewFields 2009) as a case study. Totten Inlet has the highest concentration of shellfish aquaculture in south Puget Sound (currently 59% of the intertidal zone). There was public concern for an additional 1.4 acres of shellfish aquaculture in the system. The model indicated that, despite the amount of culture operations in Totten Inlet, the percentage of phytoplankton consumption by filter feeders is approximately 1.5% of the spring/summer production (NewFields 2009). A growth study by Ruesink et al. (2014) also reported that growth is uninhibited by dense culture operations in Totten Inlet. It is notable that poor growth of the commercial product is one of the first indicators of exceeding carrying capacity within a system, and growth is monitored on a regular basis by farm operators. In general, studies conclude that shellfish aquaculture is typically located in areas with abundant food resources, and the densities proposed within Oakland Bay are negligible compared to studies in Puget Sound that concluded there were minor effects from dense culture operations. Overall, the turnover of phytoplankton resources in Oakland Bay would not be impacted by the addition of 0.3% of commercial shellfish operations in the estuary.

6.4.3 Summary of Effects to Invertebrates

The small scale of the proposed Project (0.02 acre of benthic habitat for anchors), combined with its location in subtidal areas, means that impacts to benthic fauna are expected to be minor. There would be no impact to public beaches that support the recreational, tribal, and commercial harvest locations because the proposed Project is located more than 1,000 feet away and no activities would extend into these locations. In addition, shellfish are grown in highly productive systems that do not appear to be food limited for the commercial, recreational, or native species present in the estuary. Effects to commercial and recreational shellfish areas and mobile invertebrates (e.g., crab) within Oakland Bay are expected to be minor or even beneficial considering the lack of food limitation by the cultured species and evidence that shellfish aquaculture gear or additional of biodeposits can provide habitat and food for many species.

6.5 Submerged Aquatic Vegetation

SAV is important as both food and critical habitat for salmonids. Floating structures can adversely affect primary production for SAV in the area shaded by solid structures. Shading can negatively impact seagrass biomass, density, and growth (Shafer 2002). The gear associated with the proposed Project is not solid and will not impact SAV. The total area covered by floating gear will be approximately 9.1 acres within a 50-acre DNR lease area, which is 18.3% of the total Project site and 0.3% of Oakland Bay. The gear will be constantly moved by wind, waves, and currents, which will further distribute any shading effects across the benthic portion of the Project site. Importantly, the proposed Project does not overlap with SAV areas. Access to the proposed Project site will also not affect existing macroalgae in Oakland Bay. Therefore, there would be no effects to SAV from the proposed Project.

7.0 DETERMINATION OF EFFECT

The following is a determination of effect for each species presented in Table 1, their critical habitat, and FWHCAs, if applicable. The determination is based on the information presented in the effects analysis (Section 6.0).

7.1 Federal and State Listed Species

The proposed action will not affect the viability, persistence, or distribution of ESA-listed species potentially present in the proposed Project site. The effects of the proposed action are unlikely to injure or kill individual listed species and are, therefore, unlikely to affect the continuing status of the populations. There may be temporary avoidance during installation of the floating culture and future shellfish aquaculture operations in Oakland Bay, but there are no anticipated reductions in numbers, reproduction ability, or distribution of the species. Overall, the proposed action is determined to have a minor or even negligible/beneficial impact on ESA-listed species and species of state or local importance (Table 3).

Table 3. Effects Determinations for Federal, State, or Locally Important or Listed Species

Species	Determination of Effect	Basis of Determination
ESA-Listed Fish		
Bull trout (PS/Coastal DPS)	Discountable	▪ Unlikely to occur in Project site; discountable exposure. ▪ Otherwise, similar potential effects as for salmonids.
Chinook salmon (PS ESU)	Minor to Discountable	▪ There may be some short-term displacement during gear installation or maintenance and operations. ▪ Migration, foraging, or rearing habitat would not be substantially affected by the proposed actions. ▪ Water quality effects are anticipated to be of such a small magnitude and in such a small area as to be considered discountable. ▪ Floating lines of oyster bags do not represent a significant obstruction to migration or access to foraging habitat. ▪ The project is not anticipated to negatively affect forage fish species and may have a beneficial effect to forage fish prey availability.
Steelhead (PS DPS)	Minor to Discountable	▪ Same conclusions as for Chinook salmon.
Bocaccio (PS/GB DPS)	Minor to Discountable	▪ Unlikely to occur in Project site; discountable exposure. ▪ Otherwise, similar potential effects as for salmonids.
Yelloweye rockfish (PS/GB DPS)	Minor to Discountable	▪ Unlikely to occur in Project site; discountable exposure. ▪ Otherwise, similar potential effects as for salmonids.
Forage Fish		
Surf smelt	No Effect to Discountable	▪ No overlap with spawning areas. ▪ Otherwise, similar potential effects as for salmonids.
Pacific Sand Lance	No Effect to Discountable	▪ No overlap with spawning areas. ▪ Otherwise, similar potential effects as for salmonids.
Other Marine Fish		
Coastal cutthroat trout	Minor to Discountable	▪ Same conclusions as for Chinook salmon.
Coho salmon	Minor to Discountable	▪ Same conclusions as for Chinook salmon.

Species	Determination of Effect	Basis of Determination
Fall/summer chum salmon	Minor to Discountable	▪ Same conclusions as for Chinook salmon.
Fall Chinook salmon	Minor to Discountable	▪ Same conclusions as for Chinook salmon.
Winter steelhead	Minor to Discountable	▪ Same conclusions as for Chinook salmon.
Canary rockfish	Minor to Discountable	▪ Unlikely to occur in Project site; discountable exposure. ▪ Otherwise, similar potential effects as for salmonids.
Various rockfish	Minor to Discountable	▪ Same conclusions as for canary rockfish.
Birds		
Marbled Murrelet (WA/ OR/ CA DPS)	No Effect to Discountable	▪ Murrelets that use Oakland Bay may be exposed to boat activity. ▪ Exposure to activities will be short-term, intermittent, and low-intensity. ▪ Disturbance by ongoing activities is unlikely to elicit more than a mild behavioral response. ▪ No effect to murrelet nesting, foraging, or migratory habitat is anticipated.
Great blue heron	No Effect to Discountable	▪ Exposure to activities will be short-term, intermittent, and low-intensity. ▪ Disturbance by ongoing activities is unlikely to elicit more than a mild behavioral response. ▪ No effect to great blue heron nesting, foraging, or migratory habitat is anticipated.
Various seabird species	No Effect to Discountable	▪ Exposure to activities will be short-term, intermittent, and low-intensity. ▪ Disturbance by ongoing activities is unlikely to elicit more than a mild behavioral response. ▪ No effect to nesting, foraging, or migratory habitat is anticipated.
Marine Mammals		
Southern resident killer whale (SRKW)	No Effect to Discountable	▪ Unlikely to occur in Project site. ▪ Boats will avoid approaching, if SRKW present. ▪ In-water work will be delayed if SRKW present near the Project site.
Harbor seal	No Effect to Discountable	▪ Likely to avoid Project site when boats and/or workers are present. ▪ Boats will avoid disturbing harbor seals in Project vicinity. ▪ Seals may receive slight benefit from increased foraging opportunity around floating gear.
Other pinnipeds	No Effect to Discountable	▪ Same conclusions as for harbor seals.
Invertebrates		
Hardshell clams	No effect	▪ The floating culture gear or operations would have no impact on hardshell clam beds within the intertidal zone.
Oyster beds	No effect	▪ The floating culture gear or operations would have no impact on oyster beds within the intertidal zone.

7.2 Critical Habitat for Federally Listed Species

The proposed Project site includes designated critical habitat for bull trout, Puget Sound Chinook salmon, nearshore juvenile bocaccio, and SRKW. Similar to the effects to species, potential effects to habitat are also considered minor or negligible/minor (Table 1). No critical habitat exists in the Project site for steelhead, marbled murrelet, or yelloweye rockfish. Table 4 summarizes the determination of effects to critical habitat associated with the proposed Project.

Table 4. Summary of the Determination of Effect to Critical Habitat

Species	Relevant Physical and Biological Features	Determination of Effect	Basis of Determination
Fishes			
Bull Trout	▪ Migratory habitat free from impediments ▪ Abundant food base ▪ Complex shoreline habitat ▪ Water quality	Discountable	▪ No obstructions to migration would occur. ▪ Forage potential would not be affected. ▪ There may be some increase in available cover/refugia. ▪ Only short-term adverse changes in water quality would occur during installation of anchors.
Chinook salmon	Nearshore marine & estuarine areas: ▪ Forage ▪ Free of obstruction ▪ Natural cover ▪ Salinity ▪ Water quantity and quality	Minor to Discountable	▪ No obstructions to migration would occur. ▪ Forage potential would not be affected. ▪ There may be some increase in available cover/refugia. ▪ No changes to salinity would occur. ▪ Habitat complexity and SAV would not be affected. ▪ Water temperature would not be affected. ▪ Only short-term adverse changes in water quality would occur during installation of anchors.
Bocaccio	▪ Prey quantity, quality, and availability ▪ Water quantity and quality ▪ Dissolved oxygen	Minor to Discountable	▪ Forage potential would not be affected. ▪ Only short-term adverse changes in water quality would occur during installation of anchors. ▪ No changes to dissolved oxygen would occur.
Mammals			
SRKW	▪ Water quality ▪ Prey ▪ Passage	Minor to Discountable	▪ Only short-term adverse changes in water quality would occur during installation of anchors. ▪ Insignificant beneficial increase in prey species (i.e., forage fish, Chinook salmon) would occur. ▪ No obstructions to migration would occur.

7.3 Fish and Wildlife Habitat Conservation Areas

Oakland Bay meets the definition of an FWHCA (MCC 11.04.030), and locally important species are identified above in Table 1 and Table 3. The Project may have minor to discountable effects to these species and their habitat. The effects of the Project are largely short-term and localized. Long-term effects due to the presence of floating culture gear are expected to be limited and potentially beneficial for species that would utilize the gear as resting or foraging habitat.

8.0 ASSESSMENT OF MITIGATION AND NO NET LOSS

The SMP provides that new or expanded aquaculture shall be located, designed, and maintained to assure no net loss of ecological functions, as demonstrated in a HMP or equivalent report (MCC 17.50.210(b)(1)(I)). There are no known proposals for similar actions in Oakland Bay (i.e., floating oyster bag shellfish culture), but there are other shellfish activities that include commercial, tribal, and recreational shellfish harvest. There is also an Olympia oyster reserve in Oakland Bay used for tribal shellfish harvest (Westley et al. 1985).

The following information focuses on shellfish activities in Oakland Bay and the potential impacts to the system. This analysis is consistent with, and builds upon, the analysis and evaluation of impacts associated with shellfish activities in Washington State inland marine waters described in the Corps (2015) Programmatic Biological Assessment (PBA) and the associated programmatic consultation (USFWS 2016; NMFS 2016).

The programmatic consultation covers continuing shellfish farming activities along with new shellfish farming, commercial harvest, recreational harvest, tribal harvest, and restoration activities over an anticipated 20-year timeline and is considered a state-wide cumulative impacts assessment. The programmatic consultation resulted in 32 conditions designed to avoid and limit impacts to listed species, critical habitat, and essential fish habitat. This was revised to 31 conditions after the delisting of canary rockfish (*Sebastes pinniger*) on January 23, 2017 (82 FR 7711). The proposed Project would comply with all the programmatic consultation conditions.

8.1 Water Quality

The proposed Project would add gear to Oakland Bay but would result in a negligible change in water circulation, contaminants, and suspended particulates/turbidity (refer to Section 6.1). Oakland Bay also includes other suspended culture methods and intertidal shellfish activities. Intertidal activities would result in a higher level of turbidity compared to subtidal shellfish activities due to disturbance of the sediment during harvest. Even so, the effects to water quality are considered minor, short-term, and well within the natural disturbance of the system. For example, turbidity was continuously measured for an existing oyster and Manila clam operation in Burley Lagoon from August through October of 2016 (Golder 2019). Based on the data collected and visual observations, there was no noticeable increase in turbidity during a harvesting event. The observations in October also coincided with rainfall/discharge events that resulted in large spikes in turbidity from the natural events that occur during fall. Other natural increases in turbidity were measured by Golder (2019) within the same timeframe, which were associated with advection of a turbid fringe layer during tidal exchange in shallow water, dewatering of intertidal areas during an ebb tide, and creek inputs. Overall, the turbidity generated from an intertidal harvest event is limited to the location of harvest and

overwhelmed by other natural processes such as wind-wave events, rain events, tidal movement, and river inputs.

This example emphasizes that, compared to suspended sediments deposited from Cranberry, Deer, Johns, and Goldsborough creeks that discharge into Oakland Bay or other natural events such as tidal exchange, water quality following a shellfish harvesting event would return quickly to existing conditions or would be below existing conditions, depending on the season. Therefore, shellfish activities result in short-term impacts to water quality within a relatively small area compared to existing conditions from riverine inputs or wind/wave disturbance.

As discussed above, shellfish activities are reliant on the maintenance of good water quality conditions to ensure the safety of the shellfish that are harvested for human consumption. Because of this incentive, numerous actions taken by tribes, restoration groups, regulatory agencies, and shellfish aquaculture companies result in improvements to water quality and/or the prevention of anthropogenic activities threatening water quality and habitat function. Many of these improvements within Oakland Bay were discussed above (Section 5.1). In addition, there are activities associated with conservation measures that avoid or minimize potential impacts to water quality (Corps 2015; USFWS 2016; NMFS 2016).

Activities associated with the proposed Project, other similar actions, or other shellfish activities would result in a minor amount of suspended sediments that are well within the changes of the natural system. Standard BMPs help to avoid or minimize potential impacts to water quality. More importantly, the presence of commercial, tribal, and recreational shellfish activities provides incentives to improve water quality in Oakland Bay. The proposed Project and similar actions would have an overall positive effect on water quality and would result in a no net loss of habitat.

8.2 Sediment Quality

There is a limited amount of gear directly on the substrate associated with the proposed Project. Approximately 0.02 acre of benthic area would be taken up by anchors (refer to Section 6.2). There is shellfish gear in other parts of Oakland Bay, both within the intertidal and subtidal areas, but this gear is a minor portion of the available area. For example, subtidal culture in Oakland Bay and Hammersley Inlet currently represents approximately 0.6% of the subtidal zone. Standard BMPs during site access help to minimize potential disturbance of the substrate. For example, vessels or floats are required by DNR (2022b) to avoid scarring the seabed from anchors and chains dragging along the bottom. Additional conservation measures help to avoid or minimize potential impacts to sediment quality (Corps 2015; USFWS 2016; NMFS 2016).

The main potential impact to sediment quality from floating culture is the potential increase in biodeposits that can lead to sediment organic enrichment. Studies have reported that, when there is an increase in fine sediments and organics, there may be an associated shift towards

certain species of polychaetes that can utilize the additional organics (Matisson and Lindén 1983). These species can take advantage of the additional organics in the substrate. Shellfish aquaculture has also been reported to result in increased biodeposition that may lead to changes in sediment characteristics (Cranford et al. 2009), as discussed in Section 6.2 above, but these increases are reported to be significant only at culture densities that are magnitudes higher than that proposed or existing in Oakland Bay. The degree of environmental impact is related to site conditions and culture practices, which are minor to negligible in Oakland Bay. The presence of filter feeders and their biodeposits may also affect nitrification-denitrification and regeneration of sediment nutrients to the water column (Newell 2004), which would improve sediment quality in the surrounding area.

Activities associated with the proposed Project or other similar actions are sustainable within Oakland Bay. Standard BMPs help to avoid or minimize potential impacts and potential increases in biodeposits provide opportunities for improvements in sediment quality through nitrification-denitrification and regeneration of sediment nutrients. The proposed Project and similar actions would have an overall positive effect on sediment quality and result in a no net loss of habitat.

8.3 Fish and Wildlife Habitat

Shellfish aquaculture operations have been present in Oakland Bay for over 100 years and include a variety of culture methods and types of gear used to grow shellfish. Although shellfish aquaculture activities can be described as a pulse disturbance – or a short, discrete event – the overall impact to fish and wildlife present in the area varies on the species, location in the water column, and habitat changes that result from the addition of shellfish aquaculture gear or products. The response associated with shellfish aquaculture operations from the majority of fish and wildlife species includes increased abundance and diversity. Potential adverse impacts are managed through avoidance measures and monitoring.

While the proposed Project or other similar actions avoids the primary fish and wildlife foraging locations, there are other shellfish activities in Oakland Bay that are located in intertidal areas where there is more potential overlap. Even so, intertidal activities occur when fish and marine mammals are naturally excluded (i.e., the area does not have water) or result in a minor disturbance to behavior due to the presence of humans. The infrequency of the activities associated with the proposed Project, other similar actions, or intertidal shellfish activities in Oakland Bay would result in only minor impacts to fish and wildlife habitat that result in temporary avoidance (Dumbauld et al. 2015). Studies of floating or near-bottom culture gear report primarily increases in fish abundance and diversity (Pinnix et al. 2005; Dumbauld et al. 2009; Kalson and Kramer 2015).

Multiple studies have looked at the increase in fish and wildlife prey resources in areas with shellfish culture beds (as discussed in Section 8.4 below). A few studies have expanded upon

the culture bed scale into a food web analysis that looks at the potential effects of shellfish aquaculture at a larger scale. For example, Preikshot et al. (2015) developed an Ecopath with Ecosim model for South Sound with parameters extracted from observations during the period 1970 to 2012. This parameterized model was used to evaluate the potential effects of growth in shellfish aquaculture on other aspects of the food web that are not directly related to shellfish activities. The model forecasted various scenarios through 2054, and the scenarios that included a 10-fold expansion of shellfish aquaculture (oysters, mussels and geoduck clams) were unlikely to significantly influence the biomass of other marine fish. While such ecosystem models can identify biomasses of ecosystem components, they are not an effective method for identifying the mechanism for biomass change and the cause of that change may be due to processes outside of the modeled area (e.g., salmon life stages that occur beyond the modeled area). That said, the model identified few negative feedbacks associated with shellfish aquaculture. Overall, the study suggested that shellfish aquaculture, as presently configured and even with a significant expansion of culture activities, is benign or beneficial to most fish species.

Although marine birds feed at shellfish aquaculture farms, the farms themselves do not necessarily attract larger numbers of birds compared to non-cultured areas (Hilgerloh et al. 2001). For example, Žydelis et al. (2006) found that natural environmental attributes rather than the presence of shellfish aquaculture were the primary determinants of densities of wintering surf scoters and white-winged scoters in Baynes Sound, British Columbia. These findings suggest that winter scoter populations and the shellfish aquaculture industry may be mutually sustainable because there was no evidence of a negative impact on scoter populations at the current level of shellfish farming practiced in Baynes Sound. It is notable that in 2001, Baynes Sound had over 20% of habitat used for shellfish culture (Carswell et al. 2006). Other observations of marine birds suggest that some species forage in areas with shellfish, while others will avoid locations where additional structure is added.

The proposed Project, other similar actions, and intertidal shellfish activities in Oakland Bay do not result in significant impacts to fish and wildlife habitat and may provide a benefit for additional foraging opportunities. Standard BMPs defined in the programmatic consultation help to avoid or minimize potential impacts. The proposed Project and similar actions would have an overall positive or neutral effect on fish and wildlife habitat and would result in a no net loss of habitat.

8.4 Invertebrates

Intertidal invertebrate communities exist within a habitat that is naturally dynamic, including exposure to daily tidal inundation, wind, rain, and sun. As a result, the species that are found in these areas have high tolerances to physical change and are able to re-colonize disturbed areas quickly. Both Ferns et al. (2000) and Kaiser et al. (1998) reported invertebrate community recovery rates in sandy habitats of around 50 days for species such as polychaetes and

amphipods. Oakland Bay is characterized as a sandy substrate with finer materials, especially within the subtidal areas. However, the proposed Project or similar actions would have limited impacts to benthic habitat due to the small amount of gear that interacts with the substrate.

Shellfish species harvested in public beaches include Manila clams, native littleneck clams, butter clams, and other shellfish (e.g., cockles, varnish clams, horse clams). A study in Samish Bay indicated that there is a dominance of polychaetes, crustaceans, nematodes, bivalves, and foraminifera in Manila clam culture beds (Suhrbier et al. 2017). The authors reported that, after a Manila clam harvesting event, the density and species richness of smaller epibenthic and benthic organisms were not affected. Similarly, the Kellogg et al. (2018) study discussed above looked at benthic invertebrates as an indication of ecological health associated with floating and on-bottom culture gear. The study found no significant negative impacts on the benthic invertebrate community structure from the presence of gear or oysters, and the number of invertebrates inside the farm sites were higher compared to outside.

Many studies report that invertebrates are abundant on shellfish culture gear, or on shellfish products, and create a robust community when shellfish aquaculture is present. These studies generally support the assertion that shellfish aquaculture gear provides similar benefits to benthic invertebrate abundance and variation compared to other structured habitats (e.g., eelgrass). For example, Hosack et al. (2006) reported that benthic invertebrates were strongly associated with habitat type, and structured habitats (oyster beds and eelgrass) had higher species abundance than other habitat types.

Areas with an increase in organic material or structure can enhance mobile invertebrates. McDonald et al. (2015) indicated that typical patterns for transient macrofauna (e.g., crabs, sea stars) significantly favor structure-associated species when shellfish gear is present. The provision of foraging and refuge habitat is the primary reason for the attraction to the gear, especially for crabs.

The proposed Project, other similar actions, and intertidal shellfish activities in Oakland Bay do not result in significant impacts to invertebrates and may provide an increased abundance due to presence of shellfish culture gear, shellfish products, or increased organic material. The proposed Project and similar actions would have an overall positive or neutral effect on invertebrates and would result in a no net loss of habitat.

8.5 Submerged Aquatic Vegetation

Dumbauld and McCoy (2015) suggested that shellfish influence SAV through the following mechanisms:

- Physical structure of shells/reefs;
- Nutrient additions to sediments and water column through biodeposits; and
- Increased water clarity through biological filtration.

Negative effects from shellfish activities to SAV are typically short-term and transitory (e.g., increased turbidity). Longer-term effects are associated with modifications to the substrate size and type (i.e., graveling), which is not part of the proposed Project or similar actions. Many of the effect mechanisms to SAV are limited and the best available science suggests that shellfish harvest is a sustainable activity within SAV given the long history (over 100 years), potential for recovery, and continuous co-occurrence between shellfish and SAV within major estuaries (Wisehart et al. 2007; Tallis et al. 2009; Ruesink et al. 2012; Dumbauld and McCoy 2015; Ferriss et al. 2019).

Some of the concerns related to shellfish aquaculture that could also affect SAV include: (1) the potential for escaped gear to end up on private or public beaches (Michniak, pers. Comm., 2021), and (2) direct impacts to native SAV such as eelgrass. The methods used to avoid and minimize impacts of gear escaping from a farm site includes properly maintaining and securing gear, regular beach cleanup efforts, and gear labeling. These are all conservation measures from the programmatic consultation or BMPs currently used by Taylor Shellfish. There is no documented native eelgrass in Oakland Bay (DNR 2022a), and other types of SAV and aquaculture has sustainably co-occurred in Oakland Bay for over 100 years.

Kelps are also important types of SAV of nearshore aquatic communities; however, they require rocky habitat (or some kind of hard substrate) for attachment. Shellfish aquaculture does not occur in rocky habitat, but smaller hard substrate materials (e.g., anchors, bivalve shells, etc.) may be present in aquaculture locations. This gear and cultured bivalves provide hard substrate, which can serve as attachment points for kelps and typically enhance intertidal areas by increasing other macroalgae species. Powers et al. (2007) quantified the addition of macroalgae that colonizes predator exclusion nets as providing comparable ecosystem functions (e.g., nursery habitat, epibiota biomass) as seagrass beds. Ecosystem functions were also provided by the invertebrates that attached to the gear (discussed above). The value provided by this colonization is also identified as being higher in areas where there was previously mudflat without vegetation.

The proposed Project, other similar actions, and intertidal shellfish activities in Oakland Bay do not result in significant impacts to SAV. Most shellfish locations, including the proposed Project, avoid SAV in Oakland Bay. The proposed Project and similar actions would have an overall neutral or positive effect on SAV and would result in a no net loss of habitat.

8.6 Summary of Mitigation and No Net Loss

Shellfish aquaculture is recognized for both positive and negative effects on water quality. Negative effects, such as short-term and localized increases in turbidity, are seen as pulse disturbances that do not have lasting impacts on water quality. These pulse disturbances are also well within the natural variability of a tidally-influence area. In contrast, positive effects associated with shellfish aquaculture can have lasting impacts on improvements to water

quality. Presence of commercial, tribal, and recreational groups growing and harvesting shellfish provides incentives to improve water quality in Oakland Bay. These groups have proven to be effective advocates with a history of water quality improvement in Oakland Bay.

Shellfish aquaculture, both the proposed Project and other similar actions, result in a minor amount of benthic area that is used by gear (e.g., anchors). Additional BMPs and conservation measures designed for shellfish aquaculture activities further reduces or avoids impacts to sediment quality. Potential increase in sediment organic enrichment is not at the density of shellfish aquaculture activities that would result in significant changes to invertebrate populations or sediment characteristics. The density of culture proposed or present in Oakland Bay is more likely to result in positive effects to sediment quality.

The overall impact to fish and wildlife present in the area varies on the type of species, location in the water column, and habitat changes that result from the addition of shellfish aquaculture gear or products. The proposed Project and other similar actions are designed to avoid major migration routes for fish and wildlife and are located away from nearshore areas. Food web analysis or other large-scale studies indicate that there are few negative feedbacks associated with shellfish aquaculture and the activities is mutually sustainable with the presence of fish and wildlife. Potential adverse impacts are managed through avoidance and minimization measures and monitoring, as defined in the programmatic consultation.

Shellfish aquaculture operations affect invertebrate communities in both negative and positive ways. Most literature indicates that, while there are changes to communities, these changes are considered to be temporary negative changes (i.e., pulse disturbance with a short-term recovery) and longer positive changes in terms of the functions that are provided to higher organisms (e.g., prey for fish and wildlife). These positive changes may also include increased species diversity and species abundance within shellfish aquaculture sites compared with similar habitats without shellfish aquaculture. This conclusion is consistent with the NMFS (2016) and USFWS (2016) Biological Opinions related to shellfish aquaculture activities in Washington State.

SAV and oysters have co-existed for centuries, and shellfish aquaculture has shown to be a sustainable activity within these habitats. SAV may experience periodic disturbances from aquaculture activities during bed preparation, planting, harvest, and movement of workers and gear across the farm site. As a result, there are likely to be short-term disturbances to SAV. The disturbances associated with aquaculture are often pulsed and occur at a similar (or lower) magnitude and frequency to natural disturbance events (e.g., wind-waves, tidal movement). In some cases, shellfish gear provides attachment points for kelp or other macroalgae, which can provide a benefit to ecological functions in Oakland Bay.

In summary, the proposed Project is consistent with the policies of the SMP, incorporates effective avoidance and minimization measures, and will result in a no net loss of ecological

functions. There are other shellfish activities in Oakland Bay that include commercial, tribal, and recreational shellfish harvest. There are no interactions with these other activities for water quality, sediment quality, fish and wildlife habitat, or SAV that would result in cumulative impacts. While there are minor impacts that can occur during a shellfish aquaculture operations, these impacts are well within the natural variability of the system and still maintain the natural functioning of that system. Standard BMPs and the conservation measures in the programmatic consultation, which the Project will follow, also help to help to avoid or minimize potential impacts, thereby eliminating the need for further mitigation. Overall, the proposed Project in Oakland Bay would result in no net loss of ecological functions.

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Appendix A

Fish and Wildlife and NMFS/NOAA Fisheries Habitat Database Information

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Chinook Salmon (Protected)

Chinook Salmon (Protected)

Oncorhynchus tshawytscha

Protected Status

ESA ENDANGERED
Sacramento River winter-run

ESA ENDANGERED
Upper Columbia River spring-run

ESA THREATENED
California coastal

ESA THREATENED
Central Valley spring-run

ESA THREATENED
Lower Columbia River

ESA THREATENED
Puget Sound

ESA THREATENED
Snake River fall-run

ESA THREATENED
Snake River spring/summer-run

ESA THREATENED
Upper Willamette River

ESA CANDIDATE
Upper Klamath-Trinity River

ESA EXPERIMENTAL POPULATION
Central Valley spring-run in the San Joaquin River XN

ESA EXPERIMENTAL POPULATION
Upper Columbia River spring-run in the Okanogan River subbasin XN

Quick Facts

WEIGHT	40 pounds but can be up to 120 pounds
LENGTH	3 feet
LIFESPAN	Up to 7 years, typically 3 to 4 years
THREATS	Climate change, Commercial and recreational fishing, Habitat degradation, Habitat impediments (dams), Habitat loss
REGION	West Coast

Spring Chinook Salmon. Credit: Michael Humling, U.S. Fish & Wildlife Service

About the Species

Chinook salmon are anadromous fish, which means they can live in both fresh and saltwater. Chinook salmon have a relatively complex life history that includes spawning and juvenile rearing in rivers followed by migrating to saltwater to feed, grow, and mature

before returning to freshwater to spawn. They are vulnerable to many stressors and threats including blocked access to spawning grounds and habitat degradation caused by dams and culverts. Two species of chinook salmon are listed as endangered under the Endangered Species Act, seven species are listed as threatened under the ESA, and one species is a candidate for listing under the ESA.

The Sacramento River Winter-run Chinook is one of NOAA Fisheries' Species in the Spotlight.

NOAA Fisheries is committed to conserving and protecting chinook salmon. Our scientists and partners use a variety of innovative techniques to study, learn more about, and protect this species.

Protected Status

ESA Endangered

1 evolutionarily significant unit

- Sacramento River winter-run

ESA Endangered

1 evolutionarily significant unit

- Upper Columbia River spring-run

ESA Threatened

1 evolutionarily significant unit

- California coastal

ESA Threatened

1 evolutionarily significant unit

- Central Valley spring-run

ESA Threatened

1 evolutionarily significant unit

- Lower Columbia River

ESA Threatened

1 evolutionarily significant unit

- Puget Sound

ESA Threatened

1 evolutionarily significant unit

- Snake River fall-run

ESA Threatened

1 evolutionarily significant unit

- Snake River spring/summer-run

ESA Threatened

1 evolutionarily significant unit

- Upper Willamette River

ESA Candidate

1 evolutionarily significant unit

- Upper Klamath-Trinity River

ESA Experimental Population

1 evolutionarily significant unit

- Central Valley spring-run in the San Joaquin River XN

ESA Experimental Population

1 evolutionarily significant unit

- Upper Columbia River spring-run in the Okanogan River subbasin XN

Scientific Classification

Kingdom	Animalia

Phylum	Chordata
Class	Actinopterygii
Order	Salmoniformes
Family	Salmonidae
Genus	*Oncorhynchus*
Species	*O. tshawytscha*

Last updated by NOAA Fisheries on 05/03/2022

Last updated by NOAA Fisheries on 05/03/2022

Last updated by NOAA Fisheries on 05/03/2022

In the Spotlight

Sacramento River Winter-Run Chinook

The Sacramento River winter-run evolutionarily significant unit (called an "ESU") of Chinook salmon is one of NOAA Fisheries' Species in the Spotlight. This initiative is a concerted, agency-wide effort launched in 2015 to spotlight and save the most highly at-risk marine species.

Chinook salmon are an iconic part of California's natural heritage that must be preserved in order to ensure the economic and recreational wellbeing of future generations. Millions of wild salmon once returned to spawn in the foothills and mountains of California's Central Valley. Streams fed by rainfall, snowmelt, and cold water springs encircled the valley, fostering a diversity and abundance of Chinook salmon. The endangered Sacramento River winter-run Chinook salmon are particularly important among California's salmon runs because they exhibit a life-history strategy found nowhere else on the West Coast. These Chinook salmon are unique in that they spawn during the summer months when air temperatures usually approach their warmest.

As a result, winter-run Chinook salmon require stream reaches with cold water sources that will protect their incubating eggs from the warm ambient conditions. Because of this need for cold water during the summer, winter-run Chinook salmon historically occurred only in rivers and creeks fed by cold water springs, such as the Little Sacramento, McCloud, and Pit rivers, and Battle Creek.

The construction of Shasta and Keswick dams eliminated access to the Little Sacramento, McCloud, and Pit rivers, effectively causing the extirpation of the winter-run Chinook salmon populations that spawned and reared there. The fish from these different populations were forced to mix and spawn as one population downstream of Keswick Dam on the Sacramento River. The construction and operation of hydropower facilities in Battle Creek made the creek inhospitable to winter-run Chinook salmon, and that population also was extirpated.

The one remaining winter-run Chinook salmon population has persisted in large part due to agency-managed cold water releases from Shasta Reservoir during the summer and artificial propagation from Livingston Stone National Fish Hatchery's winter-run Chinook salmon conservation program. Thus, winter-run Chinook salmon are dependent on sufficient cold water storage in Shasta Reservoir, and it has long been recognized that a prolonged drought could have devastating impacts, possibly leading to the species' extinction.

Threats

Currently, Shasta and Keswick dams block winter-run Chinook salmon from nearly all of their historical spawning habitat. The spawning habitat that is accessible is subject to water temperatures that are too warm to support egg and fry survival, particularly during droughts, some of which have been very severe in recent years.

Juvenile Sacramento River winter-run chinook salmon. Credit: NOAA Fisheries

In addition to lost and degraded spawning habitat, 98 percent of riparian and floodplain habitat along the Sacramento River is no longer available to support juvenile rearing. Other threats to winter-run Chinook salmon include water withdrawals, predation by non-native species, lack of quality rearing habitat in the Sacramento-San Joaquin Delta, and commercial and recreational fisheries.

Credit: NOAA Fisheries

Species Recovery

In 2014, NOAA Fisheries adopted a plan to recover Sacramento River winter-run Chinook salmon, as well as Central Valley spring-run Chinook salmon, and Central Valley steelhead.

State and federal agencies, public organizations, non-profit groups and others in California's Central Valley have formed strong partnerships to save Sacramento River winter-run Chinook salmon. Efforts to protect winter-run Chinook salmon include restoring habitat, utilizing conservation hatchery programs, closely monitoring the population, and carefully managing scarce cold water. Additional key actions needed to safeguard winter-run Chinook salmon from further declines include:

- Improving management of Shasta Reservoir's storage in order to provide cold water for spawning adults, eggs, and fry, stable summer flows to avoid dewatering redds, and winter/spring pulse flows to improve smolt survival through the delta.
- Completing the Battle Creek Salmon and Steelhead Restoration Project and reintroducing winter-run Chinook salmon to the restored habitat.
- Reintroducing winter-run Chinook salmon into the McCloud River.
- Improving Yolo Bypass fish habitat and passage so juveniles can more frequently utilize the bypass for rearing and adults can freely pass from the bypass back to the Sacramento River.
- Managing winter and early spring delta conditions for improved juvenile survival.

Juvenile winter-run chinook salmon being reintroduced to Battle Creek.

- Conducting landscape-scale restoration throughout the delta to improve the ecosystem's health and support native species.
- Expanding the Livingston Stone National Fish Hatchery's facilities to support both the captive broodstock and conservation hatchery programs; and
- Evaluating alternative control rules used to limit incidental take of winter-run Chinook salmon in ocean fisheries.

Species in the Spotlight Priority Actions

We developed a Species in the Spotlight 2021-2025 Priority Action Plan that builds on the recovery plan and the 2016-2020 Priority Action Plan and details the focused efforts that are needed over the next five years. The plan lists key actions NOAA Fisheries and its partners can take from 2021 to 2025 to help recover the species. These actions include:

- Improve management of Shasta Reservoir cold water storage
- Restore and reintroduce winter-run Chinook to Battle Creek habitat
- Reintroduce winter-run Chinook salmon into historical habitats above Shasta Dam
- Improve Yolo Bypass fish habitat and passage
- Manage winter and early spring delta conditions to improve juvenile survival
- Collaborative science and fostering partnerships

In our first five years of the Species in the Spotlight, we have:

- Improved Shasta Reservoir cold water management (good survival from egg to juvenile stages since 2016).
- Reintroduced 567,000+ winter-run Chinook salmon into Battle Creek.
- Documented successful spawning and natural production of juveniles in Battle Creek in 2020.
- Improved fish passage conditions with projects completed at the Knights Landing Outfall Gates, Wallace Weir, and Fremont Weir.
- Acoustically tagged winter-run Chinook salmon juveniles annually to get real-time information on distribution to inform water management decisions.

While we still have much to do, these are important steps towards recovery for Sacramento River winter-run chinook salmon.

2017 Species in the Spotlight Hero Award

Lewis Bair, General Manager of Reclamation District 108, has been a leader in northern California water and salmon issues for many years. As part of the Sacramento Valley Salmon Recovery Program, Lewis has helped implement numerous actions to benefit Sacramento River winter-run Chinook salmon. Most notably, Lewis' efforts led to the funding of two major projects. Both projects were included in the 5-year action plan: a fish barrier at the Knights Landing Outfall Gates and the Wallace Weir Fish Rescue Project.

Learn more about Lewis' work >

2019 Partner in the Spotlight Award

Randi Field with the U.S. Bureau of Reclamation's MidPacific Region is responsible for operation of the largest reservoir in California, the Shasta Reservoir. Shasta Reservoir stores up to 4.5 million acre-feet of water that meets critical water supply needs for farms and cities. It must also maintain conditions for drinking water and fish protection throughout California. Winter-run Chinook salmon eggs and fry are vulnerable to summer heat. They persist because of the careful operations of the limited cold-water pool deep in Shasta Reservoir.

Learn more about Randi's work ›

Randi Field

Lewis Bair at Wallace Weir.

Last updated by NOAA Fisheries on 05/03/2022

Management Overview

ESA-Listed Snake River Basin Species

NOAA Fisheries has adopted three recovery plans for the four ESA-listed Snake River basin species: steelhead, spring/summer Chinook salmon, fall Chinook salmon and sockeye salmon. The Snake River Sockeye Recovery Plan was adopted in June 2015. The Snake River Fall Chinook Recovery Plan and Snake River Spring/Summer Chinook Salmon and Snake River Basin Steelhead Recovery Plans were adopted in November 2017.

It is our intent to optimize Recovery Plan implementation through stakeholder involvement to prioritize and implement recovery actions; particularly through NOAA Fisheries' Snake River Coordination Group.

Learn more:

- Snake River Sockeye Salmon Recovery Plan
- Snake River Fall Chinook Salmon Recovery Plan
- Snake River Spring/Summer Chinook Salmon and Snake River Basin Steelhead Recovery Plan

Status Reviews, Recovery Plans, and Maps

- Chinook Salmon Status Reviews and 5-Year Reviews
- Chinook Salmon Recovery Plans
- Chinook Salmon Maps & GIS Data

Recovery Planning and Implementation

Species Recovery Contacts

Coastal California Chinook Salmon ESU

- Erin Seghesio, Recovery Coordinator
- Julie Weeder, Recovery Coordinator

Sacramento River Winter-Run ESU

- Brian Ellrott, Recovery Coordinator

Central Valley Spring Run ESU

- Brian Ellrott, Recovery Coordinator

Regulatory History

Upper Klamath-Trinity Rivers Chinook Salmon ESU

In 2017, the Karuk Tribe and Salmon River Restoration Council petitioned NOAA to list the Upper Klamath-Trinity Rivers (UKTR) Chinook salmon ESU or, alternatively, create a new ESU to describe Klamath Spring Chinook salmon and list it as threatened or endangered under the ESA.

NOAA Fisheries reviewed the petition and determined that a status review of the Chinook salmon in the UKTR Basin should be conducted.

Spring-run Chinook Salmon in the Oregon Coast ESU

On September 24, 2019, the Native Fish Society, Center for Biological Diversity, and Umpqua Watersheds petitioned NOAA to identify Oregon Coast spring-run Chinook salmon as a separate ESU and list the ESU as threatened or endangered under the ESA. On May 4, 2020, Richard K. Nawa also petitioned NOAA to identify Southern Oregon and Northern California Coastal spring-run Chinook salmon as a separate ESU and list the ESU as threatened or endangered under the ESA.

NOAA Fisheries reviewed both petitions and determined that a status review of Oregon Coast spring-run Chinook salmon and Southern Oregon and Northern California Coastal spring-run Chinook salmon should be conducted.

Upon completion of the status review for Oregon Coast spring-run and Southern Oregon and Northern California Coastal spring-run Chinook, NOAA Fisheries announced a joint 12-month finding on these petitions to list populations of spring-run Chinook salmon as threatened or endangered ESUs under the ESA and to designate critical habitat concurrently with the listings. Based on the best scientific and commercial data available, including the ESU configuration report, NOAA Fisheries determined that listing the Oregon Coast and Southern Oregon and Northern California Coastal spring-run Chinook salmon populations as threatened or endangered ESUs is not warranted. NOAA Fisheries determined that the Oregon Coast and Southern Oregon and Northern California Coastal spring-run Chinook salmon populations do not meet the ESU policy criteria to be considered ESUs separate from the Oregon Coast and Southern Oregon and Northern California Coastal fall-run Chinook salmon populations.

Key Actions and Documents

Actions & Documents | Incidental Take

12-Month Findings on Petitions to List Spring-run Oregon Coast Chinook Salmon and Spring-run Southern Oregon and Northern California Coastal Chinook

We, NOAA Fisheries, announce 12-month findings on two petitions to list populations of spring-run Chinook salmon (Oncorhynchus tshawytscha) as threatened or endangered Evolutionarily Significant Units (ESUs) under the Endangered Species Act (ESA) and to…

- 12-month Finding (86 FR 45970, August 17, 2021)
- 90-day Finding (86 FR 14407, March 16, 2021)
- 90-day Finding (85 FR 20476, April 13, 2020)
- Frequently Asked Questions: 12-Month Findings, Petitions to List Spring-run Ore…
- Frequently Asked Questions: 90-Day Finding, Petition to list Spring-run Souther…
- Frequently Asked Questions: 90-Day Finding, Petition To List Oregon Coast Sprin…
- Petition to list the OR Coast ESU of Spring-run Chinook Salmon under the ESA
- Petition to list Southern Oregon and Northern California Coastal spring-run Chi…
- Report on a review of the Oregon coast and Southern Oregon Northern California …

Notice

, West Coast

PUBLISHED

August 17, 2021

Proposed Rule to Authorize the Reintroduction of Central Valley Spring-Run Chinook Salmon in the Upper Yuba River

NOAA Fisheries is issuing a proposed rule to authorize the reintroduction of Central Valley (CV) spring-run Chinook salmon in the upper Yuba River above Englebright Dam. This proposed rule would designate the fish released as nonessential experimental…

- Proposed rule (85 FR 79980, 12/11/2020)
- Proposed rule; extension of public comment period (86 FR 2372, 01/12/2021)
- Draft Environmental Assessment
- Dear Recipient Letter
- Questions and Answers

Proposed Rule

, West Coast

PUBLISHED

December 11, 2020

90-Day Finding on a Petition To List Oregon Coast Spring-Run Chinook Salmon as Threatened or

Endangered Under the Endangered Species Act

We, NOAA Fisheries, announce a 90- day finding on a petition to list spring-run Chinook salmon (Oncorhynchus tshawytscha) on the Oregon coast as a threatened or endangered Evolutionarily Significant Unit under the Endangered Species Act and to designate…

- 90-Day Finding (85 FR 20476, April 13, 2020)
- Petition from the Native Fish Society, Center for Biological Diversity, and Ump…
- Frequently Asked Questions

Notice

, West Coast

ISSUED

April 13, 2020

Dungeness Hatcheries Plans

NOAA Fisheries is making available for public review its Proposed Evaluation and Pending Determination (PEPD) (PDF, 52 pages) analyzing effects of our proposed determination on three hatchery programs currently operating in the Dungeness River basin of…

- Notice of Availability (85 FR 13632, March 9, 2020)
- Proposed Evaluation and Pending Determination (PEPD) (PDF, 52 pages)

Notice

, West Coast

PUBLISHED

March 9, 2020

1 2 3 … Last »

»

Last updated by NOAA Fisheries on 05/03/2022

Science Overview

NOAA Fisheries conducts various research activities on the biology, behavior, and ecology of chinook salmon. The results of this research are used to inform management decisions for this species.

Dive Deeper Into Our Research

Chinook Salmon in Alaska

Our work to forecast salmon harvests, assess the impact of commercial fisheries on salmon, and evaluate how salmon populations respond to environmental changes enable us to estimate abundance and trends for chinook salmon in Alaska.

Salmon research in Alaska >

Juveniles of the five Pacific salmon species. Credit: NOAA Fisheries/Alaska Fisheries Science Center

Last updated by NOAA Fisheries on 05/03/2022

Documents

DOCUMENT

Annual Report for the Alaska Groundfish Fisheries Chinook Salmon Coded Wire Tag and Recovery Data for ESA Consultations

Alaska Region's data on salmon incidental catch in the Alaska groundfish fisheries, including stock…

Alaska

DOCUMENT

Environmental Assessment/Regulatory Impact Review for Proposed Amendment 14 to the Fishery Management Plan for the Salmon Fisheries in the EEZ Off Alaska

Analysis of Amendment 14 that would manage the Cook Inlet EEZ Subarea by applying the prohibition…

Alaska

DOCUMENT

Species in the Spotlight: Priority Actions 2021-2025, Sacramento River Winter-Run Chinook Salmon

The Species in the Spotlight initiative is a concerted agency-wide effort to spotlight and save…

West Coast, National

DOCUMENT

Final Review Draft for Proposed Amendment 51 to the FMP for BSAI King and Tanner Crabs, Amendment 17 to the FMP for the Scallop Fishery off Alaska, and Amendment 15 to the FMP for the Salmon Fisheries Compliance with Bycatch Reporting Methodology

Analysis of FMP amendments regarding Standardized Bycatch Reporting Methodology

Alaska

More Documents >

Data & Maps

MAP

Critical Habitat - Maps and GIS Data (West Coast Region)

West Coast

DATA

2008: Genetic Stock Composition Analysis Of Chinook Salmon Bycatch Samples From The 2008 Bering Sea Pollock Trawl Fisheries

Alaska Fisheries Science Center Salmon Bycatch Report

Alaska

DATA

2010: Genetic Stock Composition Analysis Of Chinook Salmon Bycatch Samples From The 2010 Bering Sea Trawl Fisheries

Alaska Fisheries Science Center Salmon Bycatch Report

Alaska

DATA

2011: Genetic Stock Composition Analysis Of Chinook Salmon Bycatch Samples From The 2011 Bering Sea And Gulf Of Alaska Trawl Fisheries

Alaska Fisheries Science Center Salmon Bycatch Report

Alaska

More Data and Maps >

Outreach & Education

EDUCATIONAL MATERIALS

Protectores de Salmónidos (en español)

A través de los cómics, los juegos de palabras, y los laberintos, los niños aprenden sobre la…

West Coast

EDUCATIONAL MATERIALS

¡Cuento con usted! edición salmón (en español)

Aprenda qué es lo que el salmón necesita para vivir y cómo puede hacer la diferencia.

West Coast

EDUCATIONAL MATERIALS

I'm Counting on You! Salmon Brochure About Issues Affecting Salmon and How You Can Help

Learn about the threats facing salmon and what you can do to help.

West Coast

EDUCATIONAL MATERIALS

Good Salmon Habitat, Bad Salmon Habitat Card Game

What habitat features give salmon and steelhead a chance to thrive, and what conditions are…

West Coast

More Outreach and Education Materials ›

Last updated by NOAA Fisheries on 05/03/2022

Steelhead Trout

Steelhead Trout

Oncorhynchus mykiss

Protected Status

ESA ENDANGERED
Southern California DPS

ESA THREATENED
California Central Valley DPS

ESA THREATENED
Central California Coast DPS

ESA THREATENED
Lower Columbia River DPS

ESA THREATENED

Middle Columbia River

ESA THREATENED
Northern California DPS

ESA THREATENED
Puget Sound DPS

ESA THREATENED
Snake River Basin DPS

ESA THREATENED
South-Central California Coast DPS

ESA THREATENED
Upper Columbia River DPS

ESA THREATENED
Upper Willamette River DPS

ESA EXPERIMENTAL POPULATION
Middle Columbia River XN

Quick Facts

WEIGHT	Up to 55 pounds
LENGTH	Up to 45 inches
LIFESPAN	Up to 11 years
THREATS	Climate change, Commercial and recreational fishing, Habitat degradation, Habitat impediments (dams), Habitat loss
REGION	Alaska, West Coast

Male and female steelhead trout. Credit: NOAA Fisheries

About the Species

Steelhead trout are a unique species. Individuals develop differently depending on their environment. All wild steelhead trout hatch in gravel-bottomed, fast-flowing, well-oxygenated rivers and streams. Some stay in fresh water all their lives and are called rainbow trout. Steelhead trout that migrate to the ocean typically grow larger than the ones that stay in freshwater. They then return to freshwater to spawn. Steelhead trout are vulnerable to many stressors and threats including blocked access to spawning grounds and habitat degradation caused by dams and culverts.

One distinct population segment is listed as endangered under the Endangered Species Act, and 10 DPS and 1 experimental non-essential population are listed as threatened.

NOAA Fisheries is committed to conserving and protecting steelhead trout. Our scientists and partners use a variety of innovative techniques to study, learn more about, and protect this species.

Protected Status

ESA Endangered

- Southern California DPS

ESA Threatened

- California Central Valley DPS

ESA Threatened

- Central California Coast DPS

ESA Threatened

- Lower Columbia River DPS

ESA Threatened

- Middle Columbia River

ESA Threatened

- Northern California DPS

ESA Threatened

- Puget Sound DPS

ESA Threatened

- Snake River Basin DPS

ESA Threatened

- South-Central California Coast DPS

ESA Threatened

- Upper Columbia River DPS

ESA Threatened

- Upper Willamette River DPS

ESA Experimental Population

- Middle Columbia River XN

Scientific Classification

Kingdom	Animalia
Phylum	Chordata
Class	Osteichthyes
Order	Salmoniformes
Family	Salmonidae
Genus	*Oncorhynchus*
Species	*Oncorhynchus mykiss*

Last updated by NOAA Fisheries on 02/17/2022

Last updated by NOAA Fisheries on 02/17/2022

Last updated by NOAA Fisheries on 02/17/2022

In the Spotlight

Last updated by NOAA Fisheries on 02/17/2022

Management Overview

Throughout the West Coast, 11 species of steelhead are protected under the Endangered Species Act. The West Coast Region works with its partners to protect, conserve, and recover steelhead by addressing the threats these animals face and by restoring the habitat on which they depend.

Steelhead Distinct Population Segments

- Puget Sound steelhead
- Upper Columbia River steelhead
- Snake River Basin steelhead
- Middle Columbia River steelhead
- Upper Willamette River steelhead
- Lower Columbia River steelhead
- Northern California Coast steelhead
- California Central Valley steelhead
- Central California Coast steelhead
- South Central California Coast steelhead
- Southern California Coast Steelhead

Learn more about the regulatory history of steelhead trout ›

Recovery Planning and Implementation

Species Recovery Contacts

Central California Coast Steelhead DPS

- Erin Seghesio, Recovery Coordinator

Central Valley Steelhead DPS

- Brian Ellrott, Recovery Coordinator

Northern California Coast Steelhead DPS

- Erin Seghesio, Recovery Coordinator
- Julie Weeder, Recovery Coordinator

Key Actions and Documents

Actions & Documents | Incidental Take

Dungeness Hatcheries Plans

NOAA Fisheries is making available for public review its Proposed Evaluation and Pending Determination (PEPD) (PDF, 52 pages) analyzing effects of our proposed determination on three hatchery programs currently operating in the Dungeness River basin of…

- Notice of Availability (85 FR 13632, March 9, 2020)
- Proposed Evaluation and Pending Determination (PEPD) (PDF, 52 pages)

Notice , West Coast

PUBLISHED

March 9, 2020

Notice of Issuance: Permit for the Implementation of the Carmel River Steelhead Rescue and Rearing Enhancement Program

Notice is hereby given that NOAA Fisheries has issued one direct take permit (#14741) pursuant to the Endangered Species Act (ESA) of 1973, as amended, to the Monterey Peninsula Water Management District (District) for the Carmel River Steelhead Rescue…

- Notice (85 FR 8571, 02/14/2020)
- Section 10a1A Carmel River Steelhead Enhancement Program
- Carmel River Steelhead Rescue and Rearing Managment Plan

Notice , West Coast

PUBLISHED

February 14, 2020

12-Month Finding on a Petition To List Summer-Run Steelhead in Northern California as Endangered Under the Endangered Species Act

We, NOAA Fisheries, announce a 12-month finding on a petition to delineate Northern California (NC) summer-run steelhead as a distinct population segment (DPS) of West Coast steelhead (Oncorhynchus mykiss), and to list that DPS as endangered under the…

- Not Warranted 12-month Finding (85 FR 6527, February 5, 2020)
- Northern California steelhead DPS-Configuration Review-Panel Report

Notice , West Coast

PUBLISHED

February 5, 2020

Oregon Resident Trout and Coho Fishery Plan for the Grande Ronde, Imnaha, and Snake Rivers

NOAA Fisheries is providing one Fishery Management and Evaluation Plan (FMEP) for recreational coho salmon and resident trout fisheries in the Snake River Basin for public comment. The FMEP was submitted by the Oregon Department of Fish and Wildlife …

- Notice of Availability (84 FR 57405, October 25, 2019)
- Biological Opinion: Fisheries in the Snake Basin (PDF, 96 pages)
- Final Environmental Assessment (PDF, 83 pages)

- Fisheries Management and Evaluation Plan: Oregon Coho and Trout Fisheries (PDF,…
- Finding of No Significant Impact

Notice , West Coast

PUBLISHED

October 25, 2019

1 2 3 … Last »

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Last updated by NOAA Fisheries on 02/17/2022

Science Overview

Last updated by NOAA Fisheries on 02/17/2022

Bocaccio (Protected)

Bocaccio (Protected)

Sebastes paucispinis

Also Known As

Bocaccio, Rock Salmon, Salmon Rockfish, Pacific Red Snapper, Pacific Snapper, Oregon Red Snapper, Oregon Snapper, Longjaw, Merou, Jack, Snapper, Rock Cod, Rockfish

Protected Status

ESA ENDANGERED

Puget Sound/Georgia Basin DPS

Quick Facts

WEIGHT	Up to 21 pounds
LENGTH	Up to 3 feet
LIFESPAN	Approximately 50 years
THREATS	Bycatch, Derelict fishing gear, Habitat degradation, Habitat loss, Overfishing
REGION	West Coast

About the Species

Bocaccio are large Pacific coast rockfish that are moderately slow-growing, late to mature, and long-lived. They range from Punta Blanca, Baja California, to the Gulf of Alaska off Krozoff and the Kodiak Islands, but are most common between Oregon and northern Baja California. Having struggled to recover from overfishing, the Puget Sound/Georgia Basin distinct population segment (DPS) of bocaccio is listed as endangered under the Endangered Species Act.

Non-ESA listed populations of bocaccio are harvested in commercial and recreational fisheries. Bocaccio were overfished (southern subpopulation) in the West Coast groundfish fishery and recovered well ahead of schedule.

Learn about bocaccio fisheries off the U.S. West Coast and Alaska ›

Status

NOAA Fisheries is committed to conserving and protecting the Puget Sound/Georgia Basin DPS of bocaccio. Our scientists and partners use a variety of innovative techniques to study, learn more about, and protect this species.

Find bocaccio status reviews ›

Protected Status

ESA Endangered

1 distinct population segment

- Puget Sound/Georgia Basin DPS

Threats

Because all rockfish species are an important part of the food web, actions to support rockfish recovery would benefit the Puget Sound ecosystem. For instance, larval rockfish are a food source for juvenile salmon and other marine fish and seabirds.

Rockfish are vulnerable to overfishing because many species do not begin to reproduce until they are 5 to 20 years old, and very few of their young survive to adulthood. Bocaccio can live over 50 years, and yelloweye rockfish approach up to 150 years. These traits make them susceptible to overfishing and habitat degradation.

Bocaccio were once part of a vibrant recreational and commercial groundfish fishery in Puget Sound. Washington State has closed many commercial fisheries that caught rockfish incidentally, and there is no direct commercial harvest of them in Puget Sound. Recreationally, targeting or retaining any species of rockfish in Puget Sound waters east of the Port Angeles area is not allowed.

Through work with our partners, we have supported a number of rockfish recovery actions, including derelict fishing gear surveys (PDF, 19 pages) and prevention (PDF, 15 pages) efforts, kelp conservation and recovery, the distribution of descending devices to recreational anglers, unique habitat and fish surveys, and the development of outreach materials.

Scientific Classification

Kingdom	Animalia
Phylum	Chordata
Class	Actinopterygii
Order	Scorpaeniformes
Family	Sebastidae
Genus	*Sebastes*
Species	*paucispinus*

Last updated by NOAA Fisheries on 05/09/2022

Last updated by NOAA Fisheries on 05/09/2022

Last updated by NOAA Fisheries on 05/09/2022

In the Spotlight

Last updated by NOAA Fisheries on 05/09/2022

Management Overview

The Puget Sound/Georgia Basin distinct population segment of bocaccio is listed as endangered under the Endangered Species Act.

Through work with our partners, we have supported a number of rockfish recovery actions, including derelict fishing gear surveys (PDF, 19 pages) and prevention (PDF, 15 pages) efforts, kelp conservation and recovery, the distribution of descending devices to recreational anglers, unique habitat and fish surveys, and the development of outreach materials.

Recovery Planning and Implementation

Recovery Plan

This recovery plan outlines actions and research for the conservation and survival of threatened yelloweye rockfish and endangered bocaccio using the best available science per the requirements of the Endangered Species Act (ESA).

- Yelloweye and Bocaccio Rockfish Recovery Plan
- Recovery Plan Fact Sheet & Frequently Asked Questions (PDF, 4 pages)
- Remotely Operated Vehicle Surveys
- Collaborative Genetic Research

Kelp Conservation and Recovery Plan

Kelp is a vital habitat for rockfish and numerous additional species including forage fish, invertebrates, birds, and salmon. We have partnered with a consortium of regional kelp experts to develop the Puget Sound Kelp Conservation and Recovery Plan, which was released in May of 2020.

Learn more about kelp conservation ›

Critical Habitat for Puget Sound/Georgia Basin Rockfish

In 2014, NOAA Fisheries issued a final rule to designate critical habitat for the Puget Sound/Georgia Basin DPS of bocaccio.

Learn more about the critical habitat designation for Puget Sound/Georgia Basin Rockfish ›

Conservation Efforts

Washington Department of Fish & Wildlife Permit Applications

The Washington Department of Fish and Wildlife (WDFW) submitted applications to us for four scientific research permits and one incidental take permit under the Endangered Species Act. WDFW prepared a conservation plan to minimize and mitigate effects on listed species. The permit applications are related to scientific research and fisheries management measures in Puget Sound/Georgia Basin, potentially affecting nine ESA-listed fish populations, including bocaccio and yelloweye rockfish. Following a public comment period, we released the final documents on WDFW's permit applications on November 6, 2012.

For more information, see the materials below or contact Dr. Dayv Lowry, (253) 317-1764.

- ESA Section 10 Incidental take Permit (PDF, 6 pages)
- Final Environmental Assessment (PDF, 145 pages)
- WDFW Proposed Fishery Conservation Plan (PDF, 83 pages)
- WDFW ESA Section 10 Incidental Take Permit Application (PDF, 18 pages)
- WDFW Final Environmental Impact Statement

Salish Sea Rockfish Recovery Workshop, June 2011

The Rockfish Recovery in the Salish Sea: Research and Management Priorities Workshop on June 28-29, 2011 brought together scientists, managers, and industry professionals. Their focus was on recent and on-going research and recovery efforts of rockfish and their habitats in the Salish Sea to enable further collaboration. This workshop specifically focused on rockfish in the Salish Sea because of its unique and diverse habitats and its complex socioeconomic dynamics that influence rockfish research and recovery measures.

View presentations from the workshop

Stewardship Resources

- Fishing & Barotrauma
- Report Sightings Of Derelict Fishing Gear
- Rockfish Barotrauma Video
- Species Identification Guide

Key Actions and Documents

Actions & Documents

Initiation of 5-Year Reviews for Eulachon, Yelloweye Rockfish, Bocaccio, and Green Sturgeon

We, NOAA Fisheries, are announcing 5-year reviews of four species listed under the Endangered Species Act (ESA) of 1973, as amended. The four distinct population segments (DPSs) included in this notice are the southern DPS of eulachon (Thaleichthys…

› Notice of initiation of 5-year reviews; request for information (03/05/2020, 85…

Information Gathering , West Coast

PUBLISHED

March 5, 2020

Removal of the Puget Sound/Georgia Basin Canary Rockfish DPS From the Federal List of Threatened and Endangered Species; and Update and Amendment to

We, NOAA Fisheries, are issuing a final rule to remove the Puget Sound/Georgia Basin canary rockfish (Sebastes pinniger) Distinct Population Segment (DPS) from the Federal List of Threatened and Endangered Species and remove its critical habitat…

› Final Rule (82 FR 7711, 01/23/2017)

Final Rule , Alaska , West Coast

EFFECTIVE

March 24, 2017

Draft Recovery Plan for Puget Sound/Georgia Basin Yelloweye Rockfish and Bocaccio

NOAA Fisheries announces the availability of the Puget Sound/Georgia Basin Yelloweye rockfish (Sebastes ruberrimus) and Bocaccio (S.

paucispinis) Draft Recovery Plan (Plan) for public review. NOAA Fisheries is soliciting review and comment from the…

› Notice of availability; request for comments (81 FR 54556, 08/16/2016)

Notice , Alaska, West Coast
PUBLISHED
August 16, 2016

Removal of the Puget Sound/Georgia Basin DPS of Canary Rockfish From the Federal List of Threatened and Endangered Species; Update and Amend the

We, NOAA Fisheries, are issuing a proposed rule to remove the Puget Sound/Georgia Basin canary rockfish (Sebastes pinniger) Distinct Population Segment (DPS) from the Federal List of Threatened and Endangered Species and remove its critical habitat…

› Proposed rule; request for comments (81 FR 43979, 07/06/2016)

Proposed Rule , Alaska, West Coast
PUBLISHED
July 6, 2016

1 2 Last »

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Last updated by NOAA Fisheries on 05/09/2022

Science Overview

Evaluating How an Oil Spill of Diluted Bitumen Could Affect Benthic Habitats in the Central Salish Sea

The Salish Sea, a cherished and biodiverse marine environment, is at risk for a major oil spill. Commercial marine traffic has been increasing, expanding the risk of a major oil spill from oil transport, as well as from bunker fuels from other vessels. Transport of

diluted bitumen (dilbit), a type of heavy oil that can sink to the seafloor and accumulate in troughs and canyons, presents unique challenges for protection of benthic habitats critical to rockfishes and other bottomfish.

A recent collaborative research project led by the Tombolo Mapping Laboratory has used tide and current predictions, sediment transport and deposition models, intimate knowledge of geomorphology, and fish distribution data to identify potential impacts of spilled dilbit in the central Salish Sea (the San Juan Archipelago). They predict where dilbit is likely to become embedded in rocky crevices, be dispersed by strong currents, accumulate and settle into sediments, or be trapped in bays. They also identify important benthic habitats likely to lie in the path of spilled and sunken oil released from various locations.

A draft report and companion maps are available below and will be submitted to the peer-reviewed journal Continental Shelf Research. An Esri StoryMap is also available that summarizes this work using interactive and engaging maps.

Report

Oil Spill Assessment Maps of the Central Salish Sea – Marine Seafloor and Coastal Habitats of Concern – A Tool for Oil Spill Mitigation within the San Juan Archipelago, San Juan County, Washington (PDF, 69 pages)

Maps

Plate 1 - Oil Spill Assessment Map – Behavior and Fate of Dilbit in the Central Salish Sea (PDF, 1 page)

Plate 2 - Oil Spill Assessment Map – Selected Potential Critical Benthic Habitats in the Central Salish Sea (PDF, 1 page)

StoryMap

Oil Spills and Benthic Habitats in the Salish Sea

Citizen Science Young of Year (YOY) Rockfish SCUBA Survey Project

Rockfish Need your Help!

Rockfish in Puget Sound form part of the diverse marine community that attracts thousands of divers each year, yet monitoring rockfish populations is challenging due to their habitat usage and sporadic occurrence in Puget Sound. We must collect a large amount of information to assess rockfish recovery and divers can help! A large-scale effort is underway to measure recruitment of young of year (YOY; fish that have not yet reached one year of age) and we are engaging scuba divers to assist.

Why are we interested in YOY rockfish?

Assessing the numbers and locations of YOY rockfish will help us understand preferred habitats and population characteristics. Collecting this data across multiple years and comparing it with oceanic and climatic variables could clarify conditions that lead to successful reproduction. This effort is a key part of understanding what conditions lead to successful survival of young rockfish.

How can recreational divers help?

Download our YOY survey guide linked below and conduct your own survey! Also, if you spot a YOY yelloweye rockfish, canary rockfish, or bocaccio while scuba diving, snap a picture and note your location. Then send it to us at rockfishid@noaa.gov. It's that simple! If you are not sure of the species, send it to us anyway.

Where can I find rockfish while diving?

Rockfish can be found anywhere in Puget Sound (including the San Juan Islands). We are currently developing a list of preferred sampling sites throughout Puget Sound that may inform dive locations. YOY rockfish can be found in a variety of habitats, so we encourage you to branch out and try different dive sites that may feature eelgrass, kelp, rocky reef, or soft-bottom. You never know when you will find a new favorite dive site!

To prepare for participation, check out our YOY survey guide for instructions and assistance with species identification. Most importantly, keep diving in Puget Sound and start (or continue) keeping an eye out for juvenile rockfish!

- YOY Rockfish Citizen Science Survey Guide (PDF, 2 pages)
- Download the flier (PDF, 1 page)
- Rockfish Identification
- 2015–2018 Rockfish YOY Summary Report (PDF, 13 pages)

Is your dive club interested in learning more about rockfish?

We would be happy to speak at your dive club and will do our best to make it to one of your meetings. For more information, you may contact:

- James Selleck, james.selleck@noaa.gov
- Adam Obaza, adam@pauamarineresearch.com
- Dr. Dayv Lowry, david.lowry@noaa.gov

NOAA Fisheries' Funded Research Projects that Inform Recovery Planning

NOAA Fisheries funds several projects with key research partners to inform rockfish recovery planning.

- Documenting Rockfish Bycatch in, and Removing Derelict Shrimp Pots with a Remotely Operated Vehicle (PDF, 16 pages)
- Rockfish Hot Spots: Identifying Rockfish Hot Spot Areas in Puget Sound Through a Spatial Analysis of "Grey" Data, September 2016 (PDF, 24 pages)
- Bycatch of rockfish in spot prawn traps and estimated magnitude of trap loss in Washington waters of the Salish Sea (PDF, 18 pages)
- Evidence of habitat associations and distribution patterns of rockfish in Puget Sound from archival data (1974-1977) (PDF, 36 pages)
- Puget Sound Derelict Gillnet Prevention Report (PDF, 15 pages)
- Angling for Insight: Examining the Recreational Fishing Community's Knowledge, Perceptions, Practices, and Preferences to Inform Rockfish Recovery Planning in Puget Sound, Washington (PDF, 208 pages)
- NOAA Rockfish Cooperative Research Assessment Project (PDF, 24 pages)
- Deepwater Derelict Fishing Gear Removal Protocols (PDF, 26 pages)
- Spatial Distribution and Magnitude of Derelict Shrimp Pots and their Potential Impacts to Rockfish in Puget Sound (PDF, 41 pages)
- Deepwater Sidescan Sonar and Camera Surveys for Derelict Fishing Nets in Rockfish Habitat (PDF, 19 pages)
- Perceptions of Change in Puget Sound: Documenting Historical Trends in Abundance of Marine Species Using Local Knowledge (PDF, 17 pages)

Last updated by NOAA Fisheries on 05/09/2022

Documents

DOCUMENT

Economic Analysis of Critical Habitat Designation for the Georgia Basin/Puget Sound Distinct Population Segments of Yelloweye Rockfish, Canary Rockfish, and Bocaccio

The purpose of this report is to identify and analyze the potential economic impacts associated…

West Coast

DOCUMENT

Final Section 4(b)(2) Report for the Designation of Critical Habitat for Yelloweye Rockfish, Canary Rockfish, and Bocaccio

This report contains NOAA Fisheries West Coast Region's analysis for designating critical habitat…

West Coast

DOCUMENT

Biological Report for the Designation of Critical Habitat for Yelloweye Rockfish, Canary Rockfish, and Bocaccio

This report contains a biological analysis compiled by the Protected Resources Division of NOAA…

West Coast

DOCUMENT

Yelloweye Rockfish and Bocaccio Recovery Plan

This recovery plan outlines actions and research for the conservation and survival of threatened…

West Coast, National

More Documents ›

Data & Maps

MAP

Critical Habitat - Maps and GIS Data (West Coast Region)

West Coast

MAP

Protected Resources App

West Coast

More Data and Maps ›

Last updated by NOAA Fisheries on 05/09/2022

Yelloweye Rockfish

Yelloweye Rockfish

Sebastes ruberrimus

Protected Status

ESA THREATENED

Puget Sound/ Georgia Basin DPS

Quick Facts

WEIGHT	Up to 40 pounds
LENGTH	Up to 3.5 feet
LIFESPAN	Up to 150 years

THREATS	Bycatch, Derelict fishing gear, Habitat degradation, Overfishing
REGION	Alaska, West Coast

Yelloweye rockfish. Credit: Alaska Department of Fish and Game

About the Species

Yelloweye rockfish are among the longest lived of rockfishes, with maximum age reported to be up to 150 years. This species also is very slow growing and late to mature. Although conservation measures like fishing bans have been put in place in Puget Sound, recovery from threats such as past overfishing and continued bycatch will take many years due to the life history of yelloweye rockfish. The Puget Sound/Georgia Basin distinct population segment (DPS) in Washington State is listed as threatened under the Endangered Species Act (ESA).

Non-ESA listed populations of yelloweye rockfish are harvested in commercial and recreational fisheries off the West Coast and Alaska. Fisheries harvest of yelloweye rockfish is managed under the following Fishery Management Plans (FMPs):

- Pacific Coast Groundfish FMP
- Groundfish of the Gulf of Alaska FMP
- Groundfish of the Bering Sea and Aleutian Islands FMP

Learn more about the Pacific Coast Groundfish Fishery off the West Coast ›

Assessment of the Other Rockfish stock complex in the Gulf of Alaska › (PDF, 49 pages)

Assessment of the Demersal Shelf Rockfish Stock Complex in the Southeast Outside Subdistrict of the Gulf of Alaska › (PDf, 17 pages)

Population Status

NOAA Fisheries is committed to conserving and protecting yelloweye rockfish. Our scientists and partners use a variety of innovative techniques to study, learn more about, and protect this species.

Find rockfish status reviews ›

Protected Status

ESA Threatened

1 distinct population segment

- Puget Sound/ Georgia Basin DPS

Threats

Yelloweye rockfish were once part of a vibrant recreational and commercial groundfish fishery in Puget Sound. Because all rockfish species are an important part of the food web, actions to support rockfish recovery would benefit the Puget Sound ecosystem. For instance, larval and juvenile rockfish are a food source for juvenile salmon and other marine fish and seabirds.

Many rockfish species do not begin to reproduce until they are 5 to 20 years old, their recruitment varies from year to year and reproductive success occurs at the right combination of temperature, food supply and upwelling intensity. Therefore, these species are dependent on maintaining extended population age structure, and thus very susceptible to overfishing and habitat degradation.

Washington State has closed many commercial fisheries that caught rockfishes incidentally, and there is no direct commercial harvest of them in Puget Sound. Recreationally, targeting or retaining any species of rockfish in Puget Sound waters east of the Port Angeles area is not allowed.

Through work with our partners, we have supported a number of rockfish recovery actions, including derelict fishing gear surveys (PDF, 19 pages) and prevention (PDF, 15 pages) efforts, kelp conservation and recovery, the distribution of descending devices to recreational anglers, unique habitat and fish surveys, and the development of outreach materials.

Scientific Classification

Kingdom	Animalia
Phylum	Chordata
Class	Actinopterygii
Order	Scorpaeniformes
Family	Sebastidae
Genus	*Sebastes*
Species	*ruberrimus*

Last updated by NOAA Fisheries on 05/09/2022

Last updated by NOAA Fisheries on 05/09/2022

Last updated by NOAA Fisheries on 05/09/2022

In the Spotlight

Last updated by NOAA Fisheries on 05/09/2022

Management Overview

The Puget Sound/Georgia Basin DPS of yelloweye rockfish in Washington State is listed as threatened under the Endangered Species Act.

Recovery Planning and Implementation

Recovery Plan

This recovery plan outlines actions and research for the conservation and survival of threatened yelloweye rockfish and endangered bocaccio using the best available science per the requirements of the Endangered Species Act (ESA).

- Yelloweye and Bocaccio Rockfish Recovery Plan
- Remotely Operated Vehicle Surveys
- Collaborative Genetic Research

Kelp Conservation and Recovery Plan

Kelp is a vital habitat for rockfish and numerous additional species including forage fish, invertebrates, birds, and salmon. We have partnered with a consortium of regional kelp experts to develop the Puget Sound Kelp Conservation and Recovery Plan, which was released in May of 2020.

Learn more about kelp conservation ›

Critical Habitat for Puget Sound/Georgia Basin Rockfish

In 2014, NOAA Fisheries issued a final rule to designate critical habitat for the threatened yelloweye rockfish (*Sebastes ruberrimus*) Distinct Population Segment (DPS) under the Endangered Species Act.

Learn more about the critical habitat designation for Puget Sound/Georgia Basin Rockfish ›

Conservation Efforts

Washington Department of Fish and Wildlife Permit Applications

The Washington Department of Fish and Wildlife (WDFW) developed a conservation plan to minimize and mitigate negative effects on listed species as a result of fisheries management measures in Puget Sound/Georgia Basin. These measures potentially affect nine ESA-listed fish populations, including yelloweye rockfish. This conservation plan was developed as part of WDFW's application for an incidental take permit under the ESA. Following a public comment period, we issued the incidental take permit on November 6, 2012.

For more information, see the materials below or contact Dr. Dayv Lowry, (253) 317-1764.

- ESA Section 10 Incidental take Permit (PDF, 6 pages)
- Final Environmental Assessment (PDF, 145 pages)
- WDFW Proposed Fishery Conservation Plan (PDF, 83 pages)
- WDFW ESA Section 10 Incidental Take Permit Application (PDF, 18 pages)
- WDFW Final Environmental Impact Statement

Salish Sea Rockfish Recovery Workshop, June 2011

The Rockfish Recovery in the Salish Sea: Research and Management Priorities Workshop on June 28-29, 2011 brought together scientists, managers, and industry professionals. Their focus was on recent and on-going research and recovery efforts of rockfish and their habitats in the Salish Sea to enable further collaboration. This workshop specifically focused on rockfish in the Salish Sea because of its unique and diverse habitats and its complex socioeconomic dynamics that influence rockfish research and recovery measures.

View presentations from the workshop

Stewardship Resources

- Fishing & Barotrauma
- Report Sightings Of Derelict Fishing Gear
- Rockfish Barotrauma Video
- Species Identification Guide

Regulatory History

In February 1999, we received a petition from Mr. Sam Wright of Olympia, Washington to list 18 species of marine fish in Puget Sound, including this species, under the ESA. On June 21, 1999, we found that there was insufficient information concerning stock structure, status, and trends for this species to suggest that listing this species may be warranted (64 FR 33037).

On April 9, 2007, we received a petition from Mr. Sam Wright (Olympia, Washington) to list "distinct population segments (DPSs)" of yelloweye rockfish, and four other rockfishes in Puget Sound, as endangered or threatened species under the ESA and to designate critical habitat. We found that this petition also did not present substantial scientific or commercial information to suggest that the petitioned actions may be warranted (72 FR 56986; October 5, 2007). On October 29, 2007, we received a letter from Mr. Wright presenting information that was not included in the April 2007 petition, and requesting reconsideration of the decision not to initiate a review of the species' status. We considered the supplemental information as a new petition and concluded that there was enough information in this new petition to warrant conducting status reviews of these rockfishes. We completed the status review in December 2010.

In April 2010, we listed the Puget Sound/ Georgia Basin DPS as threatened under the ESA.

Key Actions and Documents

Actions & Documents

Initiation of 5-Year Reviews for Eulachon, Yelloweye Rockfish, Bocaccio, and Green Sturgeon

We, NOAA Fisheries, are announcing 5-year reviews of four species listed under the Endangered Species Act (ESA) of 1973, as amended. The four distinct population segments (DPSs) included in this notice are the southern DPS of eulachon (Thaleichthys…

› Notice of initiation of 5-year reviews; request for information (03/05/2020, 85…

Information Gathering , West Coast

PUBLISHED

March 5, 2020

Removal of the Puget Sound/Georgia Basin Canary Rockfish DPS From the Federal List of Threatened and Endangered Species; and Update and Amendment to

We, NOAA Fisheries, are issuing a final rule to remove the Puget Sound/Georgia Basin canary rockfish (Sebastes pinniger) Distinct Population Segment (DPS) from the Federal List of Threatened and Endangered Species and remove its critical habitat…

› Final Rule (82 FR 7711, 01/23/2017)

Final Rule , Alaska, West Coast

EFFECTIVE
March 24, 2017

Draft Recovery Plan for Puget Sound/Georgia Basin Yelloweye Rockfish and Bocaccio

NOAA Fisheries announces the availability of the Puget Sound/Georgia Basin Yelloweye rockfish (Sebastes ruberrimus) and Bocaccio (S. paucispinis) Draft Recovery Plan (Plan) for public review. NOAA Fisheries is soliciting review and comment from the…

› Notice of availability; request for comments (81 FR 54556, 08/16/2016)

Notice , Alaska, West Coast
PUBLISHED
August 16, 2016

Removal of the Puget Sound/Georgia Basin DPS of Canary Rockfish From the Federal List of Threatened and Endangered Species; Update and Amend the

We, NOAA Fisheries, are issuing a proposed rule to remove the Puget Sound/Georgia Basin canary rockfish (Sebastes pinniger) Distinct Population Segment (DPS) from the Federal List of Threatened and Endangered Species and remove its critical habitat…

› Proposed rule; request for comments (81 FR 43979, 07/06/2016)

Proposed Rule , Alaska, West Coast
PUBLISHED
July 6, 2016

1 2 Last »

»

Last updated by NOAA Fisheries on 05/09/2022

Science Overview

Evaluating How an Oil Spill of Diluted Bitumen Could Affect Benthic Habitats in the Central Salish Sea

The Salish Sea, a cherished and biodiverse marine environment, is at risk for a major oil spill. Commercial marine traffic has been increasing, expanding the risk of a major oil spill from oil transport, as well as from bunker fuels from other vessels. Transport of diluted bitumen (dilbit), a type of heavy oil that can sink to the seafloor and accumulate in troughs and canyons, presents unique challenges for protection of benthic habitats critical to rockfishes and other bottomfish.

A recent collaborative research project led by the Tombolo Mapping Laboratory has used tide and current predictions, sediment transport and deposition models, intimate knowledge of geomorphology, and fish distribution data to identify potential impacts of spilled dilbit in the central Salish Sea (the San Juan Archipelago). They predict where dilbit is likely to become embedded in rocky crevices, be dispersed by strong currents, accumulate and settle into sediments, or be trapped in bays. They also identify important benthic habitats likely to lie in the path of spilled and sunken oil released from various locations.

A draft report and companion maps are available below and will be submitted to the peer-reviewed journal Continental Shelf Research. An Esri StoryMap is also available that summarizes this work using interactive and engaging maps.

Report

Oil Spill Assessment Maps of the Central Salish Sea – Marine Seafloor and Coastal Habitats of Concern – A Tool for Oil Spill Mitigation within the San Juan Archipelago, San Juan County, Washington (PDF, 69 pages)

Maps

Plate 1 - Oil Spill Assessment Map – Behavior and Fate of Dilbit in the Central Salish Sea (PDF, 1 page)

Plate 2 - Oil Spill Assessment Map – Selected Potential Critical Benthic Habitats in the Central Salish Sea (PDF, 1 page)

StoryMap

Oil Spills and Benthic Habitats in the Salish Sea

Citizen Science Young of Year (YOY) Rockfish SCUBA Survey Project

Rockfish Need your Help!

Rockfish in Puget Sound form part of the diverse marine community that attracts thousands of divers each year, yet monitoring rockfish populations is challenging due to their habitat usage and sporadic occurrence in Puget Sound. We must collect a large amount of information to assess rockfish recovery and divers can help! A large-scale effort is underway to measure recruitment of young of year (YOY; fish that have not yet reached one year of age) and we are engaging scuba divers to assist.

Why are we interested in YOY rockfish?

Assessing the numbers and locations of YOY rockfish will help us understand preferred habitats and population characteristics. Collecting this data across multiple years and comparing it with oceanic and climatic variables could clarify conditions that lead to successful reproduction. This effort is a key part of understanding what conditions lead to successful survival of young rockfish.

How can recreational divers help?

Download our YOY survey guide linked below and conduct your own survey! Also, if you spot a YOY yelloweye rockfish, canary rockfish, or bocaccio while scuba diving, snap a picture and note your location. Then send it to us at rockfishid@noaa.gov. It's that simple! If you are not sure of the species, send it to us anyway.

Where can I find rockfish while diving?

Rockfish can be found anywhere in Puget Sound (including the San Juan Islands). We are currently developing a list of preferred sampling sites throughout Puget Sound that may inform dive locations. YOY rockfish can be found in a variety of habitats, so we encourage you to branch out and try different dive sites that may feature eelgrass, kelp, rocky reef, or soft-bottom. You never know when you will find a new favorite dive site!

To prepare for participation, check out our YOY survey guide for instructions and assistance with species identification. Most importantly, keep diving in Puget Sound and start (or continue) keeping an eye out for juvenile rockfish!

- YOY Rockfish Citizen Science Survey Guide (PDF, 2 pages)
- Download the flier (PDF, 1 page)
- Rockfish Identification

- 2015–2020 Rockfish YOY Summary Report (PDF, 23 pages)

Is your dive club interested in learning more about rockfish?

We would be happy to speak at your dive club and will do our best to make it to one of your meetings. For more information, you may contact:

- James Selleck, james.selleck@noaa.gov
- Adam Obaza, adam@pauamarineresearch.com
- Dr. Dayv Lowry, david.lowry@noaa.gov

NOAA Fisheries' Funded Research Projects That Inform Recovery Planning

NOAA Fisheries funds several projects with key research partners to inform rockfish recovery planning.

- Documenting Rockfish Bycatch in, and Removing Derelict Shrimp Pots with a Remotely Operated Vehicle (PDF, 16 pages)
- Rockfish Hot Spots: Identifying Rockfish Hot Spot Areas in Puget Sound Through a Spatial Analysis of "Grey" Data, September 2016 (PDF, 24 pages)
- Bycatch of rockfish in spot prawn traps and estimated magnitude of trap loss in Washington waters of the Salish Sea (PDF, 18 pages)
- Evidence of habitat associations and distribution patterns of rockfish in Puget Sound from archival data (1974–1977) (PDF, 36 pages)
- Puget Sound Derelict Gillnet Prevention Report (PDF, 15 pages)
- Angling for Insight: Examining the Recreational Fishing Community's Knowledge, Perceptions, Practices, and Preferences to Inform Rockfish Recovery Planning in Puget Sound, Washington (PDF, 208 pages)
- NOAA Rockfish Cooperative Research Assessment Project (PDF, 24 pages)
- Deepwater Derelict Fishing Gear Removal Protocols (PDF, 26 pages)
- Spatial Distribution and Magnitude of Derelict Shrimp Pots and their Potential Impacts to Rockfish in Puget Sound (PDF, 41 pages)
- Deepwater Sidescan Sonar and Camera Surveys for Derelict Fishing Nets in Rockfish Habitat (PDF, 19 pages)
- Perceptions of Change in Puget Sound: Documenting Historical Trends in Abundance of Marine Species Using Local Knowledge (PDF, 17 pages)

Last updated by NOAA Fisheries on 05/09/2022

Documents

DOCUMENT

Economic Analysis of Critical Habitat Designation for the Georgia Basin/Puget Sound Distinct Population Segments of Yelloweye Rockfish, Canary Rockfish, and Bocaccio

The purpose of this report is to identify and analyze the potential economic impacts associated…

West Coast

DOCUMENT

Final Section 4(b)(2) Report for the Designation of Critical Habitat for Yelloweye Rockfish, Canary Rockfish, and Bocaccio

This report contains NOAA Fisheries West Coast Region's analysis for designating critical habitat…

West Coast

DOCUMENT

Biological Report for the Designation of Critical Habitat for Yelloweye Rockfish, Canary Rockfish, and Bocaccio

This report contains a biological analysis compiled by the Protected Resources Division of NOAA…

West Coast

DOCUMENT

Yelloweye Rockfish and Bocaccio Recovery Plan

This recovery plan outlines actions and research for the conservation and survival of threatened…

West Coast, National

More Documents >

Data & Maps

MAP

Critical Habitat - Maps and GIS Data (West Coast Region)

West Coast

MAP

Protected Resources App

West Coast

DATA

Center for Independent Experts Summary Report for the 2006 Alaska Rockfish Review

This report presents the summary views of Drs. Patrick Cordue, Cynthia Jones, and Robert Mohn on…

Alaska

DATA

Fish and Invertebrate Species Photo Gallery

Fish and Invertebrate Species Photo Gallery

This fish and invertebrate photo gallery serves to aid students and scientists with visual…

Alaska

More Data and Maps ›

Last updated by NOAA Fisheries on 05/09/2022

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Washington Fish And Wildlife Office
510 Desmond Drive Se, Suite 102
Lacey, WA 98503-1263
Phone: (360) 753-9440 Fax: (360) 753-9405

In Reply Refer To:
Project Code: 2022-0049851
Project Name: Oakland Bay Floating Culture

June 02, 2022

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological

evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Migratory Birds: In addition to responsibilities to protect threatened and endangered species under the Endangered Species Act (ESA), there are additional responsibilities under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA) to protect native birds from project-related impacts. Any activity, intentional or unintentional, resulting in take of migratory birds, including eagles, is prohibited unless otherwise permitted by the U.S. Fish and Wildlife Service (50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)). For more information regarding these Acts see https://www.fws.gov/birds/policies-and-regulations.php.

The MBTA has no provision for allowing take of migratory birds that may be unintentionally killed or injured by otherwise lawful activities. It is the responsibility of the project proponent to comply with these Acts by identifying potential impacts to migratory birds and eagles within applicable NEPA documents (when there is a federal nexus) or a Bird/Eagle Conservation Plan (when there is no federal nexus). Proponents should implement conservation measures to avoid or minimize the production of project-related stressors or minimize the exposure of birds and their resources to the project-related stressors. For more information on avian stressors and recommended conservation measures see https://www.fws.gov/birds/bird-enthusiasts/threats-to-birds.php.

In addition to MBTA and BGEPA, Executive Order 13186: *Responsibilities of Federal Agencies to Protect Migratory Birds*, obligates all Federal agencies that engage in or authorize activities that might affect migratory birds, to minimize those effects and encourage conservation measures that will improve bird populations. Executive Order 13186 provides for the protection of both migratory birds and migratory bird habitat. For information regarding the implementation of Executive Order 13186, please visit https://www.fws.gov/birds/policies-and-regulations/executive-orders/e0-13186.php.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Code in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Washington Fish And Wildlife Office
510 Desmond Drive Se, Suite 102
Lacey, WA 98503-1263
(360) 753-9440

Project Summary

Project Code: 2022-0049851
Event Code: None
Project Name: Oakland Bay Floating Culture
Project Type: Aquaculture
Project Description: The purpose of the Project is to grow Pacific oysters in subtidal waters. The proposed Project involves installation, maintenance, and operation of a floating oyster bag system in Oakland Bay. The Project site is within Washington State Department of Natural Resources (DNR) state-owned aquatic lands that is approximately 50 acres. The floating oyster bags includes approximately 30 lines and a total of 600 culture bags. Oyster bags will be stocked with seed oysters to increase capacity and relieve pressure on the nearby Oakland Bay Floating Upweller System (FLUPSY) installation.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@47.226708599999995,-123.05332679529285,14z

Counties: Mason County, Washington

Endangered Species Act Species

There is a total of 3 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Birds

NAME	STATUS
Marbled Murrelet *Brachyramphus marmoratus* Population: U.S.A. (CA, OR, WA) There is **final** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/4467	Threatened
Streaked Horned Lark *Eremophila alpestris strigata* There is **final** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/7268	Threatened

Fishes

NAME	STATUS
Bull Trout *Salvelinus confluentus* Population: U.S.A., conterminous, lower 48 states There is **final** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/8212	Threatened

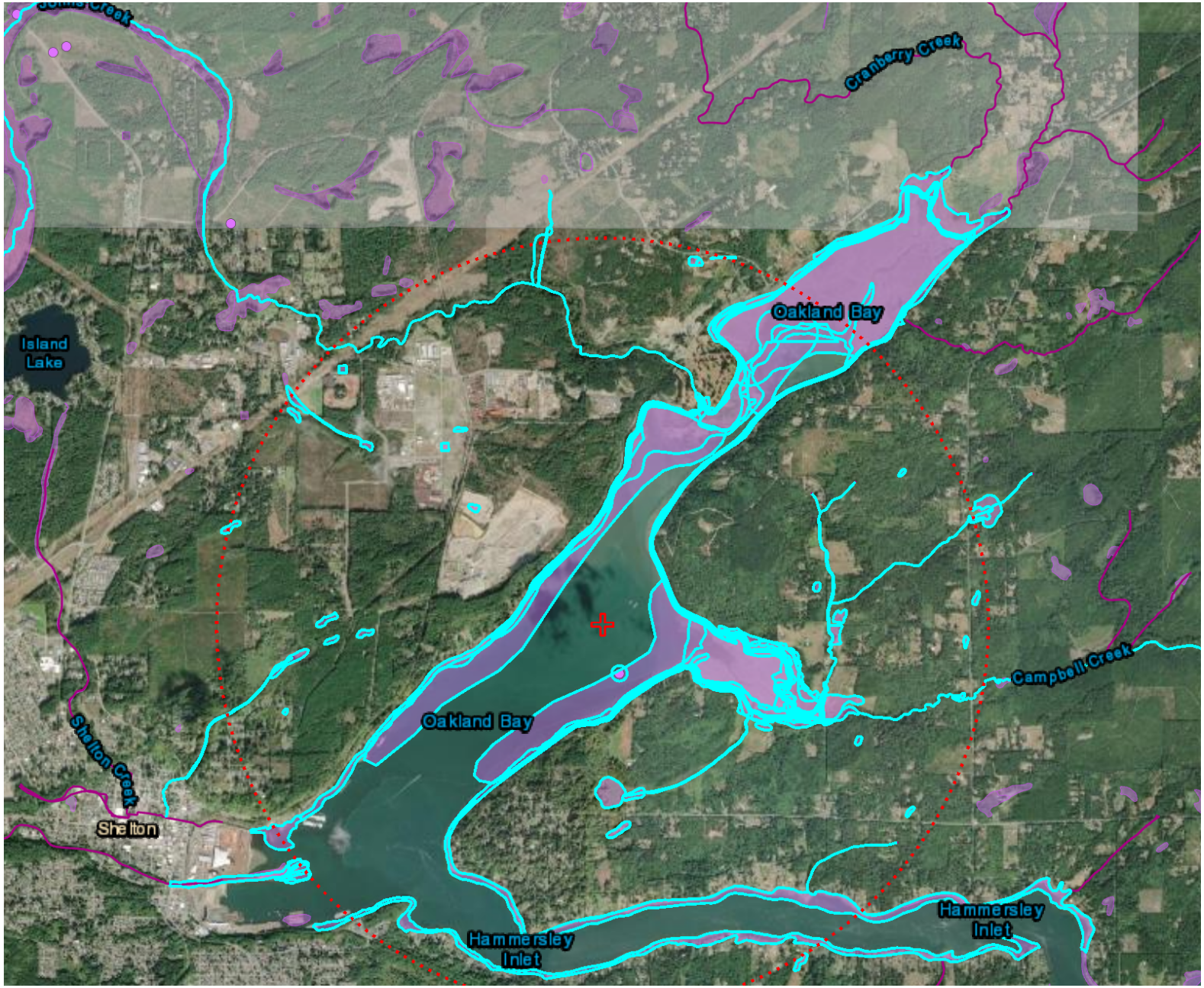
Critical habitats

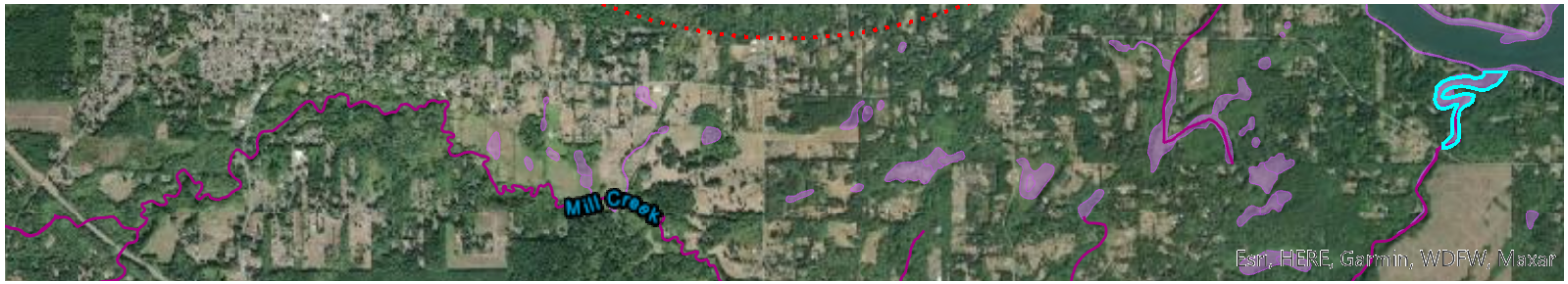
THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

IPaC User Contact Information

Agency: Confluence Environmental Company
Name: Marlene Meaders
Address: 146 N Canal St.
City: Seattle
State: WA
Zip: 98103
Email marlene.meaders@confenv.com
Phone: 2067245781

Priority Habitats and Species on the Web





Buffer radius: 2 Miles

Report Date: 06/06/2022

PHS Species/Habitats Overview:

Occurence Name	Federal Status	State Status	Sensitive Location
Harbor seal	N/A	N/A	No
Winter Steelhead	N/A	N/A	No
Resident Coastal Cutthroat	N/A	N/A	No
Coho	N/A	N/A	No
Coho	Candidate	N/A	No
Fall Chum	N/A	N/A	No
Steelhead	Threatened	N/A	No
Surf Smelt	N/A	N/A	No
Fall Chinook	N/A	N/A	No
Chum	Not Warranted	N/A	No
Summer Chum	N/A	N/A	No
Pacific Sand Lance	N/A	N/A	No
Hardshell Clam	N/A	N/A	No
Subtidal Hardshell Clam	N/A	N/A	No
Oyster Beds	N/A	N/A	No
Wetlands	N/A	N/A	No
Esturine Zone	N/A	N/A	No
Shelton pocket gopher - Mazama	Fed Spp Concern	Threatened	No
Estuarine and Marine Wetland	N/A	N/A	No
Freshwater Emergent Wetland	N/A	N/A	No
Freshwater Pond	N/A	N/A	No
Freshwater Forested/Shrub Wetland	N/A	N/A	No

PHS Species/Habitats Details:

Harbor seal	
Scientific Name	*Phoca vitulina*
Priority Area	Haulout
Site Name	SHELTON LOG RAFTS
Accuracy	1/4 mile (Quarter Section)
Source Record	112084
Source Dataset	WS_OccurPoint
Source Date	WS_OccurPoint
Source Entity	WA Dept. of Fish and Wildlife
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
Geometry Type	Points

Winter Steelhead	
Scientific Name	*Oncorhynchus mykiss*
Priority Area	Occurrence/Migration
Accuracy	NA
Notes	LLID: 1230596472542, Fish Name: Steelhead Trout, Run Time: Winter, Life History: Anadromous
Source Record	56566
Source Dataset	SWIFD
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Resident Coastal Cutthroat	
Scientific Name	*Oncorhynchus clarki*
Priority Area	Occurrence/Migration
Accuracy	NA
Notes	LLID: 1230359472219, Fish Name: Cutthroat Trout, Run Time: Unknown or not Applicable, Life History: Unknown
Source Record	56320
Source Dataset	SWIFD
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Coho	
Scientific Name	*Oncorhynchus kisutch*
Priority Area	Occurrence/Migration
Accuracy	NA
Notes	LLID: 1231000472143, Fish Name: Coho Salmon, Run Time: Unknown or not Applicable, Life History: Anadromous
Source Record	56941
Source Dataset	SWIFD
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Coho	
Scientific Name	*Oncorhynchus kisutch*
Priority Area	Occurrence
Site Name	Johns Creek
Accuracy	NA
Notes	LLID: 1230417472462, Stock Name: Deep South Sound Tribs Coho, Run: Unspecified, Status: Healthy
Source Record	3193
Source Dataset	SASI
Source Name	Not Given
Source Entity	WDFW Fish Program
Federal Status	Candidate
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Fall Chum	
Scientific Name	*Oncorhynchus keta*
Priority Area	Occurrence/Migration
Site Name	Uncle John Creek
Accuracy	NA
Notes	LLID: 1230277472236, Fish Name: Chum Salmon, Run Time: Fall, Life History: Anadromous
Source Record	56228
Source Dataset	SWIFD
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Steelhead	
Scientific Name	*Oncorhynchus mykiss*
Priority Area	Occurrence
Accuracy	NA
Notes	LLID: 1230596472542, Stock Name: Hammersley Inlet Winter Steelhead, Run: Winter, Status: Unknown
Source Record	6216
Source Dataset	SASI
Source Name	Not Given
Source Entity	WDFW Fish Program
Federal Status	Threatened
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Surf Smelt	
Scientific Name	*Hypomesus pretiosus*
Priority Area	Breeding Area
Site Name	Station Number: 5
Accuracy	NA
Source Record	26622
Source Dataset	Forage_Fish_Survey
Source Date	Forage_Fish_Survey
Source Name	Not Given
Source Entity	WDFW
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Species or Habitat
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
Geometry Type	Lines

Coho	
Scientific Name	*Oncorhynchus kisutch*
Priority Area	Occurrence/Migration
Site Name	Johns Creek
Accuracy	NA
Notes	LLID: 1230417472462, Fish Name: Coho Salmon, Run Time: Unknown or not Applicable, Life History: Anadromous
Source Record	56390
Source Dataset	SWIFD
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Resident Coastal Cutthroat	
Scientific Name	*Oncorhynchus clarki*
Priority Area	Occurrence/Migration
Site Name	Campbell Creek
Accuracy	NA
Notes	LLID: 1230268472216, Fish Name: Cutthroat Trout, Run Time: Unknown or not Applicable, Life History: Unknown
Source Record	56207
Source Dataset	SWIFD
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Fall Chinook	
Scientific Name	*Oncorhynchus tshawytscha*
Priority Area	Occurrence/Migration
Site Name	Johns Creek
Accuracy	NA
Notes	LLID: 1230417472462, Fish Name: Chinook Salmon, Run Time: Fall, Life History: Anadromous
Source Record	56387
Source Dataset	SWIFD
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Winter Steelhead	
Scientific Name	*Oncorhynchus mykiss*
Priority Area	Occurrence/Migration
Site Name	Campbell Creek
Accuracy	NA
Notes	LLID: 1230268472216, Fish Name: Steelhead Trout, Run Time: Winter, Life History: Anadromous
Source Record	56210
Source Dataset	SWIFD
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Surf Smelt	
Scientific Name	*Hypomesus pretiosus*
Priority Area	Breeding Area
Site Name	Station Number: 1
Accuracy	NA
Source Record	32334
Source Dataset	Forage_Fish_Survey
Source Date	Forage_Fish_Survey
Source Name	Not Given
Source Entity	WDFW
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Species or Habitat
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
Geometry Type	Lines

Surf Smelt	
Scientific Name	*Hypomesus pretiosus*
Priority Area	Breeding Area
Site Name	Station Number: 3
Accuracy	NA
Source Record	28294
Source Dataset	Forage_Fish_Survey
Source Date	Forage_Fish_Survey
Source Name	Not Given
Source Entity	WDFW
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Species or Habitat
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
Geometry Type	Lines

Coho	
Scientific Name	*Oncorhynchus kisutch*
Priority Area	Occurrence/Migration
Site Name	Uncle John Creek
Accuracy	NA
Notes	LLID: 1230277472236, Fish Name: Coho Salmon, Run Time: Unknown or not Applicable, Life History: Anadromous
Source Record	56229
Source Dataset	SWIFD
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Winter Steelhead	
Scientific Name	*Oncorhynchus mykiss*
Priority Area	Occurrence/Migration
Site Name	Johns Creek
Accuracy	NA
Notes	LLID: 1230417472462, Fish Name: Steelhead Trout, Run Time: Winter, Life History: Anadromous
Source Record	56393
Source Dataset	SWIFD
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Coho	
Scientific Name	*Oncorhynchus kisutch*
Priority Area	Occurrence/Migration
Accuracy	NA
Notes	LLID: 1230270472304, Fish Name: Coho Salmon, Run Time: Unknown or not Applicable, Life History: Anadromous
Source Record	56213
Source Dataset	SWIFD
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Chum	
Scientific Name	*Oncorhynchus keta*
Priority Area	Occurrence
Accuracy	NA
Notes	LLID: 1231000472143, Stock Name: Goldsborough/Shelton Creeks Fall Chum, Run: Fall, Status: Depressed
Source Record	2223
Source Dataset	SASI
Source Name	Not Given
Source Entity	WDFW Fish Program
Federal Status	Not Warranted
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Resident Coastal Cutthroat	
Scientific Name	*Oncorhynchus clarki*
Priority Area	Occurrence/Migration
Accuracy	NA
Notes	LLID: 1230294472088, Fish Name: Cutthroat Trout, Run Time: Unknown or not Applicable, Life History: Unknown
Source Record	56255
Source Dataset	SWIFD
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Surf Smelt	
Scientific Name	*Hypomesus pretiosus*
Priority Area	Breeding Area
Site Name	Station Number: 13
Accuracy	NA
Source Record	26946
Source Dataset	Forage_Fish_Survey
Source Date	Forage_Fish_Survey
Source Name	Not Given
Source Entity	WDFW
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Species or Habitat
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
Geometry Type	Lines

Chum	
Scientific Name	*Oncorhynchus keta*
Priority Area	Occurrence
Site Name	Johns Creek
Accuracy	NA
Notes	LLID: 1230417472462, Stock Name: Johns/Mill Creeks Fall Chum, Run: Fall, Status: Healthy
Source Record	2219
Source Dataset	SASI
Source Name	Not Given
Source Entity	WDFW Fish Program
Federal Status	Not Warranted
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Coho	
Scientific Name	*Oncorhynchus kisutch*
Priority Area	Occurrence
Site Name	Uncle John Creek
Accuracy	NA
Notes	LLID: 1230277472236, Stock Name: Deep South Sound Tribs Coho, Run: Unspecified, Status: Healthy
Source Record	3193
Source Dataset	SASI
Source Name	Not Given
Source Entity	WDFW Fish Program
Federal Status	Candidate
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Chum	
Scientific Name	*Oncorhynchus keta*
Priority Area	Occurrence
Accuracy	NA
Notes	LLID: 1230596472542, Stock Name: Johns/Mill Creeks Fall Chum, Run: Fall, Status: Healthy
Source Record	2219
Source Dataset	SASI
Source Name	Not Given
Source Entity	WDFW Fish Program
Federal Status	Not Warranted
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Surf Smelt	
Scientific Name	*Hypomesus pretiosus*
Priority Area	Breeding Area
Site Name	Station Number: 1
Accuracy	NA
Source Record	37554
Source Dataset	Forage_Fish_Survey
Source Date	Forage_Fish_Survey
Source Name	Not Given
Source Entity	WDFW
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Species or Habitat
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
Geometry Type	Lines

Steelhead	
Scientific Name	*Oncorhynchus mykiss*
Priority Area	Occurrence
Site Name	Johns Creek
Accuracy	NA
Notes	LLID: 1230417472462, Stock Name: Hammersley Inlet Winter Steelhead, Run: Winter, Status: Unknown
Source Record	6216
Source Dataset	SASI
Source Name	Not Given
Source Entity	WDFW Fish Program
Federal Status	Threatened
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Summer Chum	
Scientific Name	*Oncorhynchus keta*
Priority Area	Occurrence/Migration
Accuracy	NA
Notes	LLID: 1230596472542, Fish Name: Chum Salmon, Run Time: Summer, Life History: Anadromous
Source Record	56564
Source Dataset	SWIFD
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Coho	
Scientific Name	*Oncorhynchus kisutch*
Priority Area	Occurrence
Accuracy	NA
Notes	LLID: 1230596472542, Stock Name: Deep South Sound Tribs Coho, Run: Unspecified, Status: Healthy
Source Record	3193
Source Dataset	SASI
Source Name	Not Given
Source Entity	WDFW Fish Program
Federal Status	Candidate
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Coho	
Scientific Name	*Oncorhynchus kisutch*
Priority Area	Breeding Area
Site Name	Johns Creek
Accuracy	NA
Notes	LLID: 1230417472462, Fish Name: Coho Salmon, Run Time: Unknown or not Applicable, Life History: Anadromous
Source Record	56391
Source Dataset	SWIFD
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Fall Chum	
Scientific Name	*Oncorhynchus keta*
Priority Area	Occurrence/Migration
Site Name	Campbell Creek
Accuracy	NA
Notes	LLID: 1230268472216, Fish Name: Chum Salmon, Run Time: Fall, Life History: Anadromous
Source Record	56208
Source Dataset	SWIFD
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Resident Coastal Cutthroat	
Scientific Name	*Oncorhynchus clarki*
Priority Area	Occurrence/Migration
Accuracy	NA
Notes	LLID: 1231000472143, Fish Name: Cutthroat Trout, Run Time: Unknown or not Applicable, Life History: Unknown
Source Record	56939
Source Dataset	SWIFD
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Fall Chum	
Scientific Name	*Oncorhynchus keta*
Priority Area	Breeding Area
Site Name	Johns Creek
Accuracy	NA
Notes	LLID: 1230417472462, Fish Name: Chum Salmon, Run Time: Fall, Life History: Anadromous
Source Record	56388
Source Dataset	SWIFD
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Resident Coastal Cutthroat	
Scientific Name	*Oncorhynchus clarki*
Priority Area	Occurrence/Migration
Accuracy	NA
Notes	LLID: 1230270472304, Fish Name: Cutthroat Trout, Run Time: Unknown or not Applicable, Life History: Unknown
Source Record	56211
Source Dataset	SWIFD
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Coho	
Scientific Name	*Oncorhynchus kisutch*
Priority Area	Occurrence/Migration
Accuracy	NA
Notes	LLID: 1230596472542, Fish Name: Coho Salmon, Run Time: Unknown or not Applicable, Life History: Anadromous
Source Record	56565
Source Dataset	SWIFD
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Pacific Sand Lance	
Scientific Name	*Ammodytes hexapterus*
Priority Area	Breeding Area
Site Name	Station Number: 24
Accuracy	NA
Source Record	32047
Source Dataset	Forage_Fish_Survey
Source Date	Forage_Fish_Survey
Source Name	Not Given
Source Entity	WDFW
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Species or Habitat
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
Geometry Type	Lines

Winter Steelhead	
Scientific Name	*Oncorhynchus mykiss*
Priority Area	Occurrence/Migration
Site Name	Johns Creek
Accuracy	NA
Notes	LLID: 1230417472462, Fish Name: Steelhead Trout, Run Time: Winter, Life History: Anadromous
Source Record	56394
Source Dataset	SWIFD
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Surf Smelt	
Scientific Name	*Hypomesus pretiosus*
Priority Area	Breeding Area
Site Name	Station Number: 4
Accuracy	NA
Source Record	27972
Source Dataset	Forage_Fish_Survey
Source Date	Forage_Fish_Survey
Source Name	Not Given
Source Entity	WDFW
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Species or Habitat
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
Geometry Type	Lines

Coho	
Scientific Name	*Oncorhynchus kisutch*
Priority Area	Occurrence
Accuracy	NA
Notes	LLID: 1231000472143, Stock Name: Deep South Sound Tribs Coho, Run: Unspecified, Status: Healthy
Source Record	3193
Source Dataset	SASI
Source Name	Not Given
Source Entity	WDFW Fish Program
Federal Status	Candidate
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Resident Coastal Cutthroat	
Scientific Name	*Oncorhynchus clarki*
Priority Area	Occurrence/Migration
Accuracy	NA
Notes	LLID: 1230596472542, Fish Name: Cutthroat Trout, Run Time: Unknown or not Applicable, Life History: Unknown
Source Record	56562
Source Dataset	SWIFD
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Coho	
Scientific Name	*Oncorhynchus kisutch*
Priority Area	Occurrence
Site Name	Campbell Creek
Accuracy	NA
Notes	LLID: 1230268472216, Stock Name: Deep South Sound Tribs Coho, Run: Unspecified, Status: Healthy
Source Record	3193
Source Dataset	SASI
Source Name	Not Given
Source Entity	WDFW Fish Program
Federal Status	Candidate
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Chum	
Scientific Name	*Oncorhynchus keta*
Priority Area	Occurrence
Site Name	Johns Creek
Accuracy	NA
Notes	LLID: 1230417472462, Stock Name: Hammersley Inlet Summer Chum, Run: Summer, Status: Healthy
Source Record	2215
Source Dataset	SASI
Source Name	Not Given
Source Entity	WDFW Fish Program
Federal Status	Not Warranted
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Surf Smelt	
Scientific Name	*Hypomesus pretiosus*
Priority Area	Breeding Area
Site Name	Station Number: 1
Accuracy	NA
Source Record	28292
Source Dataset	Forage_Fish_Survey
Source Date	Forage_Fish_Survey
Source Name	Not Given
Source Entity	WDFW
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Species or Habitat
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
Geometry Type	Lines

Resident Coastal Cutthroat	
Scientific Name	*Oncorhynchus clarki*
Priority Area	Occurrence/Migration
Site Name	Uncle John Creek
Accuracy	NA
Notes	LLID: 1230277472236, Fish Name: Cutthroat Trout, Run Time: Unknown or not Applicable, Life History: Unknown
Source Record	56227
Source Dataset	SWIFD
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Resident Coastal Cutthroat	
Scientific Name	*Oncorhynchus clarki*
Priority Area	Occurrence/Migration
Site Name	Johns Creek
Accuracy	NA
Notes	LLID: 1230417472462, Fish Name: Cutthroat Trout, Run Time: Unknown or not Applicable, Life History: Unknown
Source Record	56386
Source Dataset	SWIFD
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Surf Smelt	
Scientific Name	*Hypomesus pretiosus*
Priority Area	Breeding Area
Site Name	Station Number: 6
Accuracy	NA
Source Record	28297
Source Dataset	Forage_Fish_Survey
Source Date	Forage_Fish_Survey
Source Name	Not Given
Source Entity	WDFW
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Species or Habitat
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
Geometry Type	Lines

Fall Chum	
Scientific Name	*Oncorhynchus keta*
Priority Area	Occurrence/Migration
Accuracy	NA
Notes	LLID: 1230596472542, Fish Name: Chum Salmon, Run Time: Fall, Life History: Anadromous
Source Record	56563
Source Dataset	SWIFD
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Coho	
Scientific Name	*Oncorhynchus kisutch*
Priority Area	Occurrence
Accuracy	NA
Notes	LLID: 1230280472371, Stock Name: Deep South Sound Tribs Coho, Run: Unspecified, Status: Healthy
Source Record	3193
Source Dataset	SASI
Source Name	Not Given
Source Entity	WDFW Fish Program
Federal Status	Candidate
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Coho	
Scientific Name	*Oncorhynchus kisutch*
Priority Area	Occurrence/Migration
Site Name	Campbell Creek
Accuracy	NA
Notes	LLID: 1230268472216, Fish Name: Coho Salmon, Run Time: Unknown or not Applicable, Life History: Anadromous
Source Record	56209
Source Dataset	SWIFD
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Fall Chum	
Scientific Name	*Oncorhynchus keta*
Priority Area	Occurrence/Migration
Accuracy	NA
Notes	LLID: 1231000472143, Fish Name: Chum Salmon, Run Time: Fall, Life History: Anadromous
Source Record	56940
Source Dataset	SWIFD
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Fall Chum	
Scientific Name	*Oncorhynchus keta*
Priority Area	Occurrence/Migration
Accuracy	NA
Notes	LLID: 1230270472304, Fish Name: Chum Salmon, Run Time: Fall, Life History: Anadromous
Source Record	56212
Source Dataset	SWIFD
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Summer Chum	
Scientific Name	*Oncorhynchus keta*
Priority Area	Breeding Area
Site Name	Johns Creek
Accuracy	NA
Notes	LLID: 1230417472462, Fish Name: Chum Salmon, Run Time: Summer, Life History: Anadromous
Source Record	56389
Source Dataset	SWIFD
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Winter Steelhead	
Scientific Name	*Oncorhynchus mykiss*
Priority Area	Occurrence/Migration
Site Name	Uncle John Creek
Accuracy	NA
Notes	LLID: 1230277472236, Fish Name: Steelhead Trout, Run Time: Winter, Life History: Anadromous
Source Record	56231
Source Dataset	SWIFD
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Hardshell Clam	
Priority Area	Presence
Site Name	Not Given
Accuracy	NA
Notes	Not Given
Source Dataset	Shellfish_Summary
Source Name	Not Given
Source Entity	WDFW
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
Geometry Type	Polygons

Hardshell Clam	
Priority Area	Presence
Site Name	Not Given
Accuracy	NA
Notes	Not Given
Source Dataset	Shellfish_Summary
Source Name	Not Given
Source Entity	WDFW
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
Geometry Type	Polygons

Hardshell Clam	
Priority Area	Presence
Site Name	Not Given
Accuracy	NA
Notes	Not Given
Source Dataset	Shellfish_Summary
Source Name	Not Given
Source Entity	WDFW
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
Geometry Type	Polygons

Subtidal Hardshell Clam	
Priority Area	Presence
Site Name	Not Given
Accuracy	NA
Notes	Not Given
Source Dataset	Shellfish_Summary
Source Name	Not Given
Source Entity	WDFW
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
Geometry Type	Polygons

Oyster Beds	
Priority Area	Presence
Site Name	Not Given
Accuracy	NA
Notes	Not Given
Source Dataset	Shellfish_Summary
Source Name	Not Given
Source Entity	WDFW
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
Geometry Type	Polygons

Wetlands	
Priority Area	Aquatic Habitat
Site Name	REGION 6 SALTWATER WETLANDS
Accuracy	1/4 mile (Quarter Section)
Notes	COASTAL SALT MARSHES SALT MEADOWS AND BRACKISH MARSHES
Source Record	904451
Source Dataset	PHSREGION
Source Name	GUFLER DAVE
Source Entity	WA Dept. of Fish and Wildlife
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Esturine Zone	
Priority Area	Aquatic Habitat
Accuracy	1/4 mile (Quarter Section)
Notes	ESTVARINE ZONE-COASTAL ZONE ATLAS OF WASHINGTON-STRONGLY INFLUENCED BY THE MARINE ENVIRONMENT AND CAN BE DISTINGUISHED BY A BRANCHING CHANNEL PATTERN IN A BROAD FLAT VALLEY. CZA CODE 511.
Source Record	904711
Source Dataset	PHSREGION
Source Name	JOHNSON, TERRY
Source Entity	WA Dept. of Fish and Wildlife
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://wdfw.wa.gov/conservation/habitat/planning/ahg/index.html
Geometry Type	Polygons

Esturine Zone	
Priority Area	Aquatic Habitat
Accuracy	1/4 mile (Quarter Section)
Notes	BAY/ESTUARY-COASTAL ZONE ATLAS CODE 54-MODERATELY PROTECTED MARINE EMBAYMENTS WITH FREE CONNECTIONS WITH THE OPEN SEA. BLUFFS, REACH SUBSTRATES MARSHES, EELGRASS BEDS, AND OTHER INTERTIDAL HABITATS ARE ASSOCIATED WITH IT.
Source Record	904754
Source Dataset	PHSREGION
Source Name	JOHNSON, TERRY
Source Entity	WA Dept. of Fish and Wildlife
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://wdfw.wa.gov/conservation/habitat/planning/ahg/index.html
Geometry Type	Polygons

Shelton pocket gopher - Mazama	
Scientific Name	*Thomomys mazama couchi*
Priority Area	Occurrence
Site Name	JOHNS PRAIRIE
Accuracy	Standard buffer
Notes	SHELTON POCKET GOPHER IOS, LOCATED ON JOHNS PRAIRIE N OF SHELTON IN HIGHLY DISTURBED SITE WITH HEAVY SCOTCH BROOM GROWTH. VERY FEW MOUNDS OBSERVED.
Source Record	3316
Source Dataset	WS_OccurPolygon
Source Date	WS_OccurPolygon
Source Name	AMENT, S/WDFW;SCHIRATO, G/WDFW
Source Entity	WA Dept. of Fish and Wildlife
Federal Status	Fed Spp Concern
State Status	Threatened
PHS Listing Status	PHS LISTED OCCURRENCE
Sensitive	N
SGCN	Y
Display Resolution	AS MAPPED
ManagementRecommendations	http://wdfw.wa.gov/publications/pub.php?id=01175
Geometry Type	Polygons

Shelton pocket gopher - Mazama	
Scientific Name	*Thomomys mazama couchi*
Priority Area	Occurrence
Site Name	JOHNS PRAIRIE
Accuracy	Standard buffer
Notes	SHELTON POCKET GOPHER IOS, LOCATED ON JOHNS PRAIRIE N OF SHELTON IN HIGHLY DISTURBED SITE WITH HEAVY SCOTCH BROOM GROWTH. VERY FEW MOUNDS OBSERVED.
Source Record	3317
Source Dataset	WS_OccurPolygon
Source Date	WS_OccurPolygon
Source Name	SCHIRATO, G/WDFW;AMENT, S/WDFW
Source Entity	WA Dept. of Fish and Wildlife
Federal Status	Fed Spp Concern
State Status	Threatened
PHS Listing Status	PHS LISTED OCCURRENCE
Sensitive	N
SGCN	Y
Display Resolution	AS MAPPED
ManagementRecommendations	http://wdfw.wa.gov/publications/pub.php?id=01175
Geometry Type	Polygons

Estuarine and Marine Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Estuarine and Marine Wetland - NWI Code: E2AB/USN
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Estuarine and Marine Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Estuarine and Marine Wetland - NWI Code: E2AB/USN
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Estuarine and Marine Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Estuarine and Marine Wetland - NWI Code: E2AB/USN
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Estuarine and Marine Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Estuarine and Marine Wetland - NWI Code: E2AB/USN
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Estuarine and Marine Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Estuarine and Marine Wetland - NWI Code: E2EM1N
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Estuarine and Marine Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Estuarine and Marine Wetland - NWI Code: E2EM1N
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Estuarine and Marine Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Estuarine and Marine Wetland - NWI Code: E2EM1N
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Estuarine and Marine Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Estuarine and Marine Wetland - NWI Code: E2EM1P
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Estuarine and Marine Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Estuarine and Marine Wetland - NWI Code: E2USM
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Estuarine and Marine Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Estuarine and Marine Wetland - NWI Code: E2USN
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Estuarine and Marine Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Estuarine and Marine Wetland - NWI Code: E2USN
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Estuarine and Marine Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Estuarine and Marine Wetland - NWI Code: E2USN
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Estuarine and Marine Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Estuarine and Marine Wetland - NWI Code: E2USN
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Emergent Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Emergent Wetland - NWI Code: PEM1A
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Emergent Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Emergent Wetland - NWI Code: PEM1A
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Emergent Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Emergent Wetland - NWI Code: PEM1A
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Emergent Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Emergent Wetland - NWI Code: PEM1A
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Emergent Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Emergent Wetland - NWI Code: PEM1A
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Emergent Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Emergent Wetland - NWI Code: PEM1A
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Emergent Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Emergent Wetland - NWI Code: PEM1A
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Emergent Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Emergent Wetland - NWI Code: PEM1A
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Emergent Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Emergent Wetland - NWI Code: PEM1A
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Pond	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Pond - NWI Code: PAB4H
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Emergent Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Emergent Wetland - NWI Code: PEM1C
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Emergent Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Emergent Wetland - NWI Code: PEM1C
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Emergent Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Emergent Wetland - NWI Code: PEM1C
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Emergent Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Emergent Wetland - NWI Code: PEM1C
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Emergent Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Emergent Wetland - NWI Code: PEM1C
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Emergent Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Emergent Wetland - NWI Code: PEM1C
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Emergent Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Emergent Wetland - NWI Code: PEM1C
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Emergent Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Emergent Wetland - NWI Code: PEM1Rd
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Forested/Shrub Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Forested/Shrub Wetland - NWI Code: PFO1A
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Forested/Shrub Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Forested/Shrub Wetland - NWI Code: PFO1A
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Forested/Shrub Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Forested/Shrub Wetland - NWI Code: PFO1C
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Forested/Shrub Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Forested/Shrub Wetland - NWI Code: PFO1C
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Forested/Shrub Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Forested/Shrub Wetland - NWI Code: PFO1C
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Forested/Shrub Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Forested/Shrub Wetland - NWI Code: PFO1C
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Forested/Shrub Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Forested/Shrub Wetland - NWI Code: PFO1C
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Forested/Shrub Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Forested/Shrub Wetland - NWI Code: PFO1C
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Forested/Shrub Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Forested/Shrub Wetland - NWI Code: PFO1R
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Forested/Shrub Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Forested/Shrub Wetland - NWI Code: PFO1R
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Forested/Shrub Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Forested/Shrub Wetland - NWI Code: PSS1C
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Forested/Shrub Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Forested/Shrub Wetland - NWI Code: PSS1C
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Forested/Shrub Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Forested/Shrub Wetland - NWI Code: PSS1C
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Forested/Shrub Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Forested/Shrub Wetland - NWI Code: PSS1C
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Forested/Shrub Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Forested/Shrub Wetland - NWI Code: PSS1C
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Forested/Shrub Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Forested/Shrub Wetland - NWI Code: PSS1C
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Forested/Shrub Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Forested/Shrub Wetland - NWI Code: PSS1C
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Forested/Shrub Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Forested/Shrub Wetland - NWI Code: PSS1C
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Forested/Shrub Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Forested/Shrub Wetland - NWI Code: PSS4C
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons