Select Area Fisheries Enhancement (SAFE) Program

Draft Environmental Assessment

U.S. Department of Energy - Bonneville Power Administration

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1 Purpose and Need

The Bonneville Power Administration (Bonneville) has received a request for funding from three fishery co-managers (Washington Department of Fish and Wildlife (WDFW), Oregon Department of Fish and Wildlife (ODFW), and Clatsop County Fisheries (CCF)) that would finance three hatchery programs involved in acclimation, transport and release of juvenile salmon (spring Chinook and coho smolts), including monitoring and evaluation and Select Area Fisheries Enhancement hatchery facilities and net pen sites (SAFE Facilities) operations and maintenance (O&M).

In meeting the need for action, Bonneville seeks to fulfill the following purposes:

- Support efforts to mitigate for effects of development and operation of the Federal Columbia River Power System (FCRPS) on fish and wildlife in the mainstem Columbia River and its tributaries pursuant to the Northwest Electric Power Planning and Conservation Act of 1980, (Northwest Power Act), 16 U.S.C. § 839 *et seq*., in a manner consistent with the Northwest Power and Conservation Council's (Council's) Columbia River Basin Fish and Wildlife Program and the purposes of the Northwest Power Act.
- Provide greater protection for weak stocks of natural origin ESA-listed salmon and steelhead.
- Minimize harm to natural and human resources, including species listed under the Endangered Species Act (ESA).
- Support conservation of ESA-listed species considered in the 2020 ESA consultations with both the National Marine Fisheries Service (NMFS) and U.S. Fish & Wildlife Service (USFWS) on the O&M of the Columbia River System.

1.1 Introduction

Bonneville has prepared this environmental assessment (EA) pursuant to the National Environmental Policy Act of 1969 (NEPA), 42 U.S.C. 4321 *et seq*, and its implementing regulations, which require Federal agencies to assess the impacts that their actions may have on the human environment and to make this analysis available to the public.

Bonneville is evaluating proposals from three fishery co-managers (WDFW, ODFW, and CCF) to fund the final stage—and thereby attain full implementation—of three Select Area Hatchery programs (namely, the Oregon SAFE Spring Chinook Program, the Oregon SAFE Coho Salmon Program, and the Deep River SAFE Coho Program) managed by separate entities with funding from multiple sources. Together, these programs (SAFE Program) contribute spring Chinook and coho salmon produced (i.e., collected and reared) at various hatchery facilities in the Lower Columbia River and its tributaries and acclimated and released from SAFE hatchery and net pen sites (SAFE Facilities) in off-channel areas (Select Areas) in the Lower Columbia River estuary (LCRE). Eventually, these fish return to these Select Areas for commercial and recreational harvest (Select Area Fisheries).

From its inception in the early 1990s, the SAFE Program was designed to include three stages of development: research, expansion, and full implementation. Bonneville funded the research and expansion phases (i.e., the Lower Columbia River Terminal Fisheries Research Project and the Youngs Bay Salmon Rearing and Release Program), which aimed to determine the feasibility of increasing protection for weak stocks by moving fisheries off the mainstem Columbia River to select areas where natural origin salmon were less likely to be harvested. The SAFE Program is now approaching maximum production capacity with the benefit of knowledge gained and techniques developed during the research and expansion stages.

Bonneville Power Administration

Bonneville is a Federal power marketing administration within the U.S. Department of Energy responsible for marketing and transmitting FCRPS-generated power. Bonneville's operations are governed by several statutes, including the Northwest Power Act, which, among other things, directs Bonneville to protect, mitigate, and enhance fish and wildlife affected by the development and operation of the FCRPS, and to do so in a manner consistent with the Council's Columbia River Basin Fish and Wildlife Program, the Council's Power Plan and the purposes of the statute. *See* 16 U.S.C. § 839b(h)(10)(A).

Northwest Power and Conservation Council's Fish and Wildlife Program

The Northwest Power Act directed the Council to develop a program to protect, mitigate, and enhance fish and wildlife habitat on the Columbia River and its tributaries. Bonneville and the other Federal agencies responsible for managing, operating, or regulating hydroelectric facilities located on the Columbia River or its tributaries must take the Council's program into account to the fullest extent practicable, and Bonneville funds fish and wildlife mitigation in a manner consistent with the Council's program, its power plan, and the purposes of the Northwest Power Act.

In its 1993 Strategy for Salmon, the Council recommended that terminal fishing sites be identified and developed to harvest abundant fish stocks while minimizing the incidental harvest of weak stocks. The Council recommended that Bonneville "fund a study to evaluate potential terminal fishery sites and opportunities" that would include: general requirements for developing those sites (e.g., construction of acclimation/release facilities for hatchery smolts so that adult salmon would return to the area for harvest); the potential number of harvesters that might be accommodated; type of gear to be used; and other relevant information needed to determine the feasibility and magnitude of the program.

Independent Scientific Review Panel (ISRP)

The current proposal incorporates information from a review by the Independent Scientific Review Panel (ISRP). The Council created the ISRP in response to a 1996 amendment to the Northwest Power Act (*see* 16 U.S.C. 839b(h)(10)(D)(i)), pursuant to which the ISRP now undertakes independent scientific review of Bonneville funding proposals and verifies that they are based on sound scientific principles, benefit fish and wildlife, have clearly defined objectives and outcomes, and contain provisions for monitoring and evaluation of results.

The ISRP provided a preliminary review on September 23, 2021—which conditionally determined that it "meets scientific Review Criteria"—and a final review on February 10, 2022. As part of the final review, the ISRP also considered the proponents' 2017-2019 Annual Report (Baker et al. 2020) and several earlier ISRP and ISRP/Independent Economic Analysis Board reviews. The ISRP's final review gave the project high marks for providing fishery opportunities in the lower river and found that the SAFE project contributes to lower-river fisheries while monitoring and considering upper river ESA-listed stocks. It also found that the SAFE project has clear benefits to fish and fisheries, as well as economic benefits to lower Columbia River communities.

1.2 SAFE Hatchery Program Background

History of SAFE

What follows is a brief history of the entire SAFE program. Bonneville would fund only the portion of the SAFE Program that is proposed in Chapter 2. The SAFE Program began in late 1993 as the Columbia River Terminal Fisheries Research Project, a decade-long Bonneville-funded comprehensive feasibility study based on a recommendation from the Council's predecessor, the Northwest Power Planning Council. The project originally focused on spring Chinook in the Youngs Bay select area, but later allowed for the development of other select area fishing sites.

The Columbia River Terminal Fisheries Research Project investigated the feasibility of creating and expanding known-stock terminal fisheries in Youngs Bay and other off-channel areas of the Columbia River in Oregon and Washington to allow harvest of strong anadromous hatchery salmonid stocks while minimizing incidental harvest of weak wild salmon stocks. The study included general requirements for developing net pen sites (e.g., construction of acclimation/release facilities for hatchery smolts so that adult salmon would return to the area for harvest); the potential number of harvesters that might be accommodated; type of gear to be used; and other relevant information needed to determine the feasibility and magnitude of the program.

This project also investigated the development of other select area fishing sites, selecting eight for further study. Following extensive evaluation of various sites, stocks, and rearing and release methods over several years, four SAFE production and fishery projects were established at four sites: Youngs Bay, Blind Slough, and Tongue Point in Oregon, and Deep River in Washington.

Bonneville completed an Environmental Assessment (EA) and Finding of No Significant Impact (FONSI) for the Columbia River Terminal Fisheries Research Project (also known as the Youngs Bay Salmon-Rearing and Release Program) in 1993 (DOE/EA-1040) and issued a Categorical Exclusion the following year in connection with additional research activities aimed at identifying and evaluating potential net pen sites as part of a planned expansion the SAFE Project (Table 1). Bonneville completed an EA in 1995 for anticipated expansion of the SAFE Project to include net pens in these new sites, including Deep River. In 2010, Bonneville completed a follow-up Supplement Analysis assessing a proposed increase in spring Chinook and coho smolt releases from the unitary Deep River net pen site.

Table 1: Bonneville's Existing NEPA Documentation for Previous Versions of the SAFE Program

1993 Environmental Assessment for Youngs Bay salmon rearing and release program and Lower Columbia River Terminal Fisheries Research Project (DOE/EA-1040)
1994 Categorical Exclusion (research activities to identify an evaluation of potential sites for expansion of SAFE)
1995 Environmental Assessment (expansion of the project to include net pens in new sites, including Deep River)
2010 Supplement Analysis to the 1995 EA/FONSI (for the increase of spring Chinook and coho smolts released)

After settling on successful sites and rearing strategies, the next phase of the SAFE Program focused on transitioning from research and expansion to attaining full-scale, maximized production at proven sites with proven stocks. Operational efficiencies (such as releases per cost) should increase in future years as the program heads towards full implementation rather than being exploratory (TRG 2006).

SAFE Hatchery and Genetic Management Plans (HGMPs)

The SAFE Program consists of activities from three separate HGMPs which are incorporated into this EA by reference. A HGMP is an application submitted to NMFS for ESA coverage by the operator/owner/funder of a hatchery or hatchery program that may affect ESA-listed species under NMFS jurisdiction. HGMPs are technical documents describing the composition and operation of each individual hatchery or program. In doing so, HGMPs comprise the technical framework for the whole SAFE program. A HGMP must contain the information outlined in 50 C.F.R. 223.203(b)(5)(i) and generally follows a standard NMFS-developed outline and template, though the content can vary greatly depending on the hatchery or program. HGMPs are formally submitted to NMFS for review before being made available for public comment.

The aforementioned co-managers recently submitted revised HGMPs for the three hatchery programs (see Table 2). Since 2005, these keystone program documents—which are currently undergoing NMFS review—have been drafted, revised, and updated with new information and operation plans.

Table 2: Hatchery Programs included in the Proposed Action

Program	HGMP Date	Program Operator(s)	Funding Agencies
Oregon SAFE Coho Salmon Program	May 25, 2021	ODFW, CCF	Bonneville, NMFS, ODFW, CCF
Oregon SAFE Spring Chinook Salmon Program	May 25, 2021	ODFW, CCF	Bonneville, NMFS, USFWS, ODFW, CCF
Deep River SAFE Coho Salmon Program	July 24, 2018	WDFW	Bonneville, NMFS, WDFW

These three hatchery programs are considered isolated programs because they acclimate and release juvenile Chinook and coho salmon from net pens in side channel and backwater areas of the LCRE so that harvest of returning adults would have a reduced effect on natural origin salmon. Thus, the SAFE Program's overall objectives include protection of endangered species and minimizing negative impact of SAFE fisheries and production on the environment.

Monitoring and Analysis

As explained in the HGMPs, all released SAFE Program fish are marked with an adipose fin clip and/or coded wire tags (CWT). Sampling of local hatchery returns and spawning grounds in local tributaries through CWT recovery data are used to monitor survival, straying, and fishery contributions.

The following protocols would be implemented to monitor and evaluate risks of the SAFE Program:

- 100 percent adipose fin clips.
- 6.8 percent CWT of coho salmon and 10 percent CWT of Chinook salmon would be used to annually evaluate straying rates.
- Spawning ground surveys along with CWT analysis would be conducted in SAFE drainage streams to determine the extent of natural spawning of program fish.
- Local area streams would be monitored for natural and hatchery-origin coho escapement based on adipose fin clip identification, and CWT would be collected for evaluation.
- Wild fish data would be obtained from juvenile freshwater surveys and life-cycle monitoring surveys.

SAFE Program Hatcheries

As described in the HGMPs, several hatcheries perform necessary functions for the SAFE Program. Such as providing eggs, rearing fish to a certain size[1], transferring fish to net pen sites for acclimation and release, and/or releasing fish directly into the Select Area Sites described above.

In most cases these activities receive a mix of state, Mitchell Act (NMFS), and other funds. Bonneville funding has gone to a subset of these hatchery facilities (i.e., Gnat Creek, Klaskanine River, CCF South Fork Klaskanine River, Beaver Creek, and Grays River) pursuant to the Northwest Power Act. All other hatcheries indirectly involved with the SAFE Program receive a combination of Federal, state, and county funds.

All associated hatcheries operate pursuant to enforceable permits requiring extensive monitoring and reporting. NMFS (2017) and NMFS (2019) ESA biological opinions and corresponding incidental take statements cover the operations of these facilities. In 2017[2] and 2019,[3] NMFS assessed the effects of these hatchery facilities for collecting broodstock[4], incubating eggs, and rearing juvenile salmon prior to transferring fish to SAFE facilities.

NMFS and other responsible agencies fund the collection of broodstock in accordance with ESA Biological Opinions, corresponding Incidental Take Statements (NMFS 2017; NMFS 2019), and NEPA and its implementing regulations. Specifically, the NMFS (2019) Biological Opinion assessed the effects of broodstock collection on ESA-listed salmon and steelhead for spring Chinook salmon releases where broodstock is collected from Upper Willamette hatchery facilities. For coho salmon, NMFS (2017) evaluated the effects of broodstock collection on ESA-listed salmon and steelhead in the Lower Columbia region from fish produced for SAFE releases.

SAFE Funding Sources

The SAFE Program, portions of which Bonneville proposes funding as described in Chapter 2, has evolved to include multiple funding and operating entities, including NMFS, ODFW, WDFW, CCF, and USFWS. Specifically, WDFW is the SAFE project co-manager overseeing the Washington hatchery program (Deep River SAFE Coho Program) sited at Deep River in Washington, while ODFW and CCF are co-managers of the Oregon SAFE Coho and Spring Chinook programs sited at the Oregon net pen sites in Youngs Bay, Blind Slough, and Tongue Point.

The approximate total annual cost of operating and maintaining the SAFE Program—excluding the value of volunteer time and donated materials—is approximately $2.4 million, which includes the

[1] The spring Chinook and coho smolts released from the net pen sites require initial rearing for almost a year in a hatchery setting (or more than a year in the case of acclimation smolts).

[2] ESA Consultation on effects of implementation of the Mitchell Act Final Environmental Impact Statement preferred alternative and administration of Mitchell Act hatchery funding.

[3] ESA Consultation on effects of the 2018-2027 U.S. v. Oregon Management Agreement.

[4] While Bonneville has funded various hatchery operations in the past, Bonneville has not funded the collection of broodstock for salmon production.

costs of operating net pens, contributing hatchery smolt production and hauling, and managing the programs. Recently, Bonneville's annual funding contribution has typically amounted to roughly $1.6 million, or two-thirds of annual O&M costs and half of smolt production costs (TRG 2006).

SAFE Program Fish

The particular species and stocks of salmon reared and released under the SAFE Program—Chinook (*Oncorhynchus tshawytscha*, hereinafter spring Chinook) and coho salmon (*Oncorhynchus kisutch*, hereinafter coho)—were selected based mainly on flesh quality, gamete availability, return timing, homing ability, and overall economic value. Two other salmonid species are produced using these same net pen and supporting hatchery facilities (tule fall Chinook and select area bright [SAB] fall Chinook) but with funding from other sources, meaning they would be produced regardless of Bonneville's funding decision.

SAFE hatchery fish (smolts) are released over a three-month period from March through May (see Appendix A for juvenile release numbers). Spring Chinook are generally released from Oregon SAFE sites as yearlings in March and April and from Deep River net pens in Washington as sub-yearlings in spring and fall. From March through May, early-run coho are released from Oregon Select Area Sites while late-run coho, historically present in the Grays basin, are released from the Deep River net pens in Washington.

The target release size for all hatchery fish in the SAFE Program is the smolt life stage for both spring Chinook salmon and coho salmon. Depending upon the species, average fork length ranges from seven inches (~170 millimeters, or mm) for spring Chinook salmon and five to seven inches (120-170 mm) for coho salmon.

Fishing on SAFE Program fish allows for greater harvest rates, since adult returns are not needed for broodstock and can be 100 percent harvested (See Appendix B for commercial and recreational harvest rates.). The greater harvest rates on the returning adults also solve some problems that accompany the usual practice of releasing smolts at upriver hatchery location sites. Specifically, too many hatchery-produced fish return to these release sites, requiring handling and disposal of surpluses (i.e., those in excess of what is needed for future generation broods). The value of the hatchery fish caught at the net pen sites is greater because of better fish condition, harvester proximity, and ready markets.

To achieve these goals, the fisheries co-managers propose producing and releasing up to 4.25 million spring Chinook salmon smolts and up to 4.3 million coho salmon smolts annually, as planned in the three HGMPs (ODFW 2021a; ODFW 2021b; WDFW 2021). Research and monitoring is an integral part of the SAFE Program and results have been used to modify each hatchery program as necessary to ensure that ecological, genetic, and harvest impacts to ESA-listed stocks are as low as possible.

Select Area Fisheries

The SAFE Program produces fish for commercial and recreational harvests which are managed during fall, winter/spring, and summer seasons at specific off-channel locations in Youngs Bay, Tongue Point, Blind Slough and Deep River in the LCRE. These fishing locations are known as Select Area Sites and the managed fisheries there are known as Select Area Fisheries.

Select Area Fisheries have known salmon stocks produced specifically for their respective areas (spring Chinook and coho)[5] to allow sport and commercial fishing without impacting threatened or endangered stocks. Also known as terminal fisheries, they have been part of the lower Columbia River and Oregon coastal river commercial fishing industry since the 1930s. The fisheries are managed primarily by the Columbia River Compact and regulatory agencies in their respective states (namely, the WDFW and ODFW), which prescribe times and areas for fishery openings, allowable gear types, and monitor fisheries' compliance with catch targets and conservation constraints and boundaries. Commercial and recreational seasons at Select Area Fisheries are prescribed by regulations that are based on test fishing results and coded-wire tagging (CWT) analyses that help determine appropriate time, area, and gear parameters for maximizing harvest of target stocks while minimizing impacts to non-local stocks. Historically, fisheries governed by these harvest policies have been managed within winter/spring, summer, and fall season timeframes, or management periods. These management periods are approximate; some fisheries are longer in duration and span multiple management periods.

The Select Area Fisheries have both a commercial and recreational fishery within each of the three management periods. The winter/spring season typically extends from January 1 to June 15, during which fisheries (seven non-treaty and six treaty) in the mainstem Columbia River primarily target spring Chinook salmon stocks returning to the upper Columbia, the Willamette River, and lower Columbia River tributaries.

The summer season typically extends from June 16 to July 31, during which fisheries (five non-treaty and five treaty) target primarily Upper Columbia River (UCR) summer Chinook salmon, which is not ESA-listed, and Upriver Columbia sockeye salmon, which contains ESA-listed Snake River salmon as a subcomponent. The summer season Select Area Fisheries target spring Chinook and fall Chinook.

Fall season typically begins on August 1 and extends to the end of the calendar year, during which fisheries (nine non-treaty and six treaty) target primarily harvestable hatchery and natural-origin fall Chinook and coho salmon, and steelhead. The fall season Select Area Fisheries target fall Chinook and coho.

At each of these Select Area Sites, the fish (spring Chinook and coho)[6] spend their juvenile life stage in net pens. During this time, the fish imprint to the scent of that area selected for rearing and harvest. After a period of time, the fish are released from the net pens to migrate the short distance to the Pacific Ocean, where they live out their ocean cycle. Coho have a three-year life

[5] Other salmon stocks are produced there, such as SAB Chinook, Fall Chinook, and Fall Coho.
[6] Fall Chinook are also raised in these net pens at different times but fall under the purview of a different hatchery program as well as a different funding source.

span, of which half is spent in the ocean. Chinook live three to five years in the ocean of which six to 18 months are spent in freshwater before migrating to the sea. Before their release, the smolts from each group are marked so they can be identified when they return as adults and are harvested. Tiny coded-wire tags (CWT) are inserted into the snout and the adipose fin is clipped.

When the adult salmon return from the ocean, they "home in" or head for the net pens where they were released and mill around outside. Both commercial and recreational fishermen have the opportunity to catch these fish during managed fisheries. (See Appendix B for Commercial and Recreational Harvest.) The intent is that 100 percent of these fish would be harvested for commercial and recreational fisheries. The release of the fish and the dates of the fishing seasons are timed to minimize competition and other impacts on ESA-listed Columbia River stocks. These fish are not meant to contribute to any natural populations or recovery of the evolutionarily significant unit (ESU); they are purely for harvest.

1.3 Public Involvement

Bonneville solicited public input on the appropriate scope of this environmental review via mailed letters on January 1st, 2024 to tribal and government agencies, and other potentially affected or concerned citizens and interest groups. The mailed correspondence provided information about the proposed SAFE Program and public scoping period, requested comments on issues to be addressed in the environmental review, and provided instructions for submitting comments (via mail, fax, telephone, and Bonneville's website). Bonneville shared the correspondence on a section of its website dedicated to the SAFE Program and the environmental review process for the general public.

The public comment period began on January 1st 2024, and Bonneville accepted comments on the SAFE Program from the public until February 1st 2024, four comments were received during the public scoping period.

All comments and project documents are available for public review and are posted on Bonneville's website at: *www.bpa.gov/nepa/SAFE*. All received comments are included in Appendix D.

2 Proposed Action and No Action Alternative

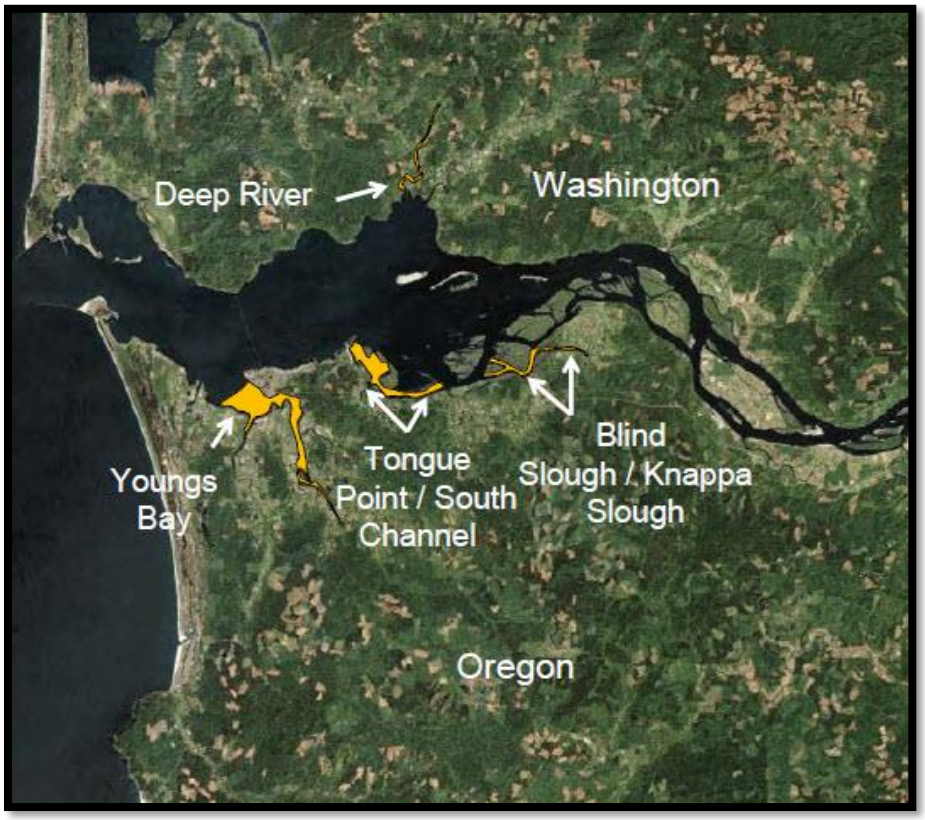
For the Proposed Action, Bonneville would fund hatchery operators and co-managers (CCF, ODFW, and WDFW) to: (1) utilize hatchery facilities to collect and initially rear juvenile Chinook and coho salmon (juveniles); (2) transport a majority of juveniles from these hatchery facilities to net pen sites in the estuary; (3) acclimate and release juveniles at the various net pen sites and hatchery release site; (4) operate and maintain net pen sites and hatchery facilities; and (5) conduct associated SAFE monitoring and evaluation activities.

These activities represent just a portion of the SAFE Program which was explained in Chapter 1.

2.1 Project Areas

The Bonneville-funded portion of the SAFE Program would consist of four main project areas in the off-channel areas in the LCRE located between river miles 10.0 and 27.0. At these sites, spring Chinook and coho are reared, acclimated, and released. These net pen sites are situated within fishery boundaries known as Select Area Fisheries where the fisheries are managed during periods in winter, spring, and summer (see Figure 1).

Figure 1: SAFE Net Pen Sites and Select Area Fisheries Locations



In the fall or early spring, juvenile salmon are brought to these net pen sites, where they are grown and released under varying management and grow-out regimes, including two-week acclimation, over-wintering, and full-term net pen rearing until release for ocean-bound migration (anywhere from two weeks to six months in the net pens).

Each net pen site is fully constructed and functional, including the net pens, pilings, access roads, access docks, and storage facilities. Ongoing maintenance activities to this infrastructure would occur. Each net pen consists of a small-mesh net suspended from a floating frame made of high-density polyethylene pipe that is secured to pilings. These net pens typically have a volume of 91 cubic meters (m^3) and have mesh sizes sufficient to retain the fish without premature escape until smolt stage is reached. The net pens at Deep River are larger with a volume of 147 m^3.

Net pens are sufficiently sturdy to withstand weather-related accidents. Water system failure or flooding incidents are not possible since the pens and fish are immersed in large water bodies rather than being externally supplied. In the event of net pen failure, fish would be capable of leaving the pens on their own and could not be recovered.

Youngs Bay

Of all the net pen sites, Youngs Bay is the most dynamic, with tidal changes providing superior flushing and greater expansion opportunity. A majority of spring Chinook and coho salmon are reared, released, and harvested here. Youngs Bay is located in Oregon waters adjacent to the city of Astoria and inland of the Highway 101 Bridge (see Figure 2 and 3) at RM 1.5-1.7 in the Columbia Estuary watershed. The upper fishing boundary of the Select Area Fishery lies at the confluence of Youngs and Klaskanine rivers. All waters at this site are under Oregon state jurisdiction, with state-issued landing permits required for participation. Youngs Bay presently has 82 net pen structures used for juvenile rearing and release. The number of net pens would vary (+/- 20 pens) depending on desired density, acclimation and release schedules, and production goals. Spring Chinook and coho juveniles are also released into the Klaskanine River adjacent to the Klaskanine Hatchery and coho juveniles are released into the South Fork Klaskanine River adjacent to the South Fork Klaskanine Hatchery.

Figure 2: Youngs Bay Net Pen Sites and Select Area Fishery

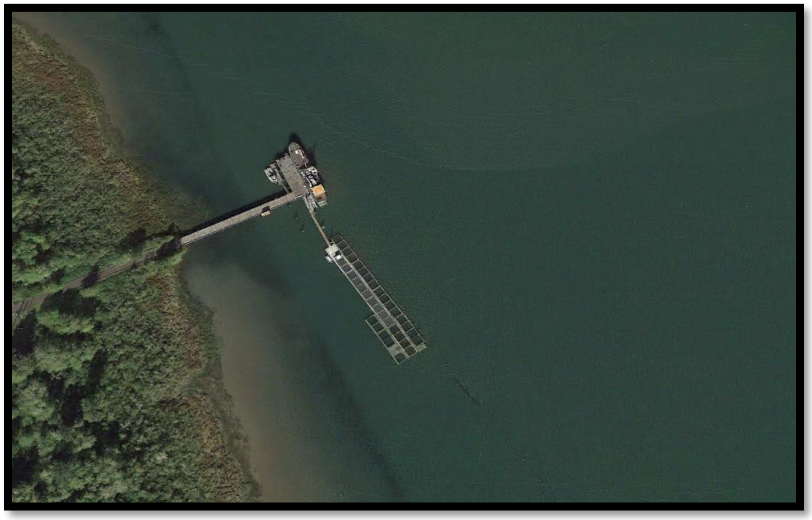
Figure 3: Aerial View of Youngs Bay Net Pen Sites

Tongue Point

Tongue Point Basin is located just east of Astoria, Oregon, in the concurrent Columbia River waters bounded by the Oregon shore and Mott and Lois islands (see Figure 4 and Figure 5) at RM 20 on the Columbia River Estuary Watershed. The terminal fishing area includes waters of South Channel. All waters at this site are under concurrent state jurisdiction. There are currently 37 net pen structures used for rearing and release. The number of net pens would vary (+/- 10 pens) depending on desired density, acclimation and release schedules, and production goals.

Figure 4: Tongue Point Net Pen Site and Select Area Fishery

Figure 5: Tongue Point Net Pen Site



Blind Slough

Blind Slough is located near Brownsmead, Oregon, and includes waters of Gnat Creek and Knappa Slough (see Figure 6 and Figure 7) at RM 27 on the Columbia River in the Columbia Estuary watershed in Clatsop County. The Blind Slough Select Area Fishery is approximately 2.5 miles long with concurrent waters extending downstream of the railroad bridge. Oregon state waters extend upstream of the railroad bridge in Blind Slough. There are currently 15 net pens located in Blind Slough used for rearing and release. The number of net pens would vary (+/- 5 pens) depending on desired density, acclimation and release schedules, and production goals. In addition, there are release sites in Gnat Creek where juvenile spring Chinook are released adjacent to Gnat Creek Hatchery.

Figure 6: Blind Slough Net Pen Site and Select Area Fishery

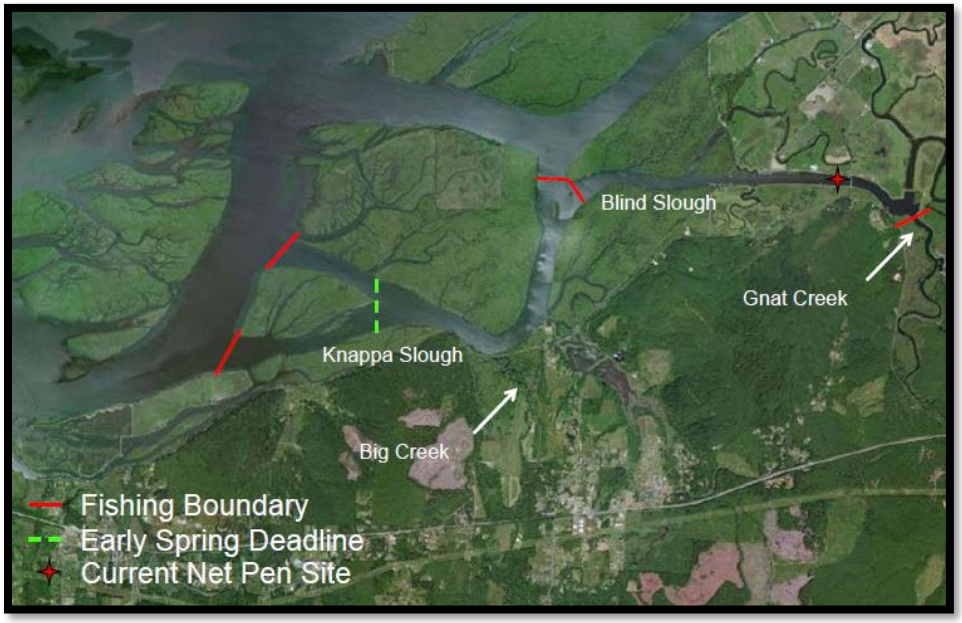


Figure 7: Aerial View of Blind Slough Net Pen Site

Deep River

The Deep River net pen site and Select Area Fishery—located within the lower reaches of Deep River below the town of Deep River, Washington—is the only site located on the Washington side of the Columbia River. It extends downstream approximately three miles to the confluence with the lower Columbia River at Grays Bay (see Figure 8 and

Figure 9). Washington state waters extend upstream of the Highway 4 bridge and concurrent state waters extend downstream. Deep River net pen site currently has a total of 40 net pen structures used for rearing and release. The number of net pens would vary (+/- 10 pens) depending on desired density, acclimation and release schedules, and production goals.

Figure 8: Deep River Net Pen Site and Select Area Fishery

Figure 9: Aerial View of Deep River Net Pen Site

2.2 Hatchery Support for Proposed Action

The hatcheries listed below would be used to provide eggs, rear fish to a certain size, transfer fish to net pen sites for acclimation and release, and/or to release fish directly into the Select Area Sites described above. The spring Chinook and coho smolts released from the net pen sites require initial rearing for almost a year in a hatchery setting (or more than a year in the case of acclimation smolts).

The hatcheries listed below would also provide direct support for the SAFE Program by providing for this initial rearing and production of juvenile fish and therefore receive partial Bonneville funding for their operations and maintenance.

Gnat Creek Hatchery (Spring Chinook)

Gnat Creek Hatchery would rear all of the SAFE-funded spring Chinook fingerlings for the SAFE net pens. Some of the production would be released off-station in adjacent Gnat Creek which is part of the Blind Slough Select Area Fishery, where an annual average of 560,000 spring Chinook have historically been released. The same amount is likely to be released into the future.

Klaskanine River Hatchery (Coho & Spring Chinook)

This facility would be used primarily for rearing SAFE Program coho and spring Chinook, of which an annual average of 1,161,237 and 280,660, respectively, would be released directly into the Klaskanine River.

CCF South Fork Klaskanine Hatchery (Coho)

The hatchery would provide juvenile rearing of coho for SAFE net pens and would directly release coho into the South Fork Klaskanine River (averaging 343,586 coho smolts).

Grays River Hatchery (Coho)

The Grays River Hatchery is located at RM 2.0 on a tributary to the Grays River, a Columbia River tributary in the State of Washington. The hatchery is operated by WDFW, which raises and releases coho smolts at the Deep River net pen site.

2.3 Juvenile Production and Release

Full SAFE Program implementation would entail releasing up to 4.25 million spring Chinook salmon smolts and up to 4.3 million coho salmon smolts annually, as described in the three HGMPs (ODFW, ODFW and WDFW). This would constitute the SAFE Program's maximum implementation phase, during which these fish would be released at various SAFE net pen sites and into rivers adjacent to several hatchery facilities (Gnat Creek, South Fork Klaskanine and Klaskanine Hatcheries).

Spring Chinook and coho salmon would typically either rear over winter in the net pens or hatchery sites until being released as juvenile smolts in the spring (from October to March/April), or would acclimate for two to three weeks prior to a spring release (March/April). With the overwintering fish, known numbers of fingerlings would be transferred from source hatcheries by tanker truck and piped directly into the pens at the various sites. The trucks would routinely haul 50,000-60,000 fish per load to achieve target density (usually 0.75 pound/cubic foot at release). With the short acclimation schedule of two to three weeks, each truck would carry about 25,000-30,000 smolts.

For all rearing strategies, fish would be fed recommended levels of pelletized feed throughout the rearing period and released as juvenile smolts according to schedules developed during the research phase of this project (FYs 1993–2006). All juveniles are released volitionally, typically

during high tides in the late evening once they show signs of wanting to leave (i.e., circling the pens) (See Appendix A for more information on juvenile release). After several years in the ocean, a small portion would return as adults to the Select Area Fisheries for commercial and recreational harvest (See Appendix B for more information on adult returns).

2.4 No Action Alternative

Under the No Action alternative, Bonneville would not fund the operators and co-managers' (WDFW, ODFW, and CCF), which could acquire funding from other, non-Federal sources and proceed with the contemplated actions. This EA accordingly assumes that portions of the SAFE Program currently being financed by other sources would continue in the event of the No Action alternative, while all Bonneville-funded hatchery production would discontinue. This assumption is bolstered by a TRG 2006 study that found juvenile production would fall to 2.4 million. Coho operations would likely continue because these fish require less time and financial investment compared to spring Chinook, although this analysis assumes they would also be reduced by half.

For spring Chinook production, the No Action Alternative would eliminate Bonneville funding for all smolt production at Gnat Creek Hatchery and net pen operations at Youngs Bay, which would likely reduce output by 800,000 smolts at Klaskanine Hatchery and 300,000 smolts at Blind Slough Net Pens. For coho production, it would likely halve output at Klaskanine Hatchery (600,000), eliminate it entirely at Youngs Bay, reduce it by 540,00 smolts at Tongue Point, and by 400,000 smolts at Deep River. This would amount to an aggregate halving of spring Chinook and coho production capacity.

These same net pens and supporting hatchery facilities also produce two other salmonids (namely, tule fall Chinook and select area bright [SAB] fall Chinook), but with third-party funding. This analysis assumes production would continue regardless of Bonneville's funding decision. This analysis similarly assumes that: (1) the SAB broodstock program would continue at the South Fork Klaskanine Hatchery; (2) production at the Cascade and Oxbow hatchery complex and Sandy Creek Hatchery would continue; and (3) the Youngs Bay Net pen Site would likely be discontinued.

To remain within budgetary constraints in the event of the No Action Alternative, the SAFE Program would need to curtail expenditures on fish food, CWTs necessary for run reconstruction, and some operational costs at hatchery facilities. Existing adult collection, holding, and spawning procedures for translocation programs would be maintained, but likely not at full production levels. In the absence of Bonneville funds, the SAFE Program would have to reduce staff time used for analyzing fishery information in-season and accordingly reduce the information used for tracking and modifying fishing regulations and fishing periods. Project staff that currently conduct analysis (required for monitoring, annual reports, in-season ESA monitoring, monitoring for the effects of project fish production, SARs, contribution to fisheries, run reconstructions, pHOS, and run size forecasting) would have to be reduced accordingly.

The SAFE Program provides partial funding for operations and maintenance of four hatcheries: Gnat Creek and both Klaskanine hatcheries in Oregon, and Grays River Hatchery in Washington. These hatcheries provide support for other programs and receive funding from other entities. While engagement in the SAFE Program may be reduced, these hatcheries would likely remain partially to fully operational.

3 Affected Environment and Environmental Consequences

This chapter describes the environment and resources that the Proposed Action and No Action Alternative could impact—namely, fish, water resources, wildlife, land use and recreation, transportation, socioeconomics, and climate change—as well as the nature and extent of those potential impacts, which are characterized as **high, moderate, low**, or **no impact** based on considerations of context and intensity set forth in Council of Environmental Quality (CEQ) NEPA implementing regulations (see 40 C.F.R. 1508.27). Effects on other areas and resources—such as geology, soils, scenic values, wetlands, vegetation, floodplains, public health and safety, land use, cultural resources, and environmental justice—were considered but are not discussed in detail for the following reasons:

- Each net pen site is intentionally located in the LCRE where the depth and flushing volumes of receiving waters do not allow for sustained deposition and would have no effect on shoreline erosion or sedimentation patterns. Therefore, there would be **no impact** on **geology** or **soil**s.
- Each net pen site has the visual appearance of a boat dock and pier which are typical features in the LCRE. These net pens already have been in existence for decades and there have been no concerns raised about the aesthetics or visual appearance. Therefore, there would be **no impact** on **scenic values**.
- Net pen sites are located in the open water, away from wetlands. The production of organic materials from the net pens is rapidly diluted and absorbed by the environment in the immediate area, does not accumulate and would not be transported into surrounding wetland habitats or nearshore vegetation. Therefore, there would be **no impact** on **wetlands** or **vegetation**.
- Net pen sites are not large enough relative to the surrounding waters to create barriers to water movement and affect hydrology of the floodplain and floodplain habitats. Therefore, there would be **no impact** on **floodplains**.
- Net pen sites are situated near river banks outside of navigation channels, and are marked and well lit to prevent any navigation hazards or collisions with water craft. Organic materials released from the net pens are rapidly diluted and absorbed into the environment, would not accumulate, thus posing **no impact** to human health. Therefore, there would be **no impact** on **public health and safety**.
- Net pen sites already exist in open waters and do not pose any competing values for adjacent or nearby lands usage or development. The immediate locations are developed and tend to support fisheries and navigation. There are no proposed changes which would compete with surrounding land use. Therefore there would be **no impact** on **land use**.
- Net pen sites already exist in open waters and would not require any ground-disturbing activities and accordingly have **no impact** on **cultural resources**.
- In Clatsop, Pacific, and Wahkiakum counties, in addition to surrounding areas, there are no communities that meet the definitions of a minority population as defined by CEQ and EPA, nor low income, which is less than or equal to twice the Federal poverty level. The Proposed Action therefore has **no impact** on **environmental justice** concerns.

3.1 Fish

3.1.1 Affected Environment

Flood control and agricultural activities— including construction of levees, dikes, and other structures—have extensively altered the LCRE. Some of these structures merely block fish access to affected habitats, while others entirely de-water them and change their functions from tidal and floodplain wetlands to dike/levee-protected farmlands or pastures. CRS construction and operation, in particular, has greatly altered the natural process of estuary marsh, swamp, and wetland habitat formation by disconnecting key sediment-transport processes, which consequently no longer influence the creation, maintenance, or distribution of estuary habitat used for juvenile salmonid rearing, overwintering, and foraging.

The impacts of these land alterations, habitat exclusions, and tidal flow changes on salmon and steelhead are particularly important, as those fish are heavily dependent on estuarine environments during rearing and outmigration. These changes have reduced and changed the sources of base-level food production, blocked availability and connectivity of habitats within the estuary, and limited their diversity and complexity.

The table below identifies the current threatened and endangered fish species and their designated critical habitat.

Table 3: ESA-Listed Fish Species in the Lower Columbia River Estuary and their Listing Status

Species	Federal Status	Critical Habitat Status
Chinook salmon (*Oncorhynchus tshawytscha*)		
Snake River spring/summer	Threatened (70 Federal Register (Fed. Reg.) 37160)	Designated (58 Fed. Reg. 68543)
Snake River fall	Threatened (70 Fed. Reg. 37160)	Designated (58 Fed. Reg. 68543)
Upper Columbia River spring	Endangered (70 Fed. Reg. 37160)	Designated (70 Fed. Reg. 52685)
Lower Columbia River	Threatened (70 Fed. Reg. 37160)	Designated (70 Fed. Reg. 52685)
Upper Willamette River	Threatened (70 Fed. Reg. 37160)	Designated (70 Fed. Reg. 52685)
Steelhead (*O. mykiss*)		
Snake River	Threatened (70 Fed. Reg. 37160)	Designated (70 Fed. Reg. 52685)
Upper Columbia River	Threatened (74 Fed. Reg. 42605)	Designated (70 Fed. Reg. 52685)
Middle Columbia River	Threatened (57 Fed. Reg. 14517)	Designated (70 Fed. Reg. 52685)
Lower Columbia River	Threatened (62 Fed. Reg. 43937)	Designated (70 Fed. Reg. 52685)
Upper Willamette River	Threatened (62 Fed. Reg. 43937)	Designated (70 Fed. Reg. 52685)
Chum Salmon (*O. keta*)		
Columbia River	Threatened (70 Fed. Reg. 37160)	Designated (70 Fed. Reg. 52685)

Species	Federal Status	Critical Habitat Status
Sockeye Salmon (*O. nerka*)		
Snake River	Endangered (70 Fed. Reg. 37160)	Designated (58 Fed. Reg. 68543)
Coho Salmon (*O. kisutch*)		
Lower Columbia River	Threatened (70 Fed. Reg. 37160)	Designated (81 Fed. Reg. 9251)
Oregon Coast	Threatened (73 Fed. Reg. 7816)	Designated (73 Fed. Reg. 7816)
Pacific Eulachon (*Thaleichthys pacificus*)		
Southern Distinct Population Segment (DPS)	Threatened (75 Fed. Reg. 13012)	Designated (76 Fed. Reg. 65324)
Green Sturgeon (*Acipenser medirostris*)		
Southern DPS	Threatened (71 Fed. Reg. 17757)	Designated (73 Fed. Reg. 52088)
Bull Trout (*Salvelinus confluentis*)		
Columbia River DPS	Threatened (63 Fed. Reg. 31647)	Designated (75 Fed. Reg. 63898)

All of the species in Table 3 either rear in, and/or migrate through, the LCRE between Bonneville Dam and the Pacific Ocean. Their range is distributed throughout the Columbia River basin and extends inland as far as Idaho.

ESA-listed salmonids likely present in and near the net pen sites include juvenile and returning adults using the LCRE as a migratory corridor. Juveniles are likely to use the project area for foraging, rearing, and migration. The duration of pre-migration estuary residence varies for each of the ESA-listed salmonid ESUs, ranging from a few days to one or two years (NMFS 2000). For ocean-type juvenile salmonids, estuarine habitat (e.g., tidal marsh and swamp) is critical for physiological transition and development of sufficient strength, energy, and reserve capacity to endure the challenges of the marine environment.

The LCRE is also important for adult anadromous fish migrating upstream to spawning areas and juveniles migrating downstream to the ocean, for which it is an important overwintering and foraging area. Juvenile salmonids may rear in shallow-water and nearshore areas for several months before migrating to the ocean (Simenstad et al. 1982, Bottom et al. 2001). These shallow water intertidal floodplains offer critical refugia from high flows, seasonal turbidity, and larger predatory species. Emergent vegetation within these inundated floodplains also provides important feeding and rearing grounds for juvenile fish. These shallow-water and near-shore habitats are crucial for juvenile salmon on their way to sea.

ESA-listed salmon ESUs in the project area primarily include:

Chinook Salmon. Stream-type Chinook salmon, which typically rear in higher elevation tributaries for one year prior to migrating to sea, are most abundant in the estuary between early April and early June. Large numbers of pre-smolt Chinook salmon rear in the estuary year round, and it is likely that many of these are fall Chinook salmon. The fall Chinook salmon migration through the estuary typically peaks between May and July but, there is typically a pulse of subyearling Chinook salmon entering the estuary in March from hatchery releases upstream of

Bonneville Dam.

***Chum Salmon*.** Chum salmon are present in the estuary following emergence as early as mid-January through mid-July, with peak abundance occurring between mid-April and mid-May as they migrate seaward. Hatchery and wild chum salmon use the estuary as a migratory route to the Pacific Ocean and also for rearing in some cases.

***Coho Salmon*.** Rearing coho salmon may be in the estuary throughout the year, with peak abundance of smolts migrating between April and June. Similar to Chinook salmon, juvenile coho salmon may be found rearing in the estuary any time of the year.

***Sockeye Salmon*.** Sockeye salmon typically rear in freshwater lakes for one to three years prior to migrating to the ocean and primarily use the estuary as a migration corridor. The limited information available indicates that sockeye salmon are most abundant in the estuary in May.

***Steelhead Salmon*.** Steelhead typically rear in freshwater tributary habitats for one to several years prior to seaward migration, although juvenile steelhead may use the estuary for limited rearing. Juvenile steelhead abundance in the estuary peaks between late May and mid-June.

The spatial overlap between SAFE spring Chinook and coho salmon released as part of the Proposed Action and these native-rearing salmon and steelhead is confined to the LCRE near the net pens where hatchery fish are released and the short migration route to the ocean. The releases of SAFE hatchery fish occur in Youngs Bay (Figure 1), Tongue Point (Figure 4), Blind Slough (Figure 6), and Deep River (Figure 8), as well as near certain hatchery facilities in Gnat Creek, Klaskanine River, South Fork Klaskanine River, and Grays River, which are all near the mouth of the Columbia River. All fish are released as smolts that have been acclimated for some time to saltwater while in the net pens. The physiological state of these fish makes them ready to immediately emigrate towards the ocean over a short period of time (i.e., a matter of weeks) upon release.

Another aspect of the interaction between hatchery fish and natural-origin juvenile salmon and steelhead is the period of time affected by the presence of hatchery fish (i.e., temporal overlap). For the Proposed Action, SAFE hatchery fish are released over a three month period from March through May. Spring Chinook salmon are released earlier in this window, while coho salmon release extends through May.

3.1.2 Environmental Consequences for Fish – Proposed Action

3.1.2.1 Effects to Salmonid Fish Species

According to NMFS[7], there are three primary effects of hatchery fish production on natural salmon and steelhead to be considered:

- Competition between hatchery and natural salmon and steelhead.
- Predation by hatchery fish on juvenile salmon and steelhead.
- Transfer of disease pathogens from hatchery fish to juvenile salmon and steelhead.

[7] Biological Opinion on SAFE Spring Chinook and Coho Salmon Hatchery Programs.

Evaluating the effects of competition, predation, and disease on juvenile salmon and steelhead requires consideration of spatial and temporal factors. Spatial overlap refers to potential overlap between releases of hatchery fish and co-occurring juvenile natural-origin salmon and steelhead in the same area. Temporal overlap refers to concurrently timed hatchery fish releases from each program, enabling interaction with juvenile natural-origin salmon and steelhead.

The target release size for all hatchery fish in the Proposed Action is the smolt life stage for both spring Chinook and coho salmon. Depending upon the species, average fork length ranges from seven inches (~170 mm) for spring Chinook salmon and five to seven inches (120-170 mm) for coho salmon. Given that hatchery fish are released as smolts in the estuary, the potential interaction period is expected to be short (less than one week) because the hatchery fish are actively emigrating to the ocean as the physiological condition of the hatchery smolts triggers their desire to emigrate.

Roegner et al. (2016), as cited by NMFS, provide detailed information on the presence of native juvenile salmonids in the LCRE throughout the year. They found all species and life stages may be found in the estuary from March till May, when SAFE hatchery fish are released from the net pen sites (see **Error! Reference source not found.**). Salmonids' use of estuary habitat differs among life stages, with smolts primarily using the deeper waters of the estuary and younger life stages using shallower nearshore habitats.

Returning adult SAFE fish may spatially overlap with native ESA-listed salmon and steelhead adults while migrating back to Select Area Fishery Sites throughout the mouth of the LCRE for a period of days during the months of February through June. However, co-occurrence of these species within the Select Area Fishery Sites—where SAFE hatchery fish travel to and congregate for harvest—is extremely unlikely due to their off-channel location and run timing. The LCRE serves as rearing and saltwater acclimation habitat for juvenile salmon and steelhead and as a migration corridor for adult salmon and steelhead. Specifically, coho and Chinook salmon and steelhead are known to utilize the Youngs Bay Watershed for spawning (Bischoff et. al. 2000), while life history stages of sockeye and chum are most likely using Youngs Bay as part of the larger migratory path and rearing habitat available to them in the LCRE.

In summary, the Proposed Action entails releasing SAFE hatchery fish over a three month period from March through May, with Spring Chinook salmon to be released earlier in this window, and coho salmon to be released later. SAFE smolts may spatially overlap with the following fish described in this section during release and out-migration towards the Pacific Ocean, but the LCRE's size—as the second largest river in the U.S. with a width of nearly 6 miles—makes precise co-occurrence of these species unlikely near the SAFE hatchery and net pen sites, where SAFE adult fish travel and congregate for harvest due to the lack of desirable habitat or resources at their isolated off-channel location.

SAFE Program fish can be easily distinguished from native ESA-listed stocks through fin-clips and CWTs. The refinement of gear restrictions, fishing periods, and area boundaries open for fishing within Select Areas has further minimized harvest impacts to native ESA-listed salmonids. Consequently, given to the limited overlap in space and time (i.e., from February through June), harvest-related impacts would be **very low.**

***Competition*.** Salmonids compete for resources limited in space or time. Because the Proposed Action occurs in the LCRE, resources such as space, cover, and forage are more abundant, as evidenced by the behavior of juvenile salmonids, which becomes more competitive (e.g., schooling together for protection and defending territories) when they are rearing in off-channel tributary freshwater habitats. Therefore, competition between SAFE hatchery salmonids and native ESA-listed salmonids is likely to be **very low**, particularly in the vast estuary environment where salmonids are transitioning from freshwater to the ocean where resources (space, cover, and forage) are less limited.

Predation. Intraspecific predation among salmonids is likely to occur when different life stages spatially and temporally overlap. Older and larger salmon and steelhead are known to prey upon smaller, younger fish. In the LCRE, predation by hatchery fish has been known to occur, typically affecting younger chum and fall Chinook salmon fry that may be present in the estuary. This predation risk is likely to be low because SAFE spring Chinook and coho salmon are found primarily in the deeper water habitats (Roegner et al. 2016), and not in the shallower, nearshore habitats where smaller, younger native salmon are common. In addition, the temporal overlap with SAFE hatchery fish released from the net pen sites is limited to be less than one week, which minimizes the overall potential for predation to occur from the Proposed Action. Other similar sized smolts are not at risk of predation from SAFE hatchery fish. Therefore, predation among salmonids would be extremely **low**.

Disease. Disease is a function of the interaction between the organism (including its genetics, immune system, etc.), the environment (e.g., stress resulting from too high or low temperatures, high densities, lack of food, pollution, decreased dissolved oxygen, culture practices), and infectious (e.g., pathogen) or non-infectious (e.g., toxin) agents (Reno 2011).

Net pen aquaculture is a monoculture where fish may be handled extensively and are crowded into unnaturally high densities in environments that are not optimal for the fish. These conditions may lead to immune suppression, increasing the risk of infection and disease (Kurath and Winton 2011). The crowded environment contributes to stress when the fish are moved from the freshwater hatchery environment to the marine net pens. These fish also are exposed to "wild" pathogens. The monoculture, high densities, suppressed immune systems, and presence of wild pathogens can promote amplification and transmission of these pathogens among the cultured fish (Kurath and Winton 2011).

There are situations where SAFE hatchery fish potentially infected with pathogens are released into the watershed. Sometimes this is intentionally done to contain disease proliferation in a hatchery environment, albeit at the cost of increasing pathogen levels in the natural environment in the event of a confirmed outbreak. This is a rare occurrence and done only when preventative measures fail to mitigate the outbreak. It is important to note, however, that pathogen detection is distinct from observed disease, as the number of pathogenic disease outbreaks in a particular hatchery system (20-30 per year) is much lower than the number of pathogen detections (3,000-4,000 per year), and many of the disease outbreaks are curable using treatments approved for use in fish culture such as formalin, hydrogen peroxide, and various antibiotics.

SAFE hatchery fish immigrate to the ocean relatively quickly, limiting exposure time and/or pathogen shedding in freshwater. CCF prefer large late-evening high tides for releasing smolts,

which Ledgerwood et al. (1997) found emigrated out of Youngs Bay within one tidal cycle. Although a number of pathogens have been detected in the hatchery system over the last few years, these have not included any novel or exotic varieties, nor resulted in any devastating outbreaks in recent years.

The low frequency of disease outbreaks from native pathogens, combined with frequent monitoring and treatment options under current fish health policies, suggests that the effects of pathogen amplification during fish rearing in SAFE Hatchery Facilities on natural-origin salmon and steelhead would be **low**.

3.1.2.2 Other ESA-listed Aquatic Species

Other ESA-listed aquatic species that may be impacted by the Proposed Action include:

***Pacific Eulachon*.** Eulachon spend little time in the estuary, rapidly traversing it to spawning streams from late Winter till mid-Spring. The larvae spend no time rearing in streams or estuaries, and are instead carried downstream into the ocean in late spring and early summer to spend the majority of their lives in the ocean. The estuary is, however, designated as critical habitat for the Southern DPS of the Pacific eulachon as it serves as the primary migration corridor between the ocean and spawning habitats in tributaries to the Columbia River. Eulachon are present in the Lower Columbia River and some of the larger tributaries. The spatial overlap between eulachon and SAFE hatchery fish occurs from February through June in the lower Columbia River. During this time, in certain years, eulachon migrate up the lower Columbia River to spawn while the SAFE hatchery fish emigrate to the ocean as juveniles and upstream as adults.

Potential interactions between eulachon and SAFE Hatchery fish as a result of the Proposed Action would likely be **low** due to differences in habitat use and behavior. Adult eulachon use the lower Columbia River as a migration corridor. These adult migrations occur throughout deeper water in the mainstem channel to the tidally influenced rivers where they spawn. The operation and location of the net pen sites would have **no to low impacts** on eulachon due to limited spatial and temporal overlap.

***Green Sturgeon*.** Sturgeon occupy the estuary in large numbers in the summer and fall and migrate to rivers in late spring to spawn. Juveniles spend up to four years rearing in the estuary before moving into the ocean, where they spend most of their lives. While released SAFE Program fish could potentially contribute to the green sturgeon's prey base (adult and juvenile), it would not be in sufficient amounts to increase the growth and abundance of the green sturgeon population. Negative ecological impacts from the Proposed Action would have **no to low impacts** due to the size of green sturgeon (sub-adult and adult), differential habitat use, and limited spatial and temporal overlap.

***Bull Trout*.** Although bull trout designated critical habitat is mapped in the main stem of the Columbia River, their occurrence in the estuary remains rare. Given the extreme low probability of spatial and temporal overlap, the SAFE Program would have **no to low impacts** on individual bull trout fish.

3.1.2.3 Other Aquatic Species

***Cutthroat trout*.** This species may use the estuary for seasonal rearing and as a migration corridor, with peak abundance of migratory juveniles occurring between March and May. SAFE coho smolts are small enough that cutthroat trout could potentially be prey upon them, but for such a brief duration (weeks) that they would not make a substantial contribution to the trout's prey base. Given this extreme low incidence of spatial overlap, the SAFE Program would have **no to low impacts** on cutthroat trout.

***Pacific Lamprey*.** Juvenile Pacific lamprey are perennially found in the estuary while adults seem to traverse it during their upstream migration from late Winter through Spring. The potential for interactions between lamprey and SAFE hatchery fish is likely to be low due to differences in habitat use and behavior. They are commonly found in deep pools in slow moving water, often near riffles or other areas with high oxygenation. Operating the SAFE net pen sites would have **no impact** on lamprey because the fish are not likely to be present for any extent of time near these off-channel net pen areas.

Aquatic Invertebrates. Aquatic invertebrate biota typical of the LCRE include numerous species of insects (dragonflies/damselflies, mayflies, stoneflies, caddisflies, butterflies, beetles, flies, midges, and true bugs). These macroinvertebrates inhabit most streams and play a key role in processing organic material and nutrient cycling, as well as serving as an important food source for fish, amphibians, and other macroinvertebrates. SAFE hatchery fish may feed on these insects while emigrating to the ocean, but for such a short duration (weeks) and in such small amounts that there would be **no to low impacts** on macroinvertebrate populations which are extremely prolific.

As further discussed in the following Section 3.2 Water Resources, the concentration of tens of thousands of fish at the SAFE net pen sites would result in localized deposition of organic matter from uneaten food, fish wastes, and biofouling drop off (i.e., organic debris from organisms growing on the net pens). Some organic waste may provide resources for the benthic community, but excess waste can result in high decomposition rates and reduced oxygen levels in the water. This may affect the benthic environment under the SAFE net pens by changing sediment chemistry (accumulation of nitrogen, carbon, and phosphorus), physical properties, and the biological community. This may happen if the accumulation of organic material exceeds the capacity of the environment to absorb it.

The SAFE Program has monitored the benthic macroinvertebrate community under the net pens since 1994. The project sponsors report the overall impact has been only a minor change in macroinvertebrate populations during the salmon-rearing period (November-April) but a return to baseline by the beginning of the next rearing season. Compared to samples taken outside the perimeter of the net pens, sampling within the perimeter averaged slightly higher numbers of oligochaetes (aquatic worms) and amphipods. This indicates that the organic material being input to the environment at each net pen site would become absorbed by the environment with a temporary increase of the population, predominantly the Oligochaeta. When the input of organic material ceases, the population would likely decrease to background levels. Therefore, the effects of the Proposed Action on the underlying benthic community would be **low** due to the consistent return to baseline population levels.

3.1.2.4 Research, Monitoring, and Evaluation Activities

All Columbia River Basin hatchery programs conduct periodic research, monitoring, and evaluation (RME) to evaluate program performance, the effects of hatchery fish, and the status of natural-origin populations. These activities primarily involve observation, but may also occasionally involve fish collection and sampling. The majority of the expected take of natural-origin salmon and steelhead is non-lethal, where natural-origin fish may be incidentally captured, handled, and then released alive. Any mortality of salmon and steelhead would be inadvertent and accidental, unless the RME specifically needs natural-origin salmon or steelhead (e.g., direct take) for study. Few if any natural-origin salmon and steelhead have been intercepted in previous years. Therefore, there would be a **very low effect** through RME activities on incidentally caught fish and **no effect** to their habitat.

3.1.2.5 Effects on Essential Fish Habitat

The project areas include areas designated as Essential Fish Habitat (EFH) for the Estuarine Composite of Pacific Coast groundfish (PFMC 1998a), coastal pelagic species (PFMC 1998b), various life-history stages of Chinook and coho salmon (PFMC 1999) (see Table 4).

Table 4: Species with Designated EFH in the Estuarine EFH Composite

Groundfish Species	
Soupfin Shark	*Galeorhinus zyopterus*
Spiny Dogfish	*Squalus acanthias*
California Skate	*Raja inornata*
Spotted Ratfish	*Hydrolagus colliei*
Lingcod	*Ophiodon elongatus*
Cabezon	*Scorpaenichthys marmoratus*
Kelp Greenling	*Hexagrammos decagrammus*
Pacific Cod	*Gadus macrocephalus*
Pacific Whiting (Hake)	*Merluccius productus*
Black Rockfish	*Sebastes maliger*
Bocaccio	*Sebastes paucispinis*
Brown Rockfish	*Sebastes auriculatus*
Copper Rockfish	*Sebastes caurinus*
Quillback Rockfish	*Sebastes maliger*
English Sole	*Pleuronectes vetulus*
Pacific Sanddab	*Citharichthys sordidus*
Rex Sole	*Glyptocephalus zachirus*
Rock Sole	*Lepidopsetta bilineata*
Starry Flounder	*Platichthys stellatus*
Coastal Pelagic Species	
Pacific Sardine	*Sardinops sagax*
Pacific (Chub) Mackerel	*Scomber japonicus*
Northern Anchovy	*Engraulis mordax*
Jack Mackerel	*Trachurus symmetricus*
California Market Squid	*Loligo opalescens*
Pacific Salmon Species	
Chinook Salmon	*Oncorhyncus tshawytcha*
Coho Salmon	*Oncorhyncus kisutch*

The EFH effects of the Proposed Action evaluated in this EA would be the same as those described in NMFS' 2021 Biological Opinion (NMFS 2021) to be of **no impact** as expressed by NMFS below:

> *"The Proposed Action has negligible, if any, effects on the major components of EFH. The net pens where hatchery fish are released have been in operation for years and are located in tidal, off-channel backwater areas of the Lower Columbia River. The amount of habitat*

affected by the placement of net pens is insignificant. Nearshore habitat is not affected as the net pens are in deeper waters and secured by existing piling structures. The proposed hatchery programs include designs to minimize each of these effects."

3.1.3 Environmental Consequences for Fish– No Action

Under the No Action alternative, the SAFE Program would not be funded to achieve the maximum production level, but would still continue with partial funding from other sources, reducing the overall impact. The lack of Bonneville funding would likely halve smolt production. Environmental variables such as ocean conditions and estuary smolt predation make it difficult to predict adult returns, but it is reasonable to assume that they would decrease by the same or lower margin. As a result, the overall **low** impact of the SAFE Program on the above-mentioned aquatic species would be further reduced due to the fewer amount of fish being released and the further reduction of spatial and temporal overlap of SAFE Program Hatchery Fish with other fish and aquatic species.

3.2 Water Resources

3.2.1 Affected Environment

The operation of a SAFE net pen facility has the potential to impact localized water quality parameters. This is because the congregation of fish in a small area can lead to the release of excessive nutrients and organic matter from the net pens, which may subsequently affect the surrounding water. This section describes the water quality parameters that these operations could affect and applicable water quality regulations. Because SAFE net pen sites do not divert or consume water or release effluent, this analysis focuses on water quality rather than quantity.

Prior to the issuance of a National Pollutant Discharge Elimination System (NPDES) permit allowing effluent discharges, Oregon and Washington have the responsibility of certifying under Section 401 of the CWA that the proposed project meets state water quality standards. This certification confirms that the permit would not lead to a violation of these standards or contribute to such a violation.

Net pen operations that hold 20,000 pounds or more of fish or administer 5,000 pounds or more of food in any given month are required to obtain such a permit. The Net Pen Sites at Steamboat Slough in Washington and Blind Slough in Oregon operate below these thresholds and therefore do not require a permit. However, permits are necessary for the Tongue Point and Youngs Bay facilities. The SAFE Program has been monitoring the water quality at both sites for years and has not detected any exceedances of parameters, such as temperature, pH, dissolved oxygen, and turbidity.

3.2.2 Environmental Consequences for Water Resources – Proposed Action

Feeding operations at the four net pen sites would congregate fish in a small area, resulting in the local deposition of organic matter. According to Sewall and Gray (2004), there are four sources of organic matter from net pen operations. The first results from the presence of the structures within the net pen sites. These provide surface area in the water column for aquatic organisms and debris to attach to. When these structures are disturbed, such as when work is done on the

nets or when the fish are released, the attached organisms and organic debris fall to the surface of the underlying sediment. The second source of organic matter is uneaten fish food passing through the bottom of the nets that can accumulate on the bottom beneath the net pens. The third source is the waste produced by the fish. Although much of this waste is in the form of ammonia and is in solution and is quickly diluted by daily flushing tides, solid waste may accumulate under the net pens, adding to organic material of various origins. These waste byproducts contribute nitrogen, carbon, and phosphorus, and fines into the surrounding water column, potentially affecting ambient water quality parameters. The fourth source of organic matter is deceased fish that are not removed from the net pens and instead sink to the bottom of the nets and decay. These latter three forms of solid organic matter (i.e., dead fish, uneaten food, and feces) have the biggest potential to impact water quality at the SAFE net pens.

As these organic materials decompose, dissolved oxygen is consumed, which when measured is typically referred to as Biological Oxygen Demand (BOD). This measurement is often used to assess the potential reduction of dissolved oxygen caused by effluent discharge into receiving water by permitting agencies. In addition to causing dissolved oxygen consumption, the Proposed Action would also result in releases of additional nutrients (nitrogen and phosphorus) into the environment. Nitrogen can occur in various forms (e.g., nitrate, nitrite, and ammonia), which varies with pH, temperature, and salinity. In areas where excess nutrients result in increased algal and plant growth, pH levels may increase and change the solubility of nutrients, altering dissolved oxygen concentrations and overall water quality. These elevated nutrient levels in the water column may encourage the growth of aquatic plants and change macroinvertebrate (e.g., aquatic insect) communities (species presence and/or abundance), thus altering local habitats.

The SAFE Program has monitored the benthic macroinvertebrates community under the net pens since in 1994. The project sponsors report the overall impact has been only a minor change in macroinvertebrate populations during the salmon-rearing period (November-April). Compared to samples taken outside the perimeter of the net pens, samples taken inside the perimeter averaged slightly higher numbers of oligochaetes (aquatic worms) and amphipods. As previously stated, most sites showed returns to baseline levels by the beginning of the next rearing season. In addition core soil samples taken by Clatsop County Staff ensured that organic materials from fish rearing is not accumulating under each individual net pen (2023 Biron et al.). The accumulation of organic material would result in the absence of live animals, H_2S odor, and the disappearance of the oxidized layer. The visual inspection of each sample supports the notion that either the organic material from fish rearing is being absorbed at the rate of which it is produced, or the biproducts are being flushed away at a rate that does not allow accumulation to occur.

Therefore, the Proposed Action would offer a local short-term benefit to the underlying benthic community but would have **no impact** relative to the surrounding estuary.

The SAFE Program's water quality impact would be confined to the immediate area under the SAFE net pens during periods of fish occupancy. Because the fish are only grown until reaching juvenile life stage (average fork length ranges from seven inches (~170 mm) for spring Chinook salmon and five to seven inches (120-170 mm) for coho salmon), the net pens are occupied for only part of the year. This would allow for a period of recovery (weeks or more) during which the daily tidal cycle would quickly dilute any elevated nutrient or chemical input with the environment absorbing the rest. In addition to this, much of the rearing occurs during times of

abundant rainfall and high flows, adding to the cleansing capability of an already turbulent, tidally influenced location.

The overall effects on water quality from the cumulative discharges from the four net pen sites would be extremely localized, rapidly diluted, and recoverable. This is mainly because of the massive dilution volume of the receiving water body (LCRE) during the winter and spring high-flow periods and the capacity of the benthic habitat absorbing materials, in addition to maintaining rearing densities at moderate levels (20,000-25,000 fish per net pen). Therefore, overall effects to water resources from the Proposed Action would be **low**.

3.2.3 Environmental Consequences for Water Resources – No Action

Under the No Action alternative, Bonneville would not fund the SAFE Program to achieve the maximum production level. The SAFE program would continue with partial funding from other sources, leading to a reduction in the number of smolts being raised in each net pen site by approximately half. This reduction would also result in a corresponding decrease in the sources of organic matter (dead fish, uneaten food, and feces) and related water quality effects. As a result, the overall **low** impact on water quality would be further reduced relative to the Proposed Action due to the reduced inputs of organic material into the system from the reduced amount of fish rearing.

3.3 Wildlife

3.3.1 Affected Environment

Urbanization, industrialization, and development (including construction of marinas, docks, and industrial shipping) have degraded the LCRE in the vicinity of the SAFE net pen sites, leaving little to no riparian cover and/or vegetation in these stretches of the river. Urbanization, in particular, has reduced water quality, increased water temperature, altered the timing and quantity of runoff, and decreased riparian cover and wildlife habitat refugia.

Several ESA-listed marine and terrestrial wildlife species are found in Pacific, Wahkiakum, and Clatsop counties under USFWS' jurisdiction (see Table 5).

Table 5: ESA-Listed Wildlife Species in the Lower Columbia River Estuary

Wildlife Species	Federal ESA Status / Critical Habitat Designation	Habitat	Range
Amphibians			
Oregon spotted frog (*Rana pretiosa*) (no known populations in implementation area)	Threatened / Proposed	Large marshes near year-round water	Oregon and Washington

Wildlife Species	Federal ESA Status / Critical Habitat Designation	Habitat	Range
Birds			
Marbled murrelet (*Brachyramphus marmoratus*)	Threatened / Designated	coastal ocean foraging, large inland tree nesting	Eastern Pacific Ocean coast north of San Francisco
Northern spotted owl (*Strix occidentalis caurina*)	Threatened/ Designated	Expansive dense forests with large trees	Oregon, Washington, northern California
Streaked horned lark (*Eremophila alpestris strigata*)	Threatened / Designated	Open grasslands; no shrubs or trees; broad range of conditions including estuaries	Puget lowlands, Estuary, Willamette Valley, Southern Oregon
Western snowy plover (*Charadrius nivosus ssp. nivosus*)	Threatened / Designated	Coastal beaches, sand spits, dune-backed beaches, sparsely-vegetated dunes, beaches at creek and river mouths, and salt flats at lagoons and estuaries	Washington to Baja California
Yellow-billed cuckoo (*Coccyzus americanus*)	Threatened / Proposed	Dense shrubs and deciduous trees	Canada, U.S., Mexico
Mammals			
Columbian white-tailed deer (*Odocoileus virginianus leucurus*)	Endangered (proposed for down-listing to Threatened) / None	Riparian areas and densely forested swamps covered with tall shrubs	Estuary population only
Reptiles			
Leatherback sea turtle (*Dermochelys coriacea*)	Endangered / Designated	Open ocean and sandy beaches	Pacific subpopulation forages along Oregon coast

3.3.2 Environmental Consequences for Wildlife – Proposed Action

3.3.2.1 Wildlife Habitat

All project activities would take place in existing net pens submerged in Youngs Bay, Tongue Point, Blind Slough, Deep River, and at hatchery release sites (Gnat Creek, Klaskanine River, South Fork Klaskanine River, and Grays River). At these sites, there are no suitable habitats for any of the species listed in Table 5 and also extremely low chances of co-occurrence with any of them, mainly due to differential habitat preferences within the LCRE (refer to Figures 3, 5, 7 and 9 for aerial imagery).

There would be no habitat or wildlife disturbance from human presence or activity because the SAFE net pens and hatchery release sites are located in surface waters in heavily utilized nearshore areas (piers and boat docks). The wildlife species and numbers living adjacent to the

project areas would remain unchanged and the Proposed Action would thus have **no impact** on wildlife habitat.

Priority habitat for migratory birds in the Columbia River estuary includes freshwater and tidal marsh wetlands. None of the net pen sites occur near these areas, with the nature of the work being non-disruptive (little to no noise). For these reasons, there would be **no impact** on migratory bird habitat.

3.3.2.2 Wildlife Predation

There would be windows of opportunity for marine mammals and certain avian species to prey upon spring Chinook and coho smolts upon release from net pen and hatchery release sites and during adult return.

Southern Resident Killer Whales. The occurrence of Southern resident killer whales along the Oregon-Washington coasts likely varies from year to year, but known occurrences near the mouth of the Lower Columbia River span late Fall (Oct-Dec) through early Spring (March-April). When present, killer whales are most likely to be preying upon Chinook salmon stocks originating from an area spanning California to southeast Alaska (Weitkamp 2010).

Marine Mammal Predators. In addition to the Southern resident killer whale, three other marine mammal species—Steller sea lions, California sea lions, and harbor seals—forage on salmon in the LCRE and in the ocean. LCRE river otter is a top predator in a wide variety of aquatic food webs in marine environments. Prey vary seasonally, but the species is heavily dependent on a wide variety of fish, including juvenile salmon, spawning salmon, and salmon carcasses.

Seabirds, Raptors, and other Piscivorous Birds. Numerous seabird species and raptors present within the Select Area Fishery boundaries—including Caspian terns, double-crested cormorants, and several species of gulls—would likely benefit from the proposed SAFE spring Chinook and coho smolt releases (of up to 4.25 million of the former and 4.3 million of the latter) from March to May.

Returning SAFE fish would be larger (spring Chinook average 12-17 pounds while coho average 8-10 pounds). Raptors (bald eagles, turkey vultures, osprey), corvids (crows, ravens), and numerous species of gulls prey on returning adult salmonids, primarily post-spawn adults. However, since all SAFE adults would be harvested at Select Area Fishery locations, there would be no added adult predation opportunities for these raptors resulting from the Proposed Action.

In either case, only a small percentage of the total outmigrating smolts and returning adults would be SAFE hatchery fish relative to total hatchery production in the Columbia River Basin. Currently, 176 salmon and steelhead hatchery programs operate at 80 hatcheries and associated artificial production facilities in the Columbia River Basin to produce over 150 million smolts on an annual basis (NMFS 2014), with returning adults numbering in the hundreds of thousands. Most fish migrate at once in large numbers during a limited window of time, satiating predators and allowing most fish to escape predation. This would make SAFE Program fish an insignificant amount of prey.

Within the SAFE net pens themselves, thousands of trapped smolts in an enclosed area could potentially become ripe targets for predators, but this risk would be minimized by preventative measures such as electric barriers, high-frequency audio devices, and bird covers affixed to the nets. These are non-lethal measures meant to discourage rather than harm predators. Additional mitigation measures would include use of a below-water feeding method to prevent fish from becoming accustomed to feeding at the surface and releasing the fish under the cover of darkness. These measures would substantially reduce the chance of birds eating the smolts on their way to the ocean.

Although the Proposed Action would increase the amount of target prey, a variety of other marine species would remain available for consumption, such as lingcod, greenling, sole, sablefish, and squid, in addition to hatchery fish from other hatchery programs. SAFE hatchery fish consumption accordingly would not occur at levels sufficient to affect the growth and abundance of the avian and marine mammal predatory species mentioned above. The overall effect of the Proposed Action on wildlife predators would thus be **low**.

3.3.3 Environmental Consequences for Wildlife – No Action

Under the No Action alternative, Bonneville would not fund the SAFE Program to achieve the maximum production level and the program would instead continue with funding from other sources, resulting in a halving of smolt production. Environmental variables such as ocean conditions and estuary smolt predation make it difficult to predict the precise effect on adult returns, but it is reasonable to assume that they would decrease by the same or greater margin. The wildlife species described above would likely not experience change in prey availability as the numbers of released smolts and returning adults from this and other hatchery programs are likely to satiate predator appetites during that brief window of time. There accordingly would be a **low** effect on wildlife under the No Action Alternative.

3.4 Transportation

3.4.1 Affected Environment

Ground transportation within the LCRE primarily utilizes state and Federal highways and roads serving residential, agricultural, and business uses. Dikes and levees are frequently topped with agricultural and recreational access roads. Most affected roads are "local," "minor collector" or "major collector" roads under the Federal Functional Classification. In addition, the LCRE provides a travel corridor for large ships and smaller vessels. Smaller boats also utilize many of the tributaries within the estuary, where most waters are navigable during high tide. SAFE net pens are located in a navigable waterway, and must comply with U.S. Coast Guard (USCG) standards aimed at preventing substantial conflicts with navigation and other water-dependent uses.

3.4.2 Environmental Consequences for Transportation – Proposed Action

The numerous net pen and hatchery facilities involved with the SAFE Program would mass haul and transport eggs, biological samples, smolts, fish feed, and other materials to each other utilizing the local road network. This routine mass hauling of fish and feed is an integral part of the SAFE Program. (See Figures 10 and 11.)

Fish would generally be transported within a 30-mile radius in trucks with specialized equipment and supplemental oxygen. Transportation would primarily occur via state and Federal highways, but also to a lesser extent on other roads serving residential, agricultural, and business uses.

Figure 10: Fish Transport Truck Transferring Juveniles into Net Pens

Figure 11: Transferring Juveniles into Net Pens

Not all of the spring Chinook and coho salmon smolts to be produced would be transported, as a portion would be released on-site at their respective hatcheries of origin or transported from hatcheries receiving state or Mitchell Act funds. Production logistics may require that fish be transferred from several different originating SAFE hatcheries (Big Creek Hatchery, Oxbow Hatchery, Gnat Creek Hatchery, Marion Forks Hatchery, South Santiam Hatchery, Clackamas Hatchery) via truck and piped directly into the net pen sites. Each hatchery has between one and five fish transport trucks of varying in capacities (ranging from 200 to 3,000 gallons) and operating according to Integrated Hatchery Operations Team (IHOT) guidelines with a transit time that ranges from 20 to 90 minutes. The trucks would routinely haul 50,000-60,000 fish per load to achieve target density (usually 0.75 pound/cubic foot at release).

Although the precise number of fish to be transported and the transit routes to be used would depend on various factors—including capacity, priorities among the various entities involved, production goals, and management objectives—it is reasonable to assume that at least half of fish would require transport to SAFE net pens, meaning SAFE operations would increase traffic by approximately 80-100 trucks traveling round trip within 30 miles of the SAFE facilities on an annual basis. The feeding of the fish would require routine transport of fish feed through similar vehicles. As there are only 10-20 trucks available for use, this would not impede traffic at any time, resulting in a **low impact** on land-based transportation from achieving maximum production levels under the SAFE Program.

With regards to water-based transportation, SAFE net pen facility fish-feeding operations are not disruptive to, nor inconsistent with, recreational boating and navigation in the adjacent channel. Achieving maximum production levels under the SAFE Program would accordingly have **no impact** on water-based transportation.

3.4.3 Environmental Consequences for Transportation – No Action

Under the No Action alternative, Bonneville would not fund the SAFE Program to achieve the maximum production level and the program would instead continue with funding from other sources, resulting in a halving of smolt production and reduced overall impact. The No Action Alternative would still require smolts to be transported from Hatchery Facilities to SAFE net pen sites under this scenario, but to a lesser extent than under the Proposed Action. There accordingly would be a **no impact** on land-based and water-based transportation under the No Action Alternative.

3.5 Socioeconomics

3.5.1 Affected Environment

This section describes economic values for affected SAFE commercial and recreational fisheries, targeting SAFE hatchery fish harvested in the four Select Area Fisheries adjacent to SAFE net pen sites in Youngs Bay, Tongue Point, Blind Slough, and Deep River, and the contribution of these fisheries to affected regional economies. This economic analysis evaluated various economic indicators, including ex-vessel values for commercial fisheries, trip-related expenditures by recreational fishermen, and regional economic impacts (jobs and personal income) associated with fishing-related activities (See Appendix C).

This analysis includes consideration of: (1) local economic activity in Clatsop County, Oregon and WaKiaKum and Pacific counties, Washington; and (2) regional economic activity in the Lower Columbia River (Fishery Zones 1 through 5) in the states of Oregon and Washington.

The portion of the LCRE that contains all SAFE facilities and Select Area Fisheries extends from the mouth of the Columbia River to approximately 30 river miles upstream. This stretch of territory includes three low river counties, and several small towns including Astoria, which forms a substantial part of its economic base (government and tourism) (see Figure 12).

Figure 12: Communities near the SAFE Facilities

Table 6 displays the population characteristics of the counties within the estuary. Clatsop and Pacific counties are the counties most likely to see the majority of the economic benefits from commercial and recreational fisheries resulting from the SAFE Program. Economic data from Clatsop County will be used predominantly in this analysis.

Table 6: Economic Characteristics of SAFE Counties (Bureau of Economic Analysis)[8]

Geographic Area	Population (2020)	Personal Income (Thousands)	Total Earnings (thousands)	Total Employment (2020)	Earnings Per Job[9]
State of Oregon	4,241,507	238,847,065	163,610,934	2,451,970	$66,726
Clatsop County, OR	40,423	1,971,732	1,262,672	23,721	$53,230[10]
State of Washington	7,693,612	516,441,099	360,258,117	4,385,827	$82,141
WahKiakum County, WA	4,498	211,526	59,806	1,537	$38,911
Pacific County, WA	22,984	1,005,532	429,217	9,470	$45,324

Clatsop County. As of the 2020 U.S. Census, there were about 37,000 people in Clatsop County (a population density of 45 people per square mile). The county has a total area of 1,084 square miles, of which 829 square miles is land and 255 square miles (24 percent) is water. The population is 91.2 percent Caucasian, 8.6 percent Latino, 0.9 percent African American, 1.4 percent Native American, and 1.6 percent Asian. The median family income was $54,886 with about 10.5 percent of the population below the national poverty level. About 30 percent of the lands within the county boundaries consist of state-managed forests. Clatsop County's principal industries are manufacturing, travel (primarily tourism), and trade. Fishing and timber are still important but contribute proportionally less to the county's employment and income than previously. Note that the calculated earnings per job value of $53,230 shall be used in this economic analysis as most of the activities and benefits flow to Clatsop County.

WahKiakum County. As of the 2020 U.S. Census, there were just fewer than 5,000 people in 268-square-mile WahKiakum County (a population density of 15.1 people per square mile), making it the second least populous county in Washington. The population is 91.2 percent Caucasian, 5.7 percent Latino, 0.7 percent African American, 0.2 percent Native American, and 1.8 percent Asian. The median family income was $53,227 with about 10.7 percent of the population below the national poverty level.

Pacific County. Pacific County is centered on Willapa Bay, a region that provides 25 percent of the U.S. oyster harvest, although forestry, fishing, and tourism are also important elements of the

[8] Bureau of Economic Analysis. May 2022. Table CA05N Personal Income by Major Source and Earnings by NAICS Industry;Table CA25N Total Full-Time and Part-Time Employment by NAICS Industry.
[9] The earnings-per-job factors for each region were calculated by dividing total earnings in each region in 2007 by total jobs, as reported by the Bureau of Economic Analysis (BEA).
[10] To be used in economic analysis.

county's economy. According to the 2020 U.S. Census, there were just fewer than 24,000 people in 932-square-mile Pacific County (a population density of 22.4 people per square mile). The population is 90 percent Caucasian, 10 percent Latino, 1.1 percent African American, 0.2 percent Native American, and 2.1 percent Asian. The median family income was $46,733 with about 13.6 percent of the population below the national poverty level. Total employment in 2019 was 4,360 jobs with 589 employer establishments.

Local Economies –Clatsop, WahKiakum and Pacific Counties. There are multiple river and ocean fisheries within the three lower-river counties, which host about one half of total licensed Columbia River Basin gillnetters, according to the number and addresses of WDFW- and ODFW-issued gillnet permits. Local businesses and infrastructure (moorage, processing facilities, gear suppliers, etc.) serving the gillnet industry also participate in the ocean and river fisheries. In addition to fish harvesting, commercial fisheries affect seafood product preparation and packing, including the canning and curing of seafood and preparation of fresh or frozen fish or seafood. Seafood processors that purchase the Columbia River salmon catches also receive deliveries from ocean catches. Community profiles of West Coast fishing communities developed by NMFS indicate that a large number of residents in Astoria, for example, participate in the lower Columbia River gillnet fishery, targeting salmon, shad, sturgeon, and eulachon. However, residents of these communities are also involved in fisheries targeting other catches, including Dungeness crab, coastal pelagic species, groundfish, and shrimp.

According to the 2006 TRG Economic Analysis study, total estimated local (Clatsop and Pacific counties) economic contribution made by gillnet permittees is $12.0 million in personal income, which represents about 225 jobs, when divided by Clatsop County earnings per job ($53,230). In comparison, total estimated regional (Oregon and Washington states) economic contribution is $20.6 million which indicates that the gillnet fishery derives primarily from Clatsop and Pacific counties. An average number of 143 vessels fish at off-channel locations on an annual basis. Most (71 percent) of those that fish at off-channel locations fish in Youngs Bay. The least fished site is Deep River (seven percent). In sum, the gillnet salmon fishery centered in Clatsop and Pacific counties is a large contributor to the regional economy, but not the only one.

Regional Economies – Lower Columbia River Mainstem. For purposes of this analysis, the regional economy consists of commercial fishery economic activity in the Lower Columbia River Mainstem (Fishery Zones 1 through 5). Within this greater area, commercial harvest is primarily from non-tribal commercial fisheries for coho salmon. With an average (2002 through 2009) annual harvest of about 117,290 fish, the coho salmon commercial fishery accounts for 58 percent of the average annual total salmon harvest in the mainstem of the Lower Columbia River (174,735 fish from 2002-2009). (See Table 8). Coho salmon also dominate the non-tribal commercial harvest in the terminal areas (SAFE areas and the Willamette River) of the lower Columbia River region, accounting for 79 percent (61,053 fish) of the annual average salmon harvest in these areas (77,284 fish). Of this amount, and in terms of number of fish, it is reasonable to assume that the SAFE Program fish have and would continue to constitute a majority of this figure, as 2010-2020 average commercial harvest are 9,407 spring Chinook with 45,079 coho harvested in SAFE Select Areas. However, upon applying calculated ex-vessel price per fish found in Appendix A, the

total ex-vessel valuation of coho harvests are only a fifth of the total ex-vessel valuation of spring Chinook. Spring Chinook weighs more and has a much higher commercial value.

Table 7: Average Lower Columbia River Commercial Harvest (2002-2009)

	Average Annual Harvest[11]	Ex-Vessel Value
Mainstem (Zones 1 to 5)		
Chinook Salmon	41,213	$3,915,235
Coho Salmon	56,238	$639,988
TOTAL	97,451	$4,555,223
Terminal Areas		
Chinook Salmon	16,231	$1,541,945
Coho Salmon	61,053	$694,783
TOTAL	77,284	$2,236,728
Chinook Salmon	57,445	$5,457,275
Coho Salmon	117,290	$1,334,760
TOTAL	**174,735**	**$6,792,035**

Regional Economies – Columbia River Basin. According to a 2017 NMFS economic analysis, harvest and primary processing of salmon caught in tribal and non-tribal commercial fisheries throughout the Columbia River Basin generates an estimated $16.2 million in personal income and 419 full-time equivalent (FTE) jobs.[12] More than two-thirds of this activity would occur in the Mid-Columbia River sub region outside of Select Area Fishery boundaries. Recreational fishing activities targeting salmon and steelhead generate an estimated $27.9 million in personal income and 672 jobs in the Columbia River region.

3.5.2 Environmental Consequences for Socioeconomics – Proposed Action

Commercial Fisheries. The SAFE Program supplements commercial fisheries, mainly the gillnet fishery, which is a small contributor to the LCRE fishing industry, representing about seven percent of all harvest revenues delivered in this area. Total estimated local (Clatsop and Pacific counties) economic contribution made by gillnet permittees is $12.0 million in personal income (TRG 2006), which represents the gillnet salmon fishery, other gillnet vessel fisheries, other gillnet permittee vessel West Coast landings, and Alaska fishery participation. The gillnet industry likely

[11] Source: Table 3-13 from 2014 NMFS Mitchel Act Final Environmental Impact Statement
[12] Expressed in 2015 dollars, Table 3-25 US v Oregon.

includes the harvesting of other anadromous fish, including sockeye salmon, steelhead, fall Chinook, certain white sturgeon populations, American shad, and Pacific eulachon, which are also commercially caught.

The total personal income generated from SAFE commercial harvest is estimated under three scenarios: the no-fund (No Action Alternative), current, and maximum (Proposed Action) production scenarios (Appendix A). This could be considered as personal income accruing to households in the local area. This value is divided by the earnings per job value of Clatsop County ($53,230) as found in Table 6 to estimate a range of employment supported by SAFE commercial fisheries. The number of jobs estimated in this analysis are expressed as FTE jobs.

Table 8: Commercial Fishery Income and Employment Scenarios

	Commercial Personal Income	No# Jobs Supported
No Fund (No Action Alternative) Scenario	$1,996,060	37
Current Scenario	$2,475,728	46
Maximum Production (Proposed Action) Scenario	$3,992,137	75
Total Gillnet Industry[13]	$12,000,000	225

As reflected in Table 8, maximum implementation of the SAFE Program would provide a beneficial effect to the local gillnet fishery in terms of personal income and employment. Catch and processing of SAFE hatchery fish, as well as related service industries that support Select Area fisheries, would provide employment and income to the region. However the difference in employment numbers between the no-fund (No Action Alternative) scenario and maximum production (Proposed Action) scenario is 38 jobs, which would represent a minor contribution to the overall gillnet industry employment (225) overall. However, most jobs in the commercial and recreational fishing industry are part-time positions due to the seasonality of salmon fishing.

Many persons engaged in salmon fishing also participate in other fisheries and/or have other occupations. As previously mentioned, other anadromous fish, including sockeye salmon, steelhead, fall Chinook, certain white sturgeon populations, American shad, and Pacific eulachon, are also commercially caught. Therefore, it is reasonable to assume that a portion of these 38 jobs would continue even if the SAFE Program discontinues. Therefore overall socioeconomic impacts of the SAFE Program on commercial fisheries would be **low to moderate**, but beneficial.

[13] Total estimated local (Clatsop and Pacific counties) economic contribution made by gillnet permittees is $12.0 million in personal income (TRG 2006), which represents the gillnet salmon fishery, other gillnet vessel fisheries, other gillnet permittee vessel West Coast landings, and Alaska fishery participation.

Recreational Fisheries. Recreational fisheries contribute to local and regional economies by acquiring fishing-related goods and supplies and retaining local services, such as outfitter and guiding services. Sectors particularly affected by recreational fishing activities include food services, eating and drinking establishments, lodging, recreation services, and fueling stations. Therefore, expenditures on fishing-related goods and services by fishermen contribute to both local and non-local businesses, which is somewhat insulated to the amount of fish caught, as a majority of fishing expeditions do not result in full catch allowances. This is important to consider as recreational fishing at SAFE net pen sites are comparatively minor harvests compared to the commercial fishery. Average annual commercial harvest for 2011 to 2020 was 55,000 fish and the recreational fishery average was 1,000 fish.

The recreational fisheries that target SAFE fisheries generate economic activity characterized by employment (jobs) and personal income. The average recreational value of recreational anglers harvesting SAFE salmon is calculated in Appendix A. Once SAFE recreational catch was converted to sport angler trips, this value was multiplied by an average cost per trip to estimate the total trip-related expenditures for spring Chinook and coho using 2020 dollars. This regional transfer of money supports payments to labor, and those payments are then re-spent regionally, resulting in a multiplier effect. The resulting total income from SAFE recreational harvest is $1,028,881, which supports 19 jobs using the earnings-to-wage amount found in Table 6.

While this income and employment provides an important contribution to the local and regional economics of the LCRE, it is a minor contribution to the greater whole of recreational fisheries on a local and regional scale. By comparison, recreational fishing activities targeting salmon and steelhead generate an estimated $19.6 million in personal income in the Lower Columbia River region and a further $27.9 million in personal income in the Columbia River region (U.S. v Oregon).

Recreational fishermen are active year round, shifting from one fishery to another as seasons open and close, while SAFE Fisheries targeting spring Chinook and coho are open from February to June. Therefore, the overall socioeconomic contribution of SAFE Program recreational fishing on both the regional and local scale would be a **low** beneficial impact.

SAFE Hatchery Facilities. The economic impact from construction, operations, and maintenance of net pen sites would be small and temporary when compared to the larger local economy. Therefore, the construction-related impacts on socioeconomics would be considered low due to the minimal amount of goods and services that are expected to be required to construct and maintain the SAFE net pens. SAFE net pens would continue to be in use in the production of smolts, as other salmon stocks from other funding sources would continue and would likely increase due to the increased availability of net pens.

The incremental addition of hatchery operations in support of the SAFE Program may add several permanent employees (Hatchery Managers and Technicians) and provide seasonal employment opportunities for at least 10-20 others. These effects would benefit specific individuals and families but likely have minimal increased benefit to the larger three-county area. The Proposed Action would have a **very low** beneficial impact on employment at hatchery facilities.

3.5.3 Environmental Consequences for Socioeconomics – No Action

Under the No Action alternative, Bonneville would not fund the SAFE Program to achieve the maximum production level and the program would instead continue with funding from other sources, resulting in a halving of smolt production, which would likely reduce adult returns. Environmental variables such as oceanic conditions and estuary smolt predation make it difficult to predict adult returns but it is reasonable to assume that they would decrease by the same or greater margin.

The difference in employment numbers between the no-fund (No Action Alternative) scenario and maximum production (Proposed Action) scenario is 38 jobs, which would represent a minor contribution to the gillnet industry employment (225) overall. However, most jobs in the commercial and recreational fishing industry are part-time positions due to the seasonality of salmon fishing. Many persons engaged in salmon fishing also participate in other fisheries and/or have other occupations. As previously mentioned, other anadromous fish, including sockeye salmon, steelhead, fall Chinook, certain white sturgeon populations, American shad, and Pacific eulachon, are also commercially caught. Therefore, it is reasonable to assume that a portion of these 38 jobs would continue even if the SAFE Program discontinues. They would shift to other fishery occupations as the acquired skillsets are readily transferable. Therefore, the overall socioeconomic effect of discontinuing the SAFE Program on commercial fisheries would be **low**.

Recreational fishing on SAFE returning adults would be subject to depressed stock impact allocations, which would likely reduce participation in Recreational Select Area fisheries. However, there would still be adult fish available for harvest in adjacent fisheries. As mentioned in Section 1.5, there are multiple overlapping salmon fisheries within each of the three management periods throughout the LCRE and mainstem Columbia River. There are seven non-treaty and six treaty fisheries in the winter/spring season that primarily target spring Chinook salmon stocks returning to the upper Columbia River (UCR), the Willamette River, and lower Columbia River tributaries. The summer season has five treaty and five non-treaty fisheries that target primarily UCR summer Chinook salmon, and Upriver Columbia sockeye salmon. There are also nine non-treaty and six treaty fisheries that target hatchery and natural-origin fall Chinook and coho salmon and steelhead. While the average fisherman out of Astoria may not have access to all of these fisheries, it is reasonable to assume that there are many alternatives available throughout the year just for salmon fisheries not to mention other species. These and other recreational fisheries would continue to provide income and employment regardless of Bonneville's funding decision. Therefore, the overall socioeconomic impact of discontinuing Bonneville's SAFE Program funding on both regional and local recreational fisheries would be **low.**

3.6 Climate Change

3.6.1 Affected Environment

Greenhouse gases (GHGs) are chemical compounds in the Earth's atmosphere that absorb and trap infrared radiation (heat) that is reflected or emitted from the Earth's surface. The trapping and subsequent buildup of heat in the atmosphere creates a greenhouse-like effect that maintains a global temperature warm enough to sustain life. GHGs can be produced either by natural processes or as a result of human activities but the current scientific consensus is that the latter are currently increasing atmospheric GHG concentrations to levels that would raise the Earth's average temperature. The U.S. Global Climate Research Program (USGCRP) found that since the 1970s, average U.S. temperatures and sea levels have risen and precipitation patterns have changed (USGCRP 2009). The Intergovernmental Panel on Climate Change found similar patterns on a global climate scale (IPCC 2007).

Ongoing global climate change has implications for the current and likely future status of salmon, particularly in the Pacific Northwest, where snow melt in the Columbia River Basin substantially influences regional hydrology. Recent studies, particularly by the Independent Scientific Advisory Board (ISAB), describe the potential impacts of climate change in the Columbia Basin. These effects may include decreased snowfall, increased early-year runoff, decreased summer and fall flow, and generally increased water temperatures. The ISAB (2007) identified the following likely effects of projected climate changes on salmon species:

***Water temperature increase*.** Systemic rises in water temperatures may result in loss of cold-water habitat (temperatures exceed upper thermal limits for a species). Projected salmon habitat loss would be most severe in Oregon and Idaho, possibly higher than 40 percent by 2090. However, this assumes a high rate of greenhouse gas emissions and used a climate model that projected a 5º C in global temperatures by 2090, a value that is higher than the scenarios considered most likely (ISAB 2007).

Variations in rainfall intensity. With reduced snowpack and greater rainfall intensity, the timing of stream flow would likely change, reducing spring and summer stream flow and increasing peak river flows (ISAB 2007). This reduction in stream flow may impact the quality and quantity of tributary rearing habitat, greatly affecting spring and summer salmon and steelhead runs. In addition, the Pacific Northwest's low late-summer and early-fall stream flows are likely to be further reduced, which would limit juvenile fall Chinook and chum salmon shallow mainstem rearing habitat.

3.6.2 Environmental Consequences for Climate Change – Proposed Action

GHG emissions associated with the SAFE Program (primarily carbon dioxide, methane, and nitrous oxide) would primarily emanate from fish transport trucks (hauling smolts or other materials and fish feed delivery). However, the small number of fish transport trucks being used coupled with the approximated mileage over the relative timeframe discussed in section 3.4.2 would not result in long term or significant impacts on greenhouse gases and would not meet the mandatory reporting identified in 40 CFR 98.

Chinook and coho salmon food sources, populations, and behavior may be adversely affected by climate change effects such as decreased reliability of water, increasing global temperatures, and increases in invasive and exotic vegetation and wildlife species (Finch et al. 2021; NAISMA 2021). The production of additional harvestable salmon smolts being produced and released each year under the Proposed Action is likely to increase the survivability and fitness of the native Chinook and coho salmon populations by ameliorating harvest pressure. Consequently, the overall impact of the Proposed Action on climate change would be **low**.

3.6.3 Environmental Consequences for Climate Change – No Action

Under the No Action alternative, Bonneville would not fund the SAFE Program to achieve the maximum production level and the program would instead continue with funding from other sources, resulting in a halving of smolt production, thus reducing overall impact. The No Action Alternative would not cease the routine hauling of fish in fish transport trucks, but it would likely occur to a lesser degree as production capacity is diminished. The overall effect of the No Action alternative on Climate Change would be **low**.

4. Cumulative Effects

Cumulative effects are the incremental effects of an action coupled with those of other past, present, and reasonably foreseeable future actions. This chapter presents information about current environmental conditions and the environmental and socioeconomic consequences of implementing the Proposed Action.

Past actions that have cumulatively contributed to current environmental conditions in the LCRE include agriculture (with water withdrawals), road construction, bridge maintenance, rural development, grazing, timber cutting, mining, suppression of natural fire regimes, commercial and recreational harvests of fish and wildlife, and fish and wildlife habitat restoration and enhancement.

Present (i.e., ongoing) actions cumulatively contributing to current environmental conditions include the use and maintenance of roads and highways, ongoing land uses and management actions such as agriculture (with continued water withdrawals), grazing, forest management, wildfire suppression and prescribed fire use, management and harvest of fish and wildlife populations, and additional aquatic and upland restoration and resource preservation actions by public and private entities in the estuary.

Throughout the LCRE, Federal, state, and local agencies, tribes, environmental organizations, and communities support habitat restoration projects focused on improving general habitat and ecosystem function or accomplishing species-specific conservation objectives that, in some cases, overlap with those of ESA recovery plans such as the NMFS (2011) Columbia River Estuary ESA recovery plan module for salmon and steelhead. Numerous actions have also helped restore habitat, improve fish passage, and reduce pollution, though annual funding levels have varied. While the potential benefits of these restoration actions within the basin are difficult to quantify, it is unlikely that substantial benefits would be realized in the project area in the future, although minor improvements would likely occur over time from local restoration efforts.

The following is a summary of other projects specifically related to the SAFE Program:

- ODFW Restoration and Enhancement, intermittent funding source but no contracts presently.
  - ODFW R&E provides substantial funding for South Fork Hatchery and Youngs Bay rearing site infrastructure improvements.
- BPA 1982-013-01, Coded Wire-Tag Pacific States Marine Fisheries Commission (PSMFC).
  - Coded Wire Tag – PSMFC coded-wire tag recovery is essential for evaluation of Select Area project impacts and benefits. Sampling of Select Area fisheries is conducted by CWT Recovery staff. Recovery data are submitted to PSMFC for uploading to the database clearinghouse by SAFE and other agencies. Queries using CWT release groups yield tag estimation by return year and recovery locations, which is used for SAR analyses.
- ODFW, 52100-801016 and previous.
  - Propagation Facility – ODFW has provided funding for the CCF propagation facility (South Klaskanine Fork Hatchery) since 1979. Presently, release goals for South Fork Klaskanine Hatchery to SAFE net pens are 385,000 coho.

- BPA 1997-024-00, Avian Predation on Juvenile Salmonids
  - This project investigates the impacts of piscivorous colonial water birds on the survival of juvenile salmonids in the lower Columbia River and monitors effectiveness of tern relocation in reducing predation. Smolts released by SAFE are subject to predation by terns and cormorants in the LCR.
- ODFW/WDFW
  - Spawning Ground Surveys – The SAFE Project utilizes and shares data with both new and established survey programs to develop run reconstruction analysis and stray rates.

Reasonably foreseeable future actions include the continuance of the ongoing actions listed above, with some increases in land-use pressures as populations increase.

4.1 Fish and Aquatic Species

In 2010, 176 hatchery programs at 80 hatchery facilities throughout the Columbia River Basin produced approximately 140 million salmon and steelhead (NMFS 2014). Slightly more than a third of Columbia River Basin hatchery programs (62 hatchery programs) receive Mitchell Act funds, while the remainder are primarily funded by Bonneville, the Corps, Reclamation, USFWS, public utility districts, tribes, and private power companies. These hatcheries are reasonably likely to continue salmon production at these or higher levels for the foreseeable future, with a range of effects as described in Section 3.1 Fish.

While a majority of these hatchery programs do not operate near SAFE net pen and hatchery facilities, all hatchery-origin fish (including juveniles and adults) migrate through the LCRE, occasionally overlapping spatially and temporally with emigrating and returning SAFE spring Chinook and coho. When considered cumulatively with the impacts of other past, present, and reasonably foreseeable future hatchery production in the Columbia River Basin, the SAFE Program's production of spring Chinook and coho salmon is not likely to contribute meaningfully to the aggregate effects of hatchery production throughout the basin, including interactions with non-salmonid aquatic species.

Future development, hydropower operations, fisheries, and climate change are expected to continue altering environmental conditions, causing negative impacts on both ESA-listed and non-listed fish by disrupting habitat formation across the basin. However, the overall impacts of the SAFE Program, considered in conjunction with the adverse effects of other past, present, and reasonably foreseeable future actions on fish and their habitat throughout the LCRE, would be **low**.

4.2 Water Resources

The cumulative effects of urbanization in the LCRE, reduction of wetlands, and increased effluent discharges from both point and non-point sources have contributed to regional environmental degradation, resulting in reduced water quality, increased water temperature, altered runoff timing and quantity, and decreased riparian cover and habitat refugia. The Oregon Department of Environmental Quality (ODEQ) lists the LCRE (from river mile 0 to 35.2) as water quality limited for temperature (summer months), dichlorodiphenyltrichloroethane (DDT), polychlorinated

biphenyls (PCBs), and arsenic (year-round). The Washington Department of Ecology (DOE) lists the same area as water quality limited for dichlorodiphenyldichloroethylene (DDE), arsenic, bis-phthalate, dieldrin, temperature, dissolved oxygen, PCBs, and fecal coliform.

The degraded conditions that lead to these excess contamination levels are basin-wide in scale. While the Proposed Action would slightly impact certain water quality parameters such as dissolved oxygen, nitrogen, and organic matter from fish feed and waste dropped at each SAFE net pen site, these contributions to the cumulative degradation of water quality in the basin, including the degradation caused by past and ongoing activities and the anticipated degradation due to reasonably foreseeable future actions, would be temporary in nature and have **low** overall impacts.

4.3 Wildlife

Human development and activity in the LCRE have caused fragmentation of wildlife habitats near SAFE net pen and hatchery facilities. Except for the Deep River site, each of the SAFE net pen sites lacks vegetation and cover in their respective stretches of the river. Human activities are routine, frequent, and disruptive, but the operation and maintenance of net pen sites, fish feeding, transport, and release are not expected to cause more disruption to wildlife than routine human activity.

As described in Section 3.3, salmonids provide a viable prey base for wildlife. However, the benefits of prey availability would unlikely mitigate the cumulative adverse impacts of past, present, and reasonably foreseeable future actions in the LCRE area, including the effects of human development and climate change. The Proposed Action's effect on marine mammal, avian, and aquatic predators would be indiscernible, as many other hatchery fish would pass through areas where SAFE fish might be preyed upon. Large numbers of smolts emigrate during a short window, which saturates predators and allows a majority to escape to the ocean. Additionally, larger numbers of smolts escaping to the ocean may not always increase adult returns due to unknown oceanic conditions affecting juvenile-to-adult survival. Therefore, the incremental effects of the Proposed Action on wildlife beyond those of past, present, and reasonably foreseeable future actions would be **low.**

4.5 Transportation

The main types of traffic in this area are fishing, residential, and recreational, all of which would continue as the proposed fish hauling/feeding activities commence. The Proposed Action would add an undiscernible amount more traffic to the rural roads throughout the county. Thus, the cumulative effect on transportation of both the Proposed Action and existing transportation network and traffic amounts would be **low**.

4.6 Socioeconomics

Although the SAFE Program would add few permanent jobs to the LCRE—and thus have low effects on local employment and personal income—the Proposed Action may have socioeconomic benefits, particularly when combined with other Bonneville-funded projects described above. These may include funding for individual restoration projects in the Estuary or the numerous

other hatchery programs.

Forecasts of future returns of anadromous salmonids are not possible, so expenditures and income associated with their potential contribution to future recreation cannot be predicted. But increased LCRE salmon returns of are reasonably expected to beneficially affect the local and regional economy, which is already profiting from recreational fishing by tourists. Environmental variables such as ocean conditions and estuary smolt predation greatly affect the realized economic returns from SAFE Program investments. If the lowest and highest SARs during the selected 1990s broodstock years are used in a sensitivity analysis, the economic effects vary by a factor of 100 (TRG 2006). Given this extreme variability, the cumulative impacts from the Proposed Action on socioeconomics, when considering past and present economic activities and likely reasonably foreseeable future developments, would be **low**.

4.7 Climate Change

Locally, vehicular traffic, ranching, agriculture, forestry management, and residential activities have all contributed to current GHG accumulations and will continue to do so. The Proposed Action would marginally increase GHG emissions via exhaust gases emitted from fish and feed transport trucks, although their operation would be fleeting (during a three-month window) and relatively small in scale (involving only a few vehicles at any given time). The effect of these marginal GHG emissions relative to the cumulative effects of other past, present, and reasonably foreseeable future contributions from recreation, residential, and fishing activities in the LCRE, would be **low**.

Rising air and water temperatures are a particular concern for salmonid species, which are important to the recreational fisheries in the Columbia River Basin. Overall, environmental changes are likely to reduce the future abundance of fish, and therefore increase the level of effort required to catch most, if not all, salmonid fish species in the Columbia River Basin. This may further affect the personal income that recreational anglers receive from participating in salmon fishing. If fewer fish are available for harvest, and more restrictions are in place (e.g., reduced bag limits and fishing seasons), fewer recreational fishermen may be willing to pay for the opportunity to fish.

Climate change and future development, hydropower operations, hatchery production, and habitat restoration may gradually reduce the availability of harvestable salmon and correspondingly diminish the income of commercial fishermen regardless of whether the Proposed Action is undertaken or not. Therefore the relative contribution of the SAFE Program to commercial and recreational fisheries relative to the cumulative effects of other past, present, and reasonably foreseeable future actions that affect climate change in the Lower Columbia River would be **low**.

5. Coordination, Consultation, and Compliance

5.1 Agency Coordination and Public Involvement

The SAFE Program has been underway since 1993 and involves a collaboration among ODFW, WDFW, and CCF, in addition to Bonneville and NMFS.

5.2 Environmental Review and Coordination

By providing a funding action, Bonneville would comply with Federal laws, regulations, and Executive Orders. The following describes how the Proposed Action is in compliance with NEPA, ESA, Cultural Resources Protection, Magnuson-Stevens Act including Essential Fish Habitat, and other relevant Federal Executive Orders.

National Environmental Policy Act

NEPA requires Federal agencies to assess the impacts that their actions may have on the environment. Major Federal actions significantly affecting the quality of the human environment require the preparation of an EIS. This EA has been prepared to determine if the project would create any significant environmental impacts that would warrant preparing an EIS, or whether it is appropriate to prepare a FONSI. In this EA, Bonneville evaluated the Proposed Action and the No Action Alternative.

Endangered Species Act

The ESA, 16 U.S.C. 1531 *et seq.*, requires Federal agencies to ensure that the actions they authorize, fund, and carry out do not jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat.

Section 7 interagency consultation with NMFS began on July 23, 1998, when Bonneville submitted a Biological Assessment proposing to fund WDFW, ODFW, and CCF to investigate the feasibility of expanding the numbers of terminal fisheries sites in the Lower Columbia River.

The first Section 7 biological opinion was issued in 1998 while five species upriver of the SAFE project were proposed for listing: Upper Willamette steelhead, Mid-Columbia steelhead, Columbia River chum, Upper Willamette Spring Chinook, and Lower Columbia fall Chinook. The re-initiation of formal consultation of SAFE occurred in 1999 once those species were officially listed (64 C.F.R. 14308). NMFS determined that the description of the SAFE project activities considered in the original 1998 opinion remained applicable. The opinion evaluated the effects of SAFE project operations for the first two phases: two years of initial research and investigation of potential sites, salmon stocks, and methodologies (including different net pen rearing regimes and harvest options), followed by roughly eight years of expansion, and data monitoring. The final phase included the establishment of terminal fisheries operating at full capacity at all acceptable sites; however, this has been constrained by stock availability and funding limitations.

NFMS issued the latest Section 7 biological opinion in 2021 (WCRO-2020-02145) (2021 Opinion), evaluating the funding, operation, maintenance, and monitoring of these three SAFE hatchery programs based on technical information found in the latest HGMPs (ODFW 2021a; ODFW 2021b;

WDFW 2018). Production and release numbers of juvenile salmonids from the SAFE Program would be constrained by the analysis and incidental take limitations outlined in the 2021 Opinion.

In the 2021 Opinion, NMFS determined that the SAFE Proposed Action is likely to adversely affect the following ESA-listed species and their critical habitat: Lower Columbia River Chinook salmon ESU, Lower Columbia River coho salmon ESU, Lower Columbia River steelhead DPS, Columbia River chum salmon ESU, Upper Willamette River Spring Chinook salmon ESU, and Snake River Spring/Summer Chinook salmon ESU.

In addition, NMFS determined the SAFE Proposed Action is not likely to adversely affect the following ESA-listed species or their critical habitat: Upper Willamette winter steelhead, Middle Columbia steelhead, Upper Columbia Spring Chinook salmon and steelhead, Snake River fall Chinook and sockeye salmon and steelhead, eulachon, Southern green sturgeon, and Southern resident killer whales.

The 2021 NMFS Opinion contained an incidental take statement describing reasonable and prudent measures that NMFS deemed necessary or appropriate to minimize the impact of incidental take associated with the Proposed Action. The take statement set forth nondiscretionary terms and conditions, including reporting requirements, that Bonneville and other action agencies would comply with to carry out the reasonable and prudent measures.

On June 6, 2024, NMFS reinitiated the 2021 formal Endangered Species Act (ESA) consultation. NMFS believes that reinitiation would be prudent to address new information available regarding the management of hatchery programs in the Lower Columbia River. The current 2021 NMFS Opinion would remain in effect during this consultation, including the terms and conditions of the Incidental Take Statement (ITS). If there are substantive changes to the 2021 NMFS analysis, Bonneville would issue a supplement analysis to incorporate those changes.

Clean Water Act

Clean Water Act implementing regulations (40 C.F.R. 122.24) require the net pen site at Youngs Bay to obtain an ODEQ-issued NPDES permit, which in turn require those sites to maintain 50-foot mixing zone from the outside boundary of the floating net-pens. CCF has finalized the permitting review process and was issued an extension of its existing NPDES Permit that expired November 30, 2023 until ODEQ acts on the renewal application (Federal Permit No. OR0040631). At Deep River, WDFW holds a NPDES permit (WA0040053) issued by the Department of Ecology. The permit requires the Net Pens to sample and report Turbidity, Dissolved Oxygen, and Biochemical Oxygen Demand (BOD) results monthly when there is fish present in the net pens, in addition to fish production, fish size, the amount of fish, and fish feed.
The production levels Tongue Point and Blind Slough sites are below the threshold that would require NPDES permits. These locations incur minimum impact and undergo routine monitoring to document any environmental changes that may occur under the net pens as compared to a reference condition.

Cultural Resources Protection

Section 106 of the National Historic Preservation Act requires Federal agencies to consider the effects of their actions on historic properties that are listed or eligible for listing on the National

Register of Historic Places.

Bonneville concluded that the Proposed Action has no potential to cause effects on historic properties since it would not include any ground-disturbing activities or any activities to affect existing structures.

Cultural resource-related laws and regulations include the following:

- Antiquities Act of 1906 (16 U.S.C. §§ 431–433),
- Historic Sites Act of 1935 (16 U.S.C. §§ 461–467),
- Section 106 of the NHPA (54 U.S.C. § 300108), as amended,
- Archaeological Data Preservation Act of 1974 (16 U.S.C. § 469 a–c),
- Archaeological Resources Protection Act of 1979 (16 U.S.C. § 470 *et seq*.), as amended,
- Native American Graves Protection and Repatriation Act (25 U.S.C. § 3001 *et seq*.),
- Executive Order 13007 Indian Sacred Sites, and
- American Indian Religious Freedom Act of 1978 (PL 95-341, 92 Stat. 469, 42 U.S.C. §§ 1996, 1996a)

Magnuson-Stevens Act and Essential Fish Habitat

NMFS is responsible for ensuring compliance with the Magnuson-Stevens Fishery Conservation and Management Act of 1975 (Magnuson-Stevens Act), as amended by the Sustainable Fisheries Act of 1996, which established new requirements for evaluating and consulting on adverse effects to essential fish habitat (EFH). Under Section 305(b)(4) of the Magnuson-Stevens Act, Bonneville is required to consult with NMFS for actions that adversely affect EFH; in turn, NMFS is required to provide EFH conservation and enhancement recommendations. EFH exists within the LCRE for Pacific Coast salmon, groundfish, and coastal pelagic species.

As discussed in Section 4.1, the Proposed Action would occur in shallow and slow-moving areas of rivers, which are not considered EFH for spawning, breeding, feeding, and growth to maturity for salmon and steelhead. Conservation measures and best management practices would be implemented to avoid and minimize impacts to fish and their habitats as identified in this EA. Since artificially propagated lamprey would be released and monitored in areas of shallow and slow-moving water, the activity would avoid habitat areas used by salmonids and would have no effect on EFH.

As discussed in Section 1.3, the Proposed Action would occur in and near the net pens where hatchery fish are released. These areas have been in operation for years and are located in tidal, off-channel backwater areas of the Lower Columbia River. The amount of habitat affected by the placement of net pens is insignificant. Nearshore habitat is not affected as the net pens are in deeper waters and secured by existing piling structures. The proposed hatchery programs include designs to minimize each of these effects.

The PFMC (2003) recognized concerns regarding the "genetic and ecological interactions of hatchery and wild fish . . . [which have] been identified as risk factors for wild populations." SAFE hatchery fish returning to the Lower Columbia River are expected to be caught at side stream/terminal fisheries and not spawn naturally. SAFE coho salmon are more likely to stray and spawn naturally than SAFE spring Chinook salmon due to their life history differences. The

areas where SAFE hatchery fish are likely to spawn near the SAFE terminal areas are not the core populations needed for recovery of the ESUs and thus, not consequential to salmon recovery.

Migratory Bird Treaty Act and Executive Order 13186

The Migratory Bird Treaty Act (MBTA), 16 U.S.C. § 703 *et seq*., implements various treaties and conventions between the U.S. and other countries, including Canada, Japan, Mexico, and Russia, for the protection of migratory birds. Under the MBTA, taking, killing, or possessing migratory birds, or their eggs or nests, is unlawful. The MBTA classifies most species of birds as migratory, except for upland and nonnative birds.

Executive Order 13186, issued in January 2001, directs each Federal agency undertaking actions that may adversely impact migratory bird population to work with USFWS to develop an agreement to conserve those birds. The protocols developed by this consultation are intended to guide future agency regulatory actions and policy decisions; renewal of permits, contracts, or other agreements; and the creation of or revisions to land management plans. This Order also requires that the environmental analysis process include effects of Federal actions on migratory birds. On August 26, 2013, USFWS and the U.S. Department of Energy signed a Memorandum of Understanding (MOU) to complement the Executive Order, which expired after five years and remains in the process of being renewed. This MOU addresses how Bonneville and USFWS work cooperatively to address migratory bird conservation.

Priority habitat for migratory birds in the LCRE includes freshwater and tidal marsh wetlands. None of the net pen sites or release sites occur near these areas with the nature of the work being non-disruptive (little to no noise). For these reasons, there would be no effect on migratory bird habitat.

Executive Order on Environmental Justice

In February 1994, Executive Order 12898, Federal Actions to Address Environmental Justice in Minority and Low-Income Populations, was released to Federal agencies. This Order states that Federal agencies shall identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations.

As discussed in Chapter 3, the Proposed Action would not affect any areas that contain minority and low-income populations.

5.3 Distribution and Availability

An electronic copy of this EA is available on the Bonneville website: *www.bpa.gov/nepa/SAFE* .

A printed copy of the EA is available on request from Bonneville's Public Affairs Department by calling the toll-free document request line at 1-800-622-4520.

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Appendix A: Juvenile Release

Releases of Hatchery Fish

Hatchery fish have been released from net pen sites within the Select Area Fisheries boundaries for decades. Current and past operations (2010-2019) are expressed in the following tables. Releases of spring Chinook in all Select Area Sites combined ranged between 1.5 and 3.7 million smolts during 2012–2021 (brood years 2010–2019) averaging 2,777,000 smolts released per year while releases of coho range from 3.3 to 5.1 million smolts during 2012–2021 (brood years 2010–2019) averaging 4.1 million smolts released per year).

These numbers have steadily been increasing during the expansion phase of the SAFE Program and with the onset of new Columbia River fishery management reform policies. The Proposed Action would entail the maximum production of fish under the SAFE Program although, due to the variability of juvenile releases from the various sites, this number may be slightly over or under exceeded. Due to annual variations in broodstock collection, and egg/juvenile and transport/rearing survival, actual releases could be 95 percent to 105 percent of the program goal.

Table 9: SAFE Spring Chinook Smolt Releases (2010-2017)[14]

CHS Brood Year	Klaskanine Hatchery	Youngs Bay Net Pens	Blind Slough Net Pens	Gnat Creek Hatchery	Tongue Point Net Pens	*Total*
2010	—	612,330	258,923	—	253,002	1,529,255
2011	—	601,862	326,490	99,190	481,617	1,829,159
2012	—	631,337	370,858	150,834	493,595	1,646,624
2013	—	560,520	437,583	142,959	465,420	1,606,482
2014	275,973	627,857	128,700	380,848	437,585	1,850,963
2015	—	910,343	116,114	379,653	399,621	1,805,731
2016	—	1,159,890	129,830	385,563	459,832	2,135,115
2017	117,495	968,404	130,489	646,836	419,608	2,452,832
2018	235,655	1,264,888	310,114	585,258	409,815	3,067,730
2019	493,518	1,331,398	411,810	630,665	375,927	3,736,384
AVERAGE	**280,660**	**1,048,137**	**245,278**	**560,902**	**410,734**	**2,776,977**

[14] Source: 2022 Joint Staff Report: Stock Status for Spring Chinook, Summer Chinook, Sockeye, Steelhead, and other Species. Joint Columbia River Management Staff. ODFW & WDFW

The objective for the proposed 4.2 million spring Chinook smolts would be to produce about 32,000 adult spring Chinook salmon that will return for harvest in ocean/Columbia River/Select Area Commercial fisheries. However, given the variability of recent returns (2010-2019 BY) it is reasonable to assume that an average of 15,500 adult fish would return for harvest under the maximum production scenario. This assumes an average, non-derived SAR ratio of 0.36 percent, which is a reasonable assumption as the average annual SAR survival. SAR rates for Youngs Bay net pens, Blind Slough nets pens, and Tongue Point net pens are 0.74 percent, 0.51 percent, and 0.45 percent, respectively.[15]

Table 10: SAFE Coho Smolt Releases (2010-2017)

COH Brood Year	S Fork Klaskanine Hatchery (CCF)	Klaskanine Hatchery	Youngs Bay Net Pens	Blind Slough Net Pens	Tongue Point Net Pens	Deep River[16] Net Pens	*Total*
2010	390,610	489,060	757,474	372,265	491,330	800,000	3,300,739
2011	386,668	607,824	769,971	586,277	849,381	600,000	3,800,121
2012	336,856	732,994	774,533	623,649	928,589	725,000	4,121,621
2013	260,289	903,119	684,309	569,921	935,023	654,000	4,006,661
2014	209,923	1,552,458	766,193	574,243	842,341	920,000	4,865,158
2015	209,745	1,487,362	550,062	349,156	747,057	855,000	4,198,382
2016	487,415	1,688,946	761,511	509,235	922,456	723,000	5,092,563
2017	384,452	1,317,407	631,898	426,637	424,659	700,000	3,885,053
2018	333,094	1,407,597	717,121	350,934	620,979	706,000	4,135,725
2019	436,803	1,425,603	745,478	367,768	646,199	176,000	3,797,851
AVERAGE	**343,586**	**1,161,237**	**715,855**	**473,009**	**740,801**	**685,900**	**4,197,892**

The objective for the 4.3 million smolts would be to produce about 86,000 adult coho, given a 2 percent SAR, that would return to the Columbia River for harvest in SAFE coho salmon commercial fisheries. However, given the variability of recent returns, it is reasonable to assume an average, non-derived SAR ratio of 1.5 percent. Survival averages for individual sites are: Klaskanine Hatchery (1.49 percent), South Fork Klaskanine Hatchery (1.13 percent), Youngs Bay net pens (1.78 percent), Tongue Point net pens (1.93 percent), and Blind Slough nets pens (1.07 percent).

[15] Source: SAFE Spring Chinook HGMP 2021

[16] Up to 400,000 coho smolts produced and released at Deep River are subject to Bonneville funding, the rest are funded by the Mitchell Act.

Appendix B: Adult Returns

Adult Returns – Commercial Fisheries

SAFE spring Chinook commercial fisheries occur in winter, spring and summer at each of the Select Area Sites, with fishing efforts separated temporally from other hatchery programs (fall Chinook, coho, and chum salmon). Spring Chinook primarily enter freshwater during February through June to spawn in Columbia River tributaries during August through October. An average of 9,400 spring Chinook are harvested at all the Select Area Sites with a majority caught at the Youngs Bay Select Area Fishery. The amount of returning adults is extremely variable, therefore a 10-year average is used to characterize the status quo spring Chinook harvest conditions for this analysis.

SAR rates to hatcheries for SAFE released spring Chinook fish ranged from 0.04 to 0.08 percent, whereas returns to hatcheries for river-released fish ranged from 0.08 to 0.43 percent. (Spring Chinook 2021 HGMP). SAR rates for coho seem to be more variable; for BYs 1992 to 2014, the average SAR for CWT groups was 1.57 percent, with 2 percent exceeded in 6 out of 23 brood years, and less than 1 percent in 7 out of 23 years (2021 SAFE Coho Salmon HGMP).

Table 11: Winter/Spring/Summer Spring Chinook Commercial Harvest at Select Area Sites (2011-2020)[17]

YEAR	Youngs Bay	Blind Slough	Tongue Point	Deep River	*TOTAL*
2011	8,751	1,611	656	100	11,118
2012	8,588	961	503	44	10,096
2013	6,648	936	374	124	8,082
2014	4,034	467	72	65	4,638
2015	9,120	3,117	1,262	204	13,703
2016	6,694	2,617	1,106	79	10,496
2017	10,799	3,261	3,517	21	17,598
2018	6,933	2,164	1,884	0	10,981
2019	2,123	500	545	0	3,168
2020	3,113	615	459	0	4,187
AVERAGE	**6,680**	**1,625**	**1,038**	**64**	**9,407**

SAFE coho commercial fisheries occur in fall (September and October), with fishing effort

[17] Source: Table 30 from 2022 ODFW&WDFW Joint Staff Report: Stock Status and Fisheries for Spring Chinook, Summer Chinook, Sockeye, Steelhead, and other Species. Joint Columbia River Management Staff. Analyses. ODFW Columbia River Joint Staff Reports (state.or.us)

concentrated prior to the presence of most wild chum and Coho that may return to the local tributary streams. Coho adults are typically age-3 fish, returning to freshwater after only one year in the ocean. Coho adults enter the Columbia River from mid-August to early October, with peak entry occurring in early September to be harvested at a very high rate (96 percent; FY 2003-2010). More than four times as many Coho (45,079 fish) are harvested commercially than spring Chinook (9,407 fish), establishing the status quo coho harvest conditions. This is likely due to the gillnet fishery more easily harvesting the more numerous and smaller coho salmon.

Table 12: Coho Commercial Harvest at Select Area Sites (2011-2020)[18]

YEAR	Youngs Bay	Blind Slough	Tongue Point	Deep River	*TOTAL*
2011	26,538	1,388	6,504	15,083	49,513
2012	5,986	1,534	3,902	3,932	15,354
2013	14,254	3,882	14,165	10,002	42,303
2014	65,936	24,620	50,752	27,262	168,570
2015	11,500	1,700	9,721	4,524	27,445
2016	15,784	1,493	11,284	6,162	34,723
2017	13,603	2,460	12,534	9,382	37,979
2018	4,229	1,477	3,682	2,723	12,111
2019	3,589	7,269	7,229	1,204	19,291
2020	19,783	10,424	10,903	2,390	43,500
AVERAGE	**18,120**	**5,625**	**13,068**	**8,266**	**45,079**

Adult Returns – Recreational Fisheries

Recreational fishing has occurred in the Select Areas and associated tributaries since 1998. Under permanent regulations, Youngs Bay, Blind Slough, and Deep River areas are open all year for retention of Chinook and adipose fin-clipped coho with a daily bag limit of two adult salmonids. Retention is limited to hatchery fish (defined in permanent regulations) for coho and steelhead year-round and for Chinook during January 1 through July 31. Recreational harvest is estimated from catch record cards which are turned in voluntarily by anglers. Reported catch is expanded by a reporting rate to come up with an estimate of total recreational harvest.

In terms of harvest numbers, nearly the opposite trend is observed for recreational fisheries. Spring Chinook are harvested at a higher rate than coho, with an average annual catch rate of 847 spring Chinook to 298 coho). Spring Chinook salmon are preferred by recreational fishermen and

[18] Source: Table 24 from 2021 ODFW&WDFW Joint Staff Report: Stock Status and Fisheries for Fall Chinook Salmon, Coho salmon, chum salmon, summer steelhead and White sturgeon. Joint Columbia River Management Staff. ODFW Columbia River Joint Staff Reports (state.or.us)

are highly prized for being the best eating of all salmon as well as being much bigger. Spring Chinook average 12-17 pounds while coho average 8-10 pounds before dressing.

Table 13: Spring Chinook and Coho Recreational Harvest in Select Areas (2011-2020)[19]

YEAR	Spring Chinook HARVEST	Coho HARVEST
2011	418	208
2012	646	96
2013	341	181
2014	315	971
2015	2,507	641
2016	1,315	115
2017	1,781	162
2018	682	169
2019	172	135
2020	289	NA
Average	**847**	**298**

Harvest levels will vary dramatically from year to year. Ocean and in-stream harvest management regimes are set by many overlapping jurisdictions that respond to international and national treaties, as well as biological conservation concerns. The 2011-2020 averages are used in this analysis to encompass how adult returns benefit economies through commercial and recreational fisheries.

[19] Source: Table 24 & 30 from 2022 ODFW&WDFW Joint Staff Report: Stock Status and Fisheries for Spring Chinook, Summer Chinook, Sockeye, Steelhead, and other Species. Joint Columbia River Management Staff.

Appendix C: Economic Analysis

Introduction

This economic analysis focuses on personal income generated from commercial and recreational fishing targeting SAFE hatchery fish harvested in the four Select Area Fisheries adjacent to SAFE net pen sites in Youngs Bay, Tongue Point, Blind Slough and Deep River.

SAFE juvenile production and subsequent adult harvest can vary from year to year. The mix of species counts one year will not be the same the following year. It was decided to use calendar year 2011-2020 release counts for the cost analysis and a range of SARs associated with 1990 broodstocks. Since the "salt" years vary among species to be between one and five years, there is a disconnect between the adopted years of broods and the adopted year used for costs estimation. This disconnected approach is meant to be the more recent approximation of the level of income at current production and maximum production level and was used by TRG 2006.

SAFE commercial and recreational fisheries generate personal income and jobs through the export of goods and services to outside economies. This transfer of money to businesses within the LCR supports payments of wages and other forms of compensation, and that money is then re-spent regionally (i.e., the multiplier effect). This is represented by applying a personal income factor to calculated gross revenue. Similarly, non-local recreational anglers (e.g., anglers who live outside the local area) spend money on guide services, lodging, and other goods and services that generate income for local communities.

Several scenarios (no-fund, current, and maximum production scenario) have been calculated in order to provide a comparison in annual personal income from commercial harvests. A no-fund scenario was calculated to represent the no-fund Bonneville decision. As previously mentioned and supported by an independent economic analysis, this would roughly halve smolt production. The current scenario represents average SAFE Program juvenile production numbers for the last 10 years (2012-2021). And finally, the maximum production scenario would entail the release of up to the proposed 4.25 million spring Chinook salmon smolts and up to 4.3 million coho salmon smolts annually as described in the three HGMPs (ODFW, ODFW, and WDFW).

Only the current scenario has been calculated for annual SAFE recreational harvests. The changes in recreational harvest are heavily dependent on variables beyond just the number of fish produced and adult survival returns. For example, success rates (catch) have varied widely over the years due to oceanic conditions, management restrictions (bag limits, seasonal openings, weekend closures, etc.), and angler motivations (weather, perceived abundances, etc.). Therefore it is unlikely to accurately extrapolate the change in recreational harvest resulting from either the no-fund scenario or maximum production scenario. The amount of personal income and jobs from recreational harvest in either of the three scenarios are likely to be similar as SAFE spring Chinook and coho salmon stocks are only a minor part of recreational fishing abundance and a variety of substitutes are available. While the number of spring Chinook salmon may increase or decrease, it is reasonable to assume that the number of sport trips and outings (used to calculate personal income) will stay relatively constant.

Commercial Income

Ex-vessel value is a minimum indicator of economic value since it does not capture any multiplier effect associated with money moving throughout the community and only reflects what is directly paid to the fishermen. The ex-vessel prices received for commercial salmon caught in the LCRE vary substantially by species (e.g., Chinook salmon vs. coho salmon), race (e.g., spring vs. fall), and stock (e.g., tules vs. brights). In general, spring Chinook salmon have a much higher commercial value per pound and average weight than other salmon species/stocks (Table 14).

Table 14: Ex-Vessel Prices per Pound and dressed weights per Spring Chinook and Coho landed in Oregon

	Average Value per Pound.[20]			Average Dressed Weight[21]	
	Spring Chinook	Coho		Spring Chinook	Coho
2011	6.12	1.99		12.5	5.6
2012	6.88	1.90		10.1	6.1
2013	7.50	2.14		11.5	5.9
2014	6.14	1.33		12.4	6.1
2015	6.52	1.72		11.4	5.1
2016	7.93	2.06		12.3	-
2017	8.22	2.23		12.1	6.0
2018	11.17	2.11		11.8	6.6
2019	11.96	1.79		10.8	4.7
2020	7.45	1.72		14.1	5.8
Average	**$7.99**	**$1.90**		**11.9**	**5.8**

For estimating the annual ex-vessel value of SAFE commercial fisheries under the no-fund, current, and maximum production scenarios, the average value per pound was multiplied by the average weight of dressed fish over the same period. This calculation yields the average value per fish ($95.00 per spring Chinook and $11.38 per coho). (See Table 15.)

[20] Pacific Fishery Management Council 2022 Stock Assessment and Fishery Evaluation (SAFE) Report, Tables IV-8 and IV-9. Available at: Salmon management documents - Pacific Fishery Management Council (pcouncil.org)
[21] Pacific Fishery Management Council 2022 (Review of 2021 Ocean Salmon Fisheries, Tables D-2 and D-3). Available at: Salmon management documents - Pacific Fishery Management Council (pcouncil.org)

This value can then be multiplied by the average number of fish commercially caught per year to derive the average annual commercial harvest value (known as the ex-vessel value, which is the price received for the product "at the dock") of salmon caught from Select Area Fisheries under each of the three scenarios with juvenile production as the independent variable . For commercial fishermen, this ex-vessel value (i.e., the price received for the product at the dock) of salmon provides a measure of current gross economic value. Then this value was converted to personal income by multiplying the ex-vessel value by a personal income factor of $1.76.22 This converted value represents the personal income gained on an average annual basis for each of the three scenarios (see table 18).

Table 15: No Fund Commercial Harvest Scenario

	Juvenile Production	SAR	Calculated Adult Returns	Average Value Per Fish	Ex-Vessel Value	Personal Income Factor	Personal Income
Spring Chinook	2,125,000	0.38%	8,075	$95.00	$767,156	$1.76	$1,350,140
Coho	2,150,000	1.50%	32,250	$11.38	$367,000	$1.76	$645,920
Total Value							$1,996,060

[22] Source for Personal Income Factor: Average of State-level income impact coefficients for Oregon and Washington Columbia River commercial salmon harvests estimated by IO-Pac (See: PFMC 2016 Salmon Review computational file tab 'Factors adjusted to 2021 dollars using USDC BEA GDP implicit price deflator.

Table 16: Current Commercial Harvest Personal Income

	Average Juvenile Production	Average Adult Returns	Average Value Per Fish	Ex-Vessel Value	Personal Income Factor	Personal Income
Spring Chinook	2,776,977	9,407	$95.00	$893,665	$1.76	$1,572,850
Coho	4,197,892	45,079	$11.38	$512,999	$1.76	$902,878
Total Value						$2,475,728

Maximum production values, at 4.25 million spring Chinook salmon smolts and up to 4.3 million coho salmon smolts annually were used to calculate the total personal income under the maximum production scenario using the exact same methodology (see Table 18).

Table 17: Maximum Production Commercial Harvest Personal Income

	Juvenile Production	SAR	Calculated Adult Returns	Average Value Per Fish	Ex-Vessel Value	Personal Income Factor	Personal Income
Spring Chinook	4,250,000	0.38%	16,150	$95.00	$1,534,250	$1.76	$2,700,280
Coho	4,300,000	1.50%	64,500	$11.38	$734,010	$1.76	$1,291,857
Total Value							$3,992,137

Environmental variables such as ocean conditions and estuary smolt predation greatly affect SAR. SAR rates to hatcheries for SAFE released spring Chinook fish ranged from 0.04 percent to 0.08 percent whereas returns to hatcheries for river-released fish ranged from 0.08 percent to 0.43 percent. (Spring Chinook 2021 HGMP). SAR rates for coho seem to be more variable. For BYs 1992 to 2014, the average coho SAR for CWT groups was 1.57 percent, with two percent exceeded in six out of 23 brood years, and less than 1 percent in seven out of 23 years.

Recreational Income

Recreational anglers harvesting SAFE salmon spend money on guide services, lodging, and other goods and services (e.g., bait, tackle, lodging, guide fees, fuel, boat-related expenses, travel

expenses, etc.) that generate household income and employment in many sectors of the regional economy. An average cost per trip out of Clatsop County/Astoria was approximated to be $149.08 per sport angler trip, chartered or private. Once SAFE recreational catch was converted to sport angler trips, this value was multiplied by an average cost per trip to estimate the total trip-related expenditures for spring Chinook and coho using 2020 dollars. This regional transfer of money supports payments to labor, goods and services provided by the local economy. (See Table 19.)

Table 18: Total income from SAFE Recreational Harvest

	Average Annual Harvest	Average Catch per Sport Trip[23]	No# Sport Trips	Average Cost Per Trip[24]	Average Annual Value
Spring Chinook	847	0.14	6050	$149.08	$901,934
Coho	298	0.35	851	$149.08	$126,867
Total Income					$1,028,881

Employment

To estimate total (direct, indirect, and induced) personal income generated by estimated commercial and recreational catch from the proposed action, personal income impact factors for Chinook and coho were applied to the converted catch (i.e., ex-vessel revenue from commercial landings and numbers of sport trips). A personal income factor of $1.76[25] was used, per ex-vessel dollar of commercially landed salmon and a recreational value of $149.08 per sport trip. These values attempt to capture the multiplier effect of money being re-spent regionally (i.e., the multiplier effect).

To estimate comparative employment levels supported by each scenario, personal income from commercial harvest is summed with total income from recreational harvest. This could be considered as personal income accruing to households in the local area from harvest of SAFE Program fish. This value is divided by the earnings per job value of Clatsop County ($53,230) to find out the number of jobs supported by each scenario (Table 20). The same earnings per job value was applied to an estimate of the total gillnet industry for relative comparisons.

[23] Average catch per trip for Oregon: compiled from 2010-2020 salmon landing and effort values from the 2021 SAFE Report, Tables IV-10 pg 123

[24] Average cost of Clatsop County trip, from Mitchel Act EIS: Table A-5 Expenditures per sport trip (2009) adjusted to 2020 dollars using USDC BEA gross domestic implicit (GDP) price index.

[25] Source for personal income factor: Average of state-level income impact coefficients for Oregon and Washington Columbia River commercial salmon harvests estimated by IO-Pac (See: PFMC 2016 Salmon Review computational file tab 'Factors adjusted to 2021 dollars using USDC BEA GDP implicit price deflator.)

Table 19: Comparative Total Income and Employment from the SAFE Program

	Commercial Income	**Recreational Income**	**Total**	**No# Jobs Supported**
No Fund Scenario	$1,996,060	$1,028,881	$3,024,941	57
Current Scenario	$2,475,728	$1,028,881	$3,504,609	66
Maximum Pro Scenario	$3,992,137	$1,028,881	$5,021,018	93
Total Gillnet Industry[26]			$12,000,000	225

[26] Total estimated local (Clatsop and Pacific counties) economic contribution made by gillnet permittees is $12.0 million in personal income (TRG 2006),

Appendix D: Public Scoping Comments

Comments Received

Bonneville received four comments during the public scoping period from January 1st through February 2nd, 2024. This section contains transcriptions of each of the comments received. Individual concerns, questions, and opinion statements were isolated from each comment and addressed in the following section.

Table 20: Public Comments Received

Comment No.	Name	Organization	Full Comment Text
SAFE24240002	Charles Pace	Private Citizen	I do not believe BPA funding for this proposal can proceed under the Federal Water Pollution Control Act, 38 U.S.C. 67 and 167; 1251 et seq., which prohibits discharging pollutants into navigable waters without a permit. Additional considerations are imposed by the constitutions, general statutes, and common laws of the states of Washington and Oregon. It is also unlikely that this proposal can be funded by Bonneville without violating the in lieu; provisions of the Northwest Power Act. Given these considerations, it would be imprudent for Bonneville to participate in this proposal. If, however, BPA moves forward with providing support, it should expect that it will be challenged and become the subject of extensive litigation. It would be foolish to embark on such a course of action.
SAFE24240003	Charles Pace	Private Citizen	I am writing this second comment to ensure the BPA is aware of the Nov. 18, 2022, announcement by the Commissioner of Washington Department of Natural Resources banning net pen aquaculture in Washington waters. According to the news release, Commissioner Franz Ends Net Pen Aquaculture in Washington's Waters and similar bans are in place in Oregon. Please see the link below: https://www.dnr.wa.gov/news/commissioner-franz-ends-net-pen-aquaculture-washington%E2%80%99s-waters#:~:text=Commissioner%20of%20Public%20Lands%20Hilary,of%20Natural%20Resources%20(DNR).

SAFE24240004	Charles Pace	Private Citizen	I am writing this third comment to ensure Bonneville is aware of a NOAA biop that found net pen aquaculture: (1) degrades water quality from discharged fish waste and other pollutants; and (2)reduces foraging production for juvenile and adult salmonids and other protected fish due to bio-deposits and contaminants Please see the following link to a news release by the Wild Fish Conservancy date July 19,2022: https://wildfishconservancy.org/new-federal-analysis-finds-puget-sound-commercial-net-pens-are-harming-salmon-steelhead-and-other-protected-fish/
SAFE24240005	Charles Pace	Private Citizen	I am writing this fourth comment to ensure Bonneville is aware of the fact that under the permitting requirements of the Clean Water Act,,net pen facilities are considered to be point sources (40 CFR 122.24 and appendix C of 40 CFR part 122). EPA also produced effluent guidelines for the industry in 40 CFR Part 451. For more information see the link below the Washington Department of Ecology website: https://apps.ecology.wa.gov/publications/documents/2206008.pdf

Comments Responses

Bonneville identified isolated concerns, questions, and opinion statements from the submitted comments and provided responses in the following table.

Table 21: Comment Responses

Comment No.	Comment	Response
SAFE24240002-1	I do not believe BPA funding for this proposal can proceed under the Federal Water Pollution Control Act, 38 U.S.C. 67 and 167; 1251 et seq., which prohibits discharging pollutants into navigable waters without a permit. Additional considerations are imposed by the constitutions, general statutes, and common laws of the states of Washington and Oregon.	As described in section 5.2, the SAFE Program is in compliance with Clean Water Act implementing regulations (see 40 C.F.R. 122.24) through attainment of State-issued NPDES permits at the individual net pen sites when required by size and production levels.

SAFE24240 02-2	It is also unlikely that this proposal can be funded by Bonneville without violating the in lieu; provisions of the Northwest Power Act.	Thank you for your comment. BPA continues to comply with the Northwest Power Act, including all in-lieu prohibitions.
SAFE24240 02-3	Given these considerations, it would be imprudent for Bonneville to participate in this proposal. If, however, BPA moves forward with providing support, it should expect that it will be challenged and become the subject of extensive litigation. It would be foolish to embark on such a course of action.	Thank you for your comment.
SAFE24240 003	I am writing this second comment to ensure the BPA is aware of the Nov. 18, 2022, announcement by the Commissioner of Washington Department of Natural Resources banning net pen aquaculture in Washington waters. According to the news release, Commissioner Franz Ends Net Pen Aquaculture in Washington's Waters and similar bans are in place in Oregon. Please see the link below: https://www.dnr.wa.gov/news/commissioner-franz-ends-net-pen-aquaculture-washington%E2%80%99s-waters#:~:text=Commissioner%20of%20Public%20Lands%20Hilary,of%20Natural%20Resources%20(DNR).	Thank you for your comment. Of all the net pen sites, only those at Deep River would fall under DNR jurisdiction. This ban on commercial net pen fin fish aquaculture was a direct response to the numerous lease violations by a private entity. There has never been a violation since the Deep River Site has been in operation since 2008. Further, this order only applies to commercial net pen fish aquaculture and does not apply to hatchery programs that restore or boost native stocks such as the Deep River hatchery program.
SAFE24240 004-1	I am writing this third comment to ensure Bonneville is aware of a NOAA biop that found net pen aquaculture: (1) degrades water quality from discharged fish waste and other pollutants;	Bonneville has consulted with NMFS pursuant to Section 7 of the ESA. A Biological Opinion (NMFS Consultation Number: WCRO-2020-02145) was issued on May 3, 2021, along with terms and conditions to minimize take. The biological opinion analyzed the effects of the proposed net pens and their operations on water quality. In the BiOp's critical habitat analysis on page 112, "Operations and maintenance activities would include net pen maintenance, cleaning of debris and algae growth on nets. These activities would not be expected to degrade water quality or adversely modify designated critical habitat, because they would occur infrequently, and only result in minor temporary effects. The

		effects of these actions on critical habitat are negligible given the scope of the actions." Anticipated effects of the proposed action on water quality are further described in more detail in Section 3.2 of this EA.
SAFE24240004-1	I am writing this third comment to ensure Bonneville is aware of a NOAA biop that found net pen aquaculture: (2)reduces foraging production for juvenile and adult salmonids and other protected fish due to bio-deposits and contaminants.	The environmental monitoring of net pen salmon rearing is to ensure that the water body is suitable for fish rearing and that the accumulation of organic matter due to fish rearing is not creating a systemic impact in the surrounding areas. The fish in each net pen facility are released as smolts, and only kept for part of the year. This allows the benthic environment time to recover. In addition to this, much of the rearing occurs during times of abundant rainfall and high flows, adding to the cleansing capability of an already turbulent, tidally influenced location. Finally, core soil samples taken by Clatsop County Staff ensured that organic materials from fish rearing are not accumulating under each individual net pen (2023 Biron et al). The visual inspection of each sample supports the notion that either the organic material from fish rearing is being absorbed at the rate of which it is produced, or the biproducts are being flushed away at a rate that does not allow accumulation to occur. The evidence of this is additionally supported by the absence of *Beggiatoa* spp. The lack of organic accumulation from continued fish rearing and acquired water quality data would suggest the areas surrounding the net pens are suitable for fish rearing.
SAFE24240004-2	Please see the following link to a news release by the Wild Fish Conservancy date July 19,2022: https://wildfishconservancy.org/new-federal-analysis-finds-puget-sound-commercial-net-pens-are-harming-salmon-steelhead-and-other-protected-fish	Thank you for bringing this to our attention. The article describes an analysis that considers interactions between hatchery and natural salmon and steelhead. Negative interactions such as competition and predation by hatchery fish on juvenile salmon and steelhead, and transfer of disease pathogens from hatchery fish to juvenile salmon and steelhead may occur. As described in Section 3.1.2.1 in this EA, each effect is a function of both spatial and

		temporal overlap; thus these effects can only take place when hatchery and natural-origin salmon and steelhead encounter each other or are rearing together. The interactions between SAFE production and native stocks are avoided by development of successful net-pen rearing strategies and release timing that facilitate rapid out-migration which eliminates this spatial and temporal overlap.
SAFE24240005	I am writing this fourth comment to ensure Bonneville is aware of the fact that under the permitting requirements of the Clean Water Act, net pen facilities are considered to be point sources (40 CFR 122.24 and appendix C of 40 CFR part 122). EPA also produced effluent guidelines for the industry in 40 CFR Part 451. For more information see the link below the Washington Department of Ecology website: https://apps.ecology.wa.gov/publications/documents/2206008.pdf	Thank you for your comment. As described in section 5.2, Clean Water Act implementing regulations (40 C.F.R. 122.24) require the net pen site at Youngs Bay to obtain an ODEQ-issued NPDES permit, which in turn requires those sites to maintain 50-foot mixing zone from the outside boundary of the floating net-pens. CCF has finalized the permitting review process and was issued an extension of its existing NPDES Permit that expired November 30, 2023, until ODEQ acts on the renewal application (Federal Permit No. OR0040631). At Deep River, WDFW holds a NPDES permit (WA0040053) issued by the Department of Ecology. The permit requires the sampling and reporting of turbidity, dissolved oxygen, and biochemical oxygen demand (BOD) results monthly when there is fish present in the net pens, in addition to fish production, fish size, the amount of fish, and fish feed. The production levels at the Tongue Point and Blind Slough sites are below the threshold that would require NPDES permits. These locations incur minimum impact and undergo routine monitoring to document any environmental changes that may occur under the net pens as compared to a reference condition. The environmental monitoring of net pen sites have confirmed that all net pen sites are in compliance with permit conditions and water quality standards.

BONNEVILLE POWER ADMINISTRATION
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