UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
1201 NE Lloyd Boulevard, Suite 1100
Portland, OR 97232

November 6, 2017

Dear Madam or Sir:

In accordance with provisions of the National Environmental Policy Act (NEPA), we announce the publication of the Final Environmental Impact Statement (FEIS) to Analyze Impacts of NOAA's National Marine Fisheries Service (NMFS) joining as a signatory to a new *U.S. v. Oregon* Management Agreement for the Years 2018-2027.

The proposed action is for the Federal parties to sign the new management agreement, as negotiated by the parties to *U.S. v. Oregon*, and for NMFS and the U.S. Fish and Wildlife Service to issue an Incidental Take Statement exempting take of listed species taken pursuant to implementing the management agreement. This new management agreement would take effect after the current management agreement expires at the end of 2017. The management agreement accomplishes two primary objectives. First, it implements harvest policies that the parties have agreed are needed. Second, the management agreement incorporates hatchery programs that support harvest and that are important to the conservation of salmon and steelhead runs above Bonneville Dam.

NOAA's Policy and Procedures for Compliance with NEPA and Related Authorities, and the Companion Manual for NOAA Administrative Order 216-6A require that we prepare and publish a Record of Decision that concludes the NEPA process for an EIS. We intend to issue the Record of Decision 30 days after the publication of the FEIS (40 CFR 1506.10).

We have made the FEIS available electronically through the NMFS West Coast Region's website at http://www.westcoast.fisheries.noaa.gov/fisheries/salmon_steelhead/united_states_v_oregon.html. The Record of Decision will also be made available at this website.

Sincerely,

Barry A. Thom
Regional Administrator

Title of Environmental Review:	Final Environmental Impact Statement to Analyze Impacts of NOAA's National Marine Fisheries Service joining as a signatory to a new *U.S. v. Oregon* Management Agreement for the Years 2018-2027.
Responsible Agency and Official:	Barry A. Thom, Regional Administrator National Marine Fisheries Service, West Coast Region West Coast Region, 7600 Sand Point Way NE, Building 1, Seattle, WA 98115-0070, (206) 526-6150
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Location of Proposed Activities:	Columbia River and Tributaries, located in Oregon and Washington
Cooperating Agencies:	U.S. Fish and Wildlife Service Bureau of Indian Affairs
Abstract:	The action considered in this final environmental impact statement (FEIS) concerns how the National Marine Fisheries Service (NMFS) views implementing salmon and steelhead fishery policies contained in a proposed *U.S. v. Oregon* Management Agreement for the Columbia River Basin. Salmon and steelhead fishery management is complex, but in general, seeks to implement fisheries that are consistent with a variety of statutory and legal obligations related to resource conservation, economic and cultural benefits associated with resource use, and treaty Trust obligations. The framework management plan would be multiyear that specifies the conservation objectives. Each year, annual fishery plans are developed within the context of the framework plan to meet the year-specific circumstances related to the status of stocks affected by the fisheries. The federal action considered is Federal agency review and approval of the framework plan and implementation of annual fishery plans that would adhere to the framework and issuance of an Incidental Take Statement under the Endangered Species Act by NMFS and the U.S. Fish and Wildlife Service. However, there are different ways to balance these objectives and different strategies that can be used that may provide better solutions for meeting the obligations and objectives of the respective framework plan. The alternatives considered in this FEIS are programmatic in nature and are designed to provide an overview of fishery management policies that can be implemented as part of the annual planning process.
Date:	November 2017

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EXECUTIVE SUMMARY

What is US v Oregon?

United States v. Oregon (*US v Oregon*) is the on-going Federal court proceeding first brought in 1968 to enforce the reserved fishing rights of the Confederated Tribes of the Warm Springs Reservation of Oregon, the Confederated Tribes of the Umatilla Indian Reservation, the Nez Perce Tribe, and the Confederated Tribes and Bands of the Yakama Nation. The Shoshone-Bannock tribes have filed a complaint in intervention, but have not taken any action on this complaint. Fisheries in the Columbia River have been managed subject to provisions of *US v Oregon* under the continuing jurisdiction of the Federal court.

What is the Management Agreement?

The 2008-2017 *US v Oregon* Management Agreement provides the current framework for managing fisheries and hatchery programs in much of the Columbia River Basin. The current agreement expires on December 31, 2017; negotiations on a new management agreement are ongoing. The parties to the *US v Oregon* management agreement, hereafter "Parties", are the State of Washington, the State of Oregon, the State of Idaho, the United States, the Shoshone-Bannock Tribes, the Confederated Tribes of the Warm Springs Reservation of Oregon, the Confederated Tribes of the Umatilla Indian Reservation, the Nez Perce Tribe, and the Confederated Tribes and Bands of the Yakama Nation.

What are the objectives of the Management Agreement?

The management agreement accomplishes two primary objectives. First, it implements harvest policies that the Parties have agreed should govern the amount of harvest. Second, the management agreement incorporates hatchery programs that provide harvest opportunities and that are important to the conservation of salmon or steelhead runs above Bonneville Dam. The purpose of the *US v Oregon* Management Agreement is to provide a framework within which the Parties may exercise their sovereign powers in a coordinated and systematic manner in order to protect, rebuild, and enhance upper Columbia River fish runs while providing harvests for both treaty Indian and non-treaty fisheries. The primary goals of the Parties are to rebuild weak runs to full productivity and fairly share the harvest of upper river runs between treaty Indian and non-treaty fisheries in the ocean and Columbia River Basin.

Which fisheries are included in the Agreement and in this document?

Treaty Indian fisheries and non-treaty fisheries prosecuted in the main stem Columbia River and certain tributaries to the Columbia River are considered in the Management Agreement and in this Environmental

Impact Statement (EIS). Treaty Indian fisheries are guaranteed by one or more treaties. These fisheries include both commercial as well as ceremonial and subsistence (C&S) fisheries. Non-treaty fisheries are those that do not have a treaty guaranteeing a fishing right. These include all state fisheries and certain Indian fisheries operated by tribes in the project area that are not party to *US v Oregon*. Non-treaty fisheries consist of both commercial and recreational fisheries.

What proposed Federal action does this EIS analyze?

The Proposed Action is for the Federal parties to sign the management agreement, as negotiated by the Parties to *US v Oregon*, and for NMFS and FWS (collectively, the "Services") to issue an Incidental Take Statement (ITS) under the Endangered Species Act (ESA) exempting take[1] of listed species taken pursuant to implementing the management agreement. A listed species is one that is identified either as endangered or threatened under the ESA.

What is the Purpose and Need?

The purpose and need for the Proposed Action is three-fold: (1) to meet the Federal government's tribal treaty rights and trust and fiduciary responsibilities; (2) to support fishing opportunities to the states of Oregon, Washington, and Idaho; and (3) to work collaboratively with co-managers to protect and conserve ESA-listed and non-listed species.

The Services have an obligation to administer the provisions of the ESA and to protect ESA-listed species. They also have a Federal trust responsibility to the treaty Indian tribes, as well as a duty to support the fishing rights reserved in their treaties as defined by the Federal courts. Thus, the Services seek to harmonize the effects of fishery programs with the provision for tribal harvest. Because of the Federal government's trust responsibility to the tribes, the Services are committed to considering the tribal co-managers' judgment and expertise regarding conservation of trust resources.

What is the purpose of this Environmental Impact Statement (EIS)?

The National Marine Fisheries Service has prepared this EIS under the National Environmental Policy Act (NEPA) to inform the decision to sign the new management agreement. The Fish and Wildlife Service and the Bureau of Indian Affairs, also signatories of the management agreement, are cooperating agencies on this EIS.

[1] While this term is defined in the glossary using the ESA definition, readers must understand that it includes fishing and hatchery use.

What is a harvest policy?

Harvest policies provide a framework designed to inform how to achieve the appropriate balance between harvest and conservation objectives. *Harvest* provides the benefits of catch including those related to treaty rights; *conservation* seeks to keep healthy stocks healthy and rebuild weak stocks so that all are sustained and can provide for the ongoing benefits of harvest. *Harvest management measures* are the actions or tactics implemented to harvest consistent with the overarching policy selected. This EIS focuses on the harvest policy alternatives and their effects on the environment.

What options do harvest policy makers have in setting harvest policy?

Policies depend on the availability of specific kinds of information. For example, abundance based management requires the availability of preseason or inseason abundance estimates; an effort based policy does not. Policy choices for a fishery directed at a single stock near the spawning grounds may be different than a fishery directed at a mix of many stocks in the ocean or mainstem Columbia River. Harvest policies for healthy and abundant stocks may be different than for a depressed stock that needs rebuilding. Specific options are addressed under each alternative analyzed in this EIS.

What alternatives are analyzed in this EIS?

This EIS analyzes six alternatives for setting harvest policies:

Alternative 1—Extension of current agreement, meaning status quo harvest policies, for the next 10 years consistent with the terms of the 2008–2017 agreement. The new agreement would use a blend of harvest policies, including a blend of abundance-based management, escapement-based management, and harvest rate management. The blend depends on the specific salmon or steelhead stock. This alternative recognizes that the stocks have varying conservation requirements, with some providing abundant opportunity for harvest, and others requiring more protection from harvest encounters at this time. This is not "no action" in the NEPA sense, because Federal action is required (signing of a new agreement) to extend the status quo harvest policies.

Alternative 2—Abundance-based Management. This alternative establishes harvest levels based on the status of the fish stocks. It provides more protection when the abundance of a given stock is low and the conservation need greatest, and more harvest opportunity when abundance is high.

Alternative 3—Fixed Harvest Rate. This alternative uses a fixed harvest rate management

framework that would apply a fixed harvest rate to each fishery regardless of abundance. Harvest rate refers to the ratio of fishery related mortality for a group of fish over its abundance in a defined period of time.

Alternative 4—Escapement-based Management. This alternative uses an escapement-based management framework. Escapement refers to the number of fish surviving (escaping from) a given fishery at the end of the fishing season and reaching a specified location where the fish can be enumerated. In cases where the projected run size is below the escapement goal, escapement goal harvest policies are sometimes coupled with a *de minimis* level of harvest opportunity to meet minimal needs for tribal fisheries and limited access to other harvestable stocks.

Alternative 5—Voluntary Fishery curtailment. Under this alternative, the sovereign Parties voluntarily curtail harvest activities for an extended period of time. This alternative may include some very limited treaty fishing opportunity to meet base ceremonial needs of the tribes. The parties may adopt a voluntary extreme harvest curtailment policy when the continued viability of the stocks are at imminent risk. This alternative does not meet the purpose and need for the action insofar as it does not provide for meaningful tribal harvest as guaranteed by Treaty and it provides no opportunity for non-treaty harvest. This alternative provides the benchmark required by NEPA in that it represents the alternative with the lowest fishing harvest

Alternative 6—No Action - Uncoordinated Harvest. Under this alternative, the existing agreement would expire without a new agreement. While it is uncertain what would transpire under this situation, NMFS anticipates that the state and tribal parties would implement harvest independently according to their own uncoordinated interpretations. Theoretically, state and or tribal parties may choose to curtail harvest entirely. Alternative 5 represents the analysis of that result. On the other hand, it is more likely that the parties' interpretation results in a level of harvest that would be very high, likely exceeding the highest historic harvest rates observed. Alternative 4 represents the analysis of that result. This alternative does not meet the purpose and need for the Proposed Action in that it does not meet the requirements of Federal parties to act in accord with other legal requirements such as the ESA or the Federal trust responsibility. This alternative provides the "no-action" alternative benchmark in that it represents the alternative of the Federal agencies doing nothing (not signing an agreement).

What environmental resources are analyzed in this EIS?

Resources that may be affected by the Proposed Action and that are analyzed in the EIS are fish, marine-derived nutrients, wildlife, economics, cultural resources, and environmental justice. These resources were identified during the public scoping period. This scoping period was initiated with a Notice of Intent to prepare a draft EIS (NOI) that was published in the Federal Register on July 1, 2016 (81 Fed. Reg. 43187). This NOI announced a 30-day public comment period (July 1, 2016 to August 1, 2016) to gather information on the scope of the issues and the range of alternatives to be analyzed in the EIS.

Why are other resources not analyzed in this EIS?

The Proposed Action would not change measures or strategies that are used to implement harvest policy. These include fishing gear, locations, and timing. These are established by the states and the Indian tribes; not by the Federal government. The proposed action is therefore limited in scope—it would not affect all environmental components of the Columbia River Basin. It does not include any form of construction or demolition to bridges, dams, hydroelectric facilities, or other related infrastructure. No effects are expected on the physical environment, habitat, ecosystem component species, or environmental resources such as air quality, water quality (other than marine-derived nutrients), or sedimentation. No effects are expected on river transportation, river navigation, or historical properties (Section 106 of the National Historic Preservation Act).

Which fish stocks are included in the analyses?

Fisheries target particular groups of fish, referred to as "stocks". Stocks targeted specifically for harvest are known as *Harvest Indicator Stocks*. Fisheries may also incidentally catch ESA—listed species, which are known as *Abundance Indicator Stocks*. Harvest Indicator Stocks are the "Management Units" of the *US v Oregon* management agreement and most have subcomponents that include ESA-listed stock.

The following *Harvest Indicator Stocks* are analyzed in the EIS: Upriver spring Chinook salmon, Upper Columbia Chinook salmon, Upriver sockeye salmon, Upriver fall Chinook salmon, and Snake River B-Index steelhead. The *Abundance Indicator Stocks (ESA-listed)* that are analyzed in the EIS are the natural-origin Snake River spring/summer Chinook salmon and natural-origin UCR spring Chinook salmon (part of the Upriver spring Chinook salmon *Harvest Indicator Stock*), Snake River sockeye salmon (part of the Upriver sockeye salmon *Harvest Indicator Stock*), natural-origin Snake River fall Chinook salmon (part of the Upriver fall Chinook salmon *Harvest Indicator Stock*) and natural-origin Snake River B-Index (part of the Snake River B-Index steelhead *Harvest Indicator Stock*). The Upper Columbia summer Chinook salmon *Harvest Indicator Stock* does not include any *Abundance Indicator Stock* components.

What are the results of the analyses? What are the environmental consequences of each alternative? Which alternative is better?

Table ES-1 presents a comparison of each alternative. The effects on each resource analyzed are described below.

Salmonids

Fisheries impact the environment by killing target species and thereby reducing fish abundance and spawning potential. Implementing a new *US v Oregon* management agreement will result in the removal of salmonids from the environment for commercial, recreational, or ceremonial and subsistence (C&S) consumption. Reducing fish abundance, and subsequent spawning population potential, can lead to impacts of population parameters. At levels of high fish removal an originally stable, mature and efficient ecosystem might be deprived of nutrient input that results in the ecosystem becoming immature and stressed. This happens in various ways. By targeting and reducing the abundance of high-value predators, fisheries modify the trophic chain and the flows of biomass (and energy) across the ecosystem as well as remove the nutrients from the system that are contained within the fish carcasses themselves.

Each harvest policy analyzed in this EIS results in a rate at which fish may be harvested. The direct inverse result of each harvest rate is a rate at which those fish are not harvested, and instead are able to escape past the fisheries and potentially return to the spawning grounds to spawn (e.g., if a harvest rate was 40%, then the subsequent escapement rate would be roughly 60% of any particular run size). Therefore, the essential elements of each alternative analyzed are the harvest rates and escapement totals. These will vary based on the alternative and the projected fish run sizes, which fluctuate due to external factors. The sections that follow (4.1.1.1 through 4.1.1.5) describe the impacts of the alternatives on each indicator stock. Section 4.2 compares these impacts of each alternative relative to no action conditions and the other alternatives for each indicator stock.

The effects of Alternative 1 and Alternative 2 on natural-origin Upper Columbia River spring Chinook salmon, natural-origin Snake River spring/summer Chinook salmon, natural-origin Snake River fall Chinook salmon, and natural-origin Snake River steelhead would not impact the status quo conditions. The effects of Alternative 3 on these same resources is nearly indistinguishable from those of Alternative 1 and Alternative 2, but generally provides a slight positive impact to spawning escapement. Alternative 4 and Alternative 6 have the greatest effects (largest harvest) on all affected salmonid species, especially for Snake River fall Chinook salmon, natural-origin Snake River spring/summer Chinook salmon, Upper Columbia River Chinook salmon, Snake River sockeye salmon and natural-origin Snake River steelhead.

Only for Upper Columbia summer Chinook salmon are the effects of Alternative 4 or Alternative 6 lower than for Alternatives 1, 2, and 3. This results in a high negative impact to spawning escapement for these two alternatives across all stocks. Alternative 5 has the lowest harvest impacts on all salmonid species because it involves voluntary curtailment of harvest (other than limited C&S harvest), and therefore provides a positive impact to spawning escapement across all stocks.

Alternative 5, however, would likely result in escapement of larger numbers of hatchery-origin adults, leading to potential negative effects from elevated levels of hatchery-origin fish spawning. These negative effects result from the high levels of unharvested hatchery fish ending up on natural spawning grounds and competing with and reproductively interacting with natural-origin (wild) fish of the same species/run. None of the alternatives, not even Alternative 5, meet the escapement goal for Snake River Sockeye salmon because of the depleted nature of the stock.

ESA-Listed Non-Salmonids

The total past and expected annual take of ESA-listed green sturgeon associated with *US v Oregon* fisheries was very low (0 to 14 fish annually). Therefore, the effect on green sturgeon would not change across any of the alternatives. There is no discernable effect on bycatch of bull trout or eulachon during salmon or steelhead fisheries under any of the alternatives.

Other Non-Salmonids (non ESA--listed Fish Species)

The *US v Oregon* agreement has not and would not specify harvest specifications for white sturgeon, American shad, Pacific lamprey and walleye. Instead, fisheries for these species are mentioned in the agreement because very small levels of salmon or steelhead bycatch might occur in fisheries targeting these species. The direct effects of salmon and steelhead fishing on these species are minor and do not meaningfully vary across alternatives.

Water Quality and Quantity — Hatchery Effects and Marine-derived Nutrients

Hatcheries can produce effluent (discharged water that has been used in the facility) with elevated temperature, as well as elevated levels of: ammonia, organic nitrogen, total phosphorus, biochemical oxygen demand (BOD), pH, and solids; as well as levels of chemicals used for disease treatment and disinfection. While this EIS stands separate from the Mitchell Act EIS, it incorporates data, analyses, and conclusions from the Mitchell Act EIS, as appropriate, and the impacts on these resources were disclosed in that EIS.

Anadromous species such as salmon and steelhead are important components of the freshwater

ecosystem, particularly for their role in transporting nutrients upstream from the marine ecosystem. Under Alternatives 1, 2, 3, 4, and 6 there will be a decrease in nutrients transported upstream, although the difference between these alternatives is negligible. By comparison, Alternative 5 would lead to an immediate positive effect and improvement over time relative to the other alternatives as there would be more marine derived nutrients deposited throughout the Columbia River basin.

Wildlife

Seabirds, raptors, and other piscivorous birds prey on salmonids. Seabirds do not prey on adult salmon and no alternative examined were expected to impact seabirds. Raptors, corvids, and numerous species of gulls prey on returning adult salmonids, primarily post-spawn adults.

Alternative 1 and Alternative 2 would have no impact change relative to status quo levels of adults available as prey to these birds. Alternative 3 would have a slightly positive impact as its average harvest is lower than that of Alternatives 1 and 2, thereby providing a larger number of prey items available. Alternative 4 and Alternative 6, with the largest harvest, would have the most noticeable negative impact on these birds by removing the largest numbers of available prey items. Alternative 5 would offer the most adult salmonids as prey since most fish would not be harvested en route to the spawning grounds, thereby providing a positive impact. This alternative would maximize post-spawn adults as a food source.

Marine mammals, especially seals and sea lions, prey on the adult salmonids that are also targets of the fisheries. Alternative 1 and Alternative 2 would have a negative effect on these marine mammals through reduction in adult fish available as prey via harvest removals, while Alternative 3 would have a slightly lower negative effect as it would have a lower average harvest. Alternative 4 and Alternative 6, with the largest harvest, would have the most noticeable negative effect on these marine mammals, as they remove the largest number of adults. Alternative 5 would offer the most adult salmonids as prey since fishing would be largely curtailed.

There is no discernable difference between the alternatives on the effect to Southern Resident Killer Whales (SRKW) as any salmonids returning to the Columbia River would have already passed through whale's ocean habitat. Furthermore, any increase in escapement of adult fish to terminal spawning areas does not always translate into an increase in juvenile salmonids because the capacity limit of the current spawning habitat does not allow for increased juvenile production at higher escapement numbers. Moreover, because *US v. Oregon* fisheries primarily target hatchery fish and hatchery production levels are independent of harvest levels, this action is not expected to substantially alter the number of adult salmon available to SRKW.

Economics

The economic analysis focuses on analyzing effects related to commercial and recreational fishing activity directed at the five harvest indicator stocks. Under existing conditions (2016 prices and recent historic average catch), there is a moderate positive effect on the value to tribal and non-tribal commercial fishers, non-tribal recreational fishers, employment, and personal income contribution to the regional and local economy. Harvest and primary processing of salmon caught in tribal and non-tribal commercial fisheries is estimated to generate $16.2 million in personal income and 419 Full-time Equivalent (FTE) jobs. Recreational fishing activities targeting salmon and steelhead would generate an estimated $27.9 million in personal income and 672 jobs.

Alternative 1 would continue to maintain this moderate positive effect. By comparison, because of the change in harvest levels based on different harvest policies, Alternative 2 would have a lower positive effect and Alternative 3 a low negative effect. Alternative 4 and Alternative 6, with more aggressive fishing policy would result in a high positive effect, while Alternative 5, with curtailed fishing, would yield a high negative economic effect.

Cultural Resources

Ceremonial and Subsistence (C&S) harvest is a priority for Indian tribes and any deficit in the harvest is taken from tribal commercial harvest. Under Alternatives 1, 2, and 3, Indian tribes in the project area would be able to continue their C&S harvest without substantial changes to tribal cultural viability. However, the effects of Alternative 4 and Alternative 6 would be negative. Under these two alternatives, the minimum C&S harvest in years with low runs may not be sufficient to meet C&S needs in years with low runs, thereby either directly negatively affecting the tribal cultural viability, or, more likely, reducing the available commercial harvest. Alternative 5 would result in a high negative effect as the C&S harvest would be largely curtailed.

Are there any Environmental Justice effects?

Each alternative was evaluated to determine whether it resulted in a disproportionate adverse effect on environmental justice communities. The analysis found that Alternatives 4, 5, and 6 would result in a disproportionate adverse effect on cultural resources for Indian Tribes as it pertains to C&S fisheries. Alternatives 1, 2, and 3 would not have a disproportionate adverse effect on either cultural resources or economics for Indian Tribes. Alternative 4 and Alternative 6 would also result in a disproportionate adverse economic effect on Indian tribes. Note that Alternative 5, although it largely curtails fishing, equally negatively affects Indian tribes and non-tribes as it pertains to economics and is therefore not disproportionate.

What are the cumulative impacts of the alternatives?

The affected environment in the project area faces a number of challenges. For example, development, habitat destruction, hydropower, and climate change will continue to negatively impact the physical and biological resources in the project area. On the other hand, habitat restoration projects in the area positively influence those resources. Effects from hatcheries have a mix of positive and negative impacts.

The direct effects of a harvest policy to the affected environment vary across alternatives (Table ES-2). For example, Alternative 5 (Voluntary Curtailed Fishing), in the absence of cumulative effects, would result in positive effects on the fish species, prey for birds, and marine-derived nutrients. The other alternatives all result in varying degrees of negative direct effects in that they all harvest fish (Table ES-2) Therefore, the adverse effects of Alternatives 1, 2, and 3 would be greater than Alternative 5 when combined with the net negative effects of non-harvest actions. By comparison, the cumulative adverse effects of Alternatives 4 and 6, with their high harvest rates, would be the greatest when compared to Alternatives 1, 2, 3 and 5. In the context of the cumulative impacts the absence of fishing, Alternative 5 (Voluntary Curtailed Fishing), has a direct effect that's positive on salmonids and steelhead but the indirect effects caused by interaction of hatchery-origin and natural-origin populations is a net negative cumulative effect. This indicates that hatchery effects from hatchery-origin on natural-origin populations are mitigated by harvest and overall that cumulative effects attributable to any harvest alternative by themselves are therefore minor (ES-2).

Alternatives 1, 2, 3, 4, and 6 all have a net positive effect on economics. On the other hand, the adverse effects from non-harvest actions in the area result in fewer fish. Therefore, these non-harvest actions diminish the positive cumulative effects of Alternatives 1, 2, 3, 4, and 6 on economics (commercial, recreational, and regional or local economic impacts). As there is no economic impact of Alternative 5 on the fisheries, there is no effect based on cumulative impacts.

The negative cumulative effects on cultural resources (C&S) are exacerbated proportionally to the cumulative decrease in fish stock that results from other actions in the project area.

Under environmental justice, the cumulative disproportionate adverse effects on cultural resources (Alternatives 4, 5, and 6) as well as economics (Alternatives 4 and 6) as it pertains to the Indian tribes does not change when effects of past, present, and reasonably foreseeable future actions are considered. These effects remain cumulatively disproportionate.

What about hatcheries?

Yes, signing a new *US v Oregon* agreement that references levels of hatchery production supporting harvest requires the federal agencies to be informed of the effects of this hatchery production on the environment. NMFS has completed an EIS on Columbia River Hatchery Operations (Final EIS to Inform Columbia River Basin Hatchery Operations and the Funding of Mitchell Act Hatchery Programs (NMFS 2014b). The Mitchell Act EIS analyzed the impacts of Basin-wide, alternative hatchery policies and resulting production levels. Therefore, NMFS will use the Mitchell Act EIS, and the analysis contained therein, where appropriate, to inform the hatchery-related effects of the harvest management alternatives analyzed in this EIS.

The existing 2008-2017 *US v Oregon* agreement includes hatchery programs that produce fish. The agreement describes the number of fish to be released, life-history of release, release location, hatchery rearing facilities, entity(s) that manages the program(s), and the responsible funding entity(s). Some of these fish are subsequently harvested in the fisheries that fall under the Agreement's management framework. Therefore, the hatcheries are included in the Agreement both as a measure to formalize the Parties' expectations regarding production of hatchery fish for harvest above Bonneville Dam and to identify hatchery programs that are important to the conservation of salmon or steelhead runs above Bonneville Dam.

Hatcheries augment fisheries by increasing certain stock abundances, including both ESA-listed and non-listed stocks. Certain fisheries would be able to continue without hatchery production, because these fisheries target non-listed stocks of relatively healthy natural-origin fish. In the absence of hatcheries, these fisheries would operate at different levels based solely on the abundance of natural-origin fish. Therefore, while this EIS stands separate from the Mitchell Act EIS, it incorporates data, analyses, and conclusions from the Mitchell Act EIS as appropriate.

Which harvest framework or policy will the Management Agreement incorporate?

The final harvest framework will depend on a number of factors that include, but are not limited to, the public's input to this EIS, the ongoing negotiations between the Parties to *US v Oregon*, and the consultations that are required under the Endangered Species Act (ESA). These consultations lead to the publishing of a Biological Opinion and an Incidental Take Statement. Upon the completion of the NEPA and ESA processes, the decision makers will select the most appropriate harvest framework.

What is the timeframe for a decision?

Under the NEPA process, the public had 45 days after publication in the Federal Register to comment on the Draft EIS. NMFS extended the public comment period for an additional 15 days for a total of 60 days. All of the comments were reviewed, and the analyses and EIS were adjusted as needed, and we are now publishing our Final EIS. NMFS will complete a "Record of Decision" (ROD) that captures the outcome of both the NEPA and ESA processes 30 days after publication of the ROD.

Table ES – 1. Summary of Alternatives

Alternative		Meets Purpose & Need	Effects Compared to Status Quo								Environmental Justice	
			Harvest	Effects on ESU-listed salmonids		Water Quality	Raptors	Mammals	Economics	Cultural	Economics	Cultural
				US v Oregon Fishing Only	Cumulative Effect	Nutrients	Prey	Pinnipeds		C&S	Disproportionate Adverse Effect	
EIS Section	2.1	2.1	2.1	4.2	5.3.1	4.3	4.4.2	4.4.2	4.5	4.6	4.7.2	4.7.1
1	Extension	Yes	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No	No
2	Abundance-Based	Yes	No Change	No Change	No Change	No Change	No Change	No Change	Slight Negative	No Change	No	No
3	Fixed Harvest Rate	Yes	Slight Decrease (1)	Slight Positive	No Change	No Change	Slight Positive	Slight Positive	Negative	No Change	No	No
4	Escapement-Based	Yes	High (Aggressive)	High Negative (2)	High Negative	No Change	Negative	Negative	High Positive	Negative	Yes	Yes
5	Voluntary Fishing Curtailment	No	No Harvest	Positive	Negative	Positive	Positive	Positive	High Negative	High Negative	No	Yes
6	No-action. Uncoordinated Harvest	No	High (Aggressive)	High Negative (2)	High Negative	No Change	Negative	Negative	High Positive	Negative	Yes	Yes

(1) No change for Sockeye salmon

(2) Except Upper Columbia summer Chinook salmon for which the fishing effort is lower than the status quo resulting in a positive effect compared to the status quo.

There are no meaningful differences across the alternatives for resources analyzed in the EIS but not presented in the table above: ESA--listed non-salmonids, other non-salmonids that are not ESA-listed, and Southern Resident Killer Whales (SRKW).

Please note the following table presents the direct effects of each alternative on each resource. It differs from table ES-1 which compares the effects to the no action alternative.

Table ES – 2. Summary of Alternatives' effects.

Resource	Effects of Present Actions (Section 5.1)	Effects of Future Actions (Section 5.2)	Effects of Proposed Action (Sections 4.2-4.7)	Cumulative Effects (Section 5.3)	Contribution of Alternative to Cumulative Effects (Section 5.3)
Salmonids and Steelhead					
Alt 1	Mixed Positive and Negative (net negative)[1]	Mixed Positive and Negative (net negative)[1]	Negative	Negative	Meaningful
Alt 2					
Alt 3					
Alt 4			High Negative	High Negative	
Alt 5			Positive	Negative[2]	
Alt 6			High Negative	High Negative	
ESA Listed non-salmonids					
Alt 1	Mixed Positive and Negative	Mixed Positive and Negative (net negative)	Negligible	Negative	Minor
Alt 2					
Alt 3					
Alt 4					
Alt 5					
Alt 6					
Non-Salmonids (non-ESA-listed Fish)					
Alt 1	Mixed Positive and Negative	Mixed Positive and Negative (net negative)	Negligible	Negative	Minor
Alt 2					
Alt 3					
Alt 4					
Alt 5					
Alt 6					
Water Quality (Nutrients)					
Alt 1	Mixed Positive and Negative	Mixed Positive and Negative (net negative)	Negative	Negative	Minor
Alt 2					
Alt 3					
Alt 4					
Alt 5			Positive		Non Discernable
Alt 6			Negative		Minor
Raptors and other Piscivorous Birds[3]					
Alt 1	Mixed Positive and Negative	Mixed Positive and Negative (net negative)	Negative	Negative	Minor
Alt 2					
Alt 3					
Alt 4					
Alt 5			Positive		Non Discernable
Alt 6			Negative		Minor
Marine Mammals					
Alt 1	Negative	Low Negative	Negative	Negative	Minor
Alt 2					
Alt 3					
Alt 4					
Alt 5			Positive		Non Discernable
Alt 6			Negative		Minor

Resource	Effects of Present Actions (Section 5.1)	Effects of Future Actions (Section 5.2)	Effects of Proposed Action (Sections 4.2-4.7)	Cumulative Effects (Section 5.3)	Contribution of Alternative to Cumulative Effects (Section 5.3)
Economics[4]					
Alt 1	Mixed Positive and Negative (net negative)	Mixed Positive and Negative (net negative)	Positive	Less positive than Direct Effects	Meaningful
Alt 2			Low Positive		
Alt 3			Low Negative		
Alt 4			High Positive		
Alt 5			High Negative	High Negative	
Alt 6			High Positive	Less positive than Direct Effects	
Cultural Resources					
Alt 1	Mixed	Negative	Low Positive	Low Positive	Meaningful
Alt 2					
Alt 3					
Alt 4					
Alt 5			High Negative	High Negative	Meaningful
Alt 6			Low Positive	Low Positive	Meaningful
Environmental Justice					
Alt 1	Some disproportionate effects depending on the action and resource		Not Dispr.	Not Dispr.	Non discernible
Alt 2					
Alt 3					
Alt 4			Dispr. Economic & Cultural	Dispr. Economic & Cultural	Primary
Alt 5			Dispr. Cultural	Dispr. Cultural	Primary
Alt 6			Dispr. Economic & Cultural	Dispr. Economic & Cultural	Primary

Dispr. Disproportionate adverse effect

1. As described in Section 5.3.1.1, the net effect of past, present, and reasonably foreseeable future actions is negative, despite the positive effects of habitat restoration. The net effects on other resources in the table (water quality nutrients, prey for wildlife, economics) follow from the net effect on salmonids and steelhead.
2. While the direct effect is positive on salmonids and steelhead due to a curtailment of fishing, the indirect effects caused by interaction of hatchery-origin and natural-origin populations as described in Section 5.3.1.1 result in a net negative cumulative effect.
3. Overall seabirds will continue to be affected by other development in the basin but no additional impacts will be added by the alternatives as described in Section 5.3.3.1.
4. For a summary of economic effects of the proposed action, see Table 4-66.

SUMMARY OF CHANGES FROM DRAFT EIS TO FINAL EIS

This final EIS incorporates revisions to the document based on comments submitted during the public review period and the identification of a preferred alternative. Below is a summary of changes made to the document.

1. Preferred Alternative. NMFS has identified Alternative 1, Extension of Current Agreement, as the Preferred Alternative for this FEIS. As described in Chapter 2, the choice of harvest policies depend on the stock and fishery. The harvest policies considered in the EIS are designed to explore options for achieving the appropriate balance between harvest and conservation objectives. Therefore, NMFS believes that the most appropriate balance between harvest and conservation objectives, accounting for the status of the affected stocks and nature of available information, would require a blend of harvest policies including applications of abundance-based management, escapement-based management, and harvest rate management. This blend of harvest policies can be found in Alternative 1.
2. Terminology. The terminology used in the final EIS is updated for consistency throughout the document (e.g., Project Area, fishing vs. harvest). All key terms used for the final EIS are described in the Glossary of Key Terms.
3. Response to draft EIS Comments. Additional information and/or corrections are made in this final EIS to respond to draft EIS public comments. Comments and NMFS' responses to comments are provided in a new appendix (Appendix C).
4. Clarified the integration of past, present, and reasonably foreseeable future actions in the Cumulative Impacts section and added a new Cumulative Impacts table in the Executive Summary.
5. Grammatical, Numerical, and Editing Changes. Grammatical, numerical, and editing errors have been corrected where observed.
6. Change from draft EIS to final EIS. Where applicable, language pertinent to the draft EIS is revised to represent the final EIS.
7. Added numerical value consistency to tables throughout the final EIS.

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ACRONYMS

BIA	Bureau of Indian Affairs
BPH	Bonneville Pool Hatchery
BOR	Bureau of Reclamation
BPA	Bonneville Power Administration
BUB	Bonneville Upriver Bright
C&S	Ceremonial and Subsistence fisheries
CEQ	Council for Environmental Quality
CFR	Code of Federal Regulations
CRFMP	Columbia River Fish Management Plan
DAO	Departmental Administrative Order
DEIS	Draft Environmental Impact Statement
DOC	Department of Commerce
DPS	Distinct Population Segment
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EJ	Environmental Justice
EO	Executive Order
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit (a term used by NMFS))
FCRPS	Federal Columbia River Power System
FEIS	Final Environmental Impact Statement
FR	Federal Register
FTE	Full-time Equivalent Job
HR	Harvest Rate
ITS	Incidental Take Statement
LCR	Lower Columbia River
MBTA	Migratory Bird Treaty Act
MMPA	Marine Mammal Protection Act
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MSF	Mark-selective fishery
NAO	NOAA Administrative Order
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
ODFW	Oregon Department of Fish and Wildlife
PFMC	Pacific Fishery Management Council
PUB	Pool Upriver Bright
PUD	Public Utility District
RIS	Rock Island Dam
RM	River mile
ROD	Record of Decision
SAFE	Select Area Fisheries Enhancement Commercial Fisheries
SMU	Species Management Unit. A term used by ODFW
SRKW	Southern Resident Killer Whale
SR	Snake River
SST	Sea Surface Temperature
TAC	*U.S. v Oregon* Technical Advisory Committee *U.S. v Oregon*
UCR	Upper Columbia River
URB	Upriver Bright
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
UWR	Upper Willamette River
WDFW	Washington Department of Fish and Wildlife

GLOSSARY OF KEY TERMS

- Abundance: Generally, the number of fish in a defined area or unit. It is also one of four parameters used to describe the viability of natural-origin fish populations (McElhany et al. 2000).
- Abundance Indicator Stock: See stock.
- Adipose fin: A small fleshy fin with no rays, located between the dorsal and caudal fins of salmon and steelhead. The adipose fin is often "clipped" on hatchery-origin fish so they can be differentiated from natural-origin fish.
- Anadromous: A term used to describe fish that hatch and rear in freshwater, migrate to the ocean to grow and mature, and return to freshwater to spawn.
- Analysis area: Within this Environmental Impact Statement (EIS), the analysis area is the geographic extent that is being evaluated for each resource. See also Project area.
- Bycatch: Species killed when fishing operations unintentionally catch or discard non-target species, potentially causing unobserved injury and mortality.
- Commercial harvest: The activity of catching fish for commercial profit.
- Conservation: Used generally in the EIS as the act or instance of conserving or keeping fish resources from change, loss, or injury, and leading to their protection and preservation. This contrasts with the definition under the United States Endangered Species Act (ESA), which refers to use and the use of all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to the ESA are no longer necessary.
- Critical habitat: A specific term and designation within the ESA,, referring to habitat area essential to the conservation of a listed species, though the area need not actually be occupied by the species at the time it is designated.
- Distinct Population Segment (DPS): Under the ESA,, the term "species" includes any subspecies of fish or wildlife or plants, and any "Distinct Population Segment" of any species or vertebrate fish or wildlife that interbreeds when mature. The ESA thus considers a DPS of vertebrates to be a "species." The ESA does not however establish how distinctness should be determined. Under NMFS policy for Pacific salmon, a population or group of populations will be considered a DPS if it represents an Evolutionarily Significant Unit (ESU) of the biological species. In contrast to salmon, NMFS lists steelhead runs under the joint NMFS-U.S. Fish and Wildlife Service (USFWS)) Policy for recognizing DPSs (DPS Policy: 61 Fed. Reg. 4722, February 7, 1996). This policy adopts criteria similar to those in the ESU policy, but applies to a broader range of animals to include all vertebrates.
- Diversity: Variation at the level of individual genes (polymorphism); provides a mechanism for populations to adapt to their ever-changing environment. It is also one of the four parameters used to describe the viability of natural-origin fish populations (McElhany et al. 2000).
- Emigration: The downstream migration of salmon and steelhead toward the ocean.
- Endangered species: As defined in the ESA, any species that is in danger of extinction throughout all or a significant portion of its range.
- Escapement: Adult salmon and steelhead that survive fisheries and natural mortality, and return to spawn.
- Estuary: The area where fresh water of a river meets and mixes with the salt water of the ocean.
- Ex-vessel value: The price (income) that fishermen receive for the fish "at the dock."
- Evolutionarily Significant Unit (ESU): A concept NMFS uses to identify Distinct Population Segmentss of Pacific salmon (but not steelhead) under the ESA. An ESU is a population or group of populations of Pacific salmon that 1) is substantially reproductively isolated from other populations, and 2) contributes substantially to the evolutionary legacy of the biological species. See also Distinct Population Segment (pertaining to steelhead).
- Fishery: Harvest under a specific jurisdiction in a specific geographical area during a specific

period of time.

- Habitat: The physical, biological, and chemical characteristics of a specific unit of the environment occupied by a specific plant or animal; the place where an organism naturally lives.
- Harvest Indicator Stock: See stock
- Harvest Rate: The ratio of fishery related mortality for a group of fish over its abundance in a defined period of time.
- Harvest Rate Limits: The total allowable harvest rate for a species or stock that may be taken during a period of time.
- Incidental fishing effects: Fish, marine birds, or mammals unintentionally captured during fisheries using any of a variety of gear types.
- Interdam Loss: The loss in fish stocks between the mouth of the river and the last upstream counting station, independent of fishing. This represents mortality due to (1) natural mortality; (2) fish turnoff to mainstem tributaries; (3) mortality caused by hydro operations through impoundment of water, inundation of habitat, alteration of sediment transport, and hampering of passage conditions both upstream and downstream; and (4) other forms of habitat degradation. The number is based on estimates developed by the *US v Oregon* TAC.
- Limiting Stock: One that constrains harvest during a season, by being the lowest in abundance and therefore restricting access to more abundant stocks and limiting total catch.
- Listed Species: Under the ESA, species may be listed as either endangered or threatened. All species of plants and animals, except pest insects, are eligible for listing as endangered or threatened. "Endangered" means a species is in danger of extinction throughout all or a significant portion of its range. "Threatened" means a species is likely to become endangered within the foreseeable future. For the purposes of the ESA, Congress defined species to include subspecies, varieties, and, for vertebrates, distinct population segments.
- Native fish: Fish that are endemic to or limited to a specific region.
- Natural-origin: A term used to describe fish that are offspring of parents that spawned in the natural environment rather than the hatchery environment, unless specifically explained otherwise in the text. "Naturally spawning" and similar terms refer to fish spawning in the natural environment.
- Population: A group of fish of the same species that spawns in a particular locality at a particular season and does not interbreed substantially with fish from any other group.
- Productivity: The rate at which a population is able to produce reproductive offspring. It is one of the four parameters used to describe the viability of natural-origin fish populations (McElhany et al. 2000).
- Project Area: The project area is the geographic area where the Proposed Action would take place. See Section 1.3 for details.
- Recovery: Defined in the ESA as the process by which the decline of an endangered or threatened species is stopped or reversed, or threats to its survival neutralized so that its long-term survival in the wild can be ensured, and it can be removed from the list of threatened and endangered species.
- Recovery plan: Under the ESA, a formal plan from NMFS (for listed salmon and steelhead) outlining the goals and objectives, management actions, likely costs, and estimated timeline to recover the listed species.
- Recreational harvest: The activity of catching fish for non-commercial reasons (e.g., sport or recreation).
- Run: The migration of salmon or steelhead from the ocean to freshwater to spawn. Defined by the season they return as adults to the mouths of their home rivers.
- Run size: The number of adult salmon or steelhead (i.e., harvest plus escapement from fisheries) returning to their natal areas.
- Salmonid: A fish of the taxonomic family Salmonidae, which includes salmon, steelhead, and trout.

- Section 7 consultation: Federal agency consultation with NMFS or USFWS (dependent on agency jurisdiction) on any actions that may affect listed species, as required under section 7 of the ESA.
- Stock: A group of fish of the same species that spawns in a particular lake or stream (or portion thereof) at a particular season and which, to a substantial degree, does not interbreed with fish from any other group spawning in a different place or in the same place in a different season.
    - Abundance Indicator Stock: Stocks that provide detailed information about natural-origin populations. Abundance Indicator Stocks are equivalent to the ESA-listed "units" (DPS or ESU) affected by *US v Oregon* fisheries.
    - Harvest Indicator Stock: Stocks that are the target of fisheries. These may include one or more Abundance Indicator Stocks.
- Take: Under the ESA, the term "take" means to "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct."
- Threat: A human action or natural event that causes or contributes to limiting factors; threats may be caused by past, present, or future actions or events.
- Threatened species: As defined by Section 4 of the ESA, any species that is likely to become endangered within the foreseeable future throughout all or a significant portion of its range.
- Tributary: A stream or river that flows into a larger stream or river.
- Viability: As used in this EIS, a measure of the status of listed salmon and steelhead that uses four criteria: abundance, productivity, spatial distribution, and diversity.
- Viable salmonid population (VSP): An independent population of salmon or steelhead that has a negligible risk of extinction over a 100-year timeframe (McElhany et al. 2000).
- Watershed: An area of land where all of the water that is under it or drains off of it goes into the same place, e.g. Rogue River watershed or Umpqua River watershed.

Section 1

1. PURPOSE OF AND NEED FOR THE PROPOSED ACTION

1.1. Background

United States v. Oregon (*US v Oregon*) is the on-going Federal court proceeding first brought in 1968 by the United States, as trustee, to enforce the reserved fishing rights of the Confederated Tribes of the Warm Springs Reservation of Oregon, the Confederated Tribes of the Umatilla Indian Reservation, the Nez Perce Tribe, and the Confederated Tribes and Bands of the Yakama Nation. In the intervening decades, the courts have established several key principles. First, that the language of the treaties provided that the tribes retain the right to take fish at all usual and accustomed fishing places "in common with the citizens of the United States [or citizens of the territory]," reserved 50 percent of the harvestable fish destined for the tribes' traditional fishing places. Moreover, the courts in *US v. Oregon* held that the state may only regulate treaty fishing when reasonable and necessary for conservation, provided: reasonable regulation of non-Indian activities is insufficient to meet the conservation purpose, the regulations are the least restrictive possible, the regulations do not discriminate against Indians, and voluntary tribal measures are not adequate.

Fisheries in the Columbia River are managed subject to the holdings in *US v Oregon* and under the continuing jurisdiction of the Federal court. In the past, the Parties litigated fishing seasons and the court determined the final structure. In more recent years, the Parties have successfully negotiated a series of agreements setting harvest strategies and allocations. Those agreements have also included hatchery production, as well as harvest policies. The Columbia River Fish Management Plan provided a framework for management from 1988 through 1998, although certain provisions were modified during that time to address concerns related to the increasing number of ESA-listed species. After 1998, fisheries were managed through a series of short term agreements, the duration of which ranged from several months to five years.

The 2008-2017 *US v Oregon* Management Agreement, which provides the current framework for

managing fisheries and hatchery programs in much of the Columbia River Basin, expires December 31, 2017. Negotiations on a new management agreement are ongoing. The signatories to the *US v Oregon* management agreement are the State of Washington, the State of Oregon, the State of Idaho, the United States, the Shoshone-Bannock Tribes, the Confederated Tribes of the Warm Springs Reservation of Oregon, the Confederated Tribes of the Umatilla Indian Reservation, the Nez Perce Tribe, and the Confederated Tribes and Bands of the Yakama Nation, the latter four, hereinafter referred to as "the Columbia River Treaty Tribes," (collectively, the Parties). In reaching this agreement, the Parties stipulated that the purpose of the Management Agreement was to provide a framework within which the Parties could exercise their sovereign powers in a coordinated and systematic manner in order to protect, rebuild, and enhance upper Columbia River fish runs while providing harvests for both treaty Indian and non-treaty fisheries. Specifically, the Parties set forth the primary goals of the agreement, which were to rebuild weak runs to full productivity and fairly share the harvest of upper river runs between treaty Indian and non-treaty fisheries in the ocean and Columbia River Basin. The Parties identified habitat protection, enhancement, and artificial production techniques as well as harvest management as tools they would use to ensure that Columbia River fish runs continue to provide a broad range of benefits in perpetuity.

The Federal parties to the management agreement have specific responsibilities for aspects of the agreement related, for example, treaty trust responsibilities, a duty to support the fishing rights in the treaties, to certain production programs, and implementation of the Endangered Species Act (ESA). The NMFS prepared this Environmental Impact Statement (EIS) under the National Environmental Policy Act (NEPA) to inform the decision to sign the new management agreement and issuance of an ITS under ESA. The FWS and BIA, also parties to the agreement, are cooperating agencies on this EIS.

The existing agreement includes, and the new agreement would include, both a list of treaty Indian and non-treaty fisheries and a list of hatchery programs in the Columbia River Basin. The management agreement provides a harvest framework via species specific harvest policies to keep healthy stocks healthy and rebuild weak stocks, and fairly share the harvest of upper river runs between treaty Indian and non-treaty fisheries. It also includes a hatchery production component with stipulated production levels, to provide harvest opportunities and the hatchery operations aspect is not authorized by the *US v Oregon* agreement and those production levels could move forward even without their inclusion in the agreement.

The harvest policies analyzed in this EIS are independent of site-specific production levels at the hatcheries. The hatchery programs included in the agreement are the product of many processes and actions occur outside the *US v Oregon* agreement, such as: Mitigation and licensing agreements for dam

operations, as well as environmental reviews under the ESA, which review and analyze the hatchery programs at site specific levels. However, because this agreement establishes the Parties' target artificial production levels, a review of the impacts from a comprehensive level of the total hatchery production referenced in the agreement is necessary to evaluate the impacts of including all of the hatchery programs collectively in the agreement. NMFS has completed an EIS and issued a Record of Decision on Columbia River Hatchery Operations (Final EIS to Inform Columbia River Basin Hatchery Operations and the Funding of Mitchell Act Hatchery Programs (NMFS 2014b); hereafter, the Mitchell Act EIS). Applicable information from the Mitchell Act EIS analyzed the impacts of Basin-wide, alternative hatchery policies and the resulting Basin-wide production. In the analysis that follows, we incorporate by reference applicable sections of the Mitchell Act EIS and summarize the relevant conclusions.

1.2. Description of the Proposed Action

The Proposed Action is for the Federal parties to sign the new management agreement, as negotiated by the Parties to *US v Oregon*, and for NMFS and FWS to issue an Incidental Take Statement (ITS) exempting take[2] of listed species pursuant to the implementation of the management agreement. This new management agreement would take effect after the current management agreement expires at the end of 2017. The management agreement accomplishes two primary objectives. First, it memorializes the harvest policies that the Parties have agreed should govern the amount of harvest. Second, the management agreement incorporates hatchery programs, developed individually at site specific locations that provide harvest and are important to the conservation of salmon or steelhead runs above Bonneville Dam.

1.3. Project and Analysis Areas

The project area is the geographic area where the Proposed Action would take place. It includes the Columbia River mainstem, the primary segment of the river as contrasted to tributary rivers that drain into it, from its mouth upstream to Wanapum Dam (river mile 415) and to the Idaho – Washington state boundary just upstream of Lower Granite Dam on the Snake River mainstem (Snake River river mile (RM) 107) (Figure 1-1). These mainstem Columbia and Snake River areas are where the *US v Oregon* Parties regulate fishing activities detailed in the *US v Oregon* Management Agreement in order to fairly share harvestable salmon and steelhead. Fishing activities, which are further detailed in Subsection 1.3.1, occur to varying degrees across the project area. These activities are generally grouped by seasonal time

[2] While this term is defined in the glossary using the ESA definition, readers must understand that it includes fishing and hatchery use.

frame, management jurisdiction and geography into separate "fisheries."

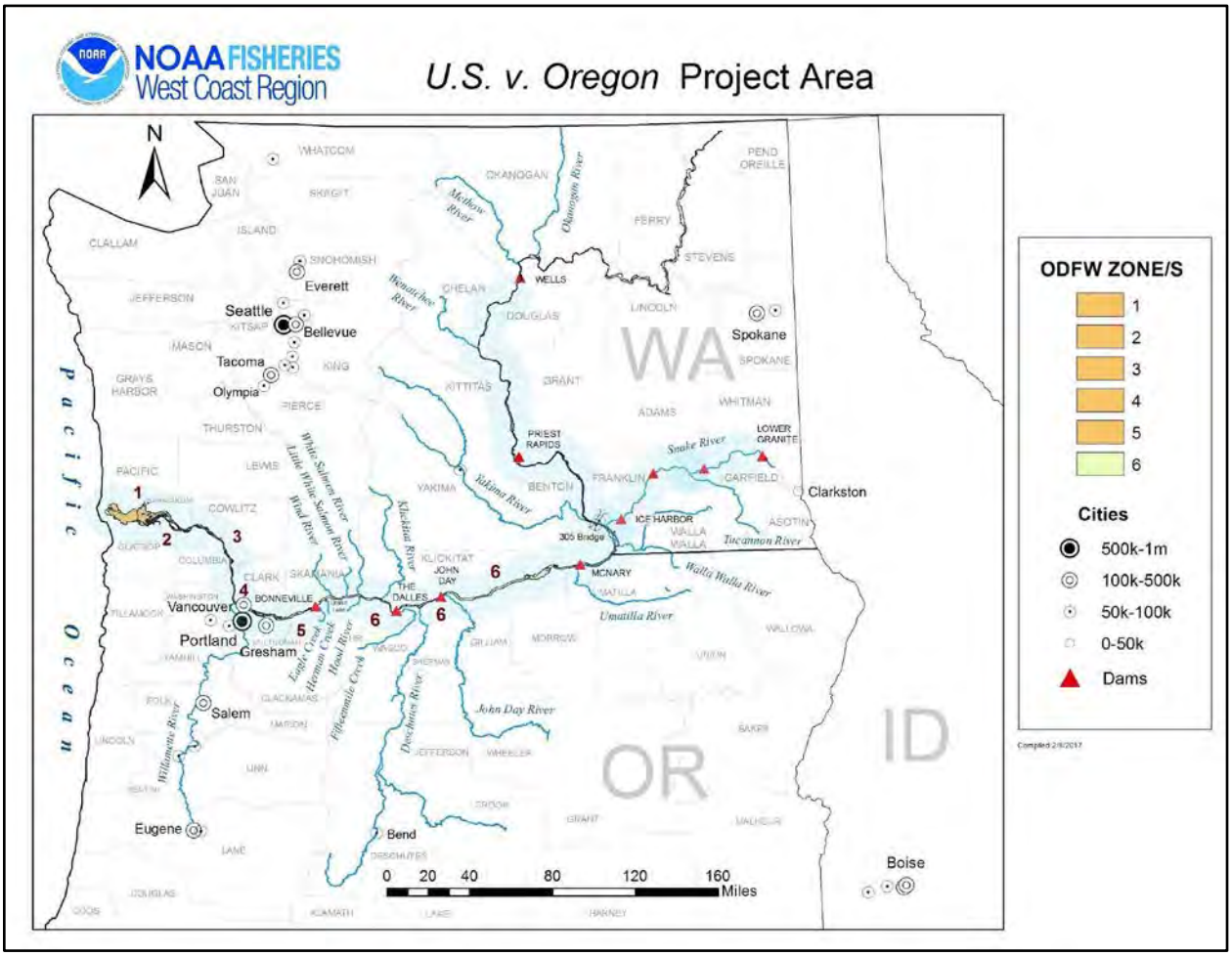

Figure 1-1. Project Area. (The states of Washington and Oregon have each adopted for statistical data-gathering, management of fisheries, and jurisdictional purposes, boundaries of areas where fisheries operate. Commercial fishery boundaries are referred to as "zones". *US v Oregon* Parties have, in general, adopted the Oregon boundary terminology and therefore we present the Oregon Department of Fish and Wildlife (ODFW) commercial fishery management zones here for general reference, as these geographical boundaries and terminology are used throughout this analysis.)

The analysis area is the geographic extent that is being evaluated for potential impacts under a particular resource and alternative. For some resources, the analysis area may be larger than the project area, since some of the effects of the alternatives may occur outside the project area. The Mitchell Act EIS utilized a larger project area because many of the hatchery facilities that it analyzed exist outside the geographic areas where the fisheries specified in the *US v Oregon* management agreement occur. As described in Subsection 1.3.2, hatchery activities, including the release of hatchery fish, also take place outside areas where these fisheries occur. This EIS examines the area where these fisheries and their effects occur.

1.3.1. Fisheries

Treaty Indian fisheries and non-treaty fisheries are considered in this EIS. Non-treaty fisheries are those that do not have a treaty guaranteeing a fishing right. These include all state fisheries and certain Indian fisheries operated by tribes that are not party to the *US v Oregon* agreement. Non-treaty fisheries consist of both commercial and recreational fisheries. Treaty Indian fisheries are guaranteed by one or more treaties. For purposes of this EIS, treaty Indian fisheries are limited to those conducted by Parties to the *US v Oregon* agreement. These fisheries include both commercial as well as ceremonial and subsistence (C&S) fisheries.

Fisheries target particular groups of fish, referred to as "stocks". The *US v Oregon* agreement establishes harvest management policies for fisheries in the project area directed at Upriver salmon and steelhead stocks. Stocks targeted specifically for harvest are known as *Harvest Indicator Stocks*. Fisheries may also incidentally catch ESA-listed species, which are known as *Abundance Indicator Stocks*. Harvest Indicator Stocks and Abundance Indicator Stocks are described in more detail in Subsection 3.2.1.

Historically, fisheries governed by the harvest policies have been managed within a winter/spring, summer, and fall season time frame, each referred to as a management period. These management periods are approximate; some fisheries are longer in duration and occur during more than one management period (See Table 1-1).

Table 1-1. Fisheries occurring in the project area during more than one management period.

Jurisdiction	Fishery Description	Target species	Location
Non-Treaty	Mainstem Recreational steelhead	Summer and winter steelhead	Mouth of Columbia (Buoy 10) upstream to Highway 395 Bridge near Pasco, WA
	Recreational fisheries in Select Areas	Select Area hatchery-origin spring Chinook, fall Chinook, and coho salmon	Off-channel areas near the mouth of the Columbia River (upstream of Buoy 10 area)
Treaty Indian	Ceremonial and Subsistence (C&S)	Salmon and steelhead	Project area

The winter/spring season extends from January 1 to June 15 (Table 1-2). During this management period fisheries in the mainstem Columbia River primarily target spring Chinook salmon stocks returning to the upper Columbia, the Willamette River, and lower Columbia River tributaries.

Table 1-2. Fisheries occurring in the project area during the winter/spring management period.

Fishery Management Period	Jurisdiction	Fishery Description	Target species	Location
Winter/Spring season (January 1 through June 15)	Non-Treaty	Commercial spring Chinook salmon	Spring Chinook salmon	Mouth of Columbia (Buoy 10) upstream to Bonneville Dam
		Commercial Fisheries in Select Areas	Select Area hatchery-origin spring Chinook, fall Chinook, and coho salmon	Off-channel areas near the mouth of the Columbia River (upstream of Buoy 10 area)
		Recreational spring Chinook salmon – below BON	Spring Chinook salmon	Mouth of Columbia (Buoy 10) upstream to Bonneville Dam
		Recreational spring Chinook salmon – BON - HWY 395 Bridge	Spring Chinook salmon	Bonneville Dam upstream to Highway 395 Bridge near Pasco, WA
		Recreational spring Chinook salmon – Snake River (WA waters Downstream of LGR)	Spring Chinook salmon	Mouth of the Snake River upstream to Lower Granite Dam
		Recreational spring Chinook salmon – Ringold Area	Spring Chinook salmon	Highway 395 Bridge near Pasco, WA upstream to Priest Rapids Dam
		Wanapum tribal spring Chinook	Spring Chinook salmon	Mainstem Columbia River from Priest Rapids upstream to Wanapum Dam
	Treaty Indian	Ceremonial and Subsistence (C&S)	Spring Chinook salmon	Project area
		Winter Gillnet (Zone 6)	White Sturgeon	Bonneville Dam to McNary Dam
		Spring gillnet (Zone 6)	Spring Chinook salmon	Bonneville Dam to McNary Dam
		Platform and Hook&Line (Zone 6 + downstream of BON)	Spring Chinook salmon	Mouth of Columbia (Buoy 10) to McNary Dam
		Permit Gillnet	Spring Chinook salmon	Project area
		McNary - HWY 395 Bridge	Spring Chinook salmon	McNary Dam upstream to Highway 395 Bridge near Pasco, WA

The summer season extends from June 16 to July 31 (Table 1-3). During this management period, fisheries 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. These stocks constrain the summer season fisheries. Summer season fisheries are

constrained primarily by the available opportunity for UCR summer Chinook salmon which includes fish returning to the Okanogan and Wenatchee rivers, and by specific harvest limits for Snake River (SR) sockeye salmon.

Table 1-3. Fisheries occurring in the project area during the summer management period.

Fishery Management Period	Jurisdiction	Fishery Description	Target species	Location
Summer season (June 16 through July 31)	Non-Treaty	Recreational – mouth to McNary	Summer Chinook and sockeye salmon and summer steelhead	Astoria-Megler Bridge upstream to Bonneville Dam
		Recreational – McNary to I-395	Summer Chinook and sockeye salmon and summer steelhead	McNary Dam upstream to Highway 395 Bridge near Pasco, WA
		Wanapum tribal summer Chinook	Summer Chinook salmon	Mainstem Columbia River from Priest Rapids upstream to Wanapum Dam
		Commercial salmon	Summer Chinook salmon	Mouth of Columbia (Buoy 10) upstream to Bonneville Dam
		Select Area commercial	Select Area hatchery-origin Spring Chinook and Fall Chinook salmon	Off-channel areas near the mouth of the Columbia River (upstream of Buoy 10 area)
	Treaty Indian	Ceremonial and Subsistence (C&S)	Summer Chinook or sockeye salmon	Project area
		Commercial gillnet (Zone 6)	Summer Chinook and sockeye salmon	Bonneville Dam to McNary Dam
		Platform and Hook&Line (Zone 6 + downstream of BON)	Summer Chinook and sockeye salmon	Mouth of Columbia (Buoy 10) to McNary Dam
		Permit Gillnet (Zone 6)	Summer Chinook salmon	Bonneville Dam to McNary Dam
		McNary - HWY 395 Bridge	Summer Chinook and sockeye salmon	McNary Dam upstream to Highway 395 Bridge near Pasco, WA

Fall season fisheries begin on August 1 and extend to the end of the calendar year (Table 1-4). During the fall management period fisheries target primarily harvestable hatchery and natural-origin fall Chinook and coho salmon, and steelhead. Fall season fisheries are constrained by specific ESA related harvest rate limits for listed SR fall Chinook salmon, and both A-Index and B-Index components of the listed UCR and SR steelhead DPSs (A-Index and B-Index steelhead are stock designations that refer to components of the summer run steelhead DPSs, that have particular life history characteristics).

Table 1-4. Fisheries occurring in the project area during the fall management period.

Fishery Management Period	Jurisdiction	Fishery Description	Target species	Location
Fall season August 1 through December 31	Non-Treaty	Commercial gillnet	Fall Chinook and coho salmon	Mouth of Columbia (Buoy 10) upstream to Bonneville Dam
		Commercial tangle net	Coho salmon	Mouth of Columbia (Buoy 10) upstream to Bonneville Dam
		Commercial seine	Fall Chinook and coho salmon	Mouth of Columbia (Buoy 10) upstream to Bonneville Dam
		Select Area commercial	Select Area hatchery-origin fall Chinook and coho salmon	Off-channel areas near the mouth of the Columbia River (upstream of Buoy 10 area)
		Recreational Buoy 10	Fall Chinook and coho salmon	Mouth of the Columbia River (Buoy 10/Estuary area)
		Mainstem Recreational – below BON	Fall Chinook, coho salmon, and summer steelhead	Upstream of Buoy 10 to Bonneville Dam
		Recreational – BON - HWY 395 Bridge	Fall Chinook, coho salmon, and summer steelhead	Bonneville Dam upstream to Highway 395 Bridge near Pasco, WA
		Recreational Lower Snake River	Fall Chinook salmon and summer steelhead	Mouth of the Snake River upstream to Lower Granite Dam
		Recreational steelhead (tributary dip-ins Klickitat, Deschutes, John Day)	Fall Chinook, coho salmon, and summer steelhead	Klickitat River, WA Deschutes River, OR John Day River, OR
	Treaty Indian	C&S fisheries	Fall Chinook salmon or steelhead	Project area
		Commercial gillnet (Zone 6)	Fall Chinook salmon	Bonneville Dam to McNary Dam
		Platform and Hook&Line (Zone 6 + downstream of BON)	Fall Chinook salmon	Mouth of Columbia (Buoy 10) to McNary Dam
		Late fall Commercial gill net	White Sturgeon	Bonneville Dam to McNary Dam
		Permit Gillnet	Fall Chinook salmon	Project Area
		McNary - HWY 395 Bridge	Fall Chinook and coho salmon	McNary Dam upstream to Highway 395 Bridge near Pasco, WA

1.3.1.1. Treaty Indian Fishery location and jurisdiction

Treaty Indian fisheries considered in the proposed new *US v Oregon* agreement would be managed subject to regulation by the tribal signatories to the agreement. Each tribe regulates its fisheries using an array of management measures designed to achieve harvests that meets its needs, including voluntary management measures to reduce or eliminate harvest of stocks for conservation needs where the tribe deems it appropriate to do so. The fisheries are managed primarily by specifying the time and area for fishery openings, allowable gear types, and monitoring the fisheries to ensure that they achieve catch targets and stay within conservation constraints. Treaty Indian fisheries are generally managed allowing the retention of all fish caught (full retention), but under some circumstances the tribes may choose to implement species selective fisheries. Within the project area, treaty Indian fisheries generally occur in the mainstem Columbia River between Bonneville Dam and McNary Dam, although some fishing does occur both above McNary and below Bonneville Dam. Impacts associated with these fisheries are accounted for wherever they occur. Reservoirs of water behind each dam are designated separately (upstream of Bonneville Dam is Bonneville Reservoir, Zone 6/61; upstream of The Dalles Dam is Lake Celilo, Zone 6/62; and, upstream of John Day Dam is Lake Umatilla, Zone 6/63). However, they are commonly known collectively as “Zone 6” (Figure 1-2).

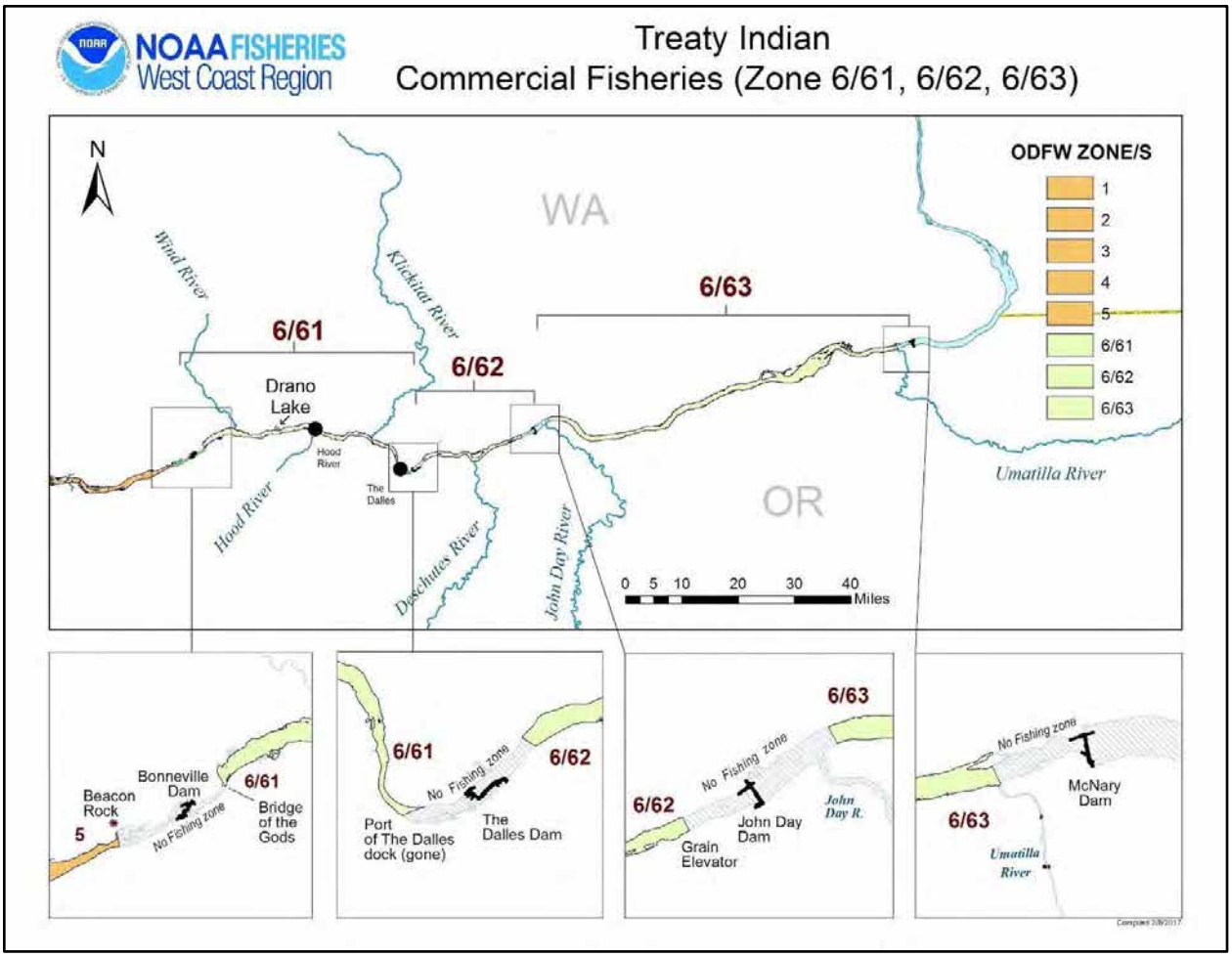

Figure 1-2. Location of mainstem treaty Indian fisheries downstream of McNary Dam, collectively known as Zone 6.

Fisheries implemented in the reservoir upstream of McNary Dam, known as Lake Wallula, up to the mouth of the Snake River are managed under the same mainstem harvest limits as the rest of the mainstem.

The tribes also manage a set of tributary fisheries discussed in Subsection 1.3.1.3. These fisheries target spring Chinook, fall Chinook, and coho salmon, or steelhead depending on the status of the stocks returning to each tributary. These fisheries are discussed further in Subsection 1.3.1.3.

1.3.1.2. Non-Treaty Fishery location and jurisdiction

Non-treaty fisheries considered in a new *US v Oregon* agreement would be managed under the jurisdiction of the states of Oregon and Washington. Generally, these include mainstem Columbia River commercial and recreational salmonid fisheries between Buoy 10 at the mouth of the Columbia River and Bonneville Dam (commonly known as Zones 1-5, described in more detail below in Subsection

1.3.1.2.1), designated off channel Select Area Fishery Enhancement fisheries (SAFE fisheries, described in more detail below in Subsection 1.3.1.2.2), mainstem recreational fisheries between Bonneville Dam and McNary Dam (commonly known as Zone 6), recreational fisheries between McNary Dam and Highway 395 Bridge in Pasco, Washington, recreational and Wanapum tribal spring Chinook salmon fisheries from McNary Dam to Priest Rapids Dam, and recreational fisheries in the Snake River upstream to the Washington/Idaho state boundary. Catch also occurs in a set of "dip-in" fisheries. These dip-in fisheries are located at mouths and lower reaches of certain tributaries in Zone 6 where migrating fish may hold prior to continuing their upstream migration. The catch of upriver stocks in these dip-in fisheries are included in the catch accounting for upriver stocks. Dip-in fishing areas include Drano Lake at the mouth of the Little White Salmon River, the lower Wind River, the lower Deschutes River (upstream to Sherars Falls), and the John Day River Arm of John Day Reservoir.

1.3.1.2.1. Mainstem Non-Treaty Commercial Fisheries

Commercial fisheries below Bonneville Dam occur in the lower Columbia River in commercial catch Zones 1-5 (Figure 1-3). The majority of commercial harvest occurs in Zones 4 and 5 (Figure 1-3).

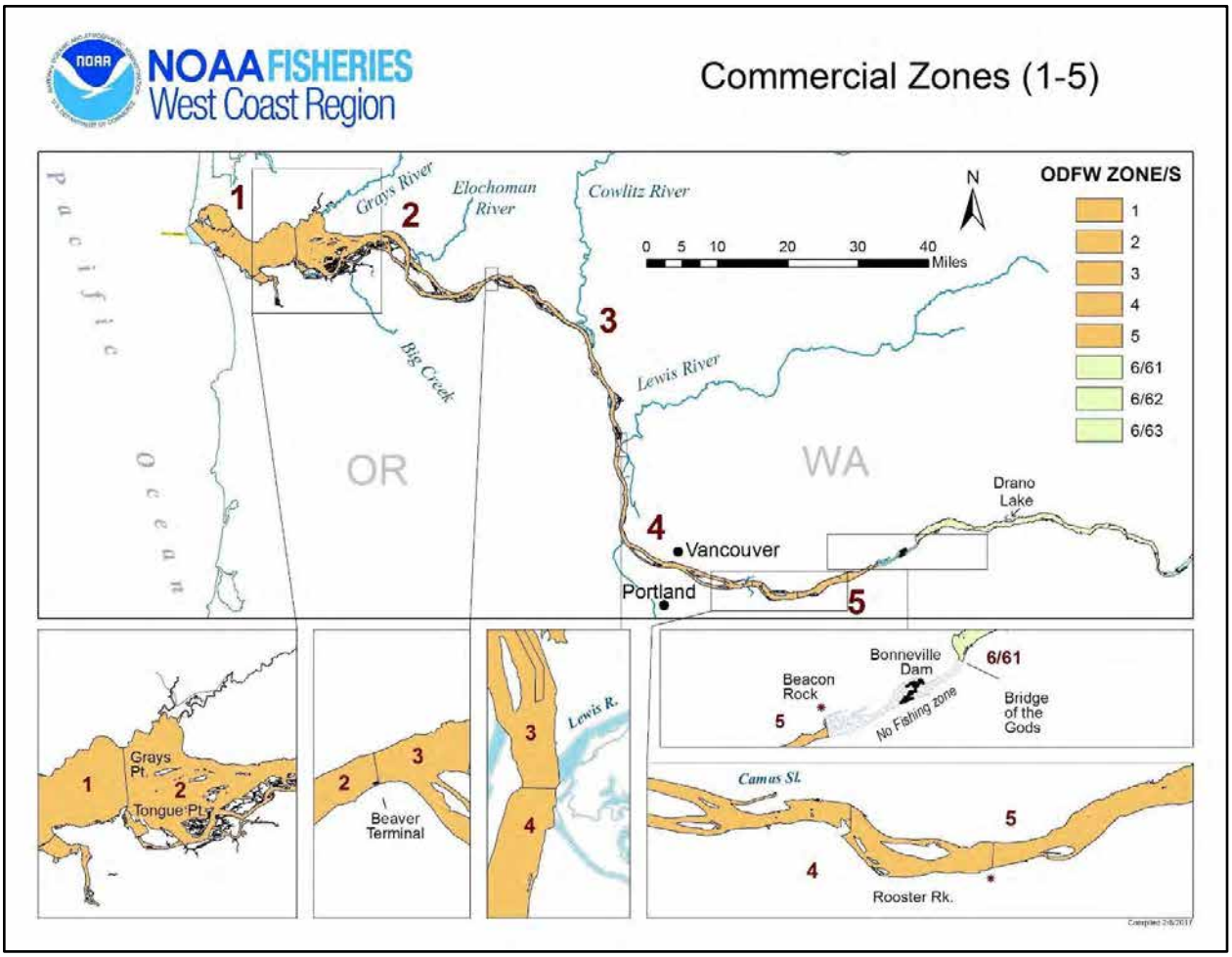

Figure 1-3. Commercial fishing zones downstream of Bonneville Dam.

1.3.1.2.2. Select Area Fisheries Enhancement (SAFE) Commercial Fisheries

SAFE fisheries occur in off-channel areas downstream of Zones 4 and 5 and target hatchery-reared and locally acclimated spring and fall Chinook and coho salmon. The SAFE area fisheries provide opportunity for expanded commercial and recreational fisheries directed at hatchery fish returning to their specific location.

SAFE areas are described as follows (see Figure 1-4):

- *Youngs Bay* is located in Oregon waters adjacent to the city of Astoria and inland of the Highway 101 Bridge. The fishing area extends from the Highway 101 Bridge upstream to Battle Creek Slough below the confluence of the Youngs and Klaskanine rivers.
- *Tongue Point Basin* is just east of the city of Astoria in Columbia River waters bounded by the Oregon shore and Mott and Lois islands. The fishing area includes the South Channel from the mouth of the John Day River upstream to its confluence with the Prairie

Channel.

- *Blind Slough* is located near Brownsmead, Oregon and comprises the lower reaches of Gnat Creek. The fishing area also includes Knappa Slough from the mouth of Blind Slough to the east end of Minaker Island.
- *Deep River* is located on the Washington side in the waters of Grays Bay and Deep River.
-

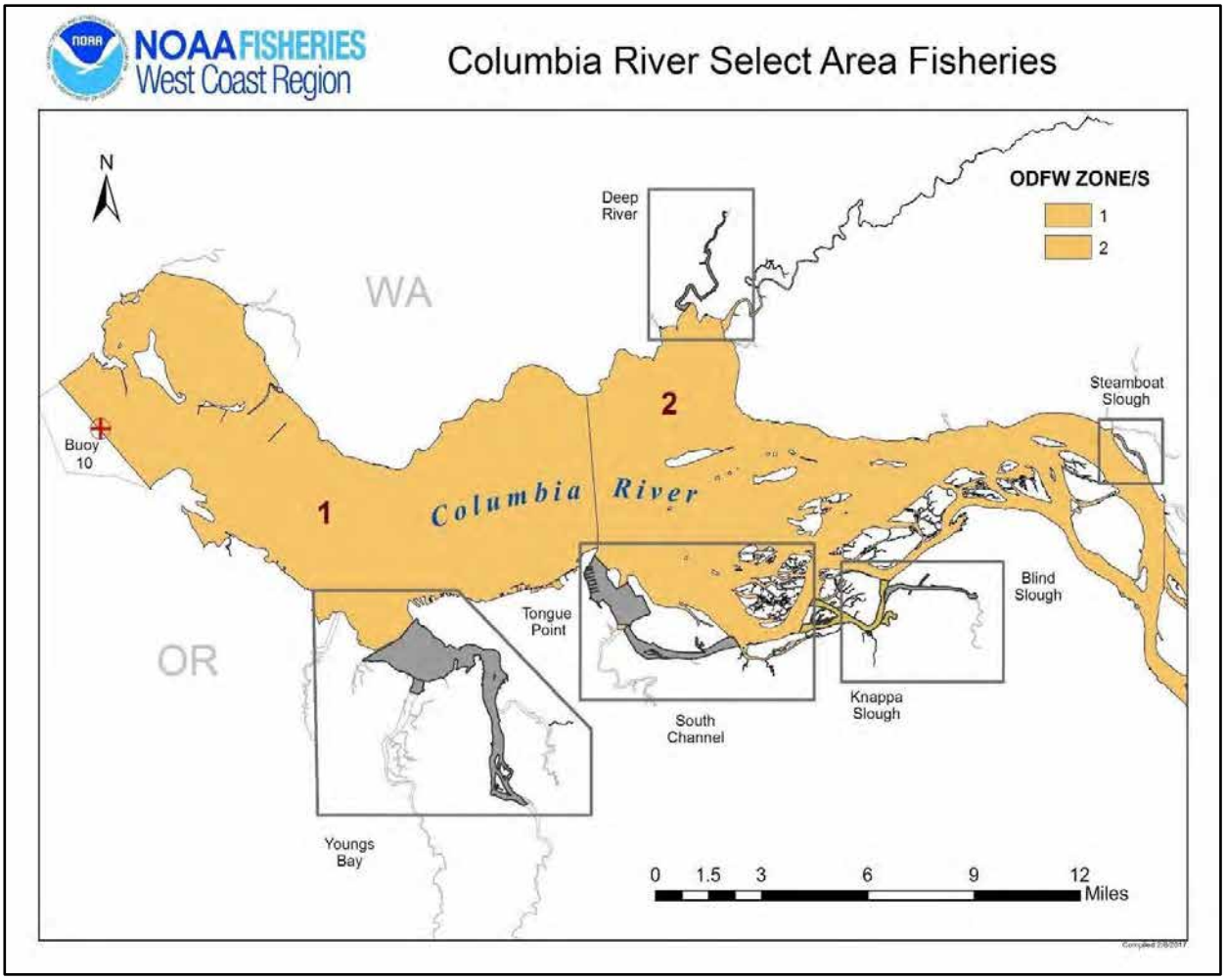

Figure 1-4. Location of SAFE fishery areas near the Columbia River mouth.

1.3.1.2.3. Columbia River Mainstem and Lower Snake River Recreational Non-treaty Fisheries

The states of Washington and Oregon individually set regulations concerning recreational fisheries in the mainstem Columbia River. These fisheries occur in the area from Buoy 10 upstream to Priest Rapids Dam, during the winter/spring, and fall management periods and upstream to Chief Joseph Dam in the summer management period. Fish targeted include hatchery spring Chinook, summer Chinook, fall

Chinook, and hatchery coho salmon and hatchery steelhead. Sockeye salmon fishing may occur if run sizes permit.

1.3.1.2.4. Non-treaty Tribal Fisheries Included in Non-Treaty Catch

The Wanapum Tribe does not have treaty fishing rights, nor is it a party to *US v Oregon* or the new *US v Oregon* agreement. Catch from Wanapum fisheries are accounted for as part of the non-treaty fisheries under the *US v Oregon* Agreement. A Washington State statute (RCW 77.12.453; WAC 220-32-055) authorizes the Director of the Washington Department of Fish and Wildlife to issue permits for subsistence fishing to Wanapum tribal members. Seasons have been authorized annually to allow subsistence fishing for spring Chinook, sockeye, and fall Chinook salmon. The tribe is required to provide catch estimates, and Grant County Public Utility District (PUD) has historically acted as a liaison between the tribe and state fishery managers.

Additionally, the Colville Tribe is a federally recognized tribe that does not have treaty fishing rights and is not party to *US v Oregon* or the new *US v Oregon* agreement. The Colville Tribe fishes for spring Chinook, summer Chinook, sockeye salmon, and steelhead using a variety of gears in both mark selective and full retention fisheries. Their catch of UCR summer Chinook salmon are counted as part of the total allowed non-treaty UCR summer harvest under the *US v Oregon* Agreement.

1.3.1.3. Treaty Indian Tributary Fisheries

The *US v Oregon* agreement has included certain treaty Indian tributary fisheries (Table 1-5). Harvest policies and management frameworks for these fisheries that may be specific to that tributary population were not described in the agreement. These policies and management frameworks were instead developed cooperatively by the States and Indian tribal management entities with primary responsibility in each tributary. However, fish caught in these tributary fisheries are components of both the Harvest and Abundance Indicator stocks. For example spring Chinook salmon returning to the Klickitat River are part of the Upriver spring Chinook salmon Harvest Indicator stock (see Subsection 4.1 for more). So, fish returning to the tributaries are part of the larger indicator stock aggregates. They are caught in mainstem fisheries, and, while present in the mainstem Columbia, are subject to the stock specific harvest policies that constrain the mainstem fisheries. Salmon or steelhead caught during the operation of these tributary fisheries are included in calculations of total fishery abundance used in this EIS. However, the harvest sharing of tributary specific stocks of fish would not generally involve all the Parties to a new *US v Oregon* agreement. The additional catch on individual populations in tributary fisheries is managed for and accounted for separately as we describe above, with only certain States and or Indian tribal management entities involved. For these reasons, the analysis does not include a detailed review of the

effects of each alternative on the tributary fisheries.

Table 1-5. Treaty Indian tributary fisheries.

Jurisdiction	Fishery Description	Target species	Location
Treaty Indian	Little White Salmon/Drano Tributary	Spring Chinook, fall Chinook, and coho salmon	Drano Lake, WA
	White Salmon River Tributary	Spring and fall Chinook salmon	White Salmon River, WA
	Hood River Tributary	Spring Chinook salmon	Hood River, OR
	Klickitat River Tributary	Spring Chinook, fall Chinook, and coho salmon	Klickitat River, WA
	Deschutes River Tributary	Spring and fall Chinook salmon	Deschutes River, OR
	John Day River Tributary	Chinook	John Day River, OR
	Umatilla River Tributary	Spring Chinook, fall Chinook, coho salmon, and steelhead	Umatilla River, OR
	Walla Walla River Tributary	Spring Chinook salmon	Walla Walla River, WA
	Yakima River Tributary	Spring, summer, and fall Chinook salmon	Yakima River, WA
	Icicle Creek Tributary	Spring Chinook salmon	Icicle Creek, WA

1.3.1.4. Fisheries with harvest policy set outside the agreement

Harvest policies for non-salmonid species and lower Columbia River stocks are not specified in the *US v Oregon* agreement and are discussed below.

1.3.1.4.1. Non-salmonid species

Harvest policies for non-salmonid species are not specified in the existing *US v Oregon* agreement, nor would they be in a new management agreement. However, these fisheries are referenced in the agreement because there is some potential for incidental take of ESA-listed salmonids in those non-salmonid fisheries and their inclusion represents the commitment of the Parties to responsibly manage these species. All salmon or steelhead caught in these fisheries as bycatch are included in harvest sharing and fishery management calculations. A list of these fisheries is provided at the end of this section in Table 1-6.

Table 1-6. Fisheries referenced in the agreement but not subject to the harvest policies contained in the agreement.

Jurisdiction	Fishery Description	Target species	Location
Non-Treaty	Recreational Walleye	Walleye	Mouth of Columbia (Buoy 10) upstream to Highway 395 Bridge near Pasco, WA
	Recreational sturgeon	White Sturgeon	Mouth of Columbia (Buoy 10) upstream to Highway 395 Bridge near Pasco, WA
	Commercial sturgeon	White Sturgeon	Mouth of Columbia (Buoy 10) upstream to Bonneville Dam
	Recreational Shad	American Shad	Mouth of Columbia (Buoy 10) upstream to Highway 395 Bridge near Pasco, WA
	Commercial shad gillnet	American Shad	Mouth of Columbia (Buoy 10) upstream to Bonneville Dam
	Commercial shad seine	American Shad	Mouth of Columbia (Buoy 10) upstream to Bonneville Dam
Treaty Indian	Zone 6	White Sturgeon, Walleye	Bonneville Dam to McNary Dam
	Shad Trap Fishery	American Shad	Bonneville Dam to McNary Dam
	Willamette River Lamprey	Lamprey	Willamette River Falls, OR

1.3.1.4.2. Lower Columbia River (LCR) Stocks

The 2008-2017 *US v Oregon* agreement sets harvest policies and provides associated management frameworks for upriver salmon and steelhead stocks returning to areas above Bonneville Dam. The agreement does not set policies or provide management frameworks for the lower river stocks that return to areas and are harvested below Bonneville Dam. These include Lower Columbia River (LCR) Chinook, coho, chum salmon or steelhead, and Upper Willamette River spring Chinook salmon or steelhead. Each of these lower river stocks are an ESA-listed species that is managed subject to the terms of applicable biological opinions and NEPA.

For example, LCR fall Chinook (a subcomponent of LCR Chinook) and LCR coho salmon are managed using frameworks that apply to all ocean and inriver fisheries below Bonneville Dam (NMFS 2012, 2015).

While the alternatives considered in this EIS focus on harvest policies used for the management of upriver stocks, the harvest of some of these upriver stocks occur in the lower Columbia River, in the same geographical area as the harvest of the LCR stocks. This is from the mouth of the Columbia River up to Bonneville Dam. Fisheries in this area are more consistently constrained due to LCR stocks, but harvest

policies for these stocks are not set in the *US v Oregon* agreement and therefore not analyzed in this EIS because they are separate actions and have been analyzed under separate NEPA and ESA authorizations. The impacts of catch of upriver stocks in these fisheries are included in this EIS.

1.3.2. Hatcheries

As mentioned in Subsection 1.1, Background, the existing 2008-2017 *US v Oregon* agreement incorporates hatchery programs that produce fish. The agreement describes the number of fish expected to be released, life-history of release, release location, hatchery rearing facilities, purpose of the program, entity(s) that manages the program(s), and the responsible funding entity(s).

As these fish are subsequently harvested in the fisheries that fall under the Agreement's management framework, the hatcheries are included in the Agreement both as a measure to formalize the parties' expectations for production of hatchery fish for harvest above Bonneville Dam and to identify hatchery programs that are important to the conservation of salmon or steelhead runs above Bonneville Dam.

The Final Environmental Impact Statement (FEIS) to Inform Columbia River Basin Hatchery Operations and the Funding of Mitchell Act Hatchery Programs (The Mitchell Act EIS; NMFS 2014b), provides a detailed analysis of all of the hatchery programs in the Columbia River Basin, many of which are not included in the Agreement.

The Mitchell Act EIS was developed by NMFS to assess one major source of Federal support for hatchery operations, Mitchell Act grants, and to guide NMFS' policy with regard to distributing Mitchell Act hatchery funding throughout the Columbia River Basin. The Mitchell Act EIS process developed and analyzed six alternatives, including a preferred alternative, which offered a range of program operation objectives that focused on balancing:

- The biological and ecological risks of artificial production;
- The benefits of the conservation of ESA-listed salmon and steelhead; and
- The harvest benefits to Treaty and non-treaty fisheries in the Columbia River Basin and in ocean fisheries.

The hatcheries augment fisheries by increasing certain stock abundances, including both ESA-listed and non-listed stocks. Certain fisheries would be able to continue without hatchery production, because these fisheries target non-listed stocks of relatively healthy natural-origin fish. In the absence of hatcheries, these fisheries would operate at different levels based solely on the abundance of natural-origin fish.

NMFS finalized the EIS in September of 2014 and issued a Record of Decision (ROD), for the Mitchell Act EIS in January of 2017.

(http://www.westcoast.fisheries.noaa.gov/hatcheries/mitchell_act/ma_programs.html).

While the purpose and need for the Mitchell Act EIS was different than for this action, the analysis of the effects of Columbia River basin hatchery production, including analysis of the relevant resources in this EIS, can fully inform NMFS of the likely impacts of the hatchery production referenced in this management agreement. Thus, as described herein, the Mitchell Act EIS analysis of hatchery effects will be incorporated by reference into this EIS.

1.4. Purpose of and Need for the Proposed Action

The purpose and need for the Proposed Action is three-fold: (1) to meet the Federal government's tribal treaty rights and trust and fiduciary responsibilities; (2) to support fishing opportunities to the states of Oregon, Washington, and Idaho; and (3) to work collaboratively with co-managers to protect and conserve ESA-listed and non-listed species.

The Services have an obligation to administer the provisions of the ESA and to protect ESA-listed species. They also have a Federal trust responsibility to the treaty Indian tribes, as well as a duty to support the fishing rights reserved in their treaties as defined by the Federal courts. Thus, the Services seek to harmonize the effects of fishery programs with the provision for tribal harvest. Because of the Federal government's trust responsibility to the tribes, the Services are committed to considering the tribal co-managers' judgment and expertise regarding conservation of trust resources.

The intent of the *US v Oregon* Management Agreement is to provide a framework within which the Parties may exercise their sovereign powers in a coordinated and systematic manner in order to protect, rebuild, and enhance upper Columbia River fish runs while providing harvests for both treaty Indian and non-treaty fisheries. The primary goals of the Parties are to rebuild weak runs to full productivity and fairly share the harvest of upper river runs between treaty Indian and non-treaty fisheries in the ocean and Columbia River Basin.

1.5. Public Involvement

1.5.1. Scoping: Notice of Intent

Public scoping was officially initiated with the Notice of Intent to prepare a draft EIS (NOI) which was published in the Federal Register on July 1, 2016 (81 Fed. Reg. 43187). This NOI announced a 30-day public comment period (July 1, 2016 to August 1, 2016) to gather information on the scope of the issues and the range of alternatives to be analyzed in the EIS.

1.5.1.1. Written Comments

Fifteen comment letters and emails were received during the public scoping period announced in the NOI, including four letters from governmental agencies, seven letters from non-governmental organizations and businesses, and four letters and emails from individual citizens. The letters all originated in Washington and Oregon, except for one from Idaho and one from Montana.

Issues raised in public comments responding to the NOI fell into four main categories:

- Concern for ESA-listed species and including recovery plans in the analysis
- Incorporation of hatchery and hydroelectric impacts in the analysis
- Ecosystem impacts such as marine derived nutrients and climate change
- Environmental justice, economics, and tribal rights

1.5.2. DEIS: Notice of Availability

The Draft Environmental Impact Statement (EIS) was published for public review and comment on June 23, 2017. The comment period was open for an initial 45-days (82 Fed. Reg. 28656, June 23, 2017) ending on August 7, 2017. Due to several requests from the public, the comment period was extended by an additional 14 days to close on August 21, 2017 (82 Fed. Reg. 35200, July 28, 2017).

This public process resulted in the National Marine Fisheries Service (NMFS) receiving 15 comment letters that were used to inform, shape, and improve this final EIS. See Appendix C for specific responses to comments and copies of the comment letters received.

1.6. Other Applicable Laws, Plans, and Policies

This EIS is being prepared under NEPA. However, there are other laws, plans, and policies that are applicable to the Proposed Action. These are described below.

1.6.1. *US v Oregon*

In 1855, representatives of the United States government negotiated separate treaties with each of the Columbia River Treaty Tribes. During treaty negotiations, the tribes sought to retain the right to continue their fishing practices as a primary objective. Each treaty contained a substantially identical provision reserving to the tribes the right take "fish at all usual and accustomed places in common with citizens of the United States."

By the late 1800s, state officials sought to regulate tribal members' fishing at their usual and accustomed fishing places. Litigation regarding the validity of state regulation occurred in both Federal and state courts throughout much of the early to mid-twentieth century. In 1969, a Federal district court ruled in *Sohappy v. Smith/United States v. Oregon* that the treaty language guaranteed an absolute right to a fair

share of the upriver Columbia River fish runs. The federal courts, both in *US v. Oregon* and the companion case *US v. Washington*, which interpreted identical treaty language in the treaties made with Puget Sound tribes, further defined the "fair share" as the right to take up to 50 percent of the harvestable fish that are destined to pass through the tribes' usual and accustomed fishing grounds. The treaty right is subject to regulation by the states only to the extent necessary for conservation of the fish, using the least restrictive regulations necessary, and without discriminating against the Indians. *See Puyallup Tribe v. Dep't of Game of Wash*., 391 U.S. 392 (1968); *Sohappy v. Smith*, 302 F. Supp. 899 (D. Or. 1969).

In the early years of *US v. Oregon*, harvest seasons were the subject of litigation and year-to-year court rulings. Since that time, the state and tribal Parties to *US v Oregon*, at the urging the Federal District Court, have entered into negotiated agreements on allocation and management of upriver salmon runs. The Parties have reached several agreements to meet this goal. In reaching agreement, the Parties have used the 50 percent treaty share as a measure of the Treaty right for a fair allocation of fish. This has served as a starting point for negotiating allocation, however, the Parties can agree to deviations from the 50 percent division in order to accommodate complex management concerns in the Columbia River. See, for example, United States v. Oregon, 718 F.2d 299, 302 (9th Cir. 1983); United States v. Oregon, 913 F.2d 576, 585 (9th Cir. 1990).

In 1988, the Columbia River Fish Management Plan (CRFMP) was agreed to by the Parties and adopted by District Court Order as a partial settlement of *US v Oregon*. The court noted that the CRFMP was a delicate, but effective structure for allocating and planning harvest activities. The purpose of the CRFMP, after 20 years of legal tests and negotiations, as defined upon adoption by the court in 1988 and agreed to by the Parties, was to:

> "provide a framework within which the Parties may exercise their sovereign powers in a coordinated and systematic manner in order to protect, rebuild, and enhance upper Columbia River fish runs while providing harvests for both treaty Indian and non-Indian fisheries.
>
> In order to achieve the goals of the CRFMP, the Parties intend to use habitat protection authorities, enhancement efforts, artificial production techniques, and harvest management to ensure that Columbia River fish runs continue to provide a broad range of benefits in perpetuity."

Fisheries in the Columbia River Basin were managed subject to provisions of the CRFMP from 1988 through 1998. Following 1998, fisheries were managed subject to provisions of a series of short term

agreements among the Parties, the durations of which ranged from several months, covering a single fishing season, to five years.

In a 1995 court settlement, the Parties agreed to discuss the possibility of amending the CRFMP and, in 1996, negotiated three-year (1996 through 1998) management agreements for upper Columbia fall Chinook and upper Columbia spring Chinook, summer Chinook, and sockeye salmon. These management agreements formed the basis for subsequent agreements, and included escapement goals, production measures and harvest allocations. Annual agreements were implemented for fall Chinook and coho salmon, and summer steelhead during the period 1999 to 2003. A 5-year agreement for harvest was reached for spring Chinook, summer Chinook, and sockeye salmon for the period 2001 through 2005.

In 2005, the Parties negotiated a 3-year (2005 through 2007) Interim Management Agreement (2005 Agreement). Unlike some previous agreements, the 2005 Agreement was a year-long agreement, applying to winter, spring, summer, and fall season fisheries. The 2005 Agreement and associated harvest provisions were the result of ongoing negotiations in *US v Oregon* and the evolution and development of fishery management in response to ESA-listings of Pacific salmon species. The 2005 Agreement expanded the use of abundance-based harvest schedules and served as the model for the current 2008 Agreement. Negotiations for these agreements have been under the continuous supervision of the Federal court with jurisdiction over *US v Oregon* and the management agreements have been submitted to the court for approval.

Management provision of the current agreement, implemented in 2008, are, in most respects, similar to those in the 2005 Agreement, and further expanded the application of abundance-based harvest rate schedules to fall Chinook salmon and steelhead fisheries. The use of abundance-based harvest rate schedules allows harvest rates to rise and fall in response to overall stock status, which the fixed harvest rate that was previously used for managing these stocks does not.

1.6.2. Endangered Species Act (ESA)

Section 7(a)(2) of the ESA requires that Federal agencies ensure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of critical habitat. In addition, Section 7(a)(3) of the ESA requires that Federal agencies consult with the Services on any action authorized, funded, or carried out by such agency that may affect a species listed under the ESA or their designated critical habitat. When a consultation results in a biological opinion that concludes that the action is likely to affect an ESA-listed species, but not cause jeopardy (i.e., appreciably reduce the

likelihood of survival and recovery of ESA-listed species), the Services issue an incidental take statement that details the amount and extent of anticipated incidental take (e.g., death, injury, harm, or harassment) that will be caused by the Proposed Action and any additional terms or conditions that must be met. Incidental Take Statements provide an exemption from ESA Section 9 prohibitions on such take.

Columbia River fisheries likely to be implemented as a result of reaching a new management agreement would affect fish species that are listed under the ESA. The Parties recognize that the Services have an obligation to consult under Section 7 of the ESA on the fishery proposals that are to be contained in the new management agreement prior to signing. Therefore, NMFS, which is the lead agency responsible for administering the ESA as it relates to anadromous fish species (e.g., ESA-listed salmon, steelhead, green sturgeon, and eulachon) and marine mammals, and FWS, which is the lead agency responsible for administering the ESA as it relates to non-anadromous fish species, terrestrial species, birds, and plants, will use the information developed in this EIS to inform their consultations. The Services will be able to sign the new management agreement after completing their ESA analyses.

The Mitchell Act EIS, incorporated herein by reference, provides additional information on the Services' roles under the ESA (NMFS 2014b) (Section 1.1.2).

1.6.2.1. Definition of "species" under the ESA

The ESA allows listing of distinct population segments (DPS) of vertebrates, as well as named species and subspecies. However, the Act provides no specific guidance for determining what constitutes a DPS, and the resulting ambiguity led to the use of a variety of approaches for considering vertebrate populations. To clarify the issue for Pacific salmon, NMFS published a policy describing how the agency would apply the definition of "species" in the ESA to anadromous salmonid species (56 Fed. Reg. 58612, November 20, 1991). NMFS' policy stipulated that a salmon population (or group of populations) would be considered "distinct" for purposes of the ESA if it represents an evolutionarily significant unit (ESU) of the biological species. An ESU is defined as a population that 1) is substantially reproductively isolated from conspecific populations and 2) represents an important component of the evolutionary legacy of the species (Waples 1991).

In 1996, the Services adopted a joint policy for recognizing DPS under the ESA (61 Fed. Reg. 4722, February 7, 1996). This policy recognized NMFS' use of ESU as consistent with the intent of the ESA; therefore, for Pacific salmon (i.e., Chinook, chum, coho, sockeye, and pink salmon), the term ESU remains in use. For other species, including steelhead, the term DPS is used, with the following two criteria: 1) the group must be discrete from other populations, i.e., markedly separated from other

populations of the same taxon as a consequence of physical, physiological, ecological, and behavioral factors, and 2) it must be significant to its taxon. As a result of this policy, the reader will see both terms, ESU and DPS, used in this EIS, as appropriate.

1.6.3. Marine Mammal Protection Act (MMPA)

The Marine Mammal Protection Act (MMPA) of 1972 (16 USC 1361) as amended, establishes a national policy designated to protect and conserve wild marine mammals and their habitats. This policy was established so as not to diminish such species or populations beyond the point at which they cease to be a significant functioning element in the ecosystem, nor to diminish such species below their optimum sustainable population. All marine mammals are protected under the MMPA.

The MMPA prohibits, with certain exceptions, the take of marine mammals in United States waters and by United States citizens on the high seas, and the importation of marine mammals and marine mammal products into the United States. The term "take," as defined by the MMPA, means to "harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal." The MMPA further defines harassment as "any act of pursuit, torment, or annoyance, which (i) has the potential to injure a marine mammal or marine mammal stock in the wild; or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing a disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering but which does not have the potential to injure a marine mammal or marine mammal stock in the wild."

NMFS is responsible for reviewing Federal actions for compliance with the MMPA. Fisheries can indirectly affect marine mammals by altering the availability of prey, such as salmon and steelhead.

1.6.4. Executive Order 12898

The objectives of Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority and Low-income Populations*, include developing Federal agency implementation strategies, identifying minority and low-income populations where proposed Federal actions could have disproportionately high and adverse human health and environmental effects, and encouraging the participation of minority and low-income populations in the NEPA process.

1.6.5. Secretarial Order 3206

Secretarial Order 3206 (*American Indian Tribal Rights, Federal-Tribal Trust Responsibilities and the ESA*) issued by the Secretaries of the Departments of Interior and Commerce, clarifies the responsibilities

of the agencies, bureaus, and offices of the Departments when actions taken under the ESA and its implementing regulations affect, or may affect, Indian lands, tribal trust resources, or the exercise of American Indian tribal rights as they are defined in the Order. The Secretarial Order acknowledges the trust responsibility and treaty obligations of the United States toward tribes and tribal members, as well as its government-to-government relationship when corresponding with tribes. Under the Order, the Services:

> will carry out their responsibilities under the [ESA] in a manner that harmonizes the Federal trust responsibility to tribes, tribal sovereignty, and statutory missions of the [Services], and that strives to ensure that Indian tribes do not bear a disproportionate burden for the conservation of listed species, so as to avoid or minimize the potential for conflict and confrontation (Secretarial Order 3206).

In the event that the Services determine that conservation restrictions directed at a tribal activity are necessary to protect ESA-listed species, specifically where the activity could result in incidental take under the ESA, the Services shall provide the affected tribe(s) written notice, including an analysis and determination that (i) the restriction is reasonable and necessary for conservation of the species; (ii) the conservation purpose of the restriction cannot be achieved by reasonable regulation of non-Indian activities; (iii) the measure is the least restrictive alternative available to achieve the required conservation purpose; (iv) the restriction does not discriminate against Indian activities, either as stated or applied; and (v) voluntary tribal measures are not adequate to achieve the necessary conservation purpose.

More specifically, the Services shall, among other things, do the following:

- Work directly with Indian tribes on a government-to-government basis to promote healthy ecosystems (Section 5, Principle 1).
- Recognize that Indian lands are not subject to the same controls as Federal public lands (Section 5, Principle 2).
- Assist Indian tribes in developing and expanding tribal programs so that healthy ecosystems are promoted and conservation restrictions are unnecessary (Section 5, Principle 3).
- Be sensitive to Indian culture, religion, and spirituality (Section 5, Principle 4).

Additionally, the U.S. Department of Commerce has issued a Departmental Administrative Order (DAO) addressing Consultation and Coordination with Indian Tribal Governments (DAO 218-8, April 26, 2012; http://www.osec.doc.gov/opog/dmp/daos/dao218_8.html), which implements relevant Executive Orders, Presidential Memoranda, and Office of Management and Budget Guidance. The DAO describes actions

to be "followed by all Department of Commerce operating units … and outlines the principles governing Departmental interactions with Indian tribal governments." The DAO affirms that the "Department works with Tribes on a government-to-government basis to address issues concerning … tribal trust resources, tribal treaty, and other rights."

1.6.6. The Federal Trust Responsibility

The United States government has a trust or special relationship with Indian tribes. The unique and distinctive political relationship between the United States and Indian Tribes is defined by statutes, executive orders, judicial decisions, and agreements, and differentiates tribes from other entities that deal with, or are affected by the Federal government. Executive Order 13175, *Consultation and Coordination with Indian Tribal Governments,* states that the United States has recognized Indian tribes as domestic dependent nations under its protection. The Federal government has enacted numerous statutes and promulgated numerous regulations that establish and define a trust relationship with Indian tribes.

The relationship has been compared to one existing under common law trust, with the United States as trustee, the Indian tribes or individuals as beneficiaries, and the property and natural resources of the United States as the trust corpus (Newton et al. 2005). The trust responsibility has been interpreted to require Federal agencies to carry out their activities in a manner that is protective of Indian treaty rights. This policy is also reflected in the March 30, 1995, document, *Department of Commerce –American Indian and Alaska Native Policy* (U. S. Department of Commerce 1995).

1.6.7. Recovery Plans for Columbia River Salmon and Steelhead

Federal recovery plans have been developed for the following ESA-listed Columbia River salmon and steelhead species:

- Upper Columbia spring Chinook salmon and Steelhead (72 Fed. Reg. 57303, October 9, 2007)
- Snake River sockeye salmon (80 Fed. Reg. 3265, June 8, 2015)
- Snake River fall Chinook salmon (80 Fed. Reg. 67386, November 2, 2015, proposed plan)
- Snake River spring/summer Chinook salmon and steelhead (81 Fed. Reg. 74770, October 27, 2016, proposed plan)
- Middle Columbia River steelhead (74 Fed. Reg. 50165, September 30, 2009)
- Upper Willamette River Chinook salmon and steelhead (76 Fed. Reg. 52317, August 22, 2011)
- Lower Columbia River Lower Columbia River Chinook salmon, coho salmon, steelhead, and Columbia River chum salmon (78 Fed. Reg. 41911, July 12, 2013)

Broad partnerships of Federal, state, local, and tribal governments and community organizations collaborated in the development of these recovery plans. The comprehensive recovery plans include conservation goals and proposed habitat, hatchery, and harvest actions needed to achieve the conservation goals for each watershed within the geographic boundaries listed species.

1.7. Other Permits and Consultations

This action will require the following permits or consultations:

- Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat (EFH) Consultation

1.8. Related Documents

This EIS should be reviewed in conjunction with the current *US v Oregon* Management Agreement for 2008 through 2017 and the associated Biological Opinion, which contain more detailed information and explanations of fishery programs affecting Columbia River resources. Links to online sources of information used in the EIS are active at the time of publication; however, NMFS cannot guarantee that they will remain active over time.

Pacific Coast Salmon Fishery Management Plan (FMP) for Commercial and Recreational Salmon Fisheries off the Coasts of Washington, Oregon, and California, as revised through Amendment 19 (Effective March 2016). The FMP forms the basis for Pacific salmon ocean fisheries management by NMFS and the Pacific Fishery Management Council, including harvest, conservation objectives, consistency with national standards, and essential fish habitat (EFH). It has been amended 19 times. This document is publicly available via this link: http://www.pcouncil.org/salmon/fishery-management-plan/current-management-plan/

Final Environmental Impact Statement to Inform Columbia River Basin Hatchery Operations and the Funding of Mitchell Act Hatchery Programs (NMFS 2014b). The Mitchell Act EIS provides a comprehensive review and analysis of the effects of all Columbia River Basin hatchery programs throughout the basin. This document is publicly available via this link: http://www.westcoast.fisheries.noaa.gov/publications/nepa/3_state_nepa_documents.html

2008-2017 United States v. Oregon Management Agreement (*US v Oregon* 2008). This is the existing agreement; it provides a basis for describing and analyzing the alternatives being analyzed in this EIS. This document is publicly available via this link: http://www.westcoast.fisheries.noaa.gov/fisheries/salmon_steelhead/united_states_v_oregon.html

Section 2

2. ALTERNATIVES

This chapter describes harvest policy alternatives that were analyzed in detail as well as alternatives that were considered but eliminated from detailed analysis.

At the outset it is useful to distinguish harvest policy from harvest management measures or strategies as they are used in this EIS. *Harvest policies* provide a framework designed to inform how to achieve the appropriate balance between harvest and conservation objectives. *Harvest* provides the benefits of catch including those related to treaty rights; *conservation* seeks to keep healthy stocks healthy and rebuild weak stocks so that all are sustained and can provide for the ongoing benefits of harvest. *Harvest management measures* are the actions or tactics implemented to harvest consistent with the overarching policy selected.

Harvest policies help set the appropriate level of catch consistent with conservation mandates of the *US v Oregon* case law and for ESA-listed species. Harvest management measures or strategies are the tools used to implement a policy. Once a harvest policy is set, there may be important allocation decisions about who will catch the fish. Where treaty Indian fisheries are involved, for example, the harvest has to be allocated in a way that assures that treaty rights are met. For treaty Indian and non-treaty fisheries there are often subsequent decisions about gear type, fishery location, and times. These include a broad array of measures and strategies used to implement a harvest policy. For example, the non-treaty catch is often allocated between recreational and commercial fishing interests. Commercial fisheries may use gillnets, purse seines, beach seines, traps or other gears. Recreational fisheries may operate from shore or boat and allow the retention of all fish or be selective in some way requiring the release of certain species or unmarked natural-origin fish. The tribes make their own decisions about commercial and C&S fisheries, the gear types to use in each, and when and where to open fisheries. The details of these allocation decisions and underlying harvest management measures and strategies provide an infinite array of choices. But they are all choices designed to describe how fisheries will be implemented consistent within boundaries the harvest policy sets for levels of allowable catch. This is fundamental to this analysis.

These conservation boundaries, defined through a chosen harvest policy, provide the framework to determine effects to stocks of fish, which then allows us to analyze effects to the environment in general.

A harvest policy choice may lead to zero available harvest on certain stocks of fish, and therefore the infinite array of choices for underlying management measures and strategies to implement fisheries (e.g., commercial or recreational choices, gear type choices, fishery location choices, limiting effort to high or low participation levels, etc.) are entirely immaterial under circumstances where harvest is zero. Therefore, in this EIS we focus on the harvest policy alternatives and their effects on the environment.

The choice between policies depends on the circumstances for each fishery application. Some policies depend on the availability of specific kinds of information. For example, abundance based management requires the availability of pre-season or in-season abundance estimates; an effort based policy does not. Policy choices for a fishery directed at a single stock near the spawning grounds may be different than a fishery directed at a mix of many stocks in the ocean or mainstem Columbia River. Harvest policies for healthy and abundant stocks may be different than for a depressed stock that needs rebuilding. The purpose of this EIS is to analyze various harvest policy alternatives that could provide a coordinated and systematic framework among the sovereign Parties to the *US v Oregon* case, and to guide more specific harvest measures in the management agreement.

2.1. Alternatives Analyzed in Detail

As presented in Section 1.3.1 and detailed in Section 4.1, harvest policies are established for each Harvest Indicator Stock. Harvest Indicator Stocks are called "Management Units" in the *US v Oregon* management agreement and tend to be aggregates of fish runs larger than the ESA-listed "units" (ESU or DPS). Abundance Indicator Stocks are equivalent to the ESA-listed "units" (DPS or ESU) affected by implementing fisheries that adhere to harvest policies specified in the agreement. Harvest Indicator Stocks may include one or more Abundance Indicator Stocks. The numbers presented in the sections that follow are based on actual observed rates of harvest and should be viewed as approximations and examples of an approach. They are not recommendations for the specific biological criteria that should be used for implementing harvest policies and the related management frameworks. Nonetheless, they are used here to evaluate the relative effects of each alternative.

Where forecasts of fish abundance are necessary to implement an alternative, the Parties rely on the Technical Advisory Committee (TAC) established by the *US v Oregon* agreement, to develop, analyze, and review data pertinent to the harvest management framework (e.g., annual forecasts, abundance estimates, catch estimates, etc.). Members are required to be qualified fisheries scientists familiar with

harvest management of Columbia River fish runs.

The *US v Oregon* agreement also establishes a regulatory coordination committee with a designee from each party to provide enforcement regulations. The Parties agree that the Columbia River Treaty Tribes bear primary responsibility for enforcing agreed-upon regulations applicable to Treaty fisheries subject to the agreement and that the States bear the similar responsibility for the non-treaty fisheries.

2.1.1. Alternative 1—Extension of current agreement (Preferred Alternative)

Under this alternative, the Federal parties would sign a new agreement, wherein the policy is to continue to manage fisheries in the Columbia River for the next 10 years consistent with the terms of the 2008–2017 agreement, and the NMFS and FWS would issue an ITS exempting take of listed species associated with implementing the terms of a new agreement pursuant to Section 7 of the ESA. This is not "no action" in the NEPA sense, because Federal action is required (signing of a new agreement) to extend the status quo harvest policies. As described in the previous section, the choice of harvest policies depend on the stock and fishery. Also, as described in Section 1.6.1 the harvest policies in the 2008-2017 agreement have been under consideration and refinement since 1988. We anticipate a new agreement would use a blend of harvest policies, including applications of abundance-based management, escapement-based management, and harvest rate management. While these management approaches are summarized in this section, Sections 2.1.2 through 2.1.4 and Section 4.1 provide additional background and examples.

This blend of harvest policies under this alternative applies to each harvest indicator stock as summarized below:

- Upriver spring Chinook salmon – The natural-origin Snake River spring/summer Chinook and natural-origin UCR spring Chinook salmon abundance indicators are both part of the Upriver Spring Chinook salmon harvest indicator. Abundance-based management for Upriver spring Chinook salmon ensures fisheries are restricted when fish returns are low, but offers greater harvest levels when abundance is high. Upriver fall Chinook salmon and Snake River steelhead are also managed under an abundance-based framework.
- Upper Columbia summer Chinook salmon – As this harvest indicator stock has no ESA-listed subcomponents, separate forecasts for the component populations are not used. Within this context, therefore, an aggregate escapement goal is most appropriate for this stock. Coupled with the escapement goal is an abundance based framework for harvest sharing purposes.
- Upriver sockeye salmon – The abundance indicator is Snake River sockeye, an ESA-listed ESU. Snake River sockeye salmon is a subcomponent of the Upriver sockeye salmon harvest indicator. Regardless of any increases in Upriver sockeye salmon, Snake River sockeye salmon require a

strong conservation focus. Therefore, a fixed harvest rate policy is more appropriate for this stock until the abundance levels for Snake River sockeye salmon increase.

These policies recognize that upriver stocks have varying conservation requirements, with some providing abundant opportunity for harvest, and others requiring more protection from harvest encounters at this time. The resulting fisheries are implemented using a complex set of harvest measures and near continuous pre-season, in-season, and postseason monitoring and analysis to ensure that the goals of this policy are being achieved.

2.1.2. Alternative 2—Abundance-based Management

Under this alternative, the Federal parties would sign a new agreement with the other parties, and salmonid fisheries in the Columbia River affecting upriver stocks would all be managed using abundance-based management frameworks, and the NMFS and FWS would issue an ITS exempting take of listed species associated with implementing the terms of a new agreement pursuant to Section 7 of the ESA. Abundance based management establishes harvest levels based on the status of the fish stock(s) affected by the fishery. The purpose is to provide more protection when the abundance of a given stock is low and the conservation need greatest, and more harvest opportunity when abundance is high. This is done by setting catch limit tiers, for example, allowing a high catch tier when stock abundance is high, and a mid-level catch tier when stock abundance is average, and a low catch limit tier when stock abundance is low. This model provides a management framework that recognizes the inherent year-to-year variability of salmonid stocks. Abundance based management plans provide the basis for managing many fisheries. For example, ocean fisheries for Chinook salmon off Alaska and Canada are managed year-to-year under the Pacific Salmon Treaty using measures of the overall abundance of Chinook salmon in each fishery. This type of policy tends not to be very aggressive towards a stock as it requires a large forecast of fish before allowing a large level of harvest to occur. In the current *US v Oregon* agreement, abundance-based frameworks are used to manage Upriver spring Chinook salmon, Upriver fall Chinook salmon, and Snake River steelhead. Abundance-based management requires the availability of preseason forecasts and/or updated in-season run size information. Catch needs to be actively monitored in-season so that fisheries can be adjusted to meet the year-specific harvest rate target. This alternative would be responsive to inter-annual variations in the abundance of Columbia River salmonid stocks.

2.1.3. Alternative 3—Fixed Harvest Rate

Under this alternative, the Federal parties would sign a new agreement with the other parties, and salmonid fisheries in the Columbia River affecting upriver stocks would be managed under fixed harvest rate management frameworks that would apply a fixed harvest rate to each fishery regardless of

abundance, and the NMFS and FWS would issue an ITS exempting take of listed species associated with implementing the terms of a new agreement pursuant to Section 7 of the ESA. Harvest rate refers to the ratio of fishery related mortality for a group of fish over its abundance in a defined period of time. For example, if a fixed harvest rate was set at 25 percent and a stock's estimated total run size in a given year consisted of 100,000 fish, then up to 25,000 could be harvested in that year. In the following year, if the stock's run size went to 200,000 fish then up to 50,000 could be harvested. Similarly, if the total run size fell to 50,000, then only 12,500 would be available.

Fixed harvest rate policies require the availability of preseason forecasts and/or updated in-season run size information. Catch needs to be actively monitored in-season so that fisheries can be adjusted to meet the fixed harvest rate target. This approach sometimes used for managing weak stocks by setting a low fixed harvest rate designed to protect the stock while providing access to more abundant co-mingled healthy stocks. Fixed harvest rate policies are also used sometimes to manage healthy stocks when there is a good understanding about the productivity of the stock and the rate of harvest that can be sustained over the long term. The allowable catch under a fixed harvest rate policy will vary from year-to-year with abundance, but tends to be more stable than under either the abundance-based or escapement-based harvest policy alternatives.

Under the current agreement, Upriver sockeye salmon is an example of a weak stock managed using what is in effect a fixed harvest rate of 8 percent.

2.1.4. Alternative 4—Escapement-based Management

Under this alternative, the Federal parties would sign a new agreement with the other parties, and salmonid fisheries in the Columbia River affecting upriver stocks would be managed under escapement-based management frameworks, and the NMFS and FWS would issue an ITS exempting take of listed species associated with implementing the terms of a new agreement pursuant to Section 7 of the ESA. Escapement refers to the number of fish surviving (escaping from) a given fishery at the end of the fishing season and reaching a specified location where the fish can be enumerated. In some applications, escapement goals are population specific and designed to provide a specific number of fish to the spawning ground. If fisheries are going to be actively managed for an escapement goal, it requires a population specific forecast and the ability to track the catch through the fisheries that affect the population. In other cases, escapement goals are stock specific where the stocks are an aggregate of two or more populations. Stock based management goals are often used when we don't have separate forecasts for the component populations and can track the stock, but not the populations, through the fisheries. Snake River steelhead and Upriver spring Chinook salmon are stocks in this context.

Escapement-based management is responsive to inter-annual variations in salmon abundance and allows fishery managers to set appropriate spawning goals for conservation. Escapement-based management can result in more year-to-year variability in harvest opportunity. The resulting harvest rates can be quite high when the run size is large relative to an escapement goal. Conversely, when the run size is low relative to an escapement goal, harvest opportunity can be very low or even reduced to zero. In cases where the projected run size is below the escapement goal, escapement goal harvest policies are sometimes coupled with a *de minimis* level of harvest opportunity to meet minimal needs for tribal fisheries and limited access to other harvestable stocks.

2.1.5. Alternative 5—Voluntary Fishery curtailment

Under this alternative, the Federal parties would sign a management agreement in which the sovereign parties voluntarily curtail harvest activities for an extended period of time, and the NMFS and FWS would issue an ITS exempting take of listed species associated with implementing the terms of a new agreement pursuant to Section 7 of the ESA. This alternative may include some very limited treaty fishing opportunity to meet base ceremonial needs of the tribes. The circumstances in which the state and tribal parties may adopt a voluntary extreme harvest curtailment policy would likely be where they determine that in the context of other mortality factors acting on the stocks across their life-cycle (e.g. prior fishery interceptions; hydrosystem operations; critically low emigration; extreme environmental impacts in ocean or spawning/rearing areas), that adding adult harvest mortality would further reduce escapement levels to the point that continued viability of upriver stocks is at imminent risk. This alternative expresses a conservation policy that even harvest actions with measures designed to target stocks with harvestable surplus must be curtailed to avoid unintentional encounters with critically weak stocks that may be interspersed with strong stocks. This voluntary extreme conservation harvest curtailment alternative does not meet the purpose and need for the action insofar as it does not provide for meaningful tribal harvest as guaranteed by Treaty and it provides no opportunity for non-treaty harvest.

NEPA requires that an EIS provide a benchmark that enables decision makers to compare the magnitude of environmental effects of the alternatives. This benchmark is often found in the “no action” alternative. For this EIS, “Alternative 5 – Voluntary Fishery curtailment” provides this benchmark in that it represents the alternative with the lowest fishing harvest, even though, in this case, it does not meet the purpose and need for the Proposed Action as described in Subsection 1.4.

2.1.6. Alternative 6—No Action—Uncoordinated Harvest

Under this alternative, the existing agreement would expire without the Services signing a new agreement with the other parties. The Services, in this case, would not issue an ITS. This could occur if the state and

tribal parties failed to reach a new agreement to coordinate their harvest activities in which the Services could join. Alternatively, this alternative may be adopted if the state and tribal parties did reach an agreement, but the Services did not concur and were unable to sign. In either case, it is uncertain what would transpire. Under this alternative, it is anticipated that the state and tribal parties would implement harvest independently according to their own uncoordinated interpretation of the prior rulings of the District Court of Oregon in *US v Oregon* since 1969, and the interpretation of their own legal authorities and harvest objectives for their constituent harvest groups. The result could be uncoordinated harvest as the sovereign managers implement fisheries absent a broad underlying agreement.

As noted above, the Services may choose not to sign if the state and tribal parties do reach a management agreement but it does not meet the requirements of Federal parties to act in accord with other legal requirements such as the ESA or the Federal trust responsibility.

Under the most foreseeable circumstances under which the Federal parties would not sign a new management agreement, actual harvest is tremendously uncertain. Theoretically, state and or tribal parties may decide that in the absence of support of the Federal parties, they would choose to curtail harvest entirely. See Alternative 5 for the analysis of that result. It is more likely, however, that the parties could each choose to implement harvest activities as they interpret the District Court's rulings in *US v Oregon*, with the result that the level of harvest would be very high, constrained primarily by the fishing effort that could be deployed. In this latter case it is reasonable to expect that the harvest rate on each upriver stock would meet and likely exceed the highest historic harvest rates observed.

Our assumption under this alternative is that the state and tribal parties would revert to the escapement-based management policies that were once implemented in the past. For purposes of analysis of this no action-uncoordinated harvest alternative, and to contrast the likely result from the other alternatives, it is assumed that actual harvest rates would be similar to the annual highest harvest rates observed in Alternative 4. Every fish that exceeds a static number of fish set as the escapement goal will be considered harvestable. This approach does not associate harvest with annual run size variations that stocks may exhibit. For example, an escapement goal of 3,000 fish allows for a harvest of 97,000 fish on a run size of 100,000 or a harvest of 27,000 fish on a run size of 30,000. No additional fish escape fisheries when run sizes fluctuate; instead harvest is maximized on the most abundant stock aggregate.

NEPA requires a 'No Action Alternative' in the full range of analyzed alternatives even though, in this case, it does not meet the purpose and need for the Proposed Action as described in Section 1.4.

2.1.7. Alternatives Considered But Not Analyzed in Detail

The following additional alternatives were identified during scoping and were considered, but not analyzed in detail.

Fixed Effort Management Alternative

Under this alternative, the Services would sign a new agreement with the other parties, and salmonid fisheries in the Columbia River that affect upriver stocks would be managed under fixed effort management frameworks. Fixed effort management would establish a constant metric of effort for each fishery. This could be number of fishing days, number of angler days, fishing hours for a net fishery, etc. Fixed effort management is useful when there is no preseason forecast of abundance. A fixed effort fishery is relatively simple to implement requiring only that effort and catch be measured. This alternative would not be actively responsive to changes in abundance. For fisheries managed under the *US v Oregon* agreement, there are preseason forecasts for all of the stocks of interest. The fixed effort strategy is designed to catch a constant fraction of the return and is therefore an indirect way of achieving a fixed harvest rate. The effects are therefore likely to be very similar to the fixed harvest rate alternative. For these reasons, this alternative was not analyzed in further detail.

3. AFFECTED ENVIRONMENT

3.1. Introduction

The Proposed Action is to sign a management agreement that establishes harvest policies and defines management frameworks for fisheries in the Columbia River and issue an ITS pursuant to Section 7 of the ESA. The Proposed Action would not change measures or strategies that are used to implement harvest policy, as discussed in Section 2, all of which are established by the states and the Indian tribes. Harvest policies are designed to respond to changes in the status of fish stocks, which are influenced by environmental conditions including those that could be driven by climate change.

The Proposed Action is therefore limited in scope—it would not affect all environmental components of the Columbia River Basin. The Proposed Action would not include any form of construction or demolition to bridges, dams, hydroelectric facilities, or other related infrastructure. No effects are expected on the physical environment, habitat, ecosystem component species, or environmental resources such as air quality, water quality (other than marine-derived nutrients), or sedimentation. No effects are expected on river transportation, river navigation, or historical properties (Section 106 of the National Historic Preservation Act). The choice of signing the agreement setting harvest policies and adopting cumulative hatchery programs and issuing an ITS does not affect these resources. Implementing fishing regulations (e.g., boats with active fishing gear) may affect these resources, but as discussed in Section 2, and reiterated above, fishing strategies or harvest management measures are state and tribal decisions with no federal involvement.

In this Section, status quo conditions are described for resources that may be affected by the Proposed Action: fish, marine-derived nutrients, wildlife, economics, cultural resources, and environmental justice. These resources were identified during scoping, including the 15 comments received on the NOI.

As described in Section 1, Subsection 1.1 and Subsection 1.3.2, NMFS is utilizing the existing Mitchell Act EIS (NMFS 2014b), and the analysis contained therein, to inform the hatchery related effects on the

harvest management alternatives. As such, under each resource discussed in this Chapter, NMFS has included in this section, a summary of the hatchery effects, as analyzed in the Mitchell Act EIS to the resources contained in this draft EIS. These include: Fish, Water Quality, Wildlife, and Environmental Justice. This information, presented in this section, includes the expected status quo hatchery effects, relative to the reference period used in the Mitchell Act EIS, which was the Columbia River basin-wide hatchery production in the year 2010, which included the hatchery production levels established within the previous (2008-2017) *US v Oregon* management agreement.

3.2. Fish

This section describes status quo conditions for fish species that may be affected by the proposed action, either through harvest or because of a predator/prey relationship with species that would be harvested. Further information on fish in the Columbia River Basin is presented in Section 3.2 of the Mitchell Act EIS, which is incorporated herein by reference.

3.2.1. Salmonids

This section provides information on salmonid species (i.e., fish taxonomically classified in the family Salmonidae) affected by the Proposed Action.

Table 3-1 summarizes all ESA-listed salmonids in the project area.

Several ESA-listed salmonids are inadvertently affected by fisheries under *US v Oregon*, but they do not drive fishery management targeting upriver stocks, and are not addressed in the agreement (refer to Subsection 1.3.1.4.2, Lower Columbia River (LCR) Stocks).

Table 3-1. ESA-listed salmonid fish species located in the project area in the Columbia River Basin.

Species	ESA-listed DPS or ESU	ESA Status	Reference
Chinook salmon	Upper Columbia River spring-run ESU	Endangered	79 Fed. Reg. 20802, April 14, 2014
Chinook salmon	Snake River spring/summer-run ESU	Threatened	79 Fed. Reg. 20802, April 14, 2014
Chinook salmon	Snake River fall-run ESU	Threatened	79 Fed. Reg. 20802, April 14, 2014
Chinook salmon	Upper Willamette River ESU	Threatened	79 Fed. Reg. 20802, April 14, 2014
Chinook salmon	Lower Columbia River ESU	Threatened	79 Fed. Reg. 20802, April 14, 2014
Chum salmon	Columbia River ESU	Threatened	79 Fed. Reg. 20802, April 14, 2014

Coho salmon	Lower Columbia River natural ESU	Threatened	79 Fed. Reg. 20802, April 14, 2014
Sockeye salmon	Snake River ESU	Endangered	79 Fed. Reg. 20802, April 14, 2014
Steelhead	Lower Columbia River DPS	Threatened	79 Fed. Reg. 20802, April 14, 2014
Steelhead	Upper Willamette River DPS	Threatened	79 Fed. Reg. 20802, April 14, 2014
Steelhead	Mid-Columbia River DPS	Threatened	79 Fed. Reg. 20802, April 14, 2014
Steelhead	Upper Columbia River DPS	Threatened	79 Fed. Reg. 20802, April 14, 2014
Steelhead	Snake River Basin DPS	Threatened	79 Fed. Reg. 20802, April 14, 2014

Salmonids in the Columbia River Basin that would be affected by the Proposed Action include four species of Pacific salmon (*Oncorhynchus* sp.), and steelhead. These species are:

- Chinook salmon (*Oncorhynchus tshawytscha*)
- Sockeye salmon (*O. nerka*)
- Steelhead (*O. mykiss*)
- Coho salmon (*O. kisutch*)

As a group, salmonids are diverse in their biology, exhibiting a range of life history and reproductive strategies, which has given rise to a unique lexicon used in salmon management. Terms that are used in this EIS to describe each species include descriptors of the migratory patterns of salmonids and the reproductive types. There are two basic migratory patterns, or life history types, of salmonids: anadromous and nonanadromous. Anadromous fish hatch from eggs in freshwater, then migrate to the ocean, while undergoing the physiological process of smoltification, to grow and mature, and then return to freshwater as adults to spawn. Nonanadromous fish remain in freshwater throughout their life cycle. Pacific salmon (e.g., Chinook salmon, coho salmon, sockeye salmon, and steelhead) are largely anadromous, although there are nonanadromous forms (e.g., nonanadromous sockeye are called kokanee, and nonanadromous steelhead are called rainbow or redband trout). Reproductively, salmonids are either semelparous—reproducing once before dying, or iteroparous—capable of reproducing multiple times. Most Pacific salmon are semelparous; however, steelhead are iteroparous. Additional life history terms are applied to individual species, and will be introduced in that context.

In Subsection 1.6.2.1, we introduced the terms ESU and DPS, which comprise one or more populations as a "species" under the ESA. A population of fish is a group of the same biological species that spawns in a particular lake or stream (or portion thereof) at a particular season and which, to a substantial degree, does

not interbreed with fish from any other group spawning in a different place or in the same place at a different season (McElhany et al. 2000). In fishery management, the term stock is commonly used to describe one or more populations that are managed collectively and are exposed to similar fishery pressure; in some cases, a stock may correspond to a single population. The ESA terms ESU and DPS comprise one or more populations, but may not be exactly identical to a stock, as the key feature of an ESU or DPS is reproductive isolation from other conspecific groups. Salmon fisheries affected by the Proposed Action generally manage for large stock groupings, as stocks, and their component populations, overlap temporally and spatially during their upstream migrations.

In Subsection 1.3.1, we introduced the concept that fisheries target particular groups of fish, referred to as "stocks". The *US v Oregon* agreement establishes harvest management policies for fisheries in the project area directed at upriver salmon and steelhead stocks. Here we will more thoroughly explain what *Harvest Indicator Stocks* and *Abundance Indicator Stocks* are so that status quo conditions for affected salmonid resources are described in the management units used by past *US v Oregon* management agreements. In order to compare the relative effect of past harvest on the resources listed in this Chapter, we must also establish specific ***defined metrics*** to use as common currency. These *defined metrics* are used to provide a quantitative assessment of past harvest effects to resources impacted by the proposed action. The modeled outputs for these *defined metrics* may change under the six alternatives for each of the *Harvest Indicator Stocks* and *Abundance Indicator Stocks* relative to status quo conditions. Changes will be presented later in Chapter 4 where we will detail how the *defined metrics* conceptually equally apply quantitative outcomes across each alternative. These *defined metrics* are listed in Table 3-2.

Table 3-2. *Defined metrics* for all alternatives.

Defined metrics for all alternatives:
Escapement for each of the Harvest Indicator Stocks at defined locations
Escapement for each of the Abundance Indicator Stocks at defined locations
Treaty harvest for Abundance and Harvest Indicator Stocks, by fishery or location
Non-treaty harvest for Abundance and Harvest Indicator Stocks, by fishery or location
Treaty HR for each Abundance Indicator Stock
Non-treaty HR for each Abundance Indicator Stock

Harvest Indicator Stocks are the "Management Units" of the *US v Oregon* Fisheries and tend to be aggregate of fish runs larger than the ESA-listed "units" (ESU or DPS). Each Harvest Indicator Stock is currently managed under a given harvest policy, such as abundance-based management, fixed harvest rate management, or fixed escapement goal management, or a combination of these. The current harvest policy type (under the 2008-2017 management agreement) for each Harvest Indicator Stock is shown in Table 3-3.

Table 3-3. Harvest Indicator Stocks and current harvest policy types.

Harvest Indicator Stocks	Current Harvest Policy Type
Upriver spring Chinook salmon	Abundance Based Management
Upriversummer Chinook salmon	Mixed-Abundance Based Management /Escapement Goal
Upriver sockeye salmon	Fixed harvest rate
Upriver fall Chinook salmon	Abundance Based Management
Snake River B-Index steelhead	Abundance Based Management

Abundance Indicator Stocks are equivalent to the ESA-listed "units" (DPS or ESU) affected by *US v Oregon* fisheries. *Harvest Indicator Stocks* may include one or more *Abundance Indicator Stocks*. For example, natural-origin Snake River spring/summer Chinook salmon and natural-origin UCR spring Chinook salmon are part of the Upriver spring Chinook salmon *Harvest Indicator Stock*. Snake River sockeye salmon is part of the Upriver sockeye salmon *Harvest Indicator Stock.* Natural-origin Snake River Fall Chinook salmon is part of the Upriver fall Chinook salmon *Harvest Indicator Stock*, and natural-origin Snake River B-Index steelhead is part of the Snake River B-Index steelhead *Harvest Indicator Stock.* Table 3-4 lists the *Abundance Indicator Stocks* along with the location where escapement counts occur and the current harvest rate limits.

Table 3-4. Abundance Indicator Stocks and locations where escapement counts occur.

Abundance Indicator Stocks	Location	Current HR Limits [1]
Natural-origin Snake River spring/summer Chinook salmon	Lower Granite Dam	5.5 - 17%
Natural-origin UCR spring Chinook salmon	Priest Rapids Dam	5.5 - 17%
Snake River sockeye salmon	Lower Granite Dam	6 - 8%
Natural-origin Snake River fall Chinook salmon	Lower Granite Dam	21.5 - 45%
Natural-origin B-Index steelhead	Lower Granite Dam	21.5 - 45%

[1] These harvest rate limits are imposed by the current Management Agreement and associated Biological Opinion (NMFS 2008b). Observed harvest rates, meaning those recorded as actually happening, are reported in Section 3 relative to these limits. Harvest Rate limits are the total allowable amount of a species or stock that may be taken during a period of time.

The following status quo descriptions for *defined metrics* for the *Harvest Indicator Stocks* and *Abundance Indicator Stocks* include estimates of escapement past fisheries, the number of fish harvested, and harvest rates (proportion of the total "Stock" that was harvested or killed by fisheries).

Hatchery Effects to Salmon and Steelhead

As described in detail in Section *3.2.3.1, General Risks and Benefits of Hatchery programs to Salmon and Steelhead Species*, in the Mitchell Act EIS (NMFS 2014b), hatchery salmon and steelhead programs can have beneficial effects to these species but also pose risks. Those beneficial effects include potential increases to abundance by increasing populations and helping maintain at-risk populations threatened by extirpation, to productivity by providing nutrients and improving spawning gravel conditions, and to spatial structure by expanding spatial distribution. Additionally, hatcheries can pose risks to natural-origin salmon and steelhead populations in the form of effects to abundance and productivity through competition, predation, disease and harvest. Interbreeding of hatchery and natural-origin fish can negatively affect genetic diversity and productivity, by interfering with the natural forces that strengthen the population genetics and by introducing maladaptive genetic changes. The presence of hatchery fish can lead to impacts to natural-origin populations from competition for resources such as food and spawning sites, and to predation by hatchery fish on natural-origin fish. Finally, hatchery facilities have impacts that result from the operation of weirs and other structures that can disrupt migrations, water intakes that risk entrainment and impingement, removal of water from the stream, discharge of effluent into streams, and impacts to river flows that interfere with migration and spawning.

3.2.1.1. Chinook Salmon

Chinook salmon are the largest of the Pacific salmon and are known by many names, most commonly king salmon or Chinook salmon. We use the name Chinook salmon in this EIS. Chinook salmon have an anadromous life history (although, nonanadromous males and landlocked populations do occur) and are semelparous. Age at maturity is highly variable among populations, but most Chinook salmon on the West Coast spawn at 3, 4, or 5 years of age. Chinook salmon are classified into two races: stream-type and ocean-type. These races have several ecological differences, but the most basic difference is how long the juveniles spend in the freshwater habitat prior to migrating to the ocean; stream-type outmigrate as yearlings, whereas ocean-type outmigrate much younger and may spend substantial time in the estuarine environment. In the Columbia River Basin, Chinook salmon occurring west of the Cascade Crest are ocean-type (Myers et al. 1998). Chinook salmon occurring east of the Cascade Crest include both stream-type and ocean-type races, with stream-type limited to the Snake River Basin (Myers et al. 1998).

Chinook salmon stocks are often described as seasonal "runs." In the Columbia River Basin, there are spring-run, summer-run, and fall-run Chinook salmon stocks. The run refers to the time of year they return to freshwater to start their spawning migration, but does not mean that all Chinook salmon of a seasonal run are closely related; for example, lower Columbia River fall Chinook salmon and Snake River fall Chinook salmon are not closely related, despite both being "fall-run" Chinook salmon. Some fall-run

Chinook salmon below Bonneville Dam are called "tules" and are distinguished by their dark skin coloration and advanced state of maturation at the time of freshwater entry (Myers et al. 1998). Other Chinook salmon stocks that return to freshwater in an immature condition are called "brights," these include a late fall run of Chinook salmon from the Lewis and Sandy River, as well as Chinook salmon from higher in the Columbia River Basin that are termed upriver brights (Myers et al. 1998).

NMFS has identified eight Chinook salmon ESUs in the Columbia River Basin (Myers et al. 1998):

- Upper Columbia River spring-run—ESA-listed (See Table 3-1)
- Snake River spring/summer-run—ESA-listed (See Table 3-1)
- Middle Columbia River spring-run
- Upper Columbia River summer-run
- Deschutes River summer/fall-run
- Snake River fall-run—ESA-listed (See Table 3-1)
- Upper Willamette River—ESA-listed (See Table 3-1)
- Lower Columbia River—ESA-listed (See Table 3-1)

Upper Willamette and LCR Chinook salmon are lower river stocks and not subject of the *US v Oregon* agreement (refer back to Subsection 1.3.1.4.2, Lower Columbia River (LCR) Stocks). All of the others are upriver stocks that are the subject of the *US v Oregon* agreement. The Upper Columbia River spring-run stock is the known limiting stock during winter/spring fisheries, which limits all catch during this season (Subsection 4.1.1 provides further details on the limiting stock concept).

Status quo conditions for the natural-origin Upper Columbia River spring Chinook salmon, natural-origin Snake River spring/summer Chinook salmon, Upper Columbia summer Chinook salmon, and natural-origin Snake River fall Chinook salmon are presented in the following tables. These conditions represent the observed minimum, maximum and average values for the river mouth run size, total harvest rate, escapement past fisheries, and escapement to a counting point such as Rock Island Dam, Priest Rapids Dam, or Lower Granite Dam over the last 12 years (2005 to 2016). Total harvest rate is the ratio of fish taken in all *US v Oregon* fisheries divided by river mouth run size. The difference between escapement past fisheries and the escapement goal at a specific counting point represent fish loses due to natural mortality or turnoff to mainstem tributaries, and mortality associated with hydro operations, illegal fishing, and habitat degradation. Below we summarize information from 2005 to 2016. The current management framework was in place during that time.

Table 3-5. Status quo conditions for natural-origin Upper Columbia River spring Chinook salmon.

	UCR spring Chinook River Mouth	Total Harvest Rate	Esc. Past Fisheries	Rock Island Dam Run
min.	1,374	9.2%	1,248	1,101
max.	5,032	13.4%	4,360	3,846
ave.	3,003	11.8%	2,650	2,338

Table 3-6. Status quo conditions for natural-origin Snake River spring/summer Chinook salmon.

	Snake River spring/summer Chinook River Mouth	Total Harvest Rate	Esc. Past Fisheries	Lower Granite Run
min.	12,017	9.2%	10,913	8,360
max.	44,014	13.4%	38,115	29,199
ave.	26,269	11.8%	23,171	17,751

Table 3-7. Status quo conditions for Upper Columbia summer Chinook salmon.

	Upper Columbia summer Chinook River Mouth	Total Harvest Rate	Esc. Past Fisheries	Priest Rapids Dam Run
min.	37,000	21.6%	29,000	30,644
max.	134,000	62.7%	50,000	80,288
ave.	74,417	52.5%	35,375	58,047

Table 3-8. Status quo conditions for natural-origin Snake River fall Chinook salmon.

	Snake River fall Chinook River Mouth	Total Harvest Rate	Esc. Past Fisheries	Expected Granite Run Size
min.	5,808	25.9%	4,305	3,228
max.	40,916	43.9%	22,960	17,216
ave.	19,804	41.0%	11,334	8,499

3.2.1.2. Coho salmon

Coho salmon are also commonly known as silver salmon; we use the name coho in this EIS. Coho are anadromous, with a fixed life history, and semelparous. Coho south of Alaska are three years old at maturity, spending half of that time in the freshwater environment prior to smolting (Weitkamp et al. 1995). Historically, coho salmon distribution likely extended to the upper Columbia River and the Snake River Basin (Weitkamp et al. 1995); however, at present, natural populations are limited to the lower Columbia River, from Hood River westward (Weitkamp et al. 1995).

Coho stocks exhibit early- or late- run timing. Early coho salmon spawn in the upper reaches of larger

rivers in the lower Columbia River. Late coho salmon generally spawn in smaller rivers or the lower reaches of larger rivers. Late-run fish also undertake oceanic migrations to the north of the Columbia River, extending as far as northern British Columbia and southeast Alaska. As a result, late coho salmon are known as "Type N" coho. LCR coho, a lower river stock (refer to Subsection 1.3.1.4.2, Lower Columbia River (LCR) Stocks), are the only ESA-listed ESU of coho in the Columbia Basin (Table 3-1). Coho found upstream of The Dalles Dam are not ESA-listed.

Although coho salmon in the upper Columbia River and its tributaries were extirpated, reintroduction programs conducted in the Clearwater, Wenatchee, Methow, and Yakima River Basins are resulting in coho returning to those rivers. Reintroduction programs are having some success. The number of adult coho salmon crossing Bonneville Dam in the last ten years (2007-2016) has averaged 119,674 (www.fpc.org fish passage query). In additional to the reintroduction programs, there are also coho salmon harvest programs, as identified in table B7 of the *US v Oregon* management agreement.

Harvest policy for the management of upriver coho has not been set in the prior *US v Oregon* agreements except to specify limitations to insure 50/50, treaty/non-treaty sharing of the catch. This is expected to continue under a new *US v Oregon* agreement as the success of reintroduction programs in the previously mentioned basins are evaluated and possibly expanded to other areas. Apart from the 50/50 sharing provisions, fisheries for upriver coho salmon are not actively managed, but are instead limited by the incidental catch of other species, particularly steelhead and fall Chinook salmon.

While the coho salmon hatchery production above Bonneville Dam does not affect a defined ESU or ESUs of coho salmon, it still has benefits to the rebuilding natural coho salmon populations (listed and unlisted) as well as benefits and risks to other salmon ESUs and steelhead DPSs. As described above, these programs can provide benefits to the abundance, productivity, and spatial structure of coho salmon, as well as providing benefits to other species of salmonids through marine derived nutrients from the adult carcasses, cleaning and transport of spawning gravels, and as a prey base for other salmonids. They also, however present risks to these other species in the form of ecological interactions, including competition for scarce resources and direct and/or indirect predation. Additionally, the hatchery facilities where these programs are reared and released pose risks associated with delaying or blocking migration of adult and juvenile fish, as well as risks from water withdrawal and effluent discharge. As explained in Subsection 1.3.2 and Subsection 3.1, above, NMFS is incorporating the analysis of effects from the Mitchell Act EIS to disclose the likely impacts from the hatchery programs referenced in the management agreement. This description of effects from the Mitchell Act EIS summarizes the past effects of ongoing hatchery operations, which are a part of the affected environment. The effects of continued hatchery

production associated with a new *US v Oregon* management agreement are discussed in Section 4.

3.2.1.3. Sockeye salmon

Sockeye salmon are also called blueback and red salmon, we use the name sockeye salmon in this EIS. The Columbia River Basin is the southern extent of the species on the West Coast (Gustafson et al. 1997). Sockeye salmon have anadromous and nonanadromous life history types; this EIS will only discuss the anadromous form, as no nonanadromous sockeye salmon populations are affected by the Proposed Action. There are three anadromous forms of sockeye salmon: lake-type, river-type, and sea-type (Gustafson et al. 1997). Sockeye salmon in the Columbia River Basin are lake-type, they spawn in either inlet or outlet streams of lakes or in lakes themselves, juveniles rear in the lake for one to three years before smolting and migrating to the marine environment for 1 to 4 years, adults generally return to their natal lake system to spawn.

NMFS' status reviews for sockeye salmon (Waples et al 1991; Gustafson et al. 1997) identified the following extant ESUs sockeye salmon in the Columbia River Basin:

- Non-ESA-listed Sockeye salmon ESUs
  - *Okanogan River ESU*. Okanogan sockeye salmon are currently the most abundant sockeye salmon stock in the Columbia River Basin, estimated return in 2014 was 523,700 fish (http://wdfw.wa.gov/fishing/salmon/sockeye/columbia_river.html). Most Okanogan sockeye salmon rear in Osoyoos Lake, which spans the U.S./Canada border; production of Okanogan sockeye salmon occurs largely in British Columbia.
  - *Lake Wenatchee ESU*. For the 10-year period 2003 to 2012, Lake Wenatchee sockeye salmon returns averaged 27,000 fish, and estimated return in 2014 was 118,500 (http://wdfw.wa.gov/fishing/salmon/sockeye/columbia_river.html). These sockeye salmon spawn and rear in and above Lake Wenatchee, a natural lake on the Wenatchee River in Washington State.
- ESA-listed Sockeye salmon ESUs (See Table 3-1)
  - *Snake River ESU*. ESA-listed Endangered. These sockeye salmon utilize Redfish Lake in Idaho; the lake is in the Salmon River Subbasin of the Snake River. This ESU includes naturally spawned anadromous and residual sockeye salmon originating from the Snake River Basin, and also sockeye salmon from one artificial propagation program: Redfish Lake Captive Broodstock Program.

Status quo information for Upriver sockeye salmon and Snake River sockeye salmon is provided in tables 3-9 and 3-10. These conditions represent the minimum, maximum and average values for the river mouth

run size, total harvest rate observed, escapement past fisheries, and escapement to Lower Granite Dam from 2005 to 2016 when the current management framework was in place.

Table 3-9. Status quo conditions for Upriver sockeye salmon.

	River Mouth Run Size	Total Harvest	Total Harvest Rate	Escapement Past Fisheries
min.	27,000	1,620	6.0%	25,380
max.	648,000	51,840	8%	596,160
ave.	277,833	22,120	8%	255,713

Table 3-10. Status quo conditions for Snake River sockeye salmon.

	Snake River Sockeye Run Size	Total Harvest Rate	Esc. Past Fisheries	Lower Granite Run Size
min.	124	6.0%	117	97
max.	2,977	8.0%	2,738	2,286
ave.	1,276	7.7%	1,175	981

Some sockeye salmon reintroduction programs have been established in areas where the species has been extirpated. A reintroduction program began in 2007 to restore sockeye salmon to the Deschutes River in Oregon (ODFW News Release http://www.dfw.state.or.us/news/2012/September/092812d.asp), where sockeye salmon historically reared in Suttle Lake. In Washington, the Yakama Nation initiated a reintroduction program in 2009 for the Cle Elum River (a tributary to the Yakima River); sockeye salmon historically reared in Cle Elum Lake (http://wdfw.wa.gov/fishing/salmon/sockeye/columbia_river.html).

The sockeye salmon hatchery program contained in the agreement is a conservation program associated with the endangered, Snake River sockeye salmon ESU. This program is operated for the conservation of this species, which has incurred abundance and spatial structure benefits from the program. Additionally, and early in the development of the program, the hatchery program acted as protection from extinction, conserving valuable genetic diversity and artificially boosting the productivity of the captive population. As explained in Subsection 1.3.2 and Subsection 3.1, above, NMFS is incorporating the analysis of effects from the Mitchell Act EIS to disclose the likely impacts from the hatchery programs referenced in the agreement. This description of effects from the Mitchell Act EIS summarizes the past effects of ongoing hatchery operations, which are a part of the affected environment. The effects of continued hatchery production associated with a new *US v Oregon* management agreement are discussed in Section 4.

3.2.1.4. Steelhead

The name steelhead has a complex history; we use the name steelhead in this EIS to refer to anadromous populations of the biological species *Oncorhynchus mykiss*. Steelhead are anadromous, although individual fish may residualize and remain nonanadromous, and have the capacity for iteroparity. Iteroparous steelhead are predominately female (Busby et al. 1996); males tend to be semelparous. Juvenile steelhead can spend between one and seven years in fresh water prior to smolting, and then spend up to three years in the ocean before their first spawning migration (Busby et al. 1996). Most steelhead in the Columbia River Basin spend two years in freshwater and two years in the ocean; some populations east of the Cascade Crest have only one ocean year (Busby et al. 1996).

Steelhead have two reproductive ecotypes: ocean-maturing and stream-maturing (Busby et al. 1996). On the West Coast, these correspond to winter steelhead and summer steelhead, respectively. Ocean-maturing winter steelhead enter fresh water in a sexually mature condition and spawn shortly thereafter; stream-maturing summer steelhead enter fresh water in a sexually immature condition, and can spend several months in fresh water prior to spawning (Busby et al. 1996). Both of these ecotypes occur in the Columbia River Basin.

Steelhead, and their nonanadromous kin, have two major genetic groupings that are significant enough to be considered subspecies by some authors: coastal steelhead and rainbow trout (*O. m. irideus*), and inland steelhead and redband trout (*O. m. gairdneri*). Both subspecies occur in the Columbia River Basin. The coastal grouping occurs as far upstream as the Hood River in Oregon and the Wind River in Washington. The inland grouping occurs upstream of those rivers. Coastal steelhead can be winter or summer steelhead; inland steelhead are almost exclusively summer steelhead, i.e., stream-maturing (Busby et al. 1996).

Inland steelhead of the Columbia River Basin, especially in the Snake River, are commonly referred to as either A-Index or B-Index. These designations are based on the observation of a bimodal migration of adult steelhead at Bonneville Dam (Columbia River river kilometer (RKm) 235) and differences in age (1- versus 2-ocean) and adult size observed among Snake River steelhead (Busby et al. 1996). A-Index steelhead have generally spent one year in the ocean and are smaller than their B-Index counterparts, which spend two years in the ocean. Under the *US v Oregon* agreement, B-Index index steelhead are defined as any steelhead measuring at least 78 cm fork length and passing Bonneville Dam between July 1 and October 31. A-Index steelhead are believed to occur throughout the steelhead-bearing streams of the Snake River Basin; additionally, inland Columbia River steelhead outside of the Snake River Basin are also considered A-Index. B-Index steelhead are thought to be produced only in the Clearwater, Middle Fork Salmon, and South Fork Salmon Rivers. (Busby et al. 1996).

NMFS has identified six DPSs for steelhead in the Columbia River Basin (Busby et al. 1996); all but one are ESA-listed:

- Non-ESA-listed steelhead DPSs
    - *Southwest Washington*. Not ESA-listed. Includes populations in the Columbia River below the Cowlitz River in Washington and below the Willamette River in Oregon.
- ESA-listed steelhead DPSs (See Table 3-1)
    - *Lower Columbia River*. ESA-listed threatened, includes naturally spawned steelhead originating below natural and manmade impassable barriers from rivers between the Cowlitz and Wind Rivers (inclusive) and the Willamette and Hood Rivers (inclusive); excludes such fish originating from the upper Willamette River basin above Willamette Falls. This DPS includes steelhead from seven artificial propagation programs.
    - *Upper Willamette River*. ESA-listed threatened, includes naturally spawned anadromous winter-run steelhead originating below natural and manmade impassable barriers from the Willamette River and its tributaries upstream of Willamette Falls to and including the Calapooia River.
    - *Mid-Columbia River*. ESA-listed threatened, includes naturally spawned steelhead originating below natural and manmade impassable barriers from the Columbia River and its tributaries upstream of the Wind and Hood Rivers (exclusive) to and including the Yakima River; excludes such fish originating from the Snake River Basin. This DPS does include steelhead from seven artificial propagation programs.
    - *Upper Columbia River*. ESA-listed threatened, includes naturally spawned steelhead originating below natural and manmade impassable barriers from the Columbia River and its tributaries upstream of the Yakima River to the U.S.-Canada border. Also, steelhead from six artificial propagation programs.
    - *Snake River Basin*. ESA-listed threatened, includes naturally spawned anadromous steelhead originating below natural and manmade impassable barriers from the Snake River basin, and also steelhead from six artificial propagation programs.

Status quo information for Snake River B-Index steelhead and natural-origin Snake River B-Index steelhead is provided in Table 3-11. These conditions represent the minimum, maximum and average values for the river mouth run size, total harvest rate observed, escapement past fisheries, and escapement to Lower Granite Dam. We summarize information from 2005 to 2016 when the current management framework was in place.

Table 3-11. Status quo conditions for natural-origin Snake River B-Index steelhead

	Snake River B-Index Steelhead Run Size	Total Harvest Rate	Escapement Past Fisheries	Expected Lower Granite Run
min.	2,420	19.2%	1,954	1,129
max.	19,951	27.8%	14,404	8,325
ave.	10,220	27.1%	7,450	4,306

Hatchery production of steelhead in the Snake River basin encompasses both harvest programs and conservation programs. As described above, conservation programs can benefit the natural populations of ESA-listed steelhead by increasing the abundance and spatial structure of the extant natural populations. The programs can also benefit the species by conserving much of the genetic diversity of the natural populations, by providing marine-derived nutrients, and by improving spawning gravel conditions. However, as also described above, both the conservation and the harvest programs can present risks to these natural populations, including: risks to population productivity and genetic diversity through interbreeding with wild fish at elevated levels; risks from direct and indirect competition and predation; and physical and ecological risks from the operation of the hatchery facilities where these steelhead programs are reared and released. As explained in Subsection 1.3.2 and Subsection 3.1, above, NMFS is incorporating the analysis of effects from the Mitchell Act EIS to disclose the likely impacts from the hatchery programs referenced in the Agreement. This description of effects summarizes the past effects of ongoing hatchery operations, which are a part of the affected environment. The effects of continued hatchery production associated with a new *US v Oregon* management agreement are discussed in Section 4.

3.2.2. Other ESA-Listed Fish Species

Other ESA-listed fish species that may be affected by the Proposed Action are listed in the table below.

Table 3-12. ESA-listed non-salmonid fish species that may be affected by the Proposed Action in the Columbia River Basin.

Species	ESA-listed DPS or ESU	ESA Status	Reference
Bull-trout	Columbia River DPS	Threatened	63 Fed. Reg. 31647, June 10, 1998
Green sturgeon	Southern DPS	Threatened	71 Fed. Reg. 17757, April 7, 2006
Eulachon	Southern DPS	Threatened	75 Fed. Reg. 13012, March 18, 2010

3.2.3. Other Non-Salmonids (non ESA-listed Fish Species)

Non-salmonid (non-ESA-listed Fish species) mentioned in the agreement are listed in Table 1.3.1.3-1 and include:

- White Sturgeon (*Acipenser transmontanus*)

White sturgeon are the largest North American sturgeon. They live in rivers from central California to southern Alaska and migrate among them via the Pacific Ocean. In the Columbia River they historically ranged from the ocean up into Idaho, Montana, and Canada. White sturgeon can live for over 100 years, can be 20 feet long, and can weigh over 1,500 pounds. Their skeleton is largely cartilage and they have thick skin and bony plates, called scutes, instead of scales. Sturgeon appeared in the fossil record 200 million years ago and have survived to the present relatively unchanged. Female sturgeon spawn at 20-25 years of age (males at about 12 years old), and can produce 300,000-4,000,000 eggs. Of these, less than 0.1% will survive the first year (Wydoski and Whitney 1979).

There are no historic estimates of white sturgeon abundance before the non-Native Americans began to settle in the Pacific Northwest and the Columbia River hydrosystem was developed. Historically, white sturgeon ranged freely up and down the Columbia and Snake Rivers (Bajkov 1951) and undertook extensive seasonal migrations among riverine habitats to take advantage of scattered and seasonally favorable resources.

Construction of dams on the Columbia and Snake Rivers from 1931 to 1968 segregated groups of white sturgeon into a series of functionally discrete populations (North et al. 1993). Development of the Columbia River Basin hydrosystem created impoundments (reservoirs) throughout the basin, restricting movements of white sturgeon and two of their principal food sources (eulachon and lamprey). Development has also degraded or destroyed white sturgeon spawning and rearing habitat. As a result, many impounded white sturgeon populations are not as productive as they were before non-Native American settlement of the region and development of the hydrosystem. In some upper Columbia River Basin reaches, isolated populations may face extirpation or extinction (Beamesderfer et al. 1995, North et al. 1993, Parsley and Beckman 1994, Parsley et al. 1993).

- American Shad (*Alosa sapidissima*)

American shad routinely average large numbers of returns to the Columbia River, and in some years the number counted at Bonneville Dam is as high as 4-5 million (5.3 million in 2004, and 4.2 million in 2005, for example). The U.S. Geological Survey has estimated as many 10 million to 20 million adult shad may enter the Columbia annually — 4,000 metric tons (adults average 2-3 pounds). Shad have migrated past Bonneville, The Dalles, John Day, McNary, and Priest Rapids dams on the Columbia and the four lower Snake River dams, according to the Survey.

Unlike salmon and steelhead, shad are not native to the Columbia. They were introduced to the Pacific

Coast from the Atlantic coast, first planted 10,000 in the Sacramento River in 1871. Five years later shad were being captured in the Columbia River and in 1880 the shad invasion was confirmed by fish scientist David Starr Jordan, who sent a specimen to the Smithsonian Institution where it is preserved to this day.

Like salmon and steelhead, shad are anadromous. Biologically part of the herring family of fish, they spawn in the mainstem Columbia River primarily above Bonneville Dam between May and July and also in the Willamette River of Oregon. Shad go to the ocean as adults, returning to spawn when they are three to five years of age. The run peaks in June. Unlike salmon and steelhead, shad spawn in open water rather than laying eggs on gravel. Also unlike salmon, shad can make the round trip to the ocean several times and spawn additional generations.

Shad spawn prolifically, produce large numbers of smolts, and return as adults in such volume that they are fished both commercially and for sport. There is no daily limit on Columbia River shad in either Washington or Oregon. Shad are caught in the lower Snake River, but that is about as far inland as they go. The bulk of the annual run spawns downstream from McNary Dam.

- Pacific Lamprey (*Entosphenus tridentatus*)

Lampreys, jawless fishes of the family Petromyzontidae, are among the oldest existing vertebrates, having changed little since emerging about 530 million years ago (Dawkins 2004). The Pacific lamprey *Entosphenus tridentatus* (formerly *Lampetra tridentata*) is an anadromous species native to the north Pacific Rim (Scott and Crossman 1973) including the Columbia River Basin. Pacific lamprey are an important food source for marine mammal, avian, and fish predators, and may act as a predation buffer for Pacific salmon Oncorhynchus species juveniles. Moreover, they are a source of marine-derived nutrients in the upper tributaries of the Columbia and Snake rivers (Close et al. 1995). Pacific lamprey may also be a key indicator of ecological health of the Columbia River Basin. Importantly, Pacific lamprey serve a role in the culture of many Native American tribes (Close et al. 2002).

Despite their persistence through time, lamprey are now believed to be declining throughout much of their distribution (e.g., see Renaud 1997). Pacific lamprey along the west coast of North America have recently experienced declines and regional extirpations (Beamish and Northcote 1989; Kostow 2002; Moser and Close 2003). These declines parallel those of Pacific salmonids, perhaps because the two groups share widely sympatric distributions (Scott and Crossman 1973; Simpson and Wallace 1978; Moyle 2002) and similar anadromous life histories (McDowall 2001; Quinn and Myers 2004). Causes for the decline in the Columbia River Basin may include construction and operation of dams for hydropower, flood control, and irrigation, habitat degradation, poor water quality, proliferation of exotic species, the relative

abundance of host species in the marine environment (Murauskas et al. 2013), and direct eradication actions.

Numerous management and research actions have been recommended to help restore Pacific lamprey in the Columbia River Basin (Nez Perce, Umatilla, Yakama, and Warm Springs Tribes 2008; Columbia Basin Fish and Wildlife Authority 2008). These actions include improving adult and juvenile passage at known and suspected obstacles, restoring degraded habitat and water quality, and implementing reintroduction methods.

- Walleye (*Sander vitreus*)

Walleye are an exotic species introduced into Lake Roosevelt in the upper Columbia River during the 1940s and 1950s. Walleye are not native to Washington fish, and exactly how they originally entered the state is unknown. The first verification of a walleye in Washington was in 1962, from Banks Lake in eastern Washington. Soon afterwards, populations began to show up in Lake Roosevelt (connected to Banks Lake through a huge pipe and pump). Since then they have spread from these original sites to the remainder of the mainstem Columbia River, from near the mouth to the Canadian border and throughout reservoirs in the Columbia River Basin.

Walleye continued to advance to other waters in the Columbia River Basin by using canals as frontier highways. They have established populations in Lake Billy Clapp, Moses Lake, Potholes Reservoir, Long Lake, Crescent Lake, Soda Lake and Scooteney Reservoir. They have thrived in reservoir environments and are a primary gamefish species. Young walleye are typically found in littoral (nearshore) areas associated with woody debris. Adults are most commonly found in pelagic (open water) areas during daylight hours and near the mouths of embayments and tributaries at night where they come to feed (Peone et al. 1990).

Hatchery Effects to Other Fish Species

Hatchery salmon and steelhead may act to enhance, artificially, existing pathways of prey, predator, and competition between the hatchery-reared species and other species, including: bull trout, eulachon, shad, lamprey, and walleye.

Bull trout feed primarily on fish (referred to as piscivorous) as subadults and adults, they can be substantial predators of young salmon and steelhead. Eulachon are important in the food chain as a prey species of salmon and steelhead. Newly hatched and juvenile eulachon are food for a variety of larger marine fish species, including salmon and steelhead. Shad are a non-indigenous species of anadromous

fish, in the Columbia River, that provide both a prey-base for some juvenile salmonids (Chinook salmon) but also may compete with salmon and steelhead for prey in the freshwater environment. Lamprey prey on a variety of fish and marine mammals (whales), including salmon, which are an important food source for lamprey. Walleye, a non-indigenous warm water fish is known to prey on seaward migrating salmon and steelhead juveniles.

3.3. Water Quality and Quantity—Hatchery Effects & Marine-Derived Nutrients

As detailed in the Mitchell Act EIS (Subsection 3.6.3.1, *Water Quality Parameters*) and incorporated herein, by reference, hatchery facilities can have impacts to in-stream water quality, where they operate. Hatcheries can produce effluent (discharged water that has been used in the facility) with elevated temperature, as well as elevated levels of: ammonia, organic nitrogen, total phosphorus, biochemical oxygen demand (BOD), pH, and solids; as well as levels of chemicals used for disease treatment and disinfection. Effluent from hatchery facilities rearing 20,000 lbs or more of fish, is regulated under the federal Clean Water Act (CWA), through National Pollutant Discharge Elimination System (NPDES) permits, and issued by the states or directly by the Environmental Protection Agency (EPA). Hatcheries that are in compliance with their NPDES permits (where required), and thus water quality standards, are considered not to cause or to contribute to a violation of water quality standards. However, the amount effluent being discharged into receiving waters from hatcheries do contribute to the total pollutant loads of those receiving waters and downstream waters. The status quo condition of water quality, with regard to the effects of hatchery production in the Columbia River basin, and including facilities that rear and release programs included in the proposed action, is consistent with current federal and state regulations.

Anadromous species such as salmon and steelhead are important components of the freshwater ecosystem, particularly for their role in transporting nutrients upstream from the marine ecosystem, and possibly as watershed engineers that structure streambed habitats and alter sediment composition during spawning.

Hatchery produced salmon and steelhead currently provide a significant number of the returning adults to the Columbia River basin, contributing substantially to the total contribution of marine-derived nutrients. This EIS incorporates by reference Subsection 3.5.6.5 of the Mitchell Act EIS (NMFS 2014b) which provides a comprehensive discussion of the role of salmon and steelhead in transporting marine-derived nutrients.

3.4. Wildlife

Fisheries have the potential to affect wildlife through interactions from changes in the availability of fish

as prey. Wildlife that are most likely to be affected by fishing activities are seabirds and marine mammals. Both of these groups are protected under Federal laws, such as the Migratory Bird Treaty Act (MBTA) and the Marine Mammal Protection Act (MMPA)

3.4.1. Seabirds, Raptors, and other Piscivorous Birds

Numerous seabird species, as well as raptors, are protected under the MBTA, including several that are present within the project area. These seabirds include Caspian terns, Double-crested cormorants, and several species of gulls. Guillemots, murres, and puffins also prey on juvenile salmon, primarily in the ocean. . These birds feed on out-migrating juvenile salmon.

Predation on juvenile salmon occurs in the Columbia River, as salmon smolts migrate downstream and into marine waters. Two man-made islands, East Sand Island and Rice Island were created using dredge spoils from the Columbia River. The islands have since become occupied by colonies of Caspian terns and double-crested cormorants. In 2010 and 2011, an estimated 19.2 million and 20.5 million (respectively) juvenile salmon were consumed by the double-crested cormorant colony on East Sand Island. These numbers are approximately equal to 18 percent of the entire Columbia River out-migrating salmon for those years (BRNW 2011). Caspian Terns nesting on East Sand Island and Rice Island also consume outmigrating salmonids: 8.1 million salmon smolts in 1997 and 12.4 million in 1998. The U.S. Army Corps of Engineers has implemented culling actions in 2015 and 2016 on double-crested cormorants in the Columbia River Estuary under MBTA depredation permit issued by the USFWS to reduce predation impacts on ESA-listed salmonids.

Raptors (bald eagles, turkey vultures, osprey), corvids (crows, ravens), and numerous species of gulls prey on returning adult salmonids, primarily post-spawn adults.

Hatchery produced salmon and steelhead make up the majority of the current, total Columbia River basin production. As such, avian species that rely on juvenile or adult salmon of steelhead, from the Columbia River are affected by the level of hatchery production of these species. Status quo conditions for Caspian terns and bald eagles result from the recent levels of hatchery production, within the Columbia River basin, as analyzed in the Mitchell Act EIS (NMFS 2014b).

3.4.2. Marine Mammals

Fisheries in the lower Columbia River can occur in the presence of harbor seals (*Phoca vitulina*) and California sea lions (*Zalophus californianus*). In compliance with the MMPA, NMFS publishes an annual list of fisheries that classifies fisheries by the level of mortality and serious injury of marine mammals that occurs incidental to each fishery. NMFS has determined that salmon troll fisheries and Columbia

River net fisheries for salmon and eulachon have little to no known impact on marine mammals (82 Fed. Reg. 3655, January 12, 2017).

California sea lions have a substantial effect on salmon and steelhead migrating up the Columbia River, through predation below Bonneville Dam. After non-lethal methods to remove or discourage sea lion predation were unsuccessful, NMFS authorized, under MMPA Section 120, the states of Washington, Oregon and Idaho to lethally remove individually identifiable California Sea Lions in the vicinity of Bonneville Dam that are having a negative impact on the recovery of salmon and steelhead listed under the ESA.

The Southern Resident Killer Whale DPS (SRKW) is ESA-listed as endangered. SRKW pods have been sighted off of the West Coast as far south as Monterey, California (SRKW recovery plan, January 2008). These whales are known to prey upon salmon in the ocean; therefore, SRKW may be affected by the Proposed Action.

NMFS' recovery plan for SRKW (2008) singles out decline of Columbia River salmon as possibly the single greatest change in food availability for SRKW since the late 1800s. Returns during the 1990s averaged only 550,000 adult salmonids crossing Bonneville Dam, representing a decline of 90 percent or more from historical levels. With so many fish present back in the 1800s, salmonids returning to the Columbia River may have been an important part of the diet of SRKW. More recently returning adults crossing Bonneville Dam has increased, as the 10-year average (2007-2016) of all salmonids crossing Bonneville Dam is now 1.8 million.

As described in the Mitchell Act EIS, hatchery produced salmon and steelhead currently provide the majority of the total fish produced from the Columbia River basin. As such, the status quo condition of marine mammal species that rely on salmon or steelhead, from the Columbia River, are affected by the level of overall hatchery production of these species, including the programs referenced in the *US v Oregon* Agreement. Status quo conditions for SRKW, resulting, in part, from recent levels hatchery Chinook salmon production from the Columbia River basin are described in Section 3.5.3.1.1, of the Mitchell Act EIS, and incorporated herein by reference. The conditions for marine mammals, resulting from the hatchery production included in this Agreement, would likely result in a small increase in overall Chinook salmon. However, this increase would likely not be discernable from the natural variability of adult Chinook salmon abundance in the ocean (NMFS 2014b).

3.5. Economics

Economic issues addressed in this section include harvest effects related to management strategies,

economic values of fish predicted to be caught in commercial tribal and non-tribal) fisheries, and the contribution of commercial and recreational fishing activity on local and regional economies in the Columbia River basin. Additional economic information related to tribal harvests is provided in Section 3.6, Cultural Resources - Ceremonial and Subsistence Harvest.

This economic analysis focuses on commercial and recreational fishing targeting five harvest indicator stocks that collectively account for more than 80 percent of the total catch of salmon and steelhead in the mainstem Columbia River. In addition to supporting tribal commercial and non-tribal recreational fisheries in the mainstem, these stocks also support ceremonial and subsistence tribal fishing.

This section describes status quo conditions for harvest and related economic values for affected commercial (tribal and non-tribal) and recreational fisheries on the mainstem Columbia River (including the mainstem Snake River), and the contribution of these fisheries to affected regional economies. For this economic analysis, indicators of economic conditions evaluated include direct and indirect employment, ex-vessel values for commercial fisheries, trip-related expenditures by recreational fishers, and regional economic impacts (jobs and personal income) associated with fishing-related activities.

The analysis area for economics includes the project area (Subsection 1.2, Description of Project Area) and areas outside the project area in which economic activity generated by fishing activities occurs. This analysis area consists of four subregions of the Columbia River Basin that are used to characterize effects on commercial harvest and recreational fishing effort:

- Lower Columbia River subregion, where catch assumed to contribute to economic activity in eight counties (Columbia, Clatsop, and Multnomah Counties in Oregon, and Pacific, Wahkiakum, Clark, Cowlitz, and Skamania in Washington) that border ODFW mainstem fishing zones 1 through 5 downstream of Bonneville Dam;
- Mid-Columbia River subregion, where catch assumed to contribute to economic activity in eight counties (Hood River, Wasco, Sherman, Gilliam, Morrow, and Crook Counties in Oregon, and Benton and Klickitat Counties in Washington) that border ODFW fishing zone 6 between Bonneville Dam and McNary Dam;
- Upper Columbia River subregion, where catch assumed to contribute to economic activity in four counties (Benton, Kittatas, Franklin and Grant Counties in Washington) that are upstream of McNary Dam; and
- Lower Snake River subregion, where catch assumed to contribute to economic activity in five counties (Walla Walla, Columbus, Garfield, Whitman, and Franklin Counties in Washington) that are upstream of the confluence with the mainstem Columbia River.

The counties that comprise these four subregions are identified in Figure 1-1. Although the analysis area for the economics assessment is defined by the four subregions and the corresponding counties identified above, it should be noted that implementation of the harvest policy alternatives would be expected to affect, to a more limited extent, economic activity in other counties in the general region of the analysis area. This would include, but not be limited to, Umatilla, Jefferson, Deschutes, Wheeler, and Grant Counties.

Communities and ports in the Lower Columbia River subregion that are affected by the commercial, recreational, and tribal ceremonial and subsistence fisheries in the project area include the ports, cities, and communities of Portland, Oregon and Cathlamet, Longview and Vancouver, Washington. Rural communities in the other three subregions that are near to the mainstem are also affected by commercial (both treaty and non-treaty) and recreational fishing activities for salmon and steelhead activities.

It should be noted that values presented in this section are not rounded to aid the reader in finding corresponding numbers between tables and text. The use of unrounded numbers, however, should not be interpreted as suggestive of unusually high levels of precision in the estimates. All numbers presented represent a reasonable estimate of the underlying values. More detailed information on methods and analyses applied in analyzing the economic resource is presented in Appendix A, Economic Methods.

3.5.1. Affected Fisheries

This subsection provides a description of commercial and recreational salmon and steelhead fisheries in the Columbia River basin, including numbers of salmon and steelhead harvested and recreational effort. It should be noted that steelhead are not legal for harvest in non-Tribal commercial fisheries anywhere in the Columbia River Basin. For historical context, harvest data from 2005 through 2016 are presented in Subsection 3.2.1, representing the period in which average conditions are developed for this analysis.

3.5.1.1. Commercial (Tribal and Non-tribal) Fisheries

The Columbia River mainstem salmon and steelhead fishery is currently divided into a non-tribal commercial salmon fishery, which is located downstream of Bonneville Dam, and a tribal commercial salmon and steelhead fishery, which is located almost entirely upstream of Bonneville Dam. The primary tribal commercial fishery is also called the Zone 6 fishery. The upstream boundary of the Zone 6 fishery is McNary Dam.

As described in Subsection 1.3.1, Fisheries, commercial fishing in the Columbia River Basin also occurs in terminal areas, such as SAFE areas and the lower Columbia River; however, as discussed in that same section the harvesting of lower Columbia River stocks in these areas is managed separately from the *US v Oregon* agreement and would not be affected by the harvest policies evaluated in this document. In

addition to commercial salmon harvesters, processors provide Columbia River basin salmon supply products to a growing market for wild-caught fish.

For tribal and non-tribal commercial harvests in the Columbia River basin, more salmon are harvested from the lower and mid-Columbia River subregions than from the other two subregions. Within the lower Columbia River subregion, the harvest is primarily from non-tribal commercial fisheries. Between 2002 and 2009, the annual harvest in the mainstem of the Lower Columbia River was 56,238 fish (NMFS 2014b). Coho and Chinook salmon account for most of the non-tribal commercial fishing harvest because steelhead are not commercially harvested by non-tribal commercial fishers.

In the tribal commercial fisheries above Bonneville Dam (Zone 6), the harvest of Chinook salmon dominates the catch in the mainstem between Bonneville Dam and McNary Dam. The tribal commercial fisheries in the upper Columbia River are mostly Chinook salmon fisheries.

As described in Subsection 3.1, average estimates of salmon and steelhead harvest between 2005 and 2016 were used to characterize status quo harvest conditions for this analysis. Indicator harvest stock-specific estimates for tribal and non-tribal fisheries are presented in the following tables. Minimum, maximum, and mean conditions are used to characterize the following status quo conditions.

Table 3-13 identifies average annual harvest conditions over 2005 and 2016 for Upriver Spring Chinook salmon, including average minimum values, average maximums, and average mean values of harvest, as measured by number of fish. As shown, all of the tribal commercial harvest is caught in the Zone 6, although it should be acknowledged that some portion of the total tribal catch reported in Table 3-15 occurs below Bonneville Dam in Zone 5, while all of the non-tribal commercial harvest is caught in Zones 1 through 5. Tribal harvest for ceremonial and subsistence needs averaged 10,340 spring Chinook salmon annually over the 12-year period (Table 3-13).

Table 3-13. Commercial harvest of Upriver spring Chinook salmon under status quo conditions.

Tribal Fisheries	Zone 1-5	Zone 6	Above Zone 6 thru I-395 Bridge	Lower Snake River	Total Commercial	C&S Fisheries
min	NA	173	NA	NA	173	6,191
max	NA	23,472	NA	NA	23,472	10,548
AVERAGE	NA	7,528	NA	NA	7,528	10,340
Non-Tribal Fisheries	**Zone 1-5**	**Zone 6**	**Above Zone 6 thru I-395 Bridge**	**Lower Snake River**	**Total Commercial**	**Above Z 6 NT Tribal**
min	1,448	NA	NA	NA	1,448	4
max	7,743	NA	NA	NA	7,743	21
AVERAGE	4,067	NA	NA	NA	4,067	11

Table 3-14 identifies average annual harvest conditions between 2005 and 2016 for Upper Columbia summer Chinook salmon, including average minimum values, average maximums, and average mean values of harvest (number of fish). Similar to Upriver spring Chinook salmon, all of the tribal commercial harvest is caught in Zone 6, although it should be acknowledged that some portion of the total tribal catch reported in Table 3-15 occurs below Bonneville Dam in Zone 5. The non-tribal commercial harvest is caught in both Zones 1 through 5 and above Zone 6. Tribal harvest for ceremonial and subsistence needs averaged 1,952 fall Chinook salmon annually over the 12-year period.

Table 3-14. Commercial harvest of Upper Columbia summer Chinook salmon under status quo conditions.

Tribal Fisheries	Zone 1-5	Zone 6	Above Zone 6 thru I-395 Bridge	Lower Snake River	Total Commercial	C&S Fisheries
min	NA	3,600	NA	NA	3,600	400
max	NA	37,800	NA	NA	37,800	4,200
AVERAGE	NA	17,569	NA	NA	17,569	1,952
Non-Tribal Fisheries	**Zone 1-5**	**Zone 6**	**Above Zone 6 thru I-395 Bridge**	**Lower Snake River**	**Total Commercial**	**Above Z 6 NT Tribal**
min	688	NA	NA	NA	688	792
max	7,221	NA	NA	NA	7,221	8,317
AVERAGE	3,356	NA	NA	NA	3,356	3,866

Table 3-15 below identifies average annual harvest conditions between 2005 and 2016 for Upriver fall Chinook salmon, including average minimum values, average maximums, and average mean values of harvest (number of fish). Similar to Upriver spring Chinook salmon, all of the tribal commercial harvest is shown as caught in the Zone 6, although it should be acknowledged that some portion of the total tribal catch reported in Table 3-15 occurs below Bonneville Dam in Zone 5. All of the non-tribal commercial harvest is caught in Zones 1 through 5. Tribal harvest for ceremonial and subsistence needs averaged 8,078 fall Chinook salmon annually over the 12-year period.

Table 3-16 below identifies average annual harvest conditions between 2005 and 2016 for Upper Columbia River (UCR) sockeye salmon, including average minimum values, average maximums, and average mean values of harvest (number of fish).

Table 3-15. Commercial harvest of Upriver fall Chinook salmon under status quo conditions.

Tribal Fisheries	Zone 1-5	Zone 6	Above Zone 6 thru I-395 Bridge	Lower Snake River	Total Commercial	C&S Fisheries
min	NA	42,849	NA	NA	42,849	1,848
max	NA	393,700	NA	NA	393,700	16,980
AVERAGE	NA	187,303	NA	NA	187,303	8,078
Non-Tribal Fisheries	**Zone 1-5**	**Zone 6**	**Above Zone 6 thru I-395 Bridge**	**Lower Snake River**	**Total Commercial**	**Above Z 6 NT Tribal**
min	3,657	NA	NA	NA	3,657	NA
max	96,614	NA	NA	NA	96,614	NA
AVERAGE	44,870	NA	NA	NA	44,870	NA

Similar to Upriver spring Chinook salmon, all of the tribal commercial harvest is caught in Zone 6, although it should be acknowledged that some portion of the total tribal catch reported in Table 3-16 occurs below Bonneville Dam in Zone 5. All of the non-tribal commercial harvest is caught in Zones 1-5. Tribal harvest for ceremonial and subsistence needs averaged 2,902 sockeye salmon annually over the 12-year period.

Table 3-17 below identifies average annual harvest conditions between 2005 and 2016 for Lower Snake River steelhead, including average minimum values, average maximums, and average mean values of harvest (number of fish). Similar to Upriver spring and summer Chinook salmon, all of the tribal commercial harvest is shown as caught in Zone 6, although it should be acknowledged that some portion of the total tribal catch reported in Table 3-15 occurs below Bonneville Dam in Zone 5. All of the non-tribal commercial harvest is caught in Zones 1-5. Tribal harvest for ceremonial and subsistence needs averaged 471 steelhead annually over the 12-year period.

Table 3-16. Commercial harvest of Upriver sockeye salmon under status quo conditions.

Tribal Fisheries	Zone 1-5	Zone 6	Above Zone 6 thru I-395 Bridge	Lower Snake River	Total Commercial	C&S Fisheries
min	NA	1,148	NA	NA	1,148	203
max	NA	38,556	NA	NA	38,556	6,804
AVERAGE	NA	16,440	NA	NA	16,440	2,901
Non-Tribal Fisheries	**Zone 1-5**	**Zone 6**	**Above Zone 6 thru I-395 Bridge**	**Lower Snake River**	**Total Commercial**	**Above Z 6 NT Tribal**
min	50	NA	NA	NA	50	NA
max	1,194	NA	NA	NA	1,194	NA
AVERAGE	512	NA	NA	NA	512	NA

Table 3-17. Commercial harvest of Snake River B-Index steelhead under status quo conditions.[1]

Tribal Fisheries	Zone 1-5	Zone 6	Above Zone 6 thru I-395 Bridge	Lower Snake River	Total Commercial	C&S Fisheries
min	NA	1,455	NA	NA	1,455	77
max	NA	17,950	NA	NA	17,950	945
AVERAGE	NA	8,945	NA	NA	8,945	471
Non-Tribal Fisheries	**Zone 1-5**	**Zone 6**	**Above Zone 6 thru I-395 Bridge**	**Lower Snake River**	**Total Commercial**	**Above Z 6 NT Tribal**
min	0	NA	NA	NA	0	NA
max	0	NA	NA	NA	0	NA
AVERAGE	0	NA	NA	NA	0	NA

1. Note that some Snake River B-Index steelhead are caught as incidental take by non-tribal fishers in the Lower Columbia River. These fish cannot be kept or sold.

In terms of economic value, the average annual harvest value (known as the ex-vessel value, which is the price received for the product 'at the dock') of salmon caught in the non-tribal commercial fisheries in the Lower Columbia River subregion was $2,414,813 (Table 3-18). In the Mid-Columbia River, the harvest value of salmon and steelhead caught by tribal commercial fishers was $7,745,794, and the value to non-tribal fishers was $148,749. No harvest value is estimated for the upper Columbia River and Lower Snake River subregions because there was no commercial harvest of the harvest indicator stocks.

Table 3-18. Commercial harvest and ex-vessel value of harvest indicator species under status quo conditions, by Columbia River subregion and type of fishery.

Subregion/Type of Fishery	Value	% of Total for All Subregions
Lower Columbia River Subregion		
Non-Tribal		
Harvest (number of fish)	52,804	17.9
Ex-vessel harvest value	$2,414,813	23.4
Tribal		
Harvest (number of fish)	0	0
Ex-vessel harvest value	$0	0
Total		
Harvest (number of fish)	52,804	17.9
Ex-vessel harvest value	$2,418,367	23.4
Mid-Columbia River Subregion		
Non-Tribal		
Harvest (number of fish)	3,877	1.3
Ex-vessel harvest value	$148,749	1.4
Tribal		
Harvest (number of fish)	237,785	100.0
Ex-vessel harvest value	$7,745,794	100.0
Total		

Subregion/Type of Fishery	Value	% of Total for All Subregions
Harvest (number of fish)	241,662	82.1
Ex-vessel harvest value	$7,894,543	76.6
ALL SUBREGIONS		
Non-Tribal		
Harvest (number of fish)	56,681	19.3
Ex-vessel harvest value	$2,563,562	24.9
Tribal		
Harvest (number of fish)	237,785	80.7
Ex-vessel harvest value	$7,745,794	75.1
Total		
Harvest (number of fish)	294,466	100.0
Ex-vessel harvest value	$10,309,356	100.0

Notes: All dollar values are expressed in 2015 dollars.
Source: Catch estimates provided by NMFS; all other estimates developed by TCW Economics.

The total ex-vessel value[3] of the commercial harvest of salmon and steelhead under the status quo conditions is $10,309,356, with tribal fisheries accounting for 81 percent ($7,745,794) of this value, and non-tribal fisheries accounting for 19 percent ($2,563,562) of the total harvest value.

3.5.1.2. Recreational Fisheries

The recreational fishery on the mainstem Columbia River below Bonneville Dam includes two main management areas; the mainstem Columbia River extending from Bonneville Dam downstream to the Point/Rocky Point line, and the Buoy 10 area extending from below the Tongue Point/Rocky Point line to Buoy 10, which marks the ocean/in-river boundary. According to information in the Mitchell Act FEIS (NMFS 2014b), about 52 percent (161,397 fish) of the annual average recreational harvest between 2002 and 2009 of salmon and steelhead in the Columbia River basin (311,252 fish) occurred in the Lower Columbia River and tributaries. This percentage was previously reported to be 80 percent in the final EIS for Pacific Salmon Fisheries Management off the Coasts of Southeast Alaska, Washington, Oregon, and California, and in the Columbia River basin (NMFS 2003), but more recent data show that the percentage has decreased. The recreational fisheries above Bonneville Dam, which account for the remainder of the harvest, are geographically widespread but socially important. Much of the recreational harvest in both the lower and upper Columbia River occurs in tributaries (NMFS 2003).

Based on historical information (NMFS 2003), the Cowlitz, Lewis, Kalama, and Elochoman Rivers in Washington and the Willamette, Sandy, and Santiam Rivers in Oregon account for approximately 45 percent of the Lower Columbia River basin salmon and steelhead harvest. Above Bonneville Dam, the

[3] The term ex-vessel value refers to the price (income) that fishermen receive for the fish "at the dock."

Klickitat, White Salmon, and Little White Salmon tributaries in Washington, the Deschutes in Oregon, and other tributaries account for approximately 60 percent of the salmon and steelhead harvest (NMFS 2003).

Similar to status quo conditions for commercial harvest of salmon and steelhead, average estimates between 2005 and 2016 were used to characterize status quo harvest conditions. Indicator harvest stock-specific estimates are presented in the following tables for affected recreational fisheries. Minimum, maximum, and mean conditions are used to characterize status quo conditions.

Table 3-19 identifies average annual catch conditions between 2005 and 2016 for upriver Spring Chinook salmon, including average minimum values, average maximums, and average mean values. As shown, most (78 percent) of the catch occurs in Zone 1 through 5.

Table 3-19. Recreational catch of Upriver spring Chinook salmon under status quo conditions.

Recreational Fisheries	Zone 1-5	Zone 6	Above Zone 6 thru I-395 Bridge	Lower Snake River	Non-treaty	Total Sport
min.	3,877	714	NA	321	NA	4,912
max.	20,726	3,817	NA	1,713	NA	26,256
ave.	10,886	2,005	NA	900	NA	13,791

Table 3-20 identifies average annual catch conditions between 2005 and 2016 for Upper Columbia summer Chinook salmon, including average minimum values, average maximums, and average mean values. Of the total sport catch, about half is caught by non-treaty tribal fishers (this catch is not part of the tribal allocation) and half by non-tribal recreational fishers. Most (about 92 percent) of the catch by non-tribal recreational fishers is caught in Zones 1 through 5.

Table 3-20. Recreational catch of Upper Columbia summer Chinook salmon under status quo conditions.

Recreational Fisheries	Zone 1-5	Zone 6	Above Zone 6 thru I-395 Bridge	Lower Snake River	Non-Treaty	Total Sport
min.	752	103	36	NA	820	1,711
max.	7,901	1,085	377	NA	8,614	17,977
ave.	3,672	504	175	NA	4,003	8,354

Table 3-21 identifies average annual catch conditions between the 2005 through 2016 for upriver fall Chinook salmon, including average minimum values, average maximums, and average mean values. As shown, most (about 82 percent) of the catch occurs in the Zone 1-5, and is only caught by non-tribal fishers.

Table 3-21. Recreational catch of Upriver fall Chinook salmon under status quo conditions.

Recreational Fisheries	Zone 1-5	Zone 6	Above Zone 6 thru I-395 Bridge	Lower Snake River	Non-treaty	Total Sport
min	2,775	477	134	NA	NA	3,386
max	73,317	12,595	3,542	NA	NA	89,453
ave.	34,050	5,849	1,645	NA	NA	41,544

Table 3-22 identifies average catch conditions over the 2005 through 2016 for upriver spring Chinook salmon, including average minimum values, average maximums, and average mean values.

Table 3-22. Recreational catch of Upriver sockeye salmon under status quo conditions.

Recreational Fisheries	Zone 1-5	Zone 6	Above Zone 6 thru I-395 Bridge	Lower Snake River	Non-treaty	Total Sport
min	220	NA	NA	NA	NA	220
max	5,286	NA	NA	NA	NA	5,286
ave.	2,266	NA	NA	NA	NA	2,266

Table 3-23 identifies average annual catch conditions between 2005 and 2016 for Snake River steelhead, including average minimum values, average maximums, and average mean values. As shown, most (about 89 percent) of the catch occurs in Zone 6 and is caught by non-treaty tribal fishers.

Table 3-23. Recreational catch of Snake River B-Index steelhead under status quo conditions.

Recreational Fisheries	Zone 1-5	Zone 6	Above Zone 6 thru I-395 Bridge	Lower Snake River	Non-Treaty	Total Sport
min	161	1,333	NA	NA	NA	1,494
max	1,327	10,992	NA	NA	NA	12,319
ave.	680	5,631	NA	NA	NA	6,310

Based on estimates of angler effort per fish caught (refer to Appendix A, Economic Methods), the total number of angler trips made to catch the five harvest indicator stocks in the mainstem of the Columbia River is estimated at 895,961 (Table 3-24). Similar to catch estimates, most of the angler trips occurred in the Lower and Mid-Columbia River Subregions. There is no recreational catch or angler trips in the Upper Columbia River Subregion. Trip-related expenditures are estimated to total $111,821,173, based on average expenditures per angler trip (refer to Appendix A, Economics Methods for details).

Table 3-24. Recreational salmon and steelhead catch, angler trips, and trip-related expenditures under status quo conditions, by Columbia River subregion.

Subregion	Value	% of Total for all Subregions
Lower Columbia River Subregion		
Catch	155,704	84.4
Trips	753,994	84.1
Trip-related expenditures	$98,390,721	88.0
Mid-Columbia River Subregion		
Catch	27,508	14.9
Trips	134,950	15.1
Trip-related expenditures	$12,779,061	11.4
Lower Snake River Subregion		
Catch	1,333	0.7
Trips	7,016	0.8
Trip-related expenditures	$651,391	0.6
ALL SUBREGIONS		
Catch	184,545	100.0
Trips	895,961	100.0
Trip-related expenditures	$111,821,173	100.0

Notes: All dollar values are expressed in 2015 dollars.
Source: Catch estimates provided by NMFS; all other estimates developed by TCW Economics.

3.5.1.3. Contribution of Affected Fisheries to Regional Economic Conditions

Commercial and recreational fisheries generate personal income and support jobs in regional and local economies throughout the Columbia River basin. Commercial landings of salmon and steelhead are frequently sold directly, or after processing, to persons or businesses located outside the region. This transfer of money supports payments to labor, which are then re-spent regionally (i.e., the multiplier effect). Similarly, non-local recreational anglers (i.e., anglers who live outside the local area) spend money on guide services, lodging, and other goods and services that generate income for local communities. Last, money spent on hatchery operations and management, which often comes from state or Federal sources located outside the local area, provides an additional infusion of income to local economies. Hatchery operations in the Columbia River basin also generate direct, indirect, and induced economic effects within the basin's four economic impact regions by providing employment opportunities and through local procurement of goods and services for hatchery operations. Hatchery-related spending affects regional economies where hatchery operations occur and where the businesses that provide materials and services are located. This spending also extends to communities where hatchery administration and management decisions take place (sometimes referred to as headquarter costs); refer to

the Mitchell Act FEIS (NMFS 2014b) (Subsection 4.3) for a discussion of hatchery-related economic effects.

Economic activity generated by commercial and recreational fishing is concentrated within certain sectors of the regional economy. In addition to the fish harvesting sector, commercial fisheries affect seafood product preparation and packing, including the canning and curing of seafood and preparation of fresh or frozen fish or seafood. Wholesaling, retailing and restaurant sectors may also be affected, although income and employment in those sectors is not included in the subregional and regional totals. Recreational fisheries contribute to local economies through the purchase of fishing-related goods and supplies, and by the retention of 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. Expenditures on fishing-related goods and services by fishermen contribute to both local and non-local businesses.

The commercial and recreational fisheries that target salmon and steelhead in the Columbia River Basin generate economic activity characterized by employment (jobs) and personal income. Commercial harvest and recreational fishing (trips) and associated employment and personal income are distributed among the four subregions constituting the analysis area (Table 3-25).

Commercial harvest of salmon and steelhead by tribal and non-tribal fishers in the Columbia River region under status quo conditions generated an estimated 419 jobs and $16.2 million in personal income. More than three-quarters of jobs and income from commercial harvests landed in the Mid-Columbia River Subregion with the remainder in the Lower Columbia River Subregion (Table 3-25). Recreational fishing activities targeting salmon and steelhead generate an estimated 672 jobs and $27.9 million in personal income in the Columbia River region (Table 3-25). More than two-thirds of jobs and income generated by recreational fishing occur in the Lower Columbia River Subregion, with most of the remainder occurring in the Mid-Columbia River Subregion and a small amount (1.4 percent of income and 2 percent of jobs as a result of recreational fishery conducted by Washington) in the Lower Snake River Subregion (Table 3-25).

Table 3-25. Regional economic effects from harvest of indicator stocks of commercial and recreational salmon and steelhead under status quo conditions, by Columbia River subregion

Subregion/Type of Fishery	Value (dollars or number of jobs)	% of All Region Total
Lower Columbia River Subregion		
Commercial (Tribal and Non-tribal) Fisheries		
Personal income	$3,799	23.4%
Jobs	86	20.6%
Recreational Fisheries		
Personal income	$19,602	70.2%
Jobs	446	66.3%
Mid-Columbia River Subregion		
Commercial (Tribal and Non-tribal) Fisheries		
Personal income	$12,400	76.6%
Jobs	332	79.4%
Recreational Fisheries		
Personal income	$7,951	28.5%
Jobs	213	31.7%
Lower Snake River Subregion		
Commercial (Tribal and Non-tribal) Fisheries		
Personal income	$0	0%
Jobs	0	0%
Recreational Fisheries		
Personal income	$387	1.4%
Jobs	13	2.0%
Total (all subregions)		
Commercial (Tribal and Non-tribal) Fisheries		
Personal income	$16,199	100%
Jobs	419	100%
Recreational Fisheries		
Personal income	$27,940	100%
Jobs	672	100%

Notes:
1. All dollar values are expressed in 2015 dollars. Jobs are expressed in full-time equivalents.
2. Estimates for commercial and recreational effects are not combined because the effects for commercial fisheries are measured at the harvesting/processing level, whereas the effects of recreational fisheries are measured at the retail level.

Source: Estimated by TCW Economics using coefficients from the IMPLAN input-output model, and based on harvest estimates provided by the NMFS (personal communication with Enrique Patiño, March 17, 2017.

3.6. Cultural Resources - Ceremonial and Subsistence (C&S) Fisheries

Salmon and steelhead play a significant role in the Ceremonial and Subsistence cultural practices among Indian tribes in the project area. This important cultural resource may be affected by the alternatives analyzed in this EIS. Salmon and steelhead have always been and will continue to be a core symbol and

foundation of tribal identity, health, individual identity, culture, spirituality, religion, emotional well-being, and economy.

Salmon evoke sharing, gifts from nature, responsibility to the resource, and connection to the land and water. They represent the ability of Indian cultures to endure; they facilitate the transmission of tribal fishing culture to younger members, who are taught from an early age to fish and to understand their responsibility to the salmon and its habitat. The struggle to affirm and maintain the right to fish has made salmon an even more evocative symbol of tribal identity.

Salmon remain central in what is known as the first foods. The salmon was the first food to appear in early spring. First salmon ceremonies focus on thanking the fish for returning and assuring the entire community of a successful harvest. These ceremonies also draw attention to the responsibility Indian people have for providing a clean, welcoming, habitat for the returning fish. Family bands gathered along the Columbia River at their favorite or traditional fishing sites to catch and dry enough salmon to use for the year ahead.

The tribes strive to keep at least some subsistence fisheries open the entire year and regard subsistence fishing as an extremely important way for tribal people to provide food for themselves. Even during commercial fisheries, a certain portion of the catch is normally retained for subsistence use. While not all tribal members currently participate in fisheries, those who fish typically share fish with family and friends. Sharing and informal distribution of fish help to bind the community in a system of relationships and obligations. Tribal subsistence harvest can also be used for trade or barter among tribes.

This EIS incorporates by reference Subsection 3.4 of the Mitchell Act EIS, which details the importance of salmon to tribes, the ceremonial and subsistence harvests, and the role that salmon plays in the cultural viability of tribes in the area. It also details how hatchery-produced salmon and steelhead contribute to C&S harvest. As detailed in the Mitchell Act EIS, C&S harvests generally do not vary a great deal from year to year because fish are taken to meet the need. Subsistence fish are, in practice, the priority fish taken by a tribe. Tribes whose fisheries are depleted are helped by buying salmon from other tribes or receiving donations of fish. Tribes make an effort to keep salmon on hand or send out special boats for occasions that include: winter ceremonials, first salmon ceremony, naming ceremonies, and funerals. Some of these occasions require the use of traditional foods, including salmon, for both Indian and non-Indian guests, hosts, and those who cook and serve.

3.7. Environmental Justice

The Environmental Justice analysis area includes counties and communities that may be affected by the alternatives analyzed in this EIS. The analysis area encompasses all Indian tribes that were identified in the Mitchell Act EIS. It also encompasses all counties and communities in the states of Washington, Oregon, and Idaho that are associated with the Columbia River watershed as defined in Subsection 1.3. Coastal counties and communities identified in the Mitchell Act EIS outside of the project area are not included in the Environmental Justice analysis area.

3.7.1. Low Income and Minority Populations

Section 3.4.3 of the Mitchell Act EIS defined the low income and minority thresholds for counties. This EIS incorporates the same methodology as Section 3.4.3 of the Mitchell Act EIS for defining low income and minority thresholds for counties. An environmental justice county is one whose minority or low-income population was meaningfully greater than the state in which the county is located. Five population categories were considered: non-white, Native American, Hispanic, per capita income and poverty rate.

Tables 3-27 and 3-28 of the Mitchell Act EIS presented counties and communities in Washington and Oregon that exceeded the environmental justice thresholds for low income and/or minority populations. By incorporating by reference the analysis and the findings presented in those tables, 21 counties (Benton, Hood River, Jefferson, Marion, Morrow, Multnomah, Sherman, Umatilla, Wasco, Washington, and Whitman counties in Oregon and Benton, Chelan, Douglas, Franklin, Grant, Kittitas, Klickitat, Okanogan, Walla Walla and Yakima in Washington), are identified as Environmental Justice communities for this EIS.

3.7.2. American Indian Tribes

Executive Order 12898 and the Council for Environmental Quality (CEQ) guidance on Environmental Justice under NEPA (CEQ, 1997) requires that effects on federally-recognized Indian tribes also be analyzed. As the alternatives analyzed in this EIS may affect Indian tribes within the analysis area, they are included as Environmental Justice communities for this EIS. The tribes include:

- Burns Paiute Tribe
- Coeur d'Alene Tribe
- Confederated Salish and Kootenai Tribes of the Flathead Nation
- Confederated Tribes and Bands of the Yakama Nation
- Confederated Tribes of the Colville Reservation
- Confederated Tribes of the Umatilla Indian Reservation

- Confederated Tribes of the Warm Springs Reservation of Oregon
- Cowlitz Indian Tribe
- Fort McDermitt Paiute Shoshone Tribes
- Kalispel Tribe of Indians
- Kootenai Tribe of Idaho
- Nez Perce Tribe
- Shoshone-Bannock Tribes of the Fort Hall Reservation
- Shoshone Paiute Tribe of Duck Valley Indian Reservation
- Spokane Tribe of Indians

4. ENVIRONMENTAL CONSEQUENCES

4.1. Introduction

As described in Section 1, the Proposed Action is to issue an ITS under ESA section 7 and sign a 10-year management agreement that establishes harvest policies and defines management frameworks for *US v Oregon* fisheries in the Columbia River between January 1, 2018 and December 31, 2027. The six alternatives analyzed here are used to compare and contrast the effects on the resources that would result from the implementation of such harvest policies and management frameworks in the prosecution of *US v Oregon* fisheries between January 1, 2018 and December 31, 2027.

As described earlier in the document, in Chapters 1 and 3, NMFS is incorporating the existing analysis of hatchery effects from the Mitchell Act EIS (NMFS), which disclose the likely impacts of the hatchery production associated with a new *US v Oregon* management agreement. After careful review of the hatchery programs adopted in the proposed action and the hatchery programs analyzed in the Mitchell Act EIS, as detailed in Subsection 4.2.1, Salmonids, below, NMFS has incorporated the analysis of the Mitchell Act EIS alternatives to disclose the likely impacts, to the relevant resources, from the hatchery production included in the proposed action. Where the impacts may vary from those described in the Mitchell Act EIS, based on the comparative review detailed in Subsection 4.2.1, below, NMFS includes an assessment of the likely difference in impacts expected. These impacts are further detailed in the subsections that follow.

4.1.1. Description of Modeled Metrics for Harvest Indicator Stocks and Abundance Indicator Stocks

In order to compare the relative effect of each alternative on the resources listed in Section 3, we modeled the behavior of the previously described specific *defined metrics* for each alternative (see Subsection 3.2.1 for a description of the *defined metrics*). Modeled outputs for these *defined metrics* are used to provide a quantitative assessment of effects on the resources under the six alternatives.

Similarly to how we presented status quo conditions, we present the modeled outputs for *defined metrics* for the Harvest Indicator Stocks and Abundance Indicator Stocks by providing estimates of escapement past fisheries, the number of fish harvested, harvest rate (proportion of the total "Stock" that was harvested or killed by fisheries) for each alternative, for each stock.

Recall from Subsection 3.2.1 the first two *defined metrics* measure the escapement of the Harvest and Abundance Indicator Stocks at defined locations. Fish returning to the Upper Columbia River are counted at Priest Rapids or Rock Island Dam and those returning to the Snake River are counted at Lower Granite Dam. This EIS models the expected abundance for a respective stock that would pass (escape) through fisheries in the *US v Oregon* agreement if that particular alternative were implemented. The expected escapement abundance outputs are modeled using recent historical minimum, average, and maximum run size information from 2005 to 2016. The harvest policies and management framework in the current management agreement have not changed since 2005.

The second set of the *defined metric*s measure catch in the Treaty commercial and C&S, and Non-treaty commercial and recreational fisheries. The expected catch is modeled based on observations from the 2005 through 2016 base years and reported showing the minimum, average, and maximum that would have occurred under each of the harvest policies analyzed.

The third set of *defined metrics* measure harvest rates in the Treaty and Non-Treaty fisheries. Harvest rates are calculated by dividing the catch and associated fishing mortality by the abundance. The expected harvest rates are modeled based on observations from the 2005 through 2016 base years and reported showing the minimum, average, and maximum that would have occurred under each of the harvest policies analyzed.

Implementing the previous *US v Oregon* agreement taught the parties that certain stocks were consistently limiting fisheries across the various seasons (season structure was described in Subsection 1.3.1). A limiting stock is one that constrains harvest during a season, by being the lowest in abundance relative to its management objective and therefore restricting access to more abundant stocks thus limiting total catch. The analysis in this EIS uses Harvest Indicator Stocks that are also the known limiting stocks, which allow for minimum and maximum catch estimates across each alternative. The modeled outputs for *defined metrics* for the Harvest Indicator Stocks and Abundance Indicator Stocks are presented in tables below.

We make the explicit assumption that the environmental conditions and status of the fish stocks for the next 10 years will be similar to those observed in the recent past. This includes effects associated with

climate change (discussed in Subsection 5.2.1). By using this short contemporary time frame of historical information (2005-2016) we assume recent variations of run sizes and harvest effects related to climate change will follow similar patterns during the next decade. We note that this time frame includes a broad range of run size and environmental conditions, including 2015 which was characterized by extreme temperature and related mortalities during upstream migration. The minimums reported in the analysis of alternatives will more closely represent the outcomes if adverse conditions resulting from climate change are more frequent over the next ten years than they were since 2005.

US v Oregon fisheries have been managed under the current management framework since 2005. We can therefore use historical information to estimate numerical outputs for each of the *defined metrics* in our analysis. Our analysis is based on historical data made available by the *US v Oregon* TAC that is used to compare the relative differences in impacts to the resources among alternatives.

Some assumptions are necessary to compare the relative effects of different alternatives and minimize the complexity of the underlying analyses. Harvest policies and associated management frameworks are used to set catch levels. But the catch must also be allocated between the treaty and non-treaty fisheries, and subsequently the states and tribes then make decisions about how to allocate further into their respective fishing sectors. The allocation of catch may not affect biological outcomes, but does affect economic outcomes. Allocations between treaty and non-treaty fisheries are explicitly determined by the *US v Oregon* management agreement for certain stocks, but not for others. In the following analysis, we use the allocations specified in the agreement where they exist, and use historic patterns of allocations where it is not otherwise specified. The allocation between non-treaty commercial and recreational fisheries is determined by the states of Oregon and Washington outside of the *US v Oregon* management agreement. These allocation decisions have changed in the past and may well change in the future. However, for the purposes of comparing the effects of the different alternatives, we have made the assumption that future allocations will be the same as those observed in recent years. Likewise, allocations in tribal fisheries between ceremonial and subsistence (C&S), and commercial fisheries are made by the tribes based on year and fishery specific circumstances. We assume observations from the recent past encompass the range of outcomes likely to be observed during the course of the next agreement.

Results from the analysis are organized as follows. First, we show the results of the analysis for all alternatives for each of the Harvest Indicator and associated Abundance Indicator Stocks one by one. The *defined metrics* provide the basis for comparison of the relative effect of each alternative. This information is then used to examine the impacts of the alternatives on each subsequent resource identified in Section 3.

We assume that all fish allowed under the "harvest policy" criteria for each alternative are caught even though in some cases, such as fall season fisheries where there are multiple limiting stocks, certain fisheries cannot always catch all their available fish from one *Indicator Stock* due to limits on other *Indicator Stocks*. In Subsections 4.2 through 4.7 we will examine one resource at a time and compare the relative effects on that resource from each alternative.

Escapement Goals

For each of the abundance indicator stocks, we use escapement-related goals to assess the conservation outcomes and impacts for each alternative. These are generally based on the population abundance recovery criteria that are summed at the ESU or DPS level and reported at the last upstream counting location - Lower Granite Dam on the Snake River and Priest Rapids or Rock Island Dam on the upper Columbia River. We further adjust the escapement goal at the last upstream counting station to account for subsequent mortality while migrating upstream from that final counting station and for the likelihood that fish arriving at the upstream counting station would distribute themselves unevenly to the individual tributaries. Fish that are not harvested but die as a result of injury during the fishery do not make it to the counting station, but fisheries are still held to meeting the escapement goal assessed at said location. In most cases this adjustment factor is 25 percent, meaning that we assume that only 75 percent survive to their final spawning ground. The 25 percent value is used as a surrogate absent better, stock specific information. However, for Snake River sockeye salmon, we have direct estimates of the survival rate from Lower Granite Dam to the Stanley Basin (55.4 percent) and use that value to approximate an escapement goal at Lower Granite Dam.

These goals should be viewed as approximations and examples of an approach and not recommendations for the specific criteria that should be used for implementing harvest policies and the related management frameworks. Nonetheless, they are used here to evaluate the relative effects of each alternative.

The escapement goal for natural-origin UCR spring Chinook salmon is 4,000 fish (4,000 fish = 3,000 fish divided by 0.75) measured at Rock Island Dam which approximates the aggregate abundance of natural-origin spawners necessary to meet recovery objectives. The aggregate abundance of natural-origin spawners necessary to meet recovery objectives for natural-origin Snake River spring/summer Chinook salmon is 34,000 (34,000 fish = 25,500 fish divided by 0.75), measured at Lower Granite Dam. The escapement goal for Upper Columbia summer Chinook salmon used for evaluating the alternatives is 20,000 hatchery and natural-origin fish (which requires 29,000 fish at the mouth of the Columbia River), measured at Priest Rapids Dam. This is consistent with the escapement goal used in the current management agreement and is used directly without expansion. For Snake River Sockeye salmon we use

12,600 (12,600 fish = 7,000 fish divided by 0.554) fish to Lower Granite Dam. The escapement goal for natural-origin Snake River fall Chinook salmon is 3,000 (3,000 fish = 2,250 fish divided by 0.75) natural-origin fish at Lower Granite Dam. The escapement goals used for Snake River Sockeye salmon and Snake River fall Chinook salmon were both developed by using the aggregated total natural-origin population-level abundance targets from their respective ESA recovery plan that would achieve the abundance level delisting criteria (NMFS 2015a, 2015b). Developing a similar benchmark for Snake River steelhead, and Snake River B-Index steelhead in particular, is more problematic. Recovery level abundance criteria have been defined for some, but not all populations. As a consequence, we describe below the approach taken for this EIS.

There are 23 populations in the Snake River steelhead DPS. Twenty-two are located above Lower Granite Dam. The Tucannon population is the exception. We have abundance-related recovery criteria for 11 of the 22 populations that sum to a total of 6,700 natural-origin steelhead. To approximate the recovery abundance of all 22 populations, we double the estimate to 13,400. The Snake River steelhead DPS includes both A-Index and B-Index fish. As described more thoroughly in Subsection 3.2.1.4, B-Index steelhead are generally older, larger, and have later run timing. Some populations have a higher proportion of B-Index fish, but none are entirely B-Index. We are not aware of a peer reviewed scientifically reviewed abundance based related recovery criterion for B-Index steelhead. We multiply 13,400 by 0.15, the average proportion of all natural-origin steelhead at Lower Granite Dam that are designated B-Index as counted over the base period (2005 - 2015). The result is approximately 2,000. Using an abundance related benchmark identical to the approach in the analysis for natural-origin Snake River fall Chinook salmon would therefore be 2,700 (2,700 fish = 2,000 fish divided by 0.75). The actual, observed ten year average between 2005 and 2015 for natural-origin Snake River B-Index steelhead is 4,700, which is a more conservative escapement benchmark, and so we chose to use that for the analysis.

The table format, shown in Text Box 4-1, is used in the sections that follow to provide the *defined metrics* for each abundance indicator stock.

Text Box 4-1. Format of *defined metrics* for each abundance indicator stock (fields have been left blank in this text box).

A	***B***	***C***	***D***	***E***	***F***	***G***
	River Mouth	*Treaty Harvest*	*Non-Treaty Harvest*	*Total HR*	*Esc. Past Fisheries*	*Dam Count*
min						
max						
ave						

- Column A. Minimum, Maximum, and Average: As described in Subsection 3.2, the minimum, maximum, and average run sizes were derived from 2005-2016 river mouth sizes. These run sizes are used as basis for each stock's *defined metrics*. They are assumed to be constant for each stock to facilitate a comparison of harvest policies across each alternative. As explained in Subsection 4.1.1, we assume recent variations of run sizes and harvest effects related to climate change will follow similar patterns during the next decade.
- Column B. River Mouth: Presents the expected minimum, maximum, and average projected run sizes for the period 2018-2027 at the mouth of the Columbia River.
- Columns C. Treaty Harvest: Presents the calculated treaty fisheries total harvest number for the stock
- Column D. Non-Treaty Harvest: Presents the calculated non-treaty fisheries total harvest number for the stock
- Column E. Total Harvest Rate. This shows the total harvest rate (treaty plus non-treaty harvest combined) as a percentage of the run size
- Column F. Esc. Past Fisheries: The modeled number of fish that escape past the fisheries; i.e., the run size (Column B) minus the total harvest number (Column C plus Column D).
- Column G. Dam Count: this is the projected count of fish at the last upstream counting location.

There are two other important indicators used in the figures in the subsections in Subsection 4.2:

- Spawning Escapement Goal – As discussed above under Escapement Goals, the modeled count at the last counting station (Column G) is further adjusted to account for the loss of fish between the

counting station and their spawning ground. This loss includes mortality upstream of the counting station as well as uneven distribution to the individual tributaries.

- Interdam Loss - This is calculated as the difference between Columns G and F, the difference in fish stocks between the mouth of the river and the last upstream counting station independent of fishing. The difference represents fish loses due to natural mortality or turnoff to mainstem tributaries, and mortality associated with hydro operations, illegal fishing, and habitat degradation. The difference is based on estimates developed by the *US v Oregon* TAC. While this number provides an illustrative benchmark by which to evaluate the effects on the stock, it is not a specific proposal for the number of fish that suffer interdam loss.

Impacts of fishing

Fisheries impact the environment by killing target species and thereby reducing fish abundance and spawning potential. Fisheries may also kill fish species that they do not target. These fish, known as bycatch, are killed when fishing operations unintentionally catch and discard non-target fish, potentially causing unobserved injury and mortality. These non-target fish may include the harvest indicator units that are the subject of this EIS. As explained in Section 1 and Section 2, a new *US v Oregon* management agreement would track salmonid harvest across a wide number of fisheries, including bycatch of salmonids in non-salmonid directed fisheries.

Implementing a new *US v Oregon* management agreement will result in the removal of salmonids from the environment for commercial, recreational, or ceremonial and subsistence (C&S) consumption. In the following Subsections (4.1.1.1 through 4.1.1.5) we provide the modeled outputs, as just described above, to the harvest indicator stocks known as limiting stocks in the form of harvest rates (recall a harvest rate is the ratio of fishery related mortality for a group of fish over its abundance in a defined period of time). Reducing fish abundance, and subsequent spawning population potential, can lead to impacts of population parameters. At levels of high fish removal an originally stable, mature and efficient ecosystem might be deprived of nutrient input that results in the ecosystem becoming immature and stressed. This happens in various ways. By targeting and reducing the abundance of high-value predators, fisheries modify the trophic chain and the flows of biomass (and energy) across the ecosystem as well as remove the nutrients from the system that are contained within the fish carcasses themselves.

Each harvest policy analyzed in this EIS results in a rate at which fish may be harvested. The direct inverse result of each harvest rate is a rate at which fish that are not harvested are able to escape past the fisheries and potentially return to the spawning grounds to spawn (e.g., if a harvest rate was 40 percent, then the subsequent escapement rate would be roughly 60 percent of any particular run size). Each

alternative analyzed in this EIS only differs in the calculation of these two rates, however escapement estimates are presented in total numbers (e.g., if a harvest rate was 40 percent on a run size of 10,000, then 4,000 fish died from harvest (10,000 * 0.4 = 4,000), and the resulting escapement is 6,000 (10,000 - harvest of 4,000 = 6,000)). Therefore, the impacts of each alternative analyzed are the harvest rates and escapement totals. These will vary based on the alternative and the fluctuating projected fish run sizes. The subsections that follow (4.1.1.1 through 4.1.1.5) describe the impacts of the alternatives on each indicator stock. Subsection 4.2 compares these impacts of each alternative relative to status quo conditions and the other alternatives for each indicator stock.

4.1.1.1. Upriver Spring Chinook Salmon

For management purposes, Upriver spring Chinook salmon are defined in the agreement as all adult spring and Snake River spring/summer Chinook salmon returning to areas upstream of Bonneville Dam between January 1 and June 15, which is the cutoff date between the winter/spring fisheries and the summer/fall fisheries. The Upriver spring Chinook salmon stock includes both hatchery and natural-origin fish. Under the current agreement, Upriver spring Chinook salmon are managed using an abundance based management framework that depends on the abundance of Upriver spring Chinook salmon, natural-origin Snake River spring/summer Chinook salmon, and natural-origin UCR spring Chinook salmon. Allowable harvest rates range from 5.5 percent to 17 percent (Table 4-1). The Parties use this stock definition for practical reasons. The number of Chinook salmon returning during that period and the catch of those fish are counted directly as they pass dams in the mainstem Columbia River. The stock includes fish from different ESUs and all of their component populations. It is not possible at this time to track the abundance and catch of individual ESUs or populations in season. The Upriver spring Chinook salmon stock is therefore managed in the aggregate. As a consequence, populations or other subcomponents of the stock may sometimes be subject to harvest rates that are lower or higher than the aggregate depending on their run timing and how the fishery is implemented in a particular year. For example, the summer component of the Snake River spring/summer Chinook salmon ESU has a later run timing than the spring timed populations. As a consequence, in some years some portion of the later timed fish may still be in Zone 6 after the June 15 cutoff date and be subject to harvest rates for Upper Columbia summer Chinook salmon, which can be higher. However, it is also true that some Upper Columbia summer Chinook salmon are counted and caught during the spring management period. The June 15 cutoff date was selected recognizing that there was a need to find the midpoint of the overlapping run timing distributions of the Upriver spring Chinook salmon stock and Upper Columbia summer Chinook salmon. Although the abundance-based harvest rate schedule from Table 4.1 is applied to the aggregate Upriver spring Chinook salmon stock, available information does not suggest that there is a

simple or systematic bias in how the fishery affects various components of the stock (Crozier et al. 2016).

Table 4-1. Spring Management Period Harvest Rate Schedule.

Harvest Rate Schedule for Chinook Salmon in Spring Management Period					
Total Upriver Spring and Snake River Summer Chinook Run Size	**Snake River Natural Spring/Summer Chinook Run Size[1]**	**Treaty Zone 6 Total Harvest Rate**	**Non-Treaty Natural Harvest Rate**	**Total Natural Harvest Rate[2]**	**Non-Treaty Natural Limited Harvest Rate[2]**
<27,000	<2,700	5.0%	<0.5%	<5.5%	0.5%
27,000	2,700	5.0%	0.5%	5.5%	0.5%
33,000	3,300	5.0%	1.0%	6.0%	0.5%
44,000	4,400	6.0%	1.0%	7.0%	0.5%
55,000	5,500	7.0%	1.5%	8.5%	1.0%
82,000	8,200	7.4%	1.6%	9.0%	1.5%
109,000	10,900	8.3%	1.7%	10.0%	
141,000	14,100	9.1%	1.9%	11.0%	
217,000	21,700	10.0%	2.0%	12.0%	
271,000	27,100	10.8%	2.2%	13.0%	
326,000	32,600	11.7%	2.3%	14.0%	
380,000	38,000	12.5%	2.5%	15.0%	
434,000	43,400	13.4%	2.6%	16.0%	
488,000	48,800	14.3%	2.7%	17.0%	

1. If the Snake River natural spring/summer forecast is less than 10 percent of the total upriver run size, the allowable mortality rate will be based on the Snake River natural spring/summer Chinook salmon run size. In the event the total forecast is less than 27,000 or the Snake River natural spring/summer forecast is less than 2,700, Oregon and Washington would keep their mortality rate below 0.5 percent and attempt to keep actual mortalities as close to zero as possible while maintaining minimal fisheries targeting other harvestable runs.

2. If the Upper Columbia River natural spring Chinook salmon forecast is less than 1,000, then the total allowable mortality for treaty and non-treaty fisheries combined would be restricted to 9 percent or less. Whenever Upper Columbia River natural fish restrict the total allowable mortality rate to 9 percent or less, than non-treaty fisheries would transfer 0.5 percent harvest rate to treaty fisheries. In no event would non-treaty fisheries go below 0.5 percent harvest rate.

Each of the alternatives for Upriver spring Chinook salmon presumes that the catch balance provisions of the agreement continue to apply. Catch balancing requires that the total fishery mortality (landed catch plus release mortality) for non-treaty fishery cannot exceed the allowed treaty total harvest. Non-treaty spring season fisheries are mark selective and treaty fisheries are full retention. Treaty fisheries utilize total harvest rate limits and non-treaty fisheries utilize natural-origin harvest rate limits and this would be expected to continue into the future under any of the alternatives. As a consequence, the following tables show the total catch of fish when comparing treaty or non-treaty total harvest is equal (catch sharing), but the catch of natural-origin fish in the non-treaty fisheries is less than treaty fisheries.

4.1.1.1.1. Alternative 1—Extension of Current Agreement

Under Alternative 1, fisheries would be managed using the abundance-based management framework that allows harvest rates to range from 5.5 percent to 17 percent. For the purpose of comparing the relative effects of the alternatives, we assume that extending the current *US v Oregon* agreement for the next ten years would result in harvest patterns similar to those of the last 12 years. Table 4-2 provides the minimum, maximum and average values for the *defined metrics* for Upriver spring Chinook salmon (a Harvest Indicator Stock). Table 4-3 and Table 4-4 provide *defined metrics* for natural-origin Snake River spring/summer Chinook salmon and natural-origin Upper Columbia River spring Chinook salmon under Alternative 1, respectively (Abundance Indicator Stocks). The values for the *defined metrics* in these three tables are based on the projected run sizes.

Under Alternative 1 (Extension), the harvest and escapement levels are unchanged from the status quo. Harvest fluctuates with the projected run size, meaning in years of low abundance harvest rates are lower than in years of high abundance. This results in escapement levels lower during years of low abundance, thereby reducing the adverse impact of removing fish from the spawning population during these years. Conversely, during years of high abundance, the greatest proportion of fish are harvested at the highest harvest rate. The resulting impact to the spawning population is negligible as the total number of fish escaping past the fisheries is still large.

Table 4-2. *Defined Metrics* for Upriver spring Chinook salmon under Alternative 1.

	Total Treaty Catch	Min. Expected C&S	Max Expected Comm.	Total Non-treaty Catch	Total Comm.	Total Z 1-5 Sport	Total Z 6 - I395 sport	Total Lower Snake Sport	Total NT Tribal
min	6,364	6,191	173	6,364	1,448	3,877	714	321	4
max	34,020	10,548	23,472	34,020	7,743	20,726	3,817	1,713	21
ave	17,868	10,340	7,528	17,868	4,067	10,886	2,005	900	11

Table 4-3. *Defined Metrics* for natural-origin Snake River spring/summer Chinook salmon under Alternative 1.

	Snake River spring/ summer Chinook salmon river mouth run size	Treaty Harvest	Non-treaty Harvest	Total HR	Esc. Past Fisheries	Lower Granite Count
min	12,017	942	161	9.2%	10,914	8,360
max	44,014	5,037	862	13.4%	38,115	29,196
ave	26,269	2,645	453	11.8%	23,171	17,749

Table 4-4. *Defined Metrics* for natural-origin UCR spring Chinook salmon under Alternative 1.

	UCR Spring Chinook salmon	Treaty Harvest	Non-treaty	Total HR	Esc. Past Fisheries	Rock Island Count

	river mouth run size		Harvest			
min	1,374	108	18	9.2%	1,248	1,101
max	5,032	576	97	13.4%	4,359	3,845
ave	3,003	302	51	11.8%	2,650	2,337

4.1.1.1.2. Alternative 2—Abundance-based Management

Under Alternative 2, fisheries would be managed using an abundance based management framework. Although other abundance based frameworks could be devised that would be more or less restrictive, the analysis assumes that the current framework would apply thus allowing harvest rates to range from 5.5 percent to 17 percent. The relative merits of abundance based management as a harvest policy are discussed in Subsection 2.1.2. Because the frameworks under Alternative 1 and Alternative 2 are the same, the analytical results and impacts are also the same (Tables 4-5 through 4-6).

Table 4-5. *Defined Metrics* for Upriver spring Chinook salmon under Alternative 2.

	Total Treaty Catch	Min. Expected C&S	Max Expected Comm.	Total Non-treaty Catch	Total Comm.	Total Z 1-5 Sport	Total Z 6 - I395 sport	Total Lower Snake Sport	Total NT Tribal
min	6,364	6,191	173	6,364	1,448	3,877	714	321	4
max	34,020	10,548	23,472	34,020	7,743	20,726	3,817	1,713	21
ave	17,868	10,340	7,528	17,868	4,067	10,886	2,005	900	11

Table 4-6. *Defined Metrics* for natural-origin Snake River spring/summer Chinook salmon under Alternative 2.

	Snake River spring/ summer Chinook salmon river mouth run size	Treaty Harvest	Non-treaty Harvest	Total HR	Esc. Past Fisheries	Lower Granite Count
min	12,017	942	161	9.2%	10,914	8,360
max	44,014	5,037	862	13.4%	38,115	29,196
ave	26,269	2,645	453	11.8%	23,171	17,749

Table 4-7. *Defined Metrics* for natural-origin UCR spring Chinook salmon under Alternative 2.

	UCR Spring Chinook salmon river mouth run size	Treaty Harvest	Non-treaty Harvest	Total HR	Esc. Past Fisheries	Rock Island Count
min	1,374	108	18	9.2%	1,248	1,101
max	5,032	576	97	13.4%	4,359	3,845
ave	3,003	302	51	11.8%	2,650	2,337

4.1.1.1.3. Alternative 3—Fixed Harvest Rate

Under Alternative 3, fisheries would be managed using a fixed harvest rate of 11.3 percent. This is the

average of the rates observed from 2005 to 2016. Although other fixed harvest rate levels could be devised that would be more or less restrictive, the average represents a plausible alternative that is used for comparison to the other alternatives. The fixed rate sets a limit on the total harvest rate. The analysis assumes that catch is distributed between fisheries using the average proportions observed during the 2005 to 2016 base years. Table 4-8 shows the minimum, maximum and average values for the *defined metrics* for Upriver spring Chinook salmon under Alternative 3. Table 4-9 and Table 4-10 provide the minimum, maximum and average values for *defined metrics* for natural-origin Snake River spring/summer Chinook salmon and natural-origin Upper Columbia River spring Chinook salmon under Alternative 3, respectively. In Table 4-8 the average expected C&S catch is greater than the maximum because in the past twelve years the tribes have allocated a greater proportion of the catch to C&S relative to commercial catch in the middle of the observed run size range. In other words, at the highest observed run size, less catch was allocated to C&S than in years of run sizes around the middle of the historical range.

Under Alternative 3, the harvest and escapement levels are constant. Harvest rate impacts occur constantly at the same proportions regardless of any fluctuation in projected run size. Therefore, in years of low abundance harvest rates are the same as those in years of high abundance. This restricts the negative impacts associated with removing a greater number of fish from the spawning population during years of high abundance, thereby providing a slightly positive increase in the escapement past fisheries during large run sizes.

Table 4-8. *Defined Metrics* for Upriver spring Chinook salmon under Alternative 3.

	Total Treaty Catch	Min. Expected C&S	Max Expected Comm.	Total Non-treaty Catch	Total Comm.	Total Z 1-5 Sport	Total Z 6 - I395 sport	Total Lower Snake Sport	Total NT tribal
min	7,826	7,613	213	7,826	1,781	4,768	878	394	5
max	28,665	8,888	19,777	28,665	6,524	17,464	3,216	1,444	17
ave	17,108	10,335	6,773	17,108	3,894	10,423	1,919	862	10

Table 4-9. *Defined Metrics* for natural-origin Snake River spring/summer Chinook salmon under Alternative 3.

	Snake River spring/ summer Chinook salmon river mouth run size	Treaty Harvest	Non-Treaty Harvest	Total HR	Esc. Past Fisheries	Lower Granite Count
min	12,017	1,159	198	11.3%	10,660	8,166
max	44,014	4,244	727	11.3%	39,043	29,907
ave	26,269	2,533	434	11.3%	23,302	17,849

Table 4-10. *Defined Metrics* for natural-origin UCR spring Chinook salmon under Alternative 3.

	UCR Spring Chinook salmon river mouth run size	Treaty Harvest	Non-Treaty Harvest	Total HR	Esc. Past Fisheries	Rock Island Count
min	1,374	132	22	11.3%	1,220	1,076
max	5,032	485	81	11.3%	4,466	3,939
ave	3,003	290	49	11.3%	2,664	2,350

4.1.1.1.4. Alternative 4—Fixed Escapement Management

Under Alternative 4, fisheries would be managed using a fixed escapement goal policy based on the abundance of natural-origin UCR spring Chinook salmon. For this example, the escapement goal was set at 4,000 natural-origin UCR spring Chinook salmon measured at Rock Island Dam. The escapement goal approximates the aggregate abundance of natural-origin spawners necessary to meet recovery objectives for the UCR spring Chinook salmon ESU, when accounting for the mortality that generally occurs upstream of the last counting location. In this example, if the expected escapement is below the escapement goal, the allowable harvest during the spring management period would be zero and Alternative 5 would best represent the expected outcome. Often under similar circumstances, a fixed escapement goal is coupled with a *de minimis* level of harvest opportunity to meet the minimal needs for tribal fisheries and allow limited access to other harvestable stocks. In this Alternative, the fixed escapement policy was coupled with a *de minimis* harvest rate cap of 1 percent for non-treaty fisheries and 5 percent for treaty fisheries. The *de minimis* rates are drawn from the lowest rates allowed in the abundance based harvest framework described in Alternative 1.

Other fixed escapement goal management objectives could have been used to explore the effect of fixed escapement goal policies. For example, the aggregate abundance of natural-origin spawners necessary to meet recovery objectives for natural-origin Snake River spring/summer Chinook salmon is 25,500 and this could also be used as the fixed escapement goal policy. Irrespective of the fixed escapement goal selected, this type of harvest policy uses a weak stock as the basis for the harvest policy. Another approach would be to design a fixed harvest rate policy designed to maximize harvest opportunity. For example, setting an escapement goal based on the aggregate abundance of hatchery and natural-origin Upriver spring Chinook salmon would maximize harvest in the short term, but would do so at the expense of weaker stocks that would routinely be subject to higher harvest rates. Choosing a more conservative approach offers the highest likelihood of adhering to recovery plans.

Table 4-11 illustrates what the minimum, maximum and average could be for the *defined metrics* for Upriver spring Chinook salmon under Alternative 4. Table 4-12 and Table 4-13 provide the minimum, maximum and average values for *defined metrics* for natural-origin Snake River spring/summer Chinook

salmon and natural-origin Upper Columbia River spring Chinook salmon under Alternative 4, respectively.

Analyzing this approach in more detail, that is harvest adhering to fixed escapement goals, may be defined in various ways. A fixed escapement goal may be defined as a number of fish escaping fisheries or it may be defined as a number of fish reaching a certain location after fisheries occur such as an upstream dam or spawning area. Fixed escapement goals imply that each fish exceeding the goal may be harvested. Under situations where run sizes are less than the escapement goal, these alternatives provide for a minimal level of fishing. This is a common practice in salmon management especially to allow some minimal opportunity to meet either treaty needs or to access other more abundant stocks. The natural-origin escapement goal for upper Columbia spring Chinook salmon was set at 4,000 fish. The average escapement past fisheries since 2005 is approximately 2,700. Historic relationships between natural-origin and total harvest rates were utilized to calculate treaty total harvest rates and non-treaty natural-origin harvest rates that would both meet the catch balance requirement and escape 4,000 natural-origin upper Columbia fish past the fisheries. Using average post fishery loss rates an expected run size to Rock Island Dam (RIS) can be calculated. Post fishery loss includes a mix of natural and anthropogenic mortality such as passage loss through the hydrosystem.

Under Alternative 4 the impacts from harvest vary based on the run size, but the associated impacts towards modifying spawning population levels are constant. A fixed number of fish escape the fisheries. Harvest rates fluctuate as the projected run sizes fluctuate. In years of low abundance harvest rates are low, but in years of high abundance harvest rates are high. This is because all fish above the fixed escapement goal are deemed harvestable. During years of high abundance, negative impacts are maximized as all the fish above the escapement level are harvested. Thereby, compared to status quo conditions, Alternative 4 results in the lowest average level of escapement towards a total spawning population abundance.

Table 4-11. *Defined Metrics* for Upriver spring Chinook salmon under Alternative 4 and Alternative 6.

	Total Treaty Catch	**Min. Expected C&S**	**Max Expected Comm.**	**Total Non-treaty Catch**	**Total Comm.**	**Total Z 1-5 Sport**	**Total Z 6 - I395 sport**	**Total Lower Snake Sport**	**Total NT tribal**
min	4,300	4,183	117	4,300	979	2,620	482	217	3
max	102,811	31,877	70,934	102,811	23,399	62,637	11,534	5,178	62
ave	26,468	11,541	14,928	26,468	6,024	16,126	2,969	1,333	16

Table 4-12. *Defined Metrics* for natural-origin Snake River spring/summer Chinook salmon under Alternative 4 and Alternative 6.

	Snake River spring/ summer Chinook salmon river mouth run size	Treaty Harvest	Non-treaty Harvest	Total HR	Esc. Past Fisheries	Lower Granite Count
min	12,017	637	109	6.2%	11,271	8,634
max	44,014	15,221	2,606	40.5%	26,187	20,059
ave	26,269	3,919	671	17.5%	21,679	16,606

Table 4-13. *Defined Metrics* for natural-origin UCR spring Chinook salmon under Alternative 4 and Alternative 6.

	UCR Spring Chinook salmon river mouth run size	Treaty Harvest	Non-treaty Harvest	Total HR	Esc. Past Fisheries	Rock Island Count
min	1,374	73	12	6.2%	1,289	1,137
max	5,032	1,740	292	40.4%	3,000	2,646
ave	3,003	448	75	17.4%	2,480	2,187

4.1.1.1.5. Alternative 5—Voluntary Fishing curtailment

Under Alternative 5, harvest rates were assumed to be almost zero thus providing a benchmark for comparison to the other alternatives. Table 4-14 shows the maximum escapement of Upriver spring Chinook salmon that could occur absent all fishing. Table 4-15 and Table 4-16 show the maximum escapement of natural-origin Snake River spring/summer Chinook salmon and natural-origin Upper Columbia River spring Chinook salmon that could occur absent all fishing, respectively.

Under Alternative 5, the impacts associated with commercial and recreational harvest are removed. This thereby provides the largest possible spawning population to the greatest extent possible each year.

Table 4-14. *Defined Metrics* for Upriver spring Chinook salmon under Alternative 5.

	Total Treaty Catch	Min Expected C&S	Max Expected Comm.	Total Non-treaty Catch	Total Comm.	Total Z 1-5 Sport	Total Z 6 - I395 sport	Total Lower Snake Sport	Total NT tribal
min	0	0	0	0	0	0	0	0	0
max	0	0	0	0	0	0	0	0	0
ave	0	0	0	0	0	0	0	0	0

Table 4-15. *Defined Metrics* for natural-origin Snake River spring/summer Chinook salmon under Alternative 5.

	Snake River spring/ summer Chinook salmon river mouth run size	Treaty Harvest	Non-Treaty Harvest	Total HR	Esc. Past Fisheries	Lower Granite Count
min	12,017	0	0	0%	12,017	9,205
max	44,014	0	0	0%	44,014	33,715
ave	26,269	0	0	0%	26,269	20,122

Table 4-16. *Defined Metrics* for natural-origin UCR spring Chinook salmon under Alternative 5.

	UCR Spring Chinook salmon river mouth run size	Treaty Harvest	Non-treaty Harvest	Total HR	Esc. Past Fisheries	Rock Island Count
min	1,374	0	0	0%	1,374	1,212
max	5,032	0	0	0%	5,032	4,438
ave	3,003	0	0	0%	3,003	2,649

4.1.1.1.6. Alternative 6—No-action—Uncoordinated Harvest

Under the No Action—Uncoordinated Harvest alternative the federal parties would not sign the new agreement, leading to tremendous uncertainty. As described in Subsection 2.2.6, the state and tribal parties might choose to forego harvest, a potential outcome that is described in Alternative 5. On the other hand, the parties could also choose to act independently to implement fisheries resulting in uncoordinated harvest that, at the upper end, would be constrained by the capacity of the various fishing sectors to catch fish. Resulting harvest levels could greatly exceed those observed in recent years. It is of course difficult to predict the level of fishing that would occur under this alternative, but the outcome can be approximated by the results and impacts described under Alternative 4.

Therefore, Alternative 6 results in aggressive harvest rates that range from 6.2 percent minimum to 40.4 percent maximum, with an average of 17.4 percent as shown in tables 4-11 through 4-13. This compares to an average harvest rate under the status quo conditions of 11.8 percent (Table 3-5).

Under Alternative 6, as just described, the highest levels of impacts observed in Alternative 4 are expected to occur. This results in maximizing negative impacts associated with removing fish from a resulting spawning population to the greatest extent during years of high abundance, and thereby results in the lowest average level of escapement towards a total spawning population.

4.1.1.2. Upper Columbia Summer Chinook Salmon

For management purposes, Upper Columbia summer Chinook salmon are defined in the agreement as all Chinook salmon passing Bonneville Dam between June 16 and July 31. The Upper Columbia summer

Chinook salmon stock includes both hatchery and natural-origin fish. In recent years, the stock has been abundant providing significant harvest opportunity and therefore can be used to illustrate harvest policy alternatives that apply to healthy stocks.

Under the current agreement, summer Chinook salmon are managed using a mix of harvest policies (Table 4-17). When the run size is less than 29,000, fisheries are managed using an abundance based harvest rate framework with harvest rates ranging from 7 percent to 17 percent. At higher run sizes, the stock is managed using a modified fixed escapement policy that allows for some of the otherwise harvestable fish to accrue to escapement to better inform management decisions in the future. As a consequence, at higher abundance, the expected escapements range from 29,000 to 41,500. If the fixed escapement policy was without this feature, expected escapements would never exceed 29,000. Upper Columbia summer Chinook salmon are generally managed to achieve 50/50 sharing between treaty and non-treaty fisheries. Under the current framework a greater proportion of the catch is allocated to the treaty fishery at low run size.

Table 4-17. Summer Management Period Chinook salmon Harvest Rate Schedule.

River Mouth Run Size	Max. Treaty Total Harvest Rate	Treaty Harvest	Max Non-treaty Total Harvest Rate	Non-treaty Harvest	Escapement Past Fisheries
5,000	5.0%	250	2.0%	<100	4,650
7,500	5.0%	375	2.7%	<200	6,925
10,000	5.0%	500	2.0%	<200	9,300
12,500	5.0%	625	1.6%	<200	11,675
15,000	5.0%	750	1.3%	<200	14,050
16,000	10.0%	1,600	5.0%	800	13,600
17,500	10.0%	1,750	5.0%	875	14,875
20,000	10.0%	2,000	5.0%	1,000	17,000
22,500	10.0%	2,250	5.0%	1,125	19,125
25,000	10.0%	2,500	5.0%	1,250	21,250
27,500	10.0%	2,750	5.0%	1,375	23,375
29,000	10.0%	2,900	5.0-6.0%	1,450-1,740	≥24,360
30,000	10.0%	3,000	5.0-6.0%	1,500-1,800	≥25,200
32,500	10.0%	3,250	7.0%	2,275	26,975
35,000	10.0%	3,500	7.0%	2,450	29,050
36,250	10.0%	3,625	10.0%	3,625	29,000
37,500	11.3%	4,250	11.3%	4,250	29,000
40,000	13.8%	5,500	13.8%	5,500	29,000
42,500	15.9%	6,750	15.9%	6,750	29,000
45,000	17.8%	8,000	17.8%	8,000	29,000
47,500	19.5%	9,250	19.5%	9,250	29,000
50,000	21.0%	10,500	21.0%	10,500	29,000
52,500	21.8%	11,438	21.8%	11,438	29,625

River Mouth Run Size	Max. Treaty Total Harvest Rate	Treaty Harvest	Max Non-treaty Total Harvest Rate	Non-treaty Harvest	Escapement Past Fisheries
55,000	22.5%	12,375	22.5%	12,375	30,250
57,500	23.2%	13,313	23.2%	13,313	30,875
60,000	23.8%	14,250	23.8%	14,250	31,500
62,500	24.3%	15,188	24.3%	15,188	32,125
65,000	24.8%	16,125	24.8%	16,125	32,750
67,500	25.3%	17,063	25.3%	17,063	33,375
70,000	25.7%	18,000	25.7%	18,000	34,000
72,500	26.1%	18,938	26.1%	18,938	34,625
75,000	26.5%	19,875	26.5%	19,875	35,250
77,500	26.9%	20,813	26.9%	20,813	35,875
80,000	27.2%	21,750	27.2%	21,750	36,500
82,500	27.5%	22,688	27.5%	22,688	37,125
85,000	27.8%	23,625	27.8%	23,625	37,750
87,500	28.1%	24,563	28.1%	24,563	38,375
90,000	28.3%	25,500	28.3%	25,500	39,000
92,500	28.6%	26,438	28.6%	26,438	39,625
95,000	28.8%	27,375	28.8%	27,375	40,250
97,500	29.0%	28,313	29.0%	28,313	40,875
100,000	29.3%	29,250	29.3%	29,250	41,500

Each alternative presumes the status quo treaty/non-treaty allocation under the *US v Oregon* agreement where the harvestable number of Chinook salmon are shared 50/50 at any run above the escapement goal with the treaty fisheries receiving a larger share at very low run sizes. The allocation for non-treaty fisheries includes non-treaty sport and commercial impacts in the Pacific Fishery Management Council (PFMC) management area as well as Wanapum and Colville tribal fishery impacts in the upper Columbia. These two tribal groups are separate from the other treaty tribes and their harvest is considered as non-treaty catch. These alternatives do not specifically analyze impacts to natural-origin fish as the summer Chinook salmon hatchery and natural-origin proportions are not available from TAC.

4.1.1.2.1. Alternative 1—Extension of Current Agreement

Under Alternative 1, fisheries would be managed using the mixed harvest management framework described above. That would allow for harvest rates that range from 7 percent to nearly 60 percent. Table 4-18 provides the minimum, maximum and average values for the *defined metrics* for Upper Columbia summer Chinook salmon.

Table 4-18. *Defined Metrics* for Upper Columbia summer Chinook salmon under Alternative 1

		Non-treaty								Treaty					
	Upper Columbia summer Chinook River Mouth	Ocean	Non-Treaty Comm.	Sport Z 1-5	Sport Z 6	Sport Mcn - PRD	Sport Above PRD	Non-Treaty Tribal	Total Non-Treaty	Treaty C&S	Treaty Comm.	Total Treaty	Total Harvest	Esc. Past Fisheries	Priest Rapids Count
min	37,000	808	688	752	103	36	820	792	4,000	400	3,600	4,000	8,000	29,000	23,867
max	134,000	8,485	7,221	7,901	1,085	377	8,614	8,317	42,000	4,200	37,800	42,000	84,000	50,000	41,150
ave	74,417	3,944	3,356	3,672	504	175	4,003	3,866	19,521	1,952	17,569	19,521	39,042	35,375	29,114

Under Alternative 1 (Extension), the harvest and escapement levels are unchanged from the status quo. Harvest fluctuates with the projected run size, meaning in years of low abundance harvest rates are lower than in years of high abundance. This results in escapement levels lower during years of low abundance, thereby reducing the adverse impact of removing fish from the spawning population during these years. Conversely, during years of high abundance, the greatest proportion of fish are harvested at the highest harvest rate. The resulting impact to the spawning population is negligible as the total number of fish escaping past the fisheries is still large.

4.1.1.2.2. Alternative 2—Abundance-based Management

Under Alternative 2 fisheries would be managed using a simple abundance management framework based on the abundance of Upper Columbia summer Chinook salmon. In the example, the total harvest rate would range from 20 percent to 60 percent with the catch shared equally between treaty and non-treaty fisheries (10 percent to 30 percent for each) (Table 4-19). Table 4-20 provides the minimum, maximum and average values for the *defined metrics* for Upper Columbia summer Chinook salmon. Because the frameworks under Alternative 1 and Alternative 2 are the same, the analytical results and impacts are also the same.

Table 4-19. Abundance-based harvest rate schedule for Upper Columbia summer Chinook salmon.

Run Size	Allowed Total Harvest	Allowed Treaty or Non-treaty Harvest	Allowed Treaty or Non-treaty Harvest Rate
37,000	7,400	3,700	10.0%
52,000	20,800	10,400	20.0%
58,000	23,200	11,600	20.0%
60,000	30,000	15,000	25.0%
61,000	30,500	15,250	25.0%
71,000	35,500	17,750	25.0%
75,000	40,500	20,250	27.0%
78,000	42,120	21,060	27.0%
83,000	44,820	22,410	27.0%
87,000	50,460	25,230	29.0%
97,000	56,260	28,130	29.0%

134,000	80,400	40,200	30.0%

Table 4-20. *Defined Metrics* for Upper Columbia summer Chinook salmon under Alternative 2

		Non-treaty								Treaty					
	Upper Columbia summer Chinook salmon river mouth run size	Ocean	Non-Treaty Comm.	Sport Z 1-5	Sport Z 6	Sport Mcn - PRD	Sport Above PRD	Non-Treaty Tribal	Total Non-Treaty	Treaty C&S	Treaty Comm.	Total Treaty	Total Harvest	Esc. Past Fisheries	Priest Rapids Count
min	37,000	748	636	696	96	33	759	733	3,700	370	3,330	3,700	7,400	29,600	24,361
max	134,000	8,122	6,911	7,562	1,039	361	8,244	7,961	40,200	4,020	36,180	40,200	80,400	53,600	44,113
ave	74,417	3,889	3,309	3,621	497	173	3,948	3,812	19,248	1,925	17,324	19,248	38,497	35,920	29,562

4.1.1.2.3. Alternative 3—Fixed Harvest Rate

Under Alternative 3, fisheries would be managed using a fixed harvest rate of 42 percent which is the recent year average. In this example, we presume that the catch would be shared equally between the treaty and non-treaty fisheries. Table 4-21 provides the minimum, maximum and average values for the *defined metrics* for Upper Columbia summer Chinook salmon.

Under Alternative 3, the harvest and escapement levels are constant. Harvest rate impacts occur constantly at the same proportions regardless of any fluctuation in projected run size Therefore, in years of low abundance harvest rates are the same as those in years of high abundance. This restricts the negative impacts from removing a greater number of fish from the spawning population during years of high abundance, thereby providing a slightly positive increase in the escapement past fisheries during large run sizes.

4.1.1.2.4. Alternative 4—Fixed Escapement Management

Under Alternative 4, fisheries would be managed using a fixed escapement goal of 29,000, but does not include other features of the management framework described under Alternative 1. Table 4-22 provides the minimum, maximum and average values for the *defined metrics* for Upper Columbia summer Chinook salmon.

Under Alternative 4 the impacts from harvest vary based on the run size, but the associated impacts towards modifying spawning population levels are constant with a fixed escapement level. A fixed number of fish escape the fisheries. Harvest rates fluctuate as the projected run sizes fluctuate. In years of low abundance harvest rates are low, but in years of high abundance harvest rates are high. This is because all fish above the fixed escapement goal are deemed harvestable. During years of high abundance, negative impacts are maximized as all the fish above the escapement level are harvested. Thereby, compared to status quo conditions, Alternative 4 results in the lowest average level of escapement towards a total spawning population abundance.

4.1.1.2.5. Alternative 5—Voluntary Fishing curtailment

Under Alternative 5, commercial and recreational harvest rates were assumed to be zero thus providing a bench for comparison to the other alternatives. Table 4-23 shows the maximum escapement of Upper Columbia summer Chinook salmon that could occur absent all fishing.

Under Alternative 5, the impacts associated with most harvest are removed. This thereby provides the largest possible spawning population to the greatest extent possible each year.

Table 4-21. *Defined Metrics* for Upper Columbia summer Chinook salmon under Alternative 3

		Non-treaty								Treaty					
	Upper Columbia summer Chinook salmon river mouth run size	Ocean	Non-Treaty Comm.	Sport Z 1-5	Sport Z 6	Sport Mcn - PRD	Sport Above PRD	Non-Treaty Tribal	Total Non-Treaty	Treaty C&S	Treaty Comm.	Total Treaty	Total Harvest	Esc. Past Fisheries	Priest Rapids Count
min	37,000	1,570	1,336	1,462	201	70	1,593	1,539	7,770	777	6,993	7,770	15,540	21,460	17,662
max	134,000	5,685	4,838	5,294	727	253	5,771	5,572	28,140	2,814	25,326	28,140	56,280	77,720	63,964
ave	74,417	3,157	2,687	2,940	404	140	3,205	3,095	15,628	1,563	14,065	15,628	31,255	43,162	35,522

Table 4-22. *Defined Metrics* for Upper Columbia summer Chinook salmon under Alternative 4/6

		Non-treaty								Treaty					
	Upper Columbia summer Chinook salmon river mouth run size	Ocean	Non-Treaty Comm.	Sport Z 1-5	Sport Z 6	Sport Mcn - PRD	Sport Above PRD	Non-Treaty Tribal	Total Non-Treaty	Treaty C&S	Treaty Comm.	Total Treaty	Total Harvest	Esc. Past Fisheries	Priest Rapids Count
min	37,000	808	688	752	103	36	820	792	4,000	400	3,600	4,000	8,000	29,000	23,867
max	134,000	10,607	9,026	9,876	1,357	471	10,767	10,396	52,500	5,250	47,250	52,500	105,000	29,000	23,867
ave	74,417	4,588	3,904	4,272	587	204	4,657	4,497	22,708	2,271	20,438	22,708	45,417	29,000	23,867

Table 4-23. *Defined Metrics* for Upper Columbia summer Chinook salmon under Alternative 5

		Non-treaty								Treaty					
	Upper Columbia summer Chinook salmon river mouth run size	Ocean	Non-Treaty Comm.	Sport Z 1-5	Sport Z 6	Sport Mcn - PRD	Sport Above PRD	Non-Treaty Tribal	Total Non-Treaty	Treaty C&S	Treaty Comm.	Total Treaty	Total Harvest	Esc. Past Fisheries	Priest Rapids Count
min	37,000	808	0	0	0	0	0	0	0	0	0	0	0	37,000	30,451
max	134,000	10,607	0	0	0	0	0	0	0	0	0	0	0	134,000	110,282
ave	74,417	4,588	0	0	0	0	0	0	0	0	0	0	0	74,417	61,245

4.1.1.2.6. Alternative 6—No-action—Uncoordinated harvest

Under the No Action—Uncoordinated Harvest alternative, the level of fishing can be approximated by the results and impacts described under Alternative 4 resulting in aggressive harvest rates, therefore Alternative 6 results range from 21.6 percent minimum to 78.4 percent maximum and an average of 61.0 percent as shown in table 4-22. This compares to an average Upper Columbia summer Chinook salmon harvest rate under the status quo conditions of 52.5 percent (Table 3-7).

Under Alternative 6, as just described, the highest levels of impacts observed in Alternative 4 are expected to occur. This results in maximizing negative impacts associated with removing fish from a resulting spawning population to the greatest extent during years of high abundance, and thereby results in the lowest average level of escapement towards a total spawning population.

4.1.1.3. Upriver Sockeye Salmon

For management purposes, Upriver sockeye salmon include stocks returning to the Okanogan, Wenatchee, and Snake rivers. These are primarily natural-origin fish. In recent years at least, the Okanogan and Wenatchee stocks have been healthy with substantial surpluses available for harvest. Snake River sockeye salmon are listed under the ESA as endangered. Upriver sockeye salmon are managed using what is nominally an abundance based harvest rate schedule that allows for rates that range from 6 percent to 8 percent (1 percent for non-treaty fisheries and 5 to 7 percent for treaty Indian fisheries) (Table 4-24). Since the upriver run has exceeded 50,000 in all recent years, the current framework is effectively a fixed harvest rate framework that allows for a harvest rate of 8 percent. Under the current agreement, the harvest rates are limited by the status of Snake River sockeye and are not structured to provide greater access to the more abundant Okanogan and Wenatchee stocks.

Table 4-24. Upriver sockeye salmon harvest framework.

Upriver Sockeye Run Size	Harvest Rate on Upriver Sockeye
<50,000	5%
50 to 75,000	7%
>75,000	7% with further discussion

4.1.1.3.1. Alternative 1—Extension of Current Agreement

Under Alternative 1 fisheries would be managed using the two step abundance based schedule described above. At run sizes less than 50,000 the total allowed harvest rate is 6 percent and at 50,000 and greater,

the allowed total harvest rate is 8 percent. The non-treaty portion of the total harvest rate is limited to 1 percent at all run sizes. Tables 4-25 and 4-26 show the *defined metrics* for upriver and Snake River sockeye salmon, respectively.

Under Alternative 1 (Extension), the harvest and escapement levels are unchanged from the status quo. Harvest fluctuates with the projected run size, meaning in years of low abundance harvest rates are lower than in years of high abundance. This results in escapement levels lower during years of low abundance, thereby reducing the adverse impact of removing fish from the spawning population during these years. Conversely, during years of high abundance, the greatest proportion of fish are harvested at the highest harvest rate. The resulting impact to the spawning population is negligible as the total number of fish escaping past the fisheries is still large.

Table 4-25. *Defined Metrics* for Upriver sockeye salmon under Alternative 1.

	River Mouth Run Size	Comm.	Sport	Total Non-treaty	Treaty C&S	Treaty Comm.	Total Treaty	Total Harvest	Escapement Past Fisheries
min	27,000	50	220	270	203	1,148	1,350	1,620	25,380
max	648,000	1,194	5,286	6,480	6,804	38,556	45,360	51,840	596,160
ave	277,833	512	2,266	2,778	2,901	16,440	19,342	22,120	255,713

Table 4-26. *Defined Metrics* for Snake River sockeye salmon under Alternative 1.

	Snake River sockeye salmon run size	Total Harvest	Total HR	Escapement Past Fisheries	Lower Granite Count
min	124	7	6.0%	117	97
max	2,977	238	8.0%	2,739	2,273
ave	1,276	102	7.7%	1,174	974

4.1.1.3.2. Alternative 2—Abundance-based Management

Under Alternative 2, fisheries would be managed using an expanded abundance based harvest rate schedule that is tied more directly to conservation related abundance objectives. In this example, a river mouth run size of 13,750 for Snake River sockeye salmon approximates the aggregate abundance necessary to meet abundance related recovery objectives for the ESU. A run size of 13,750 accounts for upstream migration losses that occur between the river mouth and Stanley Basin, the endpoint of the migration corridor for Snake River sockeye salmon. Under this framework, harvest rates range from 6 percent to 11 percent depending on the abundance of Snake River sockeye salmon (Table 4-27). Tables 4-28 and 4-29 show the *defined metrics* for upriver and Snake River sockeye salmon for Alternative 2.

Under Alternative 2, the harvest and escapement levels are slightly changed from the status quo, but only

at high abundances. Harvest fluctuates with the projected run size, meaning in years of low abundance harvest rates are lower than in years of high abundance. This results in escapement levels lower during years of low abundance, thereby reducing the adverse impact of removing fish from the spawning population during these years. Conversely, during years of high abundance, the greatest proportion of fish are harvested at the highest harvest rate. The resulting impact to the spawning population is negligible as the total number of fish escaping past the fisheries is still large.

Table 4-27. Abundance-based harvest rate schedule for Upriver sockeye salmon.

River Mouth Run size All Sockeye Stocks	Minimum Snake River Run Size at CR Mouth	Non-Treaty Total Harvest Rate	Treaty Total Harvest Rate	Total Harvest Rate
<50,000	<1,000	1%	5.00%	6.00%
50,000	1,000	1%	7.00%	8.00%
75,000	2,500	1%	7.50%	8.50%
100,000	3,000	1%	8.00%	9.00%
125,000	4,000	1%	8.25%	9.25%
150,000	5,000	1%	8.50%	9.50%
175,000	6,000	1%	8.75%	9.75%
200,000	8,000	1%	9.00%	10.00%
225,000	10,000	1%	9.50%	10.50%
250,000	12,500	1%	10.00%	11.00%
>300,000	>13,750	>1%	>10.0	>11.0%

Table 4-28. *Defined Metrics* for Upriver sockeye salmon under Alternative 2.

	River Mouth Run Size	Comm.	Sport	Total Non-treaty	Treaty C&S	Treaty Comm.	Total Treaty	Total Harvest	Escapement Past Fisheries
min	27,000	50	220	270	203	1,148	1,350	1,620	25,380
max	648,000	2,388	10,572	12,960	10,692	60,588	71,280	84,240	563,760
ave	277,833	611	2,707	3,318	4,071	23,071	27,143	30,461	247,372

Table 4-29. *Defined Metrics* for Snake River sockeye salmon under Alternative 2.

	Snake River sockeye salmon run size	Total Harvest	Total HR	Escapement Past Fisheries	Lower Granite Count
min	124	7	6.0%	117	97
max	2,977	387	13.0%	2,590	2,150
ave	1,276	140	9.7%	1,136	943

4.1.1.3.3. Alternative 3—Fixed Harvest Rate

Under Alternative 3 fisheries would be managed using a fixed harvest rate of 8 percent. This is similar to Alternative 1 except the 8 percent total harvest rate would apply to all run sizes. This alternative would not be as conservative as Alternative 1 at the lowest run sizes. Tables 4-30 and 4-31 show the *defined metrics* for Upriver and Snake River sockeye salmon for Alternative 3.

Under Alternative 3, the harvest and escapement levels are constant. Harvest rate impacts occur constantly at the same proportions regardless of any fluctuation in projected run size. Therefore, in years of low abundance harvest rates are the same as those in years of high abundance. This restricts the negative impacts associated with removing a greater number of fish from the spawning population during years of high abundance, thereby providing a slightly positive increase in the escapement past fisheries during large run sizes.

Table 4-30. *Defined Metrics* for Upriver sockeye salmon under Alternative 3.

	River Mouth Run Size	Comm.	Sport	Total Non-Treaty	Treaty C&S	Treaty Comm.	Total Treaty	Total Harvest	Escapement Past Fisheries
min	27,000	50	220	270	284	1,607	1,890	2,160	24,840
max	648,000	1,194	5,286	6,480	6,804	38,556	45,360	51,840	596,160
ave	277,833	512	2,266	2,778	2,917	16,531	19,448	22,227	255,607

Table 4-31. *Defined Metrics* for Snake River sockeye salmon under Alternative 3.

	Snake River sockeye salmon run size	Total Harvest	Total HR	Escapement Past Fisheries	Lower Granite Count
min	124	10	8.0%	114	95
max	2,977	238	8.0%	2,739	2,273
ave	1,276	102	8.0%	1,174	974

4.1.1.3.4. Alternative 4—Fixed Escapement Management

Under Alternative 4 fisheries would be managed using a fixed escapement goal of 150,000 Upriver sockeye salmon past fisheries while still allowing for a 6 percent total harvest rate for runs less than the goal. In this example, the management framework is focused on the abundance of Upriver sockeye

salmon and Snake River sockeye salmon are no longer the limiting stock. The 6 percent harvest rate provides for *de minimis* fisheries at low abundance. Otherwise, the harvest rate would be reduced to zero. The escapement past fisheries target of 150,000 approximates the aggregate abundance necessary meet escapement goals for the Wenatchee and Okanogan stocks. Tables 4-32 and 4-33 show the *defined metrics* for upriver and Snake River sockeye salmon for Alternative 4.

Under Alternative 4 the impacts from harvest vary based on the run size, but the associated impacts towards modifying spawning population levels are constant with a fixed escapement level. A fixed number of fish escape the fisheries. Harvest rates fluctuate as the projected run sizes fluctuate. In years of low abundance harvest rates are low, but in years of high abundance harvest rates are high. This is because all fish above the fixed escapement goal are deemed harvestable. During years of high abundance, negative impacts are maximized as all the fish above the escapement level are harvested. Thereby, compared to status quo conditions, Alternative 4 results in the lowest average level of escapement towards a total spawning population abundance.

Table 4-32 *Defined Metrics* for Upriver sockeye salmon under Alternative 4 and Alternative 6.

	River Mouth Run Size	Comm.	Sport	Total Non-treaty	Treaty C&S	Treaty Comm.	Total Treaty	Total Harvest	Escapement Past Fisheries
min	27,000	50	220	270	203	1,148	1,350	1,620	25,380
max	648,000	45,877	203,123	249,000	37,350	211,650	249,000	498,000	150,000
ave	277,833	14,170	62,739	76,909	11,607	65,772	77,379	154,288	123,545

Table 4-33. *Defined Metrics* for Snake River sockeye salmon under Alternative 4 and Alternative 6.

	Snake River sockeye salmon run size	Total Harvest	Total HR	Escapement Past Fisheries	Lower Granite Count
min	124	7	6.0%	117	97
max	2,977	2,288	76.9%	689	572
ave	1,276	709	36.8%	567	471

4.1.1.3.5. Alternative 5—Voluntary Fishing curtailment

Under the Alternative 5, harvest rates on sockeye salmon were assumed to be zero thus providing a bench for comparison to the other alternatives. Tables 4-34 and 4-45 show the maximum escapement of Upriver sockeye salmon and Snake River sockeye salmon that could occur absent all fishing.

Under Alternative 5, the impacts associated with harvest are removed. This thereby provides the largest possible spawning population to the greatest extent possible each year.

Table 4-34. *Defined Metrics* for Upriver sockeye salmon under Alternative 5.

	River Mouth Run Size	Commercial	Sport	Total Non-treaty	Treaty C&S	Treaty Commercial	Total Treaty	Total Harvest
min	27,000	0	0	0	0	0	0	0
max	648,000	0	0	0	0	0	0	0
ave	277,833	0	0	0	0	0	0	0

Table 4-35. *Defined Metrics* for Snake River sockeye salmon under Alternative 5.

	Snake River sockeye salmon run size	Total Harvest	Total HR	Escapement Past Fisheries	Lower Granite Count
min	124	0%	0%	124	103
max	2,977	0%	0%	2,977	2,471
ave	1,276	0%	0%	1,276	1,059

4.1.1.3.6. Alternative 6—No-action—Uncoordinated harvest

Under the No Action—Uncoordinated Harvest alternative, the level of fishing can be approximated by the results and impacts described under Alternative 4, resulting in aggressive harvest rates that range from 6 percent minimum to 76.9 percent maximum and an average of 36.8 percent as shown in Tables 4-32. This compares to an average Upriver sockeye salmon harvest rate under the status quo conditions of 8 percent (Table 3-9).

Under Alternative 6, as just described, the highest levels of impacts observed in Alternative 4 are expected to occur. This results in maximizing adverse impacts associated with removing fish from a resulting spawning population to the greatest extent during years of high abundance, and thereby results in the lowest average level of escapement towards a total spawning population.

4.1.1.4. Upriver Fall Chinook Salmon

For management purposes, Upriver fall Chinook salmon are defined as any of the fall Chinook salmon stocks passing Bonneville from August 1-December 31. The stock includes both hatchery and natural-origin fish. Upriver fall Chinook salmon include a “tule” type which is an earlier maturing fall Chinook salmon which historically spawned in tributaries downstream of Celilo falls, and a “bright” stock of later maturing fish which historically spawned primarily in mainstem and tributary areas upstream of Celilo falls however bright fall Chinook salmon likely utilized areas downstream of Bonneville as well. The upriver stocks include an upriver bright (URB) fall Chinook salmon which includes all hatchery and natural bright stock fish originating upstream of McNary Dam and natural-origin fish originating in the Deschutes River. The URB stock includes the ESA listed Snake River fall Chinook salmon ESU. The other upriver stocks include the pool upriver bright (PUB) stock, the Bonneville Pool Hatchery (BPH) stock, and the soon to be defunct Bonneville upriver bright (BUB) stock (the last return of adult BUBs

will likely occur in 2017, with the possibility of a small amount of six year old fish returning in 2018). The PUB stock includes all hatchery and any natural-origin bright stock fish originating from tributaries other than the Deschutes between Bonneville and McNary Dams. Under the current agreement, Upriver fall Chinook salmon are managed using an abundance based harvest schedule that depends on the abundance of upriver fall Chinook salmon and natural-origin Snake River fall Chinook salmon. Allowable harvest rates range from 21.5 percent to 45 percent (Table 4-36).

Table 4-36. Fall management period Chinook salmon harvest rate schedule.

Expected URB River Mouth Run Size	Expected River Mouth Snake River Natural-origin Run Size[1]	Treaty Total Harvest Rate	Non-treaty Harvest Rate	Total Harvest Rate	Expected Escapement of Snake River Natural-origin Past Fisheries
< 60,000	< 1,000	20%	1.50%	21.5%	784
60,000	1,000	23%	4.00%	27.00%	730
120,000	2,000	23%	8.25%	31.25%	1,375
> 200,000	5,000	25%	8.25%	33.25%	3,338
	6,000	27%	11.00%	38.00%	3,720
	8,000	30%	15.00%	45.00%	4,400

1. If the Snake River natural fall Chinook salmon forecast is less than level corresponding to an aggregate URB run size, the allowable mortality rate will be based on the Snake River natural fall Chinook salmon run size.

4.1.1.4.1. Alternative 1—Extension of Current Agreement

Under Alternative 1 fisheries would be managed using the abundance based schedule described above. Tables 4-37 and 4-38 provide the minimum, maximum and average values for *defined metrics* for Upriver fall Chinook salmon and natural-origin Snake River fall Chinook salmon under Alternative 1. For reference, the abundance related recovery objective for natural-origin Snake River fall Chinook salmon is an escapement of 3,000 at Lower Granite Dam.

Under Alternative 1 (Extension), the harvest and escapement levels are unchanged from the status quo. Harvest fluctuates with the projected run size, meaning in years of low abundance harvest rates are lower than in years of high abundance. This results in escapement levels lower during years of low abundance, thereby reducing the adverse impact of removing fish from the spawning population during these years. Conversely, during years of high abundance, the greatest proportion of fish are harvested at the highest harvest rate. The resulting impact to the spawning population is negligible as the total number of fish escaping past the fisheries is still large.

Table 4-37. *Defined Metrics* for Upriver fall Chinook salmon under Alternative 1.

	Total SAFE	Total Comm.	Total Lower River Sport	Total Sport	Expect. Treaty C&S	Expect. Treaty Comm.	Total Treaty	Total Non-Treaty	Total Harvest	Esc. Past Fisheries
min	180	3,657	2,775	3,265	1,848	42,849	44,697	6,923	51,620	109,431
max	4,767	96,614	73,317	86,259	16,980	393,700	410,680	182,872	593,553	540,925
ave	2,214	44,870	34,050	40,060	8,078	187,303	195,381	84,930	280,311	268,788

Table 4-38. *Defined Metrics* for natural-origin Snake River fall Chinook salmon under Alternative 1.

	Snake River fall Chinook salmon river mouth run size	HR (less due to MSF)	Harvest	Esc. Past Fisheries	Lower Granite Count
min	5,808	25.9%	1,504	4,304	3,228
max	40,916	43.9%	17,957	22,959	17,219
ave	19,804	41.0%	8,470	11,334	8,501

4.1.1.4.2. Alternative 2—Abundance-based Management

Under Alternative 2 fisheries would be managed using an abundance based management framework. Although other abundance based frameworks could be devised that would be more or less restrictive, the analysis assumes that the current framework would apply thus allowing harvest rates to range from 21.5 percent to 45 percent. Because the frameworks under Alternative 1 and Alternative 2 are the same, the analytical results and impacts are also the same (Tables 4-39 and 4-40).

Table 4-39. *Defined Metrics* for Upriver fall Chinook salmon under Alternative 2.

	Total SAFE	Total Comm.	Total Lower River Sport	Total Sport	Expect. Treaty C&S	Expect. Treaty Comm.	Total Treaty	Total Non-treaty	Total Harvest	Esc. Past Fisheries
min	180	3,657	2,775	3,265	1,848	42,849	44,697	6,923	51,620	109,431
max	4,767	96,614	73,317	86,259	16,980	393,700	410,680	182,872	593,553	540,925
ave	2,214	44,870	34,050	40,060	8,078	187,303	195,381	84,930	280,311	268,788

Table 4-40. *Defined Metrics* for natural-origin Snake River fall Chinook salmon under Alternative 2.

	Snake River fall Chinook salmon river mouth run size	HR	Harvest	Esc. Past Fisheries	Lower Granite Count
min.	5,808	25.9%	1,504	4,304	3,228
max.	40,916	43.9%	17,957	22,959	17,219
ave.	19,804	41.0%	8,470	11,334	8,501

4.1.1.4.3. Alternative 3—Fixed Harvest Rate

Under Alternative 3 fisheries would be managed using a fixed harvest rate of 40.9 percent for ESA-listed Snake River fall Chinook salmon. This is the average rate observed over the last twelve years. Tables 4-41 and 4-42 provide the minimum, maximum and average values for *defined metrics* for Upriver fall Chinook salmon and natural-origin Snake River fall Chinook salmon under Alternative 3.

Under Alternative 3, the harvest and escapement levels are constant. Harvest rate impacts occur constantly at the same proportions regardless of any fluctuation in projected run size. Therefore, in years of low abundance harvest rates are the same as those in years of high abundance. This restricts the negative impacts associated with removing a greater number of fish from the spawning population during years of high abundance, thereby providing a slightly positive increase in the escapement past fisheries during large run sizes.

Table 4-41. *Defined Metrics* for Upriver fall Chinook salmon under Alternative 3.

	Total SAFE	Total Comm.	Total Lower River Sport	Total Sport	Expect. Treaty C&S	Expect. Treaty Comm.	Total Treaty	Total Non-treaty	Total Harvest	Esc. Past Fisheries
min	587	11,887	9,020	10,613	2,330	54,027	56,357	22,499	78,856	82,194
max	4,132	83,732	63,541	74,758	16,414	380,577	396,991	158,489	555,480	578,997
ave	2,000	40,527	30,755	36,183	7,944	184,203	192,148	76,711	268,859	280,241

Table 4-42. *Defined Metrics* for natural-origin Snake River fall Chinook salmon under Alternative 3.

	Snake River fall Chinook salmon river mouth run size	HR	Harvest	Esc. Past Fisheries	Lower Granite Count
min	5,808	40.9%	2,375	3,433	2,575
max	40,916	40.9%	16,729	24,187	18,140
ave	19,804	40.9%	8,097	11,707	8,780

4.1.1.4.4. Alternative 4—Fixed Escapement Management

Under Alternative 4 fisheries would be managed using a fixed escapement goal of 3,000 natural-origin Snake River fall Chinook salmon to Lower Granite Dam. To account for the additional mortality that occurs during upstream migration, the escapement goal of 3,000 to Lower Granite Dam is expanded to 4,000. This expansion is an approximation of the interdam loss that occurs absent fishing based on estimates of conversion loss from the *US v Oregon* TAC and is an illustration of the approach rather than a specific proposal. At the highest Snake River fall Chinook salmon run sizes, harvest rates on the PUB and BUB stocks would severely limit expected escapement of these stocks. Where negative escapement past fisheries is shown, the model is in effect showing that harvest rates on the PUB and BUB stocks are

excessive based on historic allocations and fishery patterns. Tables 4-43 and 4-44 provide the minimum, maximum and average values for *defined metrics* for Upriver fall Chinook and natural-origin Snake River fall Chinook salmon under Alternative 4.

Under Alternative 4 the impacts from harvest vary based on the run size, but the associated impacts towards modifying spawning population levels are constant with a fixed escapement level. A fixed number of fish escape the fisheries. Harvest rates fluctuate as the projected run sizes fluctuate. In years of low abundance harvest rates are low, but in years of high abundance harvest rates are high. This is because all fish above the fixed escapement goal are deemed harvestable. During years of high abundance, negative impacts are maximized as all the fish above the escapement level are harvested. Thereby, compared to status quo conditions, Alternative 4 results in the lowest average level of escapement towards a total spawning population abundance.

Table 4-43. *Defined Metrics* for Upriver fall Chinook salmon under Alternative 4 and Alternative 6.

	Total SAFE	Z-1-5 Comm.	B 10	Z 1-5 Sport	Total Lower River Sport	Z-6 Sport	McN-I 395 sport	Total Sport	Total Non-treaty	Expect. Treaty C&S	Expect. Treaty Comm.	Total Treaty	Total Harvest	Esc. Past Fisheries
min	241	8,360	1,721	6,644	8,365	716	539	9,620	18,221	892	17,329	18,221	36,442	76,558
max	4,817	166,782	34,342	132,547	166,889	14,285	10,752	191,926	363,525	17,799	345,726	363,525	727,050	68,950
ave	2,065	71,514	14,725	56,834	71,559	6,125	4,610	82,295	155,874	7,632	148,242	155,874	311,747	73,525

Table 4-44. *Defined Metrics* for natural-origin Snake River fall Chinook salmon under Alternative 4 and Alternative 6.

	Snake River fall Chinook salmon river mouth run size	HR	Harvest	Esc. Past Fisheries	Lower Granite Count
min	5,808	31.1%	1,808	4,000	3,000
max	40,916	90.2%	36,916	4,000	3,000
ave	19,804	71.6%	15,804	4,000	3,000

4.1.1.4.5. Alternative 5—Voluntary Fishing curtailment

Under Alternative 5, harvest rates were assumed to be zero thus providing a bench for comparison to the other alternatives. Tables 4-45 and 4-46 show the maximum escapement of Upriver fall Chinook salmon and natural-origin Snake River fall Chinook salmon that would occur absent all fishing.

Under Alternative 5, the impacts associated with harvest are removed. This thereby provides the largest possible spawning population to the greatest extent possible each year.

Table 4-45. *Defined Metrics* for Upriver fall Chinook salmon under Alternative 5.

	Total SAFE	Total Comm.	Total Lower River Sport	Total Sport	Expected Treaty C&S	Expected Treaty Comm.	Total Treaty	Total Non-treaty	Total Harvest
min	0	0	0	0	0	0	0	0	0
max	0	0	0	0	0	0	0	0	0
ave	0	0	0	0	0	0	0	0	0

Table 4-46. *Defined Metrics* for natural-origin Snake River fall Chinook salmon under Alternative 5.

	Snake River fall Chinook salmon river mouth run size	HR (less due to MSF)	Harvest	Esc. Past Fisheries	Lower Granite Count
min	5,808	0%	0	5,808	4,356
max	40,916	0%	0	40,916	30,687
ave	19,804	0%	0	19,804	14,853

4.1.1.4.6. Alternative 6—No-action—Uncoordinated harvest

Under the No Action—Uncoordinated Harvest alternative, the level of fishing can be approximated by the results and impacts described under Alternative 4, resulting in aggressive harvest rates that range from 31.1 percent minimum to 90.2 percent maximum and an average of 71.6 percent as shown in tables 4-43 and 4-44. This compares to an average Snake River fall Chinook salmon harvest rate under the status quo conditions of 41.0 percent (Table 3-8).

Under Alternative 6, as just described, the highest levels of impacts observed in Alternative 4 are expected to occur. This results in maximizing adverse impacts associated with removing fish from a resulting spawning population to the greatest extent during years of high abundance, and thereby results in the lowest average level of escapement towards a total spawning population.

4.1.1.5. Snake River Steelhead

Upriver steelhead returning to areas above Bonneville Dam have a complex life history and protracted run timing that introduces considerable complexity into the harvest management process. Although steelhead are present in the system throughout the year, most migrate through the areas above Bonneville Dam during the fall management period. For that reason and to reduce the complexity of the analysis of harvest policy alternatives, the analysis here focuses on steelhead management during the fall season.

Under the current agreement, Snake River B-Index steelhead are used as an indicator stock. Snake River B-Index steelhead are defined as those that pass above Bonneville dam between July 1 and October 31 and are at least 78 cm in length. B-Index steelhead return primarily to areas in the Snake River. B-Index steelhead are used as an indicator because they can be visually identified based on their length, are general subject to higher harvest rates because of their size, and were, for the most part, depressed relative to other stocks in the basin. Harvest rate limits for B-Index steelhead therefore provide protection for the

smaller A-Index components of the run. Under the current agreement, fisheries are managed during the fall season using an abundance based harvest rate schedule that depends on the abundance of natural-origin Snake River B-Index steelhead. Allowable harvest rates on natural-origin fish range from 15 percent to 22 percent (Table 4-47).

Table 4-47. Fall Management Period Steelhead Harvest Rate Schedule.

Forecast Bonneville Total Snake River B-Index Steelhead Run Size	River Mouth URB Run Size	Treaty Total B Harvest Rate	Non-treaty Natural-origin B-Index Harvest Rate	Total Harvest Rate
< 20,000	Any	13%	2.0%	15.0%
20,000	Any	15%	2.0%	17.0%
35,000	>200,000	20%	2.0%	22.0%
B-Index Steelhead are defined as steelhead measuring ≥78 cm				

4.1.1.5.1. Alternative 1—Extension of Current Agreement

Under Alternative 1 fisheries would be managed using the abundance based harvest rate schedule described above that limits the harvest of natural-origin Snake River B-Index steelhead to 15 percent to 22 percent. Tables 4-48 and 4-49 show the *defined metrics* for Snake River B-Index (hatchery and natural-origin combined) and natural-origin Snake River B-Index steelhead, respectively.

Under Alternative 1 (Extension), the harvest and escapement levels are unchanged from the status quo. Harvest fluctuates with the projected run size, meaning in years of low abundance harvest rates are lower than in years of high abundance. This results in escapement levels lower during years of low abundance, thereby reducing the adverse impact of removing fish from the spawning population during these years. Conversely, during years of high abundance, the greatest proportion of fish are harvested at the highest harvest rate. The resulting impact to the spawning population is negligible as the total number of fish escaping past the fisheries is still large.

4.1.1.5.2. Alternative 2—Abundance-based Management

Under Alternative 2 fisheries would be managed using the same abundance-based harvest rate schedule as Alternative 1. Because the frameworks under Alternative 1 and Alternative 2 are the same, the analytical results and impacts are also the same (Tables 4-50 and 4-51).

4.1.1.5.3. Alternative 3—Fixed Harvest Rate

This alternative uses a fixed total natural-origin Snake River B-Index harvest rate for the tribal fishery and a fixed 2 percent natural-origin Snake River B-Index harvest rate for the non-treaty fishery.

Under Alternative 3, the harvest and escapement levels are constant. Harvest rate impacts occur constantly at the same proportions regardless of any fluctuation in projected run size. Therefore, in years of low abundance harvest rates are the same as those in years of high abundance (Tables 4-52 and 4-53). This restricts the negative impacts associated with removing a greater number of fish from the spawning population during years of high abundance, thereby providing a slightly positive increase in the escapement past fisheries during large run sizes.

4.1.1.5.4. Alternative 4—Fixed Escapement Management

This alternative uses an escapement goal of 4,700 natural-origin Snake River B-Index steelhead at Lower

Granite which is based on the 10 year average run size. This was expanded to an equivalent run size at Bonneville Dam of 8,200 using TACs run reconstruction methodology. For run sizes under 8,200 natural-origin Snake River B-Index steelhead, our analysis assumes *de minimis* fisheries of 7% for treaty fisheries and 0.7% for non-Indian fisheries.

Under Alternative 4 the impacts from harvest vary based on the run size, but the associated impacts towards modifying spawning population levels are constant with a fixed escapement level. A fixed number of fish escape the fisheries. Harvest rates fluctuate as the projected run sizes fluctuate. In years of low abundance harvest rates are low, but in years of high abundance harvest rates are high. This is because all fish above the fixed escapement goal are deemed harvestable. During years of high abundance, negative impacts are maximized as all the fish above the escapement level are harvested. Thereby, compared to status quo conditions, Alternative 4 results in the lowest average level of escapement towards a total spawning population abundance.

Table 4-48. *Defined Metrics* for Snake River B-Index steelhead under Alternative 1.

	Run Size	Z 1-5 Comm.	Z 1-5 Sport	Treaty C & S	Treaty Comm.	Total Treaty	Z 6- i395 Sport	Total Sport	Total NT	Total Catch	Escapement Past Fisheries	Expected Granite Run
min	11,780	56	161	77	1,455	1,531	1,333	1,494	1,550	3,081	8,699	8,118
max	94,476	458	1,327	945	17,950	18,895	10,992	12,319	12,777	31,672	62,804	58,609
ave	48,575	235	680	471	9,416	9,416	5,631	6,310	6,545	15,961	32,614	30,436

Table 4-49. *Defined Metrics* for natural-origin Snake River B-Index steelhead under Alternative 1.

	Run Size	Total Treaty	Treaty HR	Total NT	NT HR	Total Catch	Total HR	Escapement Past Fisheries	Lower Granite Count
min	2,420	417	17.2%	48	2.0%	465	19.2%	1,955	1,130
max	19,951	5,148	25.8%	399	2.0%	5,547	27.8%	14,404	8,326
ave	10,220	2,565	25.1%	204	2.0%	2,769	27.1%	7,451	4,307

Table 4-50. *Defined Metrics* for Snake River B-Index steelhead under Alternative 2.

	Run Size	Z 1-5 Comm.	Z 1-5 Sport	Treaty C & S	Treaty Comm.	Total Treaty	Z 6- i395 Sport	Total Sport	Total NT	Total Catch	Escapement Past Fisheries	Lower Granite Count
min	11,780	56	161	77	1,455	1,531	1,333	1,494	1,550	3,081	8,699	8,118
max	94,476	458	1,327	945	17,950	18,895	10,992	12,319	12,777	31,672	62,804	58,609
ave	48,575	235	680	471	9,416	9,416	5,631	6,310	6,545	15,961	32,614	30,436

Table 4-51. *Defined Metrics* for natural-origin Snake River B-Index steelhead under Alternative 2.

	Run Size	Total Treaty	Treaty HR	Total NT	NT HR	Total Catch	Total HR	Escapement Past Fisheries	Lower Granite Count
min	2,420	417	17.2%	48	2.0%	465	19.2%	1,955	1,130
max	19,951	5,148	25.8%	399	2.0%	5,547	27.8%	14,404	8,326
ave	10,220	2,565	25.1%	204	2.0%	2,769	27.1%	7,451	4,307

Table 4-52. *Defined Metrics* for Snake River B-Index steelhead under Alternative 3.

	Run Size	Z 1-5 Commercial	Z 1-5 Sport	Treaty C & S	Treaty Commercial	Total Treaty	Z 6- i395 Sport	Total Sport	Total NT	Total Catch	Escapement Past Fisheries	Lower Granite Count
min	11,780	56	161	106	2,014	2,120	1,333	1,494	1,550	3,670	8,110	7,568
max	94,476	458	1,327	850	16,155	17,006	10,992	12,319	12,777	29,782	64,693	60,373
ave	48,575	235	680	437	8,306	8,743	5,631	6,310	6,545	15,288	33,286	31,063

Table 4-53. *Defined Metrics* for natural-origin Snake River B-Index steelhead under Alternative 3.

	Run Size	Total Treaty	Treaty HR	Total NT	NT HR	Total Catch	Total HR	Escapement Past Fisheries	Lower Granite Count
min	2,420	578	23.9%	48	2.0%	626	25.9%	1,794	1,037
max	19,951	4,633	23.2%	399	2.0%	5,032	25.2%	14,919	8,623
ave	10,220	2,382	23.3%	204	2.0%	2,586	25.3%	7,634	4,412

Table 4-54. *Defined Metrics* for Snake River B-Index steelhead under Alternative 4 and Alternative 6.

	Run Size	Z 1-5 Commercial	Z 1-5 Sport	Treaty C & S	Treaty Commercial	Total Treaty	Z 6- i395 Sport	Total Sport	Total NT	Total Catch	Escapement Past Fisheries	Lower Granite Count
min	11,780	19	56	34	648	682	467	523	542	1,225	10,555	9,850
max	94,476	1,122	3,250	2,170	41,234	43,404	26,929	30,179	31,301	74,706	19,770	18,450
ave	48,575	348	1,008	580	11,018	11,598	8,355	9,364	9,712	21,310	27,265	25,444

Table 4-55. *Defined Metrics* for natural-origin Snake River B-Index steelhead under Alternative 4 and Alternative 6.

	Run Size	Total Treaty	Treaty HR	Total NT	NT HR	Total Catch	Total HR	Escapement Past Fisheries	Lower Granite Count
min	2,420	169	7.0%	17	0.7%	186	7.7%	2,234	1,291
max	19,951	10,774	54.0%	978	4.9%	11,752	58.9%	8,199	4,739
ave	10,220	2,879	28.2%	303	3.0%	3,182	31.1%	7,038	4,068

4.1.1.5.5. Alternative 5—Voluntary Fishing curtailment

Under Alternative 5, harvest rates on Snake River B-Index steelhead were assumed to be zero thus providing a benchmark for comparison to the other alternatives. Tables 4-56 and 4-57 show the maximum escapement of Snake River B-Index and natural-origin Snake River B-Index steelhead that could occur absent all fishing.

Under Alternative 5, the impacts associated with harvest are removed. This thereby provides the largest possible spawning population to the greatest extent possible each year.

Table 4-56. *Defined Metrics* for Snake River B-Index steelhead under Alternative 5.

	Run Size	Z 1-5 Comm.	Z 1-5 Sport	Treaty C & S	Treaty Comm.	Total Treaty	Z 6-i395 Sport	Total Sport	Total NT	Total Catch
min	11,780	0	0	0	0	0	0	0	0	0
max	94,476	0	0	0	0	0	0	0	0	0
ave	48,575	0	0	0	0	0	0	0	0	0

Table 4-57. *Defined Metrics* for natural-origin Snake River B-Index steelhead under Alternative 5.

	Run Size	Total Treaty	Treaty HR	Total NT	NT HR	Total Catch	Total HR	Escapement Past Fisheries	Lower Granite Count
min	2,420	0	0%	0	0%	0	0%	2,420	1,399
max	19,951	0	0%	0	0%	0	0%	19,951	11,532
ave	10,220	0	0%	0	0%	0	0%	10,220	5,907

4.1.1.5.6. Alternative 6—No-action—Uncoordinated harvest

Under the No Action—Uncoordinated Harvest alternative, the level of fishing can be approximated by the results and impacts described under Alternative 4, resulting in aggressive harvest rates that range from 7.7 percent minimum to 58.9 percent maximum and an average of 31.1 percent as shown in tables 4-54 through 4-55. This compares to an average Snake River B-Index steelhead harvest rate under the status quo conditions of 27.1 percent (Table 3-11).

Under Alternative 6, as just described, the highest levels of impacts observed in Alternative 4 are expected to occur. This results in maximizing adverse impacts associated with removing fish from a resulting spawning population to the greatest extent during years of high abundance, and thereby results in the lowest average level of escapement towards a total spawning population.

4.2. Fish

4.2.1. Salmonids

Salmonids in the Columbia River Basin that would be affected by the Proposed Action include five

species of Pacific salmon (*Oncorhynchus* sp.), including steelhead. Recall that each alternative analyzed in this EIS uses the rate at which fish may be harvested to assess the impact of each alternative. These rates provide the levels at which fish abundance is reduced, and subsequent spawning population potential is conversely impacted. These species impacted are:

- Chinook salmon (*Oncorhynchus tshawytscha*)
    - Upper Columbia River spring-run - ESA-listed

For natural-origin Upper Columbia River spring Chinook salmon the average harvest rate and average escapement past fisheries are the same for Alternative 1 and Alternative 2 (Table 4-58, Subsection 4.1.1.1.1 and Subsection 4.1.1.1.2). The average harvest rate of Alternative 3 is the lowest of all alternatives that provide fishing opportunity, but not by much (Table 4-58, Subsection 4.1.1.1.3). The average escapement past fisheries of Alternative 3 is the highest of all alternatives that provide fishing opportunity, but not by much. Therefore impacts to the spawning escapement level are a slight positive under Alternative 3. Alternative 4 and Alternative 6 have the highest harvest rates and the lowest average escapements past fisheries of all the alternatives (Table 4-58, Subsection 4.1.1.1.4 and Subsection 4.1.1.1.6). This results in a high negative impact to spawning escapement for these two alternatives. Alternative 5 has the lowest overall average harvest rate (0 percent) and the highest average escapement past fisheries of all alternatives because Alternative 5 does not provide any fishing opportunity (other than limited C&S harvest) but provides a positive impact to spawning escapement.

Table 4-58. Comparison of alternatives modeled outputs for natural-origin UCR spring Chinook salmon.

	Total HR			**Esc. Past Fisheries**			**Rock Island Dam Count**		
	Min	**Max**	**Ave**	**Min**	**Max**	**Ave**	**Min**	**Max**	**Ave**
Alternative 1	9.2%	13.4%	11.8%	1,248	4,359	2,650	1,101	3,845	2,337
Alternative 2	9.2%	13.4%	11.8%	1,248	4,359	2,650	1,101	3,845	2,337
Alternative 3	11.3%	11.3%	11.3%	1,220	4,466	2,664	1,076	3,939	2,350
Alternative 4/6	6.2%	40.4%	17.4%	1,289	3,000	2,480	1,137	2,646	2,187
Alternative 5	0.0%	0.0%	0.0%	1,374	5,032	3,003	1,212	4,438	2,649

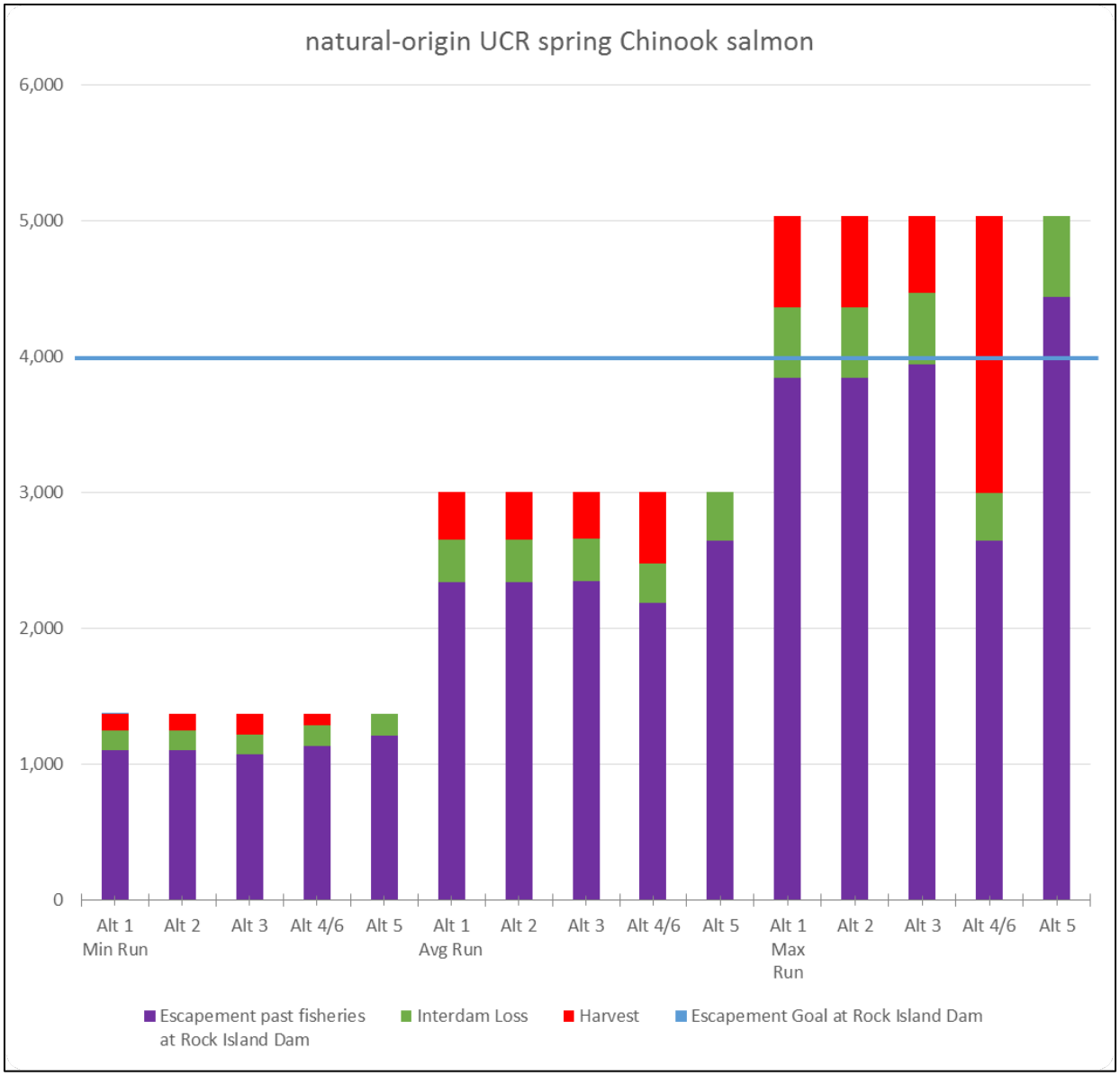

Figure 4-1. Comparison of alternatives modeled outputs for natural-origin UCR spring Chinook salmon at minimum, average, and maximum run sizes expected.

Figure 4-1 illustrates the minimum, maximum and average *defined metrics* values for UCR spring Chinook salmon, along with its escapement goal at Rock Island Dam. The escapement goals were defined in Subsection 4.1.1. The aggregate abundance of natural-origin spawners necessary to meet recovery objectives for natural-origin UCR spring Chinook salmon is 3,000. And with an average survival rate of 75 percent, the escapement goal at Rock Island Dam is 4,000. At a maximum observed river mouth run size used for modeling, of all alternatives that provide harvest, Alternative 3 is the one that comes closest to reaching the recovery target abundance of 4,000 to Rock Island Dam. All alternatives, except Alternative 5 show some level of harvest.

- Snake River spring/summer-run - ESA-listed

For natural-origin Snake River spring/summer Chinook salmon the average harvest rate and average escapement past fisheries are the same for Alternative 1 and Alternative 2 (Table 4-59, Subsection 4.1.1.2.1 and Subsection 4.1.1.2.2). The average harvest rate of Alternative 3 is the lowest of all alternatives that provide fishing opportunity, but not by much (Table 4-59, Subsection 4.1.1.2.3). The average escapement past fisheries of Alternative 3 is the highest of all alternatives that provide fishing opportunity, but not by much. Therefore impacts to the spawning escapement level are a slight positive under Alternative 3. Alternative 4 and Alternative 6 have the highest harvest rates and the lowest average escapements past fisheries of all the alternatives (Table 4-59, Subsection 4.1.1.2.4 and Subsection 4.1.1.2.6). This results in a high negative impact to spawning escapement for these two alternatives. Alternative 5 has the lowest overall average harvest rate (0 percent) and the highest average escapement past fisheries of all alternatives because Alternative 5 does not provide any fishing opportunity (other than limited C&S harvest) but provides a positive impact to spawning escapement.

Table 4-59. Comparison of alternatives modeled outputs for natural-origin Snake River spring/summer Chinook salmon

	Total HR			**Esc. Past Fisheries**			**Lower Granite Run**		
	Min	**Max**	**Ave**	**Min**	**Max**	**Ave**	**Min**	**Max**	**Ave**
Alternative 1	9.2%	13.4%	11.8%	10,914	38,115	23,171	8,360	29,196	17,749
Alternative 2	9.2%	13.4%	11.8%	10,914	38,115	23,171	8,360	29,196	17,749
Alternative 3	11.3%	11.3%	11.3%	10,660	39,043	23,302	8,166	29,907	17,849
Alternative 4/6	6.2%	40.5%	17.5%	11,271	26,187	21,679	8,634	20,059	16,606
Alternative 5	0%	0%	0%	12,017	44,014	26,269	9,205	33,715	20,122

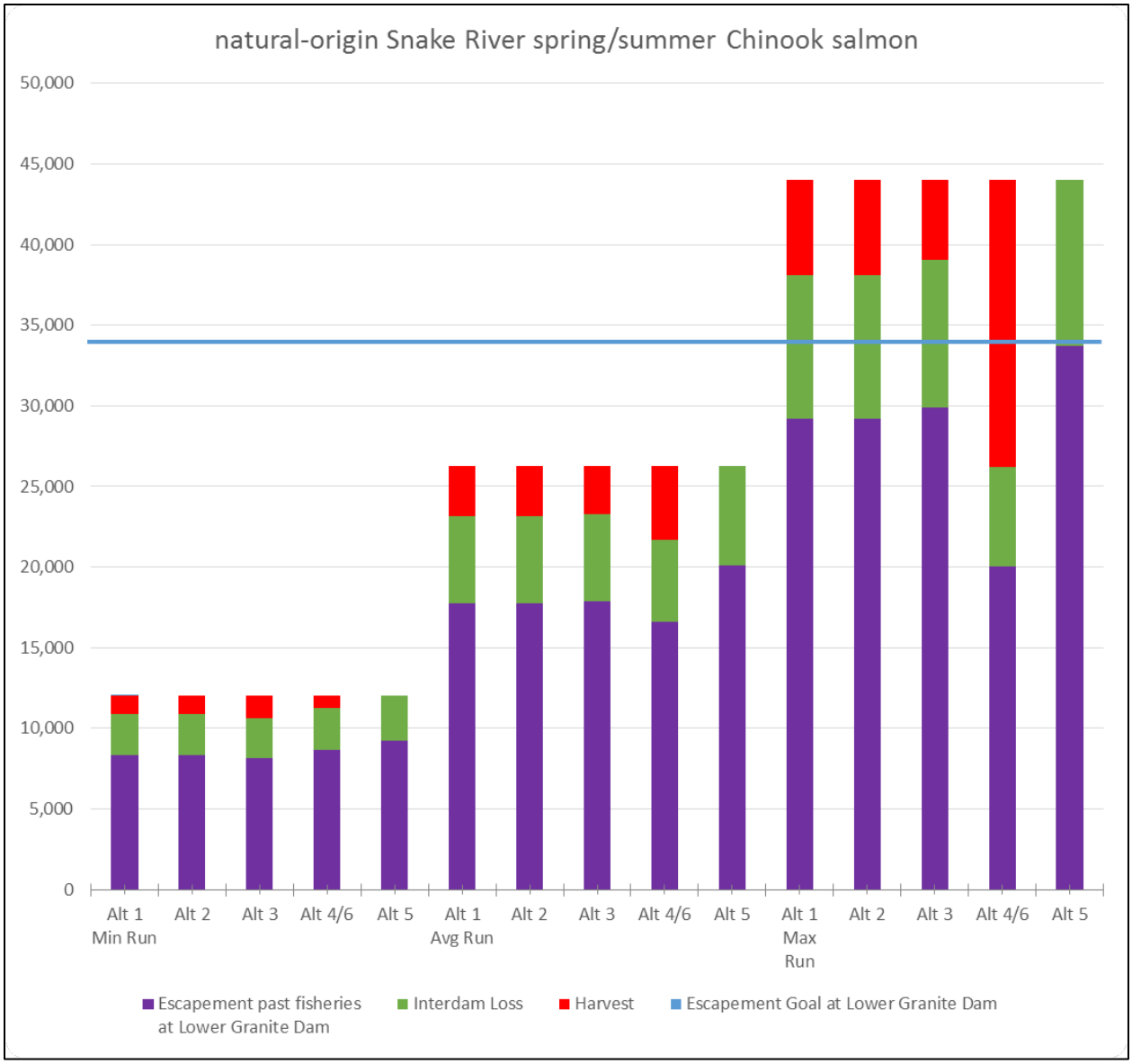

Figure 4-2. Comparison of alternatives modeled outputs for natural-origin Snake River spring/summer Chinook salmon at minimum, average, and maximum run sizes expected

Figure 4-2 illustrates the minimum, maximum and average defined metrics values for natural-origin Snake River spring/summer Chinook salmon, along with its current escapement goal. The aggregate abundance of natural-origin spawners necessary to meet recovery objectives for natural-origin Snake River spring/summer Chinook salmon is 25,500. With an average survival rate of 75 percent, the escapement goal at Lower Granite Dam is 34,000. All alternatives, except Alternative 5 show some level of commercial and recreational harvest. None of the modeled outputs for all alternatives meet the escapement goal. Escapement past fisheries is consistently higher for Alternative 5 than for the other four alternatives. Modeled outputs for escapement past fisheries under Alternative 4 and Alternative 6 are

consistently lower than for all other alternatives, except at the minimum runsize Alternative 3 is the lowest.

- Middle Columbia River spring- run

Effects to Middle Columbia River spring-run Chinook salmon are assumed to be the same as those represented by Snake River spring/summer-run Chinook salmon effects as fisheries are limited by the number of Snake River spring/summer-run Chinook salmon that can be caught and are closed once that is achieved. This means impacts to Middle Columbia River spring-run Chinook salmon will always be less than those to Snake River spring/summer-run Chinook salmon as fisheries are never constrained for this stock due to it being healthier than the Snake River stock. The Middle Columbia River spring-run Chinook salmon migrate at the same time as the Snake River stock, and therefore we expect impacts to this ESU to vary proportionally to harvest impacts of Snake River spring/summer-run Chinook salmon.

- Upper Columbia River summer-run

Upper Columbia River summer-run Chinook salmon is not an ESA-listed ESU. It is both a Harvest Indicator and, because it is a single ESU, an Abundance Indicator Stock. The average harvest rate for this stock is the lowest for Alternative 3, aside Alternative 5 that involves no fishing, other than limited C&S harvest (Table 4-60, Subsection 4.1.1.2.3 and Subsection 4.1.1.2.5). Therefore impacts to the spawning escapement level are a slight positive under Alternative 3 but a positive impact under Alternative 5. The average harvest rate is almost the same for Alternative 1 and Alternative 2 (Table 4-60, Subsection 4.1.1.2.1 and Subsection 4.1.1.2.2). The highest average harvest rate is for Alternative 4 and Alternative 6 (Table 4-60, Subsection 4.1.1.2.4 and Subsection 4.1.1.2.6). This results in a high negative impact to spawning escapement for these two alternatives. The average escapement past fisheries is almost the same for Alternative 1 and Alternative 2. The highest average escapement past fisheries, apart from Alternative 5, is for Alternative 3 (Table 4-60).

Table 4-60. Comparison of alternatives modeled outputs for Upper Columbia summer Chinook salmon.

	Total HR			Esc. Past Fisheries			Priest Rapids Dam Count		
	Min	**Max**	**Ave**	**Min**	**Max**	**Ave**	**Min**	**Max**	**Ave**
Alternative 1	21.6%	62.7%	52.5%	29,000	50,000	35,375	23,867	41,150	29,114
Alternative 2	20.0%	60.0%	51.7%	29,600	53,600	35,920	24,361	44,113	29,562
Alternative 3	42.0%	42.0%	42.0%	21,460	77,720	43,162	17,662	63,964	13,756
Alternative 4/6	21.6%	78.4%	61.0%	29,000	29,000	29,000	23,867	23,867	23,867
Alternative 5	0%	0%	0%	37,000	134,000	74,417	30,451	110,282	61,245

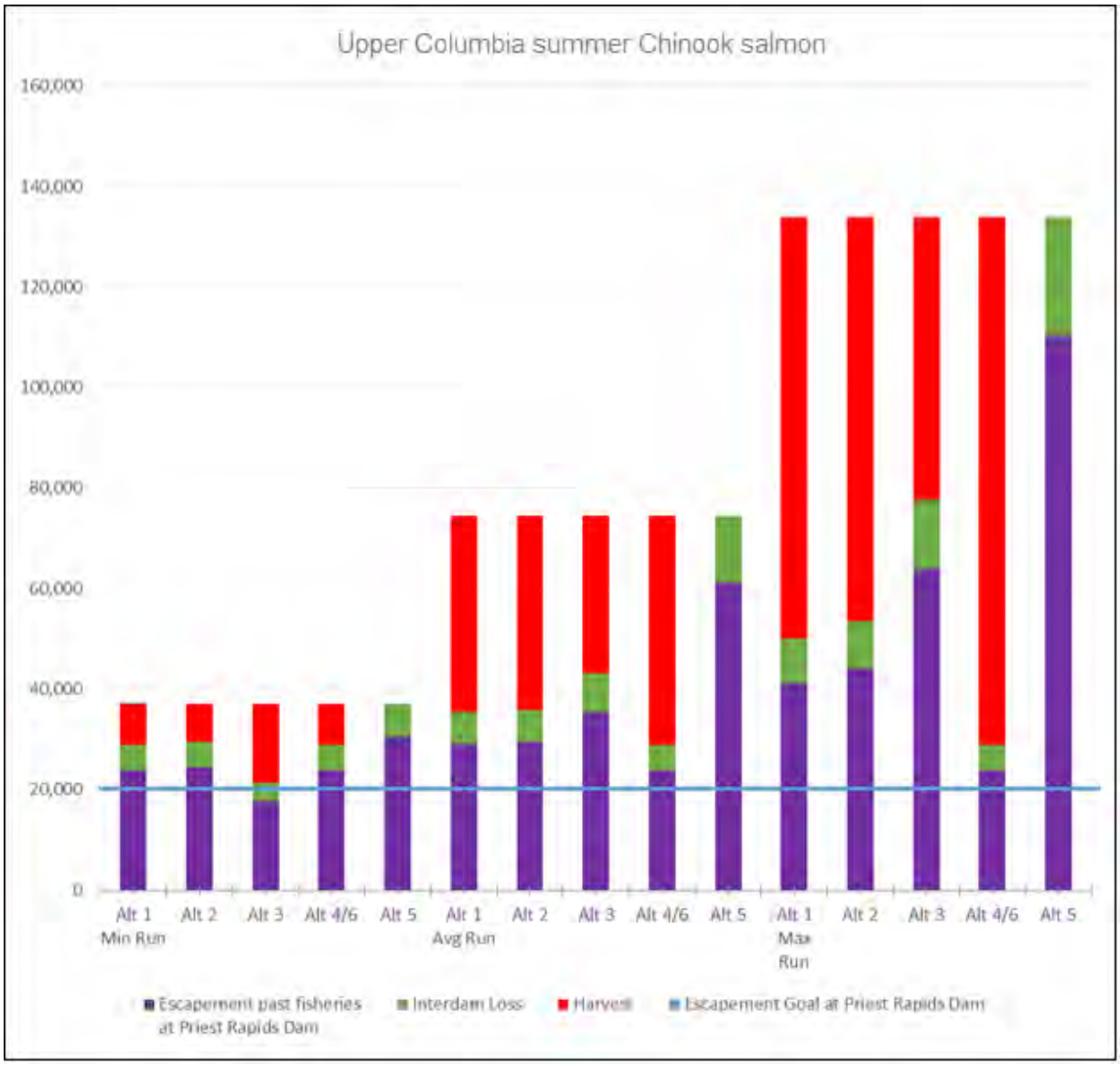

Figure 4-3. Comparison of alternatives modeled outputs for Upper Columbia summer Chinook salmon at minimum, average, and maximum run sizes expected

- Deschutes River summer/fall-run

Effects to Deschutes River summer/fall-run Chinook salmon are assumed to be the same as those represented by Upper Columbia summer Chinook salmon. Fisheries are limited by the number of Upper Columbia River summer Chinook salmon that can be caught and are closed once that is achieved. This means impacts to Deschutes River summer/fall-run Chinook salmon will always be less than those to Upper Columbia summer Chinook salmon as fisheries are never constrained for this stock. The Deschutes River summer/fall-run Chinook salmon migrate at the same time as the Upper Columbia summer Chinook salmon stock, and therefore we expect impacts to this ESU to vary proportionally to harvest impacts of Upper Columbia summer Chinook salmon stock.

- Snake River fall-run - ESA-listed

For Snake River fall-run Chinook salmon the average harvest rate and average escapement past fisheries are the same for Alternative 1 and Alternative 2 (Table 4-61, Subsection 4.1.1.4.1 and Subsection 4.1.1.4.2). The average harvest rate of Alternative 3 is the lowest of all alternatives that provide fishing opportunity, but not by much (Table 4-61). The average escapement past fisheries of Alternative 3 is the highest of all alternatives that provide fishing opportunity, but not by much (Table 4-61, Subsection 4.1.1.4.3). Therefore impacts to the spawning escapement level are a slight positive under Alternative 3. Alternative 4 and Alternative 6 have the highest harvest rates and the lowest average escapements past fisheries of all the alternatives (Table 4-61, Subsection 4.1.1.4.4 and Subsection 4.1.1.4.6). This results in a high negative impact to spawning escapement for these two alternatives. Alternative 5 has the lowest overall average harvest rate (0 percent) and the highest average escapement past fisheries of all alternatives because Alternative 5 does not provide only limited fishing opportunity but provides a positive impact to spawning escapement.

Table 4-61. Comparison of alternatives modeled outputs for natural-origin Snake River fall Chinook salmon.[1]

	Total HR			**Esc. Past Fisheries**			**Lower Granite Count**		
	Min	**Max**	**Ave**	**Min**	**Max**	**Ave**	**Min**	**Max**	**Ave**
Alternative 1	25.9%	43.9%	41.0%	4,305	22,960	11,334	3,228	17,216	8,499
Alternative 2	25.9%	43.9%	41.0%	4,305	22,960	11,334	3,228	17,216	8,499
Alternative 3	40.9%	40.9%	40.9%	3,434	24,187	11,707	2,575	18,136	8,778
Alternative 4/6	31.1%	90.2%	71.6%	4,000	4,000	4,000	3,000	3,000	3,000
Alternative 5	0%	0%	0%	5,808	40,916	19,804	4,356	30,687	14,853

1. Recall that escapement goal development is discussed in Subsection 4.1.1.

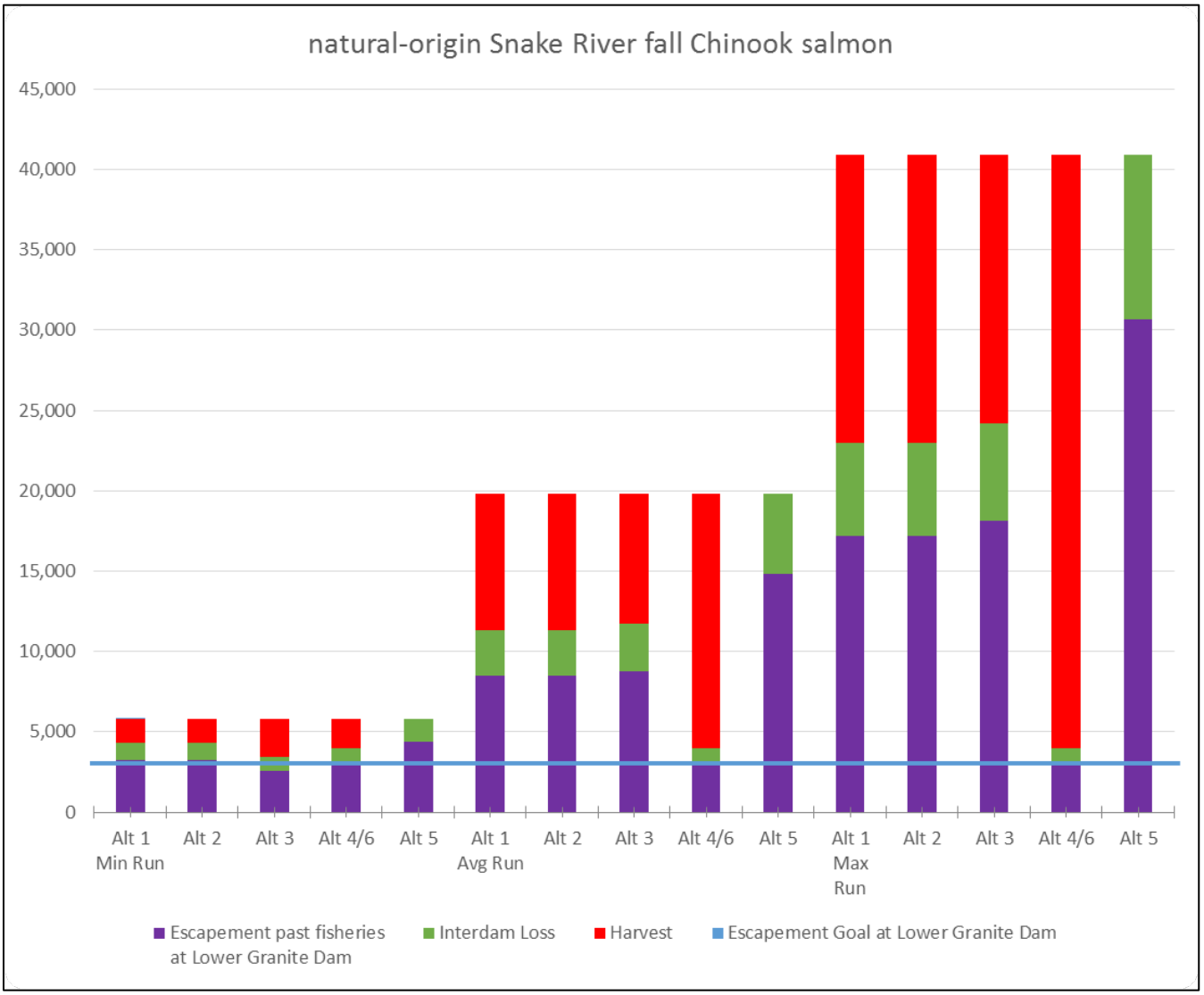

Figure 4-4. Comparison of alternatives modeled outputs for natural-origin Snake River fall Chinook salmon at minimum, average, and maximum run sizes expected.

Figure 4-4 illustrates the minimum, maximum and average *defined metrics* values for natural-origin Snake River fall Chinook salmon. There is a small difference for the minimum, average, and maximum harvest and escapement values between Alternatives 1 through 3. Alternative 4 and Alternative 6 offer the highest harvest opportunity, but also provides for the lowest escapement. The differences in escapement numbers between Alternative 1 and Alternative 3 are small for minimum, average and maximum values. Escapement for Alternative 2 is somewhat lower than for Alternative 1 and Alternative 3. Alternative 5 offers the most escapement and zero harvest (other than limited C&S harvest). For the average observed river mouth run size, the modeled output for all alternatives meet the escapement goal, except Alternative 4 and Alternative 6. For the minimum observed river mouth run size, all of the alternatives modeled

outputs exceed the escapement goal of 3,000, except Alternative 3, Alternative 4, and Alternative 6. For the average and maximum observed river mouth run sizes, the modeled outputs for Alternative 4/6 meets the escapement goal, but all other alternatives exceed the escapement goal.

- Coho salmon (*O. kisutch*)

Harvest policy for the management of Upriver coho salmon has not been set in the prior *US v Oregon* agreements except to specify limitations to insure 50/50, treaty/non-treaty sharing of the catch. This is expected to continue under a new *US v Oregon* agreement as the success of reintroduction programs in basins upstream of The Dalles Dam are evaluated and possibly expanded to other areas. Reintroduction of coho salmon into areas upstream of The Dalles Dam is still underway at this point in time. It is currently unknown the level upriver areas could support in terms of coho salmon abundance and escapement. Upriver coho salmon fall fisheries are therefore yet to be developed, but instead are currently only limited by the harvest policies that are set for steelhead and fall Chinook salmon. Fisheries targeting these two species operate during the fall and simply retain coho salmon as bycatch, but there is no harvest policy in the *US v Oregon* agreement specific for a conservation requirement for coho salmon upstream of Bonneville Dam. Therefore with no harvest policy for the management of Upriver coho salmon there will be no limits to fisheries based on coho salmon. Harvest impacts to coho salmon will vary proportionally with Snake River B-Index steelhead harvest impacts, meaning if there is a large abundance of Snake River B-Index steelhead then higher numbers of coho salmon will be caught as bycatch in fisheries targeting Snake River B-Index steelhead. If Snake River B-Index steelhead are low in abundance then lower harvest impacts to coho salmon will occur as fisheries targeting salmonids will be curtailed due to Snake River B-Index steelhead low abundances. For these reasons, the analysis does not include detailed review of the effects of each alternative on coho salmon interception.

- Sockeye salmon (*O. nerka*)
    - Okanogan River ESU.
    - Lake Wenatchee ESU.
    - Snake River ESU

For Snake River sockeye salmon, the average harvest rate for alternatives providing fishing opportunity is lowest for Alternative 1 (Table 4-62, Subsection 4.1.1.3.1). The average harvest rate of Alternative 3 is the second lowest of all alternatives that provide fishing opportunity, but not different than Alternative 1 (Table 4-62, Subsection 4.1.1.3.3). The average escapement past fisheries of Alternative 1 and Alternative 3 are the highest of all alternatives that provide fishing opportunity (Table 4-62, Subsection 4.1.1.3.1 and Subsection 4.1.1.3.3). Therefore impacts to the spawning escapement level are a slight positive under these Alternatives. Alternative 2 has no change in impact relative to the status quo. Alternative 4 and

Alternative 6 have the highest harvest rates and the lowest average escapements past fisheries of all the alternatives (Table 4-62, Subsection 4.1.1.3.4 and Subsection 4.1.1.3.6). This results in a high negative impact to spawning escapement for these two alternatives. Alternative 5 has the lowest overall average harvest rate (0 percent) and the highest average escapement past fisheries of all alternatives because Alternative 5 provides only limited C&S fishing opportunity but provides a positive impact to spawning escapement.

Table 4-62. Comparison of alternatives modeled outputs for Snake River sockeye salmon.

	Total HR			**Esc. Past Fisheries**			**Lower Granite Count**		
	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave
Alternative 1	6.0%	8.0%	7.7%	117	2,739	1,174	97	2,273	974
Alternative 2	6.0%	13.0%	9.7%	117	2,590	1,136	97	2,150	943
Alternative 3	8.0%	8.0%	8.0%	114	2,739	1,174	95	2,273	974
Alternative 4/6	6.0%	76.9%	36.8%	117	689	567	97	572	471
Alternative 5	0%	0%	0%	124	2,977	1,276	103	2,471	1,059

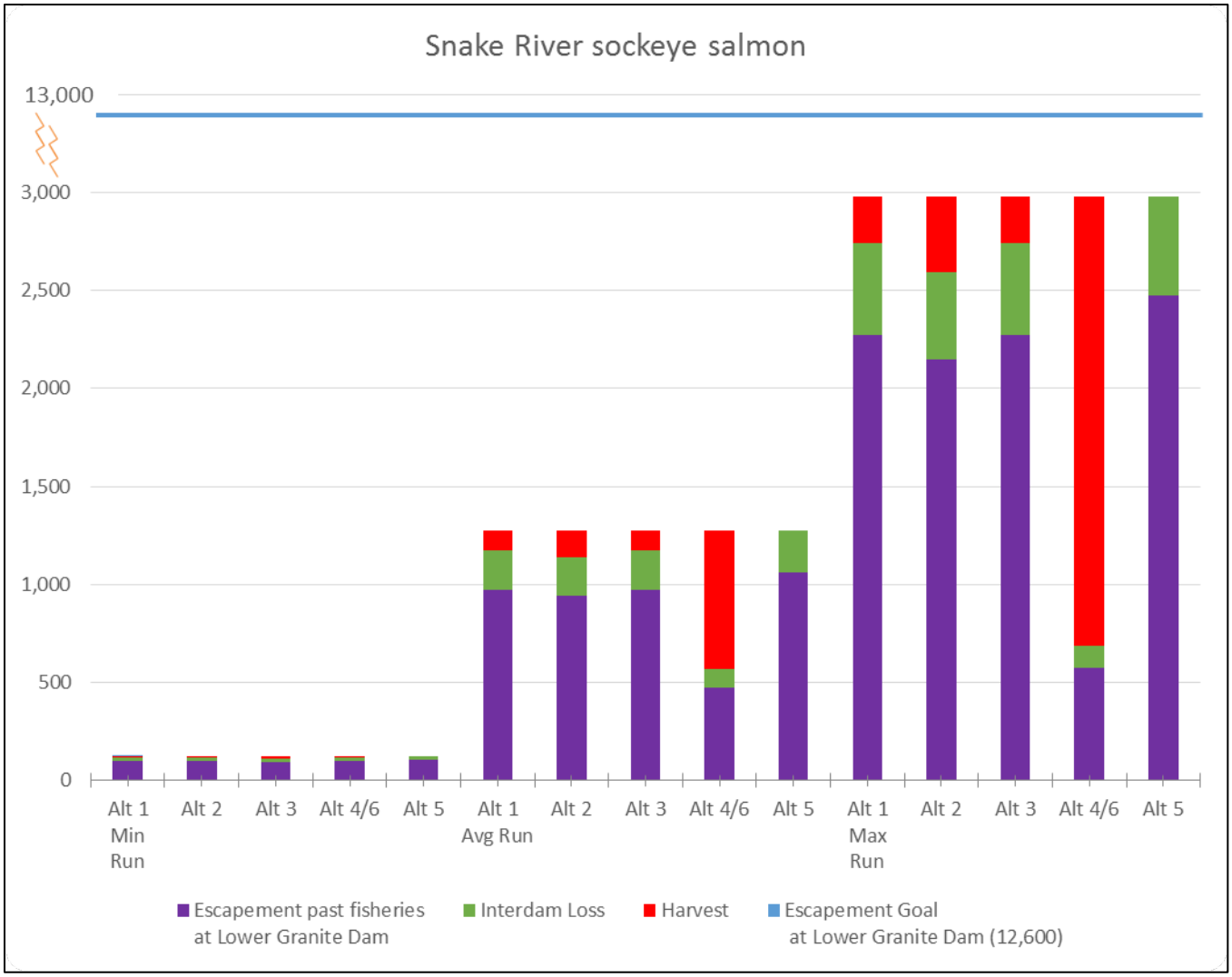

Figure 4-5. Comparison of alternatives modeled outputs for Snake River sockeye salmon at minimum, average, and maximum run sizes expected.

Figure 4-5 illustrates the minimum, maximum and average defined metrics values for Snake River sockeye salmon. For the minimum values, there is practically no difference between alternatives, except that Alternative 5 has curtailed harvest. For the average values and maximum values, Alternative 4 and Alternative 6 offer the highest harvest opportunity, but also provide for the lowest escapements. The differences in escapement numbers between Alternative 1 and Alternative 3 are small for minimum, average and maximum values. Escapement for Alternative 2 is somewhat lower than for Alternative 1 and Alternative 3. Alternative 5 offers the most escapement and zero harvest. None of the alternatives modeled outputs meet the escapement goal.

- Steelhead (*O. mykiss*)

Steelhead limits are constrained by Snake River Basin B-Index steelhead, by being the lowest in

abundance and therefore restricting access to more abundant stocks and limiting total catch. Fisheries are therefore limited by the number of Snake River Basin B-Index steelhead that can be caught and fisheries are closed once that is achieved. This means impacts to every other steelhead stock will always be less than those to Snake River Basin B-Index steelhead as fisheries are never constrained for any other steelhead stock due to them being healthier than the B-Index stock. Other steelhead migrate at the same time as the Snake River Basin B-Index steelhead stock, and therefore we expect impacts to other DPSs to vary proportionally to harvest impacts of Snake River Basin B-Index steelhead. But the harvest impacts to the other DPSs are lower, likely much lower, as these other DPSs are greater in abundance, than those to Snake River Basin B-Index steelhead, and effects were not modeled or analyzed in this EIS.

We expect harvest and resulting escapement levels, and therefore impacts, to these DPSs to vary proportionally to catch of B-Index fish.

- Southwest Washington DPS.
- Lower Columbia River DPS.
- Upper Willamette River DPS.
- Mid-Columbia River DPS.
- Upper Columbia River DPS.
- Snake River Basin DPS.

For Snake River Basin B-Index steelhead the average harvest rate and average escapement past fisheries are the same for Alternative 1 and Alternative 2 (Table 4-63, Subsection 4.1.1.5.1 and Subsection 4.1.1.5.2). The average harvest rate of Alternative 3 is the lowest of all alternatives that provide fishing opportunity, but not by much (Table 4-63, Subsection 4.1.1.5.3). The average escapement past fisheries of Alternative 3 is the highest of all alternatives that provide fishing opportunity, but not by much (Table 4-63, Subsection 4.1.1.5.3). Therefore impacts to the spawning escapement level are a slight positive under Alternative 3. Alternative 4 and Alternative 6 have the highest harvest rates and the lowest average escapements past fisheries of all the alternatives (Table 4-63, Subsection 4.1.1.5.4 and Subsection 4.1.1.5.6). This results in a high negative impact to spawning escapement for these two alternatives. Alternative 5 has the lowest overall average harvest rate (0 percent) and the highest average escapement past fisheries of all alternatives because Alternative 5 provides limited fishing opportunity but provides a positive impact to spawning escapement.

Table 4-63. Comparison of alternatives modeled outputs for natural-origin Snake River B-Index steelhead.

	Total HR			Esc. Past Fisheries			Lower Granite Count		
	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave
Alternative 1	19.2%	27.8%	27.1%	1,955	14,404	7,451	1,130	8,326	4,307
Alternative 2	19.2%	27.8%	27.1%	1,955	14,404	7,451	1,130	8,326	4,307
Alternative 3	25.9%	25.2%	25.3%	1,794	14,919	7,634	1,037	8,623	4,412
Alternative 4/6	7.7%	58.9%	31.1%	2,234	8,199	7,038	1,291	4,739	4,068
Alternative 5	0%	0%	0%	2,420	19,951	10,220	1,399	11,532	5,907

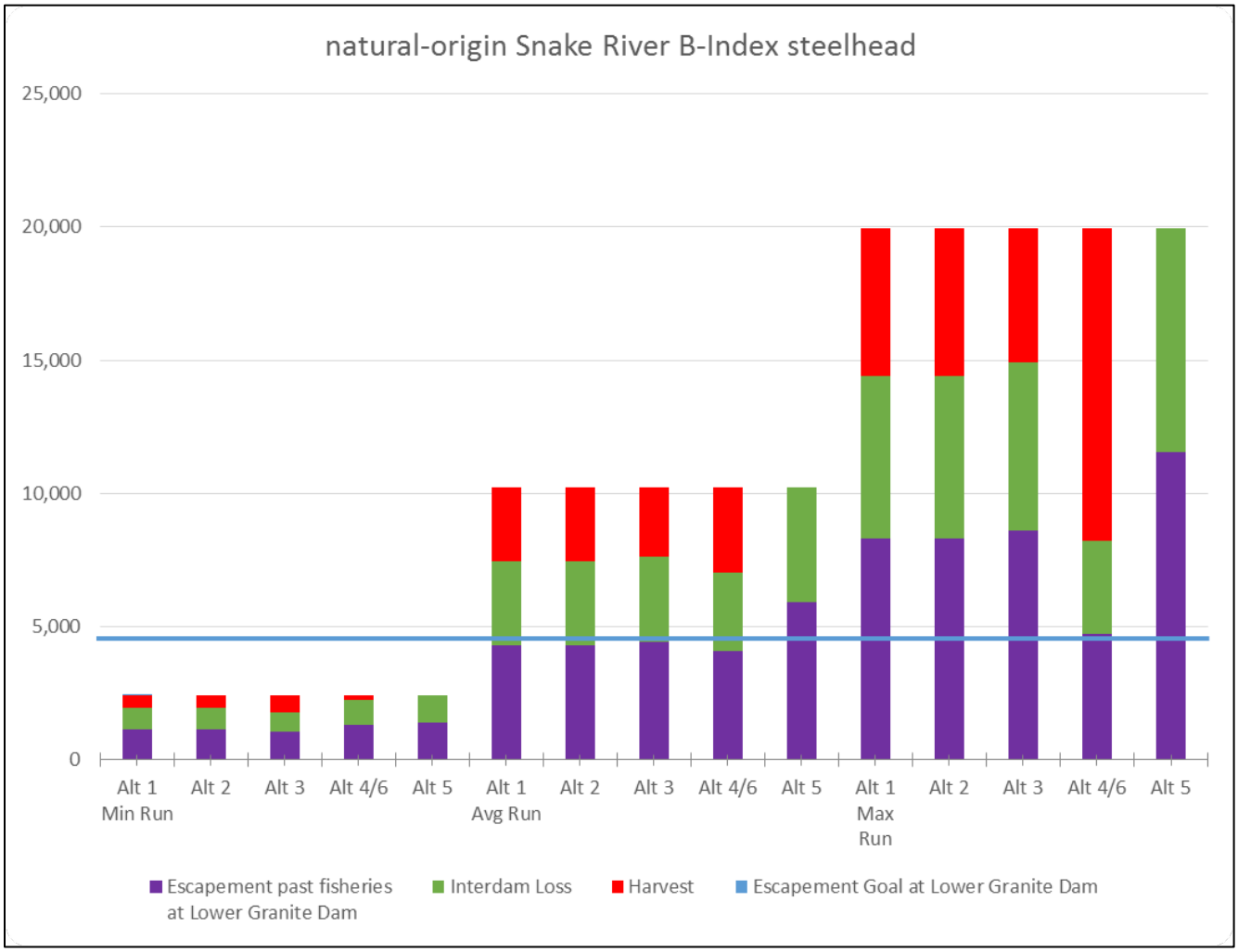

Figure 4-6. Comparison of alternatives modeled outputs for natural-origin Snake River B-Index steelhead at minimum, average, and maximum run sizes expected.

Figure 4-6 illustrates the minimum, maximum and average *defined metrics* values for natural-origin Snake River B-Index steelhead. For the minimum values, there is practically no difference between alternatives, except that Alternative 5 has almost zero harvest. For the average values and maximum values, Alternative 4 and Alternative 6 offer the highest harvest opportunity, but also provide for the lowest escapements. The differences in escapement numbers between Alternative 1 and Alternative 3 are small for minimum, average and maximum values. Escapement for Alternative 2 is somewhat lower than for Alternative 1 and Alternative 3. Alternative 5 offers the most escapement and almost zero harvest. For the minimum observed river mouth run size, none of the alternatives modeled outputs meet the escapement goal of 4,700. For the average observed river mouth run size, the modeled output for Alternative 5 meets the escapement goal, but all other alternatives also almost meet the escapement goal. For the maximum observed river mouth run size, all of the alternatives modeled outputs meet the escapement goal.

In summary, Alternative 1 and Alternative 2 on natural-origin Upper Columbia River spring Chinook salmon, natural-origin Snake River spring/summer Chinook salmon, natural-origin Snake River fall Chinook salmon, and natural-origin Snake River B-Index steelhead would not impact the current status quo conditions. The effects of Alternative 3 on these same resources is practically the same as those of Alternative 1 and Alternative 2, but generally provides a slight positive impact to spawning escapement. Alternative 4 and Alternative 6 have the greatest effects (largest harvest) on all affected salmonid species, especially for natural-origin Snake River fall Chinook salmon, natural-origin Snake River spring/summer Chinook salmon, natural-origin Upper Columbia River spring Chinook salmon, Snake River sockeye salmon and natural-origin Snake River B-Index steelhead. Only for Upper Columbia summer Chinook salmon are the effects of Alternative 4 or 6 lower than for Alternatives 1, 2, and 3. This results in a high negative impact to spawning escapement for these two alternatives across all stocks. Alternative 5 has the lowest harvest impacts on all salmonid species because it involves curtailed fishing, and therefore provides a positive impact to spawning escapement across all stocks. None of the alternatives, including Alternative 5, meet the escapement goal for Snake River sockeye salmon.

Hatchery Effects on Salmonid Populations

The operation of salmon and steelhead hatcheries in the Columbia River Basin, including the hatchery programs contained in a new *US v Oregon* management agreement, results in impacts to ESA-listed and non-listed salmon and steelhead. As discussed earlier in this EIS, the impacts of Columbia River hatcheries were disclosed in the Mitchell Act EIS. For this reason, NMFS is incorporating Section 4 of the Mitchell Act EIS into our impacts analysis here.

As described in detail in Subsection *3.2.3.1, General Risks and Benefits of Hatchery programs to Salmon and Steelhead Species*, in the Mitchell Act EIS and Appendix B of this EIS, hatchery salmon and steelhead programs can have beneficial effects to these species but also pose risks. Those beneficial effects include potential increases to abundance by increasing populations and helping maintain at-risk populations threatened by extirpation, benefits to productivity by providing nutrients and improving spawning gravel conditions, and to spatial structure by expanding spatial distribution. Additionally, hatcheries pose risks to natural-origin salmon and steelhead populations in the form of effects to abundance and productivity through competition, predation, disease and harvest. Interbreeding of hatchery and natural-origin fish can negatively affect genetic diversity and productivity, by interfering with the natural forces that strengthen the population genetics and by introducing maladaptive genetic changes. The presence of hatchery fish can lead to impacts to natural-origin populations from competition for resources such as food and spawning sites, and to predation by hatchery fish on natural-origin fish. Finally, hatchery facilities have impacts that result from the operation of weirs and other structures that can disrupt migrations, water intakes that risk entrainment and impingement, removal of water from the stream, discharge of effluent into streams, and impacts to river flows that interfere with migration and spawning.

Each of the alternatives in this action will continue to result in impacts from hatchery operations. As discussed in Subsection 1.3.2, above, hatchery production is incorporated into a new *US v Oregon* management agreement. Although individual programs are technically independent of harvest goals and would be expected to continue under any of the alternatives, continued impacts from the collective hatchery production in the Columbia River basin adopted cumulatively in a new *US v Oregon* management agreement is considered part of the impacts discussed here.

In addition to disclosing hatchery impacts generally at a basin-wide level, the Mitchell Act EIS disclosed impacts at the ESU/DPS-level as well as for each hatchery program, species by species, for each of its six hatchery alternatives, which can be viewed in the Mitchell Act EIS appendices (NMFS 2014b) (Appendices C-F).

NMFS has reviewed the Mitchell Act EIS and determined that it contains an analysis of 113 of the 115 programs incorporated into a new *US v Oregon* management agreement, and therefore the impacts disclosed in the Mitchell Act EIS comprise a significant portion of the impacts of the current action. However, two programs in the new *US v Oregon* management agreement were not analyzed in the Mitchell Act EIS, and 42 of the programs that were analyzed there have either increased or decreased in size, resulting in potential changes to the impacts of individual programs. To update the analysis for this

EIS, NMFS has reviewed the changes program-by-program and assessed how the impacts could differ from those reported in the Mitchell Act EIS. This review and its conclusions are found in Appendix B of this document.

Overall, the comparison of total programs, species by species, reveals that the production incorporated into a new *US v Oregon* management agreement falls within the range of total hatchery production analyzed in the Mitchell Act EIS for *US v Oregon* specific production, with the exception of sockeye salmon programs, which doubles the total production analyzed in the Mitchell Act EIS, and coho salmon programs, which are proposed to be 2 percent greater than the upper limit of programs analyzed in the Mitchell Act EIS.

Table 4-64. Comparison of Hatchery Program Production Referenced in the proposed *US v Oregon* Management Agreement Compared to the Hatchery Production Analyzed in the Mitchell Act EIS (NMFS 2014b).

Hatchery Species	**Total Proposed *US v Oregon* Releases**	**Mitchell Act EIS total Releases (same programs, range across alternatives)**	**Percent of *US v Oregon* Production Analyzed in Mitchell Act EIS**
spring Chinook salmon	19,236,461	14,741,000 to 20,936,000	77% - 109%
summer Chinook salmon	5,996,569	5,465,000 to 7,517,000	91% - 125%
fall Chinook salmon	42,176,000	4,359,000 to 42,680,000	10% - 101%
sockeye salmon	1,000,000	500,000	50%
steelhead	6,783,300	6,085,000 to 8,167,000	90% - 120%
coho salmon	8,550,000	2,508,000 to 8,400,000	29%-98%
Total	**83,742,330**	**33,658,000 to 88,200,000**	**40% - 105%**

	Proposed # *US v Oregon* Programs	**MA EIS Analyzed # Programs**	**% of *US v Oregon* programs analyzed in Mitchell Act**
spring Chinook salmon	39	39	100%
summer Chinook salmon	14	13	92%
fall Chinook salmon	16	15	93%
sockeye salmon	1	1	100%
steelhead	32	32	100%
coho salmon	13	12	92%
Total	**115**	**112**	**97%**

At the species level, the production referenced in a new *US v Oregon* management agreement will result in the same overall impacts to both listed and unlisted salmonids. The 2 percent increase in coho salmon does not significantly alter the effects of coho salmon production generally in the basin, and the increase in sockeye salmon production represents a single program which is proposed to double its capacity. For all other salmonid species, the production levels fall within the range of overall impacts analyzed in the Mitchell Act EIS. However, the program changes may result in changes to how each program impacts salmonid populations. For detailed program-by-program changes and assessment of impacts, please refer to Appendix B.

Chinook Salmon

As detailed in Table 4-64 above, the hatchery production levels of Chinook salmon, referenced in a new *US v Oregon* management agreement, are well represented in the range of production analyzed in the Mitchell Act EIS alternatives. Therefore, NMFS is incorporating by reference the likely effects of the Chinook salmon hatchery production, analyzed in the Mitchell Act EIS alternatives, in consideration of any program changes, as described above and in Appendix B, to the Chinook salmon ESUs impacted by new *US v Oregon* management agreement harvest actions.

- Upper Columbia River spring-run

Based on analysis of the Mitchell Act EIS alternatives, and considering any differences in release number

from the proposed programs (Appendix B, Table 2), NMFS expects that: negative hatchery effects to the productivity and abundance of this ESU would likely decrease overall, due to the reduction in total spring Chinook salmon hatchery production; negative hatchery effects to population genetic diversity would likely decrease, slightly, due to the reduction in total spring Chinook salmon hatchery production; and risk of competition and predation from hatchery fish to this ESU would likely remain consistent with status quo conditions, due to the overall hatchery salmon and steelhead production in the Upper Columbia River area.

- Snake River spring/summer-run Chinook salmon ESU

Based on the analysis of the Mitchell Act EIS alternatives, and considering any differences in release number from the proposed programs (Appendix B, Table 2), NMFS expects that: negative hatchery effects to the productivity of this ESU would likely increase, slightly, overall; while negative hatchery effects to abundance would likely be increased slightly, overall, given the potential use of more natural-origin fish in the hatchery broodstocks; negative hatchery effects to population genetic diversity would likely increase, slightly, overall; hatchery risk of competition and predation, from hatchery fish, to this ESU, would increase, slightly, due to likely increases in overall hatchery spring/summer Chinook and coho salmon production in the Snake River Basin.

- Upper Columbia River summer-run Chinook salmon ESU

Based on the analysis of the Mitchell Act EIS alternatives, and considering the differences in release number from the proposed programs (Appendix B, Table 2), NMFS expects that: negative hatchery effects to the productivity and abundance of this ESU would likely decrease, overall; negative hatchery risks to population genetic diversity would likely be decreased; and hatchery risk of competition and predation, from hatchery fish, to this ESU would likely remain consistent with status quo conditions, due to the overall hatchery salmon and steelhead production in the Upper Columbia River area.

- Snake River fall-run Chinook salmon ESU

Based on the analysis of the Mitchell Act EIS alternatives, and considering the differences in release number from the proposed programs (Appendix B, Table 2), NMFS expects that: negative hatchery effects to the productivity of this ESU would likely remain constant while abundance of natural-origin spawners would likely be reduced, slightly, given the potential use of more natural-origin fish in the hatchery broodstock; hatchery risks to population genetic diversity would also, likely remain constant; hatchery risk of competition and predation from hatchery fish to this ESU would likely increase, slightly, due to likely increases in overall hatchery spring/summer Chinook and coho salmon production in the Snake River Basin.

Coho Salmon (above Bonneville Dam)

As detailed above in Table 4-64, the hatchery production level of coho salmon, overall, referenced in a new *US v Oregon* management agreement, is slightly higher than the production level analyzed in the Mitchell Act EIS analysis. Therefore, NMFS is incorporating by reference the likely effects of the coho salmon hatchery production, analyzed in the Mitchell Act EIS, in consideration of any program changes, as described above and in Appendix B, to the coho salmon populations impacted by a new *US v Oregon* management agreement.

Based on the analysis of the Mitchell Act EIS alternatives, and considering the differences in release number from the proposed programs (Appendix B, Table 2), NMFS expects: the beneficial hatchery effects to coho salmon abundance from the programs would be higher; the hatchery effects to coho salmon productivity would likely remain constant; hatchery risks to coho salmon population genetic diversity would increase, slightly; and hatchery risks of competition and predation from hatchery fish to these coho salmon populations would likely increase, slightly.

Sockeye Salmon

As detailed above in Table 4-64, the hatchery production level of sockeye salmon, referenced in a new *US v Oregon* management agreement, is higher than the production level analyzed in the Mitchell Act EIS analysis. Therefore, NMFS is summarizing here and incorporating by reference the likely effects of sockeye salmon hatchery production, analyzed in the Mitchell Act EIS alternatives, in consideration of any program changes, as described above and in Appendix B, to the sockeye salmon ESUs impacted by a new *US v Oregon* management agreement.

- Snake River Sockeye Salmon ESU

Based on the analysis of the Mitchell Act EIS alternatives, and considering the differences in release number from the proposed programs (Appendix B, Table 2), NMFS expects: the abundance benefits from the program would likely be higher, relative to the programs analyzed in the Mitchell Act EIS alternatives; the benefits to productivity would likely be lower, relative to the programs analyzed in the Mitchell Act EIS alternatives; the risks to population genetic diversity may increase, relative to the programs analyzed in the Mitchell Act EIS alternatives; and hatchery risks of competition and predation from hatchery fish to this ESU would likely increase, slightly, due to likely increases in overall hatchery spring/summer Chinook and coho salmon production in the Snake River Basin.

Steelhead

As detailed above, the hatchery production levels of steelhead, referenced in a new *US v Oregon* management agreement, are well represented in the Mitchell Act EIS analysis. Therefore, NMFS is summarizing here and incorporating by reference the likely effects of the steelhead hatchery production, analyzed in the Mitchell Act EIS alternatives, and in consideration of any program changes, as described above and in Appendix B to the steelhead DPSs impacted by a new *US v Oregon* management agreement.

- Snake River Steelhead DPS

Based on the analysis of the Mitchell Act EIS alternatives, and considering the differences in release number from the proposed programs (Appendix B, Table 2), NMFS expects that: negative hatchery effects to the productivity of this DPS would likely decrease, with an overall decrease in hatchery steelhead production; negative hatchery effects to the abundance of this DPS would also, likely, decrease; hatchery effects to population genetic diversity would also, likely, decrease for this population. Risk of competition and predation, from hatchery fish, to this DPS would likely decrease, slightly, due to decreases in overall hatchery steelhead in the Snake River Basin.

4.2.2. ESA-Listed Fish Species (non-salmonids)

There is potential for incidental take of non-salmonid ESA-listed green sturgeon (*Acipenser medirostris*, Threatened, 71 Fed. Reg. 17757) in fisheries directed at white sturgeon. However, in 2008 NMFS determined the total expected annual take of Southern DPS green sturgeon associated with prospective *US v Oregon* non-treaty commercial white sturgeon fisheries was estimated annually to be 14 fish and zero in treaty Indian fisheries (NMFS 2008b). Between 2008 and 2013, salmon fisheries largely replaced white sturgeon seasons, further limiting the possibility of catching green sturgeon. Effective 2014, policies adopted by the Washington Fish and Wildlife Commission and Oregon Fish and Wildlife Commission prohibited the retention of white sturgeon in all non-Indian fisheries downstream of Bonneville Dam (JSR 2016), thereby reducing the likelihood of catching green sturgeon to near zero. Therefore there is no discernable effect on green sturgeon from any of the alternatives.

In 2008 the USFWS determined encounters with bull trout (*salvelinus confluentus*) were expected to be extremely limited in fisheries subject to a *US v Oregon* agreement (USFWS 2008). USFWS determined bull trout may only rarely or intermittently be present in mainstem locations. In general, bull trout are too small to be taken in gear types known to be used by treaty and non-treaty commercial fisheries. Recreational fisheries in the mainstem Columbia and Snake Rivers are not allowed to keep bull trout and all bull trout incidentally hooked in recreational fisheries must be released immediately. Therefore there is no discernable effect on bull trout from any of the alternatives.

Neither harvest policy nor salmon harvest strategies used in prospective *US v Oregon* fisheries are

expected to incidentally take ESA-listed Pacific Eulachon (*thaleichthys pacificus*, Threatened, 79 Fed. Reg. 20802). Therefore there is no discernable effect on Pacific Eulachon from any of the alternatives.

Based on the analysis of the Mitchell Act EIS alternatives, the levels of hatchery produced salmon and steelhead smolts included in the Agreement would not substantially change the impacts to bull trout as either a prey base (hatchery juveniles) or through potential competition (returning hatchery adults). Nor would the impacts to eulachon, through predation from hatchery salmon and steelhead change.

4.2.3. Other Non-Salmonids (non ESA-listed Fish Species)

Harvest policies are not set in the *US v Oregon* agreement for fisheries directed at the following species:

- White Sturgeon (*Acipenser transmontanus*)
- American Shad (*Alosa sapidissima*)
- Pacific Lamprey (*Entosphenus tridentatus*)
- Walleye (*Sander vitreus*)

The *US v Oregon* agreement does not specify conservation specific needs for any of these fish. Instead, these species are mentioned in the agreement as very small levels of salmon or steelhead bycatch might occur during fisheries targeting these species. The agreement would memorialize the Parties commitment to responsible management of these species. The parties to the *US v Oregon* management agreement track any salmon or steelhead bycatch, regardless of the low level, to ensure they remain static and accounted for in allocation and fishery management calculations. The level of effort for these fisheries have remained relatively unchanged and we expect this level of effect to continue. Therefore we expect no discernable effect on these species under any of the alternatives relative to status quo, but they are included in this EIS as a new *US v Oregon* management agreement references fisheries targeting these species so that bycatch of salmonid resources are accounted for. We account for impacts to from salmonid bycatch in the salmonid resource Subsections.

Based on the analysis of the Mitchell Act EIS alternatives, the hatchery programs included in the Agreement would not substantially alter the total production of salmon and steelhead throughout the Columbia River Basin. As such, we would not expect a discernible difference in effects to other species of fish, from the hatchery programs included in a new *US v Oregon* management agreement.

4.3. Water Quality and Quantity—Hatchery Effects & Marine-Derived Nutrients

In reviewing the differences in production levels between the agreement-referenced programs and those analyzed in the Mitchell Act EIS, NMFS considered the increases in production, for some programs, and the decreases in production, for some programs, represented by the programs in a new *US v Oregon*

agreement, relative to the programs, as analyzed, in the Mitchell Act EIS. The small scale of these changes, in numbers of fish, and the relationship of that change to the total production at the facilities used makes it difficult to estimate the likely change in facility effects (as described in Subsection 3.3) to water quality from these production differences. Additionally, considering that the facilities operating in the Columbia River basin, including the facilities associated with the production in a new *US v Oregon* agreement, operate under existing federal Clean Water Act (CWA), National Pollution Discharge Elimination System (NPDES) permits (when required), NMFS concludes that the differences in the hatchery program releases, included in the *US v Oregon* Agreement, relative to the programs analyzed in the Mitchell Act EIS, are not likely to have substantively different effects to the water quality where they operate.

As discussed in Subsection 3.3, anadromous species such as salmon and steelhead are important components of the freshwater ecosystem, particularly for their role in transporting nutrients upstream from the marine ecosystem. There is no difference in hatchery production under any of the alternatives. Therefore, our assumption is the potential level of marine derived nutrients from hatchery production entering the Columbia River Basin is constant and stable across every alternative.

Under Alternatives 1, 2, 3, 4, and 6 there will be a decrease in nutrients transported upstream in comparison to Alternative 5 because fish carcasses will be removed through harvest. Harvest would reduce nutrients to aquatic organisms, including listed salmon and steelhead, and limit stream engineering from spawning adult salmon. Table 4-65 and Figure 4-7 show the total harvest and indicates the level of reduced fish carcasses that would be distributed in the ecosystem. Alternative 5 would lead to an immediate positive effect and improvement over time relative to the other alternatives as there would be more marine derived nutrients deposited throughout the Columbia River Basin.

Table 4-65. Total treaty and non-treaty harvests of all salmon and steelhead species by minimum, maximum, and average run size abundances expected over the next 10 years.

	Treaty Total Harvest (all species)			Non-Treaty Total Harvest (all species)			Total
	Min	Max	Avg	Min	Max	Avg	Avg
Alternative 1 Extension	57,972	550,955	261,528	19,137	278,149	131,142	392,670
Alternative 2 Abundance	57,672	575,075	269,056	18,818	288,947	131,909	400,965
Alternative 3 Fixed Harvest	75,963	516,162	254,213	39,915	234,551	119,908	374,121
Alternative 4 / 6 Fixed Escapement / Uncoordinated Harvest	55,906	1,080,590	417,420	49,700	999,239	384,890	802,310
Alternative 5 Fishing curtailment	0	0	0	0	0	0	0

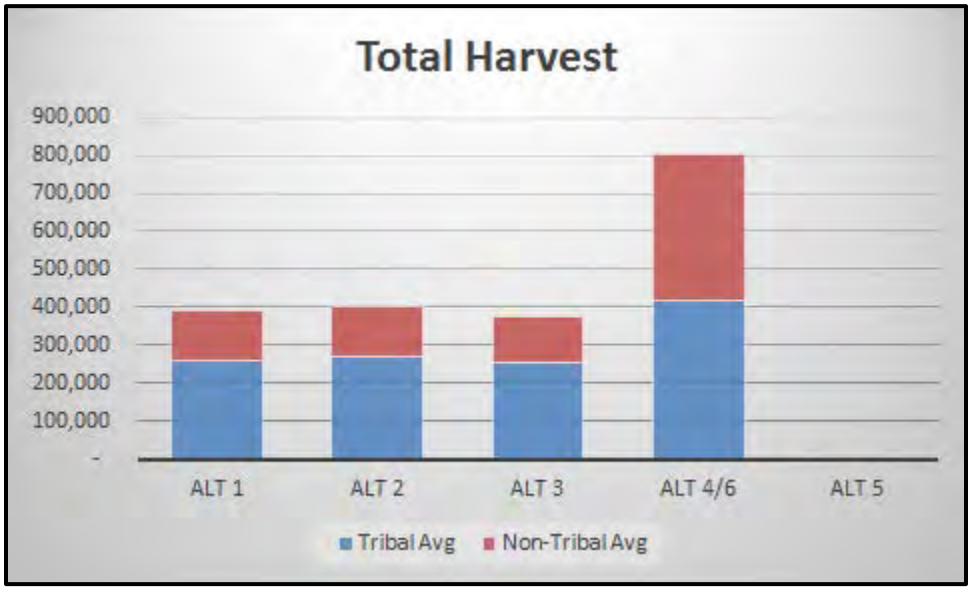

Figure 4-7. Total Treaty and Non-Treaty harvests of all salmon and steelhead species by average run size abundances expected over the next 10 years.

Alternative 3 results in the highest average escapement past fisheries, as it results in the lowest harvest

total (Table 4-65), but relative to Alternative 1 and Alternative 2, it is a low difference (6 percent), and since the majority of fish harvested are hatchery fish, and hatchery fish normally return to traps and hatcheries, the reduction in available carcasses would not equal the number of fish harvested. Alternative 4 and Alternative 6 result in the lowest number of carcasses distributed compared to the other alternatives, as both result in the highest average harvest total (Table 4-65). Alternative 5 would have the maximum stream bed modification effect due to it resulting in the largest number of escaping adults, while the other alternative would show negligible differences between each other given the slight differences in escapement.

4.4. Wildlife

As discussed in Subsection 3.4 fisheries have the potential to affect wildlife through interactions between wildlife and fishing gear and through changes in the availability of fish as prey. Wildlife that are most likely to be affected by fishing activities are seabirds and marine mammals. Analyses conducted for wildlife were based on the use of literature representing the best available science and other studies.

4.4.1. Seabirds, Raptors, and Other Piscivorous Birds

Seabirds prey on juvenile salmon as they migrate down the Columbia River, primarily in the estuary (downstream of Bonneville Dam), and in the tailraces of some dams. Seabirds that prey on juvenile salmon include Caspian terns, Double-crested cormorants, and several species of gulls. Guillemots, murres, and puffins also prey on juvenile salmon, primarily in the ocean. However, they are considered to be a minor source of predation. Seabirds do not prey on adult salmon at any time during upstream migration.

None of the harvest alternatives examined in this EIS are expected to directly affect seabirds by reducing their prey base, which do not include adult salmon. It is possible the harvest alternatives (Alternatives 1 through 6) could indirectly affect seabirds by reducing a potential food supply (by reducing the potential spawning population size). Seabirds are known to feed on juvenile salmon in the Columbia River estuary. However, the majority of the juvenile salmon eaten by seabirds originate from hatcheries downstream of Bonneville Dam. Since the alternatives do not affect the hatchery program release sizes, their production of juvenile salmon is not expected to be reduced. As such, this food source for seabirds would be maintained. However, the capacity limit of the current spawning habitat does not always allow for increased juvenile production at higher escapement numbers. In general harvest has been curtailed from historically much higher levels, which has resulted in passing higher numbers of adult fish through fisheries to the terminal area spawning grounds. Despite these increases in escapements the adult salmon and steelhead run sizes have not resulted in productivity levels high enough to change their respective

ESA-status (NWFSC 2016). Therefore, an increase in escapement of adult fish to terminal spawning areas does not simply translate into an increase in juvenile salmonids. All alternatives would have a similar positive effect when salmonid abundance is sufficient to meet escapement goals, which is to produce juveniles at the maximum level of current habitat capacity.

Raptors (bald eagles, turkey vultures, osprey), corvids (crows, ravens), and numerous species of gulls prey on returning adult salmonids, primarily post-spawn adults. Since Pacific salmon die after spawning, post-spawn adults provide an important food source for these birds in the late summer, fall, and early winter. In general, adult salmon are not susceptible to bird predation until they are either actively spawning or are in a post-spawn condition.

Alternative 1 and Alternative 2 would have no impact change relative to status quo levels of adults available as prey to these birds. Alternative 3 would have a slightly positive impact as its average harvest is lower than that of Alternative 1 and Alternative 2, thereby providing a larger number of prey items available. Alternative 4 and Alternative 6, with the largest harvest, would have the most noticeable negative impact on these birds by removing the largest numbers of available prey items. Alternative 5 would offer the most adult salmonids as prey since they would not be harvested en route to the spawning grounds, thereby providing a positive impact. This alternative would maximize post-spawn adults as a food source.

Based on the analysis of the Mitchell Act EIS alternatives, the hatchery production included in the Agreement would not be expected to change the current availability of juvenile salmonid prey base for seabirds and the resulting adult returns would be well within annual variability of total salmon and steelhead returns, so would not have a discernable effect on the availability of adult salmon and steelhead prey.

4.4.2. Marine Mammals

Subsection 3.4.2 indicates fisheries occur in areas known to be inhabited by seals and sea lions and these mammals prey on adult salmonids that are also target of the fisheries. Alternative 1 and Alternative 2 would have no impact change relative to status quo levels of adults available as prey for marine mammals while Alternative 3 would have a slightly positive impact as its average harvest is lower than that of Alternative 1 and Alternative 2. Alternative 4 and Alternative 6, with the largest harvest, would have the most noticeable negative effect on these marine mammals, as they remove the largest number of adults available as prey. Alternative 5 would offer the most adult salmonids as prey since most would not be harvested resulting in a positive impact.

Alternatives examined in this analysis represent options for controlling harvest inside the Columbia River. Any anadromous fish taken or not taken through fisheries inside the Columbia River would not be available to Southern Resident Killer Whales (SRKW) given that the fish would have already passed through their respective ocean habitat, prior to having been subject to the fisheries examined in this analysis. However, the capacity limit of the current spawning habitat does not always allow for increased juvenile production at higher escapement numbers. In general harvest has been curtailed from historically much higher levels, which has resulted in passing higher numbers of adult fish through fisheries to the terminal area spawning grounds. Despite these increases in escapements the adult salmon and steelhead run sizes have not resulted in productivity levels high enough to change their respective ESA-status (NWFSC 2016). Therefore, an increase in escapement of adult fish to terminal spawning areas does not simply translate into an increase in juvenile salmonids that would eventually serve as adult prey for the SRKW. There is no discernable difference between the alternatives on the effect to SRKW.

As detailed in Table 4-64, above, the production of hatchery Chinook salmon included in the Agreement, falls within the range of hatchery Chinook salmon production analyzed in the Mitchell Act EIS. Based on that analysis, the hatchery production Chinook salmon included in the Agreement would likely increase the number of adult Columbia River Basin Chinook salmon in the ocean, slightly. This increase, however, would likely be within the range of annual natural variability and would be difficult to distinguish from other sources of variability. Therefore, the Chinook salmon hatchery production included in the Agreement would not be expected to add a substantial benefit for the population abundance of the SRKW.

4.5. Economics

This economic analysis evaluates harvest-related effects from implementing harvest policy alternatives in the project area, relative to existing conditions as described in Subsection 3.5, Economics. This analysis focuses on analyzing effects related to commercial and recreational fishing activity directed on the five harvest indicator stocks identified in Subsection 3.5: Upriver spring Chinook salmon, Upper Columbia summer Chinook salmon, Upriver fall Chinook salmon, Upriver sockeye salmon, and Snake River B-Index steelhead. The analysis identifies the effects of the harvest policy alternatives on the number of fish harvested in affected commercial fisheries in the Columbia River mainstem, catch and effort associated with affected recreational fisheries in the Columbia River mainstem, and changes in different metrics of economic value, including the ex-vessel value of commercial landings and estimates of trip-related expenditures by recreational anglers.

Potential changes in the direct and indirect contribution of the harvest policy alternatives to employment

and personal income in the four economic impact subregions of the Columbia River basin are estimated. The numbers of jobs estimated in this analysis below are expressed as full-time equivalent (FTE) jobs. However, most jobs in the commercial fishing industry are part-time positions due to the seasonality of commercial salmon fishing. Many persons engaged in commercial salmon fishing also participate in other fisheries and/or have other occupations. This situation should be considered in interpreting the employment effects presented for estimated job changes associated with commercial fisheries (and to a lesser extent, jobs associated with businesses that support recreational fishing activity).

In summary, considering all potential economic effects from the harvest policy alternatives for the *US v Oregon* Project Area, under existing conditions (Subsection 3.5, Economics), the value to tribal and non-tribal commercial fishers and to non-tribal recreational fishers, and the employment and personal income contribution to the regional and local economy overall, has a moderate positive effect in the economic analysis area. This is because of the contribution to income and jobs that are primarily associated with tribal commercial and non-tribal recreational fisheries. The harvest policy alternatives also affect salmon and steelhead for ceremonial and subsistence fishing, as discussed in Subsection 4.6, Cultural Resources—C&S Harvest.

Table 4-66. Comparative summary of economic effects under the alternatives.

Status Quo Conditions	Alternative 1 (Extension)	Alternative 2 (Abundance-based)	Alternative 3 (Fixed Rate)	Alternative 4 / 6 (Escapement-based / Uncoordinated fishing)	Alternative 5 (Fishing curtailment)
Moderate positive	Moderate positive	Low positive	Low negative	High positive	High negative

It should be noted that the information presented in this section is organized first by harvest policy alternative and then generally follows the organization in Subsection 3.5, Economics (commercial fisheries, recreational fisheries, and contributions to regional economic activity). As indicated in Subsection 3.5, Economics, values in the following subsections are not rounded to aid the reader in finding corresponding numbers between tables and text. The use of unrounded numbers, however, should not be interpreted as suggestive of unusually high levels of precision in the estimates. All numbers presented represent a reasonable estimate of the underlying values. Information on methods and analyses used in this analysis is presented in Appendix A, Economic Methods.

4.5.1. Alternative 1 – Extension of Current Agreement

Under Alternative 1, the harvest policy would support the same level of harvest as under the status quo

condition, the same number of salmon and steelhead would be harvested in commercial and recreational fisheries as described in Subsection 3.5, Economics.

4.5.1.1. Commercial Fisheries

Upriver Spring Chinook Salmon

Under Alternative 1, the commercial harvest of Upriver spring Chinook salmon (11,606 fish) would be the same as under the status quo condition, with tribal fisheries accounting for about 65 percent (7,528 fish) of the harvest and non-tribal fisheries about 35 percent (4,078 fish) of the harvest. Ex-vessel values associated with the total harvest of Upriver spring Chinook salmon ($848,193) also would be the same as under status quo conditions, with tribal fisheries accounting for about 65 percent ($493,029) of total ex-vessel value and non-tribal fisheries for about 35 percent ($355,164) of the value. Details of ex-vessel value and harvest number of fish by subregion, alternative, and type of fishery are provided in Appendix A, Table A-7.

Upper Columbia Summer Chinook Salmon

Under Alternative 1, the commercial harvest of Upper Columbia summer Chinook salmon (24,791 fish) would be the same as under the status quo condition, with tribal fisheries accounting for about 71 percent (17,569 fish) and non-tribal fisheries about 29 percent (7,222 fish) of the harvest. Ex-vessel values associated with the total harvest of Upper Columbia summer Chinook salmon ($854,787) also would be the same as under status quo conditions, with tribal fisheries accounting for about 66 percent ($565,958) of total ex-vessel value and non-tribal fisheries for about 34 percent ($288,829) of the value. Details of ex-vessel value and harvest number of fish by subregion, alternative, and type of fishery are provided in Appendix A, Table A-8.

Upriver Fall Chinook Salmon

Under Alternative 1, the commercial harvest of Upriver fall Chinook salmon (232,173 fish) would be the same as under the status quo condition, with tribal fisheries accounting for about 81 percent (187,303 fish) of the harvest and non-tribal fisheries about 19 percent (44,870 fish) of the harvest. Ex-vessel values associated with the total harvest of Upriver fall Chinook salmon ($8,373,007) also would be the same as under status quo conditions, with tribal fisheries accounting for about 77 percent ($6,457,182) of total ex-vessel value and non-tribal fisheries for about 23 percent ($1,915,825) of the value. Details of ex-vessel value and harvest number of fish by subregion, alternative, and type of fishery are provided in Appendix A, Table A-9.

Upriver Sockeye Salmon

Under Alternative 1, the commercial harvest of Upriver sockeye salmon (16,952 fish) would be the same as under the status quo condition, with tribal fisheries accounting for about 97 percent (16,440 fish) of the harvest and non-tribal fisheries about 3 percent (512 fish) of the harvest. Ex-vessel values associated with the total harvest of Upriver sockeye ($110,569) also would be the same as under status quo conditions, with tribal fisheries accounting for about 97 percent ($106,825) of total ex-vessel value and non-tribal fisheries for about 3 percent ($3,744) of the value. Details of ex-vessel value and harvest number of fish by subregion, alternative, and type of fishery are provided in Appendix A, Table A-10.

Snake River Steelhead

Under Alternative 1, the commercial harvest of Snake River B-Index steelhead (8,946 fish) would be the same as under the status quo condition, with tribal fishers harvesting all of the fish Some steelhead are caught by non-tribal fishers as incidental take but cannot be sold. Ex-vessel values associated with the total harvest of Snake River B-Index steelhead ($122,799) also would be the same as under status quo conditions, with tribal fishers harvesting all of the fish and accounting for the total ex-vessel value Details of ex-vessel value and harvest number of fish by subregion, alternative, and type of fishery are provided in Appendix A, Table A-11.

Summary

Under Alternative 1, the total commercial harvest across all harvest indicator units would be the same as under the status quo conditions (294,466 fish), including the harvest of 237,785 fish in tribal fisheries and 56,681 fish in non-tribal fisheries. The total ex-vessel value of the commercial harvest would be $10,309,356, including $7,745,794 in tribal fisheries and $2,563,562 in non-tribal fisheries.

4.5.1.2. Recreational Fisheries

Under Alternative 1, recreational catch and effort targeting the five harvest indicator stocks (71,366 fish and 342,318 angler trips) would be the same as under the status quo condition. Trip-related expenditures associated with the total recreational effort targeting the five harvest indicator stocks ($45,465,572) also would be the same as under status quo conditions. The Lower Columbia River subregion accounts for about 72 percent of the recreational catch, about 70 percent of angler effort, and about 79 percent of trip-related expenditures. Details of recreational catch, estimated angler trips and trip-related angler expenditures by subregion and alternative are provided in Appendix A, Table A-12.

4.5.1.3. Contribution to Regional Economic Activity

Under Alternative 1, the contribution of commercial and recreational fisheries to regional economic activity would be identical to status quo conditions. Table A-13 in Appendix A presents the personal income and jobs by alternatives and subregion for commercial and recreational fisheries.

Commercial Fisheries: Harvest and primary processing of salmon caught in tribal and non-tribal commercial fisheries is estimated to generate $16.2 million in personal income and 419 Full-time Equivalent (FTE) jobs. More than two-thirds of this activity would occur in the Mid-Columbia River subregion.

Recreational Fisheries: Recreational fishing activities targeting salmon and steelhead generate an estimated $27.9 million in personal income and 672 jobs in the Columbia River region. More than two-thirds of the jobs and income would occur in the Lower Columbia River subregion, with most of the remainder in the Mid-Columbia River subregion.

4.5.2. Alternative 2—Abundance-based Management Alternative

Under Alternative 2, the same level of commercial harvest and recreational catch and effort as under the status quo condition and Alternative 1.

4.5.2.1. Commercial Fisheries

Upriver Spring Chinook Salmon

Under Alternative 2, the commercial harvest of Upriver spring Chinook salmon (11,606 fish) would be the same as under the status quo condition and Alternative 1, with tribal fisheries accounting for about 65 percent (7,528 fish) of the harvest and non-tribal fisheries about 35 percent (4,078 fish) of the harvest . Ex-vessel values associated with the total harvest of Upriver spring Chinook salmon ($848,193) also would be the same as under status quo conditions, with tribal fisheries accounting for about 65 percent ($493,029) of total ex-vessel value and non-tribal fisheries for about 35 percent ($355,164) of the value. Details of ex-vessel value and harvest number of fish by subregion, alternative, and type of fishery are provided in Appendix A, Table A-7.

Upper Columbia Summer Chinook Salmon

Under Alternative 2, the commercial harvest of Upper Columbia summer Chinook salmon (24,791 fish) would be the same as under the status quo condition and Alternative 1, with tribal fisheries accounting for about 71 percent (17,569 fish) of the harvest and non-tribal fisheries about 29 percent (7,222 fish) of the

harvest. Ex-vessel values associated with the total harvest of Upper Columbia summer Chinook salmon ($854,787) also would be the same as under status quo conditions, with tribal fisheries accounting for about 66 percent ($565,958) of total ex-vessel value and non-tribal fisheries for about 34 percent ($288,829) of the value. Details of ex-vessel value and harvest number of fish by subregion, alternative, and type of fishery are provided in Appendix A, Table A-8.

Upriver Fall Chinook Salmon

Under Alternative 2, the commercial harvest of Upriver fall Chinook salmon (232,173 fish) would be the same as under the status quo condition and Alternative 1, with tribal fisheries accounting for about 81 percent (187,303 fish) of the harvest and non-tribal fisheries about 19 percent (44,870 fish) of the harvest. Ex-vessel values associated with the total harvest of Upriver fall Chinook salmon ($8,373,007) also would be the same as under status quo conditions, with tribal fisheries accounting for about 77 percent ($6,457,182) of total ex-vessel value and non-tribal fisheries for about 23 percent ($1,915,825) of the value. Details of ex-vessel value and harvest number of fish by subregion, alternative, and type of fishery are provided in Appendix A, Table A-9.

Upriver Sockeye Salmon

Under Alternative 2, the commercial harvest of Upriver sockeye salmon (23,683 fish) would increase by 6,631 fish relative to the status quo condition and Alternative 1, with tribal fisheries accounting for more than 98 percent (6,631 fish) of the harvest increase and non-tribal fisheries about 2 percent (99 fish) of the increase. Ex-vessel values associated with the harvest of Upriver sockeye salmon ($154,386) also would increase relative to status quo conditions, with tribal fisheries accounting for about 97 percent ($149,916) of total ex-vessel value and non-tribal fisheries for about 3 percent ($4,471) of the value. Details of ex-vessel value and harvest number of fish by subregion, alternative, and type of fishery are provided in Appendix A, Table A-10.

Snake River Steelhead

Under Alternative 2, the commercial harvest of Snake River B-Index steelhead (8,945 fish) would be the same as under the status quo condition, with tribal fishers harvesting all of the fish. Some steelhead are caught by non-tribal fishers as incidental take but these fish cannot be sold. Tribal fisheries Ex-vessel values associated with the total harvest of Snake River steelhead ($122,799) also would be the same as under status quo conditions, with tribal fishers harvesting all of the fish. Some steelhead are caught by non-tribal fishers as incidental take but these fish cannot be sold. Details of ex-vessel value and harvest

number of fish by subregion, alternative, and type of fishery are provided in Appendix A, Table A-11.

Summary

As compared to status quo conditions, the total commercial harvest across all harvest indicator units under Alternative 2 would be slightly higher (6,384 fish), with all of the harvest increase occurring in tribal fisheries. Sockeye salmon accounts for all of the increase, offset by a reduction of 245 fish of Upriver spring Chinook salmon stocks. The overall ex-vessel value also would increase (by $31,869), with the value of the reduced harvest of summer Chinook salmon stocks slightly offsetting the value of the increased tribal harvest of sockeye salmon.

4.5.2.2. Recreational Fisheries

Under Alternative 2, recreational catch and effort targeting the five harvest indicator stocks (71,366 fish and 342,318 angler trips) would be the same as under the status quo condition. Trip-related expenditures associated with the total recreational effort targeting the five harvest indicator stocks ($45,465,572) also would be the same as under status quo conditions. The Lower Columbia River subregion accounts for about 72 percent of the recreational catch, about 70 percent of angler effort, and about 79 percent of trip-related expenditures. Details of recreational catch, estimated angler trips and trip-related angler expenditures by subregion and alternative are provided in Appendix A, Table A-12.

4.5.2.3. Contribution to Regional Economic Activity

Under Alternative 2, the contribution of commercial and recreational fisheries to regional economic activity would be identical to status quo conditions. Table A-13 in Appendix A presents the personal income and jobs by alternatives and subregion for commercial and recreational fisheries.

Commercial Fisheries: Harvest and primary processing of salmon caught in tribal and non-tribal commercial fisheries is estimated to generate $16.2 million in personal income and 419 FTE jobs. More than two-thirds of this activity would occur in the Mid-Columbia River subregion.

Recreational Fisheries: Recreational fishing activities targeting salmon and steelhead generate an estimated $27.9 million in personal income and 672 jobs in the Columbia River region. More than two-thirds of the jobs and income would occur in the Lower Columbia River subregion, with most of the remainder in the Mid-Columbia River subregion.

4.5.3. Alternative 3 – Fixed Harvest Rate

Under Alternative 3, the total commercial harvest would decline by 13,864 salmon and steelhead relative

to the status quo condition. The only harvest indicator stock in which there would be an increase in fish harvested relative to status quo conditions would be Upriver sockeye salmon.

4.5.3.1. Commercial Fisheries

Upriver Spring Chinook Salmon

Under Alternative 3, the commercial harvest of Upriver spring Chinook salmon (10,677 fish) would decrease relative to status quo condition, with a decrease of 755 fish in the tribal harvest and a decrease of 174 fish of the non-tribal harvest. Ex-vessel values of Upriver spring Chinook salmon also would decrease relative to status quo condition, with a decrease of $49,478 in the tribal harvest of Upriver spring Chinook salmon and a decrease of $15,146 in the non-tribal harvest value. Details of ex-vessel value and harvest number of fish by subregion, alternative, and type of fishery are provided in Appendix A, Table A-7.

Upper Columbia Summer Chinook Salmon

Under Alternative 3, the commercial harvest of Upper Columbia summer Chinook salmon (19,846 fish) would decline relative to status quo condition, with a decrease of about 3,504 fish in the tribal harvest of Upper Columbia summer Chinook salmon and a decrease of 1,441 fish) in the non-tribal harvest. Ex-vessel values of Upper Columbia summer Chinook salmon also would decrease relative to status quo condition, with a decrease of $112,878 in the tribal harvest of Upper Columbia summer Chinook salmon and a decrease of $57,618 in the non-tribal harvest value. Details of ex-vessel value and harvest number of fish by subregion, alternative, and type of fishery are provided in Appendix A, Table A-8.

Upriver Fall Chinook Salmon

Under Alternative 3, the commercial harvest of Upriver fall Chinook salmon (224,731 fish) would decline relative to status quo condition, with a decrease of 3,100 fish in the tribal harvest of Upriver fall Chinook salmon and a decrease of 4,342 fish in the non-tribal harvest. Ex-vessel values of upriver fall Chinook salmon also would decrease relative to status quo condition, with a decrease of $106,855 in the tribal harvest of Upriver fall Chinook salmon and a decrease of $185,412 in the non-tribal harvest value. Details of ex-vessel value and harvest number of fish by subregion, alternative, and type of fishery are provided in Appendix A, Table A-9.

Upriver Sockeye Salmon

Under Alternative 3, the commercial harvest of Upriver sockeye salmon (17,043 fish) would increase

relative to status quo condition, with a small increase of 91 fish in the tribal harvest and no change in the non-tribal harvest. Ex-vessel values of Upriver sockeye salmon also would slightly increase relative to status quo condition, with an increase of $592 in the tribal harvest of Upriver sockeye salmon and no change in the ex-vessel value of the non-tribal harvest. Details of ex-vessel value and harvest number of fish by subregion, alternative, and type of fishery are provided in Appendix A, Table A-10.

Snake River Steelhead

Under Alternative 3, the commercial harvest of B-Index Snake River steelhead (8,306 fish) would decline relative to status quo condition, with a decrease of 639 fish in the tribal harvest of Snake River steelhead. Ex-vessel values of Snake River steelhead also would decrease relative to status quo condition, with a decrease of $8,769 in the tribal harvest value of Snake River B-Index steelhead. Details of ex-vessel value and harvest number of fish by subregion, alternative, and type of fishery are provided in Appendix A, Table A-11.

Summary

As compared to status quo conditions, the total commercial harvest across all harvest indicator units under Alternative 3 would be lower (by 13,864 fish), with about 57 percent (7,907 fish) of the harvest decrease occurring in tribal fisheries and 43 percent (5,957 fish) occurring in non-tribal fisheries. Most of the overall decrease in harvest would occur in the Upper Columbia summer and fall Chinook salmon fisheries. The overall ex-vessel value would decrease by $535,563.

4.5.3.2. Recreational Fisheries

Under Alternative 3, recreational catch and effort targeting the five harvest indicator stocks (65,132 fish and 312,986 angler trips) would represent a decline (6,234 fish and 29,332) angler trips relative to the status quo condition. Total trip-related expenditures associated with the recreational effort targeting the five harvest indicator stocks ($441,119,593) would decrease by $4,345,979 relative to status quo conditions. The Lower Columbia River subregion would account for about a 72 percent of decrease in recreational catch, about 70 percent of decrease in angler effort, and about 75 percent of the decrease in total trip-related expenditures. Details of recreational catch, estimated angler trips and trip-related angler expenditures by subregion and alternative are provided in Appendix A, Table A-12.

4.5.3.3. Contribution to Regional Economic Activity

Under Alternative 3, impacts are slightly more negative than under status quo conditions, Alternative 1 and Alternative 2. Overall economic impacts under Alternative 3 are the second lowest among the five alternatives, being more positive than only Alternative 5. Table A-13 in Appendix A presents the personal

income and jobs by alternatives and subregion for commercial and recreational fisheries.

Commercial Fisheries: Overall impacts from tribal and non-tribal commercial fisheries would be $841 thousand in personal income and 21 FTE jobs lower than under Existing Conditions and Alternative 1. The decrease in commercial fishing activity is split between the Lower Columbia (-$359,000 income and -8 jobs) and Mid-Columbia subregions (-$482,000 income and -13 jobs).

Recreational Fisheries: Under Alternative 3, impacts from recreational fishing would be $2.4 million income and 57 FTE jobs lower than under Existing conditions and Alternative 1. The reduction in recreational fishing impacts would mainly occur in the Lower Columbia (-$1.7 million income and -38 jobs) and Mid-Columbia subregions (-$700,000 income and -19 jobs). A decrease of $16,000 income and 1 FTE job is also projected for Lower Snake River subregion.

4.5.4. Alternative 4 – Escapement-based Management

Under Alternative 4, the commercial harvest of salmon and steelhead would increase relative to the status quo condition. The only harvest indicator stock that would be harvested less than under status quo conditions would be Upriver fall Chinook salmon.

4.5.4.1. Commercial Fisheries

Upriver Spring Chinook Salmon

Under Alternative 4, the commercial harvest of Upriver spring Chinook salmon (20,968 fish) would be much greater than under the status quo condition, with tribal fisheries accounting for about 81 percent (7,400 fish) of the harvest, and non-tribal fisheries about 19 percent (1,962 fish) of the harvest. Ex-vessel values associated with the total harvest of Upriver spring Chinook salmon ($1,503,704) also would increase relative to status quo conditions, with tribal fisheries accounting for about 65 percent ($977,652) of total ex-vessel value and non-tribal fisheries for about 35 percent ($526,052) of the value. Details of ex-vessel value and harvest number of fish by subregion, alternative, and type of fishery are provided in Appendix A, Table A-7.

Upper Columbia Summer Chinook Salmon

Under Alternative 4, the commercial harvest of Upper Columbia summer Chinook salmon (28,838 fish) would be much greater than under the status quo condition, with tribal fisheries accounting for about 71 percent (20,438 fish) of the harvest and non-tribal fisheries about 29 percent (8,401fish) of the harvest. Ex-vessel values associated with the total harvest of Upper Columbia summer Chinook salmon ($994,344) also would increase relative to status quo conditions, with tribal fisheries accounting for about

66 percent ($658,372) of total ex-vessel value and non-tribal fisheries for about 34 percent ($335,972) of the value. Details of ex-vessel value and harvest number of fish by subregion, alternative, and type of fishery are provided in Appendix A, Table A-8.

Upriver Fall Chinook Salmon

Under Alternative 4, the commercial harvest of Upriver fall Chinook salmon (219,756 fish) would be lower than under the status quo condition, with tribal fisheries accounting for about 67 percent (148,242 fish) and non-tribal fisheries about 33 percent (71,514 fish) of the total harvest. The number of fish harvested by non-tribal fishers represents an increase of 26,644 fish, whereas the number of fish caught by tribal fishers represents a decrease of 39,061 fish. Ex-vessel values associated with the total harvest of Upriver fall Chinook salmon ($8,164,049) also would be lower than under status quo conditions, with the value of tribal fisheries decreasing by $1,346,609) of the ex-vessel value of non-tribal fisheries increasing by 1,137,651. Details of ex-vessel value and harvest number of fish by subregion, alternative, and type of fishery are provided in Appendix A, Table A-9.

Upriver Sockeye Salmon

Under Alternative 4, the commercial harvest of Upriver sockeye salmon (79,942 fish) would be much greater than under the status quo condition, with tribal fisheries accounting for about 65 percent (65,772 fish) and non-tribal fisheries about 35 percent (14,170 fish) of the total harvest. Ex-vessel values associated with the total harvest of Upriver sockeye ($530,993) also would be much higher than under status quo conditions, with tribal fisheries accounting for about 65 percent ($320,553) and non-tribal fisheries for about 35 percent ($99,871) of the total value of Upriver sockeye salmon. Details of ex-vessel value and harvest number of fish by subregion, alternative, and type of fishery are provided in Appendix A, Table A-10.

Snake River Steelhead

Under Alternative 4, the commercial harvest of Snake River B-Index steelhead (11,018 fish) would increase relative to the status quo condition, with tribal fisheries accounting for all of the fish caught. Ex-vessel values associated with the total harvest of Snake River B-Index steelhead ($151,257) would represent an increase of about 23 percent relative to status quo conditions, with tribal fisheries accounting for all of the increase in ex-vessel value. Details of ex-vessel value and harvest number of fish by subregion, alternative, and type of fishery are provided in Appendix A, Table A-11.

Summary

As compared to status quo conditions, the total commercial harvest across all harvest indicator units under Alternative 4 would be substantially higher (by 66,055 fish), with 36 percent (22,612 fish) of the harvest increase occurring in tribal fisheries and 64 percent (43,388 fish) occurring in non-tribal fisheries. Sockeye salmon accounts most of the harvest increase, followed by harvest increases in Upriver spring Chinook salmon and summer Chinook salmon; decreases in the harvest of Upriver fall Chinook salmon would offset the increases in the harvest of other harvest indicator stocks. The total ex-vessel value of the commercial harvest would increase by $1,034,992.

4.5.4.2. Recreational Fisheries

Under Alternative 4, recreational catch and effort targeting the five harvest indicator stocks (183,211 fish and 895,961 angler trips) would increase substantially (by 111,845 fish and 553,643 angler trips) relative to the status quo condition. Total trip-related expenditures associated with the recreational effort targeting the five harvest indicator stocks ($111,821,173) would increase by $6,635,600 relative to status quo conditions. The Lower Columbia River subregion would account for more than 90 percent of the increase in recreational catch, angler effort, and total trip-related expenditures. Details of recreational catch, estimated angler trips and trip-related angler expenditures by subregion and alternative are provided in Appendix A, Table A-12.

4.5.4.3. Contribution to Regional Economic Activity

Under Alternative 4, overall economic impacts are the most positive among the five Alternatives. Table A-13 in Appendix A presents the personal income and jobs by alternatives and subregion for commercial and recreational fisheries.

Commercial Fisheries: Overall impacts from tribal and non-tribal commercial fisheries would be $1.6 million income and 34 FTE jobs greater than under Existing Conditions and Alternative 1. Increases would occur in the Lower Columbia subregion (+$2.3 million income and +51 jobs) and Lower Snake River subregion (+$186 thousand income and +6 jobs), while the Mid-Columbia subregion would see a decrease of $622 thousand income and 17 jobs.

Recreational Fisheries: Under Alternative 4, overall impacts from recreational fishing would be $45.2 million income and 1,042 FTE jobs greater than under Existing conditions and Alternative 1. More than 90 percent of the increase in recreational fishing impacts would occur in the Lower Columbia subregion (+$41.9 million income and +954 jobs). Increases would also occur in the Mid-Columbia (+$3.1 million income and +82 jobs) and Lower Snake River subregions (+186 thousand and +6 jobs).

4.5.5. Alternative 5 - Fishing curtailment

Under Alternative 5, commercial and recreational fisheries targeting the harvest indicator stocks and other Columbia River stocks would be terminated.

4.5.5.1. Commercial Fisheries

Upriver Spring Chinook Salmon

Under Alternative 5, no commercial harvest of Upriver spring Chinook salmon would occur, resulting in the elimination of 7,528 fish harvested in tribal fisheries and 4,078 fish in non-tribal fisheries. Ex-vessel values associated with the total harvest of Upriver spring Chinook salmon also would be lost, with the value to tribal fisheries being reduced by $493,029 and the value to non-tribal fisheries being reduced by $355,164. Details of ex-vessel value and harvest number of fish by subregion, alternative, and type of fishery are provided in Appendix A, Table A-7.

Upper Columbia Summer Chinook Salmon

Under Alternative 5, no commercial harvest of Upper Columbia summer Chinook salmon would occur, resulting in the elimination of 17,569 fish harvested in tribal fisheries and 44,870 fish in non-tribal fisheries. Ex-vessel values associated with the total harvest of Upper Columbia summer Chinook salmon also would be lost, with the value to tribal fisheries being reduced by $565,928 and the value to non-tribal fisheries being reduced by $288,829. Details of ex-vessel value and harvest number of fish by subregion, alternative, and type of fishery are provided in Appendix A, Table A-8.

Upriver Fall Chinook Salmon

Under Alternative 5, no commercial harvest of Upriver fall Chinook salmon would occur, resulting in the elimination of 187,303 fish harvested in tribal fisheries and 4,078 fish in non-tribal fisheries. Ex-vessel values associated with the total harvest of Upriver fall Chinook salmon would also be lost, with the value to tribal fisheries being reduced by $6,457,182 and the value to non-tribal fisheries being reduced by $1,915,825. Details of ex-vessel value and harvest number of fish by subregion, alternative, and type of fishery are provided in Appendix A, Table A-9.

Upriver Sockeye Salmon

Under Alternative 5, no commercial harvest of Upriver sockeye salmon would occur, resulting in the elimination of 16,440 fish harvested in tribal fisheries and 512 in non-tribal fisheries. Ex-vessel values associated with the total harvest of Upriver sockeye salmon would be lost, with the value to tribal

fisheries being reduced by $ $106,825 and the value to non-tribal fisheries being reduced by $3,744. Details of ex-vessel value and harvest number of fish by subregion, alternative, and type of fishery are provided in Appendix A, Table A-10.

Snake River Steelhead

Under Alternative 5, no commercial harvest of Snake River B-Index steelhead would occur, resulting in the elimination of 8,945 fish harvested in tribal fisheries (Table 4.5.1.1-5). Ex-vessel values associated with the total harvest of Snake River steelhead also would be lost, with the value to tribal fisheries being reduced by $122,799 . Details of ex-vessel value and harvest number of fish by subregion, alternative, and type of fishery are provided in Appendix A, Table A-11.

Summary

Under Alternative 5, there would be no commercial fisheries targeting the harvest indicator stocks and other stocks that are commercially harvested. The economic effects would be the total loss of commercial harvest and ex-vessel value under existing conditions as described in Subsection 3.5, Economics.

4.5.5.2. Recreational Fisheries

Under Alternative 5, all recreational catch and effort targeting the five harvest indicator stocks and other Columbia River stocks would be eliminated, resulting in a loss of 111,845 fish caught, 342,318 angler trips, and $45,465,572 in trip-related angler expenditures. Details of recreational catch, estimated angler trips and trip-related angler expenditures by subregion and alternative are provided in Appendix A, Table A-12.

4.5.5.3. Contribution to Regional Economic Activity

Under Alternative 5, overall economic impacts are the most negative among the five harvest policy alternatives. A complete loss of the commercial and recreational fishing income and employment estimated under status quo conditions would be expected to occur under this alternative. Table A-13 in Appendix A presents the personal income and jobs by alternatives and subregion for commercial and recreational fisheries.

Commercial Fisheries: Overall impacts from tribal and non-tribal commercial fisheries would be $16.2 million income and 419 FTE jobs lower than under status quo conditions and Alternative 1 and Alternative 2. Elimination of all commercial fishing activity directed at harvest indicator stocks in all subregions where it occurs under status quo conditions would be expected under this alternative.

Recreational Fisheries: Under Alternative 5, overall impacts from recreational fishing would be $27.9

million income and 672 FTE jobs lower than under Existing conditions and Alternative 1. Elimination of all recreational fishing activity targeting harvest indicator stocks in all subregions under status quo conditions would be expected.

4.5.6. Alternative 6—No-action—Uncoordinated Harvest

Under Alternative 6, overall impacts would be assumed to be those observed under Alternative 4 at the highest harvest level.

4.6. Cultural Resources—Ceremonial & Subsistence (C&S) Fisheries

As described in Subsection 3.6, C&S Harvest is based on need and is considered a priority in that it typically occurs before fish are taken for commercial purposes. An increase in the C&S needs at a particular time, or a decrease in runs that lead to a reduction in fish available for harvest, may further reduce the fish available for commercial tribal harvests.

Table 4-67 and Figure 4-8 present a summary of the estimated availability for C&S based on the harvest modeling results as explained in Subsection 4.1. The values in the table and chart that follows are used to compare the relative numerical and proportional differences among alternatives, and they should not be considered precise predictions of actual harvests in the future.

Table 4-67. C&S harvest of all salmon and steelhead species by minimum, maximum, and average run size abundances expected over the next 10 years.

	Minimum	% change from Alt 1	Maximum	% change from Alt 1	Average	% change from Alt 1
Alternative 1 Extension	8,718	100%	39,477	100%	23,742	100%
Alternative 2 Abundance	8,688	0%	43,185	9%	24,885	5%
Alternative 3 Fixed Harvest	11,109	27%	35,770	-9%	23,196	-2%
Alternative 4 / 6 Fixed Escapement / Uncoordinated	6,704	-23%	102,814	163%	37,563	58%
Alternative 5 Fishey Curtailment	0*	-100%	0*	-100%	0*	-100%

* This alternative may include some very limited treaty fishing opportunity to meet base ceremonial needs of the tribes. However, the amounts cannot be quantified and depend on the specific needs as discussed in Subsection 3.6.

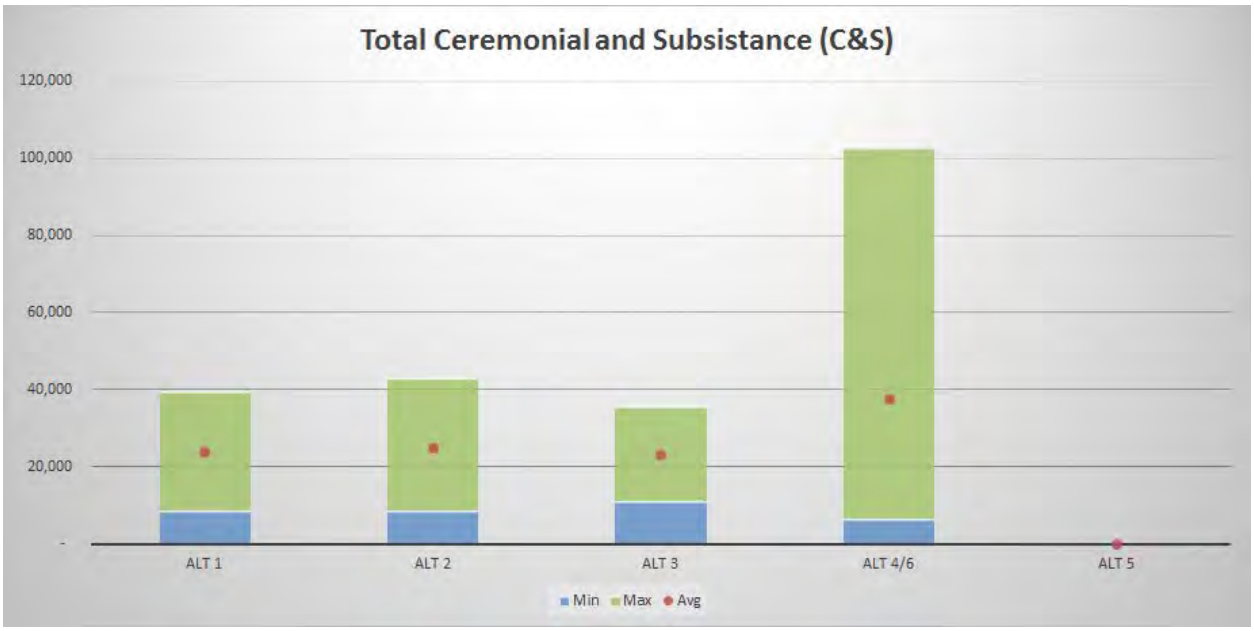

Figure 4-8. Total C&S harvest of all salmon and steelhead species by minimum, maximum, and average run size abundances expected over the next 10 years.

* See footnote to Table 4-77 above regarding ceremonial harvest.

Under Alternative 1, Extension, Alternative 2, Abundance, and Alternative 3, Fixed Harvest, tribes in the project area would be able to continue their C&S harvest without substantial changes to tribal cultural viability. The differences between the minimum and maximum harvest for each alternative is based on the modelled run sizes as described in Subsection 4.1. In years with low runs, any deficit in C&S harvest needs will likely be taken from the commercial harvest as the C&S harvest is the priority. This decision is made by the tribes as needed.

Under Alternative 4, Fixed Escapement, and Alternative 6, Uncoordinated Harvest, the modelled C&S harvest presents a wider range as compared to Alternative 1. The minimum C&S harvest, in years with low runs, may be as low as 6,704 fish, or 23 percent less than Alternative 1, while the maximum C&S harvest may be more than double (163 percent) that of Alternative 1 in years with high runs. C&S harvest levels under Alternative 4 or Alternative 6 may not be sufficient to meet C&S needs in years with low runs, thereby either directly negatively affecting the tribal cultural viability, or, more likely, reducing the available commercial harvest. The effects of Alternative 4 and Alternative 6 on cultural resources would therefore be medium negative.

Under Alternative 5, Voluntary Fishery Curtailment, there would be some very limited treaty fishing opportunity to meet base ceremonial needs of the tribes. However, C&S harvest would be largely curtailed. While salmon and steelhead could be purchased or obtained from other sources, the

fundamental role that salmon play in the lives of Indian tribes would be affected. This Alternative, therefore, results in a high negative effect on cultural resources.

Based on the analysis of the Mitchell Act EIS alternatives, the hatchery production included in the Agreement, would not be expected to alter the amount of fish available for Columbia River tribal C&S harvest.

4.7. Environmental Justice

Executive Order (E.O.) 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, states that "each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations." Further, the environmental justice analysis also determine whether such populations or communities have been sufficiently involved in the decision-making process.

Environmental justice is not an impact category standing alone. First, it must be determined if impacts in other impacts categories are adverse under any alternative, and, if so, whether such impacts may be felt disproportionately by environmental justice populations. Effects of the alternatives on fish, marine-derived nutrients, and wildlife would not impact environmental justice populations. However, the effects of alternatives on both Economics and Cultural Resources may impact environmental justice populations. These populations are the Indian tribes and those living in the 28 counties and 2 communities described in Subsection 3.7.

4.7.1. Cultural Resources - Ceremonial & Subsistence (C&S)

Alternative 1 (Extension), Alternative 2 (Abundance), and Alternative 3 (Fixed Harvest) do not have an adverse effect on cultural resources among Indian tribes (Section 4.6). However, Alternative 4 (Fixed Escapement), Alternative 5 (Fishing Curtailment), and Alternative 6 (Uncoordinated) result in a negative effect. Given the significance of salmon and steelhead to Indian tribes, and given that this significance is not paralleled among other populations that may be affected by the C&S harvest, these negative effects would be disproportionate. This disproportionate effect cannot be quantified as no metric can be attributed to the importance of this cultural resource to Indian tribes and because the importance of the C&S harvest among communities other than Indian tribes is essentially zero.

Environmental Justice Determination: Alternatives 4, 5 and 6 would result in a disproportionate adverse Cultural Resources effect on Indian tribes as it pertains to C&S fisheries.

4.7.2. Economics

Indian Tribes

Indian tribes are defined as an Environmental Justice population for this EIS in Section 3.5. The change in tribal and non-tribal commercial harvest by harvest indicator stock, presented in Subsection 4.5.1 to 4.5.6, was analyzed to determine whether any of the alternatives would result in a disproportionate adverse effect on the tribes. Table 4-68 presents these findings based on the number of fish. The corresponding economic values for the commercial harvest are proportional to the number of fish and can be found in Subsections 4.5.1.1, 4.5.2.1, 4.5.3.1, 4.5.4.1 and 4.5.5.1.

As shown in Table 4-68, Alternative 4 and Alternative 6 would result in a 198 percent increase in tribal commercial harvest for Upriver spring Chinook salmon compared to a corresponding non-tribal commercial increase of 48 percent. Similarly, Alternative 2 would result in a 40 percent increase in tribal commercial harvest for Upriver sockeye salmon, compared to no increase for the non-tribal commercial harvest. Both examples are positive disproportionate effects on an Environmental Justice population.

Table 4-68. Change in Tribal vs Non-Tribal Commercial Harvest by Harvest Indicator Stock and Alternative (Summarized from Appendix B).

Change from Existing Conditions		**Fish**	**%**	**Fish**	**%**	**Fish**	**%**	**Fish**	**%**	**Fish**	**%**
	Tribal / Non-tribal	**Alternative 1**		**Alternative 2**		**Alternative 3**		**Alternative 4 / 6**		**Alternative 5**	
Upper Spring Chinook	T	0	0	0	0	-755	-10	14,928	198	-7,528	-100
	NT	0	0	0	0	-174	-4	1,962	48	-4,078	-100
Upper Columbia Summer Chinook	T	0	0	-245	-1	-3,504	-20	2,869	16	-17,569	-100
	NT	0	0	0	0	-1,441	-20	1,179	16	-7,222	-100
Upriver Fall Chinook	T	0	0	0	0	-3,100	-2	-39,061	-21	-187,303	-100
	NT	0	0	0	0	-4,342	-10	26,644	59	-44,870	-100
Upriver Sockeye	T	0	0	6,631	40	91	0.5	49,332	300	-16,440	-100
	NT	0	0	0	0	0	0	13,658	2,667	-512	-100
Snake River B-Index Steelhead	T	0	0	0	0	-639	-7	2,073	23	-8,945	-100
	NT	0	0	0	0	0	0	0	0	0	0

Alternative 4 and Alternative 6 would result in a larger non-tribal commercial increase for Upriver sockeye salmon when compared to the tribal increase. However, given that the fact that the corresponding tribal harvest numbers are significantly higher under existing conditions and under Alternative 1, the change in non-tribal harvest would not be a disproportionate adverse effect. For example, non-tribal commercial harvest for Upriver Sockeye would increase by 300 percent from 16,440 to 49,332 under Alternatives 4 or 6. The corresponding non-tribal harvest would increase by 2,667 percent from 512 to 13,658 fish.

Tribal commercial harvest (and associated revenue) of Upriver fall Chinook salmon would decrease by 21 percent under Alternative 4 and Alternative 6, while the non-tribal commercial harvest would increase disproportionately by 59 percent.

Alternative 5 does not represents a disproportionate economic effect on Indian tribes because tribes and non-tribes are equally affected.

Environmental Justice Determination: Alternatives 4 and 6 result in a disproportionate adverse economic effect on Indian tribes as it pertains to Upriver fall Chinook salmon**.** However, given that Upriver fall Chinook salmon represents the largest percentage (64 percent) of all harvest indicator stocks under Alternatives 4 and 6, this EIS analysis concludes that the disproportionate effect of Upriver fall Chinook salmon represents that of Alternative 4 and Alternative 6 as a whole.

Counties

The economic impacts of the Proposed Action are presented by subregion within the study area as described in Subsection 4.5. It is not possible to determine the specific economic impact on each county for the following reasons:

1) The economic model applies the overall harvest management framework to each subregion in order to determine the harvest opportunities. Further dividing the subregion forecast to each county would result in a proportional distribution among the counties in that region.
2) Fish captured in one geographic area may be landed in a different geographic area.

Therefore, while the study area does include Environmental Justice counties as presented in Subsection 3.7, the analysis cannot determine whether the economic effects of any alternative result in a disproportionate effect on any of these Environmental Justice counties.

4.7.3. Public Participation

CEQ's EJ Guidance require that agencies develop appropriate public participation strategies and assure

meaningful community representation in the process. In addition, "Agencies should seek tribal representation in the process in a manner that is consistent with the government-to-government relationship between the United States and tribal governments, the Federal government's trust responsibility to federally-recognized tribes, and any treaty rights." (CEQ, 1997).

Throughout the EIS process, NMFS has attempted to ensure that the requirements of E.O. 12898 regarding environmental justice are implemented, including the conduct of appropriate tribal consultation activities. As part of the public scoping process for this EIS, NMFS directly notified tribal entities on the Proposed Action. NMFS sent a letter to Columbia River, Puget Sound/Strait of Juan de Fuca, and Washington's coastal tribes asking them to participate in an EIS scoping meeting. Additionally, on May 31, 2016 NMFS sent a joint letter, with USFWS, to invite the U.S. Bureau of Indian Affairs (BIA) to participate as a cooperating agency on the EIS. As a result the BIA, as a party to *US v Oregon* as described in Subsection 1.1, is a cooperating agency for this EIS. NMFS also solicited advice and information from *US v Oregon* parties by incorporating the help of current *US v Oregon* TAC chair, Columbia River Inter-Tribal Fish Commission employee Stuart Ellis, in developing the model outputs used in this EIS.

Notices were published in the Federal Register and picked up by regional electronic newsletters. Emails were also sent to individuals who NMFS was previously aware that are interested in salmon fishery issues (e.g., non-tribal commercial, recreational, or tribal fishers, conservation organizations, and federal, state, and local governments). All groups notified during scoping are included on the EIS distribution list and received direct information about commenting on the draft EIS. In this way, a diverse population, located over a broad geographic area, was identified and reached during the scoping process, was also notified during the review period for the draft EIS, and will be notified when the final EIS is published.

5. CUMULATIVE IMPACTS

5.1. Introduction

Section 4, Environmental Consequences, presents the incremental impacts of harvest policy alternatives for a proposed new *US v Oregon* agreement. The direct and indirect effects of each alternative on each resource's status quo conditions are presented in Section 3, Affected Environment, incorporating the past effects of harvest, hatcheries, hydropower, and habitat in the Project Area.

Section 5, Cumulative Effects, now further considers the cumulative effects of each alternative in the context of past actions, present action, and reasonably foreseeable future actions and conditions.

The cumulative effects analysis is important for review of this Proposed Action because it informs future fishery management affected by a new *US v Oregon* agreement. Provided below are known future actions reasonably likely to occur within the analysis area. Expected future actions include proposed developments, and planned habitat restoration activities. Climate change is an effect of past, present and future actions that may have a cumulative effect on resources in the analysis area.

Subsection 5.2, Future Foreseeable Actions, summarizes the anticipated effects from foreseeable future actions that may influence the Columbia and Snake Rivers, including Climate Change. Subsection 5.3, Effects From Future Actions, discusses all expected future actions within the action area including effects from Climate Change, and focuses on the effects of each alternative in the context of future climate change when combined with future actions.

Figure 5-1 shows the cumulative effects on salmonids through their complex and far-reaching life cycle. They are subject to multiple, diverse, and far-reaching effects in both freshwater and open ocean environments. It is important to keep in mind that the Columbia River harvests take place near the end of each salmonid species' life cycle. Some of the fish foregone in one fishery will be lost to other fisheries or dam mortality, while the remainder will contribute to escapement.

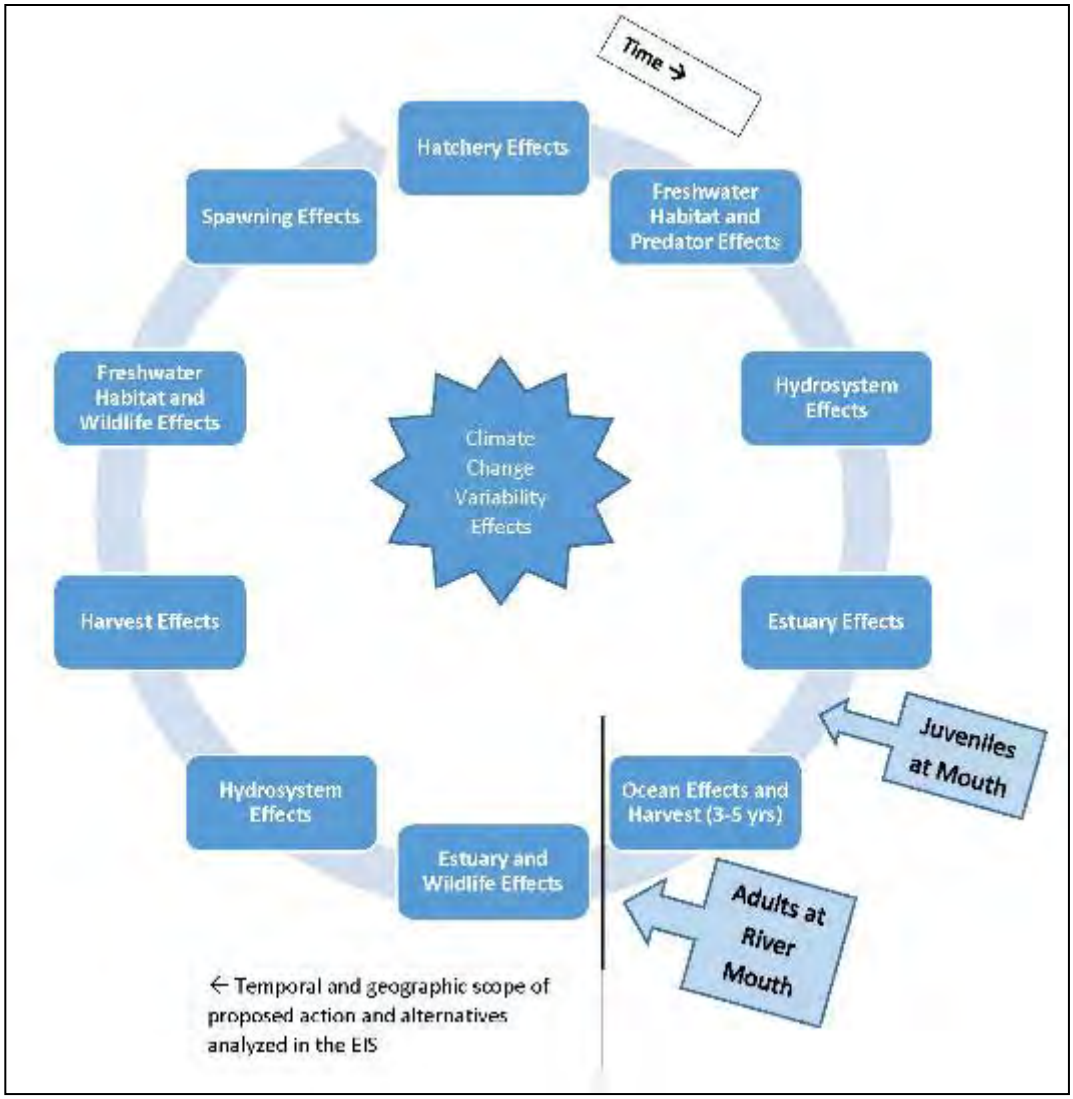

Figure 5-1. Life cycle cumulative effects diagram.

The cumulative impacts analysis area is the same as the project and analysis areas described in Subsection 1.3., consisting of the Columbia River and Snake River mainstem areas as show in in Figure 1-1. The project area does not include the ocean; the analysis of harvest policies rely on river mouth run sizes (Sections 3 and 4). Therefore, actions in the ocean (e.g., ocean fisheries) are not included in the scope of the cumulative effects analysis as they occur outside of the geographic analysis area and occur before the fisheries that are the subject of this EIS.

However, recall that we have used a “low”, “average”, and “high” tiered modeling approach for expected run sizes returning to the Columbia River. By doing so, we account for ocean actions that may modify the juvenile salmon and steelhead marine survival. This allows us to account for ocean actions that while outside the project area, might change how many adult fish return the Columbia River, as indicated by the

'Ocean Effects and Harvest (3-5 yrs)' box in Figure 5-1.

The existing conditions, as described in the resource subsections in Section 3, include influences from historical and current conditions. Human uses and development have had substantial influences on the area. Human presence in the project area dates back more than 10,000 years when the Columbia River was the dominant contributor of food, water, and transportation for humans. Presently, the primary influencing factors on the Columbia and Snake Rivers are the dams that provide electrical power, flood control, and navigational opportunities, as well as supporting agricultural needs, while simultaneously resulting in long-term environmental impacts on aquatic life.

Hydrosystem operations that affect adult salmon and steelhead are accounted in the interdam loss as described in Section 4.1. (see Text Box 4-1). Our understanding of the operation of the hydrosystem and its related cumulative effects as they pertain to resources in the basin are informed by documents evaluating these effects that have been previously completed for the Columbia Basin. These documents include:

- NMFS' Supplemental Comprehensive Analysis (SCA) (NMFS 2008d);
- NMFS's 2008 Biological Opinion on the Federal Columbia River Hydropower System (NMFS 2008a);
- NMFS' 2010 supplemental Biological Opinion and Adaptive Management Implementation Plan (AMIP)(NMFS 2009);
- NMFS' 2014 Biological Opinion on the Federal Columbia River Hydropower System (NMFS 2014a).

Negative effects of hydropower infrastructure and operations are inevitable. The nature and magnitude of the effects vary, depending on the hydropower system operation, management, and specific location of the hydropower infrastructure. In the project area, some of these effects from hydropower systems on salmon and steelhead that have been factored into this cumulative effects analysis include, but are not limited to:

- Juvenile and adult passage mortality at the eight run-of-river mainstem dams on the mainstem Snake and Columbia Rivers (safe passage in the migration corridor);
- Water quantity (i.e., flow) and seasonal timing (water quantity and velocity and safe passage in the migration corridor; cover/shelter, food/prey, riparian vegetation, and space associated with the connectivity of the estuarine floodplain);
- Temperature in the reaches below the large mainstem storage projects (water quality and safe

passage in the migration corridor) and in the mainstem migration corridors;

- Sediment transport and turbidity (water quality and safe passage in the migration corridor);
- Total dissolved gas (water quality and safe passage in the migration corridor);
- Food webs, including both predators and prey (food/prey and safe passage in the migration corridor).

We account for these effects, both upstream and downstream, in our cumulative analysis as depicted by the two 'Hydrosystem Effects' boxes in Figure 5-1. The interdam loss metric we used is primarily an adult effect (represented by the box 'Hydrosystem Effects' following the 'Estuary and Wildlife Effects' box in Figure 5-1), but downstream effects end up primarily affecting juveniles (represented by the box 'Hydrosystem Effects' following the 'Freshwater Habitat and Predator Effects' box). Here our "low", "average", and "high" tiered modeling approach also accounts for hydro operations that may modify the juvenile salmon and steelhead total outmigration downwards or upwards. This would alter the number of fish entering the ocean and therefore change the number of adults that might return.

Associated development and human uses have also impacted the Columbia River ecosystem. These factors include port improvements, dredging, fishing, urban pollution, and channelization. We are informed by these types of impacts represented by the any box in Figure 5-1 containing the words 'Habitat' or 'Estuary' through recovery planning documents such as:

- Columbia River Estuary ESA Recovery Plan Module for Salmon and Steelhead (NMFS 2011);
- Recovery Plan for Lower Columbia Chinook Salmon, Lower Columbia Coho, Columbia River Chum and Lower Columbia Steelhead (NMFS 2013a);
- Upper Columbia Spring-run Chinook and Upper Columbia Steelhead Recovery Plan (UCSRB 2007);
- Snake River Sockeye Salmon Recovery Plan (NMFS 2015a);
- Draft Snake River fall Chinook Salmon Recovery Plan (NMFS 2015b);
- Draft Snake River Spring/Summer Chinook Salmon and Steelhead Recovery Plan (NMFS 2016).

With the exception of Snake and upper Columbia fall-run Chinook salmon, which generally spawn and rear in the mainstem, salmon and steelhead spawning and rearing habitat is found in tributaries to the Columbia and Snake Rivers. The quality and quantity of habitat in many Columbia River Basin watersheds has declined dramatically in the last 150 years. Forestry, farming, grazing, road construction, hydro system development, mining, and urbanization have changed the historical habitat conditions. Currently, spawning and rearing is limited now to thirty-two subbasins in the project area (NMFS 2017a).

Water quality in many Columbia River Basin streams is degraded to varying degrees by these same human activities, such as construction and operation of dams and diversion structures, water withdrawals, farming and grazing, road construction, timber harvest activities, mining activities, and urbanization.

Many tributaries are significantly depleted by water diversions. In 1993, state, Tribal, and conservation group experts estimated that 80% of 153 Columbia tributaries had low flow problems, of which two-thirds were caused, at least in part, by irrigation withdrawals (OWRD 1993). The NWCouncil showed similar problems in many Idaho, Oregon, and Washington tributaries (NWCouncil 1992). Diminished tributary stream flows have been identified a major limiting factors for most species in the Columbia River Basin upstream of Bonneville Dam (NMFS 2007). In many watersheds, access to historical habitat areas is also lost to land development, primarily due to road culverts that are not designed or installed to permit fish passage. These impacts are captured in any box with the word 'Habitat' along with impacts in the 'Spawning Effects' box in Figure 5-1.

The 'Hatchery Effects' box in Figure 5-1 is accounted through integrating the analysis from the Mitchell Act EIS (NMFS 2014b) and is part of the proposed action. In Appendix B we review all impacts associated with hatchery effects, and those include: impacts to population viability, impacts on abundance and productivity, impacts on genetic diversity when hatchery fish spawn with wild fish or wild fish are included in hatchery broodstocks, impacts on spatial structure, ecological impacts, and hatchery facility impacts. These impacts are integrated into the analysis of effects presented in Section 4 and the cumulative effects presented in Section 5.3. We are informed about these impacts from not just the Mitchell Act EIS, and associated Biological Opinion (NMFS 2017a), but also from the following NEPA work performed in the Columbia River:

- Environmental Assessment (EA) to Analyze Impacts of a NOAA's National Marine Fisheries Service Issuance of two Permits for the Hatchery Genetic Management Plans Submitted by the Washington Department of Fish and Wildlife, the Idaho Department of Fish and Game, the Oregon Department of Fish and Wildlife, and the Nez Perce Tribe Under Section 10 of the Endangered Species Act. (NMFS 2012a);
- Final Environmental Assessment: Determination that the Hatchery and Genetic Management Plans for Sandy River Programs Submitted by the Oregon Department of Fish and Wildlife Satisfy the Endangered Species Act Section 4 (d) Rule under Limit 5 (NMFS 2012b);
- NMFS final environmental impact statement (EIS) on anadromous fish agreements and habitat conservation plans for Chelan PUD's Rocky Reach and Rock Island Dams (NMFS 2012c);
- NMFS utilized the Bonneville Power Administration Springfield Sockeye Hatchery Project EA

and Finding of No Significant Impact Recovery Plan for Lower Columbia Chinook Salmon, Lower Columbia Coho, Columbia River Chum and Lower Columbia Steelhead (BPA 2012d);

- Final Environmental Assessment to Analyze Impacts of NOAA's National Marine Fisheries Service Determination that the Confederated Tribes of the Colville Reservation Tribal Resource Management Plan Meets the Endangered Species Act Tribal§ 4(d) Rule (NMFS 2013b);
- Final Environmental Assessment for Issuance of Endangered Species Act Section 10(a)(1)(A) Permits for Spring Chinook Salmon Hatchery Programs in the Methow Basin (NMFS 2017b);
- Final Environmental Assessment to Analyze Impacts of NOAA's National Marine Fisheries Service Determination that the Confederated Tribes of the Colville Reservation Tribal Resource Management Plan Meets the Endangered Species Act Tribal§ 4(d) Rule (NMFS 2017c).

The temporal scope of the cumulative effects analysis is 10 years, coinciding with the duration of the proposed *US v Oregon* management agreement.

Despite these extensive uses, however, the basin is considered a diverse, highly productive ecosystem that will continue to provide both important biological functions and economic services. As depicted in Figure 5-1 human uses and associated development can and will act as stressors to the existing ecosystem at different locations, and these are expected to continue under future actions as described below.

5.2. Future Foreseeable Actions

Future effects of climate change are discussed, as are the effects of development and proposed or ongoing projects, and habitat restoration and protection of salmon and steelhead efforts. Each of the above topics is described in terms of effects on the project area and proposed alternatives.

5.2.1. Climate Change

One factor affecting all species managed under a new *US v Oregon* agreement, and aquatic habitat at large is climate change. The U.S. Global Change Research Program (USGCRP)[4], mandated by Congress in the Global Change Research Act of 1990, reports average warming of about 1.3ºF from 1895 to 2011 and projects an increase in average annual temperature of 3.3ºF to 9.7ºF by 2070 to 2099 (CCSP, 2014). Climate change has negative implications for habitats in the Pacific Northwest (Climate Impacts Group 2004; Scheuerell and Williams 2005; Zabel et al. 2006; ISAB 2007). According to the Independent Scientific Advisory Board (ISAB)[5], these effects pose the following impacts into the future:

[4] http://www.globalchange.gov

[5] The Independent Scientific Advisory Board (ISAB) serves the National Marine Fisheries Service (NOAA

- Warmer air temperatures will result in diminished snowpack and a shift to more winter/spring rain and runoff, rather than snow that is stored until the spring/summer melt season.
- With a smaller snowpack, these watersheds will see their runoff diminished earlier in the season, resulting in lower stream-flows in the June through September period. River flows in general and peak river flows are likely to increase during the winter due to more precipitation falling as rain rather than snow.
- Water temperatures are expected to rise, especially during the summer months when lower stream-flows co-occur with warmer air temperatures.

These changes will not be spatially homogeneous across the entire Pacific Northwest. Low-lying areas are likely to be more affected. Climate change may have long-term effects that include, but are not limited to, depletion of important cold water habitat, variation in quality and quantity of tributary rearing habitat, alterations to migration patterns, accelerated embryo development, premature emergence of fry, and increased competition among species (ISAB 2007). This is likely to occur to some degree over the next ten years, but at a similar rate as the last ten years.

Climate Change and Pacific Northwest Salmon

Climate change is predicted to cause a variety of impacts to Pacific salmon and their ecosystems (Mote et al. (2003); Crozier et al. (2008a); Martins et al. (2012); Wainwright and Weitkamp (2013)). The complex life cycles of anadromous fishes including salmon rely on productive freshwater, estuarine, and marine habitats for growth and survival, making them particularly vulnerable to environmental variation (Morrison et al. 2016). Ultimately, the effect of climate change on salmon and steelhead across the Pacific Northwest will be determined by the specific nature, level, and rate of change and the synergy between interconnected terrestrial/freshwater, estuarine, nearshore and ocean environments.

The primary effects of climate change on Pacific Northwest salmon and steelhead are:

- direct effects of increased water temperatures of fish physiology
- temperature-induced changes to stream flow patterns
- alterations to freshwater, estuarine, and marine food webs
- changes in estuarine and ocean productivity

While all habitats used by Pacific salmon will be affected, the impacts and certainty of the change vary by

Fisheries), Columbia River Indian Tribes, and Northwest Power and Conservation Council by providing independent scientific advice and recommendations regarding scientific issues that relate to the respective agencies' fish and wildlife programs. https://www.nwcouncil.org/fw/isab/

habitat type. Some effects (e.g., increasing temperature) affect salmon at all life stages in all habitats, while others are habitat specific, such as stream flow variation in freshwater, sea level rise in estuaries, and upwelling in the ocean. How climate change will affect each stock or population of salmon also varies widely depending on the level or extent of change and the rate of change and the unique life history characteristics of different natural populations (Crozier et al. 2008b). For example, a few weeks difference in migration timing can have large differences in the thermal regime experienced by migrating fish (Martins et al. 2011). This is illustrated by events in 2015 when over 475,000 Upriver Sockeye entered the Columbia River, but only two percent of sockeye counted at Bonneville Dam survived to their spawning grounds. Most died in river beginning in June when the water warmed to above 68 degrees, the temperature at which salmon begin to die. In July, temperatures reached 73 degrees due to elevated temperatures associated with lower snow pack from the previous winter and drought conditions exacerbate due to increased occurrences of warm weather patterns.

These impacts are likely to occur to some degree over the next ten years, but at a similar rate as the last ten years.

Temperature Effects

Like most fishes, salmon are poikilotherms (cold-blooded animals), therefore increasing temperatures in all habitats can have pronounced effects on their physiology, growth, and development rates (see review by Whitney et al. (2016)). Increases in water temperatures beyond their thermal optima will likely be detrimental through a variety of processes including: increased metabolic rates (and therefore food demand), decreased disease resistance, increased physiological stress, and reduced reproductive success. All of these processes are likely to reduce survival (Beechie et al. 2013; Wainwright and Weitkamp 2013; Whitney et al. 2016). As examples of this, high mortality rates for adult sockeye salmon in the Columbia River have recently been attributed to higher water temperatures and likewise in the Fraser River, as increasing temperatures during adult upstream migration are expected to result in increased mortality of sockeye salmon adults by 9 to 16 percent by century's end (Martins et al. 2011). Juvenile parr-to-smolt survival of Snake River Chinook salmon are predicted to decrease by 31 to 47 percent due to increased summer temperatures (Crozier et al. 2008b).

By contrast, increased temperatures at ranges well below thermal optima (i.e., when the water is cold) can increase growth and development rates. Examples of this include accelerated emergence timing during egg incubation stages, or increased growth rates during fry stages (Crozier et al. 2008a; Martins et al. 2012). Temperature is also an important behavioral cue for migration (Sykes et al. 2009), and elevated temperatures may result in earlier-than-normal migration timing. While there are situations or stocks

where this acceleration in processes or behaviors is beneficial, there are also others where it is detrimental (Martins et al. 2012; Whitney et al. 2016).

These impacts are likely to occur to some degree over the next ten years, but at a similar rate as the last ten years.

Freshwater Effects

As described previously, climate change is predicted to increase the intensity of storms, reduce winter snow pack at low and middle elevations, and increase snowpack at high elevations in northern areas. Middle and lower elevation streams will have larger fall/winter flood events and lower late summer flows, while higher elevations may have higher minimum flows. How these changes will affect freshwater ecosystems largely depends on their specific characteristics and location, which vary at fine spatial scales (Crozier et al. 2008b; Martins et al. 2012). For example, within a relatively small geographic area (Salmon River Basin, Idaho), survival of some Chinook salmon populations was shown to be determined largely by temperature, while others were determined by flow (Crozier and Zabel 2006). Certain salmon populations inhabiting regions that are already near or exceeding thermal maxima will be most affected by further increases in temperature and perhaps the rate of the increases while the effects of altered flow are less clear and likely to be basin-specific (Crozier et al. 2008b; Beechie et al. 2013). However, river flow is already becoming more variable in many rivers, and is believed to negatively affect anadromous fish survival more than other environmental parameters (Ward et al. 2015). It is likely this increasingly variable flow is detrimental to multiple salmon and steelhead populations, and likely multiple other freshwater fish species in the Columbia River Basin as well.

Stream ecosystems will likely change in response to climate change in ways that are difficult to predict (Lynch et al. 2016). Changes in stream temperature and flow regimes will likely lead to shifts in the distributions of native species and provide "invasion opportunities" for exotic species. This will result in novel species interactions including predator-prey dynamics, where juvenile native species may be either predators or prey (Lynch et al. 2016; Rehage and Blanchard 2016). How juvenile native species will fare as part of "hybrid food webs," which are constructed from natives, native invaders, and exotic species, is difficult to predict (Naiman et al. 2012).

Estuarine Effects

In estuarine environments, the two big concerns associated with climate change are rates of sea level rise and temperature warming (Wainwright and Weitkamp 2013; Limburg et al. 2016). Estuaries will be affected directly by sea-level rise: as sea level rises, terrestrial habitats will be flooded and tidal wetlands

will be submerged (Kirwan et al. 2010; Wainwright and Weitkamp 2013; Limburg et al. 2016). The net effect on wetland habitats depends on whether rates of sea-level rise are sufficiently slow that the rates of marsh plant growth and sedimentation can compensate (Kirwan et al. 2010).

Due to subsidence, sea level rise will affect some areas more than others, with the largest effects expected for the lowlands, like southern Vancouver Island and central Washington coastal areas (Verdonck 2006; Lemmen et al. 2016). The widespread presence of dikes in Pacific Northwest estuaries will restrict upward estuary expansion as sea levels rise, likely resulting in a near-term loss of wetland habitats for salmon (Wainwright and Weitkamp 2013). Sea level rise will also result in greater intrusion of marine water into estuaries, resulting in an overall increase in salinity, which will also contribute to changes in estuarine floral and faunal communities (Kennedy 1990). While not all anadromous fish species are generally highly reliant on estuaries for rearing, extended estuarine use may be important in some populations (Jones et al. 2014), especially if stream habitats are degraded and become less productive.

These impacts are likely to occur to some degree over the next ten years, but at a similar rate as the last ten years.

Marine Impacts

In marine waters, increasing temperatures are associated with observed and predicted poleward range expansions of fish and invertebrates in both the Atlantic and Pacific oceans (Lucey and Nye 2010; Asch 2015; Cheung et al. 2015). Rapid poleward species shifts in distribution in response to anomalously warm ocean temperatures have been well documented in recent years, confirming this expectation at short time scales. Range extensions were documented in many species from southern California to Alaska during unusually warm water associated with "The Blob" in 2014 and 2015 (Bond et al. 2015; Di Lorenzo and Mantua 2016), and past strong El Niño events (Pearcy 2002; Fisher et al. 2015).

Exotic species benefit from these extreme conditions to increase their distributions. Green crab (*Carcinus maenas*) recruitment increased in Washington and Oregon waters during winters with warm surface waters, including 2014 (Yamada et al. 2015). Similarly, Humboldt squid (*Dosidicus gigas*) dramatically expanded their range during warm years of 2004-2009 (Litz et al. 2011). The frequency of extreme conditions, such as those associated with El Niño events or "blobs" are predicted to increase in the future (Di Lorenzo and Mantua 2016). This is likely to occur to some degree over the next ten years, but at a similar rate as the last ten years.

As with changes to stream ecosystems, expected changes to marine ecosystems due to increased temperature, altered productivity, or acidification, will have large ecological implications through

mismatches of co-evolved species and unpredictable trophic effects (Cheung et al. 2015; Rehage and Blanchard 2016). These effects will certainly occur, but predicting the composition or outcomes of future trophic interactions is not possible with the tools available at this time.

Pacific Northwest anadromous fish inhabit as many as three marine ecosystems during their ocean residence period: the Salish Sea, the California Current, and the Gulf of Alaska (Brodeur et al. 1992; Weitkamp and Neely 2002; Morris et al. 2007). The response of these ecosystems to climate change is expected to differ, although there is considerable uncertainty in all predictions. It is also unclear whether overall marine survival of anadromous fish in a given year depends on conditions experienced in one versus multiple marine ecosystems. Several are important to Columbia River Basin species, including the California Current and Gulf of Alaska.

Wind-driven upwelling is responsible for the extremely high productivity in the California Current ecosystem (Bograd et al. 2009; Peterson et al. 2014). Minor changes to the timing, intensity, or duration of upwelling, or the depth of water column stratification, can have dramatic effects on the productivity of the ecosystem (Black et al. 2014; Peterson et al. 2014). Current projections for changes to upwelling are mixed: some climate models show upwelling unchanged, but others predict that upwelling will be delayed in spring, and more intense during summer (Rykaczewski et al. 2015). Should the timing and intensity of upwelling change in the future, it may result in a mismatch between the onset of spring ecosystem productivity and the timing of salmon entering the ocean, and a shift towards food webs with a strong sub-tropical component (Bakun et al. 2015).

Columbia River anadromous fish also use coastal areas of British Columbia and Alaska, and mid-ocean marine habitats in the Gulf of Alaska, although their fine-scale distribution and marine ecology during this period are poorly understood (Morris et al. 2007; Pearcy and McKinnell 2007). Increases in temperature in Alaskan marine waters have generally been associated with increases in productivity and salmon survival (Mantua et al. 1997; Martins et al. 2012), thought to result from temperatures that have been below thermal optima (Gargett 1997). Warm ocean temperatures in the Gulf of Alaska are also associated with intensified downwelling and increased coastal stratification, which may result in increased food availability to juvenile salmon along the coast (Hollowed et al. 2009; Martins et al. 2012). Predicted increases in freshwater discharge in British Columbia and Alaska may influence coastal current patterns (Foreman et al. 2014), but the effects on coastal ecosystems are poorly understood.

In addition to becoming warmer, the world's oceans are becoming more acidic as increased atmospheric CO2 is absorbed by water. The North Pacific is already acidic compared to other oceans, making it particularly susceptible to further increases in acidification (Lemmen et al. 2016). Laboratory and field

studies of ocean acidification show it has the greatest effects on invertebrates with calcium-carbonate shells and relatively little direct influence on finfish (see reviews by Haigh et al. (2015); Mathis et al. (2015). Consequently, the largest impact of ocean acidification on salmon will likely be its influence on marine food webs, especially its effects on lower trophic levels, which are largely composed of invertebrates (Haigh et al. 2015; Mathis et al. 2015).

Uncertainty in Climate Predictions

There is considerable uncertainty in the predicted effects of climate change on the globe as a whole, and on Pacific Northwest in particular and there is also the question of indirect effects of climate change and whether human "climate refugees" will move into the range of salmon and steelhead, increasing stresses on their respective habitats (Dalton et al. 2013; Poesch et al. 2016).

Many of the effects of climate change (e.g., increased temperature, altered flow, coastal productivity, etc.) will have direct impacts on the food webs that species examined in this analysis rely on in freshwater, estuarine, and marine habitats to grow and survive. Such ecological effects are extremely difficult to predict even in fairly simple systems, and minor differences in life history characteristics among stocks of salmon may lead to large differences in their response (e.g., Crozier et al. (2008b); Martins et al. (2011); Martins et al. (2012). This means it is likely that there will be "winners and losers" meaning some salmon populations may enjoy different degrees or levels of benefit from climate change while others will suffer varying levels of harm.

Pacific anadromous fish are adapted to natural cycles of variation in freshwater and marine environments, and their resilience to future environmental conditions depends both on characteristics of each individual population and on the level and rate of change. They should be able to adapt to some changes, but others are beyond their adaptive capacity (Crozier et al. 2008a; Waples et al. 2009). With their complex life cycles, it is also unclear how conditions experienced in one life stage are carried over to subsequent life stages, including changes to the timing of migration between habitats. Systems already stressed due to human disturbance are less resilient to predicted changes than those that are less stressed, leading to additional uncertainty in predictions (Bottom et al. 2011; Naiman et al. 2012; Whitney et al. 2016).

Climate change is expected to impact Pacific Northwest anadromous fish during all stages of their complex life cycle. In addition to the direct effects of rising temperatures, indirect effects include alterations in stream flow patterns in freshwater and changes to food webs in freshwater, estuarine and marine habitats. There is high certainty that predicted physical and chemical changes will occur; however, the ability to predict bio-ecological changes to fish or food webs in response to these

physical/chemical changes is extremely limited, leading to considerable uncertainty.

Climate Change and Marine Mammals

The effects of climate change on marine species including the SRKW is not definitively known, however, it is likely that any changes in weather and ocean conditions affecting salmon populations would have consequences for fish-eating SRKW (NMFS 2008). Warming water and air temperature trends are ongoing and are expected to disrupt annual precipitation cycles, alter prevailing patterns of wind and ocean currents, and raise sea levels (Glick 2005; Snover et al. 2005). Together with increased acidification of ocean waters, these changes are expected to have substantial effects on marine productivity and food webs, including populations of salmon and other killer whale prey (NMFS 2008). Climate change could result in changes to migration patterns, alteration of ecological community composition and structure as species relocate from areas they currently use in response to changes in oceanic conditions, changes in species abundance, increased susceptibility to disease and contaminants, alterations to prey composition and availability, and altered reproductive timing (MacLeod et al. 2005; Robinson et al. 2005; McMahon and Hays 2006). Such changes could affect reproductive success and survival, and therefore would have consequences for the survival and recovery of SRKW (Robinson et al. 2005; Learmonth et al. 2006; Cotte´ and Guinet 2007). Naturally occurring climatic patterns, such as the Pacific Decadal Oscillation and El Niño and La Niña events, cause major changes to marine productivity and may also influence SRKW prey abundance (Mantua et al. 1997; Francis and Hengeveld 1998; Beamish et al. 1999; Hare et al. 1999; Benson and Trites 2002; Dalton et al. 2013). Prey species such as salmon are most likely to be affected through changes in food availability and oceanic survival (Benson and Trites 2002), with biological productivity increasing during cooler periods and decreasing during warmer periods (Hare et al. 1999; NMFS 2008). This is likely to occur to some degree over the next ten years, but at a similar rate as the last ten years.

In conclusion, the current literature supports previous concerns that natural climatic variability can amplify and exacerbate long-term climate change impacts. Recent estimates of rates of climate change are similar to those previously published. Anthropogenic climate change will likely to varying degrees affect all west coast fish species, especially when interacting factors are incorporated (e.g., existing threats to populations, water diversion, accelerated mobilization of contaminants, hypoxia, and invasive species). However, through historic selective processes native fish species have adapted their behavior and physiology to inhabit available habitat ranging from southern California up to the Alaskan western coastline. This process by which animals native to the Pacific Northwest are adapted to natural cycles of variation in freshwater and marine environments required a certain degree of plasticity, and may show

resilience to future environmental conditions that mimic this natural variation. While climate change effects will certainly result in changes, it is unlikely that specifics are possible to predict. Alternate life history types, such as those associated with extended lake or estuarine rearing, provide an important component of the species diversity with which to guard against an uncertain future. However, the life history types that will be successful in the future is neither static nor predictable, therefore maintaining or promoting existing diversity that is specifically found in the natural populations of Pacific anadromous fish is essential for continued existence of populations into the future (Schindler et al. 2010; Bottom et al. 2011).

5.2.2. Development Projects

Development that has occurred within the Columbia River Basin over the past decade has affected the abundance, distribution, and health of hatchery-origin and natural-origin salmon and steelhead, other fish, economics, wildlife populations, and water quantity and quality. Provided below is a bulleted list of these development trends taken from ISAB (2007a, b) and the Lower Columbia River Estuary Partnership (2005), followed by some of the larger planned projects within the Columbia River Basin. These trends cannot be quantified in full detail because some of the development projects are in the early stages of permitting and planning, while others are closer to implementation decisions demonstrated by completion of records of decision (RODs) or draft EISs. However, this analysis assumes that all of the projects described in this chapter would be implemented during the 10-year period of the Proposed Action to provide a review of the highest-impact potential scenario.

Human populations are increasing primarily in urban metropolitan areas, with smaller increases in rural areas. Increases in demand for water, land, power, agriculture, roads, and housing are associated with this growth. Human Population Growth and Development along the Columbia River Basin Approximately 6 million people live in the Columbia River Basin, concentrated largely in urban parts of the lower Columbia River and the Willamette Valley. The population is presently expanding and is likely to continue to grow in the foreseeable future.

- Human population growth and development can be expressed as potential increases in discharges of pollutants in stormwater runoff from residential, commercial, industrial, agricultural, recreational, and transportation land uses. These are all sources of contaminants that currently degrade water quality and are likely to continue along similar historical trends while recognizing that any improvements through regional planning processes, which promote more open spaces and require stormwater treatment for new construction will likely be offset by the net level of growth.

- Freshwater withdrawals for domestic, industrial, commercial, and public uses are increasing, whereas withdrawals for irrigation purposes are decreasing due to the conversion of agricultural lands to residential areas.
- Forests are being converted for development, which is resulting in forest fragmentation.

Mining, trade and transportation projects influence the hydrology, water quality, and use of the Columbia River system. As a major river navigation route, the Columbia-Snake Inland Waterway provides shipping access from the Pacific Ocean to Lewiston, Idaho, 465 miles inland:

- Mining in the Columbia River Basin is focused on sand and gravel with the removal occurring along or within rivers.
- Globalization of trade has contributed to the loss of trade in some areas (e.g., the Mexico strawberry market) and to the increase in trade in other areas (e.g., increased Columbia River Basin wine production due to Australian droughts).
- An increase in ship traffic is likely to occur because of Columbia River channel-deepening projects.
- New port infrastructure projects continue to result in loss of aquatic habitat.
- Hazardous materials transport and airborne pollution have been increasing in the Columbia River Basin.

Hatcheries

- New, Non-*US v Oregon* management agreement hatchery production in the Columbia River Basin, including hatcheries developed as part of other mitigation efforts.
- Implementation of the preferred alternative described in the Mitchell Act EIS and continued funding for hatcheries under the Mitchell Act.

Hydropower Operations

The Federal Columbia River Power System (FCRPS) is a unique collaboration among three U.S. government agencies - the Bonneville Power Administration (BPA), the U.S. Army Corps of Engineers (the Corps) and the Bureau of Reclamation (Reclamation). The Corps of Engineers, Bureau of Reclamation, and Bonneville Power Administration, collectively, are authorized to construct, operate, and maintain projects for flood risk management, navigation, power generation, fish and wildlife conservation, recreation, municipal and industrial water supply purposes and to market and transmit the power generated by these projects. (http://www.crso.info/Library/CRSOEISScopingLetter.pdf)

- Dam operations will continue at various levels to impound water, inundate habitat, alter sediment transport, hamper passage conditions both upstream and downstream, affect seasonal, daily, and

hourly flows, and water quality (e.g., temperature, total dissolved gas, turbidity, etc.).

- Electrical demand continues to increase by up to 1 percent per year with the regional peak load for power, which typically occurs in winter, forecasted by the Northwest Council to grow at an average annual growth rate of between 0.3 – 0.8 percent (NWCouncil, 2016).

Some of these efforts are described below as they pertain to the understanding of harvest effects under *US v Oregon*.

5.2.3. Habitat Restoration and Protection of Salmonids

Throughout the Columbia River Basin, habitat restoration efforts are supported by Federal, state, and local agencies; tribes; environmental organizations; and communities. Projects supported by these entities focus on improving general habitat and ecosystem function or species-specific conservation objectives that, in some cases, are identified through ESA recovery plans. The larger, more region-wide, restoration and conservation efforts, either underway or planned throughout the Columbia River Basin, are presented below. These actions have helped restore habitat, improve fish passage, and reduce pollution. While these efforts are reasonably likely to occur, funding levels may vary on an annual basis. These include:

- Bonneville Power Administration (BPA), Bureau of Reclamation (BOR), and USACE
- National Oceanic and Atmospheric Administration (NOAA) – Community-based Restoration Program (CRP).
- NMFS – Pacific Coastal Salmon Recovery Fund (PCSRF), Columbia and Snake Rivers.
- Northwest Power Planning and Conservation Council – Fish and Wildlife Program, Columbia and Snake Rivers.
- State of Idaho – ESA Section 6 Cooperative Agreement.
- State of Oregon – Oregon Plan for Salmon and Watersheds.
- State of Washington – Governor's Salmon Recovery Office.
- Miscellaneous Funding Sources – Regional and Local Habitat Restoration and Conservation Support.
- USACE – Double-crested Cormorant Management Plan to Reduce Predation of Juvenile Salmonids in the Columbia River Estuary, Oregon.

5.3. Effects from Future Actions

Here we discuss effects of all expected future actions within the action area focusing on the additional effects of each alternative in the context of future climate change when combined with future actions.

5.3.1. Fish

Subsection 3.2, Fish, describes how past and present conditions have influenced fish populations in the

analysis area. These conditions represent effects from many years of development, as well as habitat restoration, hydropower operations, existing hatchery production. The expected impacts of the alternatives on fish populations are described in Subsection 4.2, Fish. Section 4 also presents the likely impacts from the hatchery production associated with this agreement, ongoing fisheries in the basin and, most likely, climate changes. The Proposed Action itself occurs across the Columbia River Basin, and includes both harvest and hatchery impacts as part of the Proposed Action. Moreover, the affected environment already includes the full impact of hydropower effects across the basin. Therefore a great deal of the discussion that would ordinarily be found in cumulative impacts has taken place in Section 4. However, Section 4 does not take into account future foreseeable actions, especially in the context of future climate change. Future Foreseeable Actions are described in Subsection 5.2. This section considers impacts that may occur as a result of any one of the alternatives being implemented at the same time as other anticipated future actions and presents information in the context of future climate change.

5.3.1.1. Salmonids

According to ISAB (2007a), the effects of future climate change on salmonids would vary among species and with life history stages, but they potentially may affect virtually every species and life history stage of salmonids in the Columbia River Basin. Rising temperatures will increase disease and/or mortality in several iconic salmon species, especially for spring/summer Chinook salmon and sockeye salmon in the interior Columbia and Snake River Basins (Mote et al. 2014). This is because increases in water temperature are known to increase stress on these salmonid species thereby reducing their immune response and dually also provide positive conditions for pathogen incubation that is known to be harmful to these salmonid species. All alternatives, except Alternative 5, remove fish abundance from the spawning population, which reduces genetic diversity, by simply killing possibly sexually mature adult contributors to the general spawning populations. Harvest impacts might cumulatively add to the climate change impacts associated with increased disease/decrease immune responses as the diversity that may have been present is simply reduced by lowering the size of the spawning populations via harvest removals. This added impact would be greatest in Alternative 4 and Alternative 6, the same as status quo conditions and as Alternative 1 and Alternative 2, slightly less in Alternative 3, and almost none at all in Alternative 5.

As described in Subsection 4.2.1, Alternative 1 and Alternative 2 would not result in changes from the status quo conditions of the natural-origin Upper Columbia River spring Chinook salmon, natural-origin Snake River spring/summer Chinook salmon, natural-origin Snake River fall Chinook salmon, and natural-origin Snake River B-Index steelhead. The effects of Alternative 3 on these same resources is slightly positive relative to status quo conditions, as it increases the average level of spawning

escapements. Alternative 4 and Alternative 6 have the greatest negative effects (largest harvest) on all affected salmonid species, especially for natural-origin Snake River Fall Chinook salmon, natural-origin Snake River spring/summer Chinook salmon, natural-origin Upper Columbia River spring Chinook salmon, Snake River sockeye salmon and natural-origin Snake River B-Index steelhead. Only for Upper Columbia summer Chinook salmon the effects of Alternative 4 or Alternative 6 are lower than for Alternatives 1, 2, and 3. These negative impacts to spawning escapements would subject lower numbers of spawning adults to conditions where greater abundances for a spawning population might mitigate high rates of elevated mortality due to climate change impacts described above. Thereby Alternative 4 and Alternative 6 may cumulatively add to the future climate change impacts by subjecting lower spawning populations to higher levels of elevated mortality and diminishing future returns

Alternative 5 has a positive harvest effects on all salmonid species because it involves only curtailed fishing. Alternative 5, while having a positive harvest effects on all salmonid species, because it involves only curtailed fishing, would however, likely result in escapement of larger numbers of hatchery-origin adults, leading to potential negative effects from elevated levels of hatchery-origin fish spawning. These effects, discussed in Section 4, relate to the effects of high levels of unharvested hatchery fish ending up on natural spawning grounds and competing with and reproductively interacting with natural-origin fish of the same species/run.

Cumulatively, when combined with all past, present and future actions in the Columbia River Basin, hatcheries will have a greater effect on genetic impacts from hatchery-origin interbreeding with natural-origin fish, and mortality of natural-origin fish associated with competition, predation, and disease impacts from hatchery-origin fish as those summarized above and in Section 4. As described in Subsection 3.2.1, Salmonids, unique patterns of genetic diversity can be lost in natural-origin populations when they interbreed with hatchery-origin fish. Competition, predations, and disease transmission occurs during interaction among members of the same species or different species utilizing a limited resource (e.g., food or space). These interactions typically result in winners and losers. Impacts between hatchery-origin and natural-origin fish result from direct interactions, in which hatchery-origin fish interfere with access to limited resources, predate (eat), or transmit disease to natural-origin fish. These interactions occur between juveniles during outmigration, including the mainstem and estuary areas of the Columbia River Basin, and between adults during spawning when the adults are competing for space and resources.

All alternatives that include some level of fishing (Alternatives 1, 2, 3, 4, and 6) would generally reduce genetic, competition, and disease impacts from the interaction of hatchery-origin fish with natural-origin

salmon and steelhead populations because the fishing removes adult hatchery-origin fish from the river basin. There are no additional cumulative impacts on juvenile salmonids (primarily predation and disease) as a result of any of the alternatives, because the harvest alternatives will not alter or affect the level of hatchery production, and therefore the hatchery-related impacts to salmonids under each alternative are the same impacts discussed already in Section 4. All risks, however, may exacerbate the effects of climate change on natural-origin salmon and steelhead populations. For example, if hatchery production disrupts unique patterns of genetic diversity in a natural-origin salmon or steelhead population, that population may be less able to adapt to the changing environmental conditions anticipated because of future climate change (Subsection 5.3.1, Climate Change).

Specifically, Alternative 5 would accumulate negative hatchery related impacts at the highest rate as there would be almost no fishing to remove adult hatchery-origin fish. These fish would be able to return to the spawning grounds and hatcheries and given the ratio of hatchery to non-hatchery spawners under Alternative 5, the genetic diversity will be diminished. Under this alternative, competition effects would be at the highest level, as would transmission potential of disease, while impacts from juvenile predation would likely remain similar to the other alternatives since there is no effect to the release sizes under any alternative.

Changing environmental conditions are also likely to occur as a result of future development, changes in hydropower operations, hatchery production and habitat restoration in the Columbia River Basin. When aggregated with the impacts of past, present, and reasonably foreseeable future actions in the project area, a new *US v Oregon* agreement, as a result of harvest and hatchery actions, all alternatives contribute meaningfully to cumulative effects and the result will continue to cumulatively negatively impact salmonids.

5.3.1.2. ESA-Listed Fish Species (non-salmonids)

The cumulative effects on ESA-Listed Fish Species (non-salmonids) from their bycatch during salmon and steelhead directed fisheries may be greater than those described in Subsection 4.2.2, ESA-Listed Fish Species (non-salmonids), but no discernable changes across any of the alternatives are expected. Changing environmental conditions are also likely to occur as a result of future development, changes in hydropower operations, hatchery production and habitat restoration in the Columbia River Basin. When aggregated with the impacts of past, present, and reasonably foreseeable future actions in the project area, a new *US v Oregon* management agreement resulting in fisheries and hatcheries would make a minor additive contribution to cumulative negative effects on ESA-Listed Fish Species (non-salmonids).

5.3.1.3. Other Non-Salmonids (non ESA-listed Fish Species)

The cumulative effects on non-salmonids from their bycatch during salmon and steelhead directed fisheries may be greater than those described in Subsection 4.2.3, Non-salmonids. Changing environmental conditions are also likely to occur as a result of future development, changes in hydropower operations, hatchery production and habitat restoration in the Columbia River Basin. When aggregated with the impacts of past, present, and reasonably foreseeable future actions in the project area, a new *US v Oregon* management agreement resulting in fisheries and continued hatcheries would make a minor additive contribution to cumulative adverse effects on Non-salmonids. No discernable changes across any of the alternatives are expected, especially when considering the increased potential negative effects from elevated levels of hatchery-origin fish spawning are taken into account.

5.3.2. Water Quality and Quantity—Hatchery Effects & Marine-Derived Nutrients

The effects of the alternatives on water quality from hatchery operations are described in Subsection 4.3, Water Quality and Quantity—Hatchery Effects & Marine-Derived Nutrients. Future actions are described in Subsection 5.2, Future Foreseeable Actions. This section considers effects that may occur as a result of the alternatives being implemented at the same time as other anticipated future actions. This section only discusses future impacts that have not already been described and evaluated in Subsection 4.3, Water Quality and Quantity—Hatchery Effects & Marine-Derived Nutrients. Climate change is expected to affect water quality in general by altering water temperatures and changing seasonal river flows, the cumulative effects on water quality may be greater than those summarized above and described in Subsection 4.3, Water Quality and Quantity—Hatchery Effects & Marine-Derived Nutrients, for all alternatives. Since none of the alternatives moving forward into the future would alter hatchery production, the negative impacts associated with hatchery effluent as it relates to water quality would add to the cumulative negative impacts.

Subsection 3.3, Water Quality and Quantity—Hatchery Effects & Marine-Derived Nutrients, describes how past and present conditions have influenced the level of marine derived nutrients in the Columbia River Basin, including conditions resulting from past development and ongoing restoration actions. Climate change effects on present marine derived nutrients are likely represented in these current conditions as well. The effects of the alternatives on levels of marine derived nutrients from harvest and hatchery operations are described in Subsection 4.3, Water Quality and Quantity—Hatchery Effects & Marine-Derived Nutrients. Future actions are described in Subsection 5.2, Future Foreseeable Actions. This section considers effects that may occur as a result of the alternatives being implemented at the same time as other anticipated future actions. This section only discusses future impacts that have not already

been described and evaluated in Subsection 4.3, Water Quality and Quantity—Hatchery Effects & Marine-Derived Nutrients. Climate change is expected to affect marine derived nutrients by altering water temperatures and changing seasonal river flows, affecting the ability and distribution of returning adult anadromous fish to deposit as carcasses and deliver marine derived nutrients in similar patterns.

As a result, cumulative effects may lead to less marine derived nutrients than is considered in Subsection 4.3, Water Quality and Quantity—Hatchery Effects & Marine-Derived Nutrients. The potential benefits of restoration actions within the basin are difficult to quantify. It is unlikely that substantial benefits would be realized in the action area in the future, although minor improvements would likely occur over time from local restoration efforts. When aggregated with the impacts of past, present, and reasonably foreseeable future actions in the project area, a new *US v Oregon* agreement resulting in fisheries and continued hatcheries would make a minor additive negative contribution to the cumulative negative effects on Water Quality and Quantity—Hatchery Effects & Marine-Derived Nutrients under each of the alternatives except under Alternative 5, which eliminates most of the negative harvest impact.

While the effects of the voluntary fishing curtailment in Alternative 5 will be positive on marine derived nutrients, and the effects from the hatchery production will be positive in all alternatives, these are unlikely to mitigate for the net negative cumulative effects from the impacts of past, present, and reasonably foreseeable future actions in the project area.

5.3.3. Wildlife

Subsection 3.4, Wildlife, describes how past and present conditions have influenced wildlife populations in the Columbia River Basin. These conditions represent effects from many years of basin-wide development, as well as habitat restoration, and, most likely, climate changes. The effects of the alternatives on wildlife populations are described in Subsection 4.4, Wildlife. Future actions are described in Subsection 5.2, Future Foreseeable Actions. This section considers potential effects that may occur as a result of implementing any one of the alternatives at the same time as other anticipated actions. This section only discusses future effects that have not already been described and evaluated in Subsection 4.4, Wildlife.

As described in Subsection 5.3.1, Fish, salmonids, climate change and development in the Columbia River Basin is likely to reduce the abundance and productivity of natural-origin salmon and steelhead populations. Reduction in adult fish abundance would likely have an additional low negative impact on wildlife by reducing available prey. Overall, the total number of salmon and steelhead available as prey to wildlife may be lower than that considered in Subsection 4.4, Wildlife, for all alternatives if climate change effects are more pronounced than anticipated. Reduced abundance of salmon and steelhead would

also decrease the number of salmon and steelhead carcasses available to wildlife for scavenging and for nutrient contribution to the freshwater system. The potential benefits of restoration actions within the basin are difficult to quantify. It is unknown whether these actions would fully, or even partially, mitigate for the impacts of climate change and development on salmon and steelhead abundances. Therefore, it is difficult to estimate future trends in available prey bases for wildlife and available nutrient contributions to the freshwater system. Again, however, localized microclimate fish habitat improvements may be realized from these restoration actions. This potential benefit would be experienced in the future by wildlife that reside in the same localized ecosystems.

However, when aggregated with the impacts of past, present, and reasonably foreseeable future actions in the project area, a new *US v Oregon* agreement resulting in fisheries would make a minor additive contribution to cumulative negative impacts of reducing prey availability, via harvest removal, on wildlife under each of the alternatives except under Alternative 5. Given Alternative 5 results in only limited prey being removed, by itself when also aggregating Alternative 5 with the impacts of past, present, and reasonably foreseeable future actions in the project area it wouldn't likely mitigate for changing development and climate change effects therefore results in a likely non discernible cumulative effect.

5.3.3.1. Seabirds, Raptors, and other Piscivorous Birds

Subsection 3.4.1, Seabirds, Raptors, and other Piscivorous Birds, describes how past and present conditions have influenced these resources in the Columbia River Basin. These conditions represent effects from many years of basin-wide development, as well as habitat restoration, and, most likely, climate change impacts. The effects of the alternatives on birds are described in Subsection 4.4.1, Seabirds, Raptors, and other Piscivorous Birds. Overall Seabirds will continue to be affected by other development in the Columbia River Basin, but no additional impacts will be added by a new *US v Oregon* management agreement.

For Raptors and other piscivorous birds Alternative 1 and Alternative 2 impacts from adult prey reductions were unchanged relative to status quo conditions, slightly positive in Alternative 3, negative in Alternative 4 and Alternative 6, and positive in Alternative 5. The cumulative effects to these birds would be similar to those described to other wildlife in Subsection 5.3.3, Wildlife.

5.3.3.2. Marine Mammals

Subsection 3.4.2, Marine Mammals, describes how past and present conditions have influenced marine mammals in the Columbia River Basin. These conditions represent effects from many years of basin-wide development, as well as habitat restoration, and, most likely, climate change impacts. The effects of the

alternatives on marine mammals are described in Subsection 4.4.2, Marine Mammals. For Alternative 1 and Alternative 2 impacts from prey reductions were unchanged relative to status quo conditions, slightly positive in Alternative 3, negative in Alternative 4 and Alternative 6, and positive in Alternative 5, while for SRKW there were no discernable impacts across the alternatives. Future actions are described in Subsection 5.2, Future Foreseeable Actions. This section considers potential effects that may occur as a result of implementing any one of the alternatives at the same time as other anticipated actions. This section only discusses future effects that have not already been described and evaluated in Subsection 4.4.2, Marine Mammals.

As described in Subsection 5.4, Wildlife, fish, salmonids, climate change and development in the Columbia River Basin is likely to reduce the abundance and productivity of natural-origin salmon and steelhead populations. Future actions in the project area will have a negative but unquantifiable effect on marine mammals, likely low because of Marine Mammal Protection Act restoration activities and ESA protections. When aggregated with the impacts of past, present, and reasonably foreseeable future actions in the project area, a new *US v Oregon* agreement resulting in fisheries would make a minor additive contribution to cumulative negative effects on marine mammals and SRKW under each of the alternatives except under Alternative 5, which results in a positive harvest impact to marine mammals since this alternative results in curtailed fishing and therefore almost zero prey removal via harvest.

After aggregating Alternative 5 with the impacts of past, present, and reasonably foreseeable future actions in the project area the beneficial effects of reduced harvest would not likely mitigate for changing development and climate change effects. The net cumulative effect on marine mammal would not be discernible.

Under Alternative 5, the cumulative effect would still be non-discernible for SRKW, as adult fish would have passed through areas already where they might be preyed upon. In addition, higher numbers of adults escaping to the terminal spawning grounds would not always increase juvenile production unless habitat improvements offset changing development and climate change effects enough to equate to increase future adult abundance.

5.3.4. Economics

Subsection 3.5, Economics, characterizes how past and present conditions have affected economic conditions related to commercial and recreational fishing activity targeting salmon and steelhead in the analysis area. These conditions reflect the effects of many years of land development, as well as effects from habitat restoration, hydropower operations, hatchery production and, most likely, climate changes on fisheries in the Columbia River Basin. The expected direct and indirect effects of the *US v Oregon*

agreement alternatives on fishery-related economic conditions are described in Subsection 4.5, Economics. Future Foreseeable Actions that likely will affect these conditions are described in Subsection 5.2, Future Foreseeable Actions.

This section considers impacts that may occur as a result of any one of the alternatives being implemented at the same time as other anticipated future actions, and presents findings in the context of future climate change. This section only discusses future impacts that have not already been described and evaluated in Subsection 4.5, Economics.

5.3.4.1. Commercial Fisheries

As described in Subsection 5.2, future climate change and other changes in environmental conditions can be expected to affect salmonids and other species important to commercial (and recreational) fisheries in the Columbia River Basin. While the effects would be expected to vary among species, virtually every species of salmonids in the Columbia River Basin likely will be affected, as identified in Subsection 5.3.1, Fish. Rising water and air temperatures are a major concern for salmon species, especially spring/summer Chinook salmon and sockeye salmon in the interior Columbia and Snake River Basins. The effects of Alternative 1 and Alternative 2 on the harvest of natural-origin Upper Columbia River spring Chinook salmon, natural-origin Snake River spring/summer Chinook salmon, natural-origin Snake River fall Chinook salmon, and natural-origin Snake River B-Index steelhead would be similar to status quoconditions, but Alternatives 3, 4, and 6 have the greatest effects (negative for Alternative 3 and positive for Alternative 4 and Alternative 6) on the harvest of harvest indicator stocks.

While the current and future habitat restoration activities offer mitigation, their benefits are difficult to predict in light of negative effects from concurrent development and climate changes. The number of salmon and steelhead available for harvest may be reduced over time. This, in turn, would reduce the total ex-vessel value obtained by commercial fishers relative to conditions considered in Subsection 4.5.1.1, Commercial Fisheries, for all alternatives. As a result, the cumulative effects on economic values to commercial fishers may differ from those described in Subsection 4.5.1.1, Commercial Fisheries, for all alternatives except Alternative 5. If the abundance of salmon and steelhead decreases as a result of future climate change, combined with development in the Columbia River Basin, economic values derived from commercial fisheries may be lower than those identified in Subsection 4.5.1.1, Commercial Fisheries, for all alternatives except for Alternative 5, unless ex-vessel prices increase as a result of reduced supply. This would result in greater economic impacts than described in Subsection 4.5.1.1, Commercial Fisheries, on commercial fisheries under Alternative 3 and reduced benefits under Alternative 4 and Alternative 6.

5.3.4.2. Recreational Fisheries

As described in Subsection 5.2, future climate change and other changes in environmental conditions as a result of future development, changes in hydropower operations, hatchery production and habitat restoration, can be expected to affect salmonids and other species that contribute to recreational fisheries in the Columbia River Basin. 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, catch, and level of effort directed on most, if not all, salmonid fish species in the Columbia River Basin, as compared to the direct and indirect effects on recreational fishing effort and associated economic effects described in Subsection 4.5.1.2, Recreational Fisheries, for all alternatives except Alternative 5.

Future climate change, combined with development in the basin, may affect the net benefit (benefits minus costs) that recreational anglers receive from participating in salmon and steelhead fishing. If fewer fish are available for harvest, and more restrictions are in place (e.g., reduced bag limits and fishing seasons), fewer recreational fishers may be willing to pay for the opportunity to fish. As a result, cumulative effects on economic values to recreational fishers could lead to lower future values (trip-related expenditures) than those identified in Subsection 4.5.1.2, Recreational Fisheries, for all alternatives except for Alternative 5. To some unpredictable extent, restoration actions within the basin would be expected to benefit salmonids in the Columbia River Basin. Overall, it is unknown whether restoration actions would fully, or even partially, mitigate for the impacts of climate change or development on the abundance of fish species that provide recreational fishing opportunities

5.3.4.3. Regional and Local Economic Impacts

The assessment of regional and local economic effects of the alternatives described in Subsection 4.5.1.3, Contribution to Regional Economic Activity, relies on changes in personal income and jobs as key indicators of the direction and magnitude of potential effects on regional economic activity. Commercial and recreational fisheries generate personal income and jobs in regional economies through the export of products and services to outside economies. Commercial catch of salmon and steelhead harvested in the Columbia River Basin is frequently sold directly, or after processing, to individuals or businesses located outside the regional economy. Similarly, non-local recreational anglers (i.e., anglers who do not live in a local area) spend money on guide services, lodging, and other goods and services that generate household income and employment in many sectors of the regional economy. This regional transfer of money supports payments to labor, and those payments are then re-spent regionally, resulting in a multiplier effect.

Future climate change and development-related impacts may reduce the abundance of salmon and steelhead available for catch, which would reduce the total number of salmon and steelhead exported to outside economies relative to conditions considered in Subsection 4.5.1.3, Contribution to Regional Economic Activity, for all alternatives except for Alternative 5. As a result, the cumulative effects on generating regional and local economic impacts may be lower than those identified in Subsection 4.5.1.3, Contribution to Regional Economic Activity, for all alternatives except for Alternative 5. Although it is unpredictable what effects restoration actions within the basin will have on salmonid resources, these actions would be expected to at least partially mitigate for the impacts of climate change or development on fish available for harvest in commercial or recreational fisheries, and therefore, also on regional and local economies.

5.3.5. Cultural Resources

A portion of tribal fish harvests is used to meet Ceremonial & Subsistence (C&S) needs as discussed in Subsection 3.6. The anticipated effects of each alternative on C&S harvest are described in Subsection 4.6. This section considers the effects that may occur as a result of implementing any one of the alternatives together with other foreseeable actions and the effects of climate change.

While the current and future habitat restoration activities offer mitigation, their benefits are difficult to predict in light of negative effects from concurrent development and climate changes. At the same time, the protection of ESA-listed salmonid stocks will continue. Coupled with the negative effect from development projects and habitat changes, there will likely be continuing cumulative adverse effects on cultural resources. These adverse effects are a continued reduction in the number of salmon and steelhead available for the tribe's C&S harvest that may result in a deterioration in cultural practices and the erosion of salmon and steelhead as a core symbol of tribal identity, health, individual identity, culture, spirituality, religion, emotional well-being, and economy.

However, as C&S harvests are given priority over commercial harvests, the adverse effect on C&S harvests is anticipated to be low when commercial harvests exist. Under Alternatives 1, 2, 3, 4, and 6, commercial harvests would continue. The size of the C&S harvest would therefore be driven primarily by the harvest framework in each alternative and not by other concurrent development changes or climate change. Each of these five alternatives will contribute a meaningful effect to the overall cumulative adverse effect on cultural resources.

Under Alternative 5, there would be no commercial harvest and minimal C&S harvest. Therefore, Alternative 5 contributes a higher effect on the overall cumulative adverse effect on C&S cultural resources than the other alternatives.

5.3.6. Environmental Justice

The expected effects of the alternatives on environmental justice communities, described in Subsection 4.7, found that Alternatives 4, 5, and 6 would result in a disproportionate adverse effect on Cultural Resources for Indian tribes as it pertains to C&S fisheries. Alternative 4 and Alternative 6 would also result in a disproportionate adverse economic effect on Indian tribes as it pertains to Upriver fall Chinook salmon. Future actions are described in Subsection 5.2. This section considers the cumulative effects that may occur as a result of implementing any one of the alternatives together with other foreseeable actions.

5.3.6.1. Cultural Resources—C&S

Given the significance of C&S harvests on the cultural practices and traditions among Indian tribes, the effect on Indian tribes as an Environmental Justice community would be adverse and disproportionate whenever C&S harvests are negatively affected. The C&S harvest would be negatively affected under Alternatives 4, 5, and 6 as a result in a decrease in the number of fish available to the tribes. The C&S harvest is driven primarily by the harvest framework in each alternative and not by other concurrent development changes or climate change. Therefore, Alternatives 4, 5, and 6 result in a cumulative disproportionate adverse cultural resources effect in that the Indian tribes are the only population group that is affected by the loss of cultural resources pertaining to salmon and steelhead.

5.3.6.2. Economics

As described in Subsection 4.7.2, Alternative 4 and Alternative 6 results in a disproportionate adverse economic effect on Indian tribes resulting from a decrease in tribal commercial harvest of and revenue from Upriver fall Chinook salmon by 21 percent under both alternatives compared to an increase in non-tribal commercial harvest by 59 percent. The economic impact on the tribes is driven primarily by the selected harvest. It may be affected by, but it is not driven by, other development or restoration activities. Alternative 4 and Alternative 6 would result in a cumulative disproportionate adverse economic effect on the tribes.

6. LISTS

6.1. List of Preparers

The following individuals in NOAA's National Marine Fisheries Service were responsible for the preparation of this EIS:

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- Mr. Thomas Wegge, TCW Economics.
- Ms. Tina Loucks-Jaret, Petals to Protons Technical Writing & Editing.

6.2. List of Agencies, Organizations, and Persons Contacted

The following agencies and persons were contacted in the course of preparing this EIS

- Columbia River Intertribal Fish Commission,
    - Mr. Stuart Ellis, current *US v Oregon* Technical Advisory Committee Chair, Portland, Oregon
- U.S. Fish and Wildlife Service, (Cooperating Agency)
    - Dr. Howard Schaller, Portland, Oregon
    - Mr. Mark Bagdovitz, Portland, Oregon
- U.S. Bureau of Indian Affairs, (Cooperating Agency)
    - Rudy Peone, Portland, Oregon

6.3. Distribution List for FEIS

- **Federal and State Agencies**
    - U.S. Environmental Protection Agency, Region 10
    - U.S. Fish and Wildlife Service
    - U.S. Bureau of Indian Affairs
    - U.S. Bureau of Reclamation
    - U.S. Army Corps of Engineers
    - U.S. Geological Survey
    - U.S. Department of Justice
    - U.S. Department of the Interior
    - Bonneville Power Administration
    - Oregon Department of Fish and Wildlife
    - Washington Department of Fish and Wildlife
    - Idaho Department of Fish and Game
- **Elected Officials**
    - Governor's Offices in Idaho, Montana, Oregon, and Washington
- **Tribes**
    - Burns Paiute Tribe
    - Coeur d'Alene Tribe
    - Confederated Tribes of the Colville Reservation
    - Confederated Tribes of the Warm Springs Reservation of Oregon
    - Hoh Tribe
    - Kalispel Tribe
    - Kootenai Tribe of Idaho
    - Makah Indian Tribe

- Nez Perce Tribe
- Quileute Tribe
- Quinault Indian Nation
- Confederated Salish and Kootenai Tribes
- Cowlitz Indian Tribe
- Shoshone-Bannock Tribes
- Spokane Tribe of Indians
- Confederated Tribes of the Umatilla Reservation
- Yakama Nation
- Wanapum Indian Tribe

- **Councils and Commissions**
  - Columbia River Inter-Tribal Fish Commission
- **Organizations and Associations**
  - Stoel Rives, LLP
  - Northwest RiverPartners
  - The Conservation Angler
  - Hatchery Scientific Review Group
  - DJW Associates
  - Wild Fish Conservancy
  - Defenders of Wildlife,
  - Native Fish Society
  - Salmon for All
- **Individuals**
  - C. Hyland
  - J. Publiee
  - K. Malone
  - R. Sudar

---------- Beginning of New FEIS Section ----------

6.4. Distribution List for FEIS

All entities that submitted comment letters on the DEIS also received a notice of availability and link to the FEIS. These entities are listed in Appendix C.

---------- End of New FEIS Section ----------

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APPENDICES

APPENDIX A

US v. OREGON AGREEMENT EIS

Economics Methods Appendix

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April 2017

Appendix – Economics Impact Methods

1.0 Introduction

This appendix describes the methods and data used to conduct the analysis of economic effects described in Subsection 4.5. The analysis of economic impacts considers predicted harvest-related effects in affected commercial and recreational fisheries in the mainstem Columbia River, as affected by the *US v Oregon* Agreement.

An excel workbook with linked worksheets, referred to as the Columbia River Economic Impact Model, was developed by TCW Economics to assess harvest-related economic effects of the *US v Oregon* EIS alternatives. Data and values in the worksheets are organized by economic subregions. The analytical purpose of these regions is to present the economic impacts (i.e., generation of jobs and personal income) of fishing activity that occurs in the mainstem fisheries. For purposes of the analysis, four subregions of the Columbia River Basin are used to characterize effects on commercial harvest and recreational fishing effort:

- Lower Columbia River subregion, where catch assumed to contribute to economic activity in eight counties (Columbia, Clatsop, and Multnomah Counties in Oregon, and Pacific, Wahkiakum, Clark, Cowlitz, and Skamania in Washington) that border ODFW mainstem fishing zones 1 through 5 downstream of Bonneville Dam;
- Mid-Columbia River subregion, where catch assumed to contribute to economic activity in eight counties (Hood River, Wasco, Sherman, Gilliam, Morrow, and Crook Counties in Oregon, and Benton and Klickitat Counties in Washington) that border ODFW fishing zone 6 between Bonneville Dam and McNary Dam;
- Upper Columbia River subregion, where catch assumed to contribute to economic activity in four counties (Benton, Kittatas, Franklin and Grant Counties in Washington) that are upstream of McNary Dam; and
- Lower Snake River subregion, where catch assumed to contribute to economic activity in five counties (Walla Walla, Columbus, Garfield, Whitman, and Franklin Counties in Washington) that are upstream of the confluence with the mainstem Columbia River.

The counties that comprise these four subregions are identified in Figure A-1. Although the analysis area for the economics assessment is defined by the four subregions and the corresponding counties identified above, it should be noted that implementation of the harvest policy alternatives would be expected to affect, to a more limited extent, economic activity in other counties in the general region of the analysis area. This would include, but not be limited to, Umatilla, Jefferson, Deschutes, Wheeler, and Grant Counties.

Commercial (tribal and non-tribal) and recreational fishing activity in affected fisheries in the mainstem Columbia River were assigned to the economic subregion where the fishing activity was presumed to occur. The correspondence between fishing areas and economic subregions in the Columbia River Basin are described above.

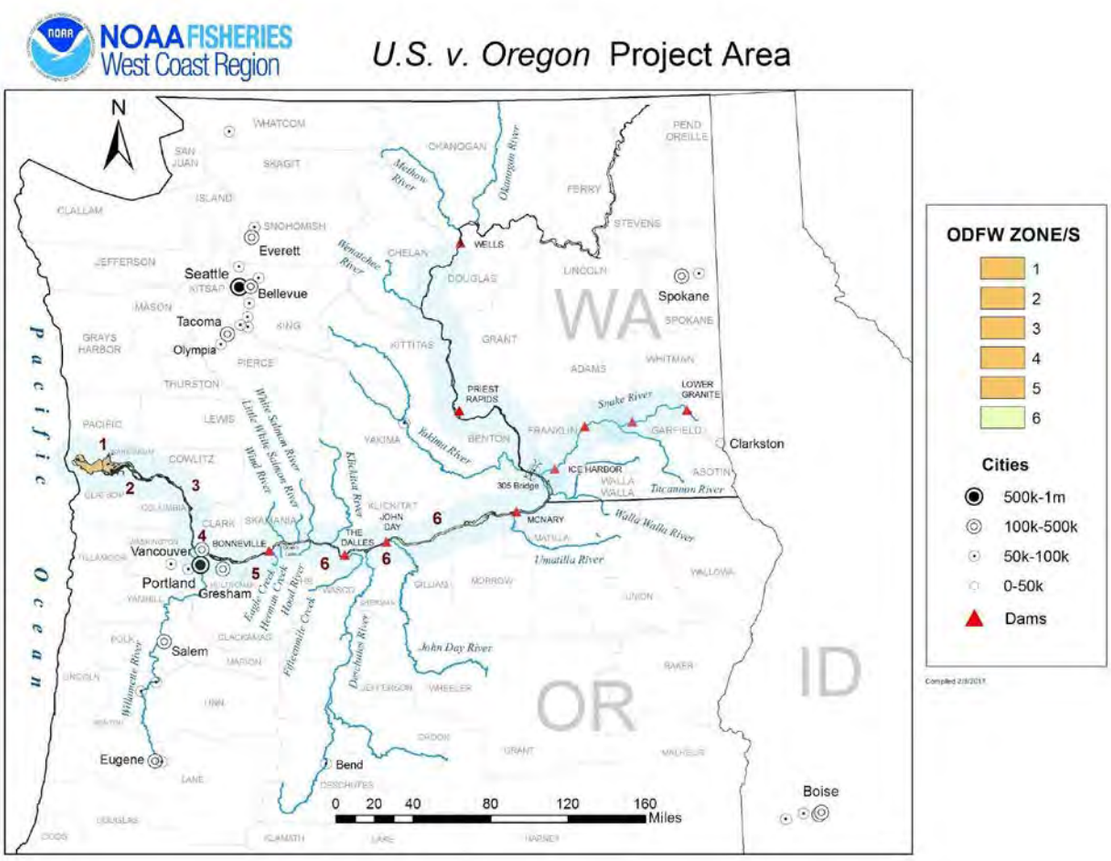

Figure A-1. Economic Analysis Area.

The economic analysis focuses on commercial and recreational fishing targeting five harvest indicator stocks that collectively are believed to account for more than 80 percent of the total catch of salmon and steelhead in the mainstem Columbia River: Upriver spring Chinook salmon, Upper Columbia summer Chinook salmon, Upriver fall Chinook salmon, Upriver sockeye salmon, and Snake River steelhead. In addition to supporting tribal commercial and non-tribal recreational fisheries in the mainstem, these stocks also support ceremonial and subsistence tribal fishing.

As explained in Section 2 of the EIS, the estimates of the number of fish harvested in commercial and recreational fisheries were estimated by the Fishery Analysis Team based on historical catch records between 2005 and 2016, and modified to meet the objectives of the different harvest policy alternatives. This 12-year period (2005-2016) represents the term of the current management framework. The historical harvest and effort information was used to estimate numerical outputs for each of the harvest indicator stocks in the analysis of the alternatives. In Subsection 4.1.1 we describe the incorporation of expected climate change effects into the analysis. The minimum, maximum and average harvest of the different harvest indicator stocks are based on implementation of the different alternatives.

2.0 Catch and Effort Estimates

The Fishery Analysis Team estimated harvest for the five harvest indicator stocks (Upriver spring Chinook, Upper Columbia summer Chinook salmon, Upriver fall Chinook salmon, Upriver sockeye salmon, and Snake River steelhead) and were presented to the economic analysis team for evaluation. The estimated number of fish (both natural-origin and hatchery fish) caught in tribal, non-tribal commercial, and recreational fisheries was estimated for different areas of the mainstem Columbia River, including ODFW fishing zones 1 through 5, ODFW fishing zone 6, upstream of McNary Dam on the mainstem Columbia River, and in the Lower Snake River upstream of the confluence with the mainstem Columbia

River. The catch estimates in each of these catch areas were then assigned to one of the four different economic subregions previously identified based on the county (and region) corresponding to the location of the fisheries. (Note that none of the catch was assigned to the Upper Columbia River subregion because there was no commercial harvest of the harvest indicator stock.)

2.1 Commercial Fisheries

Estimates of total tribal and non-tribal commercial catch provided by the Fishery Analysis Team were converted to economic values using different price factors. For estimating the ex-vessel value of commercial fisheries, the number of fish caught was first converted to pounds. The pounds-per-fish factors by species and region used in the conversion are presented in Table A-1. The data sources for these conversion factors include the following:

- Commercial weights (round weight per fish) for Columbia River regions: Calculated based on landings and weight data from fish receiving tickets reported by the Oregon Department of Fish and Wildlife, Columbia River Fishing Landing Reports, 2003-2009, available at http://www.dfw.state.or.us/fish/OSCRP/CRM/Comm_fishery_updates.asp (accessed on December 7, 2011). Calculated weights for each species, including spring, summer, and fall Chinook salmon, were averaged over the 2003-2009 period, weighted by the number of fish landed each year in Oregon. (Note that data were not available for 2002.)

Once commercial catch was converted to pounds, per pound ex-vessel prices for each species were applied to the estimates of tribal and non-tribal commercial landings to estimate the total regional ex-vessel value of commercial salmon landings in each subregion. The value-per-fish factors used to convert estimated landings to total ex-vessel values are shown in Table A-2. The data sources for these value factors include the following:

- Ex-vessel price per pound for Columbia River regions for Chinook salmon were calculated based on price and harvest data for Oregon and Washington from PFMC 2016 Salmon SAFE Report, Tables IV-8 and IV-9. Prices represent average ex-vessel prices of Columbia River coho salmon and spring and fall Chinook salmon, weighted by pounds of fish landed, over the 2014-2016 period.
- Ex-vessel price per pound for Columbia River regions for sockeye salmon and steelhead were calculated based on aggregated landings and ex-vessel revenue data from PacFIN. Prices represent average of ex-vessel prices for Columbia River sockeye salmon and steelhead over the 2014-2016 period.

Table A-1. Average pounds per commercially-landed fish.

	Tribal			**Non-Tribal**		
REGION	**Chinook**	**Steelhead**	**Sockeye**	**Chinook**	**Steelhead**	**Sockeye**
Columbia River Basin						
Lower Snake River		na	na		na	na
Spring	na			na		
Summer	na			na		

Fall	na			na		
Upper Columbia River		na	na		na	na
Spring	na			na		
Summer	na			na		
Fall	na			na		
Mid-Columbia River		10.6	3.5		na	na
Spring	14.2			na		
Summer	17.1			na		
Fall	18.3			na		
Lower Columbia River		na	na		10.6	3.5
Spring	na			14.1		
Summer	na			18.8		
Fall	na			19.1		

Notes:
na = not applicable

Sources:
Chinook salmon prices are weighted averages of 2014-2016 ex-vessel revenue per landed lb from PFMC's Review of 2016 Ocean Salmon Fisheries, Table 9.
Sockeye salmon and Steelhead prices are weighted averages of 2014-2016 ex-vessel revenue per landed lb from PacFIN annual vessel summaries for 2014-2016.

Table A-2. Ex-vessel price per pound (2016 dollars).

	Tribal			Non-tribal		
REGION	**Chinook**	**Steelhead**	**Sockeye**	**Chinook**	**Steelhead**	**Sockeye**
Columbia River Basin						
Lower Snake River		na	na		na	na
Spring	na			na		
Summer	na			na		
Fall	na			na		
Upper Columbia River		na	na		na	na

Spring	na			na		
Summer	na			na		
Fall	na			na		
Mid-Columbia River		$1.30	$1.86		na	na
Spring	$4.61			na		
Summer	$1.88			na		
Fall	$1.88			na		
Lower Columbia River		na	na		$1.43	$2.09
Spring	na			$6.18		
Summer	na			$2.24		
Fall	na			$2.24		

Notes:
na = not applicable
Sources:
Chinook salmon prices are weighted averages of 2014-2016 ex-vessel revenue per landed lb from PFMC's Review of 2016 Ocean Salmon Fisheries, Table 9.
Sockeye salmon and Steelhead prices are weighted averages of 2014-2016 ex-vessel revenue per landed lb from PacFIN annual vessel summaries for 2014-2016.

2.2 Recreational Fisheries

Table A-3 shows the angler-trip conversion factors used to convert catch to angler trips for each species and subregion. The data sources for these conversion factors include the following:

- Sport catch per trip for Columbia River region: compiled from 2002-2009 angler trips and catch data from Catch Record Card data provided by WDFW. (Note that sport-catch-per-trip factors were developed for individual species but that the same factors were used for species across all four Columbia River Basin economic impact regions. As a result, while trip estimates for the entire basin may be reasonably reliable, sport trips may be overestimated in some regions and underestimated in others.)

Table A-3. Average catch per recreational fishing trip, by species and region.

Region	Coho Salmon	Chinook Salmon	Steelhead
Columbia River Basin			
Lower Snake River	0.24		0.19
Spring Chinook		0.19	
Summer Chinook		0.19	
Fall Chinook		0.23	
Upper Columbia River	0.24		0.19
Spring Chinook		0.19	
Summer Chinook		0.19	
Fall Chinook		0.23	
Mid-Columbia River			
Spring Chinook	0.24	0.19	0.19
Summer Chinook		0.19	
Fall Chinook		0.23	

Mid-Columbia River			
Spring Chinook	0.24	0.19	0.19
Summer Chinook		0.19	
Fall Chinook		0.23	

Notes:
na = not applicable
Sources:
Sport catch per trip for Columbia River. Compiled from 2002-2009 angler trips and catch data from Sport Catch Record data (Table 2) provided by WDFW (Dixon pers. comm.).

Once catch was converted to sport angler trips, per trip expenditure factors for each species and region were applied to the estimated number of sport trips to estimate the total trip-related expenditures in each region. The per trip expenditure factors, which are shown in Table A-4 in 2016 dollars, were developed based on the following data sources.

- Columbia River: Oregon Angler Survey and Economic Study, The Research Group 1991. Estimates were price-updated to 2016 using USDC BEA GDP implicit price deflator.

Table A-4. Average expenditures per sport trip (2016 dollars).

REGION	Coho	Chinook	Steelhead
Columbia River Basin Regions			
Lower Snake River	$92.84	$92.84	$92.84
Upper Columbia River	$92.84	$92.84	$92.84
Mid-Columbia River	$92.84	$92.84	$92.84
Lower Columbia River	$92.84	$92.84	$92.84

Sources:
Columbia River: Oregon Angler Survey and Economic Study, The Research Group 1991. Price updated to 2016 using USDC BEA GDP implicit price deflator

3.0 Contribution to Regional and Local Economic Impacts

Harvest-related regional economic impacts are generated by three fishery components: 1) economic activity from tribal commercial harvests, 2) economic activity from non-tribal commercial harvests, and 3) economic activity generated by sport fishing. Estimates of regional economic impacts from these activities are expressed in terms of personal income and jobs generated in each of the four subregions in the Columbia River Basin.

3.1 Personal Income

To estimate total (direct, indirect, and induced) personal income generated by estimated commercial and recreational catch under each alternative, personal income impact factors for each species and region were applied to the converted catch (i.e., ex-vessel revenue from commercial landings and numbers of sport trips). Table A-5 shows the regional personal income impact factors (in 2016 dollars) used to convert landings revenue and angler trips for each user group, species, and region to personal income impacts. The sources for the regional income impact factors include the following:

- Source for tribal and nontribal commercial real economic impact (REI) factors: 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 <Tables CH IV Econ Sup.xlsx> tab 'CR_COM_IOPAC').
- Source for sport REI factors: 2016 WA state-level income impact factors for Buoy 10 recreational salmon fishery from PFMC 2016 Salmon Review computational file "Tables CH IV Econ Sup.slsx, tab 'B10_II_IOPAC'". Assumed that private boat income impact factors from Buoy 10 fishery were representative of average contribution from inriver sport trips.

It should be noted that regional income is measured as personal income accruing to households. It measures the contribution to personal income under current (or changed) conditions. Because dynamic changes in the economy over time are not considered in this analysis, results of the assessment are not considered valid for measuring effects on the economy over the long term from changes in fish abundance or policy.

Table A-5. Personal income factors, per ex-vessel dollar of commercially landed salmon and per sport trip (2016 dollars).

	Tribal				Non-tribal		Recreational
REGION	**Coho**	**Chinook**	**Steelhead**	**Sockeye**	**Coho**	**Chinook**	
Columbia River Basin							
Lower Snake River	**na**	**$1.57**	**$1.57**	**$1.57**	**na**	**$1.57**	**$81.62**
Upper Columbia River	**na**	**$1.57**	**$1.57**	**$1.57**	**na**	**$1.57**	**$81.62**
Mid-Columbia River	**na**	**$1.57**	**$1.57**	**$1.57**	**na**	**$1.57**	**$81.62**
Lower Columbia River	**na**	**$1.57**	**$1.57**	**$1.57**	**na**	**$1.57**	**$81.62**

Notes:
na = not applicable

Sources:
Source for tribal and nontribal commercial REI factors: 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 <Tables CH IV Econ Sup.xlsx> tab 'CR_COM_IOPAC')
Source for sport REI factors: 2016 WA state-level income impact factors for Buoy 10 recreational salmon fishery in PFMC 2016 Salmon Review computational file "Tables CH IV Econ Sup.slsx, tab 'B10_II_IOPAC'". Assumed Private boat factors were representative of average income impact factors from inriver sport trips.

3.2 Jobs

Jobs (full- and part-time; direct, indirect, and induced) generated by the commercial and recreational catch in each region under each alternative were estimated by applying an earnings-per-job factor (Table A-6) to the estimated total personal income generated by catch in each subregion described above. The earnings-per-job factors for each region were calculated by using personal income totals for each region that were then divided by the earnings-per-jobs factors to estimate total jobs in each region under each alternative.

Table A-6. Average earnings per Job (2016 dollars).

Columbia River Basin Regions	
Lower Snake River	$29,222
Upper Columbia River	$33,613
Mid-Columbia River	$37,304
Lower Columbia River	$43,979

Notes:
Factors adjusted to $2016 using USDC BEA GDP implicit price deflator

Sources:
Bureau of Economic Analysis. April 2009. Table CA05N Personal Income by Major Source and Earnings by NAICS Industry; and Table CA25N Total Full-Time and Part-Time Employment by NAICS Industry.

Table A-7. Commercial Harvest and Ex-Vessel Value of Landings by Columbia River Basin Subregion under the Project Alternatives: **Upriver spring Chinook Salmon**

Subregion / Type of Fishery	Status Quo	Alt. 1- Extension			Alt. 2 – Abundance-based	Alt. 3 – Fixed Rate		Alt. 4 / Alt 6 – Escapement-based / Uncoordinated fishing		Alt. 5 – Fishing curtailment	
	Number	Number	Change from Status Quo Condition	Number	Change from Status Quo Condition	Number	Change from Status Quo Condition	Number	Change from Status Quo Condition	Number	Change from Status Quo Condition
Lower Columbia River Subregion											
Tribal											
Harvest (number of fish)	0	0	0	0	0	0	0	0	0	0	0
Ex-vessel harvest value	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Non-tribal											
Harvest (number of fish)	4,067	4,067	0	4,067	0	3,894	-173	6,024	1,957	0	-4,067
Ex-vessel harvest value	$354,199	$354,199	$0	$354,199	$0	$339,107	-15,093	$524,641	$170,441	$0	-$354,199
Total											
Harvest (number of fish)	4,067	4,067	0	4,067	0	3,894	-173	6,024	1,957	0	-4,067
Ex-vessel harvest value	$354,199	$354,199	$0	$354,199	$0	$339,107	-$15,093	$524,641	$170,441	$0	-$354,199
Mid-Columbia River Subregion											
Tribal											
Harvest (number of	7,528	7,528	0	7,528	0	6,773	-755	14,928	7,400	0	-7,528

fish)											
Ex-vessel harvest value	$493,029	$493,029	$0	$493,029	$0	$443,551	-$49,478	$977,652	$484,622	$0	-$493,029
Non-tribal											
Harvest (number of fish)	11	11	0	11	0	10	-1	16	5	0	-11
Ex-vessel harvest value	$965	$965	$0	$965	$0	$912	-$53	$1,411	$446	$0	-$965
Total											
Harvest (number of fish)	7,539	7,539	0	7,539	0	6,783	-756	14,944	7,405	0	-7,539
Ex-vessel harvest value	$493,994	$493,994	0	$493,994	0	$444,463	-$49,531	$979,062	$485,068	$0	-$493,994
TOTAL – ALL SUBREGIONS											
Tribal											
Harvest (number of fish)	7,528	7,528	0	7,528	0	6,773	-755	14,928	7,400	0	-7,528
Ex-vessel harvest value	$493,029	$493,029	$0	$493,029	$0	$443,551	-$49,478	$977,652	$484,622	$0	-$493,029
Non-tribal											
Harvest (number of fish)	4078	4078	0	4078	0	3,904	(174)	6,040	1,962	0	-4078
Ex-vessel harvest value	$355,164	$355,164	$0	$355,164	$0	$340,018	-$15,146	$526,052	$170,887	$0	-$355,164
Total											
Harvest (number of fish)	11,606	11,606	0	11,606	0	10,677	-929	20,968	9,362	0	-11,606

Ex-vessel harvest value	$848,193	$848,193	$0	$848,193	$0	$783,569	-$64,624	$1,503,704	$655,509	$0	-$848,193

Notes: All dollar values are reported in 2015 dollars.
Source: Ex-vessel values derived based on estimates of harvest provided by NMFS and by simulating the Columbia River economic impact spreadsheet model developed by TCW Economics.

Table A-8. Commercial Harvest and Ex-Vessel Value of Landings by Columbia River Basin Subregion under the Project Alternatives: **Upper Columbia Summer Chinook Salmon**

Subregion / Type of Fishery	Status Quo	Alt. 1-Extension		Alt. 2 – Abundance-based		Alt. 3 – Fixed Rate		Alt. 4 / Alt 6 – Escapement-based / Uncoordinated fishing		Alt. 5 – Fishing curtailment	
	Number	Number	Change from Status Quo Condition	Number	Change from Status Quo Condition	Number	Change from Status Quo Condition	Number	Change from Status Quo Condition	Number	Change from Status Quo Condition
Lower Columbia River Subregion											
Tribal											
Harvest (number of fish)	0	0	0	0	0	0	0	0	0	0	0
Ex-vessel harvest value	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Non-tribal											
Harvest (number of fish)	3356	3356	0	3309	0	2687	-669	3904	548	0	-3356
Ex-vessel harvest value	$141,045	$141,045	$0	$139,076	$0	$112,914	-$28,131	$164,075	$23,031	$0	-$141,045
Total											
Harvest (number of fish)	3,356	3,356	0	3,309	0	2,687	-669	3,904	548	0	-3,356
Ex-vessel harvest value	$141,045	$141,045	$0	$139,076	$0	$112,914	-$28,131	$164,075	$23,031	$0	-$141,045
Mid-Columbia River Subregion											
Tribal											
Harvest (number of	17,569	17,569	0	17,324	-245	14,065	-3,504	20,438	2,869	0	-17,569

fish)											
Ex-vessel harvest value	$565,958	$565,958	$0	$558,058	-$7,900	$453,080	-$112,878	$658,372	$92,414	$0	-$565,958
Non-tribal											
Harvest (number of fish)	3,866	3,866	0	3,811	0	3,094	-771	4,496	630	0	-3,866
Ex-vessel harvest value	$147,784	$147,784	$0	$145,705	$0	$118,297	-$29,488	$171,897	$24,113	$0	-$147,784
Total											
Harvest (number of fish)	21,435	21,435	0	21,135	17,324	17,159	13,293	24,934	21,068	0	-21,435
Ex-vessel harvest value	$713,742	$713,742	$0	$703,763	-$7,900	$571,377	-$142,365	$830,268	$116,526	$0	-$713,742
Harvest (number of fish)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Ex-vessel harvest value	0	0	0	0	0	0	0	0	0	0	0
TOTAL – ALL SUBREGIONS											
Tribal											
Harvest (number of fish)	17569	17569	0	17324	-245	14065	-3504	20438	2869	0	-17569
Ex-vessel harvest value	$565,958	$565,958	$0	$558,058	-$7,900	$453,080	-$112,878	$658,372	$92,414	$0	-$565,958
Non-tribal											
Harvest (number of fish)	7222	7222	0	7121	0	5781	-1441	8401	1179	0	-7222

Ex-vessel harvest value	$288,829	$288,829	$0	$284,781	$0	$231,210	-$57,618	$335,972	$47,143	$0	-$288,829
Total											
Harvest (number of fish)	24,791	24,791	0	24,444	-245	19,846	-4,945	28,838	4,048	0	-24,791
Ex-vessel harvest value	$854,787	$854,787	$0	$842,839	-$7,900	$684,291	-$170,496	$994,344	$139,557	$0	-$854,787

Notes: All dollar values are reported in 2015 dollars.
Source: Ex-vessel values derived based on estimates of harvest provided by NMFS and by simulating the Columbia River economic impact spreadsheet model developed by TCW Economics.

Table A-9. Commercial Harvest and Ex-Vessel Value of Landings by Columbia River Basin Subregion under the Project Alternatives: **Upriver fall Chinook Salmon**

Subregion/ Type of Fishery	Status Quo	Alt. 1- Extension		Alt. 2 – Abundance-based		Alt. 3 – Fixed Rate		Alt. 4 / Alt 6 – Escapement-based / Uncoordinated fishing		Alt. 5 – Fishing curtailment	
	Number	Number	Change from Status Quo Condition	Number	Change from Status Quo Condition	Number	Change from Status Quo Condition	Number	Change from Status Quo Condition	Number	Change from Status Quo Condition
Lower Columbia River Subregion											
Tribal											
Harvest (number of fish)	0	0	0	0	0	0	0	0	0	0	0
Ex-vessel harvest value	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Non-tribal											
Harvest (number of fish)	44,870	44,870	0	44,870	0	40,527	-4342	71,514	26,644	0	-44870
Ex-vessel harvest value	$1,915,825	$1,915,825	$0	$1,915,825	$0	$1,730,413	-$185,412	$3,053,476	$1,137,651	$0	-$1,915,825
Total											
Harvest (number of fish)	44,870	44,870	0	44,870	0	40,527	-4342	71,514	26,644	0	-44870
Ex-vessel harvest value	$1,915,825	$1,915,825	$0	$1,915,825	$0	$1,730,413	-$185,412	$3,053,476	$1,137,651	$0	-$1,915,825
Mid-Columbia River Subregion											
Tribal											
Harvest (number of	187,303	187,303	0	187,303	0	184,203	-3,100	148,242	-39,061	0	-187,303

fish)											
Ex-vessel harvest value	$6,457,182	$6,457,182	$0	$6,457,182	$0	$6,350,328	-$106,855	$5,110,573	-$1,346,609	$0	-$6,457,182
Non-tribal											
Harvest (number of fish)	0	0	0	0	0	0	0	0	0	0	0
Ex-vessel harvest value	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total											
Harvest (number of fish)	187,303	187,303	0	187,303	0	184,203	-3,100	148,242	-39,061	0	-187,303
Ex-vessel harvest value	$6,457,182	$6,457,182	$0	$6,457,182	$0	$6,350,328	-$106,855	$5,110,573	-$1,346,609	$0	-$6,457,182
TOTAL – ALL SUBREGIONS											
Tribal											
Harvest (number of fish)	187303	187303	0	187303	0	184,203	(3,100)	148242	-39061	0	-187303
Ex-vessel harvest value	$6,457,182	$6,457,182	$0	$6,457,182	$0	$6,350,328	-$106,855	$5,110,573	-$1,346,609	$0	-$6,457,182
Non-Tribal											
Harvest (number of fish)	44,870	44,870	0	44,870	0	40,527	-4342	71,514	26,644	0	-44870
Ex-vessel harvest value	$1,915,825	$1,915,825	$0	$1,915,825	$0	$1,730,413	-$185,412	$3,053,476	$1,137,651	$0	-$1,915,825
Total											
Harvest (number of fish)	232,173	232,173	0	232,173	0	224,731	-7,442	219,756	-12,417	0	-232,173

Ex-vessel harvest value	$8,373,007	$8,373,007	$0	$8,373,007	$0	$8,080,741	-$292,266	$8,164,049	-$208,958	$0	-$8,373,007

Notes: All dollar values are reported in 2015 dollars.
Source: Ex-vessel values derived based on estimates of harvest provided by NMFS and by simulating the Columbia River economic impact spreadsheet model developed by TCW Economics.

Table A-10. Commercial Harvest and Ex-Vessel Value of Landings by Columbia River Basin Subregion under the Project Alternatives: Upriver **Sockeye Salmon**

Subregion/ Type of Fishery	Status Quo	Alt. 1-Extension		Alt. 2 – Abundance-based		Alt. 3 – Fixed Rate		Alt. 4 / Alt 6 – Escapement-based / Uncoordinated fishing		Alt. 5 – Fishing curtailment	
	Number	Number	Change from Status Quo Condition	Number	Change from Status Quo Condition	Number	Change from Status Quo Condition	Number	Change from Status Quo Condition	Number	Change from Status Quo Condition
Lower Columbia River Subregion											
Tribal											
Harvest (number of fish)	0	0	-	0	-	0	-	0	-	0	-
Ex-vessel harvest value	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Non-tribal											
Harvest (number of fish)	512	512	0	611	99	512	0	14170	13658	0	-512
Ex-vessel harvest value	$3,744	$3,744	$0	$4,471	$0	$3,743	-$1	$103,614	$99,871	$0	-$3,744
Total											
Harvest (number of fish)	512	512	0	611	99	512	0	14170	13658	0	-512
Ex-vessel harvest value	$3,744	$3,744	$0	$4,471	$0	$3,743	-$1	$103,614	$99,871	$0	-$3,744
Mid-Columbia River Subregion											
Tribal											
Harvest (number of	16440	16440	0	23071	6631	16531	91	65772	49332	0	-16440

fish)											
Ex-vessel harvest value	$106,825	$106,825	$0	$149,916	$43,091	$107,417	$592	$427,379	$320,553	$0	-$106,825
Non-tribal											
Harvest (number of fish)	0	0	0	0	0	0	0	0	0	0	0
Ex-vessel harvest value	0	0	0	0	0	0	0	0	0	0	0
Total											
Harvest (number of fish)	16440	16440	0	23071	6631	16531	91	65772	49332	0	-16440
Ex-vessel harvest value	$106,825	$106,825	$0	$149,916	$43,091	$107,417	$592	$427,379	$320,553	$0	-$106,825
TOTAL – ALL SUBREGIONS											
Tribal											
Harvest (number of fish)	16,440	16,440	0	23,071	6,631	16,531	91	65,772	49,332	0	-16,440
Ex-vessel harvest value	$106,825	$106,825	$0	$149,916	$43,091	$107,417	$592	$427,379	$320,553	$0	-$106,825
Non-tribal											
Harvest (number of fish)	512	512	0	611	99	512	0	14,170	13,658	0	-512
Ex-vessel harvest value	$3,744	$3,744	$0	$4,471	$727	$3,743	-$1	$103,614	$99,871	$0	-$3,744
Total											
Harvest (number of fish)	16,952	16,952	0	23,683	6,730	17,043	91	79,942	62,990	0	-61,310

Ex-vessel harvest value	$110,569	$110,569	$0	$154,386	$43,818	$111,160	$591	$530,993	$420,424	$0	-$110,569

Notes: All dollar values are reported in 2015 dollars.
Source: Ex-vessel values derived based on estimates of harvest provided by NMFS and by simulating the Columbia River economic impact spreadsheet model developed by TCW Economics.

Table A-11. Commercial Harvest and Ex-Vessel Value of Landings by Columbia River Basin Subregion under the Project Alternatives: **Snake River B-Index Steelhead**

Subregion/ Type of Fishery	Status Quo	Alt. 1- Extension		Alt. 2 – Abundance -based	Alt. 3 – Fixed Rate		Alt. 4 / Alt 6 – Escapement-based / Uncoordinated fishing			Alt. 5 – Fishing curtailment	
	Number	Number	Change from Status Quo Condition	Number	Change from Status Quo Condition	Number	Change from Status Quo Condition	Number	Change from Status Quo Condition	Number	Change from Status Quo Condition
Lower Columbia River Subregion											
Tribal											
Harvest (number of fish)	0	0	0	0	0	0	0	0	0	0	0
Ex-vessel harvest value	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Non-Tribal											
Harvest (number of fish)	0	0	0	0	0	0	0	0	0	0	0
Ex-vessel harvest value	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total											
Harvest (number of fish)	0	0	0	0	0	0	0	0	0	0	0
Ex-vessel harvest value	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Mid-Columbia River Subregion											
Tribal											
Harvest (number of fish)	8945	8945	0	8945	0	8306	-639	11018	2073	0	-8945
Ex-vessel harvest value	$122,799	$122,799	$0	$122,799	$0	$114,031	-$8,769	$151,257	$28,457	$0	-$122,799
Non-tribal											

Harvest (number of fish)	0	0	0	0	0	0	0	0	0	0	0
Ex-vessel harvest value	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total											
Harvest (number of fish)	8,945	8,945	0	8,945	0	8,306	-639	11,018	2,073	0	-8,945
Ex-vessel harvest value	$122,799	$122,799	$0	$122,799	$0	$114,031	-$8,769	$151,257	$28,457	$0	-$122,799
TOTAL – ALL SUBREGIONS											
Tribal											
Harvest (number of fish)	8,945	8,945	0	8,945	0	8,306	-639	11,018	2,073	0	-8,945
Ex-vessel harvest value	$122,799	$122,799	$0	$122,799	$0	$114,031	-$8,769	$151,257	$28,457	$0	-$122,799
Non-tribal											
Harvest (number of fish)	0	0	0	0	0	0	0	0	0	0	0
Ex-vessel harvest value	$0	$0	$0	$0	$0	$0	$0	$0	$1,720	$0	$0
Total											
Harvest (number of fish)	8,945	8,945	0	8,945	0	8,945	-639	11,018	2,073	0	-8,945
Ex-vessel harvest value	$122,799	$122,799	$0	$122,799	$0	$114,031	-$8,769	$151,257	$28,457	$0	-$122,799

Notes: All dollar values are reported in 2015 dollars.
Source: Ex-vessel values derived based on estimates of harvest provided by NMFS and by simulating the Columbia River economic impact spreadsheet model developed by TCW Economics.

Table A-12. Impacts of the project alternatives on catch, angler trips and trip-related angler expenditures associated with recreation fishing for all harvest indicator stocks, by Columbia River subregion.

Subregion/ Type of Fishery	Status Quo	Alt. 1- Extension		Alt. 2 – Abundance-based		Alt. 3 – Fixed Rate		Alt. 4 / Alt. 6 – Escapement-based / Uncoordinated fishing		Alt. 5 – Fishing curtailment	
	Number	Number	Change from Status Quo Condition	Number	Change from Status Quo Condition	Number	Change from Status Quo Condition	Number	Change from Status Quo Condition	Number	Change from Status Quo Condition
Lower Columbia River Subregion											
Catch	51,554	51,554	0	59,209	0	47,064	-4,490	155,704	104,150	0	-51554
Estimated angler trips	240,167	240,167	0	280,456	40,289	219,551	(20,616)	753,994	513,827	0	(240,167)
Trip-related angler expenditures	$35,708,509	$35,708,509	$0	$39,448,870	$3,740,361	$32,464,451	-$3,244,058	$98,390,721	$62,682,211	$0	-$35,708,509
Mid-Columbia-River Subregion											
Catch	19,812	19,812	0	19,748	0	18,068	-1,744	27,507	7,695	0	-19812
Estimated angler trips	97,414	97,414	0	97,076	(338)	88,899	(8,514)	134,950	37,537	0	(97,414)
Trip-related angler expenditures	$9,317,305	$9,317,305	$0	$9,285,932	-$31,372	$8,234,110	-$1,083,195	$12,779,061	$3,461,756	$0	-$9,317,305
Lower Snake River Subregion											
Catch	900	900	0	900	0	862	-38	1333	433	0	-900
Estimated angler trips	4,737	4,737	0	4,737	0	4,535	(202)	7,016	2,280	0	(4,737)
Trip-related angler expenditures	$439,758	$439,758	$0	$439,758	$0	$421,033	-$18,725	$651,391	$211,633	$0	-$439,758
TOTAL (all subregions)											
Catch	71,366	71,366	0	78,957	0	65,132	-6,234	183,211	111,845	0	-71,366

Estimated angler trips	342,318	342,318	-	382,269	39,951	312,986	(29,332)	895,961	553,643	-	(342,318)
Trip-related angler expenditures	$45,465,572	$45,465,572	$0	$49,174,560	$3,708,988	$41,119,593	-$4,345,979	$111,821,173	$66,355,600	$0	-$45,465,572

Notes: All dollar values are reported in 2016 dollars.

Source: Derived based on harvest estimates provided by NMFS and by simulating the Columbia River basin economic impact spreadsheet model developed by TCW Economics.

Table A-13. Contribution of commercial and recreational salmon and steelhead fishing for harvest indicator stocks to personal income and jobs in the Columbia River basin, by subregion.

Subregion/ Type of Fishery	Status Quo	Alt. 1- Extension		Alt. 2 – Abundance-based		Alt. 3 – Fixed Rate		Alt. 4 / Alt. 6– Escapement-based / Uncoordinated fishing		Alt. 5 – Fishing curtailment	
	Number	Number	Change from Existing Conditions	Number	Change from Existing Conditions	Number	Change from Existing Conditions	Number	Change from Existing Conditions	Number	Change from Existing Conditions
Lower Columbia River Subregion											
Commercial Fisheries											
Personal Income ($,000)	$3,783	$3,783	-	$3,781	-$2	$3,425	-$358	$6,024	+$2,241	$0	-$3,783
Jobs	86	86	-	86	0	78	-8	137	+51	0	-86
Recreational Fisheries											
Personal Income ($,000)	$19,602	$19,602	-	$22,891	+$3,288	$17,920	-$1,683	$61,541	+$41,939	$0	-$19,602
Jobs	446	446	-	520	+75	407	-38	1,399	+954	0	-446
Mid-Columbia River Subregion											
Commercial Fisheries											
Personal Income ($,000)	$12,400	$12,400	-	$12,452	+$52	$11,918	-$482	$11,778	-$622	$0	-$12,400
Jobs	332	332	-	334	+1	319	-13	316	-17	0	-332
Recreational Fisheries											
Personal Income ($,000)	$7,951	$7,951	-	$7,923	-$28	$7,256	-$695	$11,015	+$3,064	$0	-$7,951
Jobs	213	213	-	212	-1	195	-19	295	+82	0	-213
Lower Snake River Subregion											
Commercial Fisheries											
Personal	$0	$0	-	$0	-	$0	-	$0	-	$0	-

Income ($,000)											
Jobs	0	0	-	0	-	0	-	0	-	0	-
Recreational Fisheries											
Personal Income ($,000)	$387	$387	-	$387	-	$370	-$16	$573	+$186	$0	-$387
Jobs	13	13	-	13	-	13	-1	20	+6	0	-13
Total (all Columbia River subregions)											
Commercial Fisheries											
Personal Income ($,000)	$16,183	$16,183	-	$16,213	+$50	$15,343	-$841	$17,802	+$1,619	$0	-$16,183
Jobs	419	419	-	420	+1	398	-21	453	+34	0	-419
Recreational Fisheries											
Personal Income ($,000)	$27,940	$27,940	-	$31,201	+$3,261	$25,546	-$2,394	$73,128	+$45,188	$0	-$27,940
Jobs	672	672	-	746	+74	615	-57	1,714	+1,042	0	-672

Notes: All dollar values are reported in 2015 dollars.

Source: Derived based on estimates of sport fishing effort provided by NMFS and by simulating the Puget Sound economic impact spreadsheet model developed by TCW Economics.

Source: Derived by TCW Economics using estimates of commercial salmon harvest (Table 4.5-2) provided by NMFS and sport fishing trips (Table 4.5-3) estimated by TCW Economics based on catch estimates provided by NMFS, and simulation of the economic impact model.

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APPENDIX B

***US v. OREGON* AGREEMENT EIS**

***US v Oregon* Management Agreement Hatchery Production Review**

US v Oregon Management Agreement Hatchery Production Review

Comparison of the programs, as analyzed in the Mitchell Act EIS.

This review has determined that the Mitchell Act EIS contains an analysis of 113 of the 1156 programs referenced in the agreement and that, for the majority of these programs, the production levels that are referenced in the agreement tables (B1-B7), are contained at or within the individual hatchery program production levels analyzed in the Mitchell Act EIS, and therefore will result in substantially similar impacts to the environment, particularly to threatened or endangered salmon and steelhead. Additionally, the overall production level in the agreement, by species and run-timing, is also well represented in the Mitchell Act EIS analysis. Table 1 shows the overall hatchery production level and program number, referenced in the agreement compared to the levels analyzed in the Mitchell Act EIS.

Table B-1. Comparison of Hatchery Program Production Referenced in the *US v Oregon* Management Agreement Compared to the Hatchery Production Analyzed in the Mitchell Act EIS (NMFS 2014b).

Hatchery Species	Total Proposed *US v Oregon* Releases	Mitchell Act EIS Releases (range across alternatives)	Percent of *US v Oregon* Production Analyzed in Mitchell Act EIS
Spring Chinook salmon	19,236,461	14,741,000 to 20,936,000	77% - 109%
Summer Chinook salmon	5,996,569	5,465,000 to 7,517,000	91% - 125%
Fall Chinook salmon	42,176,000	4,359,000 to 42,680,000	10% - 101%
Sockeye salmon	1,000,000	500,000	50%
Steelhead	6,783,300	6,085,000 to 8,167,000	90% - 120%
coho salmon	8,550,000	2,508,000 to 8,400,000	29%-98%
Total	**83,742,330**	**33,658,000 to 88,200,000**	**40% - 105%**

6 This total (115) considers programs that release juvenile salmon or steelhead, as referenced in Tables B1-B7 of the agreement; the Snake River fall Chinook salmon program (agreement Table B4) is counted as one program, as analyzed in the MA EIS.

	Proposed # *US v Oregon* programs	**MA EIS Analyzed # Programs**	**% of *US v Oregon* programs analyzed in Mitchell Act**
Spring Chinook salmon	39	39	100%
Summer Chinook salmon	14	13	92%
Fall Chinook salmon	16	15	93%
Sockeye salmon	1	1	100%
Steelhead	32	32	100%
coho salmon	13	12	92%
Total	**115**	**112**	**97%**

Even though for most species, production levels, and program numbers identified in Table 1, the Mitchell Act EIS analysis provides a thorough analysis the effects of the production levels referenced in the agreement, there are several individual programs where the program production size in the agreement is different than either, the specific level or range of production analyzed in the Mitchell Act EIS. Of the 115 hatchery programs that are referenced in the *US v Oregon* Management Agreement tables, 2 programs are newly added, and therefore were not considered in the Mitchell Act EIS analysis, and 42 of the programs have production levels, individually, that are either less than or greater than levels analyzed in the Mitchell Act EIS, and by species the overall changes in the *US v Oregon* proposal for hatchery releases is small.

Types of Hatchery Program Referenced in the *US v Oregon* Agreement

The Production tables (B1-B7) of the agreement contain hatchery programs organized by species and run-timing. Each of the tables identified the individual hatchery program release, location, hatchery facilities related to the program, and identify a primary program purpose. These purposes are: Supplementation, Fishery, or Supplementation/Fishery.

As described in the Mitchell Act EIS, *Section 2.3.2, Purpose of Hatchery Programs*, the NMFS categorized hatchery programs, by purpose, in three categories: Conservation, Harvest, or Both. These

describe, generally, the purpose of the individual programs, relative to the intent for the returning adult salmon or steelhead. An artificial production program that produces fish primarily or exclusively for conservation rather than for harvest is a conservation program, while harvest programs produce fish exclusively for harvest augmentation. The third category are programs which are managed to generate both a harvest benefit and a benefit to the local natural-origin population of salmon or steelhead; these are categorized as "both" in the Mitchell Act EIS.

The *US v Oregon* management agreement uses different terminology to describe these same program goals. Therefore, for the purposes of this review, NMFS has classified programs identified as "Supplementation" in the agreement as "Conservation". For programs classified as "Fishery" in the agreement, NMFS has identified them as "Harvest". For programs classified as "Supplementation/Fishery" in the agreement, NMFS has identified them as "Both". This aligns the program's purpose, as described in the agreement tables, with the categories used in the Mitchell Act EIS analysis.

Comparison of Agreement-Referenced Programs and the Same Programs in the Mitchell Act EIS

Of the programs within the *US v Oregon* Agreement which have production levels that vary from the level (larger or smaller) analyzed in the Mitchell Act EIS (44), 48% (21) of them are conservation programs. Additionally, 11 of the programs (25%) are in the "both" category and have a conservation objective as part of their intended benefit, as well as harvest. Lastly, there are 12 programs (27%) that have harvest as the objective for the program.

Of the 21 conservation programs identified above: 1 program is new, and 1 program has changed release location; 10 programs propose to release fewer hatchery fish and 11 programs (including the new and changed release location programs) propose to release more hatchery fish than the same programs, as analyzed, in the Mitchell Act EIS. Of the 11 programs identified in the both category, above, 3 programs propose to release fewer hatchery fish and 8 propose to release more hatchery fish than the same programs, as analyzed, in the Mitchell Act EIS. The 12 harvest programs, identified above, all were analyzed in the Mitchell Act EIS. Of these, 5 propose to release fewer hatchery fish and 7 hatchery programs propose to release more hatchery fish than the same programs, as analyzed, in the Mitchell Act EIS.

Review of the Effects of Hatchery programs on Populations of Salmon and Steelhead

As described in detail in Section *3.2.3.1, General Risks and Benefits of Hatchery programs to Salmon and*

Steelhead Species, in the Mitchell Act EIS, hatchery salmon and steelhead programs can have beneficial effects to these species but also pose risks.

Effects to population Viability

McElhany et al. (2000) developed the viable salmonid population (VSP) concept as a means to evaluate the conservation status of Pacific salmon and steelhead. A key part of this approach was the identification of four measurable indicators of population health that should be considered in performing conservation status assessments. These indicators of population status are abundance (the number of natural-origin spawners), productivity (the ratio of natural-origin offspring produced per parent), diversity (the genetic variety among population members), and spatial structure (the distribution of population members across a subbasin or subbasins).

Hatchery programs can provide benefits to some of these VSP indicators under certain circumstances, but can pose risks to VSP as well.

Effects on Abundance and Productivity

As described in detail in *Section 3.2.3.1.1.1*, of the Mitchell Act EIS, a primary benefit conferred by hatchery programs is an increase in the total abundance of a salmon population that returns to spawn naturally. Freshwater, habitat-related factors limiting the survival and productivity of a natural-origin population can be circumvented by spawning, incubating, rearing, and releasing fish from the population in a hatchery facility. In the situation where the hatchery stock is the same genetic population as the natural-origin population, the hatchery may also act as a protection for the population against catastrophic environmental conditions (e.g., Grande Ronde spring Chinook captive broodstock and Snake River sockeye hatchery programs). Productivity may also be increased if hatchery-origin fish improve conditions of spawning gravel or add nutrients to the system.

Hatchery programs may also pose risks to abundance and productivity because they can lead to additional mortality of natural-origin fish through competition, predation, disease, and fisheries. They may also unfavorably alter the genetic character of the natural-origin population (discussed below), or restrict the distribution of a population across its habitat. Abundance and productivity would be the most directly affected by any increased mortality on natural-origin fish. Substantial increases in mortality would be readily observable as a reduction in the abundance of natural-origin fish. Increased mortality would also result in a less efficient reproductive conversion of spawning adults to surviving offspring, which would be detectable as a reduction in productivity. A reduction in productivity would be measured as the ratio of

surviving offspring (adults) per parents.

Effects on Genetic Diversity

Salmon and steelhead often differ genetically from population to population because of their strong tendency to return to spawn in their home stream. This behavior allows the forces of natural selection, mutation, and random genetic drift to operate in relative isolation in different streams or subbasins, resulting in genetic differences. In many instances, these differences are adaptive, allowing a local population to have a greater ability to survive and persist in that environment than would another population (Taylor 1991; McElhany et al. 2000).

While hatchery programs can help to conserve salmon and steelhead populations, particularly those at very low abundance and in danger of extirpation (e.g., Snake River sockeye salmon captive brood program, Tucannon River spring Chinook salmon captive brood program, and the White River [Wenatchee] spring Chinook salmon captive brood program), hatchery programs can also pose genetic risks to salmon and steelhead populations. Populations of fish, adapted to the hatchery environment, that interbreed with natural-origin populations can result in substantial genetic changes (a diversity indicator) that are maladaptive for natural-origin fish in the natural environment. In addition to affecting population diversity, such changes would likely adversely impact the reproductive efficiency of natural-origin populations, lowering productivity. These effects would be most pronounced when highly domesticated and/or non-native hatchery-origin fish from isolated hatchery programs interbreed with natural-origin fish at excessive levels. However, even optimally managed, integrated hatchery programs using native fish can be expected to result in some risks to genetic diversity.

Effects on Spatial Structure

Hatchery programs can benefit the spatial structure of salmon and steelhead populations. The potential for a hatchery program to increase total adult returns to a particular river basin (see Effects on Abundance and Productivity, above) can expand the spatial distribution of spawning by forcing fish to inhabit less competitive reaches of the basin. Programs that spatially distribute juvenile releases throughout a particular river basin can increase the distribution of the returning hatchery-origin adults. Additionally, hatchery programs can be used to expand the area of a basin that is used for natural spawning, i.e., by transporting or passing hatchery-origin adults above a dam or other impassable barrier.

Hatchery programs can also pose risks to spatial structure through a number of actions. These include the operation of weirs that can impede upstream migration of returning adults or the construction of migration

barriers to prevent the entry of spawners into portions of the watershed to ensure that the hatchery facility's water supply is less prone to carrying disease.

Other Effects from Hatchery Programs

Ecological Effects

Although competition and predation are identified as individual risks, they are related to each other and, as a consequence, are frequently lumped together and described in the scientific literature as "ecological" effects. Competition is an interaction among members of the same species or different species utilizing a limited resource (e.g., food or space). Competition typically results in winners and losers. Competition between hatchery-origin and natural-origin fish may result from direct interactions, in which hatchery-origin fish interfere with access to limited resources by natural-origin fish, or indirect interactions, as when utilization of a limited resource by hatchery-origin fish reduces the amount available for natural-origin fish (Species Interaction Work Group [SIWG] 1984). Specific types of competition include competition for food, for territory among stream-rearing juveniles, for mates, and for spawning sites.

For adult salmon and steelhead, effects from competition between hatchery-origin and natural-origin fish are assumed greatest in the spawning areas where competition for mates and spawning habitat occurs (U.S. Fish and Wildlife Service [USFWS] 1994). Hatchery-origin females compete with natural-origin females for spawning sites, and hatchery-origin males compete with natural-origin males for female mates. Although there is evidence that natural-origin fish have a competitive advantage over hatchery-origin fish in these situations (Fleming and Gross 1993; Berejikian et al. 1997) where spawning area is limited and abundances are high relative to available space, competition would likely be high. This circumstance could also result in superimposition (overlaying) of redds.

Juvenile hatchery-origin fish released into the natural environment may compete with natural-origin fish for resources as they migrate downstream. Steelhead, coho salmon, and spring Chinook salmon typically will migrate downstream rapidly once they make a complete physiological transition to the smolt life history stage. Therefore, the hatchery programs posing the least risk from competition are those that consistently produce full-term, rapidly migrating smolts that use river corridors as a "highway" to the ocean with minimal foraging and competition with natural-origin fish along the way. This ideal is difficult to achieve. Not all individuals in a population undergo the smolt transformation at the same time. Evidence suggests that smoltification timing can vary by 45 or more days within a single population (Quinn 2005). Most hatchery programs, however, release fish over a shorter period (e.g., 2 weeks). Such

releases will include fish that have not yet smolted, as well as fish for which the peak smolt condition has passed. Juveniles released too early or too late with respect to smoltification are likely to migrate slowly, if at all. Because of their prolonged period in freshwater, such fish have a much greater opportunity to compete with natural-origin fish for food and space. Competition heightens if hatchery-origin fish are more numerous and are of equal or greater size. Although non-migratory, hatchery-origin juveniles (residuals) may eventually die, there will be a period when there may be significant competition with natural-origin fish.

Migrant juvenile chum salmon and fall Chinook salmon spend an extended period in the estuarine environment feeding and growing before they move into marine waters (Quinn 2005). Hatchery programs that release sub-yearling juveniles thus are more likely to create a competitive environment for natural-origin fall Chinook salmon and chum salmon. This situation may be particularly acute in the Columbia River, where the estuary has suffered a major loss of shallow water rearing habitat in the past century (Bottom et al. 2005). These habitat losses are likely to have reduced the capacity of these areas to support juvenile salmon, therefore exacerbating competition between hatchery-origin and natural-origin fish for the remaining habitat.

Competition may also occur within stream habitats when young, pre-migratory fish are released, regardless of the species involved. Release of large numbers of fry or pre-smolts in a small area has great potential for competitive effects because interactions can occur for long periods, up to 3 years in the case of steelhead. The potential effect of competition on the behavior, and hence survival, of natural-origin fish depends on the degree of spatial and temporal overlap, relative sizes, and relative abundance of the two groups (Steward and Bjornn 1990). Effects would also depend on the degree of dietary overlap, food availability, size-related differences in prey selection, foraging tactics, and differences in microhabitat use (Steward and Bjornn 1990).

In addition to the freshwater and estuarine environments, competition between hatchery-origin and natural-origin fish may extend into the marine environment. Evidence exists for density-dependent ocean survival affecting pink and chum salmon hatchery programs in Alaska, Russia, and Japan (Pearcy 1992). However, it is unclear whether density-dependent survival is a factor for coho salmon, steelhead, and Chinook salmon.

Hatchery Facility Effects

Potential risks to natural populations of salmon and steelhead from the operation of hatchery facilities

include: hatchery facility failure (power or water loss leading to catastrophic fish losses); hatchery facility water intake effects (stream dewatering and fish entrainment); hatchery passage effects (blocking upstream or downstream fish passage); and hatchery facility effluent discharge effects (deterioration of downstream water quality).

Risk of hatchery facility failure is of particular concern when facilities rear species listed under ESA. Factors such as water supply flow reductions or failure, flooding, and poor facility conditions may cause hatchery facility failure or the catastrophic loss of fish under propagation.

Hatchery Facility Water Intake Effects. Water withdrawals for hatcheries within spawning and rearing areas can diminish streamflow, impeding migration and affecting the spawning behavior of salmon and steelhead. In addition, that portion of a hatchery facility's water supply that comes from a water source containing natural-origin fish must have an intake structure with adequate screening such that injury and mortality, whether from impingement or permanent removal, is very low or avoided altogether.

Hatchery facilities can have many types of in-stream structures, depending on the location and type of facility. Most commonly, hatchery in-stream structures are for water supply intakes. These structures, typically are used to increase the available water volume for the facility by either utilizing a small dam to back water up and increase depth and pressure for non-pump facility intakes, or increase the depth for pump facility intakes. These facilities typically require a structure across the entire width of the stream or a portion of the stream depending on the site-specific requirements. These structures can affect access to usable habitat above the hatchery facility. These structures can also affect the downstream migration of fish in the stream, water volumes and flow are significantly affected by the structure or if the structure did not consider downstream migration in the original design.

Effluent discharges can change water temperature, pH, suspended solids, ammonia, organic nitrogen, total phosphorus, and chemical oxygen demand in the receiving stream's mixing zone (Kendra 1991). Little information and data exist to show how a hatchery facility's effluent affects salmon and steelhead and other stream dwelling organisms. Generally, the level of impact depends on the amount of discharge and the flow volume of the receiving stream. Any effects probably occur at the immediate point of discharge, because the effluent would dilute rapidly as it moves downstream. The Clean Water Act (CWA) requires hatcheries (i.e., aquatic animal production facilities) with annual production greater than 20,000 pounds to obtain a National Pollutant Discharge Elimination System (NPDES) permit to discharge effluent to surface waters. Currently the states of Washington and Oregon implement NPDES permit systems. The U.S. Environmental Protection Agency (EPA) currently administers hatchery effluent permitting for the

state of Idaho (Section 1.7.8, Clean Water Act). These permits are intended to protect aquatic life and public health and to ensure that every facility treats its wastewater. The effects from the releases are analyzed prior to the issuance of the permit, and site-specific discharge limits are set. Additionally, monitoring and reporting requirements for the permits are subject to enforcement actions (EPA 2006).

Potential Differences in Effect-level of the U.S. v OR Agreement-Referenced Hatchery Production

After a thorough review, NMFS has identified the following additional effects to salmon and steelhead to disclose, beyond those discussed in the Mitchell Act EIS, which would be likely to result from the hatchery production programs referenced in the agreement tables B1-B7. A brief overview of those impacts is below, but for detailed program-specific disclosures of impacts please refer to the details in Table 2.

Conservation Programs

For conservation programs where the production level has been decreased, relative to the programs in the Mitchell Act EIS (10 programs), the potential changes in impact to affected natural populations of salmon and steelhead would be: reductions to the abundance benefit of the conservation programs; higher benefits to the population's productivity; reduced risks to population genetic diversity; and a likely lower benefit to the population's special structure.

For conservation programs where the production level has been increased, relative to the programs in the Mitchell Act EIS (11 programs), the potential changes in impact to affected natural populations of salmon and steelhead would be: increases to the abundance benefit of the conservation programs; lower benefits to the population's productivity; increased risks to population genetic diversity; and a likely greater benefit to the population's special structure.

Programs Identified as having "Both" purposes

For programs identified as having both conservation and harvest goals, and where the production level has been decreased, relative to the programs in the Mitchell Act EIS (3 programs), the potential changes in impact to affected natural populations of salmon and steelhead would be: lower benefits to population abundance; higher benefits to population productivity; lower risks to population genetic diversity; and lower benefit to population special structure.

For conservation programs where the production level has been increased, relative to the programs in the Mitchell Act EIS (8 programs), the potential changes in impact to affected natural populations of salmon

and steelhead would be: higher benefits to population abundance; higher risks to population productivity; higher risks to population genetic diversity; and higher benefit to population special structure.

Harvest Programs

For programs identified as having harvest-only goals, and where the production level has been decreased, relative to the programs in the Mitchell Act EIS (5 programs), the potential changes in impact to affected natural populations of salmon and steelhead would be: lower risks to population abundance; lower risks to the population's productivity; lower risks to population genetic diversity; and lower risks to population special structure.

For programs identified as having harvest-only goals, and where the production level has been increased, relative to the programs in the Mitchell Act EIS (7 program), the potential changes in impact to affected natural populations of salmon and steelhead would be: higher risks to population abundance; higher risks to population productivity; higher risks to population genetic diversity; and higher risks to population special structure.

All programs with different production levels

For these programs, regardless of the goal of the program, the operation of hatchery facilities presents potential risks to salmon and steelhead populations residing in the streams where the facilities are located. For these programs, regardless of the goal of the program, the operation of hatchery facilities presents potential risks to salmon and steelhead populations residing in the streams where the facilities are located. In reviewing the differences in production levels between the agreement-referenced programs and those analyzed in the Mitchell Act EIS, NMFS considered the increases in production, for some programs, and the decreases in production, for some programs, represented by the programs in the *US v Oregon* agreement, relative to the programs, as analyzed, in the Mitchell Act EIS. The small scale of these changes, in numbers of fish, and the relationship of that change to the total production at the facilities used makes it difficult to estimate the likely change in facility effects to water quality from these production differences. Additionally, considering that the facilities operating in the Columbia River basin, including the facilities associated with the production in the *US v Oregon* agreement, operate under existing federal Clean Water Act (CWA), National Pollution Discharge Elimination System (NPDES) permits (when required), NMFS concludes that the differences in the hatchery program releases, included in the *US v Oregon* Agreement, relative to the programs analyzed in

the Mitchell Act EIS, are not likely to have substantively different effects to the water quality where they operate.

For these programs, regardless of the goal of the program, the release of hatchery fish into the waters where natural salmon and steelhead populations reside presents risks from ecological effects. As described above, these ecological risks can negatively impact these population through competition for space and resources and through direct and indirect predation. Here NMFS assessment utilizes a more direct relationship between the size of the program and the potential for impact through ecological interaction, with increases in production resulting in higher potential ecological risks and lower production resulting in lower ecological risks, relative to the analysis in the Mitchell Act EIS, see Table 2.

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Table B-2. Program-specific Review of Potential Differences in Impact Level, Relative to the same Program Analyzed in the Mitchell Act EIS (alternate shading for ESU/DPS affected).

Species/Run	**Program Location** (MA EIS subbasin)	**Proposed Hatchery Program release site** (*US v Oregon* Production Tables B1-B7)	**Program Type**	**Affected Salmon/ Steelhead ESU/DPS**	**ESA Listing Status of Potentially affected Pop**	**Hatchery Program Production Referenced in *US v Oregon* Production Tables B1-B7**	**Program Size or Range Analyzed in the Mitchell Act EIS**	**Difference in *US v Oregon* Hatchery program size[1]**	**Potential Impacts of *US v Oregon* Production to Natural Salmon and Steelhead Populations, Relative to the program size analyzed in the MA EIS)**					
									Effects to Salmon and Steelhead population (VSP)				**Ecological Effects - Target population and other salmonids**	**Facility Effects**
									Abundance	Productivity	Diversity	Spatial Structure		
Spring Chinook (Agreement Table B1)	Methow	Twisp River Acc. Site	Conservation	UCR Spring Chinook	Endangered	29,123	77,000-101,000	-71%	lower benefit	higher benefit	lower risk	lower benefit	lower risk	no difference
	Wenatchee	Chiwawa R. Acc. Site	Conservation	UCR Spring Chinook	Endangered	144,026	249,000-672,000	-96%	lower benefit	higher benefit	lower risk	lower benefit	lower risk	no difference
	Wenatchee	Nason Creek	Conservation	UCR Spring Chinook	Endangered	223,670	250,000	-11%	lower benefit	higher benefit	lower risk	lower benefit	lower risk	no difference
	Clearwater	Meadow Creek (Selway)	Conservation	Snake River spring/Summer Chinook	Not listed in Clearwater River	400,000	430,000	-7%	lower benefit	higher benefit	lower risk	lower benefit	lower risk	no difference
	Clearwater	Clear Cr.	Harvest	Snake River spring/Summer Chinook	Not listed in Clearwater River	635,000	701,000	-9%	lower risk	lower risk	lower risk	lower risk	lower risk	no difference
	Salmon	On Station (Rapid River)	Harvest	Snake River spring/Summer Chinook	Threatened	2,500,000	2,600,000	15%	higher risk	higher risk	higher risk	higher risk	higher risk	no difference
	Salmon	Little Salmon River	Harvest	Snake River spring/Summer Chinook	Threatened	150,000	included in above							
	Snake	Hells Canyon – Snake R.	Harvest	Snake River spring/Summer Chinook	Threatened	350,000	included in above							
Spring Chinook (Agreement Table B1) Cont.	Clearwater	Clearwater River/NPTH	Both	Snake River spring/Summer Chinook	Not listed in Clearwater River	200,000	125,000	60%	higher benefit	higher risk	higher risk	higher benefit	higher risk	no difference
	Clearwater	On Station (Dworshak)	Harvest	Snake River spring/Summer Chinook	Not listed in Clearwater River	1,050,000	1,000,000	5%	no difference	no difference	no difference	no difference	higher risk	no difference
	Deschutes	On Station (Round Butte)	Harvest	Mid-C Spring Chinook	Not listed	380,000	240,000	58%	higher risk	higher risk	higher risk	higher risk	higher risk	higher risk

	Hood	Hood River (Round Butte/Parkdale)	Both	LCR Chinook	Threatened	250,000	75,000-85,000	194%	higher benefit	higher risk	higher risk	higher benefit	higher risk	no difference
Summer Chinook (Agreement Table B2)	UCR mainstem	Chelan River	Harvest	UCR Summer/Fall Chinook	Not listed	400,000	600,000	-4%	no difference	no difference	no difference	no difference	Lower risk	no difference
	UCR mainstem	Chelan River	Harvest	UCR Summer/Fall Chinook	Not listed	176,000	included in above							
	Wenatchee	Dryden Ponds	Both	UCR Summer/Fall Chinook	Not listed	500,000	863,000	-42%	lower benefit	higher benefit	lower risk	lower benefit	lower risk	no difference
	Methow	Carlton Rearing Pond	Both	UCR Summer/Fall Chinook	Not listed	200,000	400,000	-50%	lower benefit	higher benefit	lower risk	lower benefit	lower risk	no difference
	Okanogan	Okanogan/ Similkameen Rivers	Both	UCR Summer/Fall Chinook	Not listed	166,569	576,000-1,450,000	-89%	lower benefit	higher benefit	lower risk	lower benefit	lower risk	no difference
Summer Chinook (Agreement Table B2) Cont.	UCR mainstem	Wells or other locations	Research	UCR Summer/Fall Chinook	Not listed	200,000	399,000	-50%	lower benefit	higher benefit	lower risk	lower benefit	lower risk	no difference
	Yakima	Yakima Basin (Prosser/Marion Drain)	Both	UCR Summer/Fall Chinook	Not listed	1,000,000	500,000	100%	higher benefit	higher risk	higher risk	higher benefit	higher risk	no difference
	Salmon	Johnson Creek	Conservation	Snake River spring/Summer Chinook	Threatened	150,000	100,000	50%	higher benefit	lower benefit	higher risk	higher benefit	higher risk	no difference
	Salmon	Curtis Cr/Cabin Cr	Conservation	Snake River spring/Summer Chinook	Threatened	300,000 (eyed eggs)	New Program[2]		benefit	benefit	risk	benefit	risk	N/A
Sockeye (Agreement Table B3)	Salmon	Stanley Basin	Conservation	Snake River Sockeye	Endangered	1,000,000	500,000	100%	higher benefit	lower benefit	higher risk	higher	higher risk	no difference
Fall Chinook (Agreement Table B5)	Umatilla River	Umatilla	Both	Reintroduction	Not listed	600,000	included in below	39%	higher benefit	higher risk	higher risk	higher benefit	higher risk	no difference
	Umatilla River (Pendleton Acclimation Site)	Umatilla	Both	Reintroduction	Not listed	780,000	999,000-1,080,000							
	Umatilla River	Umatilla	Both	Reintroduction	Not listed	120,000	included in above							

Steelhead (Agreement Table B6)	Twisp River Various locations	Methow	Conservation	UCR Steelhead	Threatened	48,000	50,000	-4%	no difference	no difference	no difference	no difference	lower risk	no difference
	Cottonwood Pond, Grande Ronde River	Grande Ronde	Harvest	Snake River Steelhead	Threatened	225,000	160,000-200,000	13%	higher risk	high risk	higher risk	higher risk	higher risk	no difference
Steelhead (Agreement Table B6) Cont.	Lower South Fork Clearwater – Red House Hole	Clearwater	Harvest	Snake River Steelhead	Threatened	400,000	1,050,000	-41%	lower risk	lower risk	lower risk	lower risk	lower risk	no difference
	Lower South Fork Clearwater – Red House Hole	Clearwater	Harvest	Snake River Steelhead	Threatened	220,000	Included in above							
	Lower SF Clearwater	Clearwater	Both	Snake River Steelhead	Threatened	290,000	1,050,000	-41%	lower benefit	higher benefit	lower risk	lower benefit	lower risk	no difference
	Meadow Cr., SF Clearwater	Clearwater	Conservation	Snake River Steelhead	Threatened	210,000	included in above							
	Newsome Ck SF Clearwater	Clearwater	Conservation	Snake River Steelhead	Threatened	123,000	included in above							
	Lolo Creek, MF Clearwater	Clearwater	Conservation	Snake River Steelhead	Threatened	200,000	60,000	233%	higher benefit	lower benefit	higher risk	higher benefit	higher risk	no difference
	East Fork Salmon	Salmon	Both	Snake River Steelhead	Threatened	<=200,000	135,000-171,000	17%	higher benefit	higher risk	higher risk	higher benefit	higher risk	no difference
Steelhead (Agreement Table B6) Cont.	Upper Salmon Tribs.	Salmon	Conservation	Snake River Steelhead	Threatened	1,000,000	1,200,000	-17%	lower benefit	higher benefit	lower risk	lower benefit	lower risk	no difference
	Yankee Fork	Salmon	Both	Snake River Steelhead	Threatened	440,000	118,000-363,000K	21%	higher benefit	higher risk	higher risk	higher benefit	higher risk	higher risk
	Touchet River	Walla Walla	Harvest	Mid-C Steelhead	Threatened	100,000	84,000	19%	higher risk	higher risk	higher risk	higher risk	higher risk	no difference
Coho (Agreement Table B7)	Icicle Creek (at the NFH)	Wenatchee	Conservation	Reintroduction	Not listed	500,000	included in below	80%	higher benefit	lower benefit	higher risk	higher benefit	higher risk	no difference
	Nason Creek	Wenatchee	Conservation	Reintroduction	Not listed	400,000	808,000-1,000,000							
	Beaver Creek	Wenatchee	Conservation	Reintroduction	Not listed	100,000	included in above							

	Methow Tributaries	Methow	Conservation	Reintroduction	Not listed	800,000	included in above							
	Clear Cr., Lapwai Cr., Nez Perce Tribal Hatchery	Clearwater	Conservation	Reintroduction	Not listed	550,000	830,000	27%	higher benefit	lower benefit	higher risk	higher benefit	higher risk	no difference
	Clear Creek	Clearwater	Conservation	Reintroduction	Not listed	500,000	included in above total							
	Grande Ronde/ Lostine River	Grande Ronde	Conservation	Reintroduction	Not listed	500,000	New Release Location [3]		benefit	benefit	risk	benefit	risk	N/A

[1] The difference in hatchery program size is based on agreement production size relative to the Mitchell Act EIS analyzed specific size or the high end of the production range, represented.

[2] The Curtis Creek/Cabin Creek program is an eyed-egg, egg box program to supplement natural, juvenile summer Chinook salmon production.

[3] The coho salmon released into the Lostine River, for reintroduction purposes, were formerly released into the Umatilla River.

[New Appendix. Not in tracked changes]

APPENDIX C

***US v OREGON* AGREEMENT EIS**

Responses to Comments on the Draft EIS

Appendix C

Public Comments on the Draft Environmental Impact Statement and Responses

Introduction

The Draft Environmental Impact Statement (EIS) was published for public review and comment on June 23, 2017. The comment period was open for an initial 45-days (82 Fed. Reg. 28656, June 23, 2017) ending on August 7, 2017. Due to several requests from the public the comment period was extended by an additional 14 days to close on August 21, 2017 (82 Fed. Reg. 35200, July 28, 2017).

Additionally, NMFS established a public web page at http://www.westcoast.fisheries.noaa.gov/fisheries/salmon_steelhead/united_states_v_oregon_DEIS.html with a copy of the Federal Register notice and the EIS.

This public process resulted in the National Marine Fisheries Service (NMFS) receiving 15 comment letters that were used to inform, shape, and improve this final EIS. This Appendix is organized into the following sections.

- List of comment letters received
- Global comments and responses
- All comments received together with NMFS' written responses. These are organized into a table with a reference to the letter number and the comment number of the individual letters/testimonies received and the response to each.
- Copies of the original individual letters received

List of Comment Letters Received

NMFS received the following letters during the public comment period on the Draft EIS:

Letter Number	Commenter
	Federal Agencies
1	Department of Interior (DOI)
2	U.S. Environmental Protection Agency (EPA)
	Tribes
3	Nez Perce Tribal Executive Committee
	States and State Agencies

Letter Number	Commenter
4	State of Montana
5	Idaho Department of Fish and Game
6	Oregon Department of Fish and Wildlife
	Local Utilities
7	Public Utility District No. 1 of Douglas County, Washington
	Organizations
8	The Conservation Angler (6/15/17)[1]
9	Wild Fish Conservancy (6/21/17) [1]
10	Northwest River Partners
11	Wild Fish Conservancy
12	The Conservation Angler
	Members of the Public
13	Kevin Malone
14	Jean Publiee
15	Kevin Malone

1 When multiple comment letters were received from the same organization the date in this table denotes when the first comment was received.

Global Comments and Responses

In reviewing comments received on the Draft EIS, NMFS found that there were common themes in several of the comment letters. As noted below and in its response to individual comments NMFS has revised the EIS where appropriate and provided additionally clarifying language throughout the EIS. Rather than responding to these comments individually and likely repeating very similar if not exact answers, NMFS has generated a series of global responses to address the nine (9) commonly themed, global comments.

1. Public Comment Period. Several commenters asked that the 45-day comment period be extended. In response, NMFS extended the 45 regulatory comment period by 14 days, from August 7, 2017 to August 21, 2017. The references to the Federal Register notices for the comment period and its

extension can be found at the beginning of this Appendix.

Response: NMFS extended the 45 regulatory comment period by 14 days, from August 7, 2017 to August 21, 2017.

2. Preferred Alternative. Commenters noted that the EIS did not identify a Preferred Alternative.

Response: The EIS did not identify a Preferred Alternative; per the NEPA Implementing Regulations at 40 CFR 1500-1508 and NOAA's NEPA Policy found in the Companion Manual to NAO 216-6A, NMFS is required to identify a preferred alternative in the FEIS. This FEIS identifies Alternative 1 - Extension of Current Agreement as the Preferred Alternative as discussed in the "Summary of Changes from Draft EIS to Final EIS" before the Table of Contents in the FEIS.

3. Hydropower Cumulative Effects. Commenters noted that Harvest and Hydropower operations are connected legally, inseparable biologically, and should be evaluated together to comply with NEPA.

Response: In accordance with NEPA, the USACE, BOR, and BPA, have commenced the process for preparation of an EIS on the Columbia River System (also known as the FCRPS) operations and configurations for 14 federal projects in the interior Columbia Basin. In this Columbia River System Operations EIS, the three agencies intend to present a reasonable range of alternatives for long-term system operations and evaluate the potential environmental and socioeconomic impacts on flood risk management, irrigation, power generation, navigation, fish and wildlife, cultural resources and recreation. Details of the EIS can be found at http://www.crso.info/eis.html.

Several commenters identified the need to analyze harvest and hydropower in a single EIS or simultaneously. NEPA does not require that all actions that may have cumulative effects on the same resource be analyzed in a single EIS. This is particularly true here, where the action agencies are distinct and the timing of the two actions are not compatible. Currently the FCRPS action agencies are expected to complete their EIS in 2021. While NMFS chose to complete its FCRPS and *US v Oregon* biological opinions together in 2008, that discretionary decision by the agency does not require a single EIS for all actions affecting salmon in the Columbia River Basin.

Moreover, examining these independent projects in a single EIS is not required because NMFS has captured the impact of the dams in its analysis. In Section 4.1.1, NMFS recognized that in addition to harvest, loses due to natural mortality or turnoff to mainstem tributaries, and mortality associated with hydro operations, illegal fishing, and habitat degradation account for differences in fish stocks between

the mouth of the river and the last upstream counting station. NMFS has incorporated an 'interdam loss' metric in the EIS in each of the charts in Section 4.2. As demonstrated in the Text Box 4-1, this interdam loss metric is calculated from the values in the tables that present Defined Metrics in Sections 4.1 and 4.2. We have updated language in Section 5, Cumulative Impacts, to more clearly explain how our “low”, “average”, and “high” abundance modeling approach incorporates upstream and downstream mortality impacts. In addition, Section 5 has been updated to more clearly explain how this EIS considers and discloses impacts to the affected environment from the hydro system.

The approach used by NMFS allows us to compare the harvest alternatives against each other, thereby fulfilling a key purpose of NEPA – to support informed decision making. This approach provides the basis for comparing alternatives in support of the proposed action that includes the signing of a new management agreement and the issuance of an ITS before the current management agreement expires at the end of 2017.

4. Hatchery Cumulative Effects. Commenters noted that Harvest and Hatcheries operations are connected legally, inseparable biologically, and should be evaluated together to comply with NEPA.

Response: We do not agree with suggestion that we are not incorporating hatcheries into our analysis. Several comments indicated there is dependency of many fisheries on hatchery production, which the EIS acknowledges abundantly.

Not only do we acknowledge and include in the EIS that many of the fisheries managed under the Agreement rely on hatchery-origin fish, but additionally, we analyzed the effects of hatchery production on affected resources within the EIS.

Moreover, hatchery production in the region is carried out by a wide variety of public and private entities. Those entities are responsible for running their own programs and NMFS has no authority to require that they all participate in a single EIS process. Nor does NEPA require a single EIS for multiple actions taken by multiple agencies across a broad period of time. To the extent the comment is focused on hatcheries funded by the Mitchell Act, NMFS did complete a comprehensive EIS analyzing how that funding is disbursed. The analysis in that EIS is incorporated here where appropriate, consistent with the NEPA implementing regulations.

5. Spawning Habitat Capacity. Several commenters asked that NMFS clarify and substantiate the following statement that was made in the EIS: "Furthermore, any increase in escapement of adult

fish to terminal spawning areas does not translate into an increase in juvenile salmonids because the capacity limit of the current spawning habitat does not allow for increased juvenile production at higher escapement numbers."

Response: The FEIS has been modified in subsection 4.4.1 to address the relationship between habitat productivity and resulting juvenile production.

6. 10-year forecasting. Commenters asked that the Final EIS clarify the federal agencies' assumption that the average and range of conditions experienced in the past 10 years will apply for the next 10 years, especially considering the weak stocks, recovering stocks, and climate change.

Response: As explained in subsection 4.1.1. we have disclosed the parameters and assumptions we use to model the alternatives for worst case scenarios related to low abundances of each of the stocks. Comments that suggest the use of our 10-year forecast for effects should be more adverse do not provide quantitative parameters that we could incorporate in our analysis. Without a basis for further characterizing worst case scenarios we cannot provide actual outcomes. Using the lowest observed runsize between 2005 and 2015 in our modeling reasonably accounts for adverse unforeseen environmental impacts. That result is the "low" number used throughout the EIS. This low estimate, informs our analysis by modeling what a poor climate regime would look like. These low estimates under a poor climate regime would become more frequent occurrences.

7. Non-Retention Impacts. Commenters asked that the Final EIS discuss potential non-retention impacts (e.g., incidental injury, delayed mortality) from all fisheries including catch and release.

Response: We disagree with the general comment that we did not account for delayed mortality in our analysis. Alternatives that use a goal for escapement upstream of fisheries account for delayed mortality. The counting station will only count fish that reach its location. Fish that are not harvested but die as a result of injury during the fishery do not make it to the counting station, but fisheries are still held to meeting the escapement goal assessed at said location. Alternatives that use a harvest rate, whether fixed or abundance based, also need an upstream fish count to include in the denominator of their rate calculation. This means the rate, which is the allowable fish available for harvest, is also limited by the number of fish reaching a specific upstream location (this can be a counting station, like a dam, or a terminal tributary spawning ground, etc.). Just as the escapement based alternative, if a lower number of fish reach that upstream location due to incidental injury, delayed mortality, illegal harvest, etc. en route then the denominator in the harvest rate calculation will be lower in numerical value and in order to stay

within the allowed rate fisheries are restricted. This by default takes into account incidental injury, delayed mortality, etc. across all alternative analyzed in this EIS.

8. Several comments were received regarding NMFS' conclusions of the likely impacts to salmon and steelhead populations from the implementation of Alternative 5, curtailment of fisheries.

Response: These conclusions involved NMFS' assumption of the continuation of the hatchery production referenced in the US v Oregon Agreement. When this production assumption is combined with the curtailment of fisheries, the result is an increase in the escapement levels of hatchery-origin adults onto the spawning grounds. The comments were centered around the question of "why would NMFS not assume that reductions would be made to the hatchery programs"?

Decreasing hatchery production in response to a voluntary curtailment of fisheries would not be instantaneous or certain. Hatcheries in the project area have a wide variety of funders and varying legal obligations related to the production of fish. Changes to the *US v Oregon* Agreement would not be sufficient to affect widespread changes to hatchery production in the region. Funders and the relevant regulatory agencies would have to agree to alter production levels for individual programs. Therefore, NMFS' assumption that hatchery production would not be dramatically reduced is reasonable.

9. Ocean harvest. Several comments that ocean and freshwater harvest are connected legally, inseparable biologically, and should be evaluated together to comply with NEPA.

Response: Agreements and ESA consultations that govern escapement levels from the ocean fisheries are separate from those that affect in-river freshwater fishing. Marine fisheries have requirements to meet conservation levels that return a number of fish to each river consistent with provisions of the Pacific Salmon Treaty and Pacific Fishery Management Council's Salmon Fishery Management Plan. Scientists from federal, state, and tribal governments collectively analyze available data on salmon stocks using peer-reviewed models to forecast stock abundance and the impacts of various fisheries scenarios on those forecast abundances. Post-season analyses are used to evaluate the effectiveness of fisheries management in meeting the adopted goals and models are then routinely evaluated and updated. Annual fisheries are shaped, using these models and analyses, to meet agreed upon goals for the amount of salmon that should escape the ocean fisheries and be available for inside fisheries harvest and spawning. Freshwater fisheries are subsequently managed off this returning abundance expected at the Columbia River mouth, which is how we analyzed fisheries in the *US v Oregon* Agreement.

Letter Number	Comment Number	Comment:	Response:
1	1	The Department has no comments on the document at this time. We appreciate the opportunity to comment.	Thank you for your submission.
2	1	The DEIS does not clearly identify a preferred or a proposed alternative from among the options analyzed and discussed.	See Generic Response 2: Preferred Alternative
3	1	With the listings of salmon under the Endangered Species Act ("ESA") beginning in 1991, the state and Tribal fishery managers revisited their harvest management and voluntarily adjusted it to ensure that it is responsive to the needs of ESA-listed fish. The Tribes voluntarily chose to ensure their Treaty harvest was responsive to the needs of the fish in these United States Oregon Management Agreements. Other sources of mortality have yet to make concomitant adjustments in light of the needs of the fish and that the burden of conservation has yet to be fairly allocated consistent with the Treaty case law.	See Generic Response 3: Hydropower Cumulative Effects
3	2	Revise to correctly describe parties to the agreement	Thank you. This correction has been made in the FEIS.
3	3	Page i., lines 14-18 The descriptions of the objectives of the Management Agreement should incorporate the purposes set forth in the Management Agreement. See Management Agreement, Preamble, Docket #2546.	Thank you. This addition has been made in the FEIS.
3	4	Page 3. Ensure consistency and accuracy of project area; the foregoing description and Tables 1-1 to 1-4 is different from description in 1.3.1.1. Treaty Indian Fishery location and jurisdiction lines 10-13/1-3/7-9 on pages 9-10.	Thank you for your comment. We have reviewed and provided consistent descriptions in the mentioned sections.
3	5	Page 29 - 30. Lines 26-29 and line 1. Revise to delete "fishing" and replace with "harvest" (as shown).	Thank you. The revision has been made in the FEIS.
3	6	Pages 3l-32. Lines 29-30 and line 1. This is an inaccurate description regarding Pacific Salmon Treaty fishery framework. Suggest deleting phrase "requires that a large number of fish return" and replacing with "requires a large forecasted abundance index of fish" (as shown).	Thank you. A revision has been made to reflect this comment while maintaining straightforward language.
3	7	Pages 33-34. Lines 28-30 and lines 1-3. Include reference to "hydrosystem operations" in the parenthesis (as shown).	Thank you. The revision has been made in the FEIS.
3	8	Page 44. Lines 18-22. Flagged. Tables 3-5 to 3-8 there is only table 3-8 that includes a column titled "Average Loss to Granite", the others do not include similar information. Suggest those tables be updated to include the average loss values to a particular counting point.	The other tables do contain the same information, as the calculation in Table 3-8 was simply the escapement past fisheries minus the final counting station. In the call out box in Section 4.1.1, page 79, there is a description of how to interpret the tables presented. Table 3-8 was modified for consistency with tables 3-5 through 3-7 based on this comment.

3	9	Page 61. This paragraph is inaccurate. There are no Tribal commercial fisheries (or any *US v Oregon* tribal covered fisheries in this subregion) in the lower Snake River subregion. This would be consistent with tribal harvest values reported in this section and other parts of the DEIS.	Thank you. The revision has been made in the FEIS.
3	10	Page 65. The Snake River and its main tributaries, the Clearwater and Salmon, account for 35 percent of the Upriver steelhead harvest from the Columbia River system (NMFS 2003). Lines 24-25. We question why this information on Snake River and tributary harvest is included here for recreational fishery. Those fisheries are not covered under *US v Oregon*.	Thank you for the comment, this reference has been removed in the FEIS.
3	11	Page 69. Lines 15-17. The State of Washington is the only *US v Oregon* party to fish in the lower Snake River region. That is a recreational fishery and only involves the Upriver Spring Chinook management period and stocks (i.e., Washington utilizes a small percentage of its total allowable harvest rate for mainstem fishery that target stocks going to mid-Columbia, Upper Columbia and Snake River to target the Snake River spring/summer Chinook stock in its recreational fishery that occurs in that subregion).	Thank you for your comment, it has been noted.
3	12	Page 69. Lines 23-26. Revise sentence as shown to read as follows: "More than two-thirds of jobs and income generated by recreational fishing occur in the Lower Columbia River Subregion, with most of the remainder occurring in the Mid-Columbia River Subregion and a small amount (1.4 percent of income and 2 percent of jobs as a result of recreational fishery conducted by Washington) in the Lower Snake River Subregion (Table 3-25).	Thank you. The revision has been made in the FEIS.
3	13	Page 72-73 Lines 27-28, 1-4. Revise parenthetical to read as follows: "(the Nez Perce Tribe, the Confederated Tribes of the Umatilla Indian Reservation, the Confederated Tribes of the Warm Springs Reservation of Oregon, and the Confederated Tribes and Bands of the Yakama Nation (collectively, the Columbia River Treaty Tribes); and the Shoshone-Bannock Tribes,... Suggest deleting the phrase "as well as the Confederated Tribes of the Colville Reservation, Cowlitz Indian Tribe, and the Confederated Tribes of the Grand Ronde" and replace with "as well as other Indian tribes of the Columbia Basin."	Section 3.7.2. has been revised in the FEIS to list Columbia Basin Tribes that have not already been addressed as parties to the *US v Oregon* Management Agreement. The FEIS includes a list of all tribes in the Project Area. Thank you for the suggestion.
3	14	Page 75. Lines 26-29. Suggest revising the sentence to read as follows: "A limiting stock is one that constrains harvest during a season, by being the lowest in abundance relative to its management objective, lowest in abundance relative to other stocks in fishery, and therefore restricting access to more abundant stocks thus limiting total catch. "	Thank you for your comment; however, a limiting stock is not necessarily the lowest in abundance relative to other stocks in the fishery.

3	15	Page 77. Lines 21-23. Lines 26-29. Suggest revising the sentence to read as follows: These benchmarks should be viewed as approximations and examples of an approach and not recommendations for the specific criteria that should be used for implementing harvest policies and the related management frameworks.	Thank you for your comment, it has been noted.
3	16	Page 78. Lines 1-2, lines 2-6, lines 5-6. Page 78. Page 81. Lines 17-20. Page 107. Lines 17-20. Assume this includes hatchery origin fish.	Harvest Indicator Stocks do include hatchery and natural-origin fish. Stocks referring to only natural-origin fish have been clarified in the FEIS.
3	17	Page 97-98. Lines 26-27, 1-2. How does Alternative 5 relate to the following assertion elsewhere in the document? "Furthermore, any increase in escapement of adult fish to terminal spawning areas does not translate into an increase in juvenile salmonids because the capacity limit of the current spawning habitat does not allow for increased juvenile production at higher escapement numbers."	See Generic Response 5: Spawning Habitat Capacity
3	18	Page 126. Lines 13-16. Suggest deleting the words "as bycatch" from this part of sentence.	Thank you for your comment; however, the term bycatch is used appropriately in this context.
3	19	Page 133. Suggest including a basic description of harvest mitigation hatcheries, including specific purpose and role for tribal and non-tribal fisheries.	Thank you for your comment, hatcheries are described in the Mitchell Act FEIS.
3	20	Pg. 144-145. Suggest deleting "Puget Sound" and replace with "Columbia River"	Thank you for your suggestion. This has been corrected in the FEIS.
3	21	Page 145. Lines 6-9. Assume the 42 percent is an error and the numeric value should be 35.	That is correct. This correction has been made in the FEIS.
3	22	Page 156. Lines 16-20. As discussed above, there are no commercial fisheries in the Lower Snake River subregion (only WDFW sport fishery).	Thank you. The revision has been made in the FEIS.
3	23	Page 160-161. Lines 1-2. Suggest deleting "Native American tribes" and replace with "Columbia River treaty tribes."	Thank you, the FEIS has been revised for clarification.
3	24	Page 178. Lines 24-29. How does improving general habitat and ecosystem function relate to the following assertion? "Furthermore, any increase in escapement of adult fish to terminal spawning areas does not translate into an increase in juvenile salmonids because the capacity limit of the current spawning habitat does not allow for increased juvenile production at higher escapement numbers."	See Generic Response 5: Spawning Habitat Capacity
3	25	Page 188. Lines 23-26. The substance of this paragraph should be applicable to Tribal C&S and tribal and non-tribal commercial fisheries as well.	Thank you for your comment. The substance of the paragraph has been applied to other sections where relevant.
4	1	Harvest and Hatchery management and FCRPS Operations are connected legally, inseparable biologically, and should be evaluated together to comply with NEPA	See Generic Response 3: Hydropower Cumulative Effects and Generic Response 4: Hatchery Cumulative Effects

5	1	It would be inconsistent with the *US v Oregon* management goal for weak runs to remain at status quo for the next 10 years. The Final EIS should clarify the federal agencies' assumption to reflect the objective for improvement in weak stocks during the next 10 years.	See Generic Response 6: 10-year forecasting
5	2	The draft EIS does not identify potential impacts to ESA-listed Snake River Spring/Summer Chinook Salmon after June 15 (referred to as the summer management period)...The above "definitions" and other text describing the spring and summer management periods omit potential impacts and create confusion as to ESA-listed Snake River spring/summer chinook salmon. During the 2008-2017 *US v Oregon* Management Agreement, observations based on PIT tag and genetic sampling indicate several years between 2008-2017 in which portions of late runs of ESA-listed Snake River Spring/Summer chinook were below McNary Dam after June 15, where they were available to fisheries occurring during the summer management period. Available to TAC [sic]	Thank you for your comment. We disagree. The harvest rate alternatives do use a date range of January 1 through June 15 to estimate potential impacts to ESA-listed Snake River spring/summer Chinook salmon, however the escapement goal analysis does not. The escapement goal analysis examines how many fish end up returning to a location upstream of the fisheries, regardless of date distribution. Therefore we have identified potential impacts to this stock under Alternative 4 and Alternative 6. Additionally, we have updated the text in Section 4.1.1.1. to further address this comment.
5	3	Clarify Bycatch/Incidental Impacts from Full Retention Fisheries/Interdam Loss (E.g., Interdam Loss, Impacts of fishing at 80-81). The draft EIS appears to reflect that only landed fish are impacted in "full retention" fisheries. However, various investigations and observations indicate not all fish are landed in "full retention" fisheries. The Final EIS should discuss potential non-retention impacts (e.g., incidental injury/mortality) from all fisheries.	For interdam loss, see Generic Response 3: Hydropower Cumulative Effects. For other fishery impacts, see Generic Response 7: Non-Retention Impacts
5	4	In describing escapement, the draft EIS refers to benchmarks," "objectives" and "goals" in a manner that is difficult to follow. The Final EIS should clarify usage of these terms.	Thank you for your comment. This has been clarified in the FEIS.
5	5	In addition, the description of "escapement" should reflect that a key purpose of escapement under *US v Oregon* is for broodstock collection and juvenile production.	Hatchery broodstock escapement objectives are not incorporated into the harvest rates within the Agreement.
6	1	In general, the DEIS appears to adequately capture the scope and breadth of management measures that may be applicable to Columbia River fisheries in the next management period (2018-2027).	Thank you for your submission.
6	2	Figure 1-1 caption, page 4, lines 7-10. Oregon and Washington utilize the same terminology for fishing zones, so the caption could be revised to reflect both states. The zone boundaries for the river downstream of Bonneville Dam are based upon county line boundaries from Washington State counties bordering the river.	Oregon and Washington do not use the same terminology in their statutes. Washington Administrative code 220-22-010 uses "areas" designated by the Washington Department of Fish and Wildlife 1A through 1H. They correspond to the following Oregon Department of Fish and Wildlife "zones": 1A = Zone 1; 1B = Zone 2; 1C = Zone 3, 1D = Zone 4; 1E = Zone 5; 1F = Zone 6/61; 1G = Zone 6/62; and, 1H = Zone 6/63. The caption reflects that the terminology adopted by ODFW statute ("Zone") is also adopted by the *US v Oregon* parties when commonly referring to designated boundaries where commercial fisheries might occur.

6	3	Tables 1-2, 1-3, and 1-4 pages 6, 7, 8. The mixed use of "Project Area" and more area-specific descriptions among different fisheries is confusing. Please clarify that "Project Area" is not intended to mean fisheries occur in the entire project area? (For example, Treaty Indian Ceremonial and Subsistence fisheries do not occur throughout the entire project area as shown in Figure 1-1).	The "Project Area" was defined as the outer extent of the geographical area within which fisheries subject to the *US v Oregon* Management Agreement may occur. This area is depicted in Figure 1-1. We recognize that not all fisheries occur in all parts of the project area.
6	4	Table 1-2, 1-3, 1-4 pages 6, 7, 9. The Buoy 10 line does not reflect a lower boundary for any current Treaty fisheries. The current agreement does include language that such fisheries could occur upon agreement between the States and the Tribes. Table 1-3, page 7. If the DEIS is attempting to reflect current non-Treaty regulations, the Summer Chinook and Sockeye locations should be from Astoria-Megler Bridge to Bonneville Dam, not Buoy 10. These fisheries are not currently open between the Astoria-Megler Bridge and Buoy 10.	Thank you for your comment. The "Project Area" was defined as the outer extent of the geographical area within which fisheries subject to the *US v Oregon* Management Agreement may occur. Regarding the suggested change in location of the non-treaty recreational summer Chinook and sockeye salmon fisheries, this change has been made in the FEIS.
6	5	Page 9, line 10-12. Should this read, "…although some fishing does occur both above McNary Dam and below Bonneville Dam"? Currently "McNary Dam" is not included in the description but the preceding parts of the sentence imply that maybe it was intended to be.	Thank you. This revision has been made in the FEIS.
6	6	Page 12, line 3. In the current definition of "SAFE" the E stands for "Enhancement". Page 13, line 9-10. Please note that the Steamboat Slough SAFE area has long been discontinued and is no longer relevant. We recommend deletion of this area.	Thank you. These corrections have been made in the FEIS.
6	7	Page 16, re: discussion of inclusion of other species in agreement. The discussion that fisheries are referenced in the MA because there is some potential for incidental take of ESA-listed salmonids in the fishery is not accurate in the case of Pacific lamprey harvest in the Willamette River. There is no incidental take of ESA salmonids in pursuit of lamprey in the Willamette River, and if there were, it would be of Willamette population fish, not those stocks incorporated in the MA.	Thank you for your comment. Using our legal definitions of take, a biological opinion will determine whether incidental take occurs and possible subsequent effects to Willamette River ESA-listed species as required under the ESA.

6	8	We suggest that the words “independently by” in line 3 be replaced with “independent of the agreement by”. [DEIS p.16 lines 2-4: "Harvest policies for non-salmonid species are not specified in the existing US v Oregon agreement, nor would they be in a new management agreement. These fisheries are managed independently by the states and tribes."]	Thank you. A revision has been made to the FEIS.
6	9	Page 44, table 3-5. Is this table intended to reflect only natural-origin UC CHS, or hatchery and NO combined? Label implies the table intended to reflect all. Please review similar potential issues with respect to Tables 3-6 and 3-8 as well.	Thank you for your comment. The status quo conditions presented in Section 3 (Tables 3-5 - 3-8) are for natural-origin Upper Columbia River spring Chinook salmon, natural-origin Snake River spring/summer Chinook salmon, Upper Columbia summer Chinook salmon, and natural-origin Snake River fall Chinook salmon, respectively. Tables referring to natural-origin stocks have been clarified in the FEIS.
6	10	Page 47, line 11-12. In the coho section, areas with extirpated populations were identified. It may be helpful and appropriate to identify extirpated populations for other species, including but not limited to sockeye in Wallowa Lake.	Thank you for your comment; however, this EIS focuses on extant stocks of salmon and steelhead.
6	11	Page 59, line 21. A small portion of Umatilla County actually borders the river just below McNary Dam in Zone 6. If catch contributes to Crook County’s economic activity (presumably due to the Deschutes River) then we recommend Jefferson, Deschutes, Wheeler, and Grant Counties also be considered for inclusion.	The FEIS has been revised to indicate that counties other than those identified in each subregion would likely be affected as well by changes in commercial and recreational fishing activity in the Columbia River.
6	12	Page 60, line 18. Steelhead are not legal for harvest in non-Treaty commercial fisheries. All references to harvest of steelhead in non-Treaty commercial fisheries need to be corrected.	The FEIS has been revised to reflect that steelhead are not legal to retain for harvest by non-Treaty commercial fishers.
6	13	Page 78, re: SR sockeye and snake river CHF benchmarks. Please clarify and provide some description of how these values were derived.	Thank you for your comment, clarification has been added to the FEIS
6	14	Page 78, re: steelhead. Please clarify whether the number of steelhead (e.g., 13400 fish) is intended to apply to the sum of all natural-origin A and B run Snake River fish? Please clarify the use and basis for referenced metric.	Thank you for your comment, clarification has been added to the FEIS
6	15	Figure 4-1, page 119. In this figure, interdam losses are highest under alternative 5. As a result, it appears that escapement to Rock Island Dam is lower under this “no harvest” scenario than it is in alternatives 1-3. If this is correct, please provide clarification as to why this is the case absent error in figure values.	Thank you for your comment. Numbers in the DEIS Table 4-58 were inadvertently transposed and have been corrected in the FEIS.

6	16	Page 126, re: coho. Lower river fall fisheries are often constrained by B-Index steelhead, but also by other limitations such as Lower Columbia River tule and Lower Columbia Natural coho impact limitations. Suggest a revision to re-characterize which fisheries are discussed as being solely B-Index limited to exclude fisheries downstream of Bonneville Dam.	Thank you for your comment. Your comment refers to discussion in subsection 4.2.1, which is the subsection evaluating the impacts to salmonid species. Please see that by this point in the document we have indicated the lower river salmon stocks are not addressed in the agreement (for example introduction in subsection 3.2.1, Chinook salmon discussion in subsection 3.2.1.1 and coho salmon discussion in subsection 3.2.1.2) and that the context of further discussion in the document at that point is solely focused on upriver stocks of salmon and steelhead.
6	17	Page 126, re: coho. Additionally, this section makes a linkage to stocks such as the SW WA DPS and Upper Willamette DPS stocks, which are primarily affected by fisheries that occur prior to the B-run "window". Therefore it is not reasonable to expect harvest and impacts for these stocks to be proportional to catch of B-Index fish, as is implied here.	Thank you for your comment. We disagree. The catch of any individual stock will be directly proportional during any annual fishery cycle to whatever stock is most consistently limiting. This is generally the B-Index steelhead stock.
6	18	Page 144. Lines 3-5. Suggest that the sentence beginning "Any anadromous fish taken…" be modified to provide clarity, potentially by ending that sentence with "ocean habitat, **prior to having been subject to the fisheries examined in this analysis.**" (new text in bold).	Thank you. These corrections have been made in the FEIS.
6	19	Page 145, line 1. It appears that "Puget Sound" should be replaced with "Columbia River" or "project area".	Thank you for your suggestion. This has been corrected in the FEIS.
6	20	Page 147, line 16; page 155, lines 17-22; page 158, lines 3-9; page 165, lines 5-7 (and multiple other areas). Please clarify that Steelhead may not be retained in non-Treaty commercial fisheries; therefore, there should be no ex-vessel value expressed for steelhead for any non-Treaty commercial fisheries in this analysis. These issues also carry through to several tables in Appendix A, where values are included for non-Treaty commercial steelhead ex-vessel values. These should be all removed from the relevant tables.	The FEIS has been revised to reflect that steelhead are not legal to retain for harvest by non-Treaty commercial fishers. Changes were made in Table A-11 and A-13 of Appendix A, and in tables and text in Chapters 3 and 4.
6	21	Page 158, lines 3-9. Please clarify whether this section is intended to reflect all Snake River steelhead, or just B-run?	The FEIS has been modified to clarify that that the analysis refers to B-Index steelhead in the Snake River and Columbia River.

7	1	[p. 1] Douglas PUD does not support, and believes that NMFS also legally cannot support the inclusion of Douglas PUDs mitigation hatchery programs in the U.S. v. Oregon agreement (or associated production tables). [7 reasons provided on p.3]. NMFS can avoid this conflict (described above) between their HCP, that they signed with Douglas PUD in 2002, and any new iteration of the *US v Oregon* agreement, by disentangling the PUD mitigation hatchery production from inclusion in or management under the *US v Oregon* agreement. Therefore, please remove all of the Douglas PUD-funded hatchery-mitigation programs from the *US v Oregon* agreement to avoid a violation of the adaptive-management principles defined in the HCPs. Failure to do so, places NMFS in the untenable positon of non-compliance with at least one of two conflicting processes for defining PUD hatchery production levels and/or release locations and strategies. Should NMFS sign onto a continued or new *US v Oregon* agreement that retains the PUD hatchery-mitigation programs, then they must in the final EIS evaluate the effects on recovery of the UCR Spring Chinook ESU resulting from their failure to uphold the autonomy of the HCP decision-making process and the abdication of their authority under the HCP to mandate scientifically sound hatchery-program decision-making....[p.5 conclusion] NMFS can rectify the second issue by entirely removing the PUD hatchery programs from any version of the *US v Oregon* agreement that they sign, or by signing an iteration of the *US v Oregon* agreement that includes PUD production available for harvest only by noting that the PUDs will produce fish available for harvest but that the details of release numbers, locations, and release strategies reside entirely within the FERC jurisdictional arena of the respective HCP committees, and will become available on a year-by-year basis as those committees release such information to the TAC.	The hatchery production levels in the agreement are not static. Rather, as explained in the text of the agreement, they are subject to change based on several factors, including when NMFS requires changes due to ESA requirements. The 2008 Agreement explicitly explains that "[t]he Parties recognize that NOAA may recommend modifications to the production actions in this Agreement based on the results of these consultations." We would expect that any future Agreement would retain this language. We are aware of the Habitat Conservation Plan referenced in the comment (hereafter "Mid-Columbia HCP"). The previous *US v Oregon* Management Agreement explicitly reference this HCP and explained that the production programs in the tables "will be implemented and/or adjusted based on mid-Columbia HCP's and Settlement Agreement in the future." The Mid-Columbia HCP process is incorporated into the *US v Oregon* process and no conflict exists.
7	2	Page 44, lines 12-22, and Table 3-5: Total harvest rates reported under the baseline conditions for Upper Columbia River spring Chinook salmon do not accurately represent demographic subtleties that result from fisheries. Analysis of PIT-tag data indicates that the loss rates by brood year of Methow-Basin, natural-origin, 2-ocean spring Chinook from brood-years 2005-2013 in Zone-6 averaged 15 percent (median 15%, range 0% to 40%), while the loss rate for those same brood years of natural-origin 1-ocean Methow Basin spring Chinook was 0 percent. Thus, reporting the gross mean harvest rate does not accurately portray the demographic effects of harvest on natural-origin UCR spring Chinook, and the final EIS should include additional analyses to evaluate those effects.	Thank you for your comment. PIT tag loss in Zone 6 is not equivalent to a harvest rate. Additionally, proportional shifts in any given run year to a certain age class of fish will vary, particularly in 1-ocean fish, also known as jacks, which due to their small size are known to simply pass through fisheries. This is the reason 1-ocean fish are not included in the calculation of harvest rates in the EIS, which this comment indicates was done so accurately.

7	3	Page 50, lines 3-8: Evidence suggests that the "A" and "B" designations based on fork length and Bonneville passage-dates do not serve conservation purposes. See Copeland et al. (2017). The prudent response to such evidence would include a reconsideration of the current management designations.	Thank you for your comment, the current designations are outside the scope of the EIS.
7	4	Page 54, lines 16-19: Please also include the compelling evidence for a relationship between the abundance of host species in the marine environment and abundance of adult lamprey range-wide (Murauskas et al. 2013).	Thank you for your comment, this reference has been added to the FEIS.
7	5	To achieve recovery targets, the desired count at Rock Island Dam would also need to account for pre-spawn mortality between Rock Island Dam and the spawning grounds in the tributaries, and thus even 6,000 natural-origin fish escaping the fishery would return fewer than the target 4,500 natural-origin fish to the spawning grounds. Therefore, the escapement and dam-count numbers used in the analyses in this DEIS are inadequate to achieve the NMFS-approved recovery goals. The DEIS contains repeated references to these inadequate escapement/dam-count goals, including Page 84, Table 4-4; Page 85, Table 4-7; Page 86, Table 4-10, lines 11-15; Page 87, lines 28-30; Page 88, lines 1-5, Table 4-13; Page 119, Table 4-58 and Figure 4-1; Page 120, lines 1-8 (list not exhaustive). Therefore, the final EIS must evaluate the effects of this inadequate escapement on the recovery of the UCR Spring Chinook ESU.	Section 4.1.1 under the sub-heading Escapement Goals accounts for the pre-spawn mortality between the final counting station and the spawning grounds. The text stated "In most cases we further adjust the escapement goal at the last upstream counting station to account for subsequent mortality while migrating upstream from that final counting station...In most cases this adjustment factor is 25 percent, meaning that we assume that only 75 percent survive to their final spawning ground."
7	6	[p.4] Alternatively, NMFS must modify the *US v Oregon* agreement such that it conforms to the recovery goals that NMFS approved in 2007 or provide scientific justification for the departure from those recovery goals and also amend the 2007 Upper Columbia Spring Chinook and Steelhead Recovery Plan accordingly. [p. 5 conclusion] NMFS can rectify the first issue by simply increasing the fishery escapement number in the *US v Oregon* agreement to allow the achievement of the UCR spring Chinook recovery goals or, conversely, providing the necessary scientific justification for reducing those goals (and amending the 2007 Upper Columbia Spring Chinook Salmon and Steelhead Recovery Plan, accordingly).	Thank you for your comment. Our EIS analysis specifically captures the impacts of setting an escapement goal for UCR spring Chinook salmon at the aggregated total natural-origin population-level abundance targets from the recovery plan in Alternative 4.

7	7	Page 80, lines 14-20 (also, Page 44, lines 18-20): The accounting for fishery-related losses should also include losses attributable to net drop-outs, and such losses comprise target fish, and not only bycatch of non-target species/stocks. We observe injured fish at the count windows of the dams, and many of the observed injuries are fishery-related, some so severe that the likelihood of survival to spawning is very low. Delayed mortality associated with the fishery varies with gear type (e.g., very few or no injuries may result from purse-seining or heart traps, thereby reducing the injury-related delayed mortality), such that the EIS would need to analyze a range of delayed-mortality rates to account for the variety of fishery methods that fishers may use under the agreement.	see Generic Response 7: Non-Retention Impacts
7	8	Page 100, Section 4.1.1.3: The DEIS considers only harvest rates, without considering the effects of harvest timing on stock diversity, and persistence under changing climate...Thus, the persistence of this stock depends upon the diversification of run timing to ensure adequate escapement during extreme years. Only the earliest and latest migrants routinely avoid the thermal barriers. Therefore, to truly account for climate change, harvest managers must protect the shoulders of the run distribution when deciding on timing of harvest efforts directed at or incidentally harvesting Okanagan sockeye, and UCR Chinook and steelhead.	See Generic Response 6: 10 Year-Forecasting
7	9	Page 132, line 10: We assume that the authors intended "Upper Columbia River Chinook Salmon" to be spring Chinook, since the subject sentence and the one that follows include the other stocks to which this sentence may refer.	That is correct. This correction has been made in the FEIS.
7	10	Page 144, lines 5-8 (also Page ix, lines 11-13): In the final EIS, please abandon the argument in, or clarify and/or provide references for the sentences stating that "However, the capacity limit of the current spawning habitat does not allow for increased juvenile production at higher escapement numbers. Therefore, an increase in escapement of adult fish to terminal spawning areas does not translate into an increase in juvenile salmonids that would eventually serve as adult prey for the SRKW." Literally interpreted, these sentences indicate that all spawning habitat in the Columbia Basin is currently saturated (at carrying capacity) such that any increases in adult returns will not result in increased recruits. If accurate, this statement begs the question: why then do the action agencies continue to release millions of supplementation fish anywhere within spawning tributaries, since no additional juveniles will result from adult returns from those programs to target tributaries? Why not rather produce only segregated harvest-augmentation fish released only from mainstem Columbia (or Snake) River hatcheries, facilitating removal of returning hatchery fish at those locations to prevent them from depressing the natural-origin spawning populations in the tributaries?	See Generic Response 5: Spawning Habitat Capacity

7	11	Page 165, lines 19-21: The final EIS should evaluate the economic impact to local communities resulting from the continued failure to achieve ESA recovery because of *US v Oregon* escapement targets substantially below recovery goals (see comment above regarding targets for Rock Island Dam counts and fishery escapement).	Thank you for your comment. The NEPA Regulations at 40 CFR 1502.23 state that "For purposes of complying with the [NEPA] Act, the weighing of the merits and drawbacks of the various alternatives need not be displayed in a monetary cost-benefit analysis and should not be when there are important qualitative considerations."
8	1	We ask that NOAA substantially extend the 45 day period for public comments on the DEIS.	See Generic Response 1: Public Comment Period
9	1	I am requesting an additional 60 day extension to the public comment period.	See Generic Response 1: Public Comment Period
10	1	RiverPartners finds that this draft EIS continues to impermissibly segment *US v Oregon* harvest management from Mitchell Act hatchery management and the FCRPS EIS. All three proposed major federal actions are connected and cumulative actions that need to be addressed in a single EIS as required by NEPA.	See Generic Response 3: Hydropower Cumulative Effects and Generic Response 4: Hatchery Cumulative Effects
10	2	On duration of the Agreement, this Draft anticipates extending the current *US v Oregon* Management Agreement for another 10 years. There is no basis for such an extended timeline given today's circumstances. As noted, the 2008/2010 10-year Management Agreement, shared a common science analysis. The harvest management and FCRPS actions were analyzed together because the FCRPS Biological Opinion ("BiOp") and its measures (the "Reasonable and Prudent Alternative") provided, in part, the mitigation to offset impacts resulting from harvest activities. This relationship no longer exists – the BiOp's are not linked – meaning harvest and hatchery production levels and the resulting Incidental Take Statement (ITS) need to be adjusted taking into account the current situation.	This comment asserts that NMFS should not sign a new Management Agreement with a ten-year duration because, in its opinion, ESA coverage will not be available. NMFS has prepared and will issue a biological opinion that analyzes the proposed action, including the 10-year duration. Compliance with the ESA is required and NMFS decision here will be consistent with its obligations under the ESA. USFWS will perform similarly for species under its jurisdiction.
10	3	Further, none of the alternatives in the draft EIS address the problem of mitigating the impacts of the Management Agreement on listed fish, unless the "sliding scale" of harvest based on abundance levels is seen by NMFS as the mitigation. RiverPartners' finds this particularly important because whatever "incidental take" is authorized in the Management Agreement will affect the FCRPS level of authorized "take".	This comment expresses concern with whether the proposed action will comply with the ESA. NMFS has prepared and is issuing a biological opinion that analyzes the proposed action. Compliance with the ESA is required and NMFS decision here will be consistent with its obligations under the ESA. USFWS will perform similarly for species under its jurisdiction.
10	4	The Services could consider putting an Interim Management Agreement in place until the FCRPS NEPA and a new BiOp are complete. This would allow new data and information from those processes to be used in crafting a new Management Agreement and help ensure a more complete look at the impacts and interactions of various actions on listed salmon stocks.	We do not have an obligation to require that this action be implemented on the same timeline as FCRPS. Nothing in NEPA or its implementing regulations requires us to merge separate action, carried out by different agencies, into a single action before completing an EIS. The regulations do require the consideration of cumulative effects, which are the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions. This EIS has included FCRPS and its impacts into the cumulative effects analysis. As a result, regardless of

			whether the two processes are in lockstep, we have reviewed all information generated as part of the FCRPS process and included the relevant information in this EIS.
10	5	RiverPartners is concerned that the legal foundation for this Draft EIS on the future Management Agreement appears to assume that continued significant impacts on ESA listed fish consistent with the current harvest and hatchery management agreement is an acceptable level of environmental impact. Yet, in the same Oregon District Court, Judge Simon continues to rule that ESA listed fish in the Columbia River are in great peril and that extinction is a very real possibility. These legal findings have led Judge Simon to order significant increases in spill from the Lower Columbia and Lower Snake River dams to improve survivals of juvenile salmon and steelhead, and to call for multi-million dollar studies of breech or removal of the Snake River dams. At the same time, this Draft EIS seems to assume that there is no reason for alarm from the proposed actions that continue existing harvest and hatchery management practices. Judge Simon's dire description of the status of ESA listed fish is diametrically opposed to the description of proposed take in this Draft EIS. The inconsistency of the findings in this Draft EIS with those by Judge Simon should provide the Services food for serious thought. Listed salmon and steelhead are either on the brink of extinction and every possible action to prevent killing these fish needs to be implemented immediately, or, the fish are doing fine and current harvest and hatchery activities can continue as usual.	In this EIS, we have considered and disclosed the impact of the proposed action on the environment. The comment does not point to any impact that has not been considered and disclosed. Instead, it argues that the analysis in the Draft EIS is somehow at odds with a decision of the Federal District Court for the District of Oregon. In addition to preparation of this EIS, NMFS and USFWS are consulting on the proposed action as required by the ESA. Our final decision will be consistent with the requirements of the ESA.
10	6	The federal agencies need to be transparent about the actual effects of each of the three proposed actions at issue (hatchery, harvest and hydropower/habitat) to properly conduct their respective NEPA processes...	See Generic Response 3: Hydropower Cumulative Effects and Generic Response 4: Hatchery Cumulative Effects
10	7	The federal agencies need to be transparent about the actual effects of each of the three proposed actions at issue (hatchery, harvest and hydropower/habitat) to properly conduct their respective NEPA processes, because as explained by the Justice Department attorneys in recent briefing, NWF v. NMFS, "NEPA is a public process - not a private negotiation among a limited group of interested parties." Yet, NMFS is approaching it this way.	We complied with all applicable federal regulations and requirements for public process during the development of this FEIS. The comment points to no substantive errors, but instead draws a contrast with a different NEPA process for a very different federal action. We have been transparent about the impacts of this proposed action. The comment does not point to any impact from either the hatchery or harvest component of the action that has not been considered in this EIS. With respect to the impacts of the FCRPS, those impacts have also been disclosed as cumulative effects.
10	8	For example, in stark contrast to the NEPA scoping process for the FCRPS which included 15 public workshops in communities throughout the Northwest, there were no public scoping meetings on the Management Agreement.	The NEPA Implementing regulations, at 40 CFR 1501.7 do not require public scoping meetings. The public involvement process conducted for this EIS is described in Section 1.5.

10	9	[In attachment] We fully understand that NMFS is embarking on two separate proposed actions: harvest and hatchery management and the operation of the FCRPS. We further understand that NMFS believes these two proposed actions are not "connected" for purposes of NEPA because they have "independent utility," are timed differently and therefore need not be considered in the same NEPA document. See 40 C.F.R. 1508.25(a)(1).	See Generic Response 3: Hydropower Cumulative Effects and Generic Response 4: Hatchery Cumulative Effects
10	10	RiverPartners is also requesting that the Services extend the scoping comment period for another 60 – 90 days and hold public hearings so that interested members of the public can weigh in on these critically important issues. The thirty day comment period provided thus far is woefully inadequate under the circumstances and is inconsistent with the letter and spirit of the statute that the agencies are attempting to satisfy.	See Generic Response 1: Public Comment Period. The original comment period of 45 days was extended by a 2 week period.
11	1	The current 2017 return year crisis of upper Columbia/Snake steelhead, especially natural-origin (henceforth "wild") Snake River B steelhead, highlights that the current fisheries regime under the 2008-2017 Agreement is insufficiently risk-averse when returns of ESA-listed wild populations of Chinook and steelhead are at low abundance.	Although the comment is indirect we take the comment to express the opinion that Alternative 1 is not sufficiently protective for Snake River B-Index steelhead. Thank you for your opinion.
11	2	While each of these alternatives are helpful by outlining extremes of each management approach, none is sufficiently protective of ESA-listed stocks or populations. None appear capable of meeting all ESA requirements regarding jeopardy, nor do they appear capable of optimizing recovery opportunities in the context of also providing harvest opportunities on mitigation hatchery returns that provide the majority of treaty and nontreaty fishing opportunities.	Please see the response to comment 6 in this letter.
11	3	Alternative 2 applies incrementally increasing harvest rates to stocks based on the estimated return to the relevant in-river management point (location) and would permit some level of commercial and recreational fishing regardless of how low the return abundance. This is insufficiently protective of ESA-listed stocks and populations. Preservation and rebuilding of ESA-listed populations requires securing minimum spawning escapements to each spawning population together with the life history diversity (age structure, sex ratio, run timing) that is characteristic of local spawning populations. None of the current abundance-base harvest regimes secure this.	Please see the response to comment 6 in this letter

11	4	Alternative 3 applies a fixed annual harvest rate to each management unit stock regardless of abundance. Further, the harvest rates are derived from the recent 10-year average of observed (estimated) harvest rates. It is not clear that the selection of these rates has appropriately taken account of the variation in the rates observed over the past 10 years or the variation in implementation of the associated fishery regimes (implementation error). Regardless, this alternative is insufficiently protective of ESA-listed populations and stocks when return levels are low. This is clear from the comparisons of minimum escapements past fisheries provided in summary tables 4-58 through 4-63, pages 119 - 130.	See Generic Response 6:10-year forecasting
11	5	Alternative 4 is a particularly inappropriate and misleading caricature of escapement goal management, especially so in the context of managing for the recovery of ESA-listed populations. There is no good biological reason why managing so as to achieve (whenever returns permit) a minimum (floor) spawning escapement requires permitting any and all excess return-above-escapement floor to be harvested, rather than dividing the surplus between harvest and additional escapement.	We agree that escapement goal policies can be modified to allow for a shared distribution of the excess fish above an escapement goal as suggested by the commenter. Under the current *US v Oregon* Agreement that is actually how Upper Columbia summer Chinook are managed. But escapement goal policies are commonly used for managing fisheries. They are a common feature of management in both the Pacific Fishery Management Council and Pacific Salmon Treaty fora. They are most often used to manage healthy stocks with good estimates of the escapements associated with Maximum Sustained Yield (MSY). The purpose of Alternative 4 is to examine the characteristics of an escapement goal harvest policy as it is most often applied and compare it to other alternatives. As illustrated by the comment, the alternatives analyzed provide an opportunity to illustrate characteristics of each policy, consider the pros and cons, and provide information that is useful to help decide what harvest policy fits best under a broad range of circumstances. Alternative 4 is also not our preferred Alternative.

11	6	A new alternative is needed that contains protective elements of each of alternative 2, 3, and 4. We describe one approach in the following.A Robust Conservation-Based AlternativeFor each above-Bonneville stock, provide an abundance-based regime that includes the following:1. a minimum, recovery-based spawner escapement level (floor) that accounts for sex ratio, run timing, and age-structure diversity of individual spawning populations, and assures that all major and minor spawning locations within each population are occupied;2. includes a "stop-loss" rule (Essington et al, Science 2015; Pikitch, Science 2015) under which no fishing occurs when the expected return is below the stock- or population-specific goal;3. a sliding abundance-based harvest rate and escapement scale that partitions returns in excess of the escapement floor between escapement and harvest. This assures that returns that exceed the escapement floor will add to escapements in addition to providing harvest via exploitation rate control rules. Management strategy evaluations of each stock and its component populations should be conducted to explore the advantages and disadvantages of different ways of apportioning the returns in excess ofescapement floors between escapement and harvest (e.g., fixed proportion division, incremental increase in harvest as abundance increases, others.); and,4. Escapement goals specified as numbers of wild (NOR), and upper limits on nominal (census) pHOS levels no greater than Hatchery Science Review Group (HSRG) maximum allowable levels for Primary and Contributing (<5%, <10%, respectively). I.e., hatchery strays should not be counted toward meeting escapement goal floors.Wild Fish Conservancy strongly recommends that this alternative be developed and included in the FEIS and in the draft 2018 – 2027 *US v Oregon* Management Agreement.	Wild Fish Conservancy (WFC) suggests that NMFS analyze a new alternative because none of the alternatives considered in the DEIS are sufficiently protective of ESA-listed stocks or population. Protecting ESA-listed stocks at levels consistent with the ESA is inherent in the Management Agreement. The previous Management Agreement explains that "[t]he Parties recognize that NOAA may recommend modifications to the production actions in this Agreement based on the results of [ESA] consultations." Any final preferred alternative selected will be consistent with either NMFS's or USFWS's biological opinion evaluating this action and will comply with the requirements of the ESA. The DEIS analyzes a broad range of alternatives ranging all the way from unrestricted fishing (Alternative 4) to Voluntary Fishery Curtailment (Alternative 5). Alternative 5 presumes that there would be no harvest necessitated by conservation considerations, even at the expense of eliminating Treaty tribal and non-treaty harvest, and thus provides a no-fishing benchmark for comparison to the other alternatives. WFC suggests that Alternatives 2, 3, and 4 are not sufficiently conservative, but describes a new alternative that would allow some unspecified level of harvest. WFC's new alternative would therefore fall within the range of alternatives already analyzed. A further problem with the alternative suggested by WFC is that it does not provide the detail needed to analyze and compare to the other alternatives. WFC's Robust Conservation-Based Alternative is described in general terms as an abundance based regime that includes several features. It would rely on a minimum recovery-based spawner escapement floor that accounts for several characteristics for each population (e.g., sex ratio, run timing, age-structure, hatchery/wild ratios). But the numerical analysis of an alternative comparable to that done in the DEIS requires specifics for each of the Harvest Indicator Stocks. So for example, what escapement goal should be used under this new alternative for Snake River spring/summer Chinook or Snake River sockeye? Section 4.1.1 of the DEIS, Escapement Benchmarks, addresses the WFC's concerns related to escapement goals. The benchmarks used are generally based on the population abundance criteria that are summed at the ESU and DPS level and reported at the last upstream counting location – e.g, Lower Granite Dam on the Snake River or Rock Island Dam on the upper Columbia River. These escapement goals were further adjusted to account for subsequent mortality while migrating upstream from the final

			counting station and for the likelihood that fish arriving at the upstream counting station would distribute themselves unevenly to the individual tributaries. WFC's new alternative articulates some principles (population-specific escapement levels), but does not suggest how to translate those to the kind of benchmarks that are required for management. For example, the new alternative advocated by WFC includes a "stop-loss" rule. This means that when the expected return is below a specified level, there would be no fishing. But analysis of the new alternative requires a specific number for each of the Harvest Indicator Stocks. Exactly what is the threshold below which there should be no fishing? Another example is where, WFC suggests inclusion of an abundance-based harvest rate and escapement scale that partitions returns in excess of the escapement floor between escapement and harvest. Here again, the required specifics are lacking. What is the escapement floor and how will the excess be allocated? The Harvest Policies considered in the DEIS are designed to explore options for achieving the appropriate balance between harvest and conservation objectives and disclose the subsequent environmental impacts from implementing a policy. As discussed in Chapter 2 of the DEIS, the choice between policies depends in part on the status of the affected stocks and nature of available information. Those vary by stock. The policies considered in the DEIS for each of the Harvest Indicator Stocks are designed to illustrate the features of each policy and were not specific recommendations for how each Harvest Indicator Stock should be managed. WFC advocates for an alternative that focuses almost entirely on conservation, with little or no apparent consideration for harvest particularly as it relates to treaty Indian fisheries. However, WFC's suggested alternative falls somewhere above Alternative 5, and therefore within the range of alternatives considered and is not specific enough to allow for analysis and comparison to the alternatives already considered in the DEIS. For these reasons, we did not analyze WFC's in more detail.
11	7 and 8	The current agreement places a direct 2% cap on the combined non-treaty commercial and recreational fisheries take of ESA-listed wild Snake River B steelhead. Non-treaty recreational fishers are required to fish mark-selectively and to release any wild steelhead unharmed. Non-treaty commercial fishers are encouraged to fish mark-selectively. This 2%	Non-treaty commercial fishers are required to release all steelhead whether marked or not. With respect to the allocation of Snake River Steelhead between treaty and non-treaty fisheries, the comment misunderstands the federal government's role in how ESA-related restrictions are shared between treaty and non-treaty fisheries. As

		total mortality cap applies regardless of the estimated total return of wild (ESA-listed)-plus-(non-ESA-listed) hatchery Snake River B returns.In contrast, treaty tribal commercial fishers are not required to release non-target salmon and steelhead (including wild Snake River B) and instead are given a sliding scale harvest rate allocation ("cap) based upon the estimated total hatchery-plus-ESA-listed wild Snake River B steelhead return that is considerably greater than 2% and that includes no requirement for release of unmarked, wild steelhead or salmon. Under the current agreement these rates range from 13% to 20% (total allowable, treaty-plus-non-treaty fisheries, harvest rate 15% to 22%) (DEIS table 4-47, p. 112). The DEIS provides no clear legal justification for this severe discrepancy. We find no good reason for the presumption (implicit in the DEIS) that trust responsibilities to the Columbia River treaty tribes requires this. [7] Requiring mark-selective fishery regulations to apply to the Zone 6 tribal fishery -- would clearly appear to meet the above requirements. We recommend consideration of Zone 6 tribal fishery regulations with a more permissive take limit on listed upriver stocks than applies to the non-treaty commercial and recreational fisheries, but more restrictive than the current agreement (for wild Snake B steelhead for example, 5% instead of 2%) where justified by the appropriate analysis of the population-specific wild escapements required for rebuilding and recovery. [8]	described further in comment 10 below, NMFS and USFWS review proposed actions like the *US v Oregon* Agreement for ESA compliance, but the action represents an agreement between state and tribal co-managers about how to manage the fisheries and share both the opportunities for harvest and requirements for conservation. The sharing solution that the commenter objects to is the one agreed to by the state and tribal co-managers. The commenter appears to suggest that Zone 6 tribal fisheries include mark selective components in order to comply with the ESA. NMFS and USFWS are consulting on the proposed action under the ESA and any final decision made by either Agency will be consistent with the respective Biological Opinion and Incidental Take Statement. The commenter quotes provisions of Secretarial Order 3206 that provides guidance on federal-tribal trust responsibilities and conservation restrictions that may be considered to protect ESA listed species including a set of five conservation standards that must be met. We disagree that requiring mark-selective regulations for tribal fisheries meets all of those standards for a variety of reasons, but particularly if one of the objectives is to reallocate a portion of the ESA take limits to a non-treaty fishery.
11	9	In addition, an alternative that includes an escapement-based stop-loss rule, with an exception for a conservative de minimum C&S fishery for specific stocks, would also appear to meet the requirements. NMFS would appear to have a legal obligation under the ESA to recommend the adoption of such regulations in the renewal of the Agreement.	Please see the response to comment number 6 in this letter (letter number 9). In addition, the commenter earlier couples the stop-loss rule with other features of the proposed Conservation-Based Alternative, but here embellish further on the proposal. They suggest that the stop-loss rule be coupled with a conservative de minimum C&S fishery for specific stocks. Absent necessary specifics, this is not an alternative that can be analyzed and compared to those already considered in the DEIS.

11	10	We also note that nowhere in the DEIS or other related documents has NMFS provided any quantitative criteria by which levels of harvest pursuant to trust responsibilities are to be calculated or otherwise determined so that they can be weighed against non-tribal harvest interests and ESA-recovery requirements. Absent a quantification of de minimus levels of harvest necessary to meet trust responsibilities it is impossible for independent observers, including the interested public, to determine whether the harvest regimes that NMFS does approve are subjective or otherwise arbitrary and capricious. Nor is it possible to make rational and optimal decisions to allocate scarce conservation and management resources between competing harvest management and ESA recovery objectives and opportunities.	Consistent with Secretarial Order 3206 and other laws and policies, we strive to harmonize the federal trust responsibility to the tribes and other statutory missions of the Federal government, including the ESA. How ESA impacts are allocated between treaty and non-treaty fisheries is not part of the consultation and not something that is "approved" by NMFS, nor any other federal agency, but rather part of an overall agreement between the state and tribal co-managers that seeks to balance the interests of both parties. This NEPA document discloses the impact of the alternatives, but it is not required to analyze the Parties' agreed upon allocations.
11	11	We also note that the tribal commercial fisheries appear to secure lower financial returns than non-tribal commercial fisheries. Table 3-18 (DEIS p. 64) lists the ex-vessel value of harvest indicator species under status quo conditions. The lower Columbia (Zones 1 – 5) commercial fisheries harvested 53039 fish that returned an exvessel value of $2418367 or $45.59 per fish. The non-tribal harvest in the mid-Columbia subregion (Zone 6) above Bonneville harvested 3877 fish that returned an ex-vessel value of $148749 or $38.37 per fish. The tribal Zone 6 fishery harvested 237785 fish at an ex-vessel value of $7745794 or $32.57 per fish. This appears to indicate that the tribal fishery is not receiving an appropriate return on their catch relative to the non-treaty commercial fishery. This discrepancy might not unreasonably be interpreted as a failure to meet trust obligations.	As explained in Appendix A, the calculation of ex-vessel values is based on average prices per pound paid for different species stocks and runs (see Table A-2 in Appendix A). As identified in Tables A-7 through A-11, tribal and non-tribal fishers harvest different numbers of the stocks considered in this assessment. As a result of the variable prices and variable catch levels among tribal and non-tribal commercial fishers, the price per fish, as calculated by the commenter, is correspondingly different. It should be noted, however, that prices and level of catch vary from year to year, and the differential value in price per fish also changes. In addition, the estimated total ex-vessel value of salmon and steelhead harvested by tribal fishers in the Columbia River Basin ($7,745,794) under the Status Quo Alternative is substantially greater than the estimated total ex-vessel value for the non-tribal commercial harvest of salmon ($2,567,116), as indicated in Table 3-18.

11	12	If a more conservation-oriented alternative, such as the integrated one described above is adopted, mitigation hatchery programs will have to be re-evaluated and/or re-configured to assure that maximum allowable pHOS levels are not exceeded when returns trigger the implementation of stop-loss (no harvest) rules. When harvest is allowed, sufficient hatchery fish must be removed (harvested) so that the escapements are composed of wild spawners, keeping pHOS levels at or below maximum allowable levels. In other words, hatchery production levels must be scaled so that management directed at assuring achievement of minimum escapement floors for wild populations does not provide justification for high harvest rates in order to comply with pHOS requirements.	See Generic Response 8: Hatchery program reductions under Alternative 5
11	13	The DEIS alternatives also assume that the average and range of conditions experienced in the past 10 years (during the course of the current Agreement) will apply for the next 10 years (over the course of the renewed Agreement). This is unlikely and risky for listed stocks and populations, as evidenced by the current crisis in returns of upriver steelhead, and wild Snake River B steelhead in particular. The current (2017) disastrous returns of sockeye to the Skeena and Fraser rivers in British Columbia also suggest that climatic conditions in the northeast and northcentral Pacific Ocean have changed relative to conditions at the beginning of the current Agreement, and are becoming more variable and unpredictable. The huge block of warm Ocean water off the coasts of Southeast Alaska, British Columbia and Washington, commonly referred to as the “blob” that appeared in 2013-14 and returned in 2016 is but one indication that conditions can change rapidly and unpredictably. Elements of the climatic regime in the northeast Pacific where most CR salmonids rear appear to have shifted since the early years of the current Agreement. Consequently, model scenarios for any of the alternatives should include a wide range of values for marine survival and egg to smolt survival in the several basins of the upper Columbia and Snake River, particularly modeling conditions that are as and more adverse than some experienced by CR stocks in the last 5 years.	See Generic Response 6:10-year forecasting

11	14	Zone 6 "Conversion Rate". The so-called Bonneville-to-McNary "conversion rate" refers to the unaccounted loss of salmon and steelhead that are detected passing Bonneville Dam but neither detected at McNary Dam nor accounted for in fisheries in Zone 6. For several salmon and steelhead stocks this loss is in the neighborhood of 20% of the numbers detected at Bonneville. It is unlikely, in our and others opinion, that this magnitude loss can be assigned entirely to migration mortality. Rather, it appears more likely that some if not all of this loss is due to unreported catch, including illegal (poaching) catch by some one or more of treaty tribal commercial fishers, non-treaty commercial fishers, and/or recreational fishers. The paucity of WDFW and ODFW checkers of the recreational fisheries in the large area between Bonneville and McNary, and the absence of independent observers/checkers of the tribal commercial fishery appear to provide considerable scope for illegal fishing. This issue needs to be explicitly addressed in the new agreement. This should include immediate plans to convene a working group of state, tribal (CRITFC), federal, and independent fisheries scientists and statisticians to develop a research and monitoring plan to address the loss.	Unreported catch is not a component of the proposed action and any impact from such catch is not attributable to the proposed action. Regardless, this EIS discloses the extent of loss, including the amount attributable to the proposed action, as well as the amount of loss attributable to other sources. As described in the comment, the average loss of Spring/Summer Chinook between Bonneville and McNary Dam is about 20%. Roughly half of that can be attributed to legal and properly reported catch. Identifying the source of the remainder of the loss is an ongoing challenge for the *US v Oregon* parties. A recent report analyzed the adult survival characteristics of upriver spring/summer Chinook in the Columbia River (see revisions in Section 4.1.1.1). It is apparent from this report that adult survival is affected by many things including the downstream migration history and whether the fish are hatchery or wild origin. At this time, this is the only species that has an analysis of this type available. Run timing is key particularly as it relates to high flow and temperature conditions within differences as even a few weeks making significant differences.

11	15	Snake River SteelheadSnake River wild (NOR) B steelhead are returning this year (2017) in record low abundance. In addition to harvest impacts permitted under the current abundance-based management agreement, particularly in the Zone 6 fishery as noted above, hatchery stray rates a concern in all Snake steelhead MPGs, including the major tributaries of the Clearwater MPG, the South Fork Salmon and tributaries, and the Middle Fork salmon and tributaries that contain major spawning grounds for Snake River B steelhead. This is noted in the Idaho Management Unit Recovery Plan appendices to the 2016 Draft Snake Salmon and Steelhead Recovery Plan, and in NMFS' 2016 5-Year Review: Summary and Evaluation. The renewed agreement should better address these threats by (among other actions):• placing a conservative incidental take limit on wild steelhead encountered in this fishery, instead of the current total mortality limit on all (hatchery and wild) Snake River B steelhead, and• requiring the treaty tribal fisheries in Zone 6 to transition to mark-selective fisheries within the period of the renewed agreement, and then requiring release of all wild (non-adipose-clipped) steelhead.	We appreciate that the return of steelhead in 2017 is low and is of particular concern. The abundance based harvest schedule is designed to respond to varying conditions. We also appreciate your comment that a more conservative limit is preferred. Non-treaty fisheries are managed with a take limit on wild steelhead because their fisheries are mark selective. Treaty fisheries are not mark selective and are therefore managed to limit the overall number of steelhead they catch. The hatchery programs in the Snake Basin are being reviewed separately through a set of bundled HGMPs.
11	16	We also believe that harvest under a new agreement must provide for minimum population-specific recovery based spawner escapement goals for Snake River B steelhead (as well as other ESA-listed populations). If minimum escapement goals for the aggregate population measured at Lower Granite Dam are chosen, the aggregate should be large enough to assure that each major spawning population in the Clearwater and Salmon MPGs has a high probability (explicitly quantified in the agreement) of attaining their minimum escapements and that all major and minor spawning locations within those major spawning populations are occupied.	There is already a discussion in section 4.1.1 of the DEIS under Escapement Goals that seems to address the point made by WFC related to escapement goals. The goals used are based on the population abundance criteria targets from the respective recovery plans that are summed at the ESU and DPS level and reported at the last upstream counting location – e.g, Lower Granite Dam on the Snake River or Rock Island Dam on the upper Columbia River. These were further adjusted to account for subsequent mortality while migrating upstream from the final counting station.
12	1	The public would have benefitted from a public meeting or two in order for NOAA to explain how it conducted its analysis in the alternatives review and comparison.	The NEPA Regulations nor the "Policy and Procedures for Compliance with the National Environmental Policy Act and Related Authorities Companion Manual for NOAA Administrative Order 216-6A" do not require public meetings during the 45-day public comment period.
12	2	Critically, NOAA Fisheries did not provide some of the cited materials, reports, data, but merely contained citations to many papers and other resources that were not readily available to the public.	Please see the response to comment 4 of this letter.

12	3	Compounding that difficulty, NOAA Fisheries' Harvest DEIS tiers to a 2,000+ page FEIS on Columbia River hatchery issues that was incredibly complicated and convoluted as the Mitchell Act FEIS evaluated economic issues as well as environmental issues and even Endangered Species Act (ESA) issues.	We recognize that the harvest, economic, environmental, and ESA issues associated with the *US v Oregon* Agreement are complex. The NEPA Implementing Regulations, at 40 CFR 1502.21 require incorporation by reference such that "Agencies shall incorporate material into an environmental impact statement by reference when the effect will be to cut down on bulk without impeding agency and public review of the action. The incorporated material shall be cited in the statement and its content briefly described." We have not tiered (see 40 CFR 1508.28) this EIS. Rather, we have incorporated elements of the Mitchell Act EIS in order to 'cut down on bulk'. Page xi of the Executive Summary clarified that, "Therefore, while this EIS stands separate from the Mitchell Act EIS, it incorporates data, analyses, and conclusions from the Mitchell 1 Act EIS as appropriate." Where specific material is incorporated by reference (e.g., Section 3.2 and 3.3, Paragraph 1 and the end of Section 3.4), the relevant section of the source document is cited.
12	4	The Harvest DEIS mentions public outreach to Native American tribes, and to commercial and recreational anglers, but does not reference any outreach to conservation organizations.	Section 4.7.3, Public Participation, stated that "Emails [indicating the availability of the DEIS] were also sent to individuals who we were previously aware that are interested in salmon fishery issues" and provided examples of non-tribal commercial, recreational and tribal fishermen. We have updated this statement in the FEIS to capture other stakeholders, including conservation organizations. Section 6.3 in the DEIS presented the distribution list for the DEIS that included Conservation Anglers and several other Organizations and Associations.

12	5	There appears little if any evidence that the Harvest DEIS considered any of our scoping comments which focused on presenting other alternatives than those presented in the Notice of Intent (NOI). Indeed the Harvest DEIS on p. 35 notes that several alternatives were considered but not analyzed but yet only specifically responds to a single alternative - what NOAA describes as a "fixed effort" alternative. NOAA brief dismissal of other alternatives weakens its overall Alternatives analysis.	We did consider the six alternatives suggested by the commenter in their response to the NOI. The DEIS makes a distinction between Harvest Policies and Harvest Management Measures. The Introduction to Section 2 of the DEIS explains the distinction between Policies and Management Measures. The alternatives suggested by the commenter all fall within the definition of Management Measures that include allocation decisions and the types of fisheries and gears that might be used to implement a specific harvest policy. The DEIS is designed to evaluate the effect to the environment of a broad set of harvest policies, rather than Management Measures.
12	6	The Proposed action is drafting an Incidental Take Statement (ITS) for fisheries, presumably authorized by the on-going federal court action known as "*US v Oregon*," that will result in the direct and indirect take of ESA-listed species of salmon and steelhead, and drafting a Biological Opinion that the authorized "take" of ESA-listed species will not jeopardize the future survival and recovery of the listed species.	The Proposed Action is for the Federal parties to sign the new management agreement, as negotiated by the parties to *US v Oregon*, and for NMFS and USFWS to issue an ITS exempting take of listed species pursuant to the implementation of the management agreement. The process for development of an ITS are listed in CFR 50.402.
12	7	The priority for NOAA has been protecting resources and understanding the oceans and atmosphere. NOAA's first order in this effort is to comply with mandates to protect and recover species listed as threatened or endangered under the Endangered Species Act (ESA). NOAA's second priority is to ensure, as a representative of the United States government, that treaties signed with Native American Tribes are honored. Northwest treaty tribes' right to harvest salmon and steelhead is strong, but not absolute - they cannot catch the last of an ESA-listed fish. In that way, NOAA Fisheries role is not to "balance" the use or right to use a national or international resource, but to ensure those marine resources (in this case, Pacific salmon and steelhead) are sustained and protected - for use now, and in perpetuity. There can be no balancing when there are zero fish on one side of the scale.	Thank you for your opinion. We, specifically NMFS in regards to the content of this comment, manage the resources that are the subject of the *US v Oregon* Agreement consistent with a broad set of laws, plans and policies many of which are discussed in detail in section 1.6 of the DEIS.
12	8	There is no Preferred Alternative despite specific language requiring it in NOAA's own regulations.	See Generic Response 2: Preferred Alternative
12	9	It is not unforeseeable nor unreasonable that the legal basis of the Agreements arising from *US v Oregon* might be overturned or significantly modified by future litigation that establishes that the federal ESA can and does constrain salmon and steelhead harvest management and hatchery production and therefore the inclusion of such a scenario is a viable alternative that NOAA fails to consider. NOAA needed to consider a broader spectrum of alternatives and its failure to do so renders the Harvest DEIS inadequate. Very specifically, the Harvest DEIS unreasonably fails to include or even adequately assess additional alternatives that were identified through public comments.	We cannot reasonably anticipate the outcome of future litigation or consider related outcomes through the NEPA process. NMFS has conducted past and ongoing review for ESA compliance on *US v Oregon* Management Agreements. We did consider a broad spectrum of alternatives, which included Alternative 5 that curtailed most fishing, and disagree that the range of alternative was inadequate.

12	10	Alternative 1 is barely different than Alternative 6 (No action) as both describe little change from the current Agreement and both make assumptions that "anticipate" certain vague actions that provide little detail to enable reviewers from assessing the efficacy of the alternative. does not mean there will be no change. The description of the No Action alternative assumes that if an agreement is not signed, and if no ITS or Bi-Op is signed, that harvest will change. Where is the evidence that would occur? There is little to no substantive difference between Alt 1 and Alt 6 because harvest practices and harvest policy could be the same.	Harvest was higher prior to the first issuance of an ITS for any harvest related activity subject to *US v Oregon*. Therefore, the evidence is in the historical record. We believe that there is a substantive difference between Alternative 1 and Alternative 6. While both alternatives assume harvest would occur, they differentiate the general level at which harvest would occur as described in Section 2.
12	11	Rigid assumptions are applied to each alternative which rarely reflect reality or history. These rigid assumptions are too numerous to address individually but appear to have invaded the treatment and evaluation of most every alternative (presumably to foster an easier comparative analysis?).	We sought, to the degree possible, to compare alternatives by quantifying their relative effects. Quantification depends on the use of assumptions in order to simplify what is an inherently complicated system. Throughout we have tried to explain those assumptions.
12	12	The No Action Alternative mischaracterizes the effects of Alt 4 (escapement) on harvest rates, attributing a harvest rate to all fish returning in excess of escapement goals. This assumption ruins Alternative 4 as a viable alternative in the analysis and comparison of the entire Harvest DEIS.	See response to comment number 5 in letter number 11 that is also related to Alternative 4.
12	13	There is no fundamental discussion or presentation or description of the underlying science behind the Alternatives and the specific fishery management policies that are part of most of the alternatives.	Section 2 does discuss each alternative and their general characteristics and applications. Alternative 2, 3, and 4 (Abundance-based, Fixed Harvest rates, and Escapement Based) in particular are standard fishery management policies used throughout the world. There are more detailed discussion of the Alternatives and how and why they are applied in Section 4.

12	14	There is frequent reference to modeling yet no explanation or user guide to the scientific validity of the modeling upon which NOAA and other managers rely for forecasting and analyzing the effects of harvest on populations. Models used to calculate impacts of various harvest schemes should be explained, and their key assumptions and critical uncertainties described.	The material is inherently complex, but we disagree that there is no explanation or guide to explain to the reader how information was modeled. In subsection 2.1.1 through 2.1.6 we explain the conceptual basis for modeling each alternative. Within each alternative we give an example of how a modeled analysis could be performed to orient the reader. In subsection 3.2.1 we explain baseline components that will be used in modeling the anticipated effects of each alternative, and for the economic analysis we provide an Appendix A. Subsection 4.1.1 is titled "Description of Modeled Metrics for Harvest Indicator Stocks and Abundance Indicator Stocks" where we attempt to further explain the outputs and format of material presented in subsequent sections detailing the biological impacts to affected salmon and steelhead resources. We provide explicit examples of key assumptions and critical uncertainties in these various specific subsections.
12	15	Incorporation by reference of the *US v Oregon* Management Agreement as a baseline appears as a “precisional” statement, even if it refers to a federal court settlement. The fact is that it is an ongoing settlement that can and does change. What does NOAA mean by describing it as a baseline? How is that different than a no action or current case alternative? If the *US v Oregon* Management Agreement is a baseline, then it should be, as it exists today, as an alternative to be analyzed fully.	Alternative 1 is described in Section 2.1.1 as an "extension of the current agreement" and therefore is analyzed fully as an alternative in this EIS. The EIS has been edited for clarity to remove references to “baseline” and better explain when a comparison is made to current, status quo conditions and when a comparison is made to the No Action Alternative.

12	16	The Harvest DEIS merely describes the concept of harvest stocks v. indicator stocks - without the basis for this delineation, or the scientific literature that supports this designation and labeling.TCA believes that NOAA begins with a fundamental flaw - managing in aggregate - and that this is already a policy choice that was not analyzed As presented in Section 1.3.1 and detailed in Section 4.1, harvest policies are established for each Harvest Indicator Stock. Harvest Indicator Stocks are called “Management Units” in the *US v Oregon* management agreement and tend to be aggregates of fish runs larger than the ESA-listed “units” (ESU or DPS). Abundance Indicator Stocks are equivalent to the ESA-listed “units” (DPS or ESU) affected by implementing fisheries that adhere to harvest policies specified in the agreement. Harvest Indicator Stock - where did this concept arise, who proposed it, was it evaluated as a scientifically sound management concept. What are the critical uncertainties for using this concept, what are the assumptions behind it. What have critics of this management concept said about it? Not a single citation to scientific basis for modeling, a single citation for forecasting, and none for the scientific basis for abundance based management, indicator stock management harvest indicator stock management NOAA should be describing the scientific rational and underlying basis for each policy concept being employed and evaluated. The same is true for relying on an abundance-based management regime.	The stock concept has been a hallmark of salmon management for several decades now, extending into various management fora charged for dealing with salmon harvest management. A biological opinion determines whether the action (e.g., in river implementation of salmon and steelhead fisheries) is likely to adversely affect an ESA-listed species and, if so, would the action therefore appreciably reduce the likelihood of survival and recovery of ESA-listed species or adversely modify or destroy their critical habitat (situations that are also known as "jeopardy"). If the action is likely to adversely affect an ESA-listed species, the biological opinion will include an incidental take statement that will describe and set limits for the level of take that is anticipated. If the action is found to jeopardize the continued existence of an ESA-listed species, NMFS or USFWS will determine during ESA consultation a reasonable and prudent alternative (RPA) to the proposed action that is consistent with the intended purpose of the proposed action that will remove the risk of jeopardy. The NEPA analysis is examining the effects of alternate harvest policy choices, and not recommendations for the specific biological criteria that should be used for implementing harvest policies and the related management frameworks. We disagree that there is no explanation or guide to explain to the reader how information was modeled. Please also refer to response to comment number 14 in letter 12.

12	17	Finally, since harvest is often provided by hatchery production, it means that the effects, impacts, cumulative impacts must be evaluated completely. The Harvest DEIS improperly segments its evaluation to Columbia River basin harvest, without evaluating the impacts to abundance and stock structure caused by fisheries in Alaska, British Columbia and ocean fisheries off Oregon and Washington. These harvest regimes are also often driven by and reliant on hatchery production. Tiering to an already completed NEPA analysis so interwoven wit the Harvest DEIS is confusing and difficult to compare, contrast and not find "predecisional" conclusions already hard-wired. This precedent is set by the incorporation by reference of the Mitchell Act FEIS which does consider considered Alaskan, foreign and ocean catch (p. 1.4).	See Generic Response 4: Hatchery Cumulative Effects, and for ocean fisheries, see Generic Response 9: Ocean harvest.
12	18	NOAA should have incorporated by reference Fishery Management Plans adopted by the Pacific Fishery Management Council on an annual basis. There is much more to be understood about the information and scientific analysis contained in these annual reports, and could have served as a model for the Harvest DEIS.	Thank you for your comment. The FMPs adopted by the Pacific Fishery Management Council do contain a wealth of information, as do the annual Stock Assessment and Fishery Evaluation (SAFE) Documents found at http://www.pcouncil.org/salmon/stock-assessment-and-fishery-evaluation-safe-documents/. These documents have been referenced where germane to the content of the specific section of the EIS (e.g., economics appendix). See 40 CFR 1502.21 for specific requirements pertaining to incorporation by reference in a NEPA document. Section 1.8 of the EIS has also been updated to reflect this suggestion.
12	19	Gear and timing of fisheries are not considered in the Harvest DEIS when they have a direct and meaningful affect on all species and stocks of salmon and steelhead. There is no analysis of the non-selective nature of the commercial fishing gear used by non-tribal commercial and tribal Treaty commercial fishers. The effect of non-selective gear and their effect on stock structure and life history is one of depletion and mis-management across the entire nation, and particularly in the Pacific Northwest.	Thank you for your comment, however we disagree, as we did explain in the introduction to Section 2 regarding the distinction between Harvest Policies and Harvest Management Measures, please refer to response to comment number 5 in letter number 12.
12	20	The Harvest DEIS does not account for delayed mortality as a result of any fishery that is required to safely release non-target species. This includes a failure to evaluate the impacts of sport C&R fisheries. The Harvest DEIS did not account for sub-lethal effects, delayed mortality after release, nor spawning failure from escaping net fisheries or in sport catch and release fisheries.	See Generic Response 7: Non-Retention Impacts

12	21	TCA finds deep concern that Columbia River summer steelhead (the so-called "A-run") is not considered in the Harvest DEIS.	Columbia River summer steelhead are considered. We explain why the B-Index component of the steelhead run is an adequate proxy for effects to all other stocks of steelhead in subsection 4.1.1.5.
12	22	We share the same concern that Skamania Summer run steelhead are not considered despite effects on population by harvests governed by *US v Oregon* both below and above Bonneville Dam.	Lower Columbia River steelhead are considered. We explain why the B-Index steelhead stock is an adequate proxy for effects to all other stocks of steelhead in subsection 4.2.1.
12	23	LCR winter steelhead not considered while harvests are also governed by *US v Oregon* regarding spring chinook and summer chinook fisheries.	Lower Columbia River steelhead are considered. We explain why the B-Index steelhead stock is an adequate proxy for effects to all other stocks of steelhead in subsection 4.2.1.
12	24	Simply trying to determine the scope of the analysis for each of these documents is daunting, let alone trying to assess how the scope of each meshes with the other in the repetitive efforts to decipher the environmental, economic and ESA impacts of the varied alternatives is actually impossible due to the different affected environments each document addressed. There is no logical way for the public to understand how these three documents relate to each other, particularly given the short period allowed for public comment.	The subject matter is inherently complex and, although difficult, we believe that the DEIS includes an appropriate range of alternatives and well described analysis that help inform the necessary conclusions and recommendations.
12	25	While the Mitchell Act FEIS addresses congressionally authorized hatchery funding that is aimed to mitigate for the lost natural production of salmon and steelhead caused by the construction of large dams, the weight of credible and sound scientific evidence that hatcheries cannot achieve their originally ascribed objectives should carry more weight in favor of a complete top-to-bottom review of what was lost to the dam building and how those losses can be mitigated so that the old solutions of hatcheries are cast aside in favor of a holistic program that fosters the natural productivity of wild salmon and steelhead. The current congressionally authorized mitigation programs are doomed to eventually failure and it behooves the states and tribes to work together to revised the legislative focus from the original solution of hatcheries now that there is clear and convincing evidence that they are harmful to the watersheds of Oregon, Washington and Idaho.	Thank you for your comment. We will support States and Tribes in their efforts to improve the natural productivity of wild salmon and steelhead.
12	26	The analysis of the water quality issues with hatcheries missed the cumulative impacts of long term discharge, degradation and build up of non-biodegradable chemicals and pollutants from hatchery facilities.	Section 5.3.2, Water Quality and Quantity - Hatchery Effects and Marine Derived Nutrients, does clearly disclose that, under all alternatives the impacts of hatchery effluent would continue to add to cumulative negative impacts to water quality.

12	27	It is reported that 100% of hatchery facilities are in compliance with their NPDES permits. We doubt that.	All hatchery facilities which produce enough fish to require monitoring under the Clean Water Act, National Pollution Discharge Elimination System - managed by either the States of Washington and Oregon, or by the EPA for the State Idaho and for Federally-funded Hatcheries, currently have in place NPDES Discharge permits and operate consistent with said permits.
12	28	It was interesting to note that multiple facilities are operating on very old permits that have not been reviewed in a timely manner as required by the Clean Water Act.	Thank you for your comment. It has been noted.
12	29	Despite efforts to search for and review these documents, TCA finds that there is very little discussion of the connectivity of hatchery production that leads to harvest - related impacts on ESA-listed salmon and steelhead recovery and diminishment impact of natural production.	The DEIS does acknowledge that the hatchery production that is referenced in the Agreement, at least for those programs whose objective is harvest augmentation, support many of the fisheries that are managed under the Agreement. See Section 1.3.1 and 1.3.2.
12	30	There does not appear to be any discussion or analysis of the presence, creation and impact of non-clipped hatchery fish on harvest alternatives in the Harvest DEIS, though they are identified in Mitchell Act FEIS.	Thank you for your comment. It has been noted.
12	31	Finally, it is unclear to TCA whether the incorporation by reference to the Mitchell Act FEIS opens that NEPA document up for additional review. Even if it does not, the findings or results still deserve questions and clarifications. The Mitchell Act DEIS analyzed four action alternatives. Alternatives four and five were distinct among these because they distinguish between the Interior Columbia recovery domain and the Willamette/Lower Columbia recovery domain and because they apply different performance metrics in each domain. The analysis provides important insights regarding how the "intermediate" and "stronger" performance goals would affect each of these domains. Yet the analysis does not provide a rationale for applying different metrics to each domain, nor for treating the two domains separately. What is missing in the FEIS is an alternative that applies the stronger performance metric to each domain.	Thank you for the comment. The Mitchell Act Record of Decision was issued on March 23, 2017 and can be found at http://www.westcoast.fisheries.noaa.gov/publications/hatchery/mitchellact_feis/mitchell_act_eis_recordofdecision.pdf. The preferred alternative has been incorporated into the baseline analysis of this EIS.

12	32	It was unclear if the FEIS incorporated discussion of the monitoring program, including program development; key monitoring parameters; how implementation and effectiveness monitoring would be addressed. It left adaptation/reform unaddressed, and certainly did not confirm whether it would be implemented or funded. There does not appear to be any mention of the MER concept within the Harvest DEIS which casts doubt on whether hatchery or harvest operations in the Columbia River will ever receive ongoing or even partial review in any sort of comprehensive manner, which will leave critical uncertainties unaddressed between now and the next time the *US v Oregon* Management Agreements are revised.	The Mitchel Act FEIS and Record of Decision discuss hatchery-specific Monitoring, Evaluation, and Reform unique to the Mitchell Act program, it stands for Monitoring, Evaluation, and Reform (MER). In our identified preferred alternative, under subsection 2.1.1. in this *US v Oregon* FEIS, we do expect to evaluate performance of harvest policies relative to achievement of their respective goals on an annual basis. A description of the 2008-2017 Agreement's performance evaluation is listed on page 26, for which we've provided a link in Section 1.8 of the EIS. We expect a similar component will be included in the new Agreement.
12	33	The Executive Summary of the Harvest DEIS makes a statement at line 11 on p. ix that more adults escaping to spawn does not result in more juveniles because "escapement capacity is limiting." This is completely incorrect. This is the common agency opinion about habitat capacity and density dependence. It is essentially an MSY-oriented, harvest max-oriented opinion lacking clear supporting data. This statement also ignores the value of selection for highly competitive animals that is relevant to recovery. That is, even if there is data indicating that there is currently a ceiling on parr capacity, for example, recovery is likely to be enhanced by assuring high spawning and consequent high fry and parr numbers to assure high competition for rearing space. Further, such increased density and competition is likely necessary to push juveniles to explore marginal rearing habitats.	See Generic Response 5: Spawning Habitat Capacity
12	34	Another flawed assumption appears in the Mitchell Act FEIS where it states that marine derived nutrients from hatchery production are constant and stable across all alternatives. While this statement may be made as an assumption to ease the comparison of the alternatives, where is the evidence that this is in fact ever true?	Thank you for your comment. We assume you are referring to the *US v Oregon* EIS, and have added clarifying language.
12	35	The Harvest DEIS declares that it would not consider the lower Columbia as tribes do not harvest below Bonneville. This is an inaccurate statement. The Treaty tribes DO harvest salmon and steelhead below Bonneville. If the analysis was completed based on this statement, then the economic analysis in the Harvest DEIS is flawed.	The FEIS has been revised to clarify that the tribes do fish below Bonneville Dam and that this harvest was considered in the economic analysis.

12	36	The economic analysis considers hatcheries as part of a positive economic impact. This ignores reality, as the inputs of federal and state funds aimed at operating hatcheries come from other sources (federal excise taxes, state general funds) where the funds expended on hatchery subsidies and mitigation agreements would have been spent elsewhere in the economy. In that sense, these government funds are “costs” and not revenue. Mitigation hatcheries would not have been necessary if wild salmon and steelhead had not been prevented from reaching the natal streams. Every dollar spent on hatchery production is a “cost” or expense that all of us are paying for something that was essentially free to society but was lost. All anyone has to do is look at watersheds that still produce wild salmon and evaluate the economic benefits wild salmon produce for the local and regional economies. These are positive economic contributions. Funds spent from other sources to produce hatchery fish which in turn spurs spending to raise, release and harvest them are merely subsidies.	The commenter raises an important distinction concerning different types of economic analyses. The analytical objective of the economic analysis conducted for the DEIS was to compare the different harvest policy alternatives in terms of different economic metrics. These metrics included measures of economic value as estimated by the ex-vessel value of commercial landings and estimates of trip-related expenditures made by recreational anglers, and by the direct and indirect contribution of the harvest policy alternatives to the local and regional economy, as measured in terms of employment and personal income. Although from a state or federal budget perspective expenditures to construct and operate hatcheries would be considered a cost with a corresponding benefit, the FEIS takes a more local perspective, focusing on how the different harvest policy alternatives contribute to generating economic value for commercial and recreational anglers and to economic activity at the local and regional level. This type of "contribution" analysis considers the value added to recreational and commercial anglers, and the number of jobs and amount of personal income directly and indirectly supported by each of the harvest policy alternatives. The type of analysis that the commenter refers would be appropriate to determine the economic efficiency of the harvest policy alternatives; but for purposes of the FEIS, a comparative assessment framework focusing on changes in the different economic metrics better serves the purpose and objectives of the economic analysis. Clearly, to persons who work at hatcheries and persons whose job is supported by hatchery operations or on the expenditures made to participate in affected fisheries, the budgetary costs for hatchery operations also provide a local and regional benefit.

12	37	The economic study relied upon in the Harvest DEIS was completed in 1991. Apparently it has been revised and updated in "2016" dollars. The age of this economic analysis may make it helpful in terms of comparing its findings with the current and future economic landscape, but if all that was done was update the 1991 dollars to 2016 dollars, it renders the entire effort meaningless.	Presumably the commenter is referring to the Columbia River: Oregon Angler Survey and Economic Study, The Research Group 1991 study, which is referenced in Table A-4 of Appendix A. Very limited information from this study was used in the economic analysis conducted for the DEIS. The information from this study that was used in the DEIS economic analysis was estimates of the average cost of a sportfishing trip for salmon and steelhead on the Columbia River. Although measurement of this metric is important to the economic analysis of the affected recreational fisheries, these estimates of average per-trip spending ($92.84) are considered reasonable relative to recent but more limited estimates of angler spending per trip.
12	38	Appendix for economic analysis: It states that money is spent only within specific harvest regions. It is highly likely that salmon harvesters will spend money in one region and travel to a different harvest region and not spend any money. This is a poor and likely invalid assumption.	The commenter apparently misunderstood that the analysis assumes that money is spent only within specific harvest regions. Because information on the distribution of recreational and commercial fishing-related expenditures among the four subregions of the Columbia River Basin and outside the basin was not available to allocate expenditures to each regions, the economic impacts associated with these expenditures were assigned to the region where the fishing activity occurs. This assumption is considered reasonable and is considered preferable to attempting to provide a level of precision that cannot be supported by the available data.
12	39	Appendix for economic analysis: There does not appear to be any economic analysis or effort to quantify non-consumptive fisheries where anglers fish, spend money and do not harvest fish.	The analysis of effects on recreational fisheries is based on the predicted number of angler trips that would result from the implementation of each harvest policy alternative. As such, the unit of analysis is trips, which includes both consumptive and non-consumptive (catch-and-release) fishing trips.

12	40	The following statement creates questions whether an Economic analysis should have been conducted at all. The section states "Because dynamic changes in the economy over time are not considered in this analysis, results of the assessment are not considered valid for measuring effects on the economy over the long term from changes in fish abundance or policy." p. 215	Economic analysis is limited by the tools and data available for the analysis. The statement referred to by the commenter is intended to inform the reader that the analysis does not attempt to factor in uncertain future changes in the economy that could affect the magnitude of impacts. Attempting to forecast and incorporate such conditions into the analysis would introduce an unacceptable level of speculation. Because the primary purpose of the analysis is to compare effects across alternatives, future conditions would likely affect the alternatives similarly and would not be expected to materially affect the relative results.
12	41	NOAA Fisheries Staff and NW Fisheries Science Center staff have become aware and knowledgeable of a phenomenon of lost up-stream migrating adult salmon and steelhead. This issue is discussed in the 2015 NOAA Five-year ESA Status Review and it is estimated that up to a 20% loss of fish occurs between dams (these are fish that are unaccounted for). This phenomenon casts doubt on the effectiveness of harvest rate data, catch reporting and escapement...The fact that the Harvest DEIS did not address "conversion" despite the fact that it relates to harvest governed by the current 2008-2017 Management Agreement is a serious and game-changing flaw.	See Generic Response 3: Hydropower Cumulative Effects. The 'Conversion' is addressed and analyzed as interdam loss as explained under Generic Response 3.
12	42	Our rough calculations above would have been greatly more informed had NOAA provided us with documents, materials and communication related to the issue of "Conversion" or interdam loss as we requested in a Freedom of Information Action request (FOIA #DOC-NOAA-2017-001528). However, despite a late and very partial disclosure, TCA did not receive the bulk of the documents in time to analyze them and assist in our evaluation of the Harvest EIS in relationship with the stunning and extensive loss of wild salmon and steelhead between each and every dam. In fact, as the day of the comment deadline comes to an end, we have still not received over 80% of the relevant documents.	We received your FOIA request on June 14, 2017. The request involved over 8,000 documents across multiple parts of the government, including the Northwest Fisheries Science Center. We understand your comment regarding your concern with interdam loss. These issues are well known to us and were sufficiently raised here to allow us to respond to your comment.

12	43	TCA is aware of extensive evidence of regularly occurring illegal harvest of both ESA-listed salmon and steelhead, as well as other non-listed salmonids and non-salmonids in the Columbia River. Despite regular requests, there has been no data released on the extent of illegal harvest, and how or if it is incorporated into forecasting and harvest models or catch records. Evidence of illegal harvest is present in non-tribal commercial fishing fleet in the lower Columbia, the sport fishing fleet throughout the Columbia and Snake River main stem and in tributaries, and in the Treaty tribal fisheries (commercial, Ceremonial and subsistence fisheries).The evidence that has been collected points to an extensive pattern and frequency of illegal fishing and harvest, whose effect does not clearly appear to be factored into the Harvest DEIS anywhere.	"Section 4.1.1, Escapement Goals, described Interdam Loss as "the difference in fish stocks between the mouth of the river and the last upstream counting station independent of fishing. The difference represents fish loses due to natural mortality or turnout to mainstem tributaries, and mortality associated with hydro operations, illegal fishing, and habitat degradation." Interdam loss represents a pool of "missing" fish or unaccounted for mortality. Upstream migration that can involve hundreds of miles is a challenge for fish in the best to of times. We know that pinniped predation in the lower river is significant. Recent analysis has highlighted the influence of high temperature and flow on upstream survival. Wild fish tend to have higher upstream survival rates than hatchery fish. Fish that migrated downstream inriver as juveniles have higher survival rates during upstream passage than transported fish. Illegal harvest certainly occurs and contributes to the pool of missing fish, but the relative importance compared to the other sources of mortality is unknown. Efforts are underway to assess monitoring programs and improve them where needed and to address instances of illegal harvest as they become apparent. In the meantime, interdam loss is accounted for in management through the development of forecasts and in the analysis of the alternatives considered in the DEIS.
12	44	There is little mention of the adequacy of efforts to measure the effectiveness of various catch recording activities in the Harvest DEIS, and absolutely no mention of what comprises an effective deterrent for illegal fishing by current, let alone future fisheries enforcement.	Fishery monitoring is an important element of any fishery management program. The DEIS focuses on choices between several harvest policy alternatives. As discussed in Section 2 and elsewhere, the DEIS made a distinction between its consideration of harvest policies and harvest management measures which are the actions and tactics used to implement a fishery policy. Monitoring is therefore part of the considerations of management measures that are used once a harvest policy is chosen. Fishery monitoring is a necessary element of all of the harvest policies considered, but was not discussed in more detail because it would not help inform considerations of the alternatives.

12	45	There is no discussion nor even a citation of the 2015 Northwest Fisheries Science Center Five-year Status Review of ESA-listed salmon and steelhead. NOAA published the Science Center review in 2016, though neither can be found in the DEIS.Because neither newest 5-Year review nor the one before that suggested any change to the status of these fish, there are likely problems with the existing and current policies and management in the *US v Oregon*. The status of Columbia and Snake River salmon and steelhead matters in the Harvest DEIS, particularly since the review points out harvest as a significant factor.	We have listed the ESA-listed species that are in the 2015 Northwest Fisheries Science Center Five-year Status Review. NEPA does not perform an ESA consultation, please refer back to response to comment 12.16 of this letter. The relationship between ESA and NEPA is complex, in part because both laws address environmental values related to the impacts of a proposed action. However, each law has a distinct purpose, and the scope and standards of review under each statute are different. The purpose of an EIS under NEPA is to promote disclosure, analysis, and consideration of the broad range of environmental issues surrounding a proposed major Federal action by considering a full range of reasonable alternatives, including a no-action alternative.Public involvement promotes this purpose. The purpose of ESA is to conserve listed species and the ecosystems upon which they depend. Determinations about whether proposed actions meet ESA requirements are made under separate evaluations for ESA section 4(d), section 7, or section 10.
12	46	The Harvest DEIS incorporates by reference the 2014 Mitchell Act FEIS yet it states it only affects about one-half of the *US v Oregon* Agreement.	Please see the response to comment number 3 in this letter (number 12) for an explanation of this EIS's use of incorporation by reference.
12	47	The Harvest DEIS stated that it will not cover Lower Columbia River fisheries, yet tribal fisheries are permitted below Bonneville Dam.	The FEIS has been revised to clarify that the tribes do fish below Bonneville Dam and that this harvest was considered in the economic analysis.

12	48	The Harvest DEIS mentions the Pacific Salmon Treaty, Pacific Fishery Management Council ocean salmon management process as well as the North of Falcon process. However, it fails to analyze how prosecution of these fisheries, let alone the forecasting used to build these fisheries, have ultimate effect on how all of the salmon and steelhead returning above Bonneville Dam fare in terms of meeting escapement and ESA recovery goals.	See Generic Response 9: Ocean harvest.
12	49	The totality of separate salmon harvest regimes, independently assessed, is nothing more than sorting fish into more and more distinct and smaller user buckets as the fish approach their natal rivers and streams. This is evident with the multiple in-season management adjustments issued by NOAA and PFMC where catch and quotas are routinely transferred between aggregate catch areas or user groups. Harvest management operated in this manner is upside down and backwards in terms of managing a resource dependant on returning enough wild salmon and steelhead spawners to their natal rivers.	Fishery managers must use the best information available to them at the time that management decisions have to be made. As noted by the commenter, information about stock composition improves as the fish get closer to their natal streams. Fisheries in the ocean or lower in the river are called mixed stock fisheries because it is not possible to observe or enumerate the abundance of individual populations. As a consequence, they manage for the stock groups that can be distinguished and observed. The Harvest Indicator stocks considered in the DEIS are examples of such stock groups. The status of the populations affected by mixed stock fisheries is accounted for as harvest policies are set and those are designed to protect the weaker components of the stock. Sockeye management provides an example. Although there have been hundreds of thousands of harvestable sockeye returning to the upper Columbia River in recent years, harvest in mixed stock fisheries has been limited significantly because of the weak status of Snake River sockeye.

12	50	A simple look across the Columbia and Snake basin provides all the evidence needed to confirm that the management regimes employed by federal, state and tribal fishery authorities are not working for wild steelhead. We do not believe that a single alternative being considered in the Harvest DEIS will change this trajectory. We challenge NOAA to use every option at its disposal to change the regime and the extinction trajectory for this magnificent wild animal.	Thank you for your comment. One alternative, Alternative 5, would curtail almost all fishing and is therefore as conservative as it can be. Beyond that any of the alternatives could be configured to be as restrictive as needed depending on how it is configured and implemented. As discussed in Section 2, harvest policies are used to manage weak stocks that need protection, like Snake River sockeye, and healthy stocks that provide the opportunity for considerable harvest like upriver fall Chinook salmon. The DEIS is not designed to focus only on harvest policies needed to protect weak stocks. Instead, it is designed to provide information related to the consideration of what policy to use under a wide variety of circumstances.
12	51	The Conservation Angler looks forward to helping shape the development of the Harvest DEIS so that it can become a management framework that disrupts the current direction.	Thank you for your comment. We believe that your comments, as well as input from other commenters, have helped shape the development of the FEIS.
13	1	The following claim is made: "However, the capacity limit of the current spawning habitat does not allow for increased juvenile production at higher escapement numbers. Therefore, an increase in escapement of adult fish to terminal spawning areas does not translate into an increase in juvenile salmonids." Do you have a citation for this statement? And also do you mean that spawning habitat is limited or that juvenile habitat is limited?	See Generic Response 5: Spawning Habitat Capacity
14	1	We need to stop the....taking of all salmon for public consumption.	Thank you for your comment. It has been noted.
15	1	It would be helpful if a list of the assumptions used in the analysis were provided up front in the document or in an Appendix. In the current version of the DEIS you have to search deep into the document to find a rationale for a previous conclusion or statement.	Thank you for your comment.
15	2	the following statement needs substantial support: "Furthermore, any increase in escapement of adult fish to terminal spawning areas does not translate into an increase in juvenile salmonids because the capacity limit of the current spawning habitat does not allow for increased juvenile production at higher escapement numbers." This is a bold statement that is being applied over the entire Columbia River. The DEIS provides no support for such a conclusion nor is a source cited. ...Has NMFS concluded that these habitat actions will not increase the quality and quantity of available spawning and juvenile rearing habitat? If yes, this conclusion should be clearly stated in the DEIS and supported.	See Generic Response 5: Spawning Habitat Capacity

15	3	If the density assumption is maintained in the DEIS, then the document needs to be made consistent in regards to the claimed benefits of increased adult escapement. The values for each species at which increased adult production does produce more juveniles needs to be defined. Adult escapement levels above these levels would then be considered to produce no benefits.	See Generic Response 5: Spawning Habitat Capacity
15	4	The DEIS relies on the Mitchell Act EIS to cover hatchery production effects and this DEIS to cover harvest. This leads to conclusions about hatchery effects that seem to make little sense. For example, the DEIS assumes that if harvest is turned off under Alternative 5 hatchery production would continue as described in the Agreement. The analysis then concludes that more returning hatchery fish would have large negative effects to wild populations. But why would managers continue to spend money producing large numbers of hatchery fish for harvest if there was no harvest? Additionally, NMFS would also not allow this to occur due to impacts to ESA listed stocks so a likely response by NMFS would be to severely reduce hatchery production to levels that protect ESA listed stocks while providing for harvest in marine fisheries (?). Shouldn't these actions/responses be stated in the cumulative effects section or foreseeable future activities of the DEIS?	See Generic Response 8: Hatchery program reductions under Alternative 5
15	5	The implementation of each alternative results in a different set of cascading effects (feedback) which are not clearly presented (or maybe not required in a programmatic EIS?). For example, alternatives which have a large negative effect on wild populations will reduce population abundance resulting in a decrease in overall harvest rates (for some alternatives) in both marine and freshwater fisheries. These negative effects have the potential to reduce population abundance to levels that may require NMFS to change the listing status of populations from Threatened to Endangered resulting in severe reductions in harvest.	Thank you for your comment. Cumulative Effects are analyzed in Section 5 and the relationship between ESA and NEPA is complex, in part because both laws address environmental values related to the impacts of a proposed action. However, each law has a distinct purpose, and the scope and standards of review under each statute are different. The purpose of an EIS under NEPA is to promote disclosure, analysis, and consideration of the broad range of environmental issues surrounding a proposed major Federal action by considering a full range of reasonable alternatives, including a no-action alternative. Public involvement promotes this purpose. The purpose of ESA is to conserve listed species and the ecosystems upon which they depend. Determinations about whether proposed actions meet ESA requirements are made under separate evaluations for ESA section 4(d), section 7, or section 10.

15	6	If freshwater harvest was terminated, yet hatchery production remained unchanged, why wouldn't regulatory agencies respond by increasing ocean harvest rates or implementing selective fisheries to remove the now surplus hatchery fish? This action would result in a transfer of benefits to primarily non-tribal entities the effects of which should be covered in the Final EIS.	Voluntary curtailment of fisheries in-river would not negate the agreements and ESA consultations that govern escapement levels from the ocean fisheries. Therefore effects of a *US v Oregon* agreement are specific to the Project and Analysis Areas, described in Subsection 1.3, and ocean harvest occurs outside this area and will not be affected by the alternatives being analyzed in this EIS.
15	7	I did not see any information provided on how the implementation of each alternative would affect ocean fisheries. Is such an analysis needed in a Programmatic EIS? The negative effects to ESA-listed stocks from some of the alternatives would reduce total adult abundance over time which would likely require ocean harvest rates to be reduced?	Most of the harvest indicators stocks are not caught in ocean fisheries including Upriver spring Chinook, Snake River sockeye, or Snake River B-run steelhead (or any of the Columbia River steelhead for that matter) so a broader analysis of impacts to ocean fisheries is not needed. Upper Columbia summer Chinook and Upriver fall Chinook are caught in ocean fisheries, but they are managed based on their run size and return to the Columbia River. See Generic Response 9: Ocean harvest.
15	8	It would seem that the 10-12 year time frame for describing effects of the alternatives may be too short. For example, implementation of alternative 4/6 would likely severely reduce long term (>12 years) natural origin fish abundance which would result in decreased harvest. Or is it assumed that all alternatives will be implemented consistent with ESA and NOR abundance will not be substantially affected?	The *US v Oregon* parties are considering a new agreement that would extend for the next 10 years. The analysis is therefore configured to be consistent with the proposed action. The DEIS was designed to explore a wide range of potential harvest policy alternatives that could be used to manage both weak stocks that required protection and healthy stocks that provide opportunity for harvest. The analysis of alternatives was designed to illustrate the features of each policy and help inform the decision about what policy might be best for any particular circumstance. Additionally please see our comment response to comment 12.32 regarding our expectation of the *US v Oregon* Parties continued performance evaluation of the Agreement.

15	9	Additionally, the entire economic analysis shows results by alternative based on minimum, average and maximum run sizes estimated for the previous 12 years. This gives the impression that harvest benefits from, say the implementation of alternatives 4 and 6, and are likely to occur. But given the impacts to ESA listed stocks is it likely that these benefits are sustainable over 12 years? Past 12 years?	Although different run sizes are presented in the DEIS, the economic analysis only evaluated economic effects associated with the average (median) run size. As discussed in the preceding comment, the analysis is designed to inform decisions about what harvest policies might be better suited for the wide range of circumstances encountered in the Columbia River. As such the analysis illustrates examples where the policy may be inappropriate if implemented because it strikes the wrong balance between conservation and use objectives. The sustainability to ESA-listed stocks is why the baseline was chosen. The immediate years preceding the following decade should be a strong indicator of environmental and economic similarity to draw from for expected outcomes.
15	10	The write-up on page 77 states that a 25 percent survival adjustment factor is applied at the last counting location to account for survival to their final spawning ground. However its' use is confusing in some sections of the DEIS. For example, on pg 122 it states that the aggregate abundance of natural origin spawners necessary meet recovery objectives for natural-origin Snake River spring/summer Chinook salmon is 25,500 at Lower Granite. And with an average survival rate of 75 percent, the river mouth goal (Columbia River?) is 34,000. If it is meant to account for survival from the last counting station (Lower Granite) to the spawning grounds why isn't the 34,000 the target value at Lower Granite Dam?	Thank you for your comment. The value you identify is the target value at Lower Granite Dam as shown in Figure 4-2.
15	11	It would be helpful if tables such as 4-59 has one additional column that showed fish alive on the spawning grounds (i.e. effective spawners).	Thank you for the suggestion; however, we only have targets for effective spawners. It is not feasible to determine the number of fish alive at each spawning ground in the Columbia River Basin.
15	12	The description of Alternative 5 on page iv does not match the text presented later in the document. Here, the alternative is described as curtailing harvest or having extreme harvest curtailment. Later (pg vii) it states that fishing will be eliminated under Alternative 5. The economic analysis assumes no harvest. These sections should be made consistent in the Final EIS.	Thank you for your comment. Alternative 5 should read as curtailing harvest. Under this alternative, there would be voluntary curtailment of most fishing, except, as described in Section 2.1.5, "some very limited treaty fishing opportunity to meet base ceremonial needs of the tribes." This type of treaty fishing offers a value that is not evaluated by this economic analysis and hence the economic analysis assumes no harvest. This has been clarified in the FEIS.

15	13	On page vii it is stated the implementation of Alternative 5 would result in escapement of larger numbers of hatchery-origin adults, leading to potential negative effects from elevated levels of hatchery origin fish spawning naturally. This may indeed be the case for Oregon and Idaho populations but not necessarily for Washington State. Washington State policy calls for meeting HSRG standards for the proportion of hatchery origin fish on the spawning grounds. Therefore, the State would take actions (increased weir operations, decrease in hatchery production etc.) to achieve these targets. Shouldn't the possibility of this response be covered in the analysis?	See Generic Response 8: Hatchery program reductions under Alternative 5
15	14	The data in Table 4-58 appear to be in error or requires more explanation. Although there is no fishing, fish escapement past Rock Island dam for Alternative 5 is lower than three of the harvest alternatives.	Thank you for your comment. Numbers in the DEIS Table 4-58 were inadvertently transposed and have been corrected in the FEIS.
15	15	It is unclear why under this alternative the Lower Granite Run size was not set up to meet the escapement benchmark? For example, for natural-origin Snake River fall Chinook the minimum escapement goal is 4,000 adults measured at Lower Granite Dam (?). However, alternative 4 shows that 3,000 adults was used for all run-sizes (Table 4-61). The text on page 78 states that the escapement benchmark is 4,000 and was calculated as 3,000/0.75 (4,000). Seems like the 3,000 at Lower Granite Dam in this table should be replaced with 4,000 adults?	Thank you for your comment, this revision has been made in the FEIS.
15	16	The figures in section 4 show that total salmon production by stock/population is the same under each alternative. This seems to be because the analysis assumes that the same number of adults return to the mouth of the Columbia River for each alternative. This starting number is then apportioned to escapement past fisheries and certain points. Thus, the analysis is meant to show a relative comparison of outcomes between alternatives under an assumed minimum, maximum and average run size and not differences in the range of adult production that would be expected for each alternative; this should be stated in the headings of the figures or as a footnote.	Thank you for your comment. Your interpretation is correct, and clarification has been added in the text of Text Box 4-1, Column A in Section 4.
15	17	It would be helpful if the figure and table headings clearly identified numbers that referred to natural-origin only fish or are based on a combination of natural-origin and hatchery-origin fish.	Thank you for your suggestion. Tables and figures referring to natural-origin stocks have been clarified in the FEIS.
15	18	Having a single table where all pertinent information for each population is summarized would also be helpful. The reviewer has to sort through a lot of sections to find data needed to understand the analysis.	Thank you for your comment. We acknowledge the material is complex and believe we have presented alternatives that cover the range necessary for the public to provide meaningful input.

15	N/A	I have attached a PDF of the DEIS with comments/edits embedded...no need to respond to these comments directly as they are for the most part covered in the letter	Thank you for the detailed review of the DEIS. As requested, we are not responding to each comment embedded in the PDF of the DEIS, however, we have made changes where appropriate in the FEIS.

Letter #1

United States Department of the Interior

OFFICE OF THE SECRETARY
Office of Environmental Policy and Compliance
620 SW Main Street, Suite 201
Portland, Oregon 97205-3026

IN REPLY REFER TO:
9043.1
ER17/0307

August 4, 2017

Jeromy Jording, Fishery Biologist
NOAA Fisheries West Coast Region
510 Desmond Dr. SE, Suite 103
Lacey, WA 98503-1263

Dear Mr. Jording:

The Department of the Interior has reviewed the Draft Environmental Impact Statement to analyze impacts of the National Oceanic and Atmospheric Administration's National Marine Fisheries Service joining as a signatory to a new U.S v. Oregon Management Agreement for the Years 2018-2027. The Department has no comments on the document at this time. 1

We appreciate the opportunity to comment.

Sincerely,

Allison O'Brien
Regional Environmental Officer

Letter #2

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue
Seattle, WA 98101-3140

OFFICE OF
ENVIRONMENTAL REVIEW
AND ASSESSMENT

August 17, 2017

Jeromy Jording, Fishery Biologist
National Marine Fisheries Service
West Coast Region
510 Desmond Dr. SE, Suite 103
Lacey, WA 98503-1263

Dear Mr. Jording:

The U.S. Environmental Protection Agency has reviewed the June 2017 Draft Environmental Impact Statement to Analyze Impacts of NOAA's National Marine Fisheries Service joining as a signatory to a new *U.S. v. Oregon* Management Agreement for the years 2018-2027 (EPA Project Number: 16-0042/NOA/CEQ Number 20170106). Our review was conducted in accordance with EPA responsibilities under the National Environmental Policy Act and Section 309 of the Clean Air Act. Section 309 specifically directs the EPA to review and comment in writing on the environmental impacts associated with all major federal actions.

The DEIS analyzes the potential effects associated with alternative harvest management strategies for salmon and steelhead in the Columbia River Basin that could be adopted under a new *U.S.* v. *Oregon* Management Agreement. The DEIS considers six alternatives: (1) Extension of the Current Agreement; (2) Abundance-based Management; (3) Fixed Harvest Rate; (4) Escapement-based Management; (5) Voluntary Fishery Curtailment; and (6) No Action – Uncoordinated Harvest.

A coordinated and systematic framework to guide harvest among the sovereign parties to the *US v Oregon* case is critical to achieving the project's purposes and needs: (1) meeting the Federal government's tribal treaty rights and trust and fiduciary responsibilities; (2) supporting fishing opportunities for the states of Oregon, Washington and Idaho; and (3) working collaboratively with co-managers to protect and conserve species listed under the Endangered Species Act (ESA) and non-listed species.

It is the EPA's view the new Agreement should have the flexibility to account for the varying conservation requirements of the different stocks in the Columbia River Basin. Our review of the DEIS finds the alternatives analyzed represent an appropriate suite of approaches to allow for a balanced approach to harvest management in the basin. Our review also finds that Alternative 1 represents a blended approach, which allows harvest management to be tailored to each stock and fishery as needed. We find Alternatives 2, 3, 4, and 5 to be less able to respond to the varying conservation requirements of individual stocks. We also find that Alternatives 5 and 6 do not meet the stated purposes and needs of the DEIS. We discuss these findings in more detail below.

The DEIS does not clearly identify a preferred or a proposed alternative from among the options analyzed and discussed. When this is the case, we rate each alternative according to our rating criteria which is attached to this letter. Based on our review of the DEIS, we have assigned the following ratings to the action alternatives: 1

Action Alternative	Rating
Alternative 1	Lack of Objections (LO)
Alternative 2	Environmental Concerns – Adequate Information (EC-1)
Alternative 3	Environmental Concerns – Adequate Information (EC-1)
Alternative 4	Environmental Objections – Adequate Information (EO-1)
Alternative 5	Environmental Objections – Adequate Information (EO-1)
Alternative 6	Environmental Objections – Adequate Information (EO-1)

Our "Environmental Concerns" rating of Alternatives 2 and 3 is related to our concerns over the ability of those alternatives to account for the varying conservation requirements of each of the fish stocks managed under the Agreement. Alternative 2 (abundance-based management) provides a management framework that recognizes the inherent year-to-year variability of salmonid stocks, but it does not provide the stability of a fixed harvest rate (which can be a beneficial approach to managing weak stocks). It also does not incorporate the concept of escapement-based management, which can be beneficial when setting appropriate spawning goals for conservation. Alternative 3 (fixed harvest rate) would result in a slight positive impact to spawning escapement, but it is less able to account for year-to-year variability of salmon stocks and, like Alternative 2, does not incorporate the concept of escapement-based management. These alternatives, therefore, do not provide the needed flexibility or range of management options required to effectively manage fisheries within a system as complex as the Columbia River Basin.

Our "Environmental Objections" rating of Alternative 4 (escapement-based management) and Alternative 6 (no action – uncoordinated harvest) stems from the fact that these alternatives would have the greatest effects on all affected salmonid species and result in a high negative impact to spawning escapement across all stocks. In addition, Alternatives 4 and 6 would have a negative effect on tribal ceremonial and subsistence harvest. According to the DEIS (Section 4.7.1) the minimum ceremonial and subsistence harvest in years with low runs may not be sufficient to meet tribal needs under these alternatives. This would negatively affect tribal cultural viability. Furthermore, Alternatives 4 and 6 would potentially reduce the amount of available commercial harvest, which would have an adverse economic effect on tribes. It should also be noted that Alternative 6 would not meet the established purpose of working collaboratively with co-managers to protect and conserve ESA-listed and non-listed species.

The "Environmental Objections" rating was also assigned to Alternative 5 (voluntary curtailed fishing). Alternative 5 would allow for the voluntary extreme harvest curtailment, which would result in positive effects on fish species, prey for birds, and marine-derived nutrients, but it would not provide for meaningful tribal harvest as guaranteed by Treaty, and it would provide no opportunity for non-treaty harvest. This would result in not meeting the established purposes of (1) meeting the Federal government's tribal treaty rights and trust and fiduciary responsibilities and (2) supporting fishing opportunities to the states of Oregon, Washington and Idaho.

As noted above, we find that the alternatives analyzed in the DEIS represent an appropriate suite of approaches to allow for a balanced approach to harvest management in the basin, but in its current form, Alternative 1, no change from the current management practices, provides the much needed flexibility and range of management options to effectively manage fisheries within the basin. We encourage NMFS to select a blended approach, Alternative 1, as the preferred alternative in the Final EIS.

We appreciate the opportunity to review the DEIS. If you have any questions about our comments, please contact Teresa Kubo of my staff at 503-326-2859 or by electronic mail at kubo.teresa@epa.gov, or you may contact me at (206) 553-1841, or by electronic mail at nogi.jill@epa.gov.

Sincerely,

for

Jill A. Nogi, Manager
Environmental Review and Sediment Management Unit

Enclosure:
1. U.S. Environmental Protection Agency Rating System for Draft Environmental Impact Statements

U.S. Environmental Protection Agency Rating System for Draft Environmental Impact Statements Definitions and Follow-Up Action*

Environmental Impact of the Action

LO – Lack of Objections

The U.S. Environmental Protection Agency (EPA) review has not identified any potential environmental impacts requiring substantive changes to the proposal. The review may have disclosed opportunities for application of mitigation measures that could be accomplished with no more than minor changes to the proposal.

EC – Environmental Concerns

EPA review has identified environmental impacts that should be avoided in order to fully protect the environment. Corrective measures may require changes to the preferred alternative or application of mitigation measures that can reduce these impacts.

EO – Environmental Objections

EPA review has identified significant environmental impacts that should be avoided in order to provide adequate protection for the environment. Corrective measures may require substantial changes to the preferred alternative or consideration of some other project alternative (including the no-action alternative or a new alternative). EPA intends to work with the lead agency to reduce these impacts.

EU – Environmentally Unsatisfactory

EPA review has identified adverse environmental impacts that are of sufficient magnitude that they are unsatisfactory from the standpoint of public health or welfare or environmental quality. EPA intends to work with the lead agency to reduce these impacts. If the potential unsatisfactory impacts are not corrected at the final EIS stage, this proposal will be recommended for referral to the Council on Environmental Quality (CEQ).

Adequacy of the Impact Statement

Category 1 – Adequate

EPA believes the draft EIS adequately sets forth the environmental impact(s) of the preferred alternative and those of the alternatives reasonably available to the project or action. No further analysis of data collection is necessary, but the reviewer may suggest the addition of clarifying language or information.

Category 2 – Insufficient Information

The draft EIS does not contain sufficient information for EPA to fully assess environmental impacts that should be avoided in order to fully protect the environment, or the EPA reviewer has identified new reasonably available alternatives that are within the spectrum of alternatives analyzed in the draft EIS, which could reduce the environmental impacts of the action. The identified additional information, data, analyses or discussion should be included in the final EIS.

Category 3 – Inadequate

EPA does not believe that the draft EIS adequately assesses potentially significant environmental impacts of the action, or the EPA reviewer has identified new, reasonably available alternatives that are outside of the spectrum of alternatives analyzed in the draft EIS, which should be analyzed in order to reduce the potentially significant environmental impacts. EPA believes that the identified additional information, data, analyses, or discussions are of such a magnitude that they should have full public review at a draft stage. EPA does not believe that the draft EIS is adequate for the purposes of the National Environmental Policy Act and or Section 309 review, and thus should be formally revised and made available for public comment in a supplemental or revised draft EIS. On the basis of the potential significant impacts involved, this proposal could be a candidate for referral to the CEQ.

* From EPA Manual 1640 Policy and Procedures for the Review of Federal Actions Impacting the Environment. February, 1987.

Letter #3

Nez Perce

TRIBAL EXECUTIVE COMMITTEE
P.O. BOX 305 • LAPWAI, IDAHO 83540 • (208) 843-2253

August 21, 2017

Sent via email only to: usvornepa@noaa.gov

Mr. Jeromy Jording, Fishery Biologist
NOAA Fisheries West Coast Region
510 Desmond Dr. SE, Suite 103
Lacey, WA 98503-1263

Re: Nez Perce Tribe's Comments on NOAA Fisheries' United States v. Oregon Draft Environmental Impact Statement

Dear Mr. Jording:

The Nez Perce Tribe ("Tribe") appreciates the opportunity to comment on the National Oceanic and Atmospheric Administration ("NOAA") Fisheries' Draft Environmental Impact Statement analyzing fishery harvest policies.

In its 1855 Treaty with the United States (12 Stat. 957), the Tribe reserved the right to take fish at all usual and accustomed fishing places and the United States secured that right to the Tribe. The Tribe has traditionally and historically managed its Treaty fisheries to be responsive to the needs of the fish. In 1968, the United States, as trustee for the Yakama, Warm Springs, Umatilla, and Nez Perce Tribes, initiated *United States v. Oregon* to protect Treaty-reserved fishery harvest from infringement by the State of Oregon. The *United States v. Oregon* case and the companion *United States v. Washington* case (involving similar treaties negotiated by Isaac Stevens) establish that regulatory restrictions cannot be imposed on the Treaty fishery unless it is demonstrated that such regulation is "reasonable and necessary" for "conservation"; that such regulation is the least restrictive means to achieve the required conservation purpose; that such regulation does not discriminate against Indian activities, either on their face or as applied; that such regulations' purpose cannot be achieved by restrictions on non-treaty citizens; and, that voluntary tribal conservation measures are not adequate to achieve the required conservation purpose. After years of fishing season-by-fishing season litigation, and at the United States District Court's direction, the *United States v. Oregon* parties have negotiated a series of Management Agreements that have been entered as court orders. These Management Agreements have described their goal as follows:

> The purpose of this Management Agreement is to provide a framework within which the Parties may exercise their sovereign powers in a coordinated and systematic manner in order to protect, rebuild, and enhance upper Columbia River fish runs while providing harvests for both treaty Indian and non-treaty fisheries.
>
> The primary goals of the Parties are to rebuild weak runs to full productivity and fairly share the harvest of upper river runs between treaty Indian and non-treaty fisheries in the ocean and Columbia River Basin.
>
> As a means to accomplish this purpose, the Parties intend to use (as herein specified) habitat protection authorities, enhancement efforts, and artificial production techniques as well as harvest management to ensure that Columbia River fish runs continue to provide a broad range of benefits in perpetuity.
>
> By this Agreement, the Parties have established procedures to facilitate communication and to resolve disputes fairly. It is the intent of the Parties that these procedures will permit the Parties to resolve disputes outside of court and that litigation will be used only after good faith efforts to settle disagreements through negotiation are unsuccessful.

See United States v. Oregon Management Agreement, *United States v. Oregon*, 68-513, Docket # 2546.

With the listings of salmon under the Endangered Species Act ("ESA") beginning in 1991, the state and Tribal fishery managers revisited their harvest management and voluntarily adjusted it to ensure that it is responsive to the needs of ESA-listed fish. The Tribes voluntarily chose to ensure their Treaty harvest was responsive to the needs of the fish in these *United States Oregon* Management Agreements. Other sources of mortality have yet to make concomitant adjustments in light of the needs of the fish and that the burden of conservation has yet to be fairly allocated consistent with the Treaty case law. 1

The state and Tribal fishery managers are presently using a blend of harvest policies, including abundance-based management, escapement-based management, and harvest-rate management, acknowledging the varying conservation requirements with some providing more opportunity for harvest and some requiring more protection. NOAA Fisheries and the U.S. Fish and Wildlife Service, as parties to *United States v. Oregon*, have participated and witnessed the efforts by all of the parties over the decades to look toward the future, to consider all alternatives, and to refine fisheries management including fishery harvest policies.

The Tribe views the overarching legal framework as consisting of the Tribe's 1855 Treaty-reserved fishing rights which are the "supreme law of the land" under the U.S. Constitution and the *United States v. Oregon* case law. As a result, the attached comments are primarily focused on ensuring precision in the DEIS.

Please contact Joseph Y. Oatman, Deputy Director, Nez Perce Fisheries, if you have any questions.

Sincerely,

McCoy Oatman

for Mary Jane Miles
Chairman

Attachment - Nez Perce Tribe Comments on DEIS on Harvest Policies

The Nez Perce Tribe's harvest and production staff are committed to continuing to assist NOAA Fisheries with the accuracy and descriptions of the *U.S. v. Oregon* harvest and production programs, in addition to the comments set forth below.

Page i, lines 3-5.

> ***Revise to correctly describe that: "United States v. Oregon (US v Oregon) is the on-going Federal court proceeding that enforces and implements the reserved fishing rights of the Nez Perce, Umatilla, Warm Springs, and Yakama~~, and Shoshone-Bannock~~ tribes."*** 2

Page i, lines 14-18

> ***The descriptions of the objectives of the Management Agreement should incorporate the purposes set forth in the Management Agreement. See Management Agreement, Preamble, Docket #2546.*** 3

Page ix. Furthermore, any increase in escapement of adult fish to terminal spawning areas does not translate into an increase in juvenile salmonids because the capacity limit of the current spawning habitat does not allow for increased juvenile production at higher escapement numbers. Lines 11-13.

> ***Flagged.***

Page 3. The project area is the geographic area where the Proposed Action would take place. It includes the Columbia River mainstem, the primary segment of the river as contrasted to tributary rivers that drain into it, from its mouth upstream to Wanapum Dam (river mile 415) and to the Idaho – Washington state boundary just upstream of Lower Granite Dam on the Snake River mainstem (Snake River river mile (RM) 107) (Figure 1-1). These mainstem Columbia and Snake River areas are where the Columbia River treaty tribes and other *US v Oregon* parties regulate fishing activities detailed in the Management Agreement in order to fairly share harvestable salmon and steelhead. Fishing activities, which are further detailed in Subsection 1.3.1, occur to varying degrees across the project area.

> ***Ensure consistency and accuracy of project area; the foregoing description and Tables 1-1 to 1-4 is different from description in 1.3.1.1. Treaty Indian Fishery location and jurisdiction lines 10-13/1-3/7-9 on pages 9-10.*** 4

Section 2

Page 29 – 30. The numbers presented in the sections that follow are based on actual observed rates of ~~fishing~~ harvest and should be viewed as approximations and examples of an approach. They are not recommendations for the specific biological criteria that should be used for

implementing harvest policies and the related management frameworks. Nonetheless, they are used here to evaluate the relative effects of each alternative. Lines 26-29 and line 1.

Revise to delete "fishing" and replace with "harvest" (as shown). 5

Pages 31-32. This type of policy tends not to be very aggressive towards a stock as it requires ~~that a large number of fish return~~ a large forecasted abundance index of fish before allowing a large level of harvest to occur. Lines 29-30 and line 1.

This is an inaccurate description regarding Pacific Salmon Treaty fishery framework. Suggest deleting phrase "requires that a large number of fish return" and replacing with "requires a large forecasted abundance index of fish" (as shown). 6

Pages 33 – 34. The circumstances in which the parties may adopt a voluntary extreme harvest curtailment policy would likely be where they determine that in the context of other mortality factors acting on the stocks across their life-cycle (e.g. prior fishery interceptions; hydrosystem operations; critically low emigration; extreme environmental impacts in ocean or spawning/rearing areas), that adding adult harvest mortality would further reduce escapement levels to the point that continued viability of upriver stocks is at imminent risk. Lines 28-30 and lines 1-3.

Include reference to "hydrosystem operations" in the parenthesis (as shown). 7

Section 3

Page 41. ***Harvest Indicator Stocks*** are the "Management Units" of the *US v Oregon* Fisheries and tend to be aggregate of fish runs larger than the ESA-listed "units" (ESU or DPS). Lines 6-7.

Page 41. ***Abundance Indicator Stocks*** are equivalent to the ESA-listed "units" (DPS or ESU) affected by *US v Oregon* fisheries. Lines 13-14.

Page 44. The difference between escapement past fisheries and escapement to a specific counting point represent fish loses due to natural mortality or turnout to mainstem tributaries, and mortality associated with hydro operations, illegal fishing, and habitat degradation. The baseline summarizes information from 2005 to 2016. The current management framework was in place during that time. Lines 18-22.

Flagged.

Tables 3-5 to 3-8, there is only table 3-8 that includes a column titled "Average Loss to Granite", the others do not include similar information. Suggest those tables be updated to include the average loss values to a particular counting point. 8

Page 61. The tribal commercial fisheries in the upper Columbia River and lower Snake River subregions are mostly Chinook salmon fisheries, although small numbers of steelhead are also caught in the Lower Snake River subregion. This region is described as follows, "Lower Snake River subregion, where catch assumed to contribute to economic activity in five counties (Walla Walla, Columbus, Garfield, Whitman, and Franklin Counties in Washington) that are upstream of the confluence with the mainstem Columbia River." (Page 59 lines 27-29)).

> ***This paragraph is inaccurate. There are no Tribal commercial fisheries (or any USvOR tribal covered fisheries in this subregion) in the lower Snake River subregion. This would be consistent with tribal harvest values reported in this section and other parts of the DEIS.*** 9

Page 65. The Snake River and its main tributaries, the Clearwater and Salmon, account for 35 percent of the Upriver steelhead harvest from the Columbia River system (NMFS 2003). Lines 24-25.

> ***We question why this information on Snake River and tributary harvest is included here for recreational fishery. Those fisheries are not covered under USvOR.*** 10

Page 69. Commercial harvest and recreational fishing (trips) and associated employment and personal income are distributed among the four subregions constituting the analysis area (Table 3-25). Lines 15-17.

> ***The State of Washington is the only USvOR party to fish in the lower Snake River region. That is a recreational fishery and only involves the Upriver Spring Chinook management period and stocks (i.e., Washington utilizes a small percentage of its total allowable harvest rate for mainstem fishery that target stocks going to mid-Columbia, Upper Columbia and Snake River, to target the Snake River spring/summer Chinook stock in its recreational fishery that occurs in that subregion).*** 11

Page 69. More than two-thirds of jobs and income generated by recreational fishing occur in the Lower Columbia River Subregion, with most of the remainder occurring in the Mid-Columbia River Subregion and a small amount (1.4 percent of income and 2 percent of jobs as result of recreational fishery conducted by Washington) in the Lower Snake River Subregion (Table 3-25). Lines 23-26.

> ***Revise sentence as shown to read as follows: "More than two-thirds of jobs and income generated by recreational fishing occur in the Lower Columbia River Subregion, with most of the remainder occurring in the Mid-Columbia River Subregion and a small amount (1.4 percent of income and 2 percent of jobs as result of recreational fishery conducted by Washington) in the Lower Snake River Subregion (Table 3-25).*** 12

Page 72-73. The tribes include those that are parties to the *U.S. v. Oregon* Agreement as discussed in Section 1.1 (the Shoshone-Bannock Tribes, the Nez Perce Tribe, the Confederated Tribes of the Umatilla Indian Reservation, the Confederated Tribes of the Warm Springs

Reservation of 1 Oregon, the Confederated Tribes and Bands of the Yakama Nation (collectively, the Columbia River Treaty Tribes)) as well as ~~the Confederated Tribes of the Colville Reservation, Cowlitz Indian Tribe, and the Confederated Tribes of the Grand Ronde~~ other Indian tribes of the Columbia Basin. Lines 27-28, 1-4.

> ***Revise parenthetical to read as follows: "(the Nez Perce Tribe, the Confederated Tribes of the Umatilla Indian Reservation, the Confederated Tribes of the Warm Springs Reservation of Oregon, and the Confederated Tribes and Bands of the Yakama Nation (collectively, the Columbia River Treaty Tribes); and the Shoshone-Bannock Tribes,…*** 13
>
> ***Suggest deleting the phrase "as well as the Confederated Tribes of the Colville Reservation, Cowlitz Indian Tribe, and the Confederated Tribes of the Grand Ronde" and replace with "as well as other Indian tribes of the Columbia Basin."***

Section 4

Page 75. A limiting stock is one that constrains harvest during a season, by being the lowest in abundance relative to its management objective, lowest in abundance relative to other stocks in fishery, and therefore restricting access to more abundant stocks thus limiting total catch. Lines 26-29.

> ***Suggest revising the sentence to read as follows: "A limiting stock is one that constrains harvest during a season, by being the lowest in abundance relative to its management objective, lowest in abundance relative to other stocks in fishery, and therefore restricting access to more abundant stocks thus limiting total catch. "*** 14

Page 77. For each of the abundance indicator stocks, we use escapement related benchmarks to assess the conservation outcomes and impacts for each alternative. These are generally based on the population abundance recovery criteria that are summed at the ESU or DPS level and reported at the last upstream counting location - Lower Granite Dam on the Snake River and Rock Island Dam on the upper Columbia River. Lines 14-18. In most cases this adjustment factor is 25 percent, meaning that we assume that only 75 percent survive to their final spawning ground. The 25 percent value is used as a surrogate absent better, stock specific information. Lines 21-23. These benchmarks should be viewed as approximations and examples of an approach and not recommendations for the specific criteria that should be used for implementing harvest policies and the related management frameworks. Nonetheless, they are used here to evaluate the relative effects of each alternative. Lines 26-29.

> ***Suggest revising the sentence to read as follows: These benchmarks should be viewed as approximations and examples of an approach and not recommendations for the specific criteria that should be used for implementing harvest policies and the related management frameworks.*** 15

Page 78. The aggregate abundance of natural-origin spawners necessary to meet recovery objectives for natural-origin Snake River spring/summer Chinook salmon is 34,000 (25,500/0.75). Lines 3-5. Page 121-122. The aggregate abundance of natural-origin spawners

necessary to meet recovery objectives for natural-origin Snake River spring/summer Chinook salmon is 25,500 at Lower Granite. And with an average survival rate of 75 percent, the rivermouth goal is 34,000. Lines 5-6, 1-2.

> Page 78. Description of the abundance related benchmark of 2,700 B-run steelhead was determined. Lines 14-24. Page 114. This alternative uses an escapement goal of 4,700 natural-origin B-run steelhead at Lower Granite which is based on the 10 year average run size. This was expanded to an equivalent run size at Bonneville Dam of 8,200 using TACs run reconstruction methodology. Lines 2-6.
>
> Page 107. For reference, the abundance related recovery objective for natural-origin Snake River fall Chinook salmon is 3,500. Lines 5-6.

Page 81. Under the current agreement, Upriver spring Chinook salmon are managed using an abundance based management framework that depends on the abundance of Upriver spring Chinook salmon, natural-origin Snake River spring/summer Chinook salmon, and natural-origin UCR spring Chinook salmon. Lines 17-20.

> ***Assume this includes hatchery origin fish.*** 16

Page 86-87. For this example, the escapement goal was set at 3,000 natural-origin UCR spring Chinook salmon past fisheries. The escapement goal approximates the aggregate abundance of natural-origin spawners necessary to meet recovery objectives for the UCR spring Chinook ESU. Lines 12-15. In this Alternative, the fixed escapement policy was coupled with a *de minimis* harvest rate cap of 1 percent for non-treaty fisheries and 5 percent for treaty fisheries. The basis for choosing the conservative approach offers the highest likelihood of adhering to recovery plans. Lines 4-5, 15-16.

> ***Flagged.***

Page 97-98. Table 4-23 shows the maximum escapement of Upriver summer Chinook salmon that could occur absent all fishing. Under Alternative 5, the impacts associated with harvest are removed. This hereby provides the largest possible spawning population to the greatest extent possible each year. Lines 26-27, 1-2.

> ***How does Alternative 5 relate to the following assertion elsewhere in the document? "Furthermore, any increase in escapement of adult fish to terminal spawning areas does not translate into an increase in juvenile salmonids because the capacity limit of the current spawning habitat does not allow for increased juvenile production at higher escapement numbers."*** 17

Page 107. For reference, the abundance related recovery objective for natural-origin Snake River fall Chinook salmon is 3,500. Lines 5-6.

Page 112. Under the current agreement, B-run steelhead are used as an indicator stock. B-run steelhead are defined as those that pass above Bonneville dam between July 1 and October 31 and are at least 78 cm in length. Lines 7-8.

Page 126. Fisheries targeting these two species operate during the fall and simply retain coho salmon ~~as bycatch~~, but there is no harvest policy in the *US v Oregon* agreement specific for a conservation requirement for coho salmon upstream of Bonneville Dam. Lines 13-16.

Suggest deleting the words "as bycatch" from this part of sentence. 18

Page 133. Although individual programs are technically independent of harvest goals and would be expected to continue under any of the alternatives, continued impacts from the collective hatchery production in the Columbia River basin adopted cumulatively in a new *US v Oregon* management agreement is considered part of the impacts discussed here. Lines 12-15.

Suggest including a basic description of harvest mitigation hatcheries, including specific purpose and role for tribal and non-tribal fisheries. 19

Page 139. The parties to the *US v Oregon* management agreement track any salmon or steelhead bycatch, regardless of the low level, to ensure they remain static and accounted for in allocation and fishery management calculations. Lines 14-16.

Page 144-145. Potential changes in the direct and indirect contribution of the harvest policy alternatives to employment and personal income in the four economic impact subregions of the Columbia River basin are estimated. The numbers of jobs estimated in this analysis below are expressed as full-time equivalent (FTE) jobs. However, most jobs in the commercial fishing industry are part-time positions due to the seasonality of commercial salmon fishing in ~~Puget Sound~~ Columbia River. Lines 26-29, lines 1.

Suggest deleting "Puget Sound" and replace with "Columbia River." 20

Page 145. Ex-vessel values associated with the total harvest of Upriver Spring Chinook salmon ($848,193) also would be the same as under status quo conditions, with tribal fisheries accounting for about 65 percent ($493,029) of total ex-vessel value and non-tribal fisheries for about 42 percent ($355,164) of the value. Lines 6-9.

Assume the 42 percent is an error and the numeric value should be 35. 21

Page 156. **Commercial Fisheries:** Overall impacts from tribal and non-tribal commercial fisheries would be $1.6 million income and 34 FTE jobs greater than under Existing Conditions and Alternative 1. Increases would occur in the Lower Columbia subregion (+$2.3 million income and +51 jobs) and Lower Snake River subregion (+$186 thousand income and +6 jobs), while the Mid-Columbia subregion would see a decrease of $622 thousand income and 17 jobs. Lines 16-20.

As discussed above, there are no commercial fisheries in the Lower Snake River subregion (only WDFW sport fishery). 22

Page 160-161. Under Alternative 1, Extension, Alternative 2, Abundance, and Alternative 3, Fixed Harvest, ~~Native American tribes~~ Columbia River treaty tribes in the project area would be able to continue their C&S harvest without substantial changes to tribal cultural viability. Lines 9, Lines 1-2.

Suggest deleting "Native American tribes" and replace with "Columbia River treaty tribes." 23

Page 162. Given the significance of salmon and steelhead to Indian tribes, and given that this significance is not paralleled among other populations that may be affected by the C&S harvest, these negative effects would be disproportionate. This disproportionate effect cannot be quantified as no metric can be attributed to the importance of this cultural resource to Indian tribes and because the importance of the C&S harvest among non-Indian tribes is essentially zero. Lines 11-15.

Page 165. Alternative 5 does not represents a disproportionate economic effect on Indian tribes because tribes and non-tribes are equally affected. Lines 11-12.

Flagged.

Section 5

Page 178. Throughout the Columbia River Basin, habitat restoration efforts are supported by Federal, state, and local agencies; tribes; environmental organizations; and communities. Projects supported by these entities focus on improving general habitat and ecosystem function or species-specific conservation objectives that, in some cases, are identified through ESA recovery plans. The larger, more region-wide, restoration and conservation efforts, either underway or planned throughout the Columbia River Basin, are presented below. Lines 24-29.

How does improving general habitat and ecosystem function relate to the following assertion? "Furthermore, any increase in escapement of adult fish to terminal spawning areas does not translate into an increase in juvenile salmonids because the capacity limit of the current spawning habitat does not allow for increased juvenile production at higher escapement numbers." 24

Page 180. The effects of Alternative 3 on these same resources is slightly positive relative to baseline conditions, as it increases the average level of spawning escapements. Alternative 4 and Alternative 6 have the greatest negative effects (largest harvest) on all affected salmonid species, especially for Snake River Fall Chinook salmon, Snake River spring/summer Chinook salmon, Upper Columbia River Chinook salmon, Snake River sockeye salmon and B-run steelhead. Only for Upper Columbia River summer/fall Chinook salmon the effects of Alternative 4 or Alternative 6 are lower than for Alternatives 1, 2, and 3. These negative impacts to spawning escapements would subject lower numbers of spawning adults to conditions where greater

abundances for a spawning population might mitigate high rates of elevated mortality due to climate change impacts described above. Thereby Alternative 4 and Alternative 6 may cumulatively add to the future climate change impacts by subjecting lower spawning populations to higher levels of elevated mortality and diminishing future returns. Lines 19-30.
Page 181. Alternative 5 has a positive harvest effects on all salmonid species because it involves no fishing. Alternative 5, while having a positive harvest effects on all salmonid species, because it involves no fishing, would however, likely result in escapement of larger numbers of hatchery-origin adults, leading to potential negative effects from elevated levels of hatchery-origin fish spawning. These effects, discussed in Section 4, relate to the effects of high levels of unharvested hatchery fish ending up on natural spawning grounds and competing with and reproductively interacting with natural-origin fish of the same species/run. Cumulatively, when combined with all past, present and future actions in the Columbia River Basin, the harvest and hatcheries will have a greater effect on genetic impacts from hatchery-origin interbreeding with natural-origin fish, and mortality of natural-origin fish associated with competition, predation, and disease impacts from hatchery-origin fish as those summarized above and in Section 4. Lines 1-11.

Page 181-182. For example, if hatchery production disrupts unique patterns of genetic diversity in a natural-origin salmon or steelhead population, that population may be less able to adapt to the changing environmental conditions anticipated because of future climate change (Subsection 5.3.1, 1 Climate Change).Lines 28-30, lines 1.

Page 188. To some unpredictable extent, restoration actions within the basin would be expected to benefit salmonids in the Columbia River Basin. Overall, it is unknown whether restoration actions would fully, or even partially, mitigate for the impacts of climate change or development on the abundance of fish species that provide recreational fishing opportunities. Lines 23-26.

The substance of this paragraph should be applicable to Tribal C&S and tribal and non-tribal commercial fisheries as well. 25

Pages 190. However, as C&S harvests are given priority over commercial harvests, the adverse effect on C&S harvests is anticipated to be low when commercial harvests exist. Under Alternatives 1, 2, 3, 4, and 6, commercial harvests would continue. The size of the C&S harvest would therefore be driven primarily by the harvest framework in each alternative and not by other concurrent development changes or climate change. Each of these five alternatives will contribute a meaningful effect to the overall cumulative adverse effect on cultural resources. Lines 4-9.

Flagged.

Page 191. As described in Subsection 4.7.2, Alternative 4 and Alternative 6 results in a disproportionate adverse economic effect on Indian tribes resulting from a decrease in tribal commercial harvest of and revenue from Upriver Fall Chinook salmon by 21 percent under both alternatives compared to an increase in non-tribal commercial harvest by 59 percent. The economic impact on the tribes is driven primarily by the selected harvest. It may be affected by, but it is not driven by, other development or restoration activities. Alternative 4 and Alternative 6 would result in a cumulative disproportionate adverse economic effect on the tribes. Lines 2-8.

Section 4.7.2. description is as follows "As shown in Table 4-68, Alternative 4 and Alternative 6 would result in a 198 percent increase in tribal commercial harvest for Upper Spring Chinook salmon compared to a corresponding non-tribal commercial increase of 48 percent. Similarly, Alternative 2 would result in a 40 percent increase in tribal commercial harvest for UCR Sockeye salmon, compared to no increase for the non-tribal commercial harvest. Both examples are positive disproportionate effects on an Environmental Justice population." (pages 162-163, lines 26-28 and lines 1-2).

Flagged.

ATTORNEY GENERAL
STATE OF MONTANA

Letter #4

Tim Fox
Attorney General

Department of Justice
Joseph P. Mazurek Justice Bldg.
215 North Sanders
P.O. Box 201401
Helena, MT 59620-1401

August 21, 2017

ATTN: Barry A. Thom, Regional Administrator
West Coast Region, NMFS
7600 Sand Point Way NE
Seattle, WA 98115-6349
E-mail: barry.thom@noaa.gov

Re: U.S. v. Oregon DEIS Comment

Dear Mr. Thom:

Montana's comments and concerns regarding the National Marine Fishery Service's and the U.S. Fish and Wildlife Service's approach to the proposed draft environmental impact statement have not changed since the scoping last fall. Thus, Montana is resubmitting its comments once again for consideration. Please find enclosed the State of Montana's comments regarding the above referenced matter.

Sincerely,

MELISSA SCHLICHTING
Deputy Attorney General

Enc.

ATTORNEY GENERAL
STATE OF MONTANA

Tim Fox
Attorney General

Department of Justice
Joseph P. Mazurek Justice Bldg.
215 North Sanders
P.O. Box 201401
Helena, MT 59620-1401

Via U.S. Mail and email to:
William W. Stelle, Jr.
Regional Administrator, West Coast
Region, NMFS, 7600 Sand Point Way NE
Seattle, WA 98115–6349
USvORNEPA@noaa.gov

Re: Comment on scoping for EIS on Programmatic Review of Harvest and Hatchery Actions for Salmon and Steelhead in the Columbia River Basin Related to *U.S. v. Oregon*

Dear Mr. Stelle:

Montana appreciates the opportunity to submit the following comments on the referenced subject:

MONTANA'S INTEREST IN THE SCOPE OF NEPA REVIEW FOR THE HARVEST AND HATCHERY MANAGEMENT EIS

The State of Montana (Montana) is a sovereign party to the litigation over the impact of the Federal Columbia River Hydropower System (FCRPS) on endangered salmonids. Montana has actively participated in that litigation, generally in support of the federal agencies who operate the FCRPS and who are responsible for compliance with the terms and conditions of the Biological Opinion (BiOp) covering FCRPS operations. Montana's participation has been vigorous on the legal, technical and policy fronts, partially because hydropower operations at Libby Dam and Hungry Horse Dam have sometimes been managed to benefit anadromous salmon and steelhead far downriver with little to no consideration for the effects those operations may have on listed species in Montana (bull trout and Kootenai River white sturgeon).

Among its many operational parameters, the recently struck down FCRPS BiOp contains the so-called "Montana Operation," a suite of specific steps taken to reduce the harmful impacts on upriver listed species from unnatural river and reservoir drawdowns caused by flow decisions for downstream FCRPS operations. Inclusion of the Montana Operation in that FCRPS BiOp was hard-won, even though peer review showed it was both biologically sound for up-river species and had no measurable negative impact on salmonids in the FCRPS. The fate of the Montana Operation, and the listed species it

protects, are inexorably linked to producing a FCRPS BiOp that survives judicial scrutiny. Thus, when a federal court strikes down the FCRPS BiOp because its associated environmental review lacked a full accounting and evaluation of the impacts of all of the factors impacting salmonids, specifically including harvest, Montana's interests are directly and negatively affected.

Since it intervened as a party in the FCRPS case more than ten years ago, Montana has consistently advocated for transparent, rigorous scientific review of FCRPS operations. To do otherwise risks undermining the legitimacy and legal viability of the FCRPS's NEPA and ESA compliance. Segmenting fish mortality caused by harvest from fish mortality caused by other factors, and only evaluating hatchery actions with reference to one cause but not the others, is purely a policy decision not a scientific one. Candor and credibility are best served if all interested parties acknowledge that this separation is artificial and unwarranted, because defending it from a biological standpoint has not worked, at least for the FCRPS. The federal district court said exactly that in its recent decision: "[T]he threats facing the listed species and the required responses are 'simply too interconnected' to have any response other than a response of a 'suite' of 'all-H' measures." *NWF v. NMFS*, 2016 WL 2353647, * 55. Federal agencies disregard Judge Simon's admonition at their peril. Montana prefers to tackle these issues head on and urges the federal government to take that approach.

COMMENT:

Harvest and Hatchery Management and FCRPS Operations are Connected Legally, Inseparable Biologically, and Should Be Evaluated Together to Comply with NEPA 1

The history of FCRPS litigation strongly suggests that separating NEPA review for Harvest and Hatcheries from NEPA review for Hydro and Habitat will not pass muster – as it has not heretofore. The relevant federal agencies may believe that Harvest Management is immune to the same arguments that have consistently resonated with the Court in the FCRPS case. However, the institutional barriers created to insulate the evaluation of Harvest from legal challenge should not be mistaken for genuine compliance with NEPA or the ESA.

NEPA's fundamental objectives are to ensure that the responsible federal agencies "consider every significant aspect of the environmental impact of a proposed action" and to "inform the public that it has indeed considered environmental concerns in its decisionmaking process." *Earth Island Inst. v. U.S. Forest Serv.*, 442 F 3d 1147, 1153-54 (9th Cir. 2006); *Baltimore Gas & Elec. Co. v. Natural Res. Def. Council*, 462 U.S. 87, 97 (1983). *See also* 40 C.F.R. § 1500.1(b), (c). This is not merely Montana's opinion – it is

the law: "NEPA procedures must insure that environmental information is available to public officials and citizens before decisions are made and before actions are taken. . . . Accurate scientific analysis, expert agency comments, and public scrutiny are essential to implementing NEPA." *Id.* § 1500.1(b). NEPA's emphasis on "the importance of coherent and comprehensive up-front environmental analysis [] ensure[s] informed decision making to the end that the agency will not act on incomplete information, only to regret its decision after it is too late to correct." *Blue Mtns. Biodiversity Project v. Blackwood*, 161 F.3d 1208, 1216 (9th Cir. 1998). The truncated public notice associated with the scoping for Harvest and Hatchery management and the proposed NEPA evaluation of these "Hs" separately from the other "Hs" conflict with these basic NEPA principles.

The present system, in which the evaluation of Harvest Management is off limits to many of the FCRPS parties, and walled off by various processes from the other "H's", must be honestly addressed if there is to be a genuine effort to move beyond management of the vast Columbia River hydropower system through litigation. Likewise, evaluating Hatchery Management solely through a Harvest lens artificially limits consideration of both the benefits and detriments of Hatcheries. For example, as it now stands, an absurd system prevails in which NEPA review and ESA consultations endorse direct mortality from Harvest by imposing responsibility for all of the resulting legal and practical consequences onto the FCRPS, while separating the respective biological assessments. From Montana's perspective, that is simply trading impacts on one endangered species for impacts on others, with no opportunity to participate in the process, much less voice legitimate concerns. By raising these issues, Montana is simply requesting that the same well-recognized NEPA principles that apply to every other EIS apply in this instance to Harvest and Hatcheries.

Further to emphasize not only the importance of this point, but also why it should not be viewed as particularly remarkable, Montana notes that NEPA's "hard look" requirement includes the equally basic mandate to evaluate related and connected actions and impacts in the same EIS. CEQ's implementing regulation on the scope of a NEPA evaluation states:

> The scope of an individual statement may depend on its relationships to other statements. To determine the scope of environmental impact statements, agencies shall consider 3 types of actions, 3 types of alternatives, and 3 types of impacts. They include:

(a) Actions (other than unconnected single actions) which may be:

(1) *Connected actions*, which means that they are closely related and therefore should be discussed in the same impact statement. Actions are connected if they:

(i) Automatically trigger other actions which may require environmental impact statements.

(ii) Cannot or will not proceed unless other actions are taken previously or simultaneously.

(iii) Are interdependent parts of a larger action and depend on the larger action for their justification.

(2) *Cumulative actions*, which when viewed with other proposed actions have cumulatively significant impacts and should therefore be discussed in the same impact statement.

(3) *Similar actions*, which when viewed with other reasonably foreseeable or proposed agency actions, have similarities that provide a basis for evaluating their environmental consequences together, such as common timing or geography. An agency may wish to analyze these actions in the same impact statement. It should do so when the best way to assess adequately the combined impacts of similar actions or reasonable alternatives to such actions is to treat them in a single impact statement.

40 C.F.R. § 1508.25 (emphasis supplied).

Of course, this regulation is designed "to prevent an agency from dividing a project into multiple 'actions,' each of which individually has an insignificant environmental impact, but which collectively have a substantial impact." *Great Basin Mine Watch v. Hankins*, 456 F.3d 955, 968-969 (9th Cir. 2006) citing *Wetlands Action Network v. U.S. Army Corps of Eng'rs*, 222 F.3d 1105, 1118 (9th Cir.2000). In the interests of efficiency, Montana will not compare each point in the foregoing regulation to the circumstances here, but from our perspective it seems that the federal government's NEPA plan for the Harvest BiOp is designed to accomplish exactly what *Great Basin* condemned. Logic and common sense suggest that if the subject of the NEPA review is harvesting a species, and the plan depends wholly on mitigation supplied by another federal action, those actions are related in some fashion.

The test of whether projects are <u>connected</u> actions is determined through the concept of independent utility, i.e., whether "one of the projects might reasonably have been completed without the existence of the other, ...and are not "connected" for NEPA's purposes." *Id.* 456 F.3d at 969. The Ninth Circuit also finds that if it would be "irrational, or at least unwise to undertake one action without subsequent actions, the actions are connected." *Save the Yaak Comm. v. Block*, 840 F.2d 714, 720 (9th Cir.

1988). In this instance, the harvest of endangered species would be legally unsupportable without the mitigation measures supplied by the FCRPS. On the other hand, because dams in the FCRPS incidentally take endangered fish, and require an incidental take permit in the FCRPS BiOp, the level of authorized take should account for the direct take from fisheries through Harvest, and the Hatchery actions geared toward Harvest, but which undoubtedly impact other aspects of the FCRPS.

NEPA does not excuse separating similar actions even if they do not strictly meet the test for connected actions, however. Agencies contradict a basic tenet of legitimate NEPA review by separating the evaluation of salmonids killed by harvest from salmonids killed by dams, in the same river, involving the same species, at the same time. Harvest/Hatchery Management and the Hydro Operations and Habitat measures within the FCRPS evaluation also meet the definition of "similar actions." As noted earlier, 40 C.F.R. § 1508.25(a)(3) defines "similar actions" as those "which when viewed with other reasonably foreseeable or proposed agency actions, have similarities that provide a basis for evaluating their environmental consequences together, such as common timing or geography." Montana acknowledges that some courts afford agencies more deference in determining whether similar actions must be evaluated in a single EIS (as opposed to connected or cumulative actions). However, there may be no better example than this, where – quoting the applicable regulation – "the best way to assess adequately the combined impacts of similar actions or reasonable alternatives to such actions is to treat them in a single impact statement." The recent ruling by Judge Simon made it clear that, at least on the FCRPS side, a NEPA evaluation that does not include all "Hs" will not stand. *See NWF v. NMFS*, 2016 WL 2353647, *55. Harvest/Hatchery Management is simply the other side of the same FCRPS coin.

Sincerely,

ALAN JOSCELYN
Chief Deputy Attorney General

Letter #5

IDAHO DEPARTMENT OF FISH AND GAME
600 S Walnut / P.O. Box 25
Boise, Idaho 83707

C.L. "Butch" Otter / Governor
Virgil Moore / Director

August 21, 2017

Submitted Via Email To: usvornepa@noaa.gov

Jeromy Jording, Fishery Biologist, Comment Coordinator:
NOAA Fisheries West Coast Region
510 Desmond Dr. SE, Suite 103
Lacey, WA 98503-1263

Re: *U.S. v. Oregon* Draft EIS Comments

Dear Mr. Jording:

The Idaho Department of Fish and Game (IDFG) submits the following comments on the *U.S. v. Oregon* Draft Environmental Impact Statement.

1. **Clarify Management Agreement Objectives and Assumptions regarding Stock Status (e.g., Executive Summary, Page i, lines 14-18; Metrics, Section 4.1.1, Page 76, lines 4-5).**

The Draft EIS states that NOAA and USFWS "make the explicit assumption that the environmental conditions and status of the fish stocks for the next 10 years will be similar to those observed in the past." The primary goals of the *U.S. v. Oregon* Management Agreement are to rebuild weak runs to full productivity and fairly share the harvest of upper river runs between treaty Indian and non-treaty fisheries in the ocean and Columbia River Basin; it would be inconsistent with the *U.S. v. Oregon* management goal for weak runs to remain at status quo for the next 10 years. The Final EIS should clarify the federal agencies' assumption to reflect the objective for improvement in weak stocks during the next 10 years. 1

2. **Discuss Potential Impacts to Snake River Spring/Summer Chinook in the *U.S. v. Oregon* Summer Management Period.**

The draft EIS does not identify potential impacts to ESA-listed Snake River Spring/Summer Chinook Salmon after June 15 (referred to as the summer management period). For example, the draft EIS indicates the following "definitions" for chinook salmon: 2

4.1.1.1 Upriver Spring Chinook Salmon

For management purposes, Upriver spring Chinook salmon are defined in the agreement as all adult spring and Snake River spring/summer Chinook salmon returning to areas upstream of

Bonneville Dam between January 1 and June 15. This stock includes both hatchery and natural-origin fish.

*** *** ***

4.1.1.2 Upriver Summer Chinook Salmon. For management purposes, upper Columbia summer Chinook salmon are defined in the agreement as all Chinook salmon passing Bonneville Dam between June 16 and July 31. They are not listed under the ESA.

The above "definitions" and other text describing the spring and summer management periods omit potential impacts and create confusion as to ESA-listed Snake River spring/summer chinook salmon. During the 2008-2017 *U.S. v. Oregon* Management Agreement, observations based on PIT tag and genetic sampling indicate several years between 2008-2017 in which portions of late runs of ESA-listed Snake River Spring/Summer chinook were below McNary Dam after June 15, where they were available to fisheries occurring during the summer management period. Available to TAC

The Final EIS should discuss potential impacts to ESA-listed Snake River Spring/Summer Chinook during the *U.S. v. Oregon* summer fishery management period.

3. Clarify Bycatch/Incidental Impacts from Full Retention Fisheries/Interdam Loss (*E.g.*, Interdam Loss, Impacts of fishing at 80-81). 3

The draft EIS appears to reflect that only landed fish are impacted in "full retention" fisheries. However, various investigations and observations indicate not all fish are landed in "full retention" fisheries. The Final EIS should discuss potential non-retention impacts (*e.g.*, incidental injury/mortality) from all fisheries.

4. Clarify Description of Escapement (E.g., Section beginning at Page 77)

In describing escapement, the draft EIS refers to benchmarks," "objectives" and "goals" in a manner that is difficult to follow. The Final EIS should clarify usage of these terms. In addition, the description of "escapement" should reflect that a key purpose of escapement under *U.S. v. Oregon* is for broodstock collection and juvenile production. 4 5

Please contact Lance Hebdon, Anadromous Fish Manager, at 208-287-2711 if there are any questions regarding these comments.

Sincerely,

/s/ Ed Schriever, Acting Director for

Virgil Moore
Director

Letter #6

Oregon
Kate Brown, Governor

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August 21, 2017

Mr. Jeromy Jording
National Marine Fisheries Service
West Coast Region
510 Desmond Dr. SE, Suite 103
Lacey, WA 98503-1263

Mr. Jording,

The Oregon Department of Fish and Wildlife (ODFW) appreciates the opportunity to review the Draft Environmental Impact Statement (DEIS) to Analyze Impacts of NOAA's National Marine Fisheries Service joining as a signatory to a new *U.S v. Oregon* Management Agreement (MA) for the Years 2018-2027.

The 2008-2017 MA represented a significant improvement in the coordination and operation of Treaty tribal and non-Treaty fisheries among the signatory parties, particularly when contrasted with prior agreements. Prior agreements were generally of much shorter duration and required significant within-agreement negotiations to ensure conservation needs for Columbia River fish populations – including multiple ESA-listed stocks – were met, Treaty trust responsibilities for fisheries were honored, and fishery opportunities for non-Treaty fisheries were available.

The 2008-2017 MA provides an excellent venue for the Parties' to collaborate to meet these needs, and as a result has served the parties well, while meeting our collective conservation goals. The MA, as currently implemented, has proven to be a robust agreement, providing a strong framework for the Parties to discuss and resolve issues. One example is the Parties' consensus agreement to implement run forecast 'buffers' for non-Treaty spring Chinook fisheries following unanticipated results in the first two years of the 2008-2017 MA. ODFW is proud to have been an active participant in the current MA process, and of the results the Parties have collectively achieved through the auspices of the agreement. We look forward to continuing to work with the other Parties in the future.

In general, the DEIS appears to adequately capture the scope and breadth of management measures that may be applicable to Columbia River fisheries in the next management period (2018-2027). ODFW has provided an attached document with specific comments and suggested edits. 1

Thank you for your time and attention.

Sincerely,

J Chris Kern

Chris Kern, Deputy Fish Division Administrator, Oregon Department of Fish and Wildlife

Specific Comments and Suggested Edits

Figure 1-1 caption, page 4, lines 7-10. Oregon and Washington utilize the same terminology for fishing zones, so the caption could be revised to reflect both states. The zone boundaries for the river downstream of Bonneville Dam are based upon county line boundaries from Washington State counties bordering the river. 2

Tables 1-2, 1-3, and 1-4 pages 6, 7, 8. The mixed use of "Project Area" and more area-specific descriptions among different fisheries is confusing. Please clarify that "Project Area" is not intended to mean fisheries occur in the *entire* project area? (For example, Treaty Indian Ceremonial and Subsistence fisheries do not occur throughout the entire project area as shown in Figure 1-1). 3

Table 1-2, 1-3, 1-4 pages 6, 7, 9. The Buoy 10 line does not reflect a lower boundary for any current Treaty fisheries. The current agreement does include language that such fisheries could occur upon agreement between the States and the Tribes. 4

Table 1-3, page 7. If the DEIS is attempting to reflect current non-Treaty regulations, the Summer Chinook and Sockeye locations should be from Astoria-Megler Bridge to Bonneville Dam, not Buoy 10. These fisheries are not currently open between the Astoria-Megler Bridge and Buoy 10.

Page 9, line 10-12. Should this read, "…although some fishing does occur both above **McNary Dam and** below Bonneville Dam"? Currently "McNary Dam" is not included in the description but the preceding parts of the sentence imply that maybe it was intended to be. 5

Page 12, line 3. In the current definition of "SAFE" the E stands for "Enhancement". 6

Page 13, line 9-10. Please note that the Steamboat Slough SAFE area has long been discontinued and is no longer relevant. We recommend deletion of this area.

Page 16, re: discussion of inclusion of other species in agreement. The discussion that fisheries are referenced in the MA because there is some potential for incidental take of ESA-listed salmonids in the fishery is not accurate in the case of Pacific lamprey harvest in the Willamette River. There is no incidental take of ESA salmonids in pursuit of lamprey in the Willamette River, and if there were, it would be of Willamette population fish, not those stocks incorporated in the MA. We suggest that the words "independently by" in line 3 be replaced with "independent of the agreement by". 7 8

Page 44, table 3-5. Is this table intended to reflect only natural-origin UC CHS, or hatchery and NO combined? Label implies the table intended to reflect all. Please review similar potential issues with respect to Tables 3-6 and 3-8 as well. 9

Page 47, line 11-12. In the coho section, areas with extirpated populations were identified. It may be helpful and appropriate to identify extirpated populations for other species, including but not limited to sockeye in Wallowa Lake. 10

Page 59, line 21. A small portion of Umatilla County actually borders the river just below McNary Dam in Zone 6. If catch contributes to Crook County's economic activity (presumably due to the Deschutes River) then we recommend Jefferson, Deschutes, Wheeler, and Grant Counties also be considered for inclusion. 11

[Type here]

Page 60, line 18. Steelhead are not legal for harvest in non-Treaty commercial fisheries. All references to harvest of steelhead in non-Treaty commercial fisheries need to be corrected. 12

Page 78, re: SR sockeye and snake river CHF benchmarks. Please clarify and provide some description of how these values were derived. 13

Page 78, re: steelhead. Please clarify whether the number of steelhead (e.g., 13400 fish) is intended to apply to the sum of all natural-origin A and B run Snake River fish? Please clarify the use and basis for referenced metric. 14

Figure 4-1, page 119. In this figure, interdam losses are highest under alternative 5. As a result, it appears that escapement to Rock Island Dam is lower under this "no harvest" scenario than it is in alternatives 1-3. If this is correct, please provide clarification as to why this is the case absent error in figure values. 15

Page 126, re: coho. Please qualify the statement that B-run wild steelhead impacts are the only limiting factor for all fisheries. This is not a correct statement in reference to all fisheries but it may be if clarification provided that this statement refers only to fisheries upstream of Bonneville. Lower river fall fisheries are often constrained by B-run steelhead, but also by other limitations such as Lower Columbia River tule and Lower Columbia Natural coho impact limitations. Suggest a revision to re-characterize which fisheries are discussed as being solely B-run limited to exclude fisheries downstream of Bonneville Dam. Additionally, this section makes a linkage to stocks such as the SW WA DPS and Upper Willamette DPS stocks, which are primarily affected by fisheries that occur prior to the B-run "window". Therefore it is not reasonable to expect harvest and impacts for these stocks to be proportional to catch of B-run fish, as is implied here. 16 17

Page 144. Lines 3-5. Suggest that the sentence beginning "Any anadromous fish taken…" be modified to provide clarity, potentially by ending that sentence with "ocean habitat, **prior to having been subject to the fisheries examined in this analysis."** (new text in bold). 18

Page 145, line 1. It appears that "Puget Sound" should be replaced with "Columbia River" or "project area". 19

Page 147, line 16; page 155, lines 17-22; page 158, lines 3-9; page 165, lines 5-7 (and multiple other areas). Please clarify that Steelhead may not be retained in non-Treaty commercial fisheries; therefore, there should be no ex-vessel value expressed for steelhead for any non-Treaty commercial fisheries in this analysis. These issues also carry through to several tables in Appendix A, where values are included for non-Treaty commercial steelhead ex-vessel values. These should be all removed from the relevant tables. 20

Page 158, lines 3-9. Please clarify whether this section is intended to reflect all Snake River steelhead, or just B-run? 21

Commissioners:
RONALD E. SKAGEN
MOLLY SIMPSON
AARON J. VIEBROCK

General Manager:
GARY R. IVORY

Letter #7

Public Utility District No. 1 of Douglas County

1151 Valley Mall Parkway · East Wenatchee, Washington 98802-4497 · 509/884-7191 · FAX 509/884-0553 · www.douglaspud.org

Jeromy Jording
Sustainable Fisheries Division
National Marine Fisheries Service
West Coast Region
510 Desmond Dr. SE, Suite 103
Lacey, WA 98503-1263
usvornepa@noaa.gov

August 21, 2017

Dear Jeromy,

Thank you for the opportunity to review the Draft Environmental Impact Statement to Analyze Impacts of NOAA's National Marine Fisheries Service joining as a signatory to a new *U.S. v. Oregon* Management Agreement for the Years 2018-2027. We trust that our comments will assist NMFS in their compliance with both the NEPA and ESA, and with their obligations and responsibilities under the Wells Hydroelectric Project Anadromous Fish Agreement and Habitat Conservation Plan, and the Upper Columbia Spring Chinook Salmon and Steelhead Recovery Plan.

Should you have any questions regarding our comments, please direct them to Mr. Shane Bickford sbickford@dcpud.org (509-881-2208) or Mr. Tom Kahler tomk@dcpud.org (509-881-2322).

Sincerely,

Gary Ivory
General Manager
Public Utility District No. 1 of Douglas County

Enclosures: Douglas PUD Comments on the Draft Environmental Impact Statement to Analyze Impacts of NOAA's National Marine Fisheries Service joining as a signatory to a new *U.S. vs. Oregon* Management Agreement for the Years 2018-2027.

Douglas PUD Comments on the Draft Environmental Impact Statement to Analyze Impacts of NOAA's National Marine Fisheries Service joining as a signatory to a new *U.S. vs. Oregon* Management Agreement for the Years 2018-2027

For organizational purposes, we present these comments in a sequential manner, referring to the page and line numbers for your convenience.

Page 2, line 22: Not all hatchery programs listed in the *U.S. v. Oregon* agreement have "stipulated" production levels; instead some programs have adaptive, fluctuating or even temporary production. Specifically, the Wells Habitat Conservation Plan (HCP) and settlement agreements and Biological Opinions for the mid-Columbia Public Utility Districts (PUDs) include mitigation hatchery production comprising several categories of hatchery programs each subject to production modulation either automatically or upon consent of the parties to those agreements. Indeed, those agreements *require* systematic recalculation of production obligations at regular intervals for some programs. The HCP also establish committees comprising representatives from each signatory party to the HCP, and invest those committees with the authority to determine hatchery-release locations and strategies for Douglas PUD hatchery programs. Furthermore, the HCP authorizes the NMFS to unilaterally 1) enforce changes in PUD hatchery programs necessary to address emergency effects of those programs on ESA-listed species, and 2) to require changes in mitigation production in response to changes in NMFS hatchery policy under the ESA.

By signing the current *U.S. v. Oregon* agreement stipulating production levels and release locations for PUD hatchery programs, NMFS placed itself in conflict with the provisions of the HCP that NMFS had previously signed in 2002, and signing a continued or modified *U.S. v. Oregon* agreement would perpetuate that conflict. While the harvest of production from the PUD hatchery programs occurs at the discretion of the parties to the *U.S. v. Oregon* agreement, that production and the locations and strategies for release of that production are independent of the *U.S. v. Oregon* agreement (see Page 2, lines 27-29), falling instead under the purview of NMFS's HCP agreement with Douglas PUD under the jurisdiction of the Federal Energy Regulatory Commission (FERC). 1

Section 3.1, specifically Page 37, lines 8-17 and Page 38, lines 1-9: The Mitchell Act EIS (referenced on page 38 as "NMFS 2014") did not address the unintended effects of the *U.S. v. Oregon* agreement in precluding scientifically sound management of hatchery programs in the Upper Columbia River Spring Chinook ESU and Upper Columbia River Summer Steelhead DPS. By signing onto an agreement that establishes harvest policies and defines management frameworks for fisheries and adopts cumulative hatchery programs, NMFS agrees that the implementation of that agreement will not impede the recovery of ESA-listed species or conflict with other previous agreements. However, language within the current *U.S. v. Oregon* agreement (regarding release numbers and locations for various hatchery programs) has impeded local-scale hatchery-program management actions intended to assist in the recovery of listed stocks in the UCR Spring Chinook ESU and UCR Summer Steelhead DPS. Before signing onto the proposed *U.S. v. Oregon* agreement, yet again, the onus is upon NMFS to ensure that nothing in that agreement could be misconstrued and/or misapplied to impede actions or research

necessary to facilitate the recovery of natural-origin ESA-listed stocks. Specifically, NMFS must ensure that language in that agreement does not interfere with responsibilities and capabilities of NMFS or other parties under the Wells HCP to which NMFS and the other parties agreed in 2002, preceding the current *U.S. v. Oregon* agreement. Nothing in any agreement continuing or replacing the current *U.S. v. Oregon* agreement should impede local non-fishery actions intended to improve Viable Salmonid Population parameters or for monitoring the effects of local actions on such parameters, for any ESA-listed stock.

1 cont.

Douglas PUD does not support, and believes that NMFS also legally cannot support the inclusion of Douglas PUDs mitigation hatchery programs in the *U.S. v. Oregon* agreement (or associated production tables) for the reasons stated above and for the following specific reasons: 1) Federal jurisdiction over Douglas PUD hatchery production is via the FERC license for the Wells Hydroelectric Project, specifically incorporating the Wells HCP and ESA Section 10 permit issued by NMFS for the operation of the Wells Project and all associated mitigation as described in the Wells HCP. In contrast, *U.S. v. Oregon* has no jurisdiction over Douglas PUD's hatchery production, and NMFS has no authority to include Douglas PUD programs within *U.S. v. Oregon*, and cannot do so without placing themselves in conflict between the two agreements; 2) Douglas PUD has a separate regulatory process guided by and under the jurisdiction of the FERC that requires Douglas PUD to participate in decision making regarding their mitigation hatchery production, whereas *U.S. v. Oregon* does not provide an opportunity for Douglas PUD to participate in decision making, nor does Douglas PUD seek participation in *U.S. v. Oregon* decision making; 3) The NMFS agreement with Douglas PUD (the 2002 Wells HCP) defines processes and schedules for implementation, monitoring, and modification of Douglas PUD's hatchery-production programs that differ from the process and schedule governing *U.S. v. Oregon* hatchery production (e.g., Douglas PUD no-net-impact (NNI) hatchery-production recalculation occurs at 10-year intervals, with the next recalculation in 2023; production numbers for NNI programs also automatically change with each survival-verification study, the next of which is scheduled for 2020); 4) Douglas PUD hatchery programs are *adaptively managed* via the HCP committee process, which was envisioned to and explicitly incorporates greater flexibility in the management of its hatchery programs when compared to the *U.S. v. Oregon* programs that appear relatively inflexible and non-adaptive; 5) The Wells HCP explicitly included robust programs for monitoring and evaluating the effects of Douglas PUD hatchery programs on target populations, with the intent that the information gained from such monitoring would inform management decisions regarding continued implementation of those hatchery programs. Inclusion of the PUD hatchery programs in the current *U.S. v. Oregon* agreement has effectively prevented the implementation of some studies necessary to rigorously monitor and evaluate the effects of the PUD hatchery programs on target populations; 6) The unfortunate inclusion of the Douglas PUD hatchery programs in the current *U.S. v. Oregon* agreement has resulted in a conflict of interest for those HCP committee representatives, including the NMFS representative(s), bound to terms of both the HCPs and the *U.S. v. Oregon* agreement, and this conflict would continue under any new or modified agreement unless those PUD hatchery programs are explicitly excluded from or exempted from management under the *U.S. v. Oregon* agreement; and 7) Douglas PUD secures and holds all of its own environmental permits and is not dependent upon the *U.S. v. Oregon* agreement or its related permitting process for either permit compliance, ESA coverage, or implementation.

NMFS can avoid this conflict (described above) between their HCP, that they signed with Douglas PUD in 2002, and any new iteration of the *U.S. v. Oregon* agreement, by disentangling the PUD mitigation hatchery production from inclusion in or management under the *U.S. v. Oregon* agreement. Therefore, please remove all of the Douglas PUD-funded hatchery-mitigation programs from the *U.S. v. Oregon* agreement to avoid a violation of the adaptive-management principles defined in the HCPs. Failure to do so, places NMFS in the untenable positon of non-compliance with at least one of two conflicting processes for defining PUD hatchery production levels and/or release locations and strategies. Should NMFS sign onto a continued or new *U.S. v. Oregon* agreement that retains the PUD hatchery-mitigation programs, then they must in the final EIS evaluate the effects on recovery of the UCR Spring Chinook ESU resulting from their failure to uphold the autonomy of the HCP decision-making process and the abdication of their authority under the HCP to mandate scientifically sound hatchery-program decision-making. 1 cont.

Page 44, lines 12-22, and Table 3-5: Total harvest rates reported under the baseline conditions for Upper Columbia River spring Chinook salmon do not accurately represent demographic subtleties that result from fisheries. Analysis of PIT-tag data indicates that the loss rates by brood year of Methow-Basin, natural-origin, 2-ocean spring Chinook from brood-years 2005-2013 in Zone-6 averaged 15 percent (median 15%, range 0% to 40%), while the loss rate for those same brood years of natural-origin 1-ocean Methow Basin spring Chinook was 0 percent. Thus, reporting the gross mean harvest rate does not accurately portray the demographic effects of harvest on natural-origin UCR spring Chinook, and the final EIS should include additional analyses to evaluate those effects. 2

Page 50, lines 3-8: Evidence suggests that the "A" and "B" designations based on fork length and Bonneville passage-dates do not serve conservation purposes. See Copeland et al. (2017). The prudent response to such evidence would include a reconsideration of the current management designations. 3

Page 54, lines 16-19: Please also include the compelling evidence for a relationship between the abundance of host species in the marine environment and abundance of adult lamprey range-wide (Murauskas et al. 2013). 4

Page 78, lines 1-3: The Upper Columbia Spring Chinook Salmon and Steelhead Recovery Plan, approved by NMFS in 2007, includes abundance thresholds for recovery for each subbasin supporting spring Chinook in the UCR Spring Chinook ESU. These recovery thresholds generated by the Interior Columbia Basin Technical Recovery Team are as follows: 2,000 natural-origin spawners for each of the Wenatchee and Methow MPGs, and 500 for the Entiat MPG, for a total of 4,500 natural-origin spawners on the spawning grounds within the ESU. To achieve a count of 4,500 at Rock Island Dam according to the method used in the DEIS for calculating dam counts post fishery escapement (dividing escapement by 0.75), at least 6,000 natural-origin fish must escape the fishery. To achieve recovery targets, the desired count at Rock Island Dam would also need to account for pre-spawn mortality between Rock Island Dam and the spawning grounds in the tributaries, and thus even 6,000 natural-origin fish escaping the fishery would return fewer than the target 4,500 natural-origin fish to the spawning grounds. Therefore, the escapement and dam-count numbers used in the analyses in this DEIS are 5

inadequate to achieve the NMFS-approved recovery goals. The DEIS contains repeated references to these inadequate escapement/dam-count goals, including Page 84, Table 4-4; Page 85, Table 4-7; Page 86, Table 4-10, lines 11-15; Page 87, lines 28-30; Page 88, lines 1-5, Table 4-13; Page 119, Table 4-58 and Figure 4-1; Page 120, lines 1-8 (list not exhaustive). Therefore, the final EIS must evaluate the effects of this inadequate escapement on the recovery of the UCR Spring Chinook ESU. Alternatively, NMFS must modify the *U.S. v. Oregon* agreement such that it conforms to the recovery goals that NMFS approved in 2007 or provide scientific justification for the departure from those recovery goals and also amend the 2007 Upper Columbia Spring Chinook and Steelhead Recovery Plan accordingly. 6

Page 80, lines 14-20 (also, Page 44, lines 18-20): The accounting for fishery-related losses should also include losses attributable to net drop-outs, and such losses comprise target fish, and not only bycatch of non-target species/stocks. We observe injured fish at the count windows of the dams, and many of the observed injuries are fishery-related, some so severe that the likelihood of survival to spawning is very low. Delayed mortality associated with the fishery varies with gear type (e.g., very few or no injuries may result from purse-seining or heart traps, thereby reducing the injury-related delayed mortality), such that the EIS would need to analyze a range of delayed-mortality rates to account for the variety of fishery methods that fishers may use under the agreement. 7

Page 100, Section 4.1.1.3: The DEIS considers only harvest rates, without considering the effects of harvest timing on stock diversity, and persistence under changing climate. As an example, the Okanagan (Canadian spelling) sockeye stock faces thermal barriers in both the U.S. Okanogan River and Osoyoos Lake, whereby in most years the run stalls in the Columbia River at the confluence with the Okanogan River awaiting relief from the thermal impediment to their migration. Substantial mortality occurs among those fish attempting to complete their migration through the Okanogan River/Osoyoos Lake during periods of fluctuating temperatures prior to breakdown of the thermal barrier, and, although suitable for adult survival, temperatures in the Columbia River in July and August are too warm for ideal egg development. Climate change will affect the timing, severity, and persistence of these thermal barriers, as observed in 2015. Thus, the persistence of this stock depends upon the diversification of run timing to ensure adequate escapement during extreme years. Only the earliest and latest migrants routinely avoid the thermal barriers. Therefore, to truly account for climate change, harvest managers must protect the shoulders of the run distribution when deciding on timing of harvest efforts directed at or incidentally harvesting Okanagan sockeye, and UCR Chinook and steelhead. Additionally, the success of future efforts to reintroduce sockeye above Grand Coulee Dam may depend upon the abundance of early returning adults (Iwamoto et al. 2012) and the size of those individuals (Doctor and Quinn 2009), but both the largest and earliest returning sockeye are those most susceptible to *U.S. v. Oregon* fisheries targeting spring Chinook. Thus, the final EIS should consider a range of stock-specific consequences of harvest actions not just resulting from harvest rates, but also harvest timing and selectivity. 8

Page 132, line 10: We assume that the authors intended "Upper Columbia River Chinook Salmon" to be *spring* Chinook, since the subject sentence and the one that follows include the other stocks to which this sentence may refer. 9

Page 144, lines 5-8 (also Page ix, lines 11-13): In the final EIS, please abandon the argument in, or clarify and/or provide references for the sentences stating that "However, the capacity limit of the current spawning habitat does not allow for increased juvenile production at higher escapement numbers. Therefore, an increase in escapement of adult fish to terminal spawning areas does not translate into an increase in juvenile salmonids that would eventually serve as adult prey for the SRKW." Literally interpreted, these sentences indicate that all spawning habitat in the Columbia Basin is currently saturated (at carrying capacity) such that any increases in adult returns will not result in increased recruits. If accurate, this statement begs the question: why then do the action agencies continue to release millions of supplementation fish anywhere within spawning tributaries, since no additional juveniles will result from adult returns from those programs to target tributaries? Why not rather produce only segregated harvest-augmentation fish released only from mainstem Columbia (or Snake) River hatcheries, facilitating removal of returning hatchery fish at those locations to prevent them from depressing the natural-origin spawning populations in the tributaries? 10

Page 165, lines 19-21: The final EIS should evaluate the economic impact to local communities resulting from the continued failure to achieve ESA recovery because of *U.S. v. Oregon* escapement targets substantially below recovery goals (see comment above regarding targets for Rock Island Dam counts and fishery escapement). 11

In summary, within the DEIS we have identified a few issues to correct of an editorial nature, and others that will require additional analyses to cover aspects of potential effects not considered in the DEIS, but that should not prove too complicated to consider in the final EIS. Additionally, we have identified two substantial shortcomings of the DEIS that apparently stem from issues within the current *U.S. v. Oregon* agreement and any continued or modified form of that agreement that NMFS is considering signing: first, the issue of the DEIS escapement targets for UCR spring Chinook that fail to achieve escapement targets specified in the NMFS-approved 2007 Upper Columbia Spring Chinook Salmon and Steelhead Recovery Plan; and second, the conflict between the Wells HCP and the *U.S. v. Oregon* agreement that results from the misappropriated inclusion of PUD hatchery programs within the *U.S. v. Oregon* agreement. 1 cont.

NMFS can rectify the first issue by simply increasing the fishery escapement number in the *U.S. v. Oregon* agreement to allow the achievement of the UCR spring Chinook recovery goals or, conversely, providing the necessary scientific justification for reducing those goals (and amending the 2007 Upper Columbia Spring Chinook Salmon and Steelhead Recovery Plan, accordingly). NMFS can rectify the second issue by entirely removing the PUD hatchery programs from any version of the *U.S. v. Oregon* agreement that they sign, or by signing an iteration of the *U.S. v. Oregon* agreement that includes PUD production available for harvest only by noting that the PUDs will produce fish available for harvest but that the details of release numbers, locations, and release strategies reside entirely within the FERC jurisdictional arena of the respective HCP committees, and will become available on a year-by-year basis as those committees release such information to the TAC.

References

Copeland, T., M. W. Ackerman, K. K. Wright, and A. Byrne. 2017. Life history diversity of Snake River steelhead populations between and within management categories. *North American Journal of Fisheries Management* 37:395-404.

Doctor, K. K. and T. P. Quinn. 2009. Potential for adaptation-by-time in sockeye salmon (Oncorhynchus nerka): the interactions of body size and in-stream reproductive span with date of arrival and breeding location. Canadian Journal of Zoology 87:708-717.

Iwamoto, E. M., J. M. Myers, and R. G. Gustafson. 2012. Resurrecting an extinct salmon evolutionarily significant unit: archived scales, historical DNA and implications for restoration. Molecular Ecology 21:1567-1582.

Murauskas, J. G., A. M. Orlov, and K. A. Siwicke. 2013. Relationships between the abundance of Pacific Lamprey in the Columbia River and their common hosts in the marine environment. Transactions of the American Fisheries Society 142:143-155.

Letter #8

USvORNEPA USvORNEPA - NOAA Service Account <usvornepa@noaa.gov>

Acknowledging Receipt of the US v. Oregon DEIS; Request for an Extension of the Public Comment Period

1 message

David Moskowitz <moskosalmo@gmail.com> Thu, Jun 15, 2017 at 3:47 PM
To: "jeromy.jording@noaa.gov" <jeromy.jording@noaa.gov>, usvornepa@noaa.gov
Cc: David Moskowitz <TheConservationAngler@gmail.com>

Dear Jeromy:
By this email I wanted to acknowledge receipt this afternoon of the US. v Oregon Draft Environmental Impact Statement (DEIS) and thank you for ensuring that The Conservation Angler received this document at the earliest possible moment upon completion.

On behalf of The Conservation Angler and those organizations who joined us in providing comments on the July 2016 Notice of Intent to prepare this document, we request that NOAA extend the period for accepting public comments from 45 days to 90 days. We ask for this consideration based upon the extraordinary complexity of the analysis in the DEIS, where six alternatives are analyzed as to their affects on multiple species of fish in the Columbia River, at least 4 of which are listed under the federal Endangered Species Act (ESA). NOAA provided 30 days to comment on the relatively concise July 2016 request for scoping comments, and based on the complexity of the analysis and the importance of the acitvities that will be permitted based upon a presumed renewal of the US v. Oregon Agreement, we ask that NOAA substantially extend the 45 day period for public comments on the DEIS. 1

Please feel free to call me if you wish to discuss this request.

Very Sincerely,

David A. Moskowitz
Executive Director
The Conservation Angler
Theconservationangler@gmail.com
971-235-8953

–
David Moskowitz
971-235-8953

Letter #9

USvORNEPA USvORNEPA - NOAA Service Account <usvornepa@noaa.gov>

Request to extend public comment period

1 message

kurt beardslee <kurt@wildfishconservancy.org> Wed, Jun 21, 2017 at 3:41 PM
To: usvornepa@noaa.gov

Hi Jeromy,

I recently received notice that the *DEIS to Analyze Impacts of NOAA's National Marine Fisheries Service joining as a signatory to a new U.S. v. Oregon Management Agreement for the Years 2018-2027* is now out for public review and comment. As you are aware this is a large complex document that will require considerable time and resources to properly analyze and develop meaningful response comments. Due to the size, complexity and the important nature of this document I am requesting an additional 60 day extension to the public comment period. 1

Respectfully,

Kurt

Kurt Beardslee
Executive Director
Wild Fish Conservancy
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Letter #10

Northwest RiverPartners
For salmon, our economy and quality of life

August 18, 2017

VIA EMAIL AND FIRST CLASS MAIL

Barry A. Thom
Regional Administrator, West Coast Region, NMFS
7600 Sand Point way NE
Seattle, WA 98115-6349

Re: U.S. v. Oregon DEIS Comment

Dear Mr. Thom:

Northwest RiverPartners ("RiverPartners") provides these comments on the National Marine Fisheries Service's ("NMFS") Draft Environmental Impact Statement ("EIS") (together with the U.S. Fish and Wildlife Service or "FWS", collectively "the Services") for a programmatic environmental impact statement on proposed harvest and hatchery actions pursuant to the *U.S. v. Oregon* Management Agreement. We find the DEIS to be insufficient from a legal and public process standpoint and urge the Services to take the necessary time to do the NEPA analysis correctly and comprehensively.

RiverPartners is an alliance of utilities, ports, farmers and businesses that support salmon restoration efforts based in sound science to ensure actions taken provide demonstrable benefits to the listed species. Our members and their customers and constituents pay the vast majority of the costs of the region's fish and wildlife program and have a vested interest in how proposed management actions for both hatcheries and harvest affect the region's recovery efforts. RiverPartners has a keen interest in issues pertaining to the conservation and management of salmon and steelhead and in ensuring that the Federal Columbia River Power System ("FCRPS") continues to co-exist with healthy, robust populations of Endangered Species Act ("ESA") protected species and all other fish and wildlife in the basin.

RiverPartners appreciates the importance of sport, commercial and tribal harvest and the role hatcheries play in ensuring productive fisheries and to some extent,

species conservation. We recognize and appreciate the unique commercial, subsistence and ceremonial interests held by the Treaty Tribes in particular to fish for salmon and steelhead as well as non-Treaty tribes that also rely on fishing for sport or their livelihoods. By filing these comments, RiverPartners communicates its concerns that NMFS has not fully satisfied its duties under either the ESA or the National Environmental Policy Act ("NEPA") for reasons described below.

RiverPartners finds that this draft EIS continues to impermissibly segment *U.S. v. Oregon* harvest management from Mitchell Act hatchery management and the FCRPS EIS. All three proposed major federal actions are connected and cumulative actions that need to be addressed in a single EIS as required by NEPA. The proposed harvest and hatchery Management Agreement and court orders and biological opinions directing FCRPS operations are cumulative actions that are being proposed in the *same* geographic area, occur at the *same* time, and impact the *same* fish. It is not only logical that the agencies should develop one comprehensive NEPA analysis, it is exactly what the law intends and requires (See Stoel Rives legal analysis attached). 1

Indeed, the agencies clearly recognized this inherent linkage in 2008 by joining the FCRPS, *US vs Oregon* Management Agreement, and the Upper Snake project review, all together with a common science analysis. In elaborating on this issue, the agencies explained that:

> "The FCRPS and Reclamation Actions, along with the fishery Actions being considered in this Biological Opinion, are largely coincident both in time and place. The actions would all occur over the next ten years…and affect listed species by their action in significant portions of the Columbia River basin. Understanding the relationship between the FCRPS and Reclamation Actions and fisheries considered under the proposed 2008 Agreement, provides necessary context for this consultation", and, "This coordination of consultations insures that the best available information, reflected by the Comprehensive Analysis and Supplemental Comprehensive Analysis, was used consistently,"

The region cannot continue to adequately protect ESA-listed salmon without a science-driven, comprehensive all-"H" (hydro, habitat, hatcheries, harvest) approach addressing all sources of human caused mortality throughout the entire salmon's life-cycle. To adequately meet its ESA, NEPA and Treaty obligations, the agencies must take a "hard look" at the totality of the adverse effects of these actions on all salmon, especially ESA listed species, in the basin. This is especially true because ocean conditions, recognized by fisheries scientists as the

overwhelming factor affecting salmon returns and over which we have no control, vary widely over time. And, there is little to no regulation of commercial ocean harvest impacts on listed stocks. This means there must be a "hard look" at all those factors over which there is some measure of control and that independently and cumulatively affect listed stocks.

The only way to be transparent, and to properly satisfy the NEPA mandates for the *US v Oregon* and FCRPS proposed actions, is to merge these analyses into a single document and a single NEPA process. This would give the public, state, tribal and federal decision-makers a more robust and simultaneous look at the *whole* problem presented by the ESA listings and provides for reasonable alternatives to emerge that take into account the entirety of actions affecting listed stocks. As stated by Judge Simon in his May 3 ruling on the FCRPS Biological Opinion: "…the threats facing the listed species and the required responses are 'simply too interconnected' to have any response other than a response of a 'suite' of 'all-H' measures".

Instead, given the poor construct of this DEIS, anyone that wishes to understand the environmental consequences of proposed actions to recover endangered salmon and steelhead must now consult the EIS for the *U.S. v. Oregon* Harvest Management Agreement, the EIS for Mitchell Act Hatchery actions, and the yet to be conducted EIS for operation of the FCRPS. This piecemeal approach to evaluating the environmental effects of proposed and cumulative federal actions falls short of the legal requirements of the National Environmental Policy Act, which does not serve the Services or the parties to the Agreement very well.

On duration of the Agreement, this Draft anticipates extending the current *U.S. v. Oregon* Management Agreement for another 10 years. There is no basis for such an extended timeline given today's circumstances. As noted, the 2008/2010 10-year Management Agreement, shared a common science analysis. The harvest management and FCRPS actions were analyzed together because the FCRPS Biological Opinion ("BiOp") and its measures (the "Reasonable and Prudent Alternative") provided, in part, the mitigation to offset impacts resulting from harvest activities. 2

This relationship no longer exists – the BiOp's are not linked – meaning harvest and hatchery production levels and the resulting Incidental Take Statement (ITS) need to be adjusted taking into account the current situation. Further, none of the alternatives in the draft EIS address the problem of mitigating the impacts of the Management Agreement on listed fish, unless the "sliding scale" of harvest based on abundance levels is seen by NMFS as the mitigation. RiverPartners' finds this particularly important because whatever "incidental take" is authorized in the 3

Management Agreement will affect the FCRPS level of authorized "take". Quite simply, there is only so much "take" of listed salmon that can be allowed overall without compromising the ability to restore these fish. All of this (again) argues for a comprehensive all-"H" approach and a much shorter term Management Agreement that provides some flexibility to respond to current fishery and other conditions, as has been done in the past. That said, the Services could consider putting an Interim Management Agreement in place until the FCRPS NEPA and a new BiOp are complete. This would allow new data and information from those processes to be used in crafting a new Management Agreement and help ensure a more complete look at the impacts and interactions of various actions on listed salmon stocks. 4

RiverPartners is concerned that the legal foundation for this Draft EIS on the future Management Agreement appears to assume that continued significant impacts on ESA listed fish consistent with the current harvest and hatchery management agreement is an acceptable level of environmental impact. Yet, in the same Oregon District Court, Judge Simon continues to rule that ESA listed fish in the Columbia River are in great peril and that extinction is a very real possibility. These legal findings have led Judge Simon to order significant increases in spill from the Lower Columbia and Lower Snake River dams to improve survivals of juvenile salmon and steelhead, and to call for multi-million dollar studies of breech or removal of the Snake River dams. 5

At the same time, this Draft EIS seems to assume that there is no reason for alarm from the proposed actions that continue existing harvest and hatchery management practices. Judge Simon's dire description of the status of ESA listed fish is diametrically opposed to the description of proposed take in this Draft EIS.

The inconsistency of the findings in this Draft EIS with those by Judge Simon should provide the Services food for serious thought. Listed salmon and steelhead are either on the brink of extinction and every possible action to prevent killing these fish needs to be implemented immediately, or, the fish are doing fine and current harvest and hatchery activities can continue as usual.

The federal agencies need to be transparent about the actual effects of each of the three proposed actions at issue (hatchery, harvest and hydropower/habitat) to properly conduct their respective NEPA processes, because as explained by the Justice Department attorneys in recent briefing, NWF v. NMFS, "NEPA is a public process - not a private negotiation among a limited group of interested parties." Yet, NMFS is approaching it this way. For example, in stark contrast to the NEPA 6 7 8

scoping process for the FCRPS which included 15 public workshops in communities throughout the Northwest, there were no public scoping meetings on the Management Agreement. NMFS simply issued a one-page Notice of Intent, identified alternatives and asked for written comments within 30 days, with one comment extension.

In summary, by trifurcating the NEPA analysis, the Services are obfuscating the cumulative environmental effects of the major federal actions affecting listed salmon species. This DEIS also applies different legal and process standards as compared to those applied to the FCRPS and thus falls short of meeting the law's requirements. We urge you to take the time to do a transparent, robust DEIS that looks at all the actions affecting the listed salmon species and to provide opportunities for more public involvement.

Sincerely,

Terry Flores, Executive Director

Cc: Elliot Mainzer, Regional Administrator, Bonneville Power Administration
Brigadier General Scott A. Spellmon, Commander Northwestern Division, US Army Corps
Lorri Lee, Pacific Northwest Regional Director, Bureau of Reclamation
Henry Lorenzen, Chair, NW Power and Conservation Council

Letter #10
Attachment

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The US v. Oregon Management EIS should be combined with the FCRPS EIS in a single NEPA document addressing the totality of the environmental effects on salmon and steelhead.

The Services appear intent on improperly segmenting the harvest and hatchery management Environmental Impact Statement (EIS) from the broader National Environmental Policy Act (NEPA) inquiry being simultaneously conducted by the Services and the action agencies, (*e.g.*, the U.S. Army Corps of Engineers ("Corps"), the Bureau of Reclamation ("BOR") and the Bonneville Power Administration ("BPA") for the Federal Columbia River Power System (FCRPS) EIS. But, the Harvest/Hatchery Management EIS and the FCRPS EIS are plainly closely related and should be addressed in the same NEPA analysis to properly satisfy the intent of the statute, which as applied here, is to ensure that impacts to these ESA protected salmonids are fully, fairly and publicly evaluated.

As required by NEPA, the FCRPS EIS must take a hard look at alternatives to the planned operation and maintenance of the FCRPS including consideration of reasonable and prudent alternatives ("RPAs") that reduce mortality of listed salmonids. The Harvest/ Hatchery Management EIS, as required by NEPA, must take a hard look at alternatives to planned harvest and hatchery activities that are a major source of mortality for those very same listed salmonids that travel in the same action area in which the FCRPS operates. It is extremely difficult to comprehend how the Services could possibly take a "hard look" at the effects of the US vs Oregon Management Agreement ("Management Agreement") on salmonids without simultaneously looking at effects to these same species from hydropower operations. *See e.g., N. Plains Res. Council, Inc. v. Surface Transp. Bd*, 668 F.3d 1067, 1075 (9th Cir. 2011)(requiring agencies to take a "hard look" at all of the environmental impacts of their actions).

NMFS' plan to evaluate the impacts of harvest and hatcheries separately and in advance of planned operations for the FCRPS is inconsistent with the letter and spirit of NEPA. These fish are simultaneously impacted by the hydrosystem, harvest, hatchery management, habitat impairment and hatcheries ("the 4 Hs"), and to pretend otherwise is to do nothing other than subvert the intent of the "hard look" mandated by NEPA.

We fully understand that NMFS is embarking on two separate proposed actions: harvest and hatchery management and the operation of the FCRPS. We further understand that NMFS believes these two proposed actions are not "connected" for purposes of NEPA because they 9

have "independent utility," are timed differently and therefore need not be considered in the same NEPA document. *See* 40 C.F.R. 1508.25(a)(1). But, as explained more fully below, the history of these actions and the manner in which they were treated by the Services in the past indicates that they are clearly connected. Moreover, any timing distinctions are entirely artificial. Both the Management Agreement and the FCRPS operations are ongoing and long running actions. They will be implemented at the same time and impact the exact same endangered and threatened fish in the same geographic area. Salmon and steelhead do not understand or respect the "proposed action" distinctions and legal niceties; those are legal artifices that as applied here by the federal government, hide the actual and synergistic effects of these federal actions.

What the Services overlook in structuring the "serial yet separate" NEPA reviews proposed for these two actions is that the completion of the new Management Agreement will undoubtedly affect the manner in which the FCRPS operations are managed and *visa versa*. Both proposed actions harm these fish while the goal of both proposed actions is to accomplish their respective purpose and need (*i.e*., continued operation of the hydrosystem, and continued authorization and management of harvest and hatchery activities) while not doing so to the point of jeopardizing these species or adversely modifying their habitat, as prohibited under ESA section 7(a)(2), 16 U.S.C. §1536(a)(2).

In other words, the levels of harvest and hatchery production authorized in the proposed Management Agreement will undoubtedly affect the amount of incidental take authorized by future Biological Opinions for the FCRPS because there is only so much "take"-- whether "incidental" or otherwise-- that can be authorized before compromising the ability to restore these protected fish. Thus, to look at the effects of one action, separate and apart from the effects of the other, when they each involve the same geographic area-- the Columbia River mainstem and the very same fish-- is to impermissibly segment the full analysis and to subvert the "hard look" required by NEPA.

This argues strongly in favor of a 4H approach to the NEPA process- similar to the 4H approach utilized by the Services and the action agencies in conducting the ESA section 7 consultations for the FCRPS since the publication of the Basinwide Salmon Recovery Strategy ("BSRS") in 2000. The Services' decision to evaluate harvest and hatcheries in a vacuum from the operation of the FCRPS and other actions that may be directly, indirectly, or cumulatively impacting salmonids is a one hundred eighty degree and unprecedented departure from its conduct over the better part of the last two decades. *See* *Natl. Wildlife Fedn v. Natl. Marine Fisheries Serv.*, 254 F. Supp. 2d 1196, 1212 (D. Or. 2003) ("In the 2000 BiOp and the BSRS, NOAA makes clear that the short-term survival and recovery of the eight salmon ESUs depend in part on range-wide offsite mitigation, habitat, harvest, and hatchery actions.").

A further look at the prior history of the manner in which these two proposed actions were handled by the government in the analogous ESA context illustrates their connectivity. The

Services' desire to now de-couple these two proposed actions flies in the face of the manner in which the Services previously treated these two proposed actions. Indeed, the last time the Management Agreement was re-negotiated, and re-issued in 2008, the Services clearly understood their inherent linkage and issued the respective BiOps on the basis of the same "Supplemental Comprehensive Analysis" and aggregated the analyses for: (1) the BOR's operation of the Upper Snake projects; (2) the Corps' operation of the FCRPS; and (3) NOAA Fisheries' participation in the 2008-20017 Management Agreement. *See U.S. v. Oregon Management Agreement Biop* (May 5, 2008) at 1-9 establishing that:

> The FCRPS and Reclamation Actions, along with the fishery Actions being considered in this Biological Opinion, are largely coincident both in time and place. The actions would all occur over the next ten years. . . and affect listed species by their actions in significant portions of the Columbia River basin. Understanding the relationship between the FCRPS and Reclamation Actions and fisheries considered under the proposed 2008 Agreement, provides necessary context for this consultation.

Id. In elaborating on this point, the Services explained that "this coordination of consultations insures that the best available information, reflected by the CA and SCA, was used consistently." *Id.* The Services further justified its joint treatment of the Management and FCRPS actions by emphasizing that

> [t]he close relationship between the remand process, the consultation on the FCRPS and Reclamation Actions, and consultation on the 2008 Agreement is worth noting. All of the state and Tribal parties to *U.S. v. Oregon* were directly involved in the FCRPS litigation and associated remand process.

Id. at 1-10. Notably, the rationale for historically combining these analyses remains equally availing today, where the parties to the Management Agreement are parties to the continuing FCRPS litigation, and given the close relationship between the issues involved in each EIS.

Thus, in executing their statutory responsibilities, the Services recognized (as did Federal District Judge Redden) that these various federal actions were taking place in the same geographic area,

involved the same fish, and had similar consequences (*i.e.*, harm to protected ESA species) and therefore needed to be evaluated together. [1] *See* Natl. Wildlife Fedn. v. Natl. Marine Fisheries Serv., CV 01-640-RE, 2005 WL 3576843, at *9 (D. Or. Dec. 29, 2005) ("The federal defendants have promised a thorough review of the four 'H's'"). Natl. Wildlife Fedn. v. Natl. Marine Fisheries Serv., CV 01-640-RE, 2005 WL 1278878, at *21 (D. Or. May 26, 2005) ("I conclude that the ESA regulations and NOAA's Consultation Handbook appropriately require NOAA to consider the effects of future state-managed harvest and hatcheries in any jeopardy analysis because such actions are reasonably certain to occur and undoubtedly impact the status of the listed species.")

While the Services did not at that time complete a NEPA review, their actions in carrying out their ESA responsibilities in this comprehensive manner is both telling and an acknowledgement of their inherent linkage. The fact that the Services and Judge Redden understood the need to simultaneously, comprehensively and transparently evaluate these "two sides of the same coin" demonstrates the problems inherent in attempting to de-link them in the manner now proposed by the Services. *See Westlands Water Dist v. U.S. Dept of Interior*, 275 F. Supp. 2d 1157, 119091 (E.D. Cal. 2004)("whatever nomenclature is applied to the relationship between the Biop's RPMs, the EIS and the ROD the end result is that they are inextricably intertwined as part of the same action to restore the Trinity River fishery, which in turn requires they be analyzed in the same EIS.").

Separating the effects analyses as now proposed is counter to Judge Simon's recent NEPA ruling in National Wildlife Federation v. NMFS

In segmenting the harvest/hatchery management and FCRPS EISs, the Services are effectively thwarting Judge Simon's recent NEPA ruling in *NWF v. NMFS*, 2016 WL 2353647 **55-62. In recently ordering the governmental defendants in *NWF v NMFS* to conduct a comprehensive NEPA analysis encompassing the effects of all 73 individual actions comprising the FCRPS RPA, Judge Simon was intent on requiring the government to look at the totality of the effects on these listed species in a manner that addressed all four of the "H's"- hydropower, habitat, harvest, and hatcheries. He was concerned that failing to look at all the individual RPA measures together in one single EIS would subvert the very purpose of NEPA. After all, "[t]he idea behind NEPA is that if the agency's eyes are open to the environmental consequences of its actions, and if it considers options that entail less environmental damage, it may be persuaded to alter what it proposed. *Lemon v. Geren*, 514 F.3d 1312, 1315 (D.C. Cir. 2008).

[1] The harvest management and FCRPS proposed actions were also analyzed together because the FCRPS BiOp and its attendant Reasonable and Prudent Alternative ("RPA") provided the necessary mitigation to offset the impacts resulting from harvest.

Accordingly, he held that the various individual RPA measures were both connected and cumulative actions and otherwise resulted in cumulative effects that needed to be addressed in a single EIS. Judge Simon emphasized that

> [a]s the Federal Defendants contend in the jeopardy portion of their summary judgment brief, the threats facing the listed species and the required responses are "simply too interconnected" to have any response other than a response of a "suite" of "all-H" measures.

NWF v. NMFS, 2016 WL 2353647, * 55. *See Earth Island Ins. v. U.S. Forest Serv.*, 351 F.3d 1291, 1304-05 (9th Cir. 2003)(noting that a single EIS is required where the projects are connected, cumulative or similar); *Native Ecosystems Council v. Dombeck*, 304 F.3d 886, 89394 (9th Cir. 2002) (same). *See also* 40 C.F.R. 1508.25 (a)(2)(defining cumulative actions as those "which when viewed with other proposed actions have cumulatively significant impacts and should therefore be discussed in the same impact statement."); 40 C.F.R. 1508.25(a)(3)(defining "similar actions" as those which when viewed with other reasonably foreseeable or proposed agency actions, have similarities that provide a basis for evaluating their environmental consequences together, such as common timing or geography"). These implementing regulations further admonish agencies to evaluate similar actions in the same EIS when "the best way to assess adequately the combined impacts of similar actions or reasonable alternatives to such actions is to treat them in a single impact statement."

Indeed, the crux of Judge Simon's NEPA decision required a single EIS "so that the Action Agencies, the public, and public officials can take a hard look at the programmatic plan to offset the adverse effects of the FCRPS and consider the reasonable alternatives." 2016 WL 2353647 * 56. It is difficult to imagine how the agencies can accomplish this task without looking at the effects of harvest and hatchery management and the on-going FCRPS operations, together with habitat actions, in the same EIS.

In other words, to use Judge Simon's words, "at a macro level, these [actions] are all connected because they are needed to offset the adverse effects of [each other.] . . . If one action is replaced with a different action providing greater survival benefits, another "independent" action will not be required." *Id*. Thus, "for example, a very large offset can be achieved through bypassing one or more of the four lower Snake River dams, than many other actions may not need to occur, such as killing DCCO, hazing Caspian terns, or improving the estuary habitat." *Id*. Judge Simon could just as easily used modifications to on-going harvest/hatchery management as another example to illustrate his broader holding that that the 73 individual actions that comprise the broader RPA needed to be evaluated in a single EIS.

<u>The 30-days scoping period proposed for the U.S. v. Oregon EIS is woefully insufficient</u>

In addition to impermissibly segmenting the effects analysis of the *U.S. v. Oregon* Management Agreement from the broader EIS for the FCRPS, the Services are proposing a *pro forma* 30-days public process that does not meet the spirit or requirements of NEPA given the issues at hand. In juxtaposition, this 30-days scoping period commencing on the eve of the long Fourth of July weekend with no notice other than a Federal Register notice is woefully inadequate to achieve the underlying purpose of the NEPA *e.g.* to enable decision-makers to take "a hard look" at the totality of environmental effects caused by their proposed actions and develop reasonable alternatives that if taken, would avoid such adverse effects. The Services should reconsider this bare-bones "process" and instead, afford members of the public a robust and transparent opportunity to weigh in on issues governing hatcheries and harvest.

<u>Conclusion</u>

NEPA requires a comprehensive assessment of the significant environmental impacts of reissuance of the *U.S. v Oregon* Management Agreement. NEPA also requires that cumulative, connected and similar actions be evaluated in the same EIS to provide the various decisionmakers the information necessary to make informed decisions about the ramifications of their proposed actions on the environment.

To that end, RiverPartners asks the Services to combine the Harvest Management EIS process with the FCRPS EIS process so that one comprehensive, robust analysis is produced that would enable the states and Tribes and the Services, together with BPA, the Corps and the BOR to make informed decisions about continued harvest management and continued FCRPS operations that will impact the same fish in the same stretches of the Columbia and Snake rivers. That is what Judge Simon demanded in his recent Opinion and Order in *NWF v. NMFS*, and that is what the region needs to participate in an informed manner in the upcoming NEPA review(s) for these proposed actions.

RiverPartners is also requesting that the Services extend the scoping comment period for another 60 – 90 days and hold public hearings so that interested members of the public can weigh in on these critically important issues. The thirty day comment period provided thus far is woefully inadequate under the circumstances and is inconsistent with the letter and spirit of the statute that the agencies are attempting to satisfy. 10

Letter #11

Wild Fish Conservancy
NORTHWEST
SCIENCE · EDUCATION · ADVOCACY

U.S. v. Oregon DEIS Comments
Submitted by
Wild Fish Conservancy
August 21, 2017

Attn: Jeromy Jording, Fishery Biologist
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Jeromy,

Wild Fish Conservancy appreciates the opportunity to provide the following comments on the DEIS. We hope you find our comments constructive and helpful in achieving a new U.S. v. Oregon Fisheries management plan that is fully protective of all affected ESA-listed populations while meeting NMFS' treaty trust responsibilities.

Sincerely,

Kurt Beardslee
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In support of these comments:

Pete Soverel,
President
The Conservation Angler

Bill Bakke
Conservation Director
The Conservation Angler

Introduction

The renewal of the U.S. v. Oregon management agreement (henceforth, "Agreement") presents NMFS with the ability to improve opportunities for recovering ESA-listed Chinook and steelhead populations in the Upper Columbia and Snake River basins, relative to the current state of affairs. Wild Fish Conservancy believes that it is possible to achieve improvement in recovery of ESA-listed populations and improve economic returns to tribal and non-tribal commercial fisheries. The current 2017 return year crisis of upper Columbia/Snake steelhead, especially natural-origin (henceforth "wild") Snake River B steelhead, highlights that the current fisheries regime under the 2008-2017 Agreement is insufficiently risk-averse when returns of ESA-listed wild populations of Chinook and steelhead are at low abundance. In our assessment, none of the four primary, viable, alternatives described in the DEIS (alternatives 1 – 4) are adequate by themselves. However, three (alternatives 2, 3, and 4) contain elements that could be combined to provide a credibly risk-averse management plan, if also combined with additional elements pertaining to the conduct of individual fisheries. In the following comments, we first describe the combination of elements from alternatives 2, 3, and 4 that we recommend NMFS further examine in developing a draft Agreement for 2018-2027. We then address additional issues in the DEIS that we believe to be important. 1

A Risk-Averse Alternative

Alternative 2 would extend the abundance-based management regime that currently applies to a subset of Chinook, sockeye and steelhead stocks in the upper Columbia/Snake basin to all upriver (above Bonneville Dam) populations. Alternative 3 would manage all fisheries affecting upriver populations using fixed harvest rates. The harvest rates for individual stocks (population aggregates) or populations would be the average harvest rates observed in the past 10 years (essentially those observed under the current agreement). Alternative 4 would manage all fisheries affecting upriver populations to attain fixed stock- or population-specific escapement goals, also based on the recent 10-year averages. Under this alternative no or only de minimus tribal ceremonial and subsistence (C&S) fisheries would occur when the estimated terminal run of a stock or population to a specific location (Columbia River (CR) mouth, Bonneville, Rock Island, or Lower Granite Dam) was expected to be below the escapement goal. Otherwise, harvest would be configured to take all of the return in excess of the goal.

While each of these alternatives are helpful by outlining extremes of each management approach, none is sufficiently protective of ESA-listed stocks or populations. None appear capable of meeting all ESA requirements regarding jeopardy, nor do they appear capable of optimizing recovery opportunities in the context 2

of also providing harvest opportunities on mitigation hatchery returns that provide the majority of treaty and non-treaty fishing opportunities.

Alternative 2 applies incrementally increasing harvest rates to stocks based on the estimated return to the relevant in-river management point (location) and would permit some level of commercial and recreational fishing regardless of how low the return abundance. This is insufficiently protective of ESA-listed stocks and populations. Preservation and rebuilding of ESA-listed populations requires securing minimum spawning escapements to each spawning population together with the life history diversity (age structure, sex ratio, run timing) that is characteristic of local spawning populations. None of the current abundance-base harvest regimes secure this. 3

Alternative 3 applies a fixed annual harvest rate to each management unit stock regardless of abundance. Further, the harvest rates are derived from the recent 10-year average of observed (estimated) harvest rates. It is not clear that the selection of these rates has appropriately taken account of the variation in the rates observed over the past 10 years or the variation in implementation of the associated fishery regimes (implementation error). Regardless, this alternative is insufficiently protective of ESA-listed populations and stocks when return levels are low. This is clear from the comparisons of minimum escapements past fisheries provided in summary tables 4-58 through 4-63, pages 119 - 130. 4

Alternative 4 would employ a fixed escapement goal for each stock and employ associated fishing control rules that would aim to harvest all surplus returns in excess of the goal. While this would secure the largest (modeled) minimum escapement of the four alternatives, it would secure the lowest maximum and average escapements of the four (Tables 4-58 through 4-63). Further, as with the stock-specific harvest rates under Alternative 3, the proposed escapement goals appear to be derived from average escapements for the most recent 10 years, and not from biological determination of recovery requirements. Alternative 4 is a particularly inappropriate and misleading caricature of escapement goal management, especially so in the context of managing for the recovery of ESA-listed populations. There is no good biological reason why managing so as to achieve (whenever returns permit) a minimum (floor) spawning escapement requires permitting any and all excess return-above-escapement floor to be harvested, rather than dividing the surplus between harvest and additional escapement. 5

These extreme characterizations of alternatives 3 and 4 require the conservation-minded public to gamble between obtaining slightly greater escapements when returns are greater than the floor escapement levels under alternative 4 (by choosing alternative 3) against the slightly to modestly greater escapements when returns are near or below the escapement goals (by choosing Alternative 4. This Sophie's Choice is unnecessary and inappropriate.

A new alternative is needed that contains protective elements of each of alternative 2, 3, and 4. We describe one approach in the following. 6

A Robust Conservation-Based Alternative

For each above-Bonneville stock, provide an abundance-based regime that includes the following:

1. a minimum, recovery-based spawner escapement level (floor) that accounts for sex ratio, run timing, and age-structure diversity of individual spawning populations, and assures that all major and minor spawning locations within each population are occupied;

2. includes a "stop-loss" rule (Essington et al, Science 2015; Pikitch, Science 2015) under which no fishing occurs when the expected return is below the stock- or population-specific goal;

3. a sliding abundance-based harvest rate and escapement scale that partitions returns in excess of the escapement floor between escapement and harvest. This assures that returns that exceed the escapement floor will add to escapements in addition to providing harvest via exploitation rate control rules. Management strategy evaluations of each stock and its component populations should be conducted to explore the advantages and disadvantages of different ways of apportioning the returns in excess of escapement floors between escapement and harvest (e.g., fixed proportion division, incremental increase in harvest as abundance increases, others.); and,

4. Escapement goals specified as numbers of wild (NOR), and upper limits on nominal (census) pHOS levels no greater than Hatchery Science Review Group (HSRG) maximum allowable levels for Primary and Contributing (<5%, <10%, respectively). I.e., hatchery strays should not be counted toward meeting escapement goal floors.

Wild Fish Conservancy strongly recommends that this alternative be developed and included in the FEIS and in the draft 2018 – 2027 U.S. v. Oregon Management Agreement.

Selective Fishery Requirements and Tribal Treaty Trust Responsibilities

Commercial harvest in the CR, both treaty tribal and non-treaty, is directed primarily at hatchery stocks produced to subsidize harvest (mitigation). The principal exception to this are harvest of upper CR Summer Chinook and Fall Upriver Bright (particularly Hanford Reach) Chinook. This includes the major tribal Zone 6 fishery for Snake

River fall Chinook. Wild, including ESA-listed steelhead, are known collateral damage in both the Zone 6 tribal and below-Bonneville non-treaty commercial and recreational fisheries. The current agreement places a direct 2% cap on the combined non-treaty commercial and recreational fisheries take of ESA-listed wild Snake River B steelhead. Non-treaty recreational fishers are required to fish mark-selectively and to release any wild steelhead unharmed. Non-treaty commercial fishers are encouraged to fish mark-selectively. This 2% total mortality cap applies regardless of the estimated total return of wild (ESA-listed)-plus-(non-ESA-listed) hatchery Snake River B returns. 7

In contrast, treaty tribal commercial fishers are not required to release non-target salmon and steelhead (including wild Snake River B) and instead are given a sliding scale harvest rate allocation ("cap) based upon the estimated total hatchery-plus-ESA-listed wild Snake River B steelhead return that is considerably greater than 2% and that includes no requirement for release of unmarked, wild steelhead or salmon. Under the current agreement these rates range from 13% to 20% (total allowable, treaty-plus-non-treaty fisheries, harvest rate 15% to 22%) (DEIS table 4-47, p. 112).

The DEIS provides no clear legal justification for this severe discrepancy. We find no good reason for the presumption (implicit in the DEIS) that trust responsibilities to the Columbia River treaty tribes requires this. The relevant principle in Secretarial Order 3206 (providing guidance on federal-tribal trust responsibilities and the ESA) would appear to be Principle 3(C), the second paragraph of which states

> In the event that the Departments determine that conservation restrictions are necessary in order to protect listed species, the Departments, in keeping with the trust responsibility and government-to government relationships, shall consult with affected tribes and provide written notice to them of the intended restriction as far in advance as practicable. If the proposed conservation restriction is directed at a tribal activity that could raise the potential issue of direct (directed) take under the Act, then meaningful government-to-government consultation shall occur, in order to strive to harmonize the federal trust responsibility to tribes, tribal sovereignty and the statutory missions of the Departments. In cases involving an activity that could raise the potential issue of an incidental take under the Act, such notice shall include an analysis and determination that all of the following conservation standards have been met: (i) the restriction is reasonable and necessary for conservation of the species at issue; (ii) the conservation purpose of the restriction cannot be achieved by reasonable regulation of non-Indian activities; (iii) the measure is the least restrictive alternative available to achieve the required conservation purpose; (iv) the restriction does not discriminate against Indian activities, either as stated or applied; and, (v) voluntary tribal measures are not adequate to achieve the necessary conservation purpose.

Requiring mark-selective fishery regulations to apply to the Zone 6 tribal fishery -- would clearly appear to meet the above requirements. We recommend consideration of Zone 6 tribal fishery regulations with a more permissive take limit on listed upriver stocks than applies to the non-treaty commercial and recreational fisheries, but more restrictive than the current agreement (for wild Snake B steelhead for example, 5% instead of 2%) where justified by the appropriate analysis of the population-specific wild escapements required for rebuilding and recovery. In 8

addition, an alternative that includes an escapement-based stop-loss rule, with an exception for a conservative de minimum C&S fishery for specific stocks, would also appear to meet the requirements. NMFS would appear to have a legal obligation under the ESA to recommend the adoption of such regulations in the renewal of the Agreement. 9

We also note that nowhere in the DEIS or other related documents has NMFS provided any quantitative criteria by which levels of harvest pursuant to trust responsibilities are to be calculated or otherwise determined so that they can be weighed against non-tribal harvest interests and ESA-recovery requirements. Absent a quantification of de minimus levels of harvest necessary to meet trust responsibilities it is impossible for independent observers, including the interested public, to determine whether the harvest regimes that NMFS does approve are subjective or otherwise arbitrary and capricious. Nor is it possible to make rational and optimal decisions to allocate scarce conservation and management resources between competing harvest management and ESA recovery objectives and opportunities. 10

Economic returns to treaty tribal and non-treaty commercial fisheries

We also note that the tribal commercial fisheries appear to secure lower financial returns than non-tribal commercial fisheries. Table 3-18 (DEIS p. 64) lists the ex-vessel value of harvest indicator species under status quo conditions. The lower Columbia (Zones 1 – 5) commercial fisheries harvested 53039 fish that returned an ex-vessel value of $2418367 or $45.59 per fish. The non-tribal harvest in the mid-Columbia subregion (Zone 6) above Bonneville harvested 3877 fish that returned an ex-vessel value of $148749 or $38.37 per fish. The tribal Zone 6 fishery harvested 237785 fish at an ex-vessel value of $7745794 or $32.57 per fish. This appears to indicate that the tribal fishery is not receiving an appropriate return on their catch relative to the non-treaty commercial fishery. This discrepancy might not unreasonably be interpreted as a failure to meet trust obligations. 11

The renewal of the Agreement provides an opportunity to evaluate how this imbalance in return per fish landed might be redressed, while better furthering the conservation and recovery of ESA-listed populations. We have suggested that one way that this can occur is under a tribal mark-selective fishery whereby commercially caught mitigation hatchery fish are marketed as sustainably-caught, ESA-friendly. We recommend that NMFS pursue this in the draft 2018-2027 Management Agreement.

Hatchery Impacts on listed wild populations

If a more conservation-oriented alternative, such as the integrated one described above is adopted, mitigation hatchery programs will have to be re-evaluated and/or re-configured to assure that maximum allowable pHOS levels are not exceeded when returns trigger the implementation of stop-loss (no harvest) rules. When harvest is allowed, sufficient hatchery fish must be removed (harvested) so that the escapements are composed of wild spawners, keeping pHOS levels at or below maximum allowable levels. In other words, hatchery production levels must be scaled so that management directed at assuring achievement of minimum escapement floors for wild populations does not provide justification for high harvest rates in order to comply with pHOS requirements. 12

Assumption that environmental conditions experienced in the most recent 10-year period will apply to the next 10 years

The DEIS alternatives also assume that the average and range of conditions experienced in the past 10 years (during the course of the current Agreement) will apply for the next 10 years (over the course of the renewed Agreement). This is unlikely and risky for listed stocks and populations, as evidenced by the current crisis in returns of upriver steelhead, and wild Snake River B steelhead in particular. The current (2017) disastrous returns of sockeye to the Skeena and Fraser rivers in British Columbia also suggest that climatic conditions in the northeast and northcentral Pacific Ocean have changed relative to conditions at the beginning of the current Agreement, and are becoming more variable and unpredictable. The huge block of warm Ocean water off the coasts of Southeast Alaska, British Columbia and Washington, commonly referred to as the "blob" that appeared in 2013-14 and returned in 2016 is but one indication that conditions can change rapidly and unpredictably. Elements of the climatic regime in the northeast Pacific where most CR salmonids rear appear to have shifted since the early years of the current Agreement. 13

Consequently, model scenarios for any of the alternatives should include a wide range of values for marine survival and egg to smolt survival in the several basins of the upper Columbia and Snake River, particularly modeling conditions that are as and more adverse than some experienced by CR stocks in the last 5 years.

Zone 6 "Conversion Rate"

The so-called Bonneville-to-McNary "conversion rate" refers to the unaccounted loss of salmon and steelhead that are detected passing Bonneville Dam but neither detected at McNary Dam nor accounted for in fisheries in Zone 6. For several salmon and steelhead stocks this loss is in the neighborhood of 20% of the numbers detected at Bonneville. It is unlikely, in our and others opinion, that this magnitude loss can be assigned entirely to 14

migration mortality. Rather, it appears more likely that some if not all of this loss is due to unreported catch, including illegal (poaching) catch by some one or more of treaty tribal commercial fishers, non-treaty commercial fishers, and/or recreational fishers. The paucity of WDFW and ODFW checkers of the recreational fisheries in the large area between Bonneville and McNary, and the absence of independent observers/checkers of the tribal commercial fishery appear to provide considerable scope for illegal fishing. This issue needs to be explicitly addressed in the new agreement. This should include immediate plans to convene a working group of state, tribal (CRITFC), federal, and independent fisheries scientists and statisticians to develop a research and monitoring plan to address the loss.

Snake River Steelhead

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Snake River wild (NOR) B steelhead are returning this year (2017) in record low abundance. In addition to harvest impacts permitted under the current abundance-based management agreement, particularly in the Zone 6 fishery as noted above, hatchery stray rates a concern in all Snake steelhead MPGs, including the major tributaries of the Clearwater MPG, the South Fork Salmon and tributaries, and the Middle Fork salmon and tributaries that contain major spawning grounds for Snake River B steelhead. This is noted in the Idaho Management Unit Recovery Plan appendices to the 2016 Draft Snake Salmon and Steelhead Recovery Plan, and in NMFS' 2016 5-Year Review: Summary and Evaluation. The renewed agreement should better address these threats by (among other actions):

- placing a conservative incidental take limit on wild steelhead encountered in this fishery, instead of the current total mortality limit on all (hatchery and wild) Snake River B steelhead, and
- requiring the treaty tribal fisheries in Zone 6 to transition to mark-selective fisheries within the period of the renewed agreement, and then requiring release of all wild (non-adipose-clipped) steelhead.

16

We also believe that harvest under a new agreement must provide for minimum population-specific recovery-based spawner escapement goals for Snake River B steelhead (as well as other ESA-listed populations). If minimum escapement goals for the aggregate population measured at Lower Granite Dam are chosen, the aggregate should be large enough to assure that each major spawning population in the Clearwater and Salmon MPGs has a high probability (explicitly quantified in the agreement) of attaining their minimum escapements and that all major and minor spawning locations within those major spawning populations are occupied.

Letter #12

August 21, 2017

Jeromy Jording
Sustainable Fisheries Division
National Marine Fisheries Service, West Coast Region
510 Desmond Dr. SE, Suite 103, Lacey, WA 98503-1263
jeromy.jording@noaa.gov, (360) 753-9576

Via Email

Re: US v. Oregon DEIS Comments

Dear Jeromy:

The Conservation Angler is a wild fish conservation organization based in Washington State whose supporters have a deep and abiding passion for the protection, conservation and recovery of wild fish and wild rivers across the Pacific Region, including the Columbia and Snake River Basin.

On behalf of these people, The Conservation Angler (TCA) is submitting, via this letter, our comments and analysis of the US v. Oregon Draft Environmental Impact Statement (DEIS)(hereinafter "Harvest DEIS"). The Conservation Angler has also joined with other organizations in a joint scientific critique of the Harvest DEIS.

These comments attempt to address primarily the legal and administrative issues with the Harvest DEIS.

Public Participation and Process:
The Harvest DEIS covers a topic that is highly technical, complicated and complex. For that reason, TCA believes that the 45 day public comment timeline was too short, though we appreciated the 15 day extension.

The public would have benefitted from a public meeting or two in order for NOAA to explain how it conducted its analysis in the alternatives review and comparison. 1

Critically, NOAA Fisheries did not provide some of the cited materials, reports, data, but merely contained citations to many papers and other resources that were not readily available to the public. 2

Compounding that difficulty, NOAA Fisheries' Harvest DEIS tiers to a 2,000+ page FEIS on Columbia River hatchery issues that was incredibly complicated and convoluted as the Mitchell Act FEIS evaluated economic issues as well as environmental issues and even Endangered Species Act (ESA) issues. 3

The Harvest DEIS mentions public outreach to Native American tribes, and to commercial and recreational anglers, but does not reference any outreach to conservation organizations. 4

There appears little if any evidence that the Harvest DEIS considered any of our scoping comments which focused on presenting other alternatives than those presented in the Notice of Intent (NOI). Indeed the Harvest DEIS on p. 35 notes that several alternatives were considered but not analyzed but yet only specifically responds to a single alternative - what NOAA describes as a "fixed effort" alternative. NOAA brief dismissal of other alternatives weakens its overall Alternatives analysis. 5

DEIS Structure and Content contrasted with NEPA Guidance

The Purpose and Need and the Proposed Action are out of order in terms of describing the federal activity requiring or triggering the need for a NEPA analysis.

The purpose and need for the NEPA analysis in the Harvest DEIS is to inform NOAA and the public of the impacts to the environment created by the Proposed Action. The Proposed action is drafting an Incidental Take Statement (ITS) for fisheries, presumably authorized by the on-going federal court action known as "US v. Oregon," that will result in the direct and indirect take of ESA-listed species of salmon and steelhead, and drafting a Biological Opinion that the authorized "take" of ESA-listed species will not jeopardize the future survival and recovery of the listed species. 6

That is how the "purpose and need" and the "proposed action" should be legally described under NEPA guidelines proposed by the Center for Environmental Quality (CEQ) and by NOAA's own guidelines.

NOAA's Fisheries is responsible for the stewardship of the nation's ocean resources and their habitat. Stewardship is defined as the responsibility to oversee and protect something considered worth caring for and preserving. The historic focus has been on the marine environment. The priority for NOAA has been protecting resources and understanding the oceans and atmosphere. NOAA's first order in this effort is to comply with mandates to protect and recover species listed as threatened or endangered under the Endangered Species Act (ESA). NOAA's second priority is to ensure, as a representative of the United States government, that treaties signed with Native American Tribes are honored. Northwest treaty tribes' right to harvest salmon and steelhead is strong, but not absolute - they cannot catch the last of an ESA-listed fish. In that way, NOAA Fisheries role is not to "balance" the use or right to use a national or international resource, but to ensure those marine resources (in this case, Pacific salmon and steelhead) are sustained and protected - for use now, and in perpetuity. There can be no balancing when there are zero fish on one side of the scale. 7

Alternatives

There is no Preferred Alternative despite specific language requiring it in NOAA's own regulations. See NAO 216-6 Environmental Review Procedures for implementing NEPA, .04 General Regulations for EIS and SEIS, B.3. Preferred Alternative: 8

> 3. It is NOAA and CEQ (40 CFR 1502.14(e)) policy to require identification of the preferred alternative(s) in the draft EIS/SEIS, whenever such preferences exist, and in the FEIS unless another law prohibits the expression of such a preference. When preferred alternatives do not exist, the document must provide a range of alternatives or other indication of the alternatives most likely to be selected, thus informing the public of the likely final action and its environmental consequences. The public is thus able to more effectively focus its comments.

This is major problem for the Harvest DEIS, but by no means the only problem.

NEPA requires a reasonable range of alternatives and this section should be the heart of the environmental impact statement. The CEQ Regulations implementing NEPA note that based on the information and analysis presented in the sections on the Affected Environment (Sec. 1502.15) and the Environmental Consequences (Sec. 1502.16), an EIS should present the environmental impacts of the proposal and the alternatives in comparative form, thus sharply defining the issues and providing a clear basis for choice among options by the decisionmaker and the public.

The CEQ Regulations go on to state that “agencies shall:
(a) Rigorously explore and objectively evaluate all reasonable alternatives, and for alternatives which were eliminated from detailed study, briefly discuss the reasons for their having been eliminated.
(b) Devote substantial treatment to each alternative considered in detail including the proposed action so that reviewers may evaluate their comparative merits.
(c) Include reasonable alternatives not within the jurisdiction of the lead agency.
(d) Include the alternative of no action.
(e) Identify the agency's preferred alternative or alternatives, if one or more exists, in the draft statement and identify such alternative in the final statement unless another law prohibits the expression of such a preference.
(f) Include appropriate mitigation measures not already included in the proposed action or alternatives.”

As the regulations state, NEPA requires agencies to “rigorously explore and objectively evaluate all reasonable alternatives” to a proposed plan of action that has significant environmental effects. 40 C.F.R. § 1502.14(a) (2000).

Federal Courts have regularly held that the alternatives analysis is “the heart” of an EIS. City of Carmel-by-the-Sea v. United States Dep't of Transp., 123 F.3d 1142, 1155 (9th Cir.1997). “The existence of a viable but unexamined alternative renders an environmental impact statement inadequate.” Citizens for a Better Henderson v. Hodel, 768 F.2d 1051, 1057 (9th Cir.1985). The range of reasonable alternatives is “dictated by the nature and scope of the proposed action, and [must be] sufficient to permit a reasoned choice.” Idaho Conservation League v. Mumma, 956 F.2d 1508, 1520 (9th Cir.1992) (internal citation and quotations omitted). The “no action” alternative must also be considered in detail. Alaska Wilderness Recreation & Tourism Ass’n v. Morrison, 67 F.3d 726, 729 -730 (9th 1995).

CEQ’s guidance, Forty Most Asked Questions Concerning CEQ’s NEPA Regulations, Fed Reg 18026 (1981), elaborates further on the range of alternatives:

“Q1b. How many alternatives have to be discussed when there is an infinite number of possible alternatives?

A. For some proposals there may exist a very large or even an infinite number of possible reasonable alternatives. For example, a proposal to designate wilderness areas within a National Forest could be said to involve an infinite number of alternatives from 0 to 100 percent of the forest. When there are potentially a very large number of

alternatives, only a reasonable number of examples, covering the full spectrum of alternatives, must be analyzed and compared in the EIS. An appropriate series of alternatives might include dedicating 0, 10, 30, 50, 70, 90, or 100 percent of the Forest to wilderness. What constitutes a reasonable range of alternatives depends on the nature of the proposal and the facts in each case."

It is not unforeseeable nor unreasonable that the legal basis of the Agreements arising from U.S. v. Oregon might be overturned or significantly modified by future litigation that establishes that the federal ESA can and does constrain salmon and steelhead harvest management and hatchery production and therefore the inclusion of such a scenario is a viable alternative that NOAA fails to consider. NOAA needed to consider a broader spectrum of alternatives and its failure to do so renders the Harvest DEIS inadequate. Very specifically, the Harvest DEIS unreasonably fails to include or even adequately assess additional alternatives that were identified through public comments. 9

Specific Comments Regarding the Alternatives, Analysis and Assumptions

Alternative 1 is barely different than Alternative 6 (No action) as both describe little change from the current Agreement and both make assumptions that "anticipate" certain vague actions that provide little detail to enable reviewers from assessing the efficacy of the alternative. does not mean there will be no change. The description of the No Action alternative assumes that if an agreement is not signed, and if no ITS or Bi-Op is signed, that harvest will change. Where is the evidence that would occur? There is little to no substantive difference between Alt 1 and Alt 6 because harvest practices and harvest policy could be the same. 10

Rigid assumptions are applied to each alternative which rarely reflect reality or history. These rigid assumptions are too numerous to address individually but appear to have invaded the treatment and evaluation of most every alternative (presumably to foster an easier comparative analysis?). 11

The No Action Alternative mischaracterizes the effects of Alt 4 (escapement) on harvest rates, attributing a harvest rate to all fish returning in excess of escapement goals. This assumption ruins Alternative 4 as a viable alternative in the analysis and comparison of the entire Harvest DEIS. 12

There is no fundamental discussion or presentation or description of the underlying science behind the Alternatives and the specific fishery management policies that are part of most of the alternatives. 13

There is frequent reference to modeling yet no explanation or user guide to the scientific validity of the modeling upon which NOAA and other managers rely for forecasting and analyzing the effects of harvest on populations. Models used to calculate impacts of various harvest schemes should be explained, and their key assumptions and critical uncertainties described. 14

Incorporation by reference of the US v Oregon Management Agreement as a baseline appears as a “precisional” statement, even if it refers to a federal court settlement. The fact is that it is an ongoing settlement that can and does change. What does NOAA mean by describing it as a baseline? How is that different than a no action or current case alternative? If the US v. Oregon Management Agreement is a baseline, then it should be, as it exists today, as an alternative to be analyzed fully. 15

The Harvest DEIS merely describes the concept of harvest stocks v. indicator stocks - without the basis for this delineation, or the scientific literature that supports this designation and labeling. 16

TCA believes that NOAA begins with a fundamental flaw - managing in aggregate - and that this is already a policy choice that was not analyzed

As presented in Section 1.3.1 and detailed in Section 4.1, harvest policies are established for each Harvest Indicator Stock. Harvest Indicator Stocks are called “Management Units” in the US v Oregon management agreement and tend to be aggregates of fish runs larger than the ESA-listed “units” (ESU or DPS). Abundance Indicator Stocks are equivalent to the ESA-listed “units” (DPS or ESU) affected by implementing fisheries that adhere to harvest policies specified in the agreement.

Harvest Indicator Stock - where did this concept arise, who proposed it, was it evaluated as a scientifically sound management concept. What are the critical uncertainties for using this concept, what are the assumptions behind it. What have critics of this management concept said about it?

Not a single citation to scientific basis for modeling, a single citation for forecasting, and none for the scientific basis for abundance based management, indicator stock management harvest indicator stock management

NOAA should be describing the scientific rational and underlying basis for each policy concept being employed and evaluated. The same is true for relying on an

abundance-based management regime

Finally, since harvest is often provided by hatchery production, it means that the effects, impacts, cumulative impacts must be evaluated completely. The Harvest DEIS improperly segments its evaluation to Columbia River basin harvest, without evaluating the impacts to abundance and stock structure caused by fisheries in Alaska, British Columbia and ocean fisheries off Oregon and Washington. These harvest regimes are also often driven by and reliant on hatchery production. Tiering to an already completed NEPA analysis so interwoven wit the Harvest DEIS is confusing and difficult to compare, contrast and not find "predecisional" conclusions already hard-wired. This precedent is set by the incorporation by reference of the Mitchell Act FEIS which does consider considered Alaskan, foreign and ocean catch (p. 1.4). 17

NOAA should have incorporated by reference Fishery Management Plans adopted by the Pacific Fishery Management Council on an annual basis. There is much more to be understood about the information and scientific analysis contained in these annual reports, and could have served as a model for the Harvest DEIS. 18

Resources Analyzed or Not analyzed:

Gear and timing of fisheries are not considered in the Harvest DEIS when they have a direct and meaningful affect on all species and stocks of salmon and steelhead. 19

There is no analysis of the non-selective nature of the commercial fishing gear used by non-tribal commercial and tribal Treaty commercial fishers. The effect of non-selective gear and their effect on stock structure and life history is one of depletion and mis-management across the entire nation, and particularly in the Pacific Northwest.

The Harvest DEIS does not account for delayed mortality as a result of any fishery that is required to safely release non-target species. This includes a failure to evaluate the impacts of sport C&R fisheries. The Harvest DEIS did not account for sub-lethal effects, delayed mortality after release, nor spawning failure from escaping net fisheries or in sport catch and release fisheries. 20

TCA finds deep concern that Columbia River summer steelhead (the so-called "A-run") is not considered in the Harvest DEIS. 21

We share the same concern that Skamania Summer run steelhead are not considered despite effects on population by harvests governed by US v. Oregon both below and above Bonneville Dam. 22

LCR winter steelhead not considered while harvests are also governed by US v. Oregon regarding spring chinook and summer chinook fisheries. 23

Mitchell Act FEIS and Hatcheries

In general, harvest and hatcheries in the Columbia and Snake Rivers are two ends of the same rope. It is virtually impossible to consider one without the other. While NEPA envisions that NOAA would tier to the Mitchell Act FEIS, it is as unwieldy as it gets, akin to trying to tie two-pound tippet for a tiny dry fly to 100 pound hard monofilament for a tarpon fly. Some things just don't go together.

Tiering to the Mitchell Act FEIS causes two problems. First, it creates complexity for the general public trying to come to grips with the technical nature of both the scientific language but also the economic analysis. NEPA requires that the language and organization of an EIS be understandable for a lay person. The Harvest DEIS is 288 pages alone. The current 2008-2017 US v. Oregon Management Agreement is 150 pages, and finally, there is the 2014 Mitchell Act FEIS weighing in at over 2,000 pages.

Simply trying to determine the scope of the analysis for each of these documents is daunting, let alone trying to assess how the scope of each meshes with the other in the repetitive efforts to decipher the environmental, economic and ESA impacts of the varied alternatives is actually impossible due to the different affected environments each document addressed. There is no logical way for the public to understand how these three documents relate to each other, particularly given the short period allowed for public comment. 24

While the Mitchell Act FEIS addresses congressionally authorized hatchery funding that is aimed to mitigate for the lost natural production of salmon and steelhead caused by the construction of large dams, the weight of credible and sound scientific evidence that hatcheries cannot achieve their originally ascribed objectives should carry more weight in favor of a complete top-to-bottom review of what was lost to the dam building and how those losses can be mitigated so that the old solutions of hatcheries are cast aside in favor of a holistic program that fosters the natural productivity of wild salmon and steelhead. The current congressionally authorized mitigation programs are doomed to eventually failure and it behooves the states and tribes to work together to revised the legislative focus from the original solution of hatcheries now that there is clear and convincing evidence that they are harmful to the watersheds of Oregon, Washington and Idaho. 25

Specific comments:

The analysis of the water quality issues with hatcheries missed the cumulative impacts of long term discharge, degradation and build up of non-biodegradable chemicals and pollutants from hatchery facilities. 26

Iti s reported that 100% of hatchery facilities are in compliance with their NPDES permits. We doubt that. 27

It was interesting to note that multiple facilities are operating on very old permits that have not been reviewed in a timely manner as required by the Clean Water Act. 28

There was a general lack of analysis on the connection between wild and hatchery fish as hatchery operations are affecting returning wild fish in many direct ways. Releasing hatchery smolts increases predation on the out-migrating juveniles, an effect that is magnified as the hatchery smolts are often and typically much larger and they prey on concurrent migrating wild smolts. Additionally, many hatchery smolts end up residualizing and increasing predation on multiple species of salmon and steelhead, as well as competing with wild fish for space and food.

When hatchery adults return, they also tend to attract predators, and they concentrate harvest effort, which leads to higher encounter rates and therefore, as a direct result of hatchery salmon returns, the higher encounters lead to increased catch and release mortality for salmon and steelhead that must be released unharmed, as well as increases in sub-lethal effects affecting migration, later mortality from injury, and failure to reach natal spawning grounds.

Despite efforts to search for and review these documents, TCA finds that there is very little discussion of the connectivity of hatchery production that leads to harvest - related impacts on ESA-listed salmon and steelhead recovery and diminishment impact of natural production. 29

There does not appear to be any discussion or analysis of the presence, creation and impact of non-clipped hatchery fish on harvest alternatives in the Harvest DEIS, though they are identified in Mitchell Act FEIS. 30

Finally, it is unclear to TCA whether the incorporation by reference to the Mitchell Act FEIS opens that NEPA document up for additional review. Even if it does not, the findings or results still deserve questions and clarifications. 31

The Mitchell Act DEIS analyzed four action alternatives. Alternatives four and five were distinct among these because they distinguish between the Interior Columbia recovery domain and the Willamette/Lower Columbia recovery domain and because they apply different performance metrics in each domain. The analysis provides important insights regarding how the "intermediate" and "stronger" performance goals would affect each of these domains. Yet the analysis does not provide a rationale for applying different metrics to each domain, nor for treating the two domains separately. What is missing in the FEIS is an alternative that applies the stronger performance metric to each domain.

Monitoring Evaluation and Reform (Within the Mitchell Act FEIS):
The hatchery science review group (HSRG) reported to Congress about hatchery reform in the Columbia River basin. They recommended the following specific steps:
1) setting clear goals;
2) scientific defensibility; and
3) monitoring, evaluation and adaptive management.

This last recommendation was addressed in the Mitchell Act DEIS on page 2-14, where the document states that each alternative's policy direction includes goals and/or principles related to monitoring, evaluation, and reform (MER). MER is foundational to successful hatchery reform in the basin, and NOAA must describe what a comprehensive, basin-wide plan for MER would look like. It was unclear if the FEIS incorporated discussion of the monitoring program, including program development; key monitoring parameters; how implementation and effectiveness monitoring would be addressed. It left adaptation/reform unaddressed, and certainly did not confirm whether it would be implemented or funded. There does not appear to be any mention of the MER concept within the Harvest DEIS which casts doubt on whether hatchery or harvest operations in the Columbia River will ever receive ongoing or even partial review in any sort of comprehensive manner, which will leave critical uncertainties unaddressed between now and the next time the US v. Oregon Management Agreements are revised. 32

Failed Assumptions and Inconvenient Truths

The Executive Summary of the Harvest DEIS makes a statement at line 11 on p. ix that more adults escaping to spawn does not result in more juveniles because “escapement capacity is limiting.” This is completely incorrect. This is the common agency opinion about habitat capacity and density dependence. It is essentially an MSY-oriented, harvest max-oriented opinion lacking clear supporting data. This statement also ignores the value of selection for highly competitive animals that is relevant to recovery. That is, 33

even if there is data indicating that there is currently a ceiling on parr capacity, for example, recovery is likely to be enhanced by assuring high spawning and consequent high fry and parr numbers to assure high competition for rearing space. Further, such increased density and competition is likely necessary to push juveniles to explore marginal rearing habitats.

More wild fish escaping into “terminal” spawning areas helps expand the creative margins and this process is fundamental to increasing diversity. When wild fish escape to spawning areas, they do not all simply mate and spawn in the same place. The more wild fish escaping to natal rivers means they compete for space and mates - fundamental life history traits that are essential for diversity, survival and fitness. They also push into unoccupied spawning areas - the so-called “grub steak” habitats that may not be productive every single season, but when they are, they are incredibly important for productivity and diversity. When “excess” adult salmon or steelhead escape into natal rivers, and are pushed into marginal habitats, their mere presence improves the quality and capacity of the habitats by moving gravels and also by dying and adding nutrients to these areas. They make the “neighborhood” better because they work on making their house better. These concepts are well documented in the scientific literature, including some of the citations in the Harvest DEIS.

Another flawed assumption appears in the Mitchell Act FEIS where it states that marine derived nutrients from hatchery production are constant and stable across all alternatives. While this statement may be made as an assumption to ease the comparison of the alternatives, where is the evidence that this is in fact ever true? 34

Economics

TCA did not have adequate time to rully review and evaluate the economic analysis. There were a few issues that did rise up and require comment.

1. The Harvest DEIS declares that it would not consider the lower Columbia as tribes do not harvest below Bonneville. This is an inaccurate statement. The Treaty tribes DO harvest salmon and steelhead below Bonneville. If the analysis was completed based on this statement, then the economic analysis in the Harvest DEIS is flawed. 35

2. The economic analysis considers hatcheries as part of a positive economic impact. This ignores reality, as the inputs of federal and state funds aimed at operating hatcheries come from other sources (federal excise taxes, state general funds) where the funds expended on hatchery subsidies and mitigation agreements would have been spent elsewhere in the economy. In that sense, these government funds are “costs” and not revenue. Mitigation hatcheries would not have been necessary if wild salmon 36

and steelhead had not been prevented from reaching the natal streams. Every dollar spent on hatchery production is a "cost" or expense that all of us are paying for something that was essentially free to society but was lost. All anyone has to do is look at watersheds that still produce wild salmon and evaluate the economic benefits wild salmon produce for the local and regional economies. These are positive economic contributions. Funds spent from other sources to produce hatchery fish which in turn spurs spending to raise, release and harvest them are merely subsidies.

3. The economic study relied upon in the Harvest DEIS was completed in 1991. Apparently it has been revised and updated in "2016" dollars. The age of this economic analysis may make it helpful in terms of comparing its findings with the current and future economic landscape, but if all that was done was update the 1991 dollars to 2016 dollars, it renders the entire effort meaningless. 37

Appendix for economic analysis:

It states that money is spent only within specific harvest regions. It is highly likely that salmon harvesters will spend money in one region and travel to a different harvest region and not spend any money. This is a poor and likely invalid assumption. 38

There does not appear to be any economic analysis or effort to quantify non-consumptive fisheries where anglers fish, spend money and do not harvest fish. 39

The following statement creates questions whether an Economic analysis should have been conducted at all. The section states "Because dynamic changes in the economy over time are not considered in this analysis, results of the assessment are not considered valid for measuring effects on the economy over the long term from changes in fish abundance or policy." p. 215 40

Failure to raise and consider these topics in the DEIS Are Fatal Flaws

We could not find any discussion of the following topics in the Harvest DEIS which means, to the uninformed public, that they were not addressed in the comparative analysis of the alternatives.

Conversion and Interdam Loss:

NOAA Fisheries Staff and NW Fisheries Science Center staff have become aware and knowledgeable of a phenomenon of lost up-stream migrating adult salmon and steelhead. This issue is discussed in the 2015 NOAA Five-year ESA Status Review and it is estimated that up to a 20% loss of fish occurs between dams (these are fish 41

that are unaccounted for). This phenomenon casts doubt on the effectiveness of harvest rate data, catch reporting and escapement.

TCA did a simple calculation on B-run steelhead migration between Bonneville and Lower Granite (LGD) dams, counting fish passing Bonneville, and then subtracting the number of fish passing LGD. The resulting difference is divided by the total past Bonneville to establish a percentage of fish unaccounted for between the two dams. The range of unaccounted for fish is as low as 13% and as high as 70% for the B-run index (both hatchery and wild), but for wild B-runs, the percentage runs from a low of 22% to a high of 87%. In fact, the percentage of unaccounted for wild B-runs exceeds the percentage of the index B-run in 24 of the past 30 years. The average conversion rate for wild B-run steelhead is 55% while the conversion rate for the index is 45%.

Our rough calculations above would have been greatly more informed had NOAA provided us with documents, materials and communication related to the issue of "Conversion" or interdam loss as we requested in a Freedom of Information Action request (FOIA #DOC-NOAA-2017-001528). However, despite a late and very partial disclosure, TCA did not receive the bulk of the documents in time to analyze them and assist in our evaluation of the Harvest EIS in relationship with the stunning and extensive loss of wild salmon and steelhead between each and every dam. In fact, as the day of the comment deadline comes to an end, we have still not received over 80% of the relevant documents. The fact that the Harvest DEIS did not address "conversion" despite the fact that it relates to harvest governed by the current 2008-2017 Management Agreement is a serious and game-changing flaw. 42

<u>Illegal Harvest</u>

TCA is aware of extensive evidence of regularly occurring illegal harvest of both ESA-listed salmon and steelhead, as well as other non-listed salmonids and non-salmonids in the Columbia River. Despite regular requests, there has been no data released on the extent of illegal harvest, and how or if it is incorporated into forecasting and harvest models or catch records. 43

Evidence of illegal harvest is present in non-tribal commercial fishing fleet in the lower Columbia, the sport fishing fleet throughout the Columbia and Snake River main stem and in tributaries, and in the Treaty tribal fisheries (commercial, Ceremonial and subsistence fisheries).

The evidence that has been collected points to an extensive pattern and frequency of illegal fishing and harvest, whose effect does not clearly appear to be factored into the Harvest DEIS anywhere.

Enforcement - adequacy of state, tribal and federal efforts

There is little mention of the adequacy of efforts to measure the effectiveness of various catch recording activities in the Harvest DEIS, and absolutely no mention of what comprises an effective deterrent for illegal fishing by current, let alone future fisheries enforcement. 44

Five Year ESA Status Review

There is no discussion nor even a citation of the 2015 Northwest Fisheries Science Center Five-year Status Review of ESA-listed salmon and steelhead. NOAA published the Science Center review in 2016, though neither can be found in the DEIS. 45

Because neither newest 5-Year review nor the one before that suggested any change to the status of these fish, there are likely problems with the existing and current policies and management in the US v OR Agreement.

In fact, in that review, NOAA reported that Snake River-bound steelhead are harvested in tribal fisheries (both in platform and boat commercial fishing) annually at a rate from 15 to 20% over the past decade or more. The current maximum harvest rate for the so-called B-run steelhead bound for Idaho (if you are an angler, “B” is for “big”) is 15%, and only 13% when the total B-run is predicted to be less than 20,000 fish.

That report also noted that lower Columbia River gillnetters and sport fishers throughout the Columbia and Snake cause mortality to wild B-run steelhead through catch and release fisheries in the mainstem and in tributaries where the B-run fish go to seek cold water refuge. These fisheries have a 2% ESA impact no matter the run size, but there is little monitoring and observation to be able to accurately calculate their impact.

The status of Columbia and Snake River salmon and steelhead matters in the Harvest DEIS, particularly since the review points out harvest as a significant factor.

Relationship to Existing Fishery Programs

The Harvest DEIS incorporates by reference the 2014 Mitchell Act FEIS yet it states it only affects about one-half of the US v. OR Agreement. 46

The Harvest DEIS stated that it will not cover Lower Columbia River fisheries, yet tribal fisheries are permitted below Bonneville Dam. 47

The Harvest DEIS mentions the Pacific Salmon Treaty, Pacific Fishery Management Council ocean salmon management process as well as the North of Falcon process. However, it fails to analyze how prosecution of these fisheries, let alone the forecasting used to build these fisheries, have ultimate effect on how all of the salmon and steelhead returning above Bonneville Dam fare in terms of meeting escapement and ESA recovery goals. 48

The totality of separate salmon harvest regimes, independently assessed, is nothing more than sorting fish into more and more distinct and smaller user buckets as the fish approach their natal rivers and streams. This is evident with the multiple in-season management adjustments issued by NOAA and PFMC where catch and quotas are routinely transferred between aggregate catch areas or user groups. Harvest management operated in this manner is upside down and backwards in terms of managing a resource dependant on returning enough wild salmon and steelhead spawners to their natal rivers. 49

Conclusion

A final comment needs to be made regarding wild steelhead returning to the Columbia and Snake Rivers and their tributaries.

The Conservation Angler believes that fishery management by NOAA, the states of Oregon, Washington and Idaho, as well as by the Columbia River Treaty Tribes is driving wild steelhead to extinction. The inconvenient truth is that wild steelhead are poorly understood because the complexity of their biology, ecology and life history create daunting challenges for conducting basic research, as well as establishing and maintaining appropriate and adequate monitoring of productivity and abundance. The wild steelhead of the Columbia and Snake River Basins confound the managers as they try to “balance” access to more abundant and subsidized salmon returns.

A simple look across the Columbia and Snake basin provides all the evidence needed to confirm that the management regimes employed by federal, state and tribal fishery authorities are not working for wild steelhead. We do not believe that a single alternative being considered in the Harvest DEIS will change this trajectory. We challenge NOAA to use every option at its disposal to change the regime and the extinction trajectory for this magnificent wild animal. 50

The Conservation Angler looks forward to helping shape the development of the Harvest DEIS so that it can become a management framework that disrupts the current direction. 51

Sincerely,

David A. Moskowitz
(electro nic signature via email)

David A. Moskowitz
Executive Director

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Letter #13

USvORNEPA USvORNEPA - NOAA Service Account <usvornepa@noaa.gov>

DEIS

1 message

Kevin Malone <1976malone@gmail.com> Fri, Jun 16, 2017 at 3:16 PM
To: usvornepa@noaa.gov

In the US V Oregon DEIS the following claim is made:

1

However, the capacity limit of the current spawning habitat does not allow for increased juvenile production at higher escapement numbers. Therefore, an increase in

escapement of adult fish to terminal spawning areas does not translate into an increase in juvenile salmonids.

Do you have a citation for this statement? And also do you mean that spawning habitat is limited or that juvenile habitat is limited?

Kevin Malone

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5426 E Blaisdell Rd, Port Orchard

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1976malone@gmail.com

Letter #14

USvORNEPA USvORNEPA - NOAA Service Account <usvornepa@noaa.gov>

Re: Notification of the availability of a Draft Environmental Impact Statement

1 message

Jean Public <jeanpublic1@yahoo.com> Sat, Jun 17, 2017 at 12:57 PM
Reply-To: Jean Public <jeanpublic1@yahoo.com>
To: USvORNEPA USvORNEPA - NOAA Service Account <usvornepa@noaa.gov>

PUBLI CCOMMENT ON FEDERAL RGISER. THE PEOPLE OF HTIS COUNTRY DO NOT WANT OUR WATERS USED SO THAT SALMON CAN BE PROTECTED AT THE LOSS OF BIRDS AND SEALS AND MARINE CREATURS THAT NEED TO FEED ON SALMON. WE NEED TO STOP THE HOGGING, MALICIOUS, EVIL TAKING OF ALL SALMON FOR PUBLIC CONSUMPTION. WE ARE SICK OF THE HORROR OF SEEING SEALS AND BIRDS SHOT TO DEATH BECAUSE OF HUMAN GREED IN TAKING ALL SALMON. THAT NEEDS TO BSTOPL THIS COMMENT IS FOR THE PUBLIC RECORD. PLEASE RECEIPT. JEAN PUBLIEE JEANPUBLIC1@GMAIL.COM 1

From: USvORNEPA USvORNEPA - NOAA Service Account <usvornepa@noaa.gov>
To: USvORNEPA USvORNEPA - NOAA Service Account <usvornepa@noaa.gov>
Sent: Thursday, June 15, 2017 5:53 PM
Subject: Notification of the availability of a Draft Environmental Impact Statement

NOAA Fisheries is announcing the availability for review of a draft environmental impact statement (DEIS) analyzing the new US v Oregon management agreement for the years 2018-2027.

- The official title of the DEIS is: *DEIS to Analyze Impacts of NOAA's National Marine Fisheries Service joining as a signatory to a new U.S. v. Oregon Management Agreement for the Years 2018-2027*.

The DEIS is available for viewing or download on the NOAA Fisheries West Coast Region website, at the link below. Comments on this DEIS will be accepted for 45 days from the date the Environmental Protection Agency publishes its notification in the Federal Register. Information on how to submit comments is provided at the link below. Please note, any comments received may be made available to the public.

If you have any questions, please reply to this email (usvornepa@noaa.gov) or contact: Jeromy Jording (telephone: 360-753-9576).

Link to NOAA Fisheries' web page for the US v OR DEIS

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USvOR NOAA NEPA Team

Letter #15

USvORNEPA USvORNEPA - NOAA Service Account <usvornepa@noaa.gov>

US v Oregon DEIS Comment

1 message

Kevin Malone <1976malone@gmail.com> Mon, Jul 17, 2017 at 2:09 PM
To: usvornepa@noaa.gov

See files for comments on the US v Oregon Agreement. I have attached a PDF of the DEIS with comments/edits imbedded…no need to respond to these comments directly as they are for the most part covered in the letter. <<…>> <<…>>

Kevin Malone

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2 attachments

2017_14_06_complete_deis-usvor_final_draft KM.pdf
4152K

Malone Comments US V Oregon.docx
68K

Letter #15
Attachment

Kevin Malone

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7/17/2017

Dear Sirs:

Below you will find a summary of my major comments on the DEIS for the new U.S. v. Oregon management agreement for the Years 2018-2027. More detailed comments are provided in the attached PDF file.

My comments are in general focused on the analysis and inherent assumptions presented for each alternative and not which alternative should be preferred by NMFS. I would defer to the Tribes to determine which alternative best meets their needs and satisfies Federal tribal treaty rights etc.

Major Comments

Assumptions

It would be helpful if a list of the assumptions used in the analysis were provided up front in the document or in an Appendix. In the current version of the DEIS you have to search deep into the document to find a rationale for a previous conclusion or statement. 1

Analysis

Although it is recognized that this is a programmatic DEIS the lack of analysis on impacts to ESA listed stocks is surprising. While this may be fine for most conclusions the following statement needs substantial support: 2

Furthermore, any increase in escapement of adult fish to terminal spawning areas does not translate into an increase in juvenile salmonids because the capacity limit of the current spawning habitat does not allow for increased juvenile production at higher escapement numbers.

This is a bold statement that is being applied over the entire Columbia River. The DEIS provides no support for such a conclusion nor is a source cited. Salmon populations are currently being re-introduced to relatively vacant habitat in the Cowlitz River, Lewis River, Deschutes River, Okanogan River and Willamette River. Coho are being reintroduced throughout the Mid-Columbia. Also, over the term of this Agreement a possible future action is the reintroduction of salmon upstream of Chief Joseph Dam. Historically, these systems were large producers of salmonids. Lower harvest rates and increased adult escapement is likely to increase production in these systems. Additionally, as the DEIS notes, habitat restoration activities are on-going throughout the basin and at least Washington State is legally required to remove culverts that block salmon access to upstream habitat. Has NMFS concluded that these habitat actions will not increase the quality and quantity of available spawning and juvenile rearing habitat? If yes, this conclusion should be clearly stated in the DEIS and supported.

The ISAB recently reviewed this topic and concluded that density dependence is evident in "many" ESA listed populations in the basin[1] . However, they noted the source of this effect could be from multiple factors including spawning habitat limitations, lack of rearing habitat, food supply, predator prey relationships and the release of hatchery juveniles. They also note that Okanogan River sockeye do not show signs of density dependence.

Also, even if there are indications of density dependence in these populations, increased adult escapement should still result in a higher number of juveniles on average over time. This occurs because the lowest spawning escapement levels observed would be higher under the no harvest alternative resulting in higher juvenile abundance when production is below capacity (if indeed that is what is limiting).

If the density assumption is maintained in the DEIS, then the document needs to be made consistent in regards to the claimed benefits of increased adult escapement. The values for each species at which increased adult production does produce more juveniles needs to be defined. Adult escapement levels above these levels would then be considered to produce no benefits. 3

[1] https://www.nwcouncil.org/media/7148891/isab2015-1.pdf

Hatchery Production Evaluation

The DEIS relies on the Mitchell Act EIS to cover hatchery production effects and this DEIS to cover harvest. This leads to conclusions about hatchery effects that seem to make little sense. For example, the DEIS assumes that if harvest is turned off under Alternative 5 hatchery production would continue as described in the Agreement. The analysis then concludes that more returning hatchery fish would have large negative effects to wild populations. But why would managers continue to spend money producing large numbers of hatchery fish for harvest if there was no harvest? Additionally, NMFS would also not allow this to occur due to impacts to ESA listed stocks so a likely response by NMFS would be to severely reduce hatchery production to levels that protect ESA listed stocks while providing for harvest in marine fisheries (?). Shouldn't these actions/responses be stated in the cumulative effects section or foreseeable future activities of the DEIS? 4

Cumulative Effects

The implementation of each alternative results in a different set of cascading effects (feedback) which are not clearly presented (or maybe not required in a programmatic EIS?). For example, alternatives which have a large negative effect on wild populations will reduce population abundance resulting in a decrease in overall harvest rates (for some alternatives) in both marine and freshwater fisheries. These negative effects have the potential to reduce population abundance to levels that may require NMFS to change the listing status of populations from Threatened to Endangered resulting in severe reductions in harvest. 5

Additionally, if freshwater harvest was terminated, yet hatchery production remained unchanged, why wouldn't regulatory agencies respond by increasing ocean harvest rates or implementing selective fisheries to remove the now surplus hatchery fish? This action would result in a transfer of benefits to primarily non-tribal entities the effects of which should be covered in the Final EIS. 6

I did not see any information provided on how the implementation of each alternative would affect ocean fisheries. Is such an analysis needed in a Programmatic EIS? The negative effects to ESA-listed stocks from some of the alternatives would reduce total adult abundance over time which would likely require ocean harvest rates to be reduced? 7

It would seem that the 10-12 year time frame for describing effects of the alternatives may be too short. For example, implementation of alternative 4/6 would likely severely reduce long term (>12 years) natural origin fish abundance which would result in decreased harvest. Or is it assumed 8

that all alternatives will be implemented consistent with ESA and NOR abundance will not be substantially affected?

Additionally, the entire economic analysis shows results by alternative based on minimum, average and maximum run sizes estimated for the previous 12 years. This gives the impression that harvest benefits from, say the implementation of alternatives 4 and 6, are likely to occur. But given the impacts to ESA listed stocks is it likely that these benefits are sustainable over 12 years? Past 12 years? 9

Again, having a section that details the assumptions used in the analysis early in the report would help clarify why certain conclusions were reached.

25 Percent Survival adjustment Factor

The write-up on page 77 states that a 25 percent survival adjustment factor is applied at the last counting location to account for survival to their final spawning ground. However its' use is confusing in some sections of the DEIS. For example, on pg 122 it states that the aggregate abundance of natural origin spawners necessary meet recovery objectives for natural-origin Snake River spring/summer Chinook salmon is 25,500 at Lower Granite. And with an average survival rate of 75 percent, the river mouth goal (Columbia River?) is 34,000. If it is meant to account for survival from the last counting station (Lower Granite) to the spawning grounds why isn't the 34,000 the target value at Lower Granite Dam? 10

It would be helpful if tables such as 4-59 has one additional column that showed fish alive on the spawning grounds (i.e. effective spawners). 11

Alternative 5

The description of Alternative 5 on page iv does not match the text presented later in the document. Here, the alternative is described as curtailing harvest or having extreme harvest curtailment. Later (pg vii) it states that fishing will be eliminated under Alternative 5. The economic analysis assumes no harvest. These sections should be made consistent in the Final EIS. 12

On page vii it is stated the implementation of Alternative 5 would result in escapement of larger numbers of hatchery-origin adults, leading to potential negative effects from elevated levels of hatchery origin fish spawning naturally. This may indeed be the case for Oregon and Idaho populations but not necessarily for Washington State. Washington State policy calls for meeting HSRG standards for the proportion of hatchery origin fish on the spawning grounds. Therefore, the State would take actions (increased weir operations, decrease in hatchery production etc.) to achieve these targets. Shouldn't the possibility of this response be covered in the analysis? 13

The data in Table 4-58 appear to be in error or requires more explanation. Although there is no fishing, fish escapement past Rock Island dam for Alternative 5 is lower than three of the harvest alternatives. 14

Alternative 4

It is unclear why under this alternative the Lower Granite Run size was not set up to meet the escapement benchmark? For example, for natural-origin Snake River fall Chinook the minimum escapement goal is 4,000 adults measured at Lower Granite Dam (?). However, alternative 4 shows that 3,000 adults was used for all run-sizes (Table 4-61). The text on page 78 states that the escapement benchmark is 4,000 and was calculated as 3,000/0.75 (4,000). Seems like the 3,000 at Lower Granite Dam in this table should be replaced with 4,000 adults? 15

Section 4 Figures

The figures in section 4 show that total salmon production by stock/population is the same under each alternative. This seems to be because the analysis assumes that the same number of adults return to the mouth of the Columbia River for each alternative. This starting number is then apportioned to escapement past fisheries and certain points. Thus, the analysis is meant to show a relative comparison of outcomes between alternatives under an assumed minimum, maximum and average run size and not differences in the range of adult production that would be expected for each alternative; this should be stated in the headings of the figures or as a footnote. 16

Identifying Natural-Origin and Hatchery-Origin

It would be helpful if the figure and table headings clearly identified numbers that referred to natural-origin only fish or are based on a combination of natural-origin and hatchery-origin fish. 17

Summary Table

Having a single table where all pertinent information for each population is summarized would also be helpful. The reviewer has to sort through a lot of sections to find data needed to understand the analysis. 18

Population	Location	Escapement Benchmark	Origin	Harvest Management	Harvest Rates
Natural Origin Upriver Spring Chinook	Lower Granite		NOR + HOR	Abundance Based	5.5-17 Percent
Natural Origin Upriver Summer Chinook			NOR		
Natural Origin UCR Spring Chinook	Rock Island dam	4,000	NOR	Mixed-Abundance Based	5.5-17 percent
Natural Origin Snake river spring/summer Chinook	Lower Granite Dam (Or river Mouth?)	25,500, 34000	NOR		
Snake River Sockeye	Lower Granite Dam	12,600	NOR	Fixed Harvest Rate	6-8%
Natural Origin Snake River Fall Chinook	Lower Granite Dam	4,000	NOR	Abundance Based Manag	21.5-45%
Natural Origin Snake River B-run steelhead	Lower Granite Dam	2,700	NOR	Abundance Based Manag	21.5-45%
UCR Summer Chinook	Mouth Of Columbia	29,000	NOR + HOR		

Sincerely,

Kevin Malone

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