

**Snake River
Harvest Module**

June 2014

Prepared by the:

**National Marine Fisheries Service
West Coast Region
Portland, Oregon**

Contents

1. Purpose and Introduction	3
2. Overview of Fisheries Affecting ESA-listed Snake River Species	4
2.1 Fisheries Management Processes.....	5
2.1.1 Pacific Salmon Treaty and Pacific Salmon Commission	6
2.1.2 Pacific Fishery Management Council.....	9
2.1.3 U.S. v. Oregon	11
2.1.4 Snake River Mainstem and Tributary Fisheries.....	14
2.2 Harvest Management under the Endangered Species Act	15
2.2.1 Take Prohibitions	15
2.2.2 Section 7 Consultations.....	16
2.2.3 Section 4(d) Limits	16
2.2.4 Section 10.....	17
2.2.5 Determining Allowable Harvest Rates	17
2.3 Regional Fisheries.....	18
2.3.1 Pacific Salmon Treaty Fisheries	18
2.3.2 Pacific Fishery Management Council (PFMC) and North of Falcon (NOF) Fisheries	19
2.3.3 U.S. v. OR Fisheries	19
3. Historical and Current Impacts by Species.....	25
3.1 Snake River Fall Chinook Salmon ESU	27
3.2 Snake River Spring/Summer Chinook Salmon	31
3.3 Snake River Steelhead DPS	34
3.4 Snake River Sockeye ESU.....	36
4. Expectations and Considerations for Future Harvest Management	37
4.1 Snake River Spring and Summer Chinook Salmon ESU	38
4.2 Snake River Fall Chinook Salmon ESU	39
4.3 Snake River Steelhead DPS	40
4.4 Snake River Sockeye Salmon ESU.....	41
5. Literature Cited	42

1. Purpose and Introduction

This module provides out-of-basin fishery management information to complement tributary-level fishery information in the recovery plans for the four species of Snake River salmon and steelhead listed under the Endangered Species Act (ESA). Three of the species are ESUs (evolutionary specific unit) and one is a DPS (distinct population segment). These species are:

- Snake River spring/summer Chinook salmon (ESU)
- Snake River steelhead (DPS)
- Snake River fall Chinook salmon (ESU)
- Snake River sockeye salmon (ESU)

The purpose of this module is to describe fishery management processes for ocean and mainstem Columbia and Snake River fisheries, together with historical and current harvest rates of those fisheries. It also provides considerations for current and recommended future strategies that will aid in conserving the four listed Snake River species. This module is organized into four sections. Following this introduction (section one), section two describes salmon fisheries, section three provides historical and current fishery impacts by species, and the final section describes expectations and considerations for future fisheries management actions. In drafting this module, NMFS used information from the May 5, 2008 Biological Opinion for *U.S. v. Oregon* fisheries (NMFS 2008a) and the Associated Supplemental Comprehensive Analysis (NMFS 2008b), as well as the 2008 Pacific Salmon Treaty biological opinion (NMFS 2008c), and information available through the *U.S. v. Oregon's* Technical Advisory Committee (Patino 2014).

This module complements the Snake River tributary-level fishery management information provided in the three Snake River recovery plans: (1) spring/summer Chinook and steelhead Management Unit Plans -Southeast Washington, Northeast Oregon, and Idaho and the species-level Roll-up Plan; (2) Fall Chinook Recovery Plan; and (3) Sockeye Recovery Plan. These recovery plans identify the actions that will restore viability of the species, identify key information needs, define an adaptive management strategy and describe plan implementation. In support of these recovery plans, several modules have been developed that present detailed and specific information on a particular subject to inform recovery planning and allow for consistent treatment of these topics in all three plans. Other modules produced for Snake River recovery planning include the Hydro, Ocean and Estuary Modules (NMFS 2014; Fresh et al. 2014; NMFS 2011a).

2. Overview of Fisheries Affecting ESA-listed Snake River Species

The Columbia River Tribes have harvested salmon for cultural, subsistence and for economic purposes for thousands of years. They utilized all species of fish passing through their traditional fishing areas at all times of the year. They fished in both mainstem and tributaries utilizing a variety of fishing gear types. Fisheries were managed through a number of traditional practices which dictated where, when, and by whom fish were to be harvested. These management practices went along with stable and consistent fish runs and the ability of the tribes to use fish as a significant component of their total diet. One hundred and forty-one years ago, the United States made commitments to various Indian tribes to protect the tribes' treaty reserved rights to take fish. The tribes' right to take fish is of enormous cultural and societal importance to the tribes. For more information on Tribal Treaty Rights, please refer to those sections of each recovery plan.

The largest harvest of Columbia River Chinook salmon took place in 1883, when West Coast canneries packed 43 million pounds of salmon. These early fisheries depended on gillnetting and seining at the river mouth, but with the invention of the gasoline engine and its adaptation to oceangoing boats around the turn of the century, trolling also expanded rapidly. Ocean fishing remained unregulated until 1949, with the creation of the Pacific States Marine Fisheries Commission. Ocean harvest of salmon remained significant in the 1970s and 1980s, but unfavorable conditions greatly affected West Coast commercial salmon fisheries in the early 1990s. Ocean commercial and recreational harvest of salmon has been reduced significantly – more than 90 percent since the mid-1970s – as a result of a decline in abundance and the response through international treaties, fisheries conservation acts, regional conservation goals, the Endangered Species Act, and state and tribal management agreements.

Snake River spring/summer and fall Chinook salmon, Snake River sockeye salmon and Snake River steelhead are exposed to fisheries in the Columbia River estuary, mainstem Columbia, Snake River, and to varying degrees in the ocean and in the Snake River tributaries. The impact of ocean fisheries is very low for Snake River sockeye and Snake River spring/summer Chinook salmon, and essentially non-existent for Snake River steelhead. It is believed the migration path and ocean distribution of Snake River sockeye and Snake River spring/summer Chinook salmon, and Snake River steelhead is such that they are not present in near shore areas where ocean salmon fisheries traditionally occur. This situation is a very different than the case for Snake River fall Chinook salmon, which are frequently caught in ocean fisheries from Oregon north to Alaska.

Fisheries are currently managed to focus on different stocks and populations, and to take fish in order to meet commercial, recreational and tribal needs. Fisheries influence salmonid population viability by causing direct and incidental mortality to natural-origin fish. Direct mortality is

associated with fisheries that are managed to specifically harvest target stocks. Incidental mortality includes mortality of fish that are harvested incidentally to the target species or stock, caught and released, or captured by fishing gear but not landed (drop-off).

2.1 Fisheries Management Processes

Snake River salmon and steelhead are affected by fisheries in the Columbia and Snake Rivers, Snake River tributaries, and to varying degrees along the West Coast of the United States and Canada. These fisheries are managed by multiple jurisdictions interacting through several institutional processes:

Ocean Fisheries

- Ocean salmon fisheries targeting stocks of mutual concern to Southeast Alaska, British Columbia (B.C.), Washington and Oregon are managed pursuant to the provisions of the Pacific Salmon Treaty (Pacific Salmon Treaty) between the U.S. and Canada. The Pacific Salmon Commission (PSC) negotiates, facilitates and monitors implementation of fishing regimes. PSC does not regulate; regimes are implemented by the Parties' (Canada and the United States) domestic management entities. The agreed fishing regimes are contained in Chapters 1-6 of Annex IV of the Treaty. The PSC reached agreement on new fishing regimes for five chapters in May of 2008 which took effect on January 1, 2009 and will continue through 2018. Chapter 4, which governs Fraser River sockeye and pink salmon fisheries, was modified by agreement in 2013, taking effect on January 1, 2014 and will continue through 2019.
- Fisheries in the Pacific, south of the U.S./Canada border and between 3 and 200 miles from the coast, are managed subject to the provisions of the Magnuson-Stevens Fishery Conservation and Management Act of 1976 (revised and reauthorized in 2006), through the Pacific Fishery Management Council (PFMC) process. The PFMC is one of eight fishery management councils established by the Act.
- Ocean salmon fisheries between Cape Falcon (on the north Oregon coast) and the Canadian border are coordinated with fisheries in the Columbia River, Puget Sound, and coastal rivers through the North of Falcon (NOF) process. This process was established by the states and the Pacific Northwest treaty tribes; it occurs largely coincident with the PFMC process. Coordinating preseason fishing plans between ocean and river fisheries ensures that conservation and various allocation objectives are met. Allocation objectives include treaty Indian/non-treaty allocations for Puget Sound and Washington coastal river fisheries and allocations between various non-treaty user groups, such as commercial and recreational fisheries.

Columbia Basin Fisheries

- Fisheries in the Columbia Basin, particularly in the mainstem of the Columbia River, are managed pursuant to fishing plans developed by the parties to *U.S. v Oregon*, under the

continuing jurisdiction of the Federal district court. Parties to this process include the Federal government, the states of Oregon, Washington, and Idaho, and the four Columbia River Treaty Tribes and the Shoshone-Bannock Tribes. A negotiated long-term Management Agreement for 2008–2017 covers all anadromous salmonids in the Columbia Basin (including Snake River spring/summer and fall Chinook salmon, Snake River sockeye, Snake River steelhead, Coho, white sturgeon fisheries and other species.)

- Commercial fisheries in the mainstem of the Columbia River separating Oregon and Washington are managed through the Columbia River Compact. This agreement between the two states dates back to the early 1900s. Mainstem Columbia fisheries in the Compact area are coordinated for consistency in the Compact forum, but are actually regulated by each state.
- Sport fisheries in the Columbia River are managed through a process of Joint State Sport Hearings.
- The Columbia River treaty tribes have authority to regulate treaty Indian fisheries in the mainstem Columbia River. Each Tribe regulates Columbia and Snake Rivers tributary fisheries under their respective jurisdictions.
- Regulations for recreational fisheries in the tributaries of the Columbia and Snake Rivers are developed by the Fish and Wildlife Commissions of Idaho, Washington, and Oregon for their respective waters.
- Treaty/non-treaty allocation of tributary fisheries is negotiated by the relevant co-managers.

These processes are further described below.

2.1.1 Pacific Salmon Treaty and Pacific Salmon Commission

The United States and Canada ratified the Pacific Salmon Treaty in 1985 following many years of intermittent negotiations. The Pacific Salmon Treaty provides a framework for the management of salmon fisheries in those waters of the United States and Canada that fall within the Pacific Salmon Treaty's geographical scope (Figure 1). In addition to institutional and procedural provisions (e.g., establishment of the Commission and its panels; meeting schedules and protocols, etc.), the Pacific Salmon Treaty established fishing regimes that set upper limits on intercepting fisheries, defined as fisheries in one country that harvest salmon originating in another country, and sometimes include provisions that apply to the management of the Parties' nonintercepting fisheries as well. The Pacific Salmon Treaty also established procedural mechanisms for revising the regimes, which serve the overall purpose of accomplishing the conservation, production, and harvest allocation objectives set forth in the Pacific Salmon Treaty. It is important to note that these fishing regimes are not self-executing; they must be implemented by the Parties with conforming regulations issued under the authority of their respective management agencies.

The fishing regimes contained in Annex IV of the Pacific Salmon Treaty are expected to be amended periodically upon recommendation of the Commission as new information becomes available to better accomplish the Pacific Salmon Treaty's conservation, production, and allocation objectives. The original (1985) regimes varied in duration and some were modified and extended for several years, but by the end of 1992, all had expired. Despite several years of negotiations, both within the Commission and a variety of other processes and forums, the United States and Canada were unable to reach a comprehensive new agreement until 1999. During the interim period (1993 through 1998), fisheries subject to the Pacific Salmon Treaty generally were managed pursuant to short term (annual) agreements that governed only some of the fisheries. When even short term agreements were not reached, the fisheries were managed independently by the Parties' respective domestic management agencies, but generally in approximate conformity with the most recently applicable bilateral agreement.

The agreement finally reached in 1999 (hereafter the "1999 Agreement") came to fruition through a government-to-government process rather than within the normal PSC process established under the Pacific Salmon Treaty. The 1999 Agreement was comprehensive, and included amended versions of Chapters 1-6 of Annex IV, as well as a variety of other provisions designed to improve implementation of the Pacific Salmon Treaty and the operations of the Commission.

Figure 1. Pacific Salmon Treaty Area.



The fishing regimes in Chapters 1-6 applied for a duration of ten years, expiring at the end of 2008, except for Chapter 4 (Fraser River Sockeye and Pink Salmon), which applied for twelve years, through 2010, but which was later extended through 2013. The Pacific Salmon Treaty provides mechanisms whereby the Commission may recommend amendments to any fishing regime at any time, including prior to their scheduled expiration date; this in fact has occurred for some of the fishing regimes contained in the 1999 Agreement, but in each case the expiration dates set in 1999 were left unchanged. Approval of Commission recommendations to amend fishing regimes is formalized by the two countries in an exchange of diplomatic notes between the U.S. Secretary of State and Canada's Minister of Foreign Affairs.

Anticipating the expiration of the fishing regimes established in the 1999 Agreement and the time required to negotiate new regimes, the Commission began negotiations for new regimes in January of 2007. After nearly 18 months of negotiations, the Commission reached agreement in May of 2008 on amended versions of each of the five expiring Chapters of Annex IV. By letter dated May 21, 2008, the Commission transmitted the amended Chapters to the governments of Canada and the United States and recommended their approval (Koenings and Sprout 2008).

A major component of the 2008 Agreement, and the one that proved most difficult and time-consuming to negotiate, is the management regime set forth in Chapter 3 of Annex IV for Chinook salmon. It continues the basic aggregate abundance-based management (AABM) approach established in the 1999 Agreement for three major ocean Chinook salmon fisheries in southeast Alaska and Canada, coupled with an individual stock-based management (ISBM) approach for all other Pacific Salmon Treaty-area fisheries in Canada and the Pacific Northwest. The new Chinook regime incorporates several revisions, including reductions in two major fisheries relative to those allowed under the 1999 Agreement.

Pursuant to the Pacific Salmon Treaty Act of 1985 (16 USC 3631), the U.S. Federal law governing implementation of the Pacific Salmon Treaty, the Secretary of State, in consultation with the Secretaries of Commerce and Interior, is authorized to approve, on behalf of the United States, fishing regimes recommended by the Commission. Throughout the negotiations that occurred within the Commission to develop new regimes, the U.S. Federal representatives involved in the negotiations indicated to all participants, Canadian and U.S. alike, that approval of the new regimes by the United States would be considered a Federal action that required consultation under section 7 of the ESA, and thus the approval of a new agreement by the U.S. government was contingent on a determination by NMFS that implementation of the agreement would meet the requirements of the ESA. A biological opinion dated December 22, 2008 determined that salmon fisheries in southeast Alaska (SEAK), British Columbia, and the Pacific Northwest, if managed consistent with the Commission's proposed Agreement, are not likely to jeopardize the continued existence of ESA listed species including in particular salmon, steelhead, the Southern Distinct Population Segment (DPS) green sturgeon, Southern Resident killer whales and steller sea lions, or result in the destruction or adverse modification of their

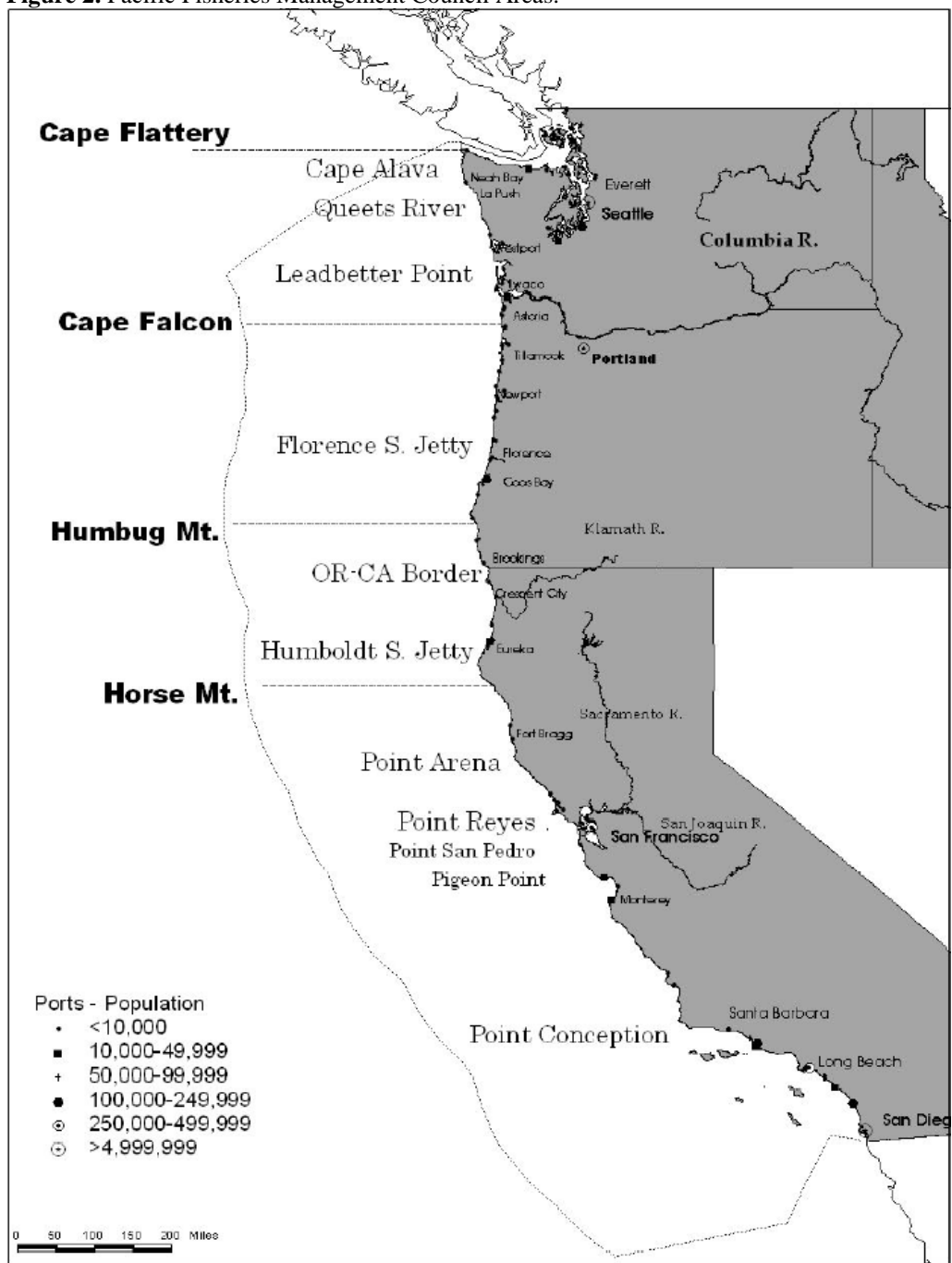
critical habitat. This determination took into account other applicable fishing plans implemented per U.S. domestic regulatory process that affect the same listed species.

2.1.2 Pacific Fishery Management Council

The Magnuson-Stevens Fishery Conservation and Management Act (MSA) of 1976 is the principal law governing marine fisheries in the United States. The Act was adopted for the purposes of managing fisheries 3-200 miles offshore of the U.S. coastline, phasing out foreign fishing activity within this zone, recovering overfished stocks, and conserving and managing fishery resources. In 1996, Congress passed the Sustainable Fisheries Act, which revised the MSA and reauthorized it through 1999; the Act was again reauthorized in 2006. The Pacific Fishery Management Council (PFMC) is one of eight regional fishery management councils established by the MSA. The PFMC is responsible for fisheries off the coasts of California, Oregon, and Washington (Figure 2). Thus, the PFMC is responsible for all ocean fisheries, including salmon, groundfish, pelagic fish, etc., and does not focus solely on salmonids. It is responsible for regulating fisheries regimes agreed by the PSC.

Chinook and Coho salmon are the main salmon species managed by the PFMC in waters extending from the Canadian border to Mexico, and 3-200 nautical miles offshore. In odd-numbered years, it may also manage special fisheries near the Canadian border for pink salmon. Sockeye, chum, and steelhead are rarely caught in these ocean fisheries. The PFMC's Salmon Fishery Management Plan (SFMP) describes the goals and methods for salmon management. Central parts of the plan are annual spawner escapement goals for the major salmon stocks and an allocation of the harvest among different fisheries or locations (i.e. allocations are set for ocean or inland commercial, recreational, or tribal fisheries as well as for specific ports). The PFMC uses management tools such as season length, quotas, bag limits, and gear restrictions to achieve fishery management goals. Most non-treaty Coho salmon fisheries north of Cape Falcon are mark selective. There is normally a mark selective chinook recreational fishery north of Cape Falcon in May and June.

Figure 2. Pacific Fisheries Management Council Areas.



Annually, a preseason process of meetings and public hearings is used to develop recommendations for management of the ocean fisheries. Past harvest data and preseason salmon abundance forecasts are the primary basis for management decisions concerning season structure and harvest quotas. Final recommendations are adopted annually in April and implemented by NMFS beginning in May. The Salmon Technical Team (STT) provides technical information

and data analysis to the PFMC; the team is composed of eight representatives from state, Federal, and tribal fisheries management agencies. The Salmon Advisory Subpanel (SAS) has 17 members who represent commercial, recreational, and tribal interests, as well as a public representative and a conservation representative.

Impacts on each species vary widely, depending on many complicated factors, including annual salmon abundance and ESA restrictions. The PFMC evaluates ESA consultation standards each year and provides guidance for the upcoming ocean fishing season. Further ESA restrictions apply to specific Columbia River fisheries.

2.1.2.1 North of Falcon Process

As described in Section 2.1, folded into the PFMC management process is a parallel public process referred to as North of Falcon (NOF). The NOF process integrates management of ocean fisheries between Cape Falcon (on the north Oregon coast) and the Canadian border with inland area fisheries (Figure 2). Columbia River fall Chinook salmon fisheries are a significant part of the NOF process. Coordination and shaping of the ocean and freshwater fisheries occurs to assure that fish conservation objectives are met and there is reasonable sharing of the conservation burden between the fisheries and various user groups. With the implementation of multi-year management agreements between the states and Columbia River Tribes, the treaty/non-treaty allocation is addressed through the management agreements and no longer negotiated during the PFMC/NOF processes.

2.1.3 U.S. v. Oregon

In 1968, the U.S. District Court ruled that Columbia River treaty Indians were entitled to an equitable share of the upper Columbia River fish returns (fish stocks returning above Bonneville Dam), in a court case known as *U.S. v. Oregon*. After 20 years of legal tests and negotiations, the CRFMP was adopted by District Court order in 1988 and agreed to by the parties: the United States; the states of Oregon, Washington,; and the four treaty Indian tribes. The purpose of the Columbia River Fish Management Plan (CRFMP) as defined by the court 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. The CRFMP was a stipulated agreement adopted by the Federal Court under the continuing jurisdiction of *U.S. v. Oregon* (Civ. No. 68-513 (D. Or.)). 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 1996, the parties to *U.S. v. Oregon* negotiated three-year (1996–98) management agreements: one each for upper Columbia fall Chinook and upper Columbia spring Chinook, summer Chinook, and sockeye. The agreements were a result of a 1995 court settlement where the parties agreed to discuss the possibility of amending the CRFMP. The 1996–1998 management agreements formed the basis for subsequent agreements, and included escapement goals, production measures and harvest allocations. Annual agreements have occurred for fall Chinook, Coho, and summer steelhead during 1999–2004. A three year management agreement with a provision to extend harvest rates for 5-years was reached for spring Chinook, summer Chinook, and sockeye for the period 2001–2005.

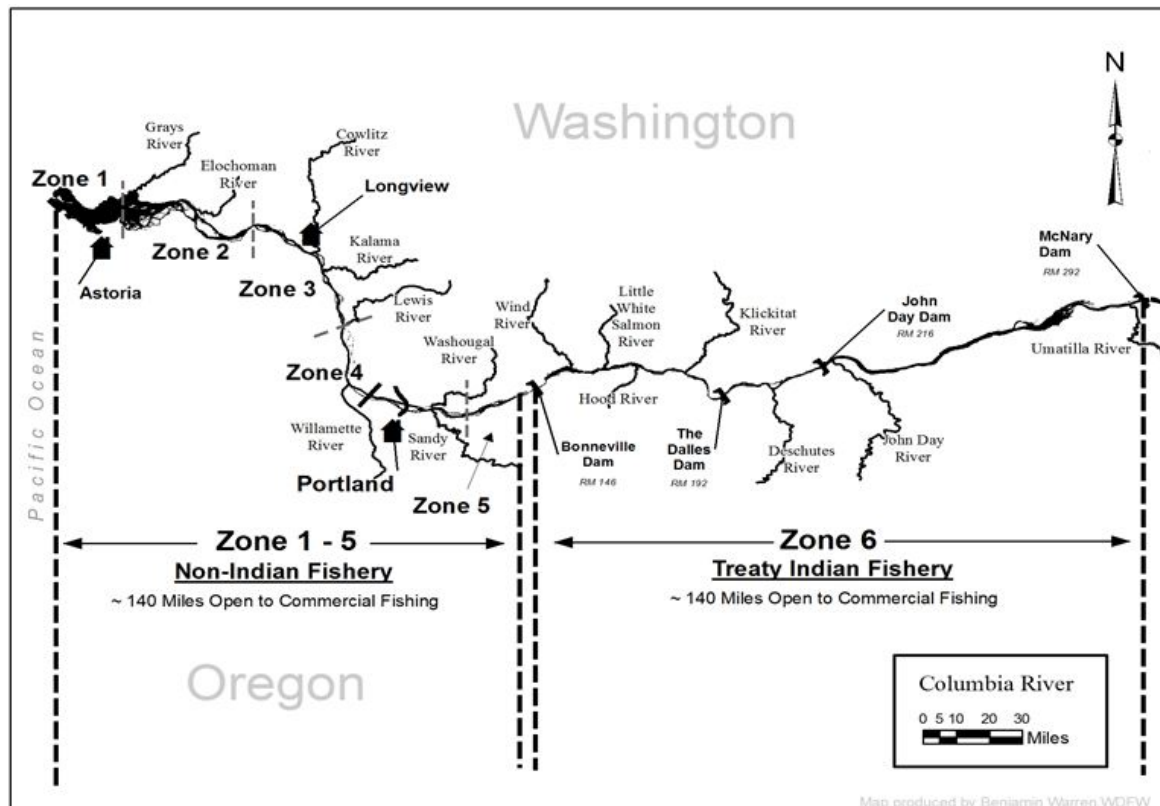
In 2005, the parties to *U.S. v. Oregon* negotiated a three-year (2005–2007) Interim Management Agreement (2005 Agreement) (U.S. District Court 2005). The 2005 Agreement applied to winter, spring, summer, and fall season fisheries. The 2005 Agreement and associated harvest provisions were the result of ongoing negotiations in *U.S. v. Oregon* and the sequential evolution and development of fishery management since the initial salmon listings in 1992. These negotiations have been under the continuous supervision of the Federal Court with jurisdiction over *U.S. v. Oregon*. The most recent iteration of the negotiations began with completion of the Interim Agreement in 2005. The 2005 Agreement served as the model for the successor 2008 Agreement.

The 2008 Agreement management provisions are, in most respects, similar to those in the 2005 Agreement. This is true in particular for the winter, spring, and summer season fisheries. There are, however, two notable changes in management of fall season fisheries. Under the 2005 Agreement, fall season fisheries were subject to fixed harvest rate constraints of 31.3% for Snake River fall Chinook and 17.0% for B-run steelhead¹. However, the 2008 Agreement includes abundance based harvest rate schedules that allow the harvest rates to vary up or down from the status quo rates depending on the overall abundance of Snake River fall Chinook and B-run steelhead. The use of abundance based harvest rate schedules generally is more responsive to overall stock status. Abundance based harvest rates schedules previously were developed for other stocks including upriver spring Chinook (including the Snake River spring/summer Chinook salmon ESU), sockeye, and upper Columbia River summer Chinook. These were

¹ Inland steelhead in the Columbia River Basin are commonly referred to as either A-run or B-run, based on migration timing and differences in age and size at return. A-run steelhead are believed to occur throughout the steelhead streams in the Snake River Basin, and B-run are thought to produce only in the Clearwater and Salmon rivers.

incorporated into the 2005 Agreement and directly carried over into the 2008 Agreement. Development of abundance based harvest rate schedules for Snake River fall Chinook and B-run steelhead for use in the 2008 Agreement applies the benefits of abundance based management to these two additional stocks.

Figure 3. The area covered for fisheries under the 2008 *U.S. v. Oregon* Agreement (TAC 2008).



2.1.3.1 Columbia River Compact

In 1918, the U.S. Congress ratified a compact between Oregon and Washington covering concurrent jurisdiction of mainstem Columbia River commercial fisheries. The Columbia River Compact comprises the Washington Fish and Wildlife Commission (WFWC) and the Oregon Fish and Wildlife Commission (OFWC). In recent years, the commissions have delegated decision-making authority to the state fish and wildlife agency's director or designee. Periodic hearings to adopt or review seasonal commercial regulations (including those related to fisheries in the *U.S. v. Oregon* agreements) are held just before major fishing seasons to consider current information and establish season dates and gear restrictions. Additional hearings are held in-season when updated information concerning run size, attainment of escapement goals, or catch guidelines indicates a need to adjust the season.

The Compact jurisdiction includes the Columbia River from the mouth to just upstream of McNary Dam. The Compact sets fishing seasons in Zones 1-5 (Mouth to Bonneville Dam) and

currently adopts the treaty Indian commercial sales in area Zone 6 (Bonneville Dam to McNary Dam) (Figure 3). Working together under the Compact, the states have the responsibility to address the allocation of fish harvest among non-tribal commercial and recreational fisheries and meet the requirements of the *US v. Oregon* agreements. Specific fisheries are overviewed below. A nearly identical process of Joint State Sport Hearings addresses the concurrent management of sport fisheries in the mainstem.

2.1.4 Snake River Mainstem and Tributary Fisheries

Salmon and steelhead fishing occurs in the Snake River mainstem and its tributaries in the states of Washington, Oregon and Idaho. Co-managers currently develop and submit to NMFS yearly Fishery Implementation Plans (FIP). The FIPs include annual pre-season fishery impact rates consistent with fishery management frameworks currently being developed through the Snake Basin Harvest Forum (SBHF), an offshoot of the *U.S. v. Oregon* process. These frameworks being developed are based on sliding scales that tie allowed fishery impact rates to forecast return of natural-origin adults. When the return of natural-origin returns to a population or a defined management area is low, the allowed ESA impact rate is prescribed at low levels. When a large number of natural-origin fish is expected to a given population or to a defined management area, the allowed ESA impact rate can be higher without increasing the risk to ESA-listed populations. According to fishery management frameworks being developed, each year the total ESA impact rate for a population or to a defined management area will be allocated by the tribal and state managers. Co-managers' report harvest statistics as close to real-time as possible and all fisheries are managed not to exceed any of the ESA limits on any given year. More specific information on tributary fisheries in Washington, Oregon and Idaho can be found in the respective Snake River ESA Recovery Plans.

2.2 Harvest Management under the Endangered Species Act

In the 1990s, 12 Columbia River basin Evolutionarily Significant Units (ESUs) were listed as threatened or endangered; one, the Lower Columbia Coho, was added in June 2005, and all were reaffirmed in status reviews June 2005 and January 2006, except the Upper Columbia steelhead, which was upgraded to Threatened in January 2006, reinstated as endangered by court order in June 2007, and upgraded again as threatened by court order in June 2009. Currently there are four species in the Snake River listed under the ESA. This module focuses on these 4 species in the Snake River Basin, which are:

ESU	Original Listing Date	ESA Listing Status	ESA Critical Habitat
Snake River spring/summer Chinook salmon	Listed as threatened on April 22, 1992	Listed as threatened on June 28, 2005 [NMFS 2005a]	Critical habitat designated on October 25, 1999 [NMFS 1999a]
Snake River fall Chinook salmon	Listed as threatened on April 22, 1992	Listed as threatened on June 28, 2005 [NMFS 2005a]	Critical habitat designated on December 28, 1993 [NMFS 1993]
Snake River steelhead	Listed as threatened on August 8, 1997	Listed as threatened on January 5, 2006 [NMFS 2006a]	Critical habitat designated on September 2, 2005 [NMFS 2005b]
Snake River sockeye salmon	Listed as endangered on November 20, 1991	Listed as endangered on June 28, 2005 [NMFS 2005a]	Critical habitat designated on December 28, 1993 [NMFS 1993]

Because of the ESA status of these Snake River salmonids, NMFS is required to review the effects of the fisheries through various regulatory processes.

2.2.1 Take Prohibitions

Section 9 of the ESA prohibits the unauthorized “take” of listed species. Under the ESA, “take” means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. NMFS can authorize take that is incidental to otherwise lawful activities, such as fisheries targeting non-listed species, using authorities provided in sections 4(d), 7 and 10 of the ESA. For threatened salmon ESUs and *O. mykiss* DPS, NMFS will apply

section 4(d) protections to natural and hatchery fish with an intact adipose fin, but not to listed hatchery fish that have had their adipose fin removed prior to release into the wild (NMFS 2005).

2.2.2 Section 7 Consultations

Under section 7 of the ESA, each Federal agency must, in consultation with NMFS, insure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of its designated critical habitat. Federal agencies proposing to take an action that might affect ESA-listed salmon must first consult with NMFS about such effects. NMFS may authorize actions that result in take of listed salmon, provided that:

- such take is incidental to, and not the primary purpose of the proposed action; and,
- the effects of the proposed action are not to jeopardize the continued existence of the species nor destroy or adversely modify designated critical habitats.

Because NMFS has a significant role representing the Federal government in the fishery management arena, most of its section 7 consultations on fishery management are actually section 7 consultations with itself. Section 7 consultations have occurred prior to the implementation of fishing plans and agreements covering both ocean and in-river fisheries. Some of the consultations have involved a fishing plan for a single year and fishery. Others have covered multiple years and fisheries. NMFS posts section 7 Consultations that have been completed for salmon fishing at the following website: <https://pcts.nmfs.noaa.gov/pcts-web/homepage.pcts>.

2.2.3 Section 4(d) Limits

NMFS issued a final rule pursuant to section 4(d) of the ESA (NMFS 2000a), adopting the take prohibitions in section 9(a)(1) of the ESA. As part of the rule, NMFS also sets forth specific circumstances when the prohibitions will not apply, known as 4(d) limits. The 4(d) Rule limits the application of the take prohibitions if a management agency develops and implements a Fishery Management and Evaluation Plan (*hereafter* FMEP) that NMFS determines will not appreciably reduce the likelihood of survival and recovery of the listed species. As a result, take of any listed species normally prohibited under section 9 may be exempted via consideration of a FMEP through the 4(d) rule.

A separate but closely related tribal 4(d) rule created an additional limit for tribal resource management plans (NMFS 2000b). The Tribal 4(d) Rule limits the application of the take prohibitions if a tribe develops and implements a Tribal Resource Management Plans (*hereafter* TRMP) that NMFS determines its implementation will not appreciably reduce the likelihood of

survival and recovery of the listed species. As a result, take of any listed species normally prohibited under section 9 may be exempted via consideration of a TRMP through the Tribal 4(d) rule.

Once those FMEPs or TRMPs are approved, the take of listed species is authorized to the extent that it occurs in fisheries managed in conformity with those approved plans. Completed FMEPs and TRMPs can be found at:

http://www.westcoast.fisheries.noaa.gov/fisheries/salmon_steelhead/salmon_and_steelhead_fisheries.html.

2.2.4 Section 10

Section 10 of the ESA allows NMFS to issue permits for scientific purposes, to enhance the propagation or survival of listed species, or when a take is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Section 10 permits have been issued by NMFS for a number of fisheries regulated by the states, particularly certain tributary fisheries directed at harvestable hatchery origin salmon and steelhead.

More information is available in the Salmon Harvest and Hatcheries section of the following website: <http://www.westcoast.fisheries.noaa.gov/index.html>.

2.2.5 Determining Allowable Harvest Rates

NMFS' approach for determining allowable harvest and exploitation rates is described in a document entitled "NMFS Approach to Making Determinations Pursuant to the Endangered Species Act about the Effects of Harvest Actions on Listed Pacific Salmon and Steelhead" (NMFS 2004a), which is available online at:

http://www.westcoast.fisheries.noaa.gov/publications/fishery_management/salmon_steelhead/2004_easa_harvest_salmon.pdf.

NMFS regional policy on the relationship between recovery and section 7 is provided in the document titled, Integrating Recovery Plan Products and Section 7 consultations in the NMFS Northwest Region, July 24 2008 (NMFS 2008d).

2.3 Regional Fisheries

The current distribution of harvest (who is catching the fish) results from a complex interaction of management processes (as described above), regions, and types of effort (e.g., commercial, recreational, tributary, ocean troll, treaty Indian, non-treaty Indian).

2.3.1 Pacific Salmon Treaty Fisheries

Snake River fall Chinook salmon are caught in all of the major marine mixed stock fisheries between Northern California and Alaska, including within the Columbia River. Snake River fall Chinook salmon stocks are major contributors to the Southeast Alaska troll fishery all year except during the spring. Canadian marine fisheries include commercial troll and net fisheries as well as recreational sport fisheries in northern B.C., Central B.C., West Coast of Vancouver Island, Strait of Georgia, and Strait of Juan de Fuca. In Southeast Alaska, Pacific Salmon Treaty Chinook salmon marine fisheries include commercial troll and net fisheries as well as recreational sport fisheries. In recent years, fall Chinook salmon harvest in terminal fisheries in Alaska and harvest of Alaska hatchery production has increased, although these harvests are not subject to Pacific Salmon Treaty limitations, and these fisheries do not impact Snake River fall Chinook salmon.

In June 1999, under the Pacific Salmon Treaty, Canada and the U.S. agreed on a new approach for managing Chinook salmon fishing regimes wherein Southeast Alaska (all gear), northern B.C. (troll and recreational), and West Coast Vancouver Island (troll and outside recreational) fisheries would be managed under AABM regimes. This approach establishes annual catch ceilings derived from estimates of total aggregate abundance of all stocks contributing to the fishery that year and target fisheries harvest rates. Fisheries not managed under AABM are required to be managed so as to reduce harvest rates relative to those observed in a standard base period (1979-1982). Canadian fisheries were required to reduce by 36.5 percent and U.S. fisheries by 40 percent. Smaller reductions apply for stocks meeting their escapement objectives. Ocean fisheries have been required since 1996, through ESA consultation, to achieve a 30% reduction in the average exploitation rate observed during the 1988 to 1993 base period.

The basic Chinook salmon management approach established in 1999 was continued, with certain refinements, in the new Chinook chapter put in place from 2009 through 2018, with the most significant change being a reduction of 15 percent for the Southeast Alaska fishery and 30 percent for the West Coast Vancouver Island fishery relative to those provided in the 1999 Agreement.

2.3.2 Pacific Fishery Management Council (PFMC) and North of Falcon (NOF) Fisheries

Snake River fall Chinook salmon are caught in all of the major marine mixed stock fisheries in the West Coast of the United States. Ocean fisheries along the U.S. West Coast are separated into four major management areas (Figure 2):

- U.S./Canada border to Cape Falcon, Oregon
- Cape Falcon, Oregon to Humbug Mountain, Oregon
- Humbug Mountain, Oregon, to Horse Mountain, California
- Horse Mountain, California to the U.S./Mexico border.

These management areas are further subdivided depending on the type of fishery. Numerous treaty Indian commercial troll, non-Indian commercial troll, and recreational marine fisheries exist along the West Coast. While these areas are subdivided, the PFMC manages the U.S. West Coast concurrently for no less than a 30.0 percent reduction in a Snake River Fall Chinook salmon Index compared to the 1988-1993 base period adult equivalent exploitation rate for all ocean fisheries combined (PFMC 2014).

2.3.3 U.S. v. OR Fisheries

Fisheries managed under the *U.S. v. Oregon* Management Agreement (2008-2017) and the associated Biological Opinion (NMFS 2008a), including non-Indian commercial and recreational fisheries, and treaty Indian fisheries in the Columbia River as described in Section 2.1.5 and Figure 3. The list of fisheries included in the U.S. v Oregon Agreement is presented in Table 2.

Table 2. Fisheries included in the 2008-2017 *U.S. v. Oregon* Agreement.

Fishery Management	Jurisdiction	Fishery Description by Target Species/Area
All Year	Non-Treaty	Commercial anchovy/herring/sardine
		Commercial carp
		Recreational steelhead (mouth to Hwy 395 Bridge)
		Recreational warm water species
		Recreational sturgeon - below Bonneville Dam
		Recreational sturgeon - above Bonneville Dam
		Commercial sturgeon
		Recreational fisheries in select areas
		Commercial fisheries in select areas
		Research, Monitoring and Evaluation
Winter-Spring season January 1 through June 15	Non-Treaty	Commercial spring Chinook
		Commercial smelt (mainstem and tributaries)
		Commercial shad (mainstem and Washougal Reef)
		Recreational spring Chinook - below Bonneville Dam
		Recreational spring Chinook - above Bonneville Dam
		Recreational spring Chinook - Snake River
		Recreational spring Chinook – Ringold
		Recreational smelt (mainstem and tributaries)
		Wanapum tribal spring Chinook
		Treaty Tribal
	Sturgeon gill net with incidental Chinook and steelhead	
	Winter/Spring season salmon with incidental steelhead	

		Spring Chinook C&S
		Spring tributary fisheries
Summer season June 16 through July 31	Non-tribal	Recreational salmon – mouth to PR Dam
		Commercial salmon
		Commercial shad (mainstem and Washougal River)
	Treaty Tribal	Summer Chinook with incidental steelhead
		Sockeye
		Sturgeon set line
		Summer tributary fisheries
		Shad (may start in spring season)
		Lamprey (may start in spring season)
	Fall season August 1 through December 31	Non-tribal
Recreational Lower Snake River Salmon		
Recreational Buoy 10		
Recreational salmon (TP/RP upstream to PR Dam)		
What about fall Chinook above PRD?		
Recreational steelhead (tributary dip-ins)		
Commercial smelt (mainstem and tributaries)		
Recreational smelt (mainstem and tributaries)		
Treaty tribal		Fall Chinook with incidental Coho and steelhead
		Sturgeon gill net
		Sturgeon set line
		Fall tributary fisheries
		Yellow Perch

2.3.3.1 Lower Columbia River Commercial Fisheries

Lower Columbia River non-Indian commercial fisheries occur below Bonneville Dam in the mainstem (statistical Zones 1-5) or in select off-channel fishing areas (statistical Zones 7, 71, 74, and 80). Commercial fishing seasons in the mainstem Columbia River are established by the Columbia River Compact, while Select Area seasons are established by the state in which the fishery occurs. Zone 6 (from above Bonneville Dam to just below the Deschutes River) was open to non-Indian commercial fishing until 1956; gill nets, set lines, and seines were used, although seines were finally prohibited in 1950. In 1957, Zone 6 was closed to non-Indian commercial fishing (see further discussion under Treaty Indian Fishery below).

The number of drift gill net licenses in the commercial fishery declined after 1938, with a low of 597 in 1969, but increased to a high of 1,524 in 1979. In 1980, a limited entry vessel permit moratorium went into effect. In the mid-1980s, 288 licenses were purchased and permanently retired; 135 licenses were bought back by Washington in 1995–96. In 1999, Columbia River commercial licenses totaled 591.

The number of seasons and fishing days allowed for the commercial mainstem fishery has declined dramatically since 1938. Before 1943, over 270 fishing days were allowed annually. From 1977 through the 1980s an average of 38 fishing days were allowed annually and, in the 1990s, 29 average annual fishing days were allowed. A Commercial fishing season for spring Chinook salmon (including Snake River spring/summer Chinook salmon) has occurred since 2001. Sockeye retention has recently been allowed in summer season fisheries in the Columbia Basin in accordance with the 2008 Biological Opinion. Since the 1980s fall season (August through October) seasons have been limited by time, area, and harvest quotas, but have occurred each year.

Commercial fishing in Columbia River off-channel areas was initiated in 1962 with the adoption of salmon seasons for Youngs Bay, Oregon. Recent declines in mainstem fishing opportunities prompted the Bonneville Power Administration (BPA) to fund a research project to expand net-pen programs to select off-channel fishing areas. The result of this effort was the Select Area Fishery Enhancement (SAFE) project. These commercial fisheries currently target hatchery Coho, Select Area bright fall Chinook salmon, and spring Chinook salmon returning to these programs. Fisheries in SAFE areas are not located in the migratory corridor of the Columbia River and have low impacts on Snake River stocks, averaging an annual harvest rate of 0.14 percent of Snake River wild fall Chinook salmon since 2007 (Whisler 2014).

Currently, winter and spring fisheries in the mainstem are mark selective but summer are not. Most fall fisheries are not mark selective, but a mark selective Coho tanglenet fishery was implemented in 2013. The lower Columbia River commercial fisheries target spring Chinook (including Snake River spring/summer) salmon beginning in early March- April and can occasionally extend through June 15 (considered the end of the run timing for Snake River

spring/summer Chinook salmon through McNary Dam). Select Area commercial fisheries harvest spring Chinook in off-channel areas (Youngs Bay, Tongue Point, and Blind Slough in Oregon and Deep River in Washington) returning from net pen and hatchery releases in these areas. Seine fishing will begin to be re-established in 2014.

2.3.3.2 Lower Mainstem Columbia River Recreational Fisheries

The lower Columbia River mainstem below Bonneville Dam is separated into two main areas for recreational harvest; Buoy 10 (ocean/in-river boundary) to the Rocky Point/Tongue Point line, and the Rocky Point/Tongue Point line to Bonneville Dam. Separate regulations of the Buoy 10 area are only used in fall season fisheries. Recreational fisheries are mark-selective for spring Chinook, summer chinook, Coho salmon and steelhead. Some fall Chinook salmon recreational fisheries are mark selective. Sockeye fisheries are not mark selective. The lower Columbia River sport fishery catches summer and fall Chinook, sockeye, and Coho salmon, and summer and winter steelhead in the mainstem Columbia River from Rocky Point/Tongue Point to Bonneville Dam. Recreational fisheries also occur in the Select Areas, upstream of Bonneville Dam and in the lower Snake River up to the Washington-Idaho border. Catch in recreational fisheries above Bonneville is generally low compared to the fisheries below Bonneville. Steelhead harvest is the exception.

2.3.3.3 Recreational fisheries from Bonneville Dam to the mouth of the Snake River

Recreational fisheries in the Columbia River target different stocks at different times of year. State permanent regulations allow steelhead fishing for adipose clipped steelhead from January 1- March 31 and June 16-Dec 31. Steelhead fishing can be allowed at other times of the year by temporary regulation. State permanent regulations allow fishing for fall chinook and Coho between Aug 1-Dec 31. Fall chinook fisheries are not mark selective and Coho fisheries upstream of the Hood River Bridge are not mark selective. Normally there are seasons for adipose clipped spring chinook and adipose clipped summer chinook, but these seasons vary by run size and allocation decisions. Tributary fisheries in the Zone 6 area have some impact on Snake River steelhead and these impacts are counted toward the total mainstem fishery limits.

2.3.3.4 Treaty Indian Mainstem Fisheries

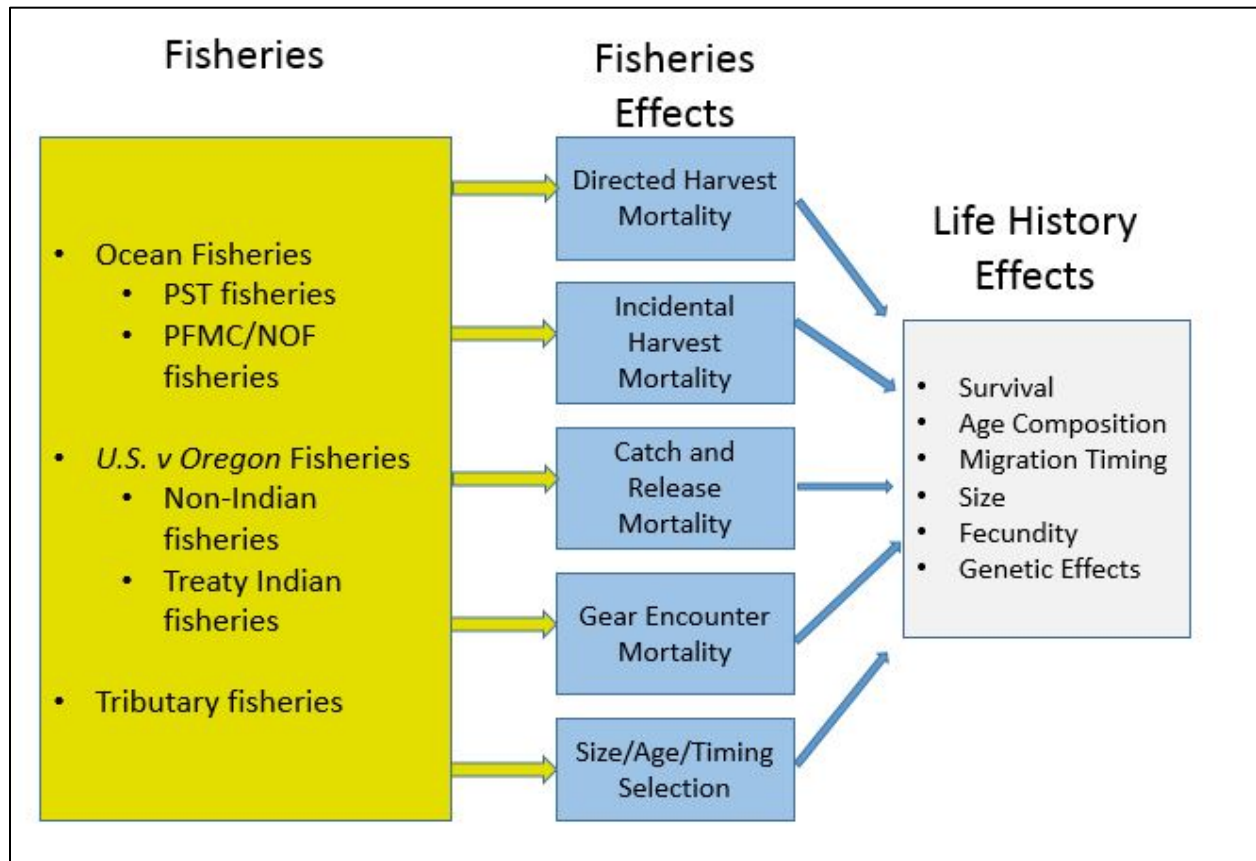
The Columbia River treaty tribes have authority to regulate treaty Indian fisheries in the Columbia River. The Compact actions approve consistent state commercial regulations that allow non-Indians to purchase fish from the treaty Indian commercial fisheries in Zone 6 (Bonneville Dam to McNary Dam), in bank fisheries downstream of Bonneville Dam, and in any tributary fisheries where sales are authorized (Figure 3). Treaty tribal harvest includes commercial and ceremonial and subsistence (C&S) fisheries. The tribal ceremonial fisheries are of highest priority and generally occur before tribal commercial fishing. The tribal fisheries involve members of the four Columbia River treaty Indian tribes: Yakama Nation, Nez Perce Tribe, the Confederated Tribes of the Umatilla Indian Reservation and Confederated Tribes of the Warm Springs Reservation. The mainstem Columbia River fishing area currently includes all

of the area between Bonneville and McNary Dams along with areas downstream of Bonneville roughly downstream to Beacon Rock outlined in MOU's/MOA's with the states of Oregon and Washington. These fisheries are managed under the jurisdiction of *U.S. v. Oregon*. The *U.S. v. Oregon* Management Agreement for 2008-2017 implements abundance-based management on Snake River spring/summer Chinook salmon, upper Columbia summer chinook, fall chinook, sockeye, and steelhead in treaty mainstem fisheries such that fishery impacts increase in proportion to the abundance of natural-origin fish forecast to return once certain run-sizes has been achieved.

3. Historical and Current Impacts by Species

Many of the regulating factors that affect harvest impacts on Columbia River stocks are associated with treaties, laws, policies, or guidelines established for the management of other stocks or combined stocks, but indirectly control impacts of Columbia River fish as well. Because annual management measures must meet the conservation objectives of all the key stocks, fishing seasons are usually limited by the necessity of meeting the requirements for the least abundant stock (i.e., weak stock management). The emphasis of weak stock management has changed over the last 25 years, as ocean and freshwater fisheries have been widely reduced and refocused on hatchery-origin or healthy wild fish using a combination of time, area, and mark-selective regulations. Although direct harvest of weak stocks or populations has never been a desirable management practice, incidental fishery impacts have now become much more important in managing weak stocks than directed harvest. Limits intended to protect weak stocks in mixed stock fisheries reduce access to healthy wild or hatchery runs. Relatively small numbers or proportions of a protected stock may be impacted in a mixed stock fishery, but the regulatory consequences of those small impact allowances can result in significant reduction in harvest opportunity in mixed stock fisheries.

Listed fish generally comprise a small percentage of the total fish caught by any fishery. Every listed fish may correspond to tens, hundreds, or thousands of other stocks in the total catch. As a result of weak stock constraints, surpluses of hatchery and strong naturally spawning runs often go unharvested. Small reductions in fishing rates on listed populations can translate to large reductions in catch of other stocks and recreational trips to communities which provide access to fishing, with significant economic consequences.

Figure 4. Fisheries, Fisheries Effects, and Life History Effects.

Analysis of fisheries impacts may consider a variety of direct and indirect effects (Figure 4). Direct effects include mortality in fisheries that are managed to specifically harvest target stocks. Indirect effects include incidental mortality of fish that are caught and released, encounter fishing gear but are not landed, or are harvested incidentally to the target species or stock. Indirect effects also might include genetic, growth, or reproductive changes when fishing rates are high and selective by size, age, or run timing.

Fishery impact analyses may be conducted at population or fishery-specific levels. Population-specific analyses would treat impacts by all fisheries in aggregate. Fishery-specific analyses would consider fine-scale impacts. By nature of their wide ranging travels, anadromous salmonids can be exposed to a wide variety of fisheries from their Columbia Basin watershed of origin all the way to Canada and Alaska. This broad distribution can substantially complicate analysis and attempts to limit impacts on specific stocks.

Analysis of fishing and harvest is also complicated by the need to consider fisheries impacts at both the species impact and population goal levels. Fishing mortality can be considered an impact that interacts with other factors to affect salmon productivity and viability and thus needs to be addressed as part of recovery planning and actions. However, directed harvest or increased

accessibility to other populations in mixed stock fisheries are also key elements of broad recovery goals, because recovery objectives include sustaining healthy, harvestable populations.

Fishery impact limits to protect listed weak populations are generally based on risk assessments that identify points where fisheries do not pose jeopardy to the continued persistence of a listed group of fish. In many cases, these assessments identify the point where additional fishery reductions provide little reduction in extinction risks. A population may continue to be at significant risk of extinction but those risks are no longer substantially affected by the specified fishing levels. Often, no level of fishery reduction will be adequate to meet naturally spawning population escapement goals related to population viability. In those cases, elimination of harvest will not in itself lead to the recovery of a population. However, prudent and careful management of harvest is necessary to prevent unacceptable risk to listed populations and can help close the gap and protect listed populations while habitat is being restored.

The main purpose for hatchery production in the Columbia River is to provide for harvest opportunity and meet mitigation goals (although there are some situations where hatchery production is also a conservation tool that can aid recovery). Hatcheries can cause additional impacts and risks to listed species. Adverse impacts can result when natural-origin fish are harvested when hatchery-origin fish are targeted in a particular fishery. Hatchery-origin fish spawning in the wild can potentially also result in adverse impacts to natural-origin fish. Hatchery impacts are addressed more specifically in the MU plans and in the Snake River recovery hatchery module.

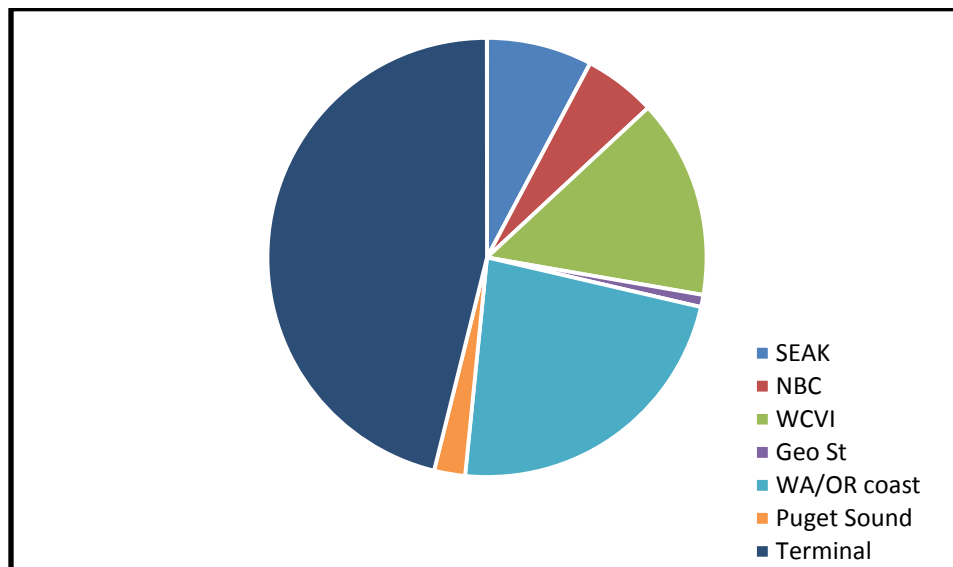
3.1 Snake River Fall Chinook Salmon ESU

Snake River fall Chinook salmon are present throughout ocean fisheries from Alaska to California, and in fall season fisheries in the mainstem Columbia River. Incidental catch occurs in fisheries that target harvestable hatchery and non-listed natural-origin fish. The presence of large numbers of harvestable natural-origin Chinook salmon in the fishing locations from other sources makes it infeasible to distinguish Snake River fall Chinook salmon through means of mark-selective fishing techniques.

Total harvest mortality for the combined ocean and inriver fisheries can be expressed in terms of exploitation rates which provide a common currency for comparing ocean and inriver fishery impacts (Fisheries in the Columbia River are generally managed subject to harvest rate limits. Harvest rates are expressed as a proportion of the run returning to the river that is killed in river fisheries). The total exploitation rate has declined significantly since the ESA listing. Ocean fisheries have been required since 1996, through ESA consultation, to achieve a 30% reduction in the average exploitation rate observed during the 1988 to 1993 base period.

Figure 5 depicts the distribution of Lyons Ferry Hatchery average total fishing mortalities among fisheries. Lyons Ferry Hatchery fish are used as a surrogate for natural-origin Snake River fall Chinook salmon for ocean fisheries.

Figure 5. Percent distribution of Lyons Ferry Hatchery fish average total fishing mortalities among fisheries (1999-2011).



Under the 2008-2017 *U.S. v. Oregon* Management Agreement, the harvest of Snake River fall Chinook in the Columbia River may vary from year-to-year based on the abundance-based harvest rate schedule in Table 3. Allowable harvest on any given year depends on the abundance of unlisted upriver fall Chinook salmon and natural-origin Snake River fall Chinook salmon. The allowable harvest rate ranges from 21.5% to 45.0%.

The harvest rate schedule in Table 3 modifies the past practice of managing fisheries subject to a fixed harvest rate, providing a management structure that is responsive to the status of the species. Under the new schedule (Table 3), harvest may vary up or down depending on the overall abundance of unlisted upriver fall Chinook and listed natural-origin Snake River fall Chinook salmon. The harvest rate schedule is generally calibrated to provide higher harvest rates when abundance is high enough to accommodate the increased harvest and still meet the TRT recovery abundance threshold of 3,000 natural-origin fish to Lower Granite Dam. Conversely, when numbers are low, harvest rates are reduced to provide greater protection.

Table 3. Abundance-based harvest rate schedule for Snake River fall Chinook (TAC 2008).

State/Tribal Proposed Snake River Fall Chinook Harvest Rate Schedule under the 2008-2017 *U.S. v Oregon* Management Agreement.

State/Tribal Proposed Snake River Fall Chinook Harvest Rate Schedule					
Expected URB River Mouth Run Size	Expected River Mouth Snake River Wild Run Size ¹	Treaty Total Harvest Rate	Non-Treaty Harvest Rate	Total Harvest Rate	Expected Escapement of Snake R. Wild Past Fisheries
< 60,000	Or < 1,000	20%	1.50%	21.50%	784
>60,000	And > 1,000	23%	4%	27.00%	730
>120,000	And > 2,000	23%	8.25%	31.25%	1,375
> 200,000	And > 5,000	25%	8.25%	33.25%	3,338
	And > 6,000	27%	11%	38.00%	3,720
	And > 8,000	30%	15%	45.00%	4,400

1. If the Snake River natural fall Chinook 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 run size.

Notes:

Treaty Fisheries include: Zone 6 Ceremonial, subsistence, and commercial fisheries from August 1-December 31.

Non-Treaty Fisheries include: Commercial and recreational fisheries in Zones 1-5 and mainstem recreational fisheries from Bonneville Dam upstream to the confluence of the Snake River and commercial and recreation SAFE (Selective Areas Fisheries Evaluation) fisheries from August 1-December 31.

The Treaty Tribes and the States of Oregon and Washington may agree to a fishery for the Treaty Tribes below Bonneville Dam not to exceed the harvest rates provided for in this Agreement.

Fishery impacts in Hanford sport fisheries count in calculations of the percent of harvestable surplus achieved.

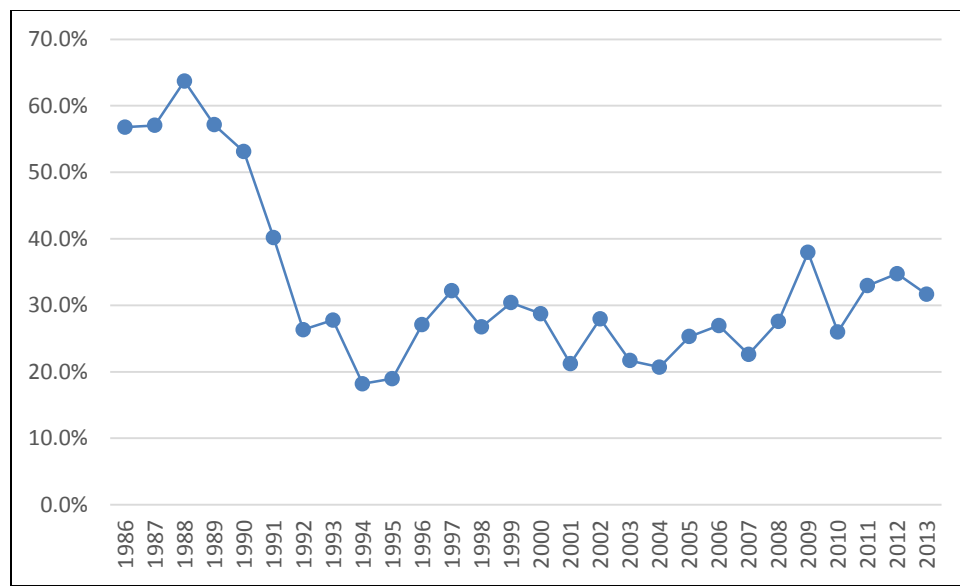
When expected river-mouth run sizes of naturally produced Snake River Fall Chinook equal or exceed 6,000, the states reserve the option to allocate some proportion of the non-treaty harvest rate to supplement fall Chinook directed fisheries in the Snake River.

Since 1996, based on a post season review, actual Columbia River harvest rates have, with one exception, been less than the ESA-authorized limit. The difference between the allowed and observed harvest rate has ranged from -0.9% to 13.8% (Table 4). In the last 3 years, when the ESA-authorized limit was 45% according to Table 3, the average observed HR was 32.9%. Figure 6 presents observed harvest rate on Snake River fall Chinook salmon since 1986.

Table 4. Observed harvest rate on Snake River fall Chinook salmon compared to the maximum allowable harvest rate limit under the 2008-2017 *U.S. v Oregon* Management Agreement (Patiño 2014).

Year	Observed HR (%)	Allowed HR (%)	Difference
1996	27.1%	31.3%	4.2%
1997	32.2%	31.3%	-0.9%
1998	26.7%	31.3%	4.6%
1999	30.4%	31.3%	0.9%
2000	28.7%	31.3%	2.6%
2001	21.2%	31.3%	10.1%
2002	28.0%	31.3%	3.3%
2003	21.7%	31.3%	9.6%
2004	20.7%	31.3%	10.6%
2005	25.3%	31.3%	6.0%
2006	27.0%	31.3%	4.3%
2007	22.6%	31.3%	8.7%
2008	27.6%	31.3%	3.7%
2009	38.0%	38.0%	0.0%
2010	26.0%	33.3%	7.3%
2011	32.8%	45.0%	12.2%
2012	34.8%	45.0%	10.2%
2013	31.2%	45.0%	13.8%
Average	27.9%		6.2%

Figure 6. Fishery-related mortalities for Snake River fall Chinook salmon in *U.S. v. OR* fisheries since 1986 (Patiño 2014).



3.2 Snake River Spring/Summer Chinook Salmon

The ocean fishery mortality on upriver spring/summer Chinook salmon is very low and, for practical purposes, assumed to be zero, based on the rare occurrence of coded wire tag (CWT) recoveries in ocean fisheries. Incidental take of ESA-listed Snake River spring/summer and Upper Columbia River Chinook salmon occurs in spring and summer season fisheries in the mainstem Columbia River that target harvestable hatchery and natural-origin stocks. While Upper Columbia spring Chinook and Snake River spring/summer Chinook salmon are ESA-listed, Upper Columbia summer/fall Chinook salmon are not listed and often have a large surplus that can be harvested.

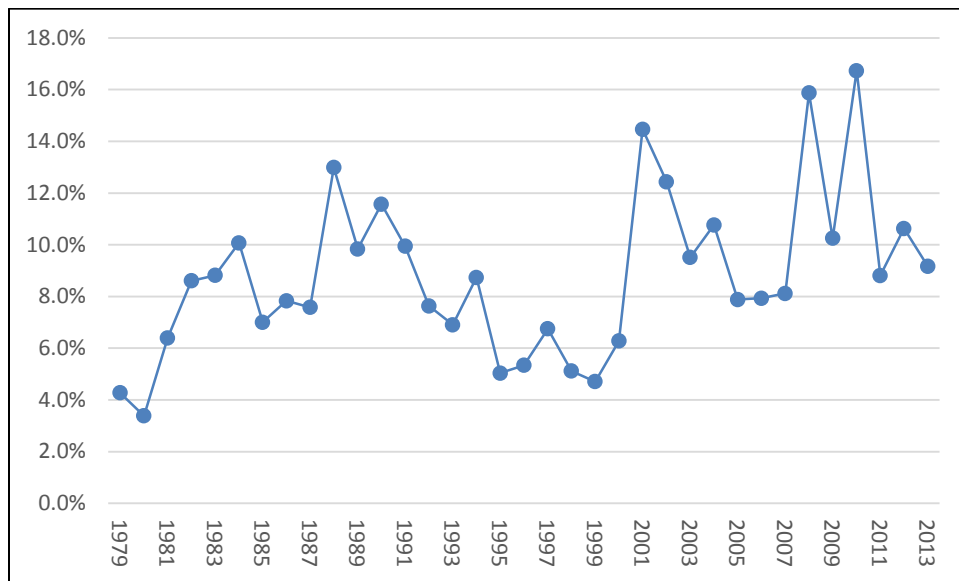
Under the terms of the 2008–2017 Agreement, fisheries are subject to a harvest rate schedule that varies from year-to-year based on an abundance-based harvest rate schedule ranging from 5.5 percent to 17 percent (Table 5), described in the *U.S. v. Oregon* 2008–2017 Management Agreement. Harvest depends on the total (hatchery + natural origin) abundance of upriver spring (including Snake River Spring/summer Chinook salmon), natural-origin Snake River spring/summer Chinook salmon, and may be further limited by natural-origin Upper Columbia River spring Chinook salmon (see footnote 4 of Table 5). The allowable harvest rate may range from 5.5% to 17%. As indicated in Table 5, most of the harvest under the 2008-2017 *U.S. v. Oregon* Agreement occurs in treaty Indian fisheries. Recent estimates of the harvest rate of Snake River spring/summer Chinook salmon from 1979 to 2013 are presented in Figure 7. The incidental take of these fish resulting from fisheries under *U.S. v. Oregon* jurisdiction since 2001 has averaged 11.0%.

Table 5. Abundance-based harvest rate schedule for upriver spring Chinook and Snake River spring/summer Chinook salmon in spring management period fisheries under the 2008-2017 *U.S. v. Oregon* Management Agreement (TAC 2008).

Harvest Rate Schedule for Chinook in Spring Management Period					
Total Upriver Spring and Snake River Summer Chinook Run Size	Snake River Natural Spring/Summer Chinook Run Size¹	Treaty Zone 6 Total Harvest Rate^{2,5}	Non-Treaty Natural Harvest Rate³	Total Natural Harvest Rate⁴	Non-Treaty Natural Limited Harvest Rate⁴
<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% of the total upriver run size, the allowable mortality rate will be based on the Snake River natural spring/summer Chinook 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% and attempt to keep actual mortalities as close to zero as possible while maintaining minimal fisheries targeting other harvestable runs.
2. Treaty Fisheries include: Zone 6 Ceremonial, subsistence, and commercial fisheries from January 1-June 15. Harvest impacts in the Bonneville Pool tributary fisheries may be included if TAC analysis shows the impacts have increased from the background levels.
3. Non-Treaty Fisheries include: Commercial and recreational fisheries in Zones 1-5 and mainstem recreational fisheries from Bonneville Dam upstream to the Hwy 395 Bridge in the Tri-Cities and commercial and recreation SAFE (Selective Areas Fisheries Evaluation) fisheries from January 1-June 15; Wanapum tribal fisheries, and Snake River mainstem recreational fisheries upstream to the Washington-Idaho border from April through June. Harvest impacts in the Bonneville Pool tributary fisheries may be included if TAC analysis shows the impacts have increased from the background levels.
4. If the Upper Columbia River natural spring Chinook forecast is less than 1,000, then the total allowable mortality for treaty and non-treaty fisheries combined would be restricted to 9% or less. Whenever Upper Columbia River natural fish restrict the total allowable mortality rate to 9% or less, then non-treaty fisheries would transfer 0.5% harvest rate to treaty fisheries. In no event would non-treaty fisheries go below 0.5% harvest rate.
5. The Treaty Tribes and the States of Oregon and Washington may agree to a fishery for the Treaty Tribes below Bonneville Dam not to exceed the harvest rates provided for in this Agreement.

Figure 7. Snake River spring/summer Chinook salmon harvest rates resulting from the implementation of fisheries under *U.S. v. Oregon* jurisdiction since 1979 (Patiño 2014).



3.3 Snake River Steelhead DPS

Few steelhead are caught in ocean fisheries. Harvest mortality in ocean fisheries is assumed to be zero. Snake River Steelhead are caught in fisheries in the mainstem Columbia and tributaries (e.g. Deschutes River), and Snake Rivers and Snake River tributary areas. Fisheries in the mainstem Columbia River are currently being managed subject to the terms of the *U.S. v. Oregon* Management Agreement for 2008–2017. Non-Indian fisheries are subject to a 2 percent harvest rate limit on A-run steelhead in winter, spring, and summer season fisheries, and a 2 percent harvest rate limit separately on A-run and B-run steelhead in fall season fisheries. Treaty-Indian fall season fisheries are currently managed using the abundance based harvest rate schedule for B-run steelhead, as contained in the 2008 Agreement (Table 6). Under the abundance based harvest rate schedule, the harvest rate limit may change depending on the abundance of B-run steelhead. The harvest rate allowed under the current harvest rate schedule is also limited by the abundance of upriver fall Chinook salmon. The purpose of this provision is to recognize that impacts to B-run steelhead may be higher when the abundance, and thus fishing opportunity for fall Chinook salmon, is higher and remains consistent with conservation goals. However, higher harvest rates are allowed only if the abundance of B-run steelhead is also greater than 35,000. This provision is designed to provide greater opportunity for the tribes to satisfy their treaty right, to harvest 50% of the harvestable surplus of fall Chinook salmon, in years when conditions are generally favorable. Even with these provisions, it is unlikely that the treaty right for Chinook salmon or steelhead can be fully satisfied. The harvest rate in tribal fall season fisheries may range from 13 to 20% and the non-Treaty fall season fishery harvest rate would remain fixed at 2% (Table 6).

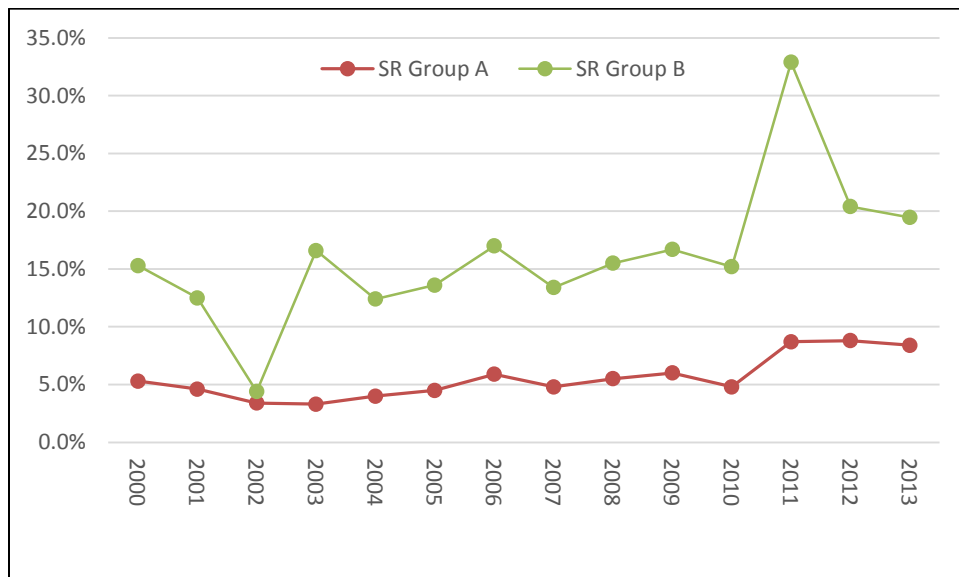
Table 6. Abundance Based Harvest Rate Schedule for B-run Steelhead (TAC 2008).

Upriver Summer Steelhead Total B Harvest Rate Schedule				
Forecast Bonneville Total B Steelhead Run Size	River Mouth URB Run Size	Treaty Total B Harvest Rate	Non-Treaty wild B Harvest Rate	Total Harvest Rate
< 20,000	Any	13%	2.0%	15.0%
> 20,000	Any	15%	2.0%	17.0%
>35,000	And >200,000	20%	2.0%	22.0%

B-run steelhead is used as the primary steelhead related harvest constraint for tribal fall season fisheries and are thus the indicator stock used for management purposes. Generally, the status of B-run steelhead is worse than that of A-run steelhead. B-run steelhead are subject to higher harvest rates because they are larger and thus more susceptible to catch in gillnets. Harvest impacts on B-run steelhead generally are also higher because their timing coincides with the return of fall Chinook salmon, the primary target of tribal fall season fisheries. A-run steelhead

typically return a few weeks earlier and thus are less susceptible to catch. Consequently, there are no specific management constraints in tribal fisheries for A-run steelhead. Recent estimates of the harvest rate of Snake River steelhead from 2000 to 2013 are presented in Figure 8.

Figure 8. Snake River steelhead harvest rates resulting from the implementation of fisheries under *U.S. v. Oregon* jurisdiction since 2000 (Patiño 2014).



3.4 Snake River Sockeye ESU

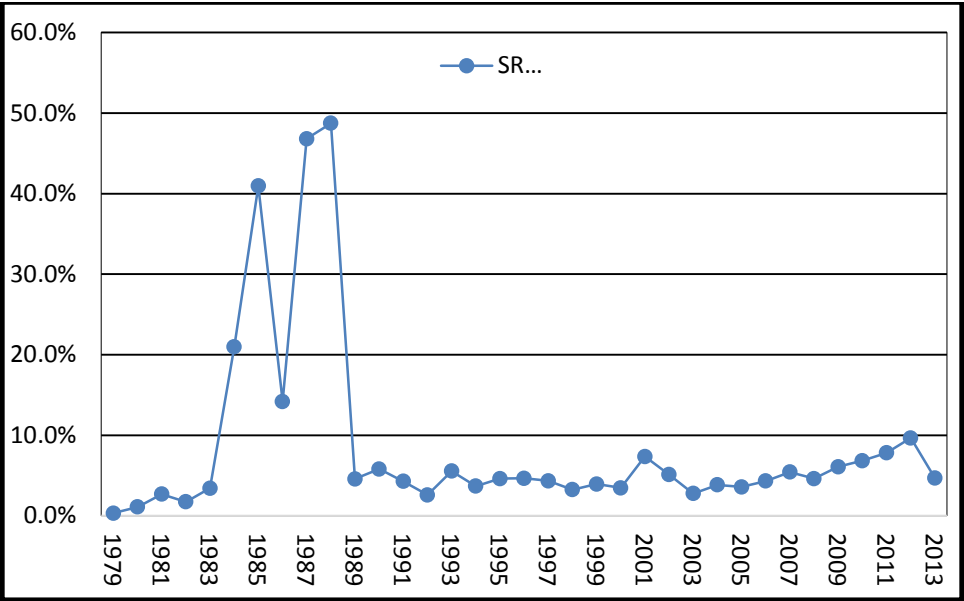
Few sockeye are caught in ocean fisheries. Ocean fishing mortality on Snake River Sockeye is assumed to be zero. Management provisions for sockeye in the 2008 *U.S. v. Oregon* agreement have not changed from those in the 2005-2007 agreement. Non-Indian fisheries in the Columbia River mainstem below the highway 395 bridge where it crosses the Columbia River between Kennewick and Pasco, WA are limited to a harvest rate of 1% and Treaty Indian fisheries to 5 to 7%, depending on the run size of upriver sockeye stocks (Table 7 estimates of the harvest rate of Snake River sockeye salmon from 1979 to 2013 are presented in Figure 9.)

Table 7. Sockeye Harvest Rate Schedule (TAC 2008).

River Mouth Sockeye Run Size	Treaty Harvest Rate	Non-Treaty Harvest Rate	Total Harvest Rate
< 50,000	5%	1%	6%
50,000 -75,000	7%	1%	8%
> 75,000	7% *	1%	8 % *

*If the upriver sockeye run size is projected to exceed 75,000 adults over Bonneville Dam, any party may propose harvest rates exceeding those specified in Part II.C.2. or Part II.C.3. of the 2008-2017 Management Agreement. The parties shall then prepare a revised biological assessment of proposed Columbia River fishery impacts on ESA-listed sockeye and shall submit it to NMFS for consultation under Section 7 of the ESA.

Figure 9. Snake River sockeye salmon harvest rates resulting from the implementation of fisheries under *U.S. v. Oregon* jurisdiction since 1979 (Patiño 2014).



4. Expectations and Considerations for Future Harvest Management

Provisions of the Pacific Salmon Treaty that relate to management of Chinook salmon fisheries in particular will be in place through 2018. Fisheries managed under the jurisdiction of the PFMC are subject to long-term biological opinions that are in place until changed. Fisheries in the mainstem Columbia River will be managed subject to the *U.S. v. Oregon* Management Agreement through at least 2017. If and how these fisheries will change thereafter is unclear. The existing fishery regimes have been developed over the years since the first ESA listings in the Columbia River Basin in 1991, and include substantial reductions in fisheries considered necessary to comply with ESA requirements to date. It is reasonable to expect that fishery management provisions will continue to evolve in response to new information, including recommendations developed through the recovery planning process. However, it is not possible to predict the direction or magnitude of change for any particular ESU/DPS. Given these uncertainties, if it is necessary for planning or analysis purposes to make assumptions about harvest impacts in the future, the most reasonable assumption is that future harvest impacts will not increase over current levels.

The Snake Basin Harvest Forum (*hereafter* SBHF), an informal offshoot of the *U.S. v. Oregon* process, was formed in early 2009 to develop comprehensive and coordinated fishery proposals for the three Management Units of the Snake River spring/summer Chinook and Steelhead Recovery Plan (Southeast Washington, Northeast Oregon and Idaho). NMFS approved Washington Department of Fish and Wildlife (WDFW) FMEP that includes fisheries targeting hatchery-origin Steelhead in the southeast Washington portion of the Snake River that include retention of adipose-clipped Snake River fall Chinook (NMFS 2011b). Other FMEPs and TRMPs for steelhead fisheries are expected in the near future. NMFS also approved a package of management plans targeting Snake River spring/summer Chinook salmon in the Northeast Oregon portion of the Snake River (NMFS 2013a). NMFS has approved IDFG's FMEP and the Shoshone-Bannock Tribes TRMP for spring/summer Chinook salmon fisheries in the Salmon River Basin (NMFS 2013b). NMFS expects that *U.S. v Oregon* Parties will use the SBHF to develop additional proposals for harvest of Snake River spring/summer and fall Chinook salmon and steelhead in the near future.

Ideally, agreements can be reached through the SBHF for long-term frameworks for managing all fisheries in the Snake Basin consistent with ESA and the needs of the co-managers. The ESA analysis of Snake Basin fishery proposals for Snake River spring/summer Chinook salmon, Snake River fall Chinook salmon and Snake River steelhead will require consideration of the combined effects of all the proposed fisheries on a given population, Major Population Groups (MPGs) and ultimately on each of the affected ESA-listed species that may occur. The goal is to ensure that these fisheries are consistent with recovery of these listed species.

The ongoing hatchery reform outside and within the Snake River basin may affect harvest management outside and within the basin, and its effect on fisheries in the Columbia River may alter the fisheries effects describes in this module to varying degrees. More information on hatchery recovery strategies and proposed actions can be found in the respective Snake River ESA Recovery Plans.

4.1 Snake River Spring and Summer Chinook Salmon ESU

NMFS believes there are opportunities to develop proposals that emphasize harvest of hatchery-origin Snake River Spring/Summer Chinook salmon with adequately low risk for natural origin spawners. It is appropriate to consider the fisheries that have occurred in recent years that emphasize the harvest of hatchery-origin fish, particularly in terminal areas. For tribal fisheries, and particularly as we approach a recovered status for listed species, harvest proposals targeting natural-origin stocks may be deemed appropriate. NMFS recommends developing abundance-based harvest rate schedules that respond to the return of natural-origin fish. Fisheries may occur in mixed stock areas and be based on indicators of aggregate abundance. However, NMFS also suggests development of, and possibly greater emphasis on, terminal area fisheries that are based on population-specific abundance-based harvest rate schedules. One of the recovery strategies in the Snake River Basin will be to account for population specific impacts that occur in mixed stock fisheries

4.2 Snake River Fall Chinook Salmon ESU

Since there is only one extant population in the Snake River Fall Chinook salmon ESU, the management situation is less complicated than that for Snake River steelhead or Snake River spring/summer Chinook salmon. Thus it is appropriate to consider developing total combined abundance-based harvest rate schedule for fisheries in the Snake River that responds to the return of natural-origin fish in a given year. A return of 3,000 natural-origin spawners is a logical benchmark that would be included in such a schedule. These fisheries should generally target hatchery-origin fish and emphasize the reduction of potential hatchery-origin spawners. As abundance of natural origin fish increases there may be more harvest opportunities in terminal areas.

4.3 Snake River Steelhead DPS

The Snake River Steelhead DPS is listed as threatened. Most of the fishing occurs in mixed stock areas with the associated consequences to weaker populations. The tribes have indicated their interest in more fishing opportunity than they have had in the recent past. These circumstances all contribute to what will be a challenging management problem.

Generally, NMFS believes it is possible to support fishing levels in the Snake Basin similar to those that have occurred in recent years. Fisheries should continue to emphasize the harvest of hatchery-origin fish. Greater flexibility may be attained through the development of abundance-based harvest rate schedules (especially if these are population-specific) that respond to the return of natural-origin fish. NMFS suggests the consideration of greater emphasis on terminal area, population-specific harvest frameworks, although NMFS understands that fishing opportunity in terminal areas of the Snake Basin for steelhead may be limited relative to those for spring/summer Chinook salmon.

NMFS believes that increasing harvest impacts beyond those that have occurred in the past may be problematic. The tribes have a treaty rights to fish for steelhead in the Snake River Basin. As a consequence, it may be necessary to develop a co-management framework that allows for the allocation of existing impacts among greater number of participants.

4.4 Snake River Sockeye Salmon ESU

The status of the Snake River Sockeye Salmon ESU is the highest risk of extinction of any listed salmonid species in the Columbia River Basin. Currently, the ESU is represented by fish produced by a captive propagation program with fish returning to Redfish Lake near the headwaters of the Salmon River in Idaho. Adult sockeye salmon returning to the Sawtooth Valley pass through fisheries directed at other species in the Columbia River and lower Snake River. NMFS believes that the opportunity to manage fisheries directed at Snake River sockeye salmon is a long term goal but the opportunity to design such fisheries will not arise until sometime in the future.

Because the hatchery program is expected to be tightly integrated with any developing natural production for an indeterminate amount of time into the future, it is unclear when harvest scenarios can begin to be developed that would provide for meaningful harvest directed at Snake River sockeye salmon. Until the viability of populations have improved to the point that harvest rate schedules can be devised that would not result in impediments to achieving recovery objectives, any harvest impacts on Snake River sockeye salmon should be kept at low levels and should accrue only incidentally in fisheries targeting other species. The recovery plan for Snake River sockeye salmon may consider how limited fishery opportunity would be phased in, in which areas, and under which conditions. In the near future, fisheries currently incidentally impacting Snake River sockeye salmon should continue to be managed, with accompanying adequate monitoring programs, to minimize their impacts on this ESU.

5. Literature Cited

- Fresh, K. et al. 2014. Module for the Ocean Environment. NMFS Northwest Fisheries Science Center, Seattle, WA.
- Koenings, J.P. and P. Sprout. 2008. Letter to the Honorable Condoleezza Rice. May 21, 2008. 3pp. w/Amended Chapters of Annex IV of the PST.
- NMFS (National Marine Fisheries Service). 2000a. Endangered and Threatened Species: Final Rule Governing Take of 14 Threatened Salmon and Steelhead Evolutionarily Significant Units (ESUs). Federal Register 65 (132): 42422-42481, 7/10/2000.
- NMFS (National Marine Fisheries Service). 2000b. Modification to ESA 4(d) rule (protective regulations) for listed West Coast salmon under tribal resource management plans. Federal Register 65 (132): 42481, 7/10/2000.
- NMFS (National Marine Fisheries Service). 2004a. NOAA Fisheries' approach to making determinations pursuant to the Endangered Species Act about the effects of harvest actions on listed Pacific salmon and steelhead. NMFS, Northwest Region Sustainable Fisheries Division. November 16, 2004.
- NMFS (National Marine Fisheries Service). 2005. Endangered and Threatened Species: Final Listing Determinations for 16 ESUs of West Coast salmon, and Final 4(d) Protective Regulations for Threatened Salmonid ESUs. Final Rule. Federal Register 70 (123): 37160-37204, 6/28/2005.
- NMFS (National Marine Fisheries Service). 2008a. Endangered Species Act - Section 7(a)(2) Consultation, Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation. Consultation on remand for operation of the Federal Columbia River Power System, 11 Bureau of Reclamation Projects in the Columbia Basin and ESA Section 10(a)(1)(A) Permit for Juvenile Fish Transportation Program (Revised and reissued pursuant to court order, NWF v. NMFS, Civ. No. CV 01-640-RE (D. Oregon)). National Marine Fisheries Service, Portland, Oregon, 5/5/2008.
- NMFS (National Marine Fisheries Service). 2008b. Supplemental comprehensive analysis of the Federal Columbia River Power System and mainstem effects of the Upper Snake and other tributary actions. National Marine Fisheries Service, Portland, Oregon, 5/5/2008.
- NMFS (National Marine Fisheries Service). 2008c. Endangered Species Act Section 7(a)(2) Consultation. Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation on the Approval of Revised Regimes

under the Pacific Salmon Treaty and Deferral of Management to Alaska of Certain Fisheries Included in those Regimes. December 22, 2008.

NMFS (National Marine Fisheries Service). 2008d. Integrating Recovery Plan Products and Section 7 consultations in the NMFS Northwest Region. July 24, 2008.

NMFS (National Marine Fisheries Service). 2011a. Columbia River Estuary ESA Recovery Plan Module for Salmon and Steelhead. NMFS Northwest Region. Portland, OR. Prepared for NMFS by the Lower Columbia River Estuary Partnership (contractor) and PC Trask & Associates, Inc. (subcontractor). January 2011.

NMFS (National Marine Fisheries Service). 2011b. Endangered Species Act – Section 7 Consultation Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation. Consultation on Fisheries Management and Evaluation Plan for IDFG Recreational Fisheries for Spring/Summer Chinook Salmon. October 19, 2011.

NMFS (National Marine Fisheries Service). 2013a. Endangered Species Act – Section 7 Consultation Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation. Consultation on the Effects of the three Tribal Resource Management Plans and two Fishery Management and Evaluation Plans on Snake River Chinook Salmon and Steelhead Species Listed Under the Endangered Species Act

NMFS (National Marine Fisheries Service). 2013b. Endangered Species Act – Section 7 Consultation Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation. Consultation on the Effects of the Shoshone-Bannock Tribes' Tribal Resource Management Plan on Snake River Chinook Salmon and Steelhead Species Listed Under the Endangered Species Act.

NMFS (National Marine Fisheries Service). 2014. Supplemental recovery plan module for snake river salmon and steelhead mainstem columbia river hydropower projects. Portland, OR.

Patino, E. 2014. Memorandum to the File. ESA Impacts for US v. OR Fisheries. May 26, 2014.

PFMC (Pacific Fishery Management Council). 2014. Review of 2013 Ocean Salmon Fisheries: Stock Assessment and Fishery Evaluation Document for the Pacific Coast Salmon Fishery Management Plan. PFMC, 7700 NE Ambassador Place, Suite 101, Portland, OR 97220-1384.

TAC, (U.S. v. Oregon Technical Advisory Committee). 2008. 2008 Biological assessment of incidental impacts on salmon species listed under the Endangered Species Act in the 2008-2017 non-Indian and treaty Indian fisheries in the Columbia River Basin, 4/21/2008.

US District Court (D. Oregon). 2005. US v. Oregon. Civil No. 68-513KI. 2005-2007 interim management agreement for upriver Chinook, sockeye, steelhead, coho and white sturgeon, 5/11/2005.

Whisler, G. 2014. Average annual harvest rate of Snake River wild fall Chinook salmon since 2007. Personal Communication to Enrique Patino (NMFS) from Geoffrey Whisler (ODFW). June 25, 2014.