UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Silver Spring, Maryland 20910

JUL 31 2000

MEMORANDUM TO: Will Stelle
Northwest Regional Administrator

FROM: Don Knowles
Director, Office of Protected Resources

SUBJECT: Endangered Species Act Biological Opinion on 2000 Treaty Indian and Non-Indian Fall Season Fisheries in the Columbia River Basin

Attached is the Biological Opinion on the 2000 Treaty Indian and Non-Indian Fall Season Fisheries in the Columbia River Basin. The Biological Opinion concludes that the 2000 Treaty Indian and Non-Indian Fall Season Fisheries in the Columbia River Basin are not likely to jeopardize the continued existence of Snake river fall chinook salmon, Lower Columbia River chinook salmon, Snake River basin steelhead, Upper Columbia River steelhead, Middle Columbia River steelhead, Lower Columbia River steelhead, or chum salmon. The Biological Opinion includes an incidental take statement for these species.

If you require further information on the Biological Opinion, please feel free to contact Ms. Wanda Cain or Mr. Chris Mobley of my staff.

Attachment

BIOLOGICAL OPINION
AND INCIDENTAL TAKE STATEMENT

2000 Treaty Indian and Non-Indian Fall Season Fisheries
in the Columbia River Basin

Agency: National Marine Fisheries Service,
Northwest and Southwest Regional
Sustainable Fisheries Divisions

Consultation Conducted by
National Marine Fisheries Service
Protected Resources Division

Date Issued: JUL 31 2000

Approved By: [signature]

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INTRODUCTION

The National Marine Fisheries Service (NMFS) is required under section 7 of the Endangered Species Act (ESA) to consult on federal actions which may affect salmon species listed under the ESA. This Biological Opinion considers the effects of treaty Indian and non-Indian fisheries proposed for the fall of 2000 in the Columbia River Basin on listed populations of salmon and steelhead.

CONSULTATION HISTORY

Fisheries in the Columbia River Basin were managed subject to provisions of the Columbia River Fish Management Plan (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. NMFS provided consultation under section 7 of the ESA on proposed fisheries in the Columbia Basin since 1992. The Technical Advisory Committee (TAC) of U.S. v Oregon routinely prepared biological assessments for proposed fisheries that were submitted to NMFS through the U.S. Fish and Wildlife Service (USFWS). The TAC biological assessments considered treaty Indian and non-Indian fisheries within the jurisdiction of the CRFMP (with the exception of Idaho State fisheries in the Snake River Basin, which were considered separately under section 10 of the ESA).

Fall season fisheries in the Columbia River were managed from 1996-1998 under provisions of the 1996-1998 Management Agreement for Upper Columbia River Fall Chinook. The Management Agreement modified provisions of the CRFMP to include specific management provisions for the management of Snake River fall chinook. NMFS issued a Biological Opinion covering fall season fisheries under the terms of the three year agreement (NMFS 1996a). NMFS then reinitiated consultation in 1998 to consider additional management measures for the protection of newly listed steelhead species and issued a revised Opinion that covered the 1998 fall season fisheries (NMFS 1998).

The CRFMP expired on December 31, 1998, but was extended by court order through July 31, 1999. The Plan expired thereafter. The 1999 fall season fisheries were managed pursuant to the 1999 Management Agreement between the state, tribal and federal parties to U.S. v Oregon. The proposed state and tribal fisheries were considered through a section 7 consultation. The federal government's participation in that agreement was the federal action that provided the necessary nexus for consultation.

The form of the consultation process related to the 2000 fall season fishery was initially unclear. At the outset there was no agreement among the parties regarding fall fisheries, particularly with respect to allocation. Absent an agreement or other recognizable federal action, there was no nexus for covering proposed state fisheries under section 7, and NMFS advised the states of Oregon and Washington that they should apply for a section 10 permit. Although the states disagreed with NMFS on the question of nexus for the state fisheries, they nonetheless submitted a section 10 permit application for consideration of their fall season fisheries (Greer and Koening 2000a). NMFS began processing the permit application by noticing for public comment the permit application and draft Environmental Assessment.

Section 7 consultation regarding the fall season fisheries was initiated on behalf of the tribes by the Bureau of Indian Affairs (BIA) based on the federal government's trust responsibility to the tribes, including the responsibility and authority of the BIA to impose reasonable and necessary conservation measures on the exercise of treaty rights if necessary in the interest of conservation, and where tribal regulations are inadequate to ensure conservation. Accordingly, the BIA provided a biological assessment regarding the tribes' proposed fall season fisheries (Jamison 2000).

Initially, the state and tribal fisheries were analyzed separately using the section 7 and 10 processes. However, prior to completion of the consultation, the U.S. v Oregon parties resolved the outstanding issues and concluded an agreement regarding management of the 2000 fall season fisheries (U.S. v Oregon Parties 2000). As was the case in 1999, this agreement among the state, tribal, and federal parties provides a nexus for NMFS' consideration of the combined state and tribal fisheries through a single section 7 consultation. The states' permit application and the tribes' biological assessment describe the respective proposed fisheries. The states and tribes subsequently requested that their initial proposals be considered as part of a joint action pursuant to the new fall agreement, and provided updates where necessary to clarify the magnitude of impacts that would be associated with their now revised fishery proposals (Greer and Koenins 2000c).

BIOLOGICAL OPINION

I. Description of the Proposed Action

A. Proposed Action

The action considered in this Biological Opinion includes 2000 fall season fisheries in the Columbia River Basin proposed by the Columbia River treaty tribes (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 Indian Nation) (Jamison 2000). The treaty Indian fall season fisheries included in this biological assessment will occur between August 1, 2000, and December 31, 2000, and include:

- all mainstem Columbia River fisheries between Bonneville Dam and McNary Dam (commonly known as Zone 6),
- all mainstem Columbia River fisheries upstream of McNary Dam to Wanapum Dam (commonly known as the Hanford Reach Area), and
- all fisheries within tributaries above Bonneville Dam except Snake River Basin.

Methods of fishing include a dipnet, hoopnet, bagnet, hook-line and set gillnet. There is also the potential for sturgeon setline fisheries which target sturgeon exclusively. All of these fishing methods may be employed for ceremonial, subsistence and commercial harvest. In the past few years, commercial gillnet fishing has occurred from mid-August through early October. In some years, subsistence gillnet fisheries have been authorized by the tribes in October.

Also considered in the Opinion are non-Indian fisheries proposed by the states of Oregon and Washington from August 1, 2000 to December 31, 2000 in the Columbia River mainstem from its mouth to Priest Rapids Dam and to Ice Harbor Dam on the Snake River (Greer and Koenings 2000a). Non-Indian fisheries addressed by this assessment include mainstem sport fisheries for salmonids from Buoy 10 upstream to Priest Rapids Dam, commercial fisheries for salmon and sturgeon from the Columbia mouth to Bonneville Dam, sport sturgeon and warmwater fisheries from the Columbia mouth to Priest Rapids Dam, Wanapum tribal fisheries downstream from Priest Rapids Dam, and various fishery monitoring activities (Table 2).

B. Action Area

For purposes of this Biological Opinion, the action area encompasses the Columbia River from its mouth upstream to the Wanapum Dam, including its tributaries (with the exception of the Willamette River) and the Snake River Basin and its tributaries.

Table 1. Summary of salmonid species from the Columbia River Basin listed under the Endangered Species Act by the NMFS. Those shown in bold are potentially affected by the proposed action. [1]

Species	Evolutionarily Significant Unit	Present Status	Federal Register Notice
Chinook Salmon (*O. tshawytscha*)	**Snake River Fall** Snake River Spring/Summer **Lower Columbia River** Upper Willamette River Upper Columbia River Spring	Threatened Threatened Threatened Threatened Endangered	57 FR 14653 4/22/92 57 FR 14653 4/22/92 64 FR 14308 3/24/99 64 FR 14308 3/24/99 64 FR 14308 3/24/99
Chum Salmon (*O. keta*)	**Columbia River**	Threatened	64 FR 14570 3/25/99
Sockeye Salmon (*O. nerka*)	Snake River	Endangered	56 FR 58619 11/20/91
Steelhead (*O. mykiss*)	**Upper Columbia River** **Snake River Basin** **Lower Columbia River** Upper Willamette River **Middle Columbia River**	Endangered Threatened Threatened Threatened Threatened	62 FR 43937 8/18/97 62 FR 43937 8/18/97 63 FR 13347 3/19/98 64 FR 14517 3/25/99 64 FR 14517 3/25/99

[1]Other ESUs are not affected because their run timing is such that they have passed through areas of proposed fisheries prior to the start of fishing on August 1st.

II. Status of the Species and Critical Habitat

A. Species and Critical Habitat Description

1. Chinook Salmon

The Snake River (SR) fall chinook ESU includes all natural-origin populations of fall chinook in the mainstem Snake River and several tributaries including the Tucannon, Grande Ronde, Salmon, and Clearwater rivers. Fall chinook from the Lyons Ferry Hatchery are included in the ESU but are not listed.

The Lower Columbia River (LCR) chinook ESU includes all native populations from the mouth of the Columbia River to the crest of the Cascade Range, excluding populations above Willamette Falls. Not included in this ESU are "stream-type" spring-run chinook salmon found in the Klickitat River (which are considered part of the Mid-Columbia River Spring-Run ESU) or the introduced Carson spring-chinook salmon strain. "Tule" fall chinook salmon in the Wind and Little White Salmon Rivers are included in this ESU, but not introduced "upriver bright" fall-chinook salmon populations in the Wind, White Salmon, and Klickitat Rivers. For the LCR chinook ESU, the Cowlitz, Kalama, Lewis, White Salmon, and Klickitat Rivers are the major river systems on the Washington side, and the Willamette and Sandy Rivers are foremost on the Oregon side. The majority of this ESU is represented by fall-run fish and includes both north migrating tule-type stocks and far-north migrating bright stocks, but the few remaining spring stocks in the Lower Columbia are included as well. Several of the hatchery populations in the Lower Columbia River are included in the ESU but none are listed.

2. Steelhead

The Snake River Basin (SRB) steelhead ESU includes all natural-origin populations of steelhead in the Snake River Basin of Southeast Washington, northeast Oregon, and Idaho. None of the hatchery stocks in the Snake River Basin are listed, but several are included in the ESU.

The Upper Columbia River (UCR) steelhead ESU includes all natural-origin populations of steelhead in the Columbia River Basin between the Yakima River and the U.S./Canada Border. The Wells Hatchery stock is included among the listed populations.

The Middle Columbia River (MCR) steelhead ESU includes all natural-origin populations in the Columbia River Basin from above the Wind River in Washington and the Hood River in Oregon upstream to include the Yakima River in Washington. Steelhead of the Snake River Basin are not included in the MCR steelhead ESU. Both the Deschutes River and Umatilla River hatchery stocks are included in the ESU, but are not listed.

The LCR steelhead ESU includes all natural-origin populations in tributaries to the Columbia River between the Cowlitz and Wind Rivers in Washington and the Willamette and Hood Rivers in Oregon, inclusive. Excluded are steelhead in the upper Willamette River and steelhead from the Little and Big White Salmon Rivers, Washington, which are in the Middle Columbia River ESU. None of the hatchery stocks were included as part of the listed ESU.

3. Chum Salmon

The Columbia River (CR) chum ESU includes all natural-origin populations in the lower Columbia River. Chum salmon from the Grays River Hatchery and Cowlitz River Hatchery are considered part of the ESU, but are not listed.

B. Critical Habitat

Critical habitat was designated for SR fall chinook salmon on December 28, 1993 (58 FR 68543). Critical habitat for LCR chinook, CR chum, and the UCR, SRB, MCR, and LCR steelhead ESUs of concern in this opinion were designated in a recent final rule dated February 16, 2000 (65 FR 7764). The essential features of the critical habitat include four components: (1) spawning and juvenile rearing areas, (2) juvenile migration corridors, (3) areas of growth and development to adulthood, and (4) adult migration corridors.

C. Life History

General life history information is presented below for chinook salmon, west coast steelhead, and chum salmon. More specific information regarding species status and recent population trends are provided separately for each ESU in the following section.

1. Chinook Salmon

Chinook salmon is the largest of the Pacific salmon. The species' distribution historically ranged from the Ventura River in California to Point Hope, Alaska in North America, and in northeastern Asia from Hokkaido, Japan to the Anadyr River in Russia (Healey 1991). Additionally, chinook salmon have been reported in the Mackenzie River area of northern Canada (McPhail and Lindsey 1970). Of the Pacific salmon, chinook salmon exhibit arguably the most diverse and complex life history strategies. Healey (1986) described 16 age categories for chinook salmon, 7 total ages with 3 possible freshwater ages. This level of complexity is roughly comparable to sockeye salmon (*O. nerka*), although sockeye salmon have a more extended freshwater residence period and utilize different freshwater habitats (Miller and Brannon 1982, Burgner 1991). Two generalized freshwater life-history types were initially described by Gilbert (1912): "stream-type" chinook salmon reside in freshwater for a year or more following emergence, whereas "ocean-type" chinook salmon migrate to the ocean within their first year. Healey (1983, 1991) has promoted the use of broader definitions for "ocean-type" and "stream-type" to describe two distinct races of chinook salmon. This racial approach incorporates life history traits, geographic distribution, and genetic differentiation and provides a valuable frame of reference for comparisons of chinook salmon populations. For the purposes of this Opinion, those chinook salmon (spring and summer runs) that spawn upriver from the Cascade crest are generally "stream-type"; those which spawn downriver of the Cascade Crest (including in the

Willamette River) are generally "ocean-type".

The generalized life history of Pacific salmon involves incubation, hatching, and emergence in freshwater, migration to the ocean, and subsequent initiation of maturation and return to freshwater for completion of maturation and spawning. Juvenile rearing in freshwater can be minimal or extended. Additionally, some male chinook salmon mature in freshwater, thereby foregoing emigration to the ocean. The timing and duration of each of these stages is related to genetic and environmental determinants and their interactions to varying degrees. Salmon exhibit a high degree of variability in life-history traits; however, there is considerable debate as to what degree this variability is the result of local adaptation or the general plasticity of the salmonid genome (Ricker 1972, Healey 1991, Taylor 1991). More detailed descriptions of the key features of chinook salmon life history can be found in Myers, et al. (1998) and Healey (1991).

2. Steelhead

Biologically, steelhead can be divided into two basic run-types, based on the state of sexual maturity at the time of river entry and duration of spawning migration (Burgner et al. 1992). The stream-maturing type, or summer steelhead, enters fresh water in a sexually immature condition and requires several months in freshwater to mature and spawn. The ocean-maturing type, or winter steelhead, enters fresh water with well-developed gonads and spawns shortly after river entry (August 9, 1996, 61 FR 41542; Barnhart 1986). Variations in migration timing exist between populations. Some river basins have both summer and winter steelhead, while others only have one run-type.

Summer steelhead enter fresh water between May and October in the Pacific Northwest (Busby et al. 1996; Nickelson et al. 1992a). They require cool, deep holding pools during summer and fall, prior to spawning (Nickelson et al. 1992). They migrate inland toward spawning areas, overwinter in the larger rivers, resume migration in early spring to natal streams, and then spawn (Meehan and Bjornn 1991; Nickelson et al. 1992).

Winter steelhead enter fresh water between November and April in the Pacific Northwest (Busby et al. 1996; Nickelson et al. 1992), migrate to spawning areas, and then spawn in late winter or spring (Nickelson et al. 1992). Some adults, however, do not enter coastal streams until spring, just before spawning (Meehan and Bjornn 1991).

Steelhead typically spawn between December and June (Bell 1991), and there is a high degree of overlap in spawn timing between populations regardless of run type (Busby et al. 1996). Difficult field conditions at that time of year and the remoteness of spawning grounds contribute to the relative lack of specific information on steelhead spawning.

Unlike Pacific salmon, steelhead are iteroparous, or capable of spawning more than once before death. However, it is rare for steelhead to spawn more than twice before dying; most that do so are females (August 9, 1996, 61 FR 41542; Nickelson et al. 1992). Iteroparity is more common among southern steelhead populations than northern populations (Busby et al. 1996). Multiple spawnings for steelhead range from 3-20% of runs in Oregon coastal streams.

Steelhead spawn in cool, clear streams featuring suitable gravel size, depth, and current velocity. Intermittent streams may be used for spawning (Barnhart 1986; Everest 1973). Steelhead enter streams and arrive at spawning grounds weeks or even months before they spawn and are vulnerable to disturbance and predation. Cover, in the form of overhanging vegetation, undercut banks, submerged vegetation, submerged objects such as logs and rocks, floating debris, deep water, turbulence, and turbidity (Giger 1973) are required to reduce disturbance and predation of spawning steelhead. It appears that summer steelhead occur where habitat is not fully utilized by winter steelhead; summer steelhead usually spawn further upstream than winter steelhead (Withler 1966; Behnke 1992).

Depending on water temperature, steelhead eggs may incubate for 1.5 to 4 months (August 9, 1996, 61 FR 41542) before hatching. Summer rearing takes place primarily in the faster parts of pools, although young-of-the-year are abundant in glides and riffles. Winter rearing occurs more uniformly at lower densities across a wide range of fast and slow habitat types. Productive steelhead habitat is characterized by complexity, primarily in the form of large and small wood. Some older juveniles move downstream to rear in larger tributaries and mainstem rivers (Nickelson et al. 1992).

Juveniles rear in fresh water from one to four years, then migrate to the ocean as smolts (August 9, 1996, 61 FR 41542). Winter steelhead populations generally smolt after two years in fresh water (Busby et al. 1996).

Steelhead typically reside in marine waters for two or three years prior to returning to their natal stream to spawn as four- or five-year olds (August 9, 1996, 61 FR 41542). Populations in Oregon and California have higher frequencies of age-1-ocean steelhead than populations to the north, but age-2-ocean steelhead generally remain dominant (Busby et al. 1996). Age structure appears to be similar to other west coast steelhead, dominated by four-year-old spawners (Busby et al. 1996).

Based on purse seine catch, juvenile steelhead tend to migrate directly offshore during their first summer from whatever point they enter the ocean rather than migrating along the coastal belt as do salmon. During fall and winter, juveniles move southward and eastward (Hartt and Dell 1986). Oregon steelhead tend to be north-migrating (Nicholas and Hankin 1988; Pearcy et al. 1990; Pearcy 1992).

3. Chum Salmon

Historically, chum salmon were distributed throughout the coastal regions of western Canada and the United States, as far south as Monterey Bay, California. Presently, major spawning populations are found only as far south as Tillamook Bay on the northern Oregon coast.

Chum salmon (*Oncorhynchus keta*) are semelparous, spawn primarily in freshwater and, apparently, exhibit obligatory anadromy (there are no recorded landlocked or naturalized freshwater populations) (Randall et al. 1987). Chum salmon spend more of their life history in marine waters than other Pacific salmonids. Chum salmon, like pink salmon, usually spawn in the lower reaches of rivers, with redds usually dug in the mainstem or in side channels of rivers from just above tidal influence to nearly 100 km from the sea. Juveniles outmigrate to seawater almost immediately after emerging from the gravel that covers their redds (Salo 1991). This ocean-type migratory behavior contrasts with the stream-type behavior of some other species in the genus Oncorhynchus (e.g., coastal cutthroat trout, steelhead, coho salmon, and most types of chinook and sockeye salmon), which usually migrate to sea at a larger size, after months or years of freshwater rearing. This means that survival and growth in juvenile chum salmon depend less on freshwater conditions (unlike stream-type salmonids which depend heavily on freshwater habitats) than on favorable estuarine conditions. Another behavioral difference between chum salmon and species that rear extensively in freshwater is that chum salmon form schools, presumably to reduce predation (Pitcher 1986), especially if their movements are synchronized to swamp predators (Miller and Brannon 1982).

D. Population Dynamics and Distribution

To determine the conservation status of the listed ESUs, NMFS is relying increasingly on the evolving scientific analysis contained in the Cumulative Risk Initiative (CRI), which is an ongoing effort of the Northwest Fisheries Science Center (NWFSC 2000). The CRI is designed to provide a standardized assessment of extinction risks and the magnitude of improvements required to mitigate these risks. The CRI also provides an analytical structure that begins to allow evaluation of the potential effects of management actions aimed at different life stages or sources of mortality. In general, the CRI therefore provides a tool to assess the degree to which survival improvements in a particular sector can be combined with expected improvements in other sectors to provide the necessary overall improvements required for survival and recovery. The CRI analysis is being coupled with the Federal Columbia River Power System (FCPRS) biological opinion and a Basin Wide Recovery Strategy (referred to as the “All-H” paper throughout this biological opinion) which will help resolve critical questions about how necessary survival improvements will be allocated among the various H’s including harvest (NMFS 2000a).

The CRI constructs population models for each species and assesses the risk of extinction for populations and/or for ESUs (depending on the data available). To assess the risk of extinction, the CRI examines the population growth rate from 1980 through the most recent returns, and the year-to-year variability of the population’s productivity.

For both ESUs and individual index stocks the CRI estimates average annual rate of population change or “lambda”. Lambda, which incorporates year-to-year variability, is the best summary statistic of how rapidly a population is growing or shrinking. A lambda less than 1.0 means the population is declining; a lambda greater than 1.0 means the population is increasing.

By combining lambda with estimates of environmental variability it is possible to calculate "extinction risk metrics." The CRI assesses the risk of *absolute* extinction, that is, one or no fish for five consecutive years. The analysis also reports the risk of 90% decline in abundance. All extinction metrics are calculated on a 24- and 100-year timeframe. For index stocks, where the data represent entire population counts, extinction risks are expressed in terms of the probability of an adult population falling to only one spawner. For ESUs we calculate extinction metrics as the probability of a 90% decline after 24 years and after 100 years, because it is unlikely that entire ESUs have been accurately counted.

The models use survival for each life-stage, which allows a closer examination of the impacts of the various Hs (Hydro, Habitat, Hatcheries and Harvest) on population growth and on corresponding extinction risk. The models can help identify the life stages at which changes in survival will yield the largest impact on population growth rates. By running numerical experiments, the modelers can help put in perspective the impact of a particular activity, such as harvest, on the likelihood of extinction for a given population or ESU.

The CRI models project risks of extinction *if all factors remain the same as they were from 1980-94.* NMFS recognizes that many actions have been taken to improve the survival of these ESUs since 1994, and also recognizes that the base period arguably represents a particularly bad time for ocean survival of most ESUs. In the All-H paper and the FCRPS biological opinion, NMFS has taken into account the management improvements that have been made, as well as the potential benefits from improved ocean conditions of the past few years.

Because the ESA is directed at the conservation of naturally reproducing species and their habitats, NMFS uses the CRI models to determine the risk of extinction of the naturally spawning populations and ESUs. A major source of uncertainty in these analyses is whether and to what extent hatchery-spawned fish contribute to the next generation (certain assumptions must therefore be made about the spawning success of these adults). The uncertainties related to hatchery fish greatly affect estimates of productivity and in turn estimates of extinction risk and the magnitude of survival improvements that may be required.

1. Chinook Salmon

Snake River Fall Chinook

The spawning grounds between Huntington (RM 328) and Auger Falls (RM 607) were historically the most important for this species. Only limited spawning activity was reported downstream from RM 273 (Waples, et al. 1991), about one mile upstream of Oxbow Dam. Since then, irrigation and hydropower projects on the mainstem Snake River have blocked access to or inundated much of this habitat—causing the fish to seek out less-preferable spawning grounds wherever they are available. Natural fall chinook salmon spawning now occurs primarily in the Snake River below Hells Canyon Dam and the lower reaches of the Clearwater, Grand Ronde, Salmon, and Tucannon Rivers.

Adult Snake River fall chinook salmon enter the Columbia River in July and migrate into the

Snake River from August through October. Fall chinook salmon generally spawn from October through November and fry emerge from March through April. Downstream migration generally begins within several weeks of emergence (Becker 1970, Allen and Meekin 1973), and juveniles rear in backwaters and shallow water areas through mid-summer prior to smolting and migrating to the ocean—thus they exhibit an "ocean" type juvenile history. Once in the ocean, they spend one to four years (though usually, three) before beginning their spawning migration. Fall returns in the Snake River system are typically dominated by four-year-old fish. For detailed information on the Snake River fall chinook salmon, see NMFS (1991) and June 27, 1991, 56 FR 29542.

No reliable estimates of historical abundance are available, but because of their dependence on mainstem habitat for spawning, fall chinook have probably been impacted to a greater extent by the development of irrigation and hydroelectric projects than any other species of salmon. It has been estimated that the mean number of adult Snake River fall chinook salmon declined from 72,000 in the 1930s and 1940s to 29,000 during the 1950s. In spite of this, the Snake River remained the most important natural production area for fall chinook in the entire Columbia River basin through the 1950s. The number of adults counted at the uppermost Snake River mainstem dams averaged 12,720 total spawners from 1964 to 1968, 3,416 spawners from 1969 to 1974, and 610 spawners from 1975 to 1980 (Waples, et al. 1991).

Counts of adult fish of natural-origin continued to decline through the 1980s reaching a low of 78 individuals in 1990 (Table 2). Since then the return of natural-origin fish to Lower Granite Dam (LGD) has been variable, but generally increasing reaching a recent year high of 905 in 1999. The five year average return has increased from 419 for the 1990-1994 time frame to 599 since 1995.

These returns can be compared to the previously identified lower abundance threshold of 300 and the recovery escapement goal of 2,500 which are the kinds of benchmarks suggested in the Viable Salmonid Populations paper (McElhany et. Al. 1999) for evaluating population status. The lower threshold is considered indicative of increased relative risk to a population in the sense that the further and longer a population is below the threshold the greater the risk; it was clearly not characterized as a "redline" below which a population must not go (BRWG 1994). The recovery standard that was initially identified in the 1995 BiOp for Snake River fall chinook was a population of at least 2,500 naturally produced spawners (to be calculated as an eight year geometric mean) in the lower Snake River and its tributaries. The LGD counts can not be compared directly to the natural spawner escapement objective since it is also necessary to account for adults which may fall back below the dam after counting and prespawning mortality. A preliminary estimate suggested that a LGD count of 4,300 would be necessary to meet the 2,500 fish escapement goal (NMFS 1995a). Recent escapements have clearly been well below this goal, but they have also been consistently above the lower abundance threshold and generally increasing in recent years.

A further consideration regarding the status of SR fall chinook is the existence of the Lyons Ferry Hatchery stock which is considered part of the ESU. There have been several hundred adults returning to the Lyons Ferry Hatchery in recent years. More recently, supplementation efforts designed to accelerate rebuilding were initiated beginning with smolt outplants from the 1995 brood year. The supplementation program has been scaled up over the last several years to provide both fingerling and yearling outplants that are acclimated and released in areas above LGD with an immediate objective of increasing the number of natural-origin spawners. The return of adults to LGD from the supplementation program was 479 in 1998 and 882 in 1999 (this is in addition to the adults returning from natural production, see Table 2) and the immediate prospects are for equal or greater returns in the future.

The existence of the Lyons Ferry program has been an important consideration in evaluating the status of the ESU since it reduces the short-term risk of extinction by providing a reserve of fish from the ESU. The return of fish from the supplementation program is not a substitute for recovery which depends on the return of self-sustaining populations in the wild. However, supplementation can be used to mitigate the short-term risk of extinction by boosting the initial abundance of spawners while other actions are taken to increase the productivity of the system to the point where the population is self-sustaining and supplementation is no longer required.

The estimated growth rate or lambda for SR fall chinook is 0.931 confirming that the ESU has undergone a period of decline since 1980. The probabilities of extinction and 90% decline in abundance over the next 24 years are relatively low, 0.00 and 0.06, respectively indicating that there is little short-term risk of extinction. However, the probabilities for the 100 time frame are both close to 1.00 (Table 3) strongly suggesting that the ESU will go extinct eventually if actions are not taken to improve past survival conditions. The analysis further suggests that by increasing lambda by 2.5% or 6.5%, respectively, the probabilities associated with the extinction and 90% decline risk metrics will be met.

Table 2. Escapement and Stock Composition of Fall Chinook at Lower Granite Dam[1]

Year	L. Granite Count	Marked Fish to Lyons Ferry Hatch.	L. Granite Dam Escapement	Stock Comp. of L. Granite Escapement		
					Hatchery Origin	
				Naturally Spawned	Snake R.	Non-Snake R.
1975	1000		1000	1000		
1976	470		470	470		
1977	600		600	600		
1978	640		640	640		
1979	500		500	500		
1980	450		450	450		
1981	340		340	340		
1982	720		720	720		
1983	540		540	428	112	
1984	640		640	324	310	6
1985	691		691	438	241	12
1986	784		784	449	325	10
1987	951		951	253	644	54
1988	627		627	368	201	58
1989	706		706	295	206	205
1990	385	50	335	78	174	83
1991	630	40	590	318	202	70
1992	855	187	668	549	100	19
1993	1170	218	952	742	43	167
1994	791	185	606	406	20	180
1995	1067	430	637	350	1	286
1996	1308	389	919	639	74	206
1997	1451	444	1007	797	20	190
1998	1909	947	962	306	479	177
1999[2]	3381	1519	1862	905	882	75

[1]Information taken from *Revised Tables for the Biological Assessment of Impacts of Anticipated 1996-1998 Fall Season Columbia River Mainstem and Tributary Fisheries on Snake River Salmon Species Listed Under the Endangered Species Act*, prepared by the U.S. v. Oregon Technical Advisory Committee.
[2]Source: Memorandum from Glen Mendel (WDFW) to Cindy Lefluer (WDFW) dated March 3, 2000. "Fall chinook run reconstruction at LGD for 1999.

	λ	Risk of extinction [1]		Probability of 90% decrease in stock abundance[1]		Percent increase in λ required to reduce risk of extinction and 90% decline [2]	
		24 yrs	100 yrs	24 yrs	100 yrs	extinction 100 years	90% decline 100 yrs
FALL CHINOOK							
Snake River fall chinook	0.931	0.00	0.97	0.06	1.00	2.5%	6.5%
Lower Columbia River fall chinook	1.074[3]						
East Fork Lewis River (tule) chinook	1.006	0.00	0.00	0.02	0.28	0.0%	2.5%
North Fork Lewis River (bright)	0.975	0.00	0.05	0.02	0.82	0.0%	4.0%
Sandy River (bright) chinook	0.946	0.00	0.40	0.03	1.00	1.5%	5.5%
CHUM SALMON							
Lower Columbia River Chum	1.099	0.00	0.00	0.00	0.00	0.0%	0.0%
STEELHEAD							
Snake River Basin steelhead	0.965						
A-run	0.984	0.00	0.00	0.00	0.00	0.0%	0.0%
B-run	0.959	0.00	0.25	0.06	0.98	1.5%	1.5%
Upper Columbia River steelhead	0.866	0.00	1.00	0.97	1.00	13.0%	17.5%
Middle Columbia River steelhead	0.882						
Beaver Creek summer steelhead	0.890	0.00	0.00	0.99	1.00	0.0%	11.0%
Deschutes river summer steelhead	0.901	0.00	1.00	0.74	1.00	4.0%	8.0%
Mill Creek summer steelhead	1.077	0.00	0.00	0.00	0.00	0.0%	0.0%
Shitike Creek summer steelhead	0.903	0.00	1.00	0.73	1.00	3.0%	7.0%
Warm Springs summer steelhead	0.922	0.00	0.98	0.55	1.00	3.5%	7.0%
Umatilla River summer steelhead	0.948	0.00	0.17	0.00	1.00	0.5%	4.5%
Yakima River summer steelhead	0.986	0.00	0.00	0.00	0.46	0.0%	2.0%
Lower Columbia River steelhead	0.952[3]						
Clackamas River summer steelhead	0.901	0.00	1.00	0.73	1.00	7.0%	11.0%
Kalama River summer steelhead	1.019	0.00	0.00	0.00	0.01	0.0%	0.0%
Washington summer steelhead	0.861	0.00	1.00	0.99	1.00	13.0%	17.0%

[1] From Table B.IV. Cumulative Risk Initiative. April 7, 2000.
[2] From Table B.VIII. Cumulative Risk Initiative. April 7, 2000.
[3] From Table V-7. Cumulative Risk Initiative. April 7, 2000.

Lower Columbia River Chinook

The LCR chinook ESU includes spring stocks and fall tule and bright components. Spring-run chinook salmon on the lower Columbia River, like those from coastal stocks, enter freshwater in March and April well in advance of spawning in August and September. The spring component of the LCR chinook ESU will not be affected by the proposed fall season fisheries.

Fall chinook predominate the Lower Columbia River salmon runs. Fall chinook return to the river in mid-August and spawn within a few weeks (WDF and WDW 1993, Kostow 1995). The majority of fall-run chinook salmon emigrate to the marine environment as subyearlings (Reimers and Loeffel 1967, Howell et al. 1985, WDF and WDW 1993). A portion of returning adults whose scales indicate a yearling smolt migration may be the result of extended hatchery-rearing programs rather than of natural, volitional yearling emigration. It is also possible that modifications in the river environment may have altered the duration of freshwater residence. Adults return to tributaries in the Lower Columbia River at 3 and 4 years of age for fall-run fish and 4 to 5 years of age for spring-run fish. This may be related to the predominance of yearling smolts among spring-run stocks. Marine coded-wire-tag recoveries for lower Columbia River stocks tend to occur off the British Columbia and Washington coasts, though a small proportion of the tags are recovered as far north as Alaska.

There are no reliable estimates of historic abundance for this ESU, but it is generally agreed that there have been vast reductions in natural production over the last century. Recent abundance of spawners includes a 5-year average of 17,400 natural spawners (1995-1999) with an additional escapement of 28,300 fish to the hatcheries (PFMC 2000). An unknown but likely substantial proportion of the natural-origin spawners were presumably first-generation hatchery strays.

All basins in the region are affected to varying degrees by habitat degradation. Major habitat problems are related primarily to blockages, forest practices, urbanization in the Portland and Vancouver areas, and agriculture in flood plains and low-gradient tributaries. Substantial chinook salmon spawning habitat has been blocked (or passage substantially impaired) in the Cowlitz (Mayfield Dam 1963, RKm 84), Lewis (Merwin Dam 1931, RKm 31), Clackamas (North Fork Dam 1958, RKm 50), Hood (Powerdale Dam 1929, RKm 7), and Sandy (Marmot Dam 1912, RKm 48; Bull Run River dams in the early 1900s) rivers (WDF and WDW 1993, Kostow 1995).

Hatchery programs to enhance chinook salmon fisheries in the lower Columbia River began in the 1870s, expanded rapidly, and have continued throughout this century. Although the majority of the stocks have come from within this ESU, over 200 million fish from outside the ESU have been released since 1930. Available evidence indicates a pervasive influence of hatchery fish on natural populations throughout this ESU, including both spring- and fall-run populations (Howell et al. 1985, Marshall et al. 1995). In addition, the exchange of eggs between hatcheries in this ESU has led to the extensive genetic homogenization of hatchery stocks (Utter et al. 1989).

Hatchery production in the lower Columbia has been reduced substantially in recent years largely due to budget cuts. Releases of tule fall chinook in the lower Columbia have been reduced by about half since the mid-90s. Hatchery production programs in the lower Columbia and throughout the basin are now the subject of an ongoing consultation which should address, at least in the long-term, the adverse affects of hatchery practices on the ESU.

There are only two or three self-sustaining natural populations of tule chinook in the Lower Columbia River (Coweeman, East Fork Lewis, and possibly Clackamas) that are not substantially influenced by hatchery strays. Recent 5 and 10 year average escapements to the Coweeman are about 900 and 600, respectively compared to an interim natural escapement goal of 1000 (pers. comm., from G. Norman, WDFW to P. Dygert NMFS, February 22, 1999) although escapements in 1998 and 1999 averaged only about 125. The East Fork Lewis has two peak spawn times with the earlier fish believed to represent the tule component of the ESU. Escapements have been stable, but average only about 125 fish over the last five years. The status of the Clackamas stock is uncertain, but may also be supported in part by hatchery strays. There is some natural spawning of tule fall chinook in the Wind and Little White Salmon Rivers, tributaries above Bonneville Dam (the only component of the ESU that is affected by tribal fisheries). Although there may be some natural production in these systems, the spawning results primarily from hatchery-origin strays.

The LCR bright stocks are one of the few healthy natural chinook stocks in the Columbia River Basin. Escapement to the North Fork Lewis River has exceed its escapement goal of 5,700 by a substantial margin every year since 1980 with a recent five year average escapement of 10,000. The escapement in 1999 was about 3,200, substantially below goal for the first time in 20 years or more. The expected escapement in 2000 is only about 2,200, again well below goal. The low returns in 1999 and 2000 have been attributed to severe flooding that occurred in 1995 and 1996 although there are indications broader declines in productivity that merit continued monitoring.

There are two smaller populations of LCR brights in the Sandy and East Fork Lewis River. Average run sizes in the Sandy have averaged about 1,100 and been stable for the last 10-12 years. There is also a late spawning component in the East Fork Lewis that is comparable in timing to the other bright stocks. Escapements to the East Fork have averaged only about 110 over the last five years, but have been relatively stable (range 52-167).

Available results from the CRI analysis are equivocal. This ESU is more complicated than most in that it is comprised of many stocks with one of three different life history types. Lambda for the ESU as a whole was 1.074 indicating positive population growth. However, the estimate is confounded because it is derived from this aggregation of stocks with different life histories, many of which are believed to be influenced substantially by hatchery strays. Three of the individual stocks included in the CRI analysis are the East Fork Lewis tule stock, and North Fork Lewis and Sandy River bright stocks which, as discussed above, are considered largely free of hatchery strays. The lambda values for these stocks ranged around 1 (0.975, 1.006, and 0.946, respectively) indicating that little change in the population growth rates is needed to meet the probability objectives associated with the risk metrics. The 24 year extinction and 90% decline probabilities were all quite low indicating little risk of near-term extinction, but the probabilities associated with the 100 year extinction and decline metrics were, at least in some cases, substantial (Table 3).

2. Steelhead

Steelhead stocks in the Columbia Basin have traditionally been distinguished as summer or winter-run stocks based on state of sexual maturity and time of river entry. All native fish returning to the Upper Willamette have a late winter-run return timing. Steelhead returning to the LCR are primarily winter-run fish while those returning to the MCR are primarily summer-run fish. All steelhead returning to the UCR and SRB ESUs are considered summer-run steelhead. The return timing of winter steelhead to Bonneville Dam is between November 1 and March 31 with fish return to lower river tributaries during the same time frame. Winter-run fish returning to the Upper Willamette, LCR, and MCR ESUs are therefore largely unaffected by the proposed fall season fisheries which occur primarily from August through October.

Summer-run steelhead are divided further as A-run and B-run steelhead based on size and age differences and run timing. Hatchery and natural-origin stocks can be readily distinguished based on scale patterns or the adipose fin clip that is applied to virtually all hatchery-origin fish in the Columbia Basin. ESU designations, based in part on genetic affinities, do not correspond with these traditional stock divisions. As indicated above, some of the ESUs are a mix of summer and winter-run fish. All B-run steelhead return to the Snake River, but the Snake has A-run steelhead too which are all part of the SRB ESU. Because of past practice, management data bases are aligned with these more traditional designations. Only in the last couple of years in response to recent listings have managers sought to assess harvest mortality by ESU or looked at other methods that allow different or finer levels of stock resolutions. The transition in assessment techniques is underway, but is not yet complete. Initial efforts using Genetic Stock Identification (GSI) techniques have been promising, but will require at least another year or two of assessment and development before it can be considered for use as a management alternative.

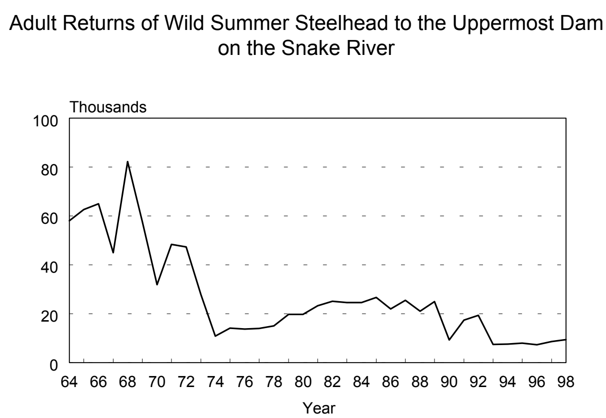
Prior to the 1999 fall season TAC completed a review of information related to the biology and harvest of steelhead in the fall season fisheries with particular emphasis on alternative methods for measuring harvest related mortality. Based on this review, and assuming that there is an intention to manage specifically for the more sensitive components of the composite of wild steelhead in the basin, TAC recommended that steelhead mortality in fall season fisheries be assessed using a simplified method that differentiates between hatchery and wild fish and then further distinguishes based on length between small and large fish using a 77.5 cm threshold. This would replace the date and length methods that were used previously to distinguish between A and B-run steelhead (TAC 1999). The smaller summer run fish are all considered A-run steelhead and these too must be allocated among the various steelhead ESUs. At this point this is done using average proportional run sizes from the TAC run reconstruction data base.

This revised method is intended to resolve long standing concerns and debate about the date and length methods that were used previously to differentiate between A and B-run steelhead both in terms of run size and catch accounting. The method is an improvement in that it requires fewer assumptions and relies on a physical property (i.e., fish length) that can be mapped directly back to the populations of greatest concern. As discussed below, B-run steelhead are at substantial risk because of their current depressed status. Upon review TAC confirmed the prior observation that the fish returning to the traditional B-run tributaries were predominately large fish (defined as greater than 77.5 cm). These larger fish are more vulnerable to the fall season fisheries because their large size makes them more susceptible to capture in gillnets and because their timing is coincident with that of the upriver chinook that are being targeted. A management system that focuses on large fish therefore also properly focuses on the most vulnerable component of the run. Small fish benefit from this management approach too as they are subject to lower harvest rates due to their smaller size and earlier timing.

Snake River Basin Steelhead

The longest consistent indicator of Snake Basin steelhead abundance is based on counts of natural-origin steelhead at the uppermost dam on the lower Snake River. Abundance of natural-origin summer steelhead at the uppermost dam on the Snake River has declined from a 4-year average of 58,300 beginning in 1964 to an average of 8,300 ending in 1998. The general pattern has included a sharp decline in abundance in the early 1970's, modest rebuilding from the mid-1970's through the 1980's, and second period of decline during the decade of the 1990's (Figure 1). The return of natural-origin steelhead to Lower Granite Dam in 1999 was 11,100.

Figure 1.



These broad scale trends in the abundance of steelhead have been reviewed recently through the PATH process. The report concluded that the initial substantial decline was coincident with the declining trend in downstream passage survival. However, the more recent decline in abundance observed over the last decade or more is not coincident with declining passage survival but can be at least partially accounted for by a shift in climatic regimes which has affected ocean survival (Marmorek 1998, NMFS 1999d).

The available data allows us to distinguish the abundance of the A-run and B-run components of Snake Basin steelhead only since 1985. Both components have declined through the 90's, but the decline for B-run steelhead has been the most significant. The 4-year average counts at LGD declined from 18,700 to 7,400 beginning in 1985 for A-run steelhead and from 5,100 to 900 for B-run steelhead. Counts over the last five or six years have been stable for A-run steelhead and without significant trend (Figure 2). Counts for B-run steelhead have been low and highly variable, but also without apparent trend (Figure 3). The returns of natural-origin steelhead to Lower Granite Dam in 1999 were 10,200 and 900, respectively (ODFW/WDFW 2000). The predicted return for 2000 is similar to the 1999 return for A-run steelhead, but about three times higher than the return observed in recent years for B-run fish.

Figure 2.

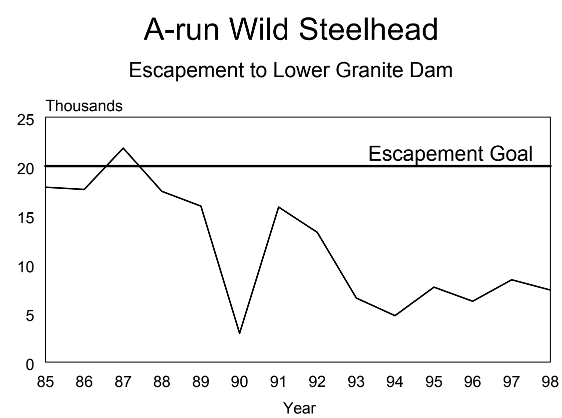
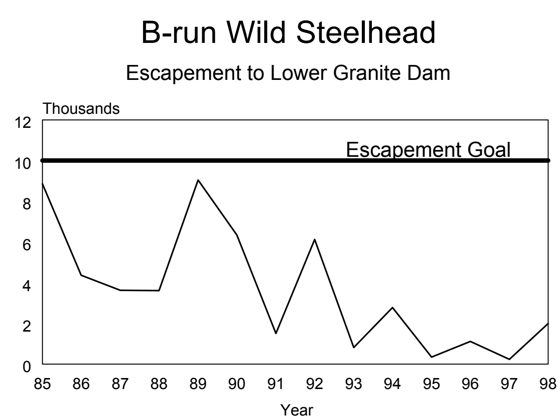


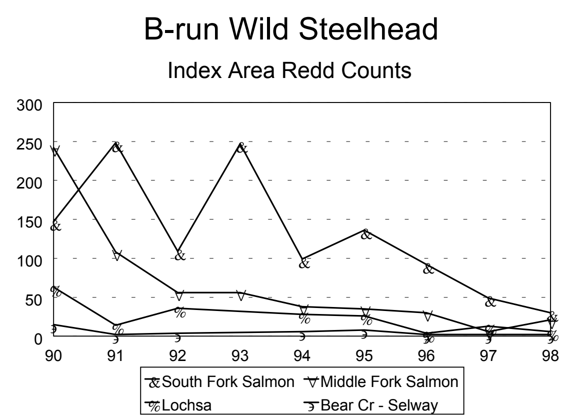
Figure 3.



Comparison of recent dam counts with escapement objectives provides perspective regarding the status of the ESU. The management objective from the CRFMP for Snake River steelhead was to return 30,000 natural/wild steelhead to LGD. The All Species Review (TAC 1997) further clarifies that this objective is subdivided into 20,000 A-run and 10,000 B-run steelhead to LGD. Idaho has reevaluated these escapement objectives using estimates of juvenile production capacity. This alternative methodology lead to estimates of 22,000 for A-run and 31,400 for B-run steelhead (pers. comm., S. Keifer, IDFG. with P. Dygert, NMFS).

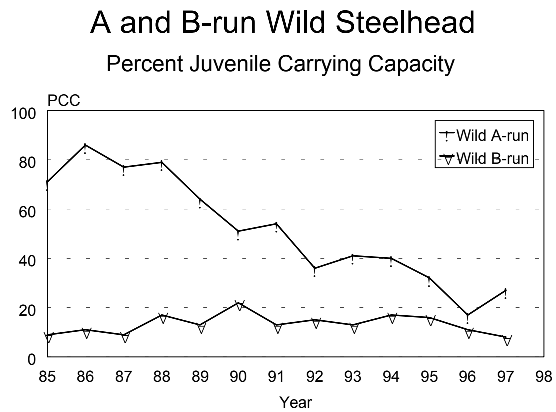
The State of Idaho has conducted redd count surveys in all of the major subbasins since 1990. Although the surveys are not intended to quantify adult escapement they can be used as indicators of relative trends. The sum of redd counts in natural-origin B-run production subbasins declined from 467 in 1990 to 59 in 1998. The declines are evident in all four of the primary B-run production areas. Index counts in the natural-origin A-run production areas have not been conducted with sufficient regularity in place and time to similarly characterize the relative trend in escapement in A-run production areas.

Figure 4.



Idaho has also conducted surveys for juvenile abundance in index areas throughout the Snake River Basin since 1985. Parr densities of A-run steelhead have declined from an average of about 75% of carrying capacity in 1985 to an average of about 35% in recent years through 1995. Further declines were observed in 1996 and 1997. Parr densities of B-run steelhead have been low, but relatively stable since 1985 averaging 10-15% of carrying capacity through 1995. Parr densities in B-run tributaries in 1996 and 1997 declined further to 11% and 8%, respectively. Comparable information for more recent years is not currently available.

Figure 5.



It is apparent from the available data that B-run steelhead are much more depressed than the A-run component. In evaluating the status of the Snake Basin steelhead ESU it is pertinent to consider whether B-run steelhead represent a "significant portion" of the ESU. This is particularly relevant because the tribes have proposed in the past to manage the SRB steelhead ESU as a whole without distinguishing between components. Despite their reservations, the tribes' biological assessment does provide estimates of harvest rate for the ESU as a whole and for the A and B-run components.

It is first relevant to put the Snake Basin into context. The Snake Basin historically supported over 55% of total natural-origin production of steelhead in the Columbia Basin and now has approximately 63% of the Columbia Basin's natural production potential for natural-origin steelhead (Mealy 1997). B-run steelhead occupy four major subbasins including two on the Clearwater (Lochsa and Selway) and two on the Salmon River (Middle Fork and South Fork Salmon), areas that for the most part are not occupied by A-run steelhead. Some natural production of B-run steelhead also occurs in parts of the mainstem Clearwater and its major tributaries. There are alternative escapement objectives for B-run steelhead of 10,000 (CRFMP) and 31,400 (Idaho). B-run steelhead therefore represent at least 1/3 and as much as 3/5 of the production capacity of the ESU.

B-run steelhead are distinguished from the A-run component by their unique life history characteristics. B-run steelhead were traditionally distinguished as larger and older, later-timed fish that return primarily to the South Fork Salmon, Middle Fork Salmon, Selway, and Lochsa rivers. The recent review by TAC concluded that different populations of steelhead do have different size structures with populations dominated by larger fish (>77.5 cm) occurring in the traditionally defined B-run basins (TAC 1999). Larger fish occur in other populations throughout the basin, but at much lower rates. (Evidence suggests that fish returning to the Middle Fork Salmon and Little Salmon are intermediate in that they have a more equal distribution of large and small fish.)

B-run steelhead are also generally older. A-run steelhead are predominately age-1-ocean fish while most B-run steelhead generally spend two or more years in the ocean prior to spawning. The differences in ocean age are primarily responsible for the differences in the size of A and B-run steelhead. However, B-run steelhead are also thought to be larger at age than A-run fish. This may be due, at least in part, to the fact that B-run steelhead leave the ocean later in the year than A-run steelhead and thus have an extra month or more of ocean residence at a time when growth rates are generally at their greatest.

Historically there was a distinctly bimodal pattern of freshwater entry that was used to distinguish A-run and B-run fish. A-run steelhead were presumed to cross Bonneville Dam from June to late August while B-run steelhead enter from late August to October. TAC also reviewed the available information on timing and confirmed that the majority of large fish still have a later timing as counted at Bonneville with 70% of the larger fish crossing the dam after August 26, the traditional date method cutoff for separating A and B-run fish. The timing of earlier A-run fish has shifted somewhat later thereby reducing the timing separation that was so apparent in the 60's and 70's. However, TAC concluded that the timing of the larger, natural-origin B-run fish is unchanged (TAC 1999).

As pointed out above, the geographic distribution of B-run steelhead is restricted to particular watersheds within the Snake River Basin (areas of the mainstem Clearwater, Selway and Lochsa Rivers, South and Middle Forks of the Salmon River). Although recent genetic data are not yet available for steelhead populations in the Salmon River, the Dworshak NFH stock and natural populations in the Selway and Lochsa Rivers are the most genetically distinct populations of steelhead in the Snake River basin (NMFS, unpublished). In addition, the Selway and Lochsa River populations from the Middle Fork Clearwater appear to be very similar to each other genetically, and naturally produced rainbow trout from the North Fork Clearwater River (above Dworshak Reservoir) clearly show an ancestral genetic similarity to Dworshak NFH steelhead. The existing genetic data, the restricted geographic distribution of B-run steelhead in the Snake River basin, and the unique life history attributes of these fish (i.e. larger, older adults with a later distribution of run timing compared to A-run steelhead in other portions of the Columbia River Basin) clearly support the discrimination of B-run steelhead as a biologically significant and distinct component of the SRB ESU.

Another approach to assessing the status of an ESU being developed by NMFS is to consider the status of its component populations. For this purpose a population is defined as a group of fish of the same species spawning in a particular lake or stream (or portion thereof) at a particular season which to a substantial degree do not interbreed with fish from any other group spawning in a different place or in a the same place at a different season. Because populations as defined here are relatively isolated, it is biologically meaningful to evaluate the risk of extinction of one population independently from any other. Some ESUs may have only one population while others will have many. (The background and guidelines related to the assessment of the status of populations is described in a recent draft report discussing the concept of Viable Salmonid Populations (McElhany et. al. 2000).

The task of identifying populations within an ESU will require making judgements based on the available information. Information regarding the geography, ecology, and genetics of the ESU are relevant to this determination. Although NMFS has not compiled and formally reviewed all the available information for this purpose, it is reasonable to conclude at a minimum that each of the major subbasins in the ESU represent a population within the context of this discussion. A-run populations would therefore include at least the tributaries to the lower Clearwater, the upper Salmon River and its tributaries, the lower Salmon River and its tributaries, the Grand Ronde, Imnaha, and possibly the Snake mainstem tributaries below Hells Canyon Dam. B-run populations would include both the Middle Fork and South Fork Salmon River and the Lochsa and Selway which are major tributaries of the upper Clearwater, and possibly the B-run production areas in the mainstem Clearwater.

These basins are, for the most part, large geographical areas and it is quite possible that there is additional population structure within at least some of these basins. However, that has not been demonstrated to date and for the sake of this discussion we will assume that there are a minimum of five populations of A-run steelhead and five populations of B-run steelhead in the Snake River ESU. Table 4 shows the escapement objectives for A and B-run production areas in Idaho based on estimates of smolt production capacity.

Table 4. Adult steelhead escapement objectives based on estimates of 70% smolt production capacity.

A-run Production Areas		B-run Production Areas	
Upper Salmon	13,570	Mid Fk Salmon	9,800
Lower Salmon	6,300	Sth Fk Salmon	5,100
Clearwater	2,100	Lochsa	5,000
Grand Ronde	(1)	Selway	7,500
Imnaha	(1)	Clearwater	4,000
Total	21,970	Total	31,400

(1) Comparable estimates for Washington and Oregon populations are not available.

A comparison of measures of abundance to critical populations thresholds provides further perspective regarding the status of SRB populations. The VSP paper provides several rules of thumb that are intended to serve as guidelines for setting population specific threshold (McElhany et al. 2000). However, since they are general, and not population specific, threshold determinations for selected populations should be made by considering both the rules of thumb, and other more population-specific information.

The critical threshold guidelines were developed from a consideration of genetic, demographic, and spatial risk factors for each population. Genetic risks to small populations include the loss of genetic variation, inbreeding depression, and the accumulation of deleterious mutations. The risk posed to a population by genetic factors is often expressed relative to the effective population size (N_b), or the size of an idealized population that would produce the same level of inbreeding or genetic drift that is seen in an observed population. Guidance from the VSP paper suggests that population sizes of 167-1,667 per generation (N_b = 50-500) are at high to very high risk. The population size range per generation was converted to an annual spawner abundance range of 42-417 by dividing by four, the approximate generation length for chinook stocks.

The Biological Requirements Work Group (BRWG 1994) took genetic considerations and other factors into account in their effort to provide guidance with respect to a lower population threshold for Snake River spring/summer chinook. They recommended that annual escapements of 150 and 300, for small and large populations, represented levels below which survival becomes increasingly uncertain due to various risk factors and lack of information regarding populations responses at low spawning levels.

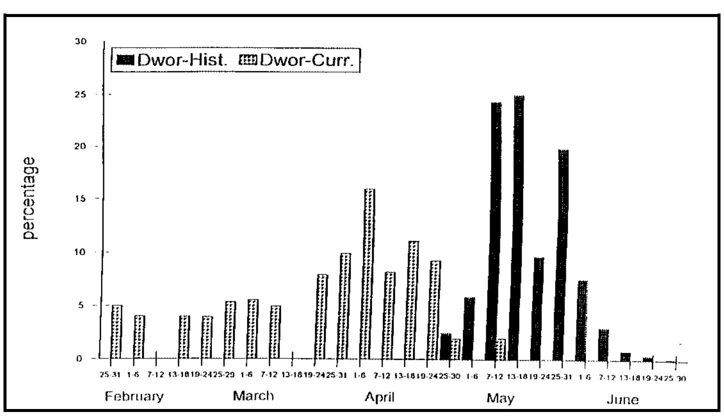
For specific populations, the default values should be modified on the basis of relevant factors including the spatial structure of spawning aggregations and the relationship of abundance to spawners per stream kilometer. In this case, the number of populations was estimated conservatively and there may well be a finer level of resolution in the populations structure of the ESU. Even if not these are large geographic areas with spawning capacities in excess of 10,000 fish in some cases. This case specific application would suggest that critical population thresholds should be set at the high end of the range of 42-417 for average annual spawner abundance.

The average count of natural-origin A-run steelhead over the last five years is 8,000. Absent specific information of how these fish may have distributed themselves between subbasins or populations, we can assume that they are distributed either equally among the five production areas or in proportion to the respective subbasin production capacities. Comparable estimates of production capacities for the Imnaha and Grande Ronde are not available, but an equal distribution of spawners would result in a return of 1,600 spawners per population. This analysis suggests that A-run steelhead, though depressed, are probably above critical threshold.

The average return to Lower Granite of natural-origin B-run steelhead over the last five years is about 900 fish. Average escapement per population is 180 if the fish are presumed to distribute equally among the five populations. If the fish distribute in proportion to the respective subbasin capacities, the return to each would range between 114 and 281. This analysis suggests that B-run steelhead have been returning below critical threshold levels in recent years.

Hatchery populations, if genetically similar to their natural-origin counter parts, provide a safeguard against the short-term risk of extinction of the natural populations although the associated long-term risks are less clear. The Imnaha and Oxbow hatchery stocks are A-run stocks currently included in the SRB steelhead ESU. The Pahsimeroi and Wallowa hatchery stocks may also be appropriate and available for use in developing supplementation programs. NMFS has required in their recent Biological Opinion on hatchery operations in the Columbia River Basin that this program begin to transition to a local-origin broodstock to provide a source for future supplementation efforts in the lower Salmon River (NMFS 1999b). The other stocks provide more immediate opportunity to initiate supplementation programs at least within some basins. However, it may also be necessary and desirable to develop additional broodstocks that can be use for supplementation in other natural production areas. Despite uncertainties related to the likelihood that supplementation programs can accelerate the recovery of naturally spawning populations, these hatchery stocks do provide a safeguard against the further decline of natural-origin populations.

There is one B-run hatchery stock in the Snake Basin located at the Dworshak NFH. The Dworshak stock was developed from natural-origin steelhead from within the North Fork Clearwater, is largely free of introductions from other areas, and was included as part of the ESU although not part of the listed population. However, past hatchery practices and possibly changes in flow and temperature conditions related to Dworshak Dam have lead to substantial divergence in spawn timing compared to what was observed historically in the North Fork Clearwater, and to natural-origin populations in other parts of the Clearwater Basin. The spawn timing of hatchery stocks is much earlier than it was historically (Figure 6) and this may limit the success of supplementation efforts. Past supplementation efforts in the South Fork Clearwater River using this stock have been largely unsuccessful, although better out planting practices may yield different results. In addition, the unique genetic character of Dworshak Hatchery steelhead noted above will limit the degree to which the stock can be used for supplementation in other parts of the Clearwater and particularly in the Salmon River B-run basins. Supplementation efforts in those areas, if undertaken, will more likely have to rely on the development of local broodstocks which do not exist at this time. Supplementation opportunities in many of the B-run production areas will be limited in any case because of logistical difficulties in getting to and working in these high mountain, wilderness areas. Opportunities to accelerate the recovery of B-run steelhead through supplementation even if successful are therefore limited. Maximizing escapement of natural-origin steelhead in the near term is therefore essential.



The estimated growth rate or lambda for SRB steelhead is 0.965. The stock-specific estimates for the A and B-run components are 0.984 and 0.959, respectively. The probabilities of extinction and 90% decline in abundance over the next 24 years are all at or close to 0.00 indicating that there is little short-term risk of extinction. However, the probabilities of extinction and decline for B-run steelhead for the 100 year time frame are 0.25 and 0.98, respectively, (Table 3), indicating a significant risk if actions are not taken to improve past survival conditions.

Upper Columbia River

The return of UCR natural-origin steelhead to Priest Rapids dam has declined from a 4-year average of 2,900 beginning in 1986/87 to 900 at present although the escapement as indicated by counts at Priest Rapids Dam have been stable, ranging between 800-900, for the last six years. The escapement goal for natural-origin fish is 4,500. UCR hatchery steelhead are included in the ESU and are also listed as endangered. The hatchery component is relatively abundant and routinely exceeds hatchery supplementation program needs by a substantial margin. The naturally spawning population of UCR steelhead have been augmented for a number of years by stray hatchery fish that have spawned naturally. Replacement ratios for naturally spawning fish (natural-origin and hatchery strays) are quite low, on the order of 0.3. This very low return rate suggests either that the productivity of the system is very low and the hatchery strays are largely supporting the population, or that the natural-origin fish are returning at or just below the replacement rate and the hatchery strays are not contributing substantially to subsequent adult returns. Obviously the truth likely lies somewhere between the extremes. This is a good example of the fundamental uncertainty related to the contribution of hatchery-origin fish that has emerged from the CRI analysis. The presence of hatchery-origin fish on the spawning grounds and our uncertainty about their contribution to future returns confounds our ability to assess the current productivity of the system and, therefore, how much it must be improved to achieve survival and recovery objectives.

Because of concerns related to the low abundance of some of the populations and apparent shortfalls in system productivity, NMFS has authorized several steelhead supplementation programs in the upper Columbia River Basin. Efforts are underway to diversify broodstocks used for supplementation in an effort to minimize the differences between hatchery and natural-origin fish and to minimize the concerns associated with supplementation. NMFS expects that the supplementation program will benefit the listed fish due to the early life history survival advantage expected from the hatchery action. However, there are also substantive concerns about the long term effect on the fitness of natural-origin populations resulting from continuous long term infusion of hatchery-influenced spawners (Busby et al. 1996). In summary, the hatchery component of the UCR listed steelhead is relatively abundant with a stable population, while the natural component is depressed. It is hoped that supplementation efforts can be used to prevent further declines in abundance until the necessary improvements in system productivity take effect.

The estimated growth rate or lambda for UCR steelhead is 0.866. The estimated probability of extinction in 24 years is low, but the risk of 90% decline in abundance over the next 24 years is 0.97. The probabilities of extinction and decline for the ESU for the 100 year time frame are both 1.00 (Table 3) clearly indicating a significant risk if actions are not taken to improve past survival conditions.

Middle Columbia River

The Middle Columbia steelhead ESU occupies the Columbia River Basin from Mosier Creek, OR, upstream to the Yakima River, WA, inclusive (61 FR 41541; August 9, 1996). Steelhead from the Snake River Basin (described elsewhere) are excluded. This ESU includes the only populations of inland winter steelhead in the United States, in the Klickitat River and Fifteenmile Creek (Busby *et al*. 1996). Two hatchery populations are included in this ESU, the Deschutes River stock and the Umatilla River stock; listing for these stocks was not considered warranted.

The ESU is in the intermontane region and includes some of the driest areas of the Pacific Northwest, generally receiving less than 40 cm of rainfall annually (Jackson 1993). Vegetation is of the shrub-steppe province, reflecting the dry climate and harsh temperature extremes. Because of this habitat, occupied by the ESU, factors contributing to the decline include agricultural practices, especially grazing, and water diversions/withdrawals. In addition, hydropower development has impacted the ESU through loss of habitat above hydro projects, and mortalities associated with migration through the Columbia River hydro system.

Life history information for steelhead of this ESU indicates that most MCR steelhead smolt at 2 years and spend 1 to 2 years in salt water (i.e., 1-ocean and 2-ocean fish, respectively) prior to re-entering fresh water, where they may remain up to a year prior to spawning (Howell et al., 1985). Within this ESU, the Klickitat River is unusual in that it produces both summer and winter steelhead, and the summer steelhead are dominated by 2-ocean steelhead, whereas most other rivers in this region produce about equal numbers of both 1-and 2-ocean steelhead.

Within the ESU, the Yakima, Umatilla and Deschutes River basins have shown an overall upward trend, although all tributary counts in the Deschutes River are downward and the Yakima River is recovering from extremely low abundance in the early 1980s. The John Day River probably represents the largest native, natural spawning stock in the ESU, and the combined spawner surveys for the John Day River have been declining at a rate of about 15 percent per year since 1985. However, estimates based on dam counts show an overall increase in steelhead abundance, with a relatively stable naturally-produced component. The NMFS, in proposing this ESU be listed as threatened under the ESA, cited low returns to the Yakima River, poor abundance estimates for Klickitat River and Fifteenmile Creek winter steelhead, and an overall decline for naturally-producing stocks within the ESU.

Hatchery fish are widespread and stray to spawn naturally throughout the region. Recent estimates of the proportion of natural spawners with hatchery origin range from low (Yakima

River, Walla Walla River, John Day River) to moderate (Umatilla River, Deschutes River). Most hatchery production in this ESU is derived primarily from within-basin stocks. One recent area of concern is the increase in the number of Snake River hatchery (and possibly wild) steelhead that stray and spawn naturally within the Deschutes River Basin. Studies have been proposed to evaluate, hatchery programs within the Snake River Basin that have shown high rates of straying into the Deschutes River, and to make changes to minimize straying to rivers with in the Middle Columbia River ESU.

The estimated growth rate or lambda for the MCR steelhead ESU is 0.882. The MCR ESU includes both winter and summer run stocks. Lambda values for the summer stocks included in the analysis range from 0.901 to 1.077 (Table 3). The estimated probability of extinction in 24 years for all of the stocks is low, but the risk of 90% decline in abundance over the next 24 years is greater than 0.50 for four out of the seven stocks. The probabilities of extinction in 100 years are near 1.0 for three of the seven stocks; the probability of 90% decline in 100 years are high for all but one of the seven stocks indicating that the ESU is at significant risk if actions are not taken to improve past survival conditions.

Lower Columbia River

The Lower Columbia River ESU includes naturally-produced steelhead returning to Columbia River tributaries on the Washington side between the Cowlitz and Wind rivers in Washington and on the Oregon side between the Willamette and Hood rivers, inclusive. In the Willamette River, the upstream boundary of this ESU is at Willamette Falls. This ESU includes both winter and summer steelhead. Two hatchery populations are included in this ESU, the Cowlitz Trout Hatchery winter-run stock and the Clackamas River stock (ODFW stock 122); listing for these hatchery populations was not considered necessary.

Available historical and recent Lower Columbia River steelhead abundance information is summarized in Busby *et al*. (1996). No estimates of historical (pre-1960s) abundance specific to this ESU are available. Because of their limited distribution in upper tributaries and the urbanization surrounding the lower tributaries (e.g., the lower Willamette, Clackamas, and Sandy Rivers run through Portland or its suburbs), summer steelhead appear to be at more risk from habitat degradation than are winter steelhead. The lower Willamette, Clackamas, and Sandy steelhead trends are stable or slightly increasing, but this is based on angler surveys for a limited time period, and may not reflect trends in underlying population abundance. Total annual run size data are only available for the Clackamas River (1,300 winter steelhead, 70% hatchery; 3,500 natural-origin summer steelhead).

The estimated growth rate or lambda for the LCR steelhead ESU is 0.952. The lambda estimates for the summer-run components of the ESU range from 0.861 to 1.019 (Table 3). The estimated probability of extinction in 24 years for all three of the stocks is 0.00, but the risk of 90% decline in abundance over the next 24 years is greater than 0.50 for four out of the seven stocks. The probabilities of extinction and 90% in 100 years are 1.00 for two of the three stocks again indicating that the ESU is at significant risk if actions are not taken to improve past survival conditions.

3. Chum Salmon

The Columbia River historically contained large runs of chum salmon that supported a substantial commercial fishery in the first half of this century. These landings represented a harvest of more than 500,000 chum salmon in some years. Currently chum salmon are limited to tributaries below Bonneville Dam, with the majority of fish spawning on the Washington side of the Columbia River. Many lower Columbia tributaries once produced chum, however, significant chum natural production is currently limited to just two areas: Grays River near the mouth of the Columbia River, and Hardy and Hamilton creeks that are just downstream of Bonneville Dam. Small numbers of adult chum salmon have been observed in several other lower Columbia River tributaries. A few chum cross Bonneville Dam in some years, but these are likely lost to the system as there are no known spawning areas above Bonneville Dam. Grays River chum salmon enter the Columbia River from mid-October to mid-November, but apparently do not reach the Grays River until late October to early December. These fish spawn from early November to late December. Fish returning to Hamilton and Hardy Creeks begin to appear in the Columbia River earlier than Grays River fish (late September to late October) and have a more protracted spawn timing (mid-November to mid-January).

Of the three primary populations in the lower Columbia River, Grays River and Hamilton Creek are considered depressed though not critical, while the Hardy Creek population is considered healthy (WDF and WDW 1993) based on long term escapement trends. Hymer (1993, 1994) and WDF and WDW (1993) monitored returns of chum salmon to three streams in the Columbia River and suggested that there may be a few thousand, perhaps up to 10,000, chum salmon spawning annually in the Columbia River basin.

The Grays River is located near the mouth of the Columbia River. Escapement to the Grays River has ranged from several hundred to over 5,000 over the last ten years. A hatchery supplementation program was initiated in the Grays River beginning in 1996 using native broodstock to help rebuild the population.

Hamilton Creek is located 3.0 miles below Bonneville Dam. There is only about 1 mile of spawning habitat in Hamilton Creek and its tributaries. Escapements have averaged less than 100 fish in recent years. The WDFW recently completed a major restoration effort on Spring Channel which is a spring fed tributary to Hamilton Creek that supports chum spawning.

Hardy Creek is located just downstream of Hamilton Creek. Chum spawn in the lower 1.5 miles of the stream. Annual escapements over the last 10 years have ranged from 22 to 1,153 spawners, but are generally increasing. Hardy Creek is now incorporated into the Pierce National Wildlife Refuge and has benefitted from recent habitat improvement programs as well.

Although current abundance is only a small fraction of historical levels, and much of the original inter-populational diversity has presumably been lost, the total spawning run of chum salmon to the Columbia River has been relatively stable since the mid 1950s, and total natural escapement for the ESU is probably at least several thousand fish per year.

The estimated lambda value for CR chum is 1.099 indicating that the population is growing. The probabilities associated with both the short and long-term extinction and 90% decline metrics are 0.00.

III. Environmental Baseline

Environmental baselines for biological opinions include the past and present impacts of all state, federal or private actions and other human activities in the action area, the anticipated impacts of all proposed federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of state or private actions which are contemporaneous with the consultation in process (50 CFR §402.02).

A. Status of the Species and Critical Habitat within the Action Area

The status of the affected ESUs is reflected by information on the size, variability, and stability of each the populations as discussed in the previous section. The designated critical habitat for all of the ESUs includes the freshwater areas within which it resides. The following section provides a general discussion of the status and factors affecting Columbia River Basin migration corridor and rearing areas.

B. Factors Affecting Species Environment Within the Action Area

The environmental baseline for this Biological Opinion includes the effects of several activities that affect the survival and recovery of threatened and endangered species in the action area. In addition to harvest activities, the activities having the greatest impact on the environmental baseline generally fall into three categories: hydropower system impacts on juvenile outmigration and adult return migration; habitat degradation effects on water quality and availability of adequate incubation and rearing locations; and adverse genetic and competitive impacts from artificial production programs.

There are two pending activities that will greatly affect the environmental baseline including completion of the Biological Opinion on the Federal Columbia River Power System (FCRPS) and the related “All-H paper”. The FCRPS Opinion and the All-H documents were released in draft on July 27, 2000, for state and tribal technical review. These documents should be finalized in the fall of 2000. The status and scope of the FCRPS opinion is discussed in more detail in the following section. The All-H paper, formally entitled “Conservation of Columbia Basin Fish – Building a Conceptual Recovery Plan,” was prepared by NMFS with the help of eight other

Federal agencies. The All-H paper is a conceptual, basin-wide recovery strategy for Columbia Basin salmon and steelhead. The paper recommends in general the measures necessary in hydropower, hatcheries, harvest and habitat to recover these fish. NMFS intends to follow the recommendations in the paper as it makes determinations under the ESA, for example in section 7 consultations with other Federal agencies.

However, critical parts of the analysis were ongoing as this opinion was being finalized. NMFS expects to rely on the FCRPS opinion and the associated All-H paper in the future. Because of the comprehensive nature and long-term scope of these products and the substantial uncertainties associated with the currently available CRI analysis, NMFS chose to continue to rely on harvest standards developed through recent consultations for this year and await the more definitive guidance that is anticipated before considering whether additional reductions in harvest may be required.

The following discussion reviews recent developments in each of the sectors, and outlines their anticipated impacts on natural conditions and the future performance of the listed ESUs. In developing conclusions with respect to the proposed action, NMFS has paid particular attention to the discussion of the species' status and population trends which reflect the additive effects of past and on-going human and natural factors leading to the current status of the species.

1. Hydropower Impacts

Columbia Basin salmonids, especially those above Bonneville Dam, have been dramatically affected by the development and operation of the Federal Columbia River Power System (FCRPS). Storage dams have altered the natural hydrograph of the Snake and Columbia Rivers, decreasing spring and summer flows and increasing fall and winter flows. Power operations cause fluctuation in flow levels and river elevations, affecting fish movement through reservoirs and riparian ecology and stranding fish in shallow areas. The eight dams in the migration corridor of the Snake and Columbia Rivers block smolt and adult migrations. Smolts experience a high level of mortality passing the dams. The dams also have converted the once-swift river into a series of slack-water lakes, slowing the smolts' journey to the ocean and creating habitat for predators.

There have been numerous changes in the operation and configuration of the FCRPS as a result of ESA consultations between the Action Agencies (BPA, Corps, BoR) and the Services (NMFS and USFWS). These have resulted in survival improvements for listed fish migrating through the Snake and Columbia rivers. Increased spill at all of the FCRPS dams allows smolts to avoid both turbine intakes and bypass systems. Increased flow in the mainstem Snake and Columbia rivers provides better inriver conditions for smolts. The transportation of smolts from the Snake River has also improved by the addition of new barges and modification of existing barges.

In addition to the flow, spill and transportation improvements, the Corps implemented numerous other improvements to project operations and maintenance at all Columbia and Snake river dams.

These improvements, such as operating turbines at peak efficiency, new extended length screens at McNary, Little Goose, and Lower Granite dams, and extended operation of bypass screens, are enumerated in greater detail in the 1995 FCRPS Biological Opinion (NMFS 1995b). The next FCRPS opinion, when completed, will provide further direction with respect to operation of the hydro power system in the near term, as well as decisions related to its long-term configuration.

It is difficult to quantify the survival benefits accruing from actions taken to date for each of the listed ESUs. For Snake River spring/summer chinook smolts migrating inriver, the estimated survival through the hydropower system is now between 40% and 60%, compared to an estimated survival rate during the 1970s of 20% to 40%. It is likely that Snake River steelhead have received a similar benefit as their life history and run timing is similar to that of spring/summer chinook. It is more difficult to obtain direct data and compare survival improvements for fish transported from the Snake River, but there are likely to be improvements for transported fish as well. It is reasonable to expect that the improvements in operation and configuration of the FCRPS will benefit all listed Columbia Basin salmonids and that the benefits will be greater the farther upriver the ESU. Nonetheless, because the Federal hydropower system is widely accepted to be the single greatest source of human-caused mortality for some ESUs, the additional improvements that are considered necessary will be specified in the forthcoming FCRPS opinion.

Several non-Federal, FERC-licensed projects also affect these 12 ESUs, most notably the five Public Utility District projects on the mainstem Columbia above the confluence with the Snake River (Wells, Rocky Reach, Rock Island, Wanapum, and Priest Rapids dams) and Idaho Power Company's Hells Canyon complex on the mainstem Snake River above Lower Granite Dam. All of these projects are the subject of ongoing formal consultations among NMFS, FERC, and the license-holders. Many of the ESUs are also affect by smaller tributary FERC projects or other water development projects. Many of these are also in various stages of consultation.

2. Habitat Impacts

The quality and quantity of freshwater habitat in much of the Columbia River basin has declined dramatically in the last 150 years. Forestry, farming, grazing, road construction, hydropower development, mining and urbanization have radically changed the historical habitat conditions of the basin. With the exception of fall chinook, 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. Anadromous fish typically spend from a few months to three years rearing in freshwater tributaries. Depending on the species, they spend from a few days to one or two years in the Columbia River estuary before migrating out to the ocean and another one to four years in the ocean before returning as adults to spawn in their natal streams. Thirty-two subbasins provide spawning and rearing habitat.

Water quality in streams throughout the Columbia River basin has been degraded by human activities such as dams and diversion structures, water withdrawals, farming and grazing, road construction, timber harvest activities, mining activities and urbanization. Over 2,500 streams and river segments and lakes do not meet federally-approved, state and tribal water quality standards under the Clean Water Act (CWA) and are now listed as water quality limited under Section 303(d). Tributary water quality problems contribute to poor water quality where sediment and contaminants from the tributaries settle in mainstem reaches and the estuary.

Most of the waterbodies in Oregon, Washington, and Idaho that are on the 303(d) list do not meet water quality standards for temperature. Temperature alterations affect salmonid metabolism, growth rate, and disease resistance and the timing of adult migrations, fry emergence, and smoltification. Many factors can cause high stream temperatures, but they are primarily related to land use practices rather than point-source discharges. Some common actions that result in high stream temperatures are the removal of trees or shrubs that directly shade streams and excessive water withdrawals for irrigation or other purposes combined with warm irrigation return flows. Loss of wetlands and increases in groundwater withdrawals have contributed to lower base-stream flows, which in turn contribute to temperature increases. Channel widening and land uses that create shallower streams also cause temperature increases.

Pollutants also degrade water quality. Salmon require clean gravel for successful spawning, egg incubation and emergence of fry. Fine sediments clog the spaces between gravel and restrict the flow of oxygen-rich water to the incubating eggs. Excess nutrients, low levels of dissolved oxygen, heavy metals, and changes in pH also directly affect the suitability of waters for salmon and steelhead.

Water quantity problems are also a significant cause of habitat degradation and reduced fish production. Millions of acres of land in the basin are irrigated. Although some of the water withdrawn from streams eventually returns as agricultural runoff or groundwater recharge, crops consume a large proportion. Withdrawals affect seasonal flow patterns by removing water from streams in the summer (mostly May through September) and restoring it to surface streams and groundwater in ways that are difficult to measure. Withdrawing water for irrigation, urban, and other uses can increase temperatures, smolt travel time, and sedimentation. Return water from irrigated fields can introduce nutrients and pesticides into streams and rivers.

On a larger landscape scale, human activities have affected the timing and amount of peak water runoff from rain and snowmelt. Forest and range management practices have changed vegetation types and density, which can affect timing and duration of runoff. Many riparian areas, flood plains, and wetlands that once stored water during periods of high runoff have become developed; urbanization paves over or compacts soil and increases the amount and pattern of runoff reaching rivers and streams.

Many tributaries have been significantly depleted by water diversions. Fish and wildlife agency, tribal, and conservation group experts estimated in 1993 that 80% of 153 Oregon tributaries had low-flow problems (two-thirds caused at least in part by irrigation withdrawals) (Oregon Water Resources Department 1993). The Council showed similar problems in many Idaho, Oregon and

Washington tributaries (NPPC 1992).

Blockages that stop the downstream and upstream movement of fish exist at many agricultural, hydropower, municipal/industrial, and flood control dams and barriers. Highway culverts that are not designed for fish passage also block upstream migration. Migrating fish are diverted into unscreened or inadequately screened water conveyances or turbines, resulting in unnecessary mortality. Whereas many fish-passage improvements have been made in recent years, manmade structures continue to block migrations or kill fish throughout the basin.

Land ownership has played a part in habitat and land use changes. Federal lands, which comprise 50% of the basin, are generally forested and influence upstream portions of the watersheds. Whereas there is substantial habitat degradation across all ownerships, in general, habitat in many headwater stream sections is in better condition than in the largely non-federal lower portions of tributaries (Doppelt et al. 1993, Frissell et al. 1993, Henjum et al. 1994; Quigley and Arbelbide 1997). In the past, valley bottoms were among the most productive fish habitats in the basin (Stanford and Ward 1992, Spence et al. 1996, ISG 1996). Today, agricultural and urban land development and water withdrawals have significantly altered the habitat and how fish and wildlife use these areas. Streams in these areas typically experience problems with high water temperatures, sedimentation, low flows, simplified stream channels and reduced riparian vegetation.

Mainstem habitats of the Columbia, Snake, and Willamette rivers have been affected by impoundments that have inundated large amounts of spawning and rearing habitat. Historically, fall chinook salmon spawned in mainstem reaches from near The Dalles, Oregon, upstream to the Pend Oreille and Kootenai rivers in Idaho, to the Snake River downstream of Shoshone Falls and from the mouth of the Snake River upstream to Grand Coulee Dam. Current mainstem production areas for fall chinook are mostly confined to the Hanford Reach of the mid-Columbia River and to the Hells Canyon Reach of the Snake River, with minor spawning populations elsewhere in the mid-Columbia, below the lower Snake River dams, and below Bonneville Dam. Hanford Reach is the only known mainstem spawning area for steelhead. Chum salmon habitat in the lower Columbia may also have been inundated by Bonneville reservoir. Mainstem habitat in the Columbia, Snake, and Willamette rivers has been reduced, for the most part, to a single channel, flood plains have been reduced in size, off-channel habitat features have been lost or disconnected from the main channel, and the amount of large woody debris (large snags/log structures) in rivers has been reduced. Most of the remaining habitats are impacted by flow fluctuations associated with reservoir management.

The Columbia River estuary has also been changed by human activities. Historically, the downstream half of the estuary was a dynamic environment with multiple channels, extensive wetlands, sandbars and shallow areas. The mouth of the Columbia River was about 4 miles wide. Winter and spring floods, low flows in late summer, large woody debris floating downstream and a shallow bar at the mouth of the Columbia River kept the environment dynamic. Today, navigation channels have been dredged, deepened and maintained, jetties and pile dike fields have been constructed to stabilize and concentrate flow in navigation channels, marsh and riparian habitats have been filled and diked, and causeways have been constructed across waterways. These actions have decreased the width of the mouth of the Columbia River to 2 miles and increased the depth of the Columbia River channel at the Bar from less than 20 to more than 55 feet. Sand deposition has extended the Oregon coastline, at the mouth, approximately 4 miles seaward and the Washington coastline, at the mouth, approximately 2 miles seaward (Thomas 1981).

More than 50% of the original marshes and spruce swamps in the estuary have been converted to industrial, transportation, recreation, agricultural, or urban uses and more than 3,000 acres of intertidal marsh and spruce swamps have been converted to other uses since 1948 (Lower Columbia River Estuary Program 1999). Many wetlands along the shore in the upper reaches of the estuary have been converted to industrial and agricultural lands after levees and dikes were constructed. Further, water storage and release patterns from reservoirs upstream of the estuary have changed the seasonal pattern and volume of discharge. The peaks of spring-summer floods have been reduced and the amount of water discharged during winter has increased.

There is a broad range of current habitat programs. Because most of the basin's anadromous fish habitat is in Federal ownership, Federal land management programs are of primary importance. Current management is governed by PACFISH and associated biological opinions, an interim strategy that covers the majority of the basin accessible to anadromous fish, and that has specific prescriptions designed to halt habitat degradation.

There are also a large number of non-Federal habitat programs. However, because non-Federal habitat is managed predominately for private rather than public purposes, current expectations for non-Federal habitat are harder to assess. Long-term projections beyond the next ten years are largely speculative.

3. Hatcheries

Artificial production can adversely affect salmonids in a number of ways. Taking naturally produced fish for broodstock can deplete the naturally spawning populations; interbreeding between hatchery fish and naturally spawned fish can reduce the genetic fitness of the natural fish; hatchery fish can transmit diseases to natural populations; and hatchery fish compete with naturally spawned fish for space and food. NMFS has recently completed a reinitiated consultation that covers species listed through 1998 (NMFS 1999c). NMFS expects to further consider hatchery operations shortly with respect to their affect on the most recently listed ESUs. As a result, hatchery management is undergoing substantial reform to reprioritize objectives to the benefit of natural-origin stocks. For example, many non-indigenous stocks are being phased out of production and replaced with locally adapted stocks. Release locations and strategies are being modified to reduce straying into natural production areas. The total number of hatchery fish released has been reduced by 26% since 1994 thus reducing the potential for competition and disease transmission that may adversely affect natural-origin fish.

It is especially difficult to quantify the benefits of improvements in artificial production throughout the Basin, but it is reasonable to expect that the listed ESUs will benefit over time from these improvements.

4. Harvest

There is some harvest to listed species considered in the opinion that occurs within the action area, but outside the scope of the proposed fall season fisheries. This includes Indian and non-Indian harvest during the 2000 winter, spring, and summer season fisheries covered under an earlier biological opinion (NMFS 2000b), and tributary recreational fisheries that are being considered separately under section 4d of the ESA. The harvest rates associated with these fisheries are summarized in Table 5.

Table 5. Expected harvest rates to listed salmonids that will occur within the action area, but outside the scope of proposed fall season fisheries. Included are impacts to listed salmonids in 2000 Columbia River Basin winter, spring, and summer season fisheries, by ESU, as described in the 2000 winter/spring/summer fisheries biological opinion and the 2000 Snake River fisheries biological assessment for Treaty Indian and Non-Indian. Also shown are impacts associated with tributary recreational steelhead fisheries. (NA - estimates not available.)

ESU	Non-Indian fisheries		Treaty Indian fisheries
	(wtr/spr/sum)	Tributary fisheries	(wtr/spr/sum)
Lower Columbia River chinook	1.8%[a]	NA	0
Snake River steelhead			
A-run	0.2%	2.5%[c]	2.2%[b]
B-run	0	2.5%[c]	[b]
Upper Columbia River steelhead			
Naturally-produced	0.5%	0	3.2%
Hatchery-produced	5.1%	0	2.1%
Mid-Columbia River steelhead	0.3%	NA	3.3%
Lower Columbia River steelhead	0.8%	NA	1.0%
Columbia River chum	0	[d]	0
Snake River sockeye	0	0	0

[a] Spring component of the LCR ESU only.
[b] B-run steelhead of the current return year are primarily caught in fall season fisheries. However, a portion of the summer steelhead run holds over in the lower Columbia River above Bonneville dam until the following winter and spring; these fish, thought to be mostly A-run, are caught in fisheries in those seasons.
[c] Maximum harvest rate applied to wild fish passing through terminal fishery areas where hatchery fish are being targeted; hooking mortality of 5% applied to an assumed 50% encounter rate. Harvest rates to stocks not passing through targeted terminal fishing areas will be less.
[d] Chum may be taken occasionally in tributary fisheries below Bonneville Dam. Retention is prohibited.

C. Harvest Activities Affecting Species Outside the Action Area

1. Chinook

Snake River Fall Chinook

Although consultation related to PFMC salmon fisheries and those that occur in Southeast Alaska and Canada are considered in separate biological opinions, ocean fisheries in general have all been subject in recent years to the same ocean fishery jeopardy standard for SR fall chinook. The combined ocean fisheries are required to achieve a 30% reduction in the average 1988-93 base period exploitation rate (ER) on SR fall chinook.

In recent years, there have been substantial reductions ocean fisheries in general, and in Canadian fisheries in particular. As a result, the ER reduction for combined ocean fisheries has met and exceeded the prescribed standard for Snake River fall chinook (PFMC 1999). The base period reduction in combined ocean fisheries has averaged 37% since 1996. The expected base period reduction for the combined 2000 ocean fisheries is 45% (Simmons, D. NMFS, pers. com., w/ P. Dygert, NMFS, July 20, 2000).

Lower Columbia River Chinook

The LCR chinook ESU includes spring, tule, and bright components. The ERs for each of these components resulting from 2000 ocean fisheries are reported in the recent Biological Opinion regarding 2000 PFMC fisheries (NMFS 2000c). The spring component of the LCR ESU will not be affected by the fall season fisheries being considered as part of this proposed action. The expected ER on tule stocks is 29.4% for all ocean fisheries combined including 18.8% in PFMC fisheries. The ocean ER on LCR bright stocks is expected to be 13.9% including 4.3% in PFMC fisheries. Because of anticipated low returns of LCR bright stocks in 2000, the states designed their fisheries with a harvest rate objective of less than 10% for the combined PFMC and inriver fisheries that are subject to their control. Both the ocean and inriver fisheries were shaped to meet this overall objective. NMFS concluded that the 2000 ocean fisheries were not likely to jeopardize their continued existence as discussed in the opinion on the fishery (NMFS 2000c).

2. Steelhead

Steelhead are rarely caught in ocean fisheries and are thus not considered a significant source of mortality to any of the listed steelhead ESUs considered in this opinion (NMFC 2000b).

3. Chum Salmon

Chum salmon are not caught in ocean salmon fisheries off the Washington, Oregon, and California coast managed by the Pacific Fishery Management Council (PFMC) (NMFS 2000c). There are fisheries directed at chum in Puget Sound and in Canada and Alaska that generally target maturing fish returning to nearby terminal areas in the fall. We have no specific information on the ocean distribution of LCR chum salmon, but given the timing and distant location of fisheries directed at chum, it is unlikely that LCR chum are significantly affected by ocean fisheries.

D. Natural Factors Causing Variability in Population Abundance

Changes in the abundance of salmon and steelhead populations are a result of variations in freshwater and marine environments. Large scale changes in climatic regimes, such as El Niño, likely affect changes in ocean productivity; much of the Pacific coast was subject to a series of very dry years during the first part of the decade which adversely affected some the stocks. In more recent years, severe flooding has adversely affected some stocks. For example, the low return of Lewis River bright fall chinook in 1999 and anticipated low return in 2000 is attributed, at least in part, to flood events during both 1995 and 1996. The unexpectedly low return of Snake River fall chinook in 1998 may also have been related to flooding early in 1995 which would have affected the 1994 brood year, the primary contributor to the 1998 return.

Recent information suggests that avian predation is a significant source of juvenile mortality. A recent increase in several avian populations in the lower Columbia River has resulted in high levels of predation on smolts. The world's largest colony of Caspian terns and the two largest colonies of double-crested cormorants on the west coast of North America have recently become established in the Columbia estuary. The tern colony alone is estimated to take between 6 and 25 million smolts annually. Total predation impacts are estimated to be in the range of 10 to 30 percent of all salmonid smolts that reach the estuary. NMFS biologists estimate that one to three million smolts of listed or proposed species are being taken from the estuary annually by avian predators. This smolt loss may represent more than 30,000 adults of listed species that are lost to future spawning escapements. Two smaller tern colonies, several large gull colonies and cormorants living on islands in the upstream hydropower reservoirs consume additional millions of smolts. Nonetheless, it is reasonable to expect that ocean conditions are cyclic and will eventually improve. It is also reasonable to expect that current efforts to relocate the bird populations will eventually reduce the avian predation. These conditions, however, may be currently creating a survival bottleneck for many listed populations.

Salmonids are exposed to high rates of natural predation, particularly during freshwater rearing and migration stages. Ocean predation likely also contributes to significant natural mortality, although the levels of predation are largely unknown. In general, salmon are prey for pelagic fishes, birds, and marine mammals, including harbor seals, sea lions, and killer whales. There have been recent concerns that the rebounding of seal and sea lion populations, following their protection under the Marine Mammal Protection Act of 1972, has resulted in substantial mortality for salmonids. In recent years, for example, sea lions have learned to target Upper Willamette River (UWR) spring chinook at Willamette Falls and have gone so far as to climb into the fish ladder where they can easily pick-off migrating spring chinook. In past years, steelhead have been targeted by sea lions at the Ballard Locks in Puget Sound which substantially reduced the critically low abundance of the effected populations.

A key factor that has substantially affected many west coast salmon and steelhead stocks has been the general pattern of long-term decline in ocean productivity. The mechanism whereby stocks are affected is not well understood. The pattern of response to these changing ocean conditions has differed between stocks, presumably due to differences in their timing and distribution. It is presumed that ocean survival is driven largely by events between ocean entry and recruitment to a sub-adult life stage. One indicator of early ocean survival can be computed as an index of coded wire tag (CWT) recoveries at age 2 relative to the number of CWTs released from that brood year. The survival indices for Upper Willamette River spring chinook and Lewis River fall chinook differ in detail, but both show a highly variable or declining trend in early ocean survival with very low survivals in recent years (Figures 7 and 8). As discussed above, evidence regarding the decline in steelhead abundance in the Columbia River Basin since the mid-80s is most consistent with the suggested relationship with declining ocean productivity.

Recent information suggests that ocean conditions may be improving and there are some biological indicators to support these observations. Chinook jack counts give a preliminary indication of ocean survival conditions. The jack counts of spring chinook in 1999 were near record highs; the subsequent return of upriver spring chinook in this year the highest it has been since 1977. The jack counts of spring chinook in 2000 were substantially higher than in 1999 suggesting another record return in 2001. The return of sockeye salmon to the Columbia River in 2000 was also 4-5 times the preseason expectation again suggesting that survival conditions, at least for these fish, were substantially better than in past years. The return in 2000 of Skamania stock steelhead, which are an early timed summer-run stock that returns to the lower and mid-Columbia River areas (generally below the Dalles Dam) were also about twice the preseason forecast.

Figure 7. Early ocean survival rate index for Lewis River fall chinook.

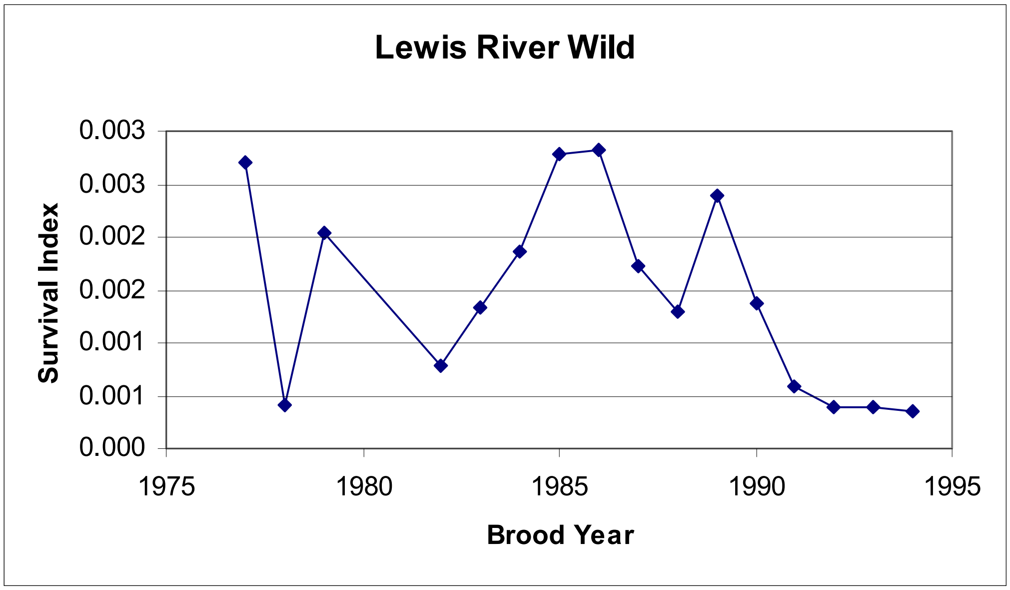
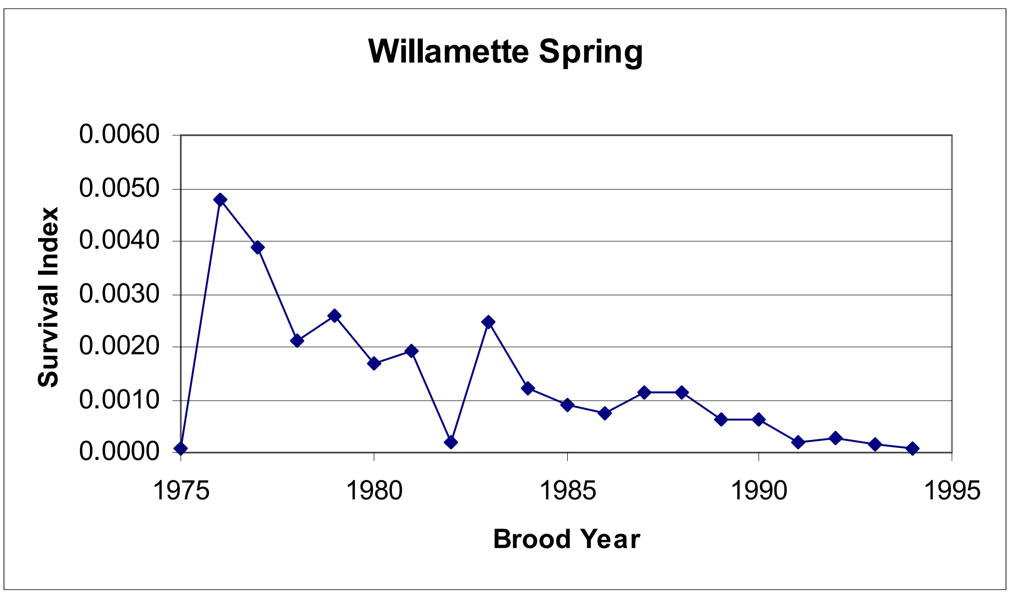


Figure 8. Early ocean survival rate index for Upper Willamette River chinook.



IV. Effects of the Action

This section and the following Integration and Synthesis section of the Biological Opinion assess whether the proposed fisheries are likely to jeopardize the continued existence of one or more of the threatened or endangered salmon species (ESUs) that may be adversely affected by the fisheries. This analysis considers the direct, indirect, interrelated and interdependent effects of the proposed fisheries and compares them against the Environmental Baseline to determine if the proposed fisheries will appreciably reduce the likelihood of survival and recovery of these listed salmon in the wild. The effects of the proposed action on critical habitat are also considered.

Critical habitat has now been designated for all of the affected ESUs. While harvest activities do affect passage in that fish are intercepted, those impacts are accounted for explicitly in the following analyses regarding harvest related mortality. Most of the harvest related activities occur from boats or along river banks. Gears that are used include primarily hook-and-line, drift and set gillnets, and hoop nets that do not substantially affect the habitat. The activities considered in this consultation will not result in the destruction or adverse modification of any of the essential features of the critical habitat in which these fisheries occur.

Selecting the proper ecological scale is essential to this analysis. Jeopardy determinations for threatened and endangered salmon should consider direct and indirect effects on specific runs, subpopulations, or populations rather than the entire ESU because species generally become extinct through the loss of subpopulations or populations (Ruggiero et al. 1994). The jeopardy analysis should consider the direct and indirect effects of different harvest rates associated with the proposed fisheries on the persistence of different runs to construct an assessment for the ESU as a whole. The analysis should also differentiate between strong and weak runs of salmon, which will have different responses to harvest rates that could affect a jeopardy determination. To the degree possible, therefore, this consultation considers the status of the component populations and the effect of the proposed action on those components in making the jeopardy determination for each ESU.

In the past, jeopardy determinations related to harvest actions have been largely qualitative. The opinions considered the status of the species in the broader context of the environmental baseline and the magnitude of harvest reductions made in recent years. Determinations were based on best available information and professional judgement to determine whether the proposed harvest rate reductions would appreciably reduce the likelihood of survival and recovery of listed salmon in the wild. These more qualitative judgements were necessary, in most cases, because of the absence of life cycle models that provided a more holistic assessment of extinction risk and the effects of harvest and other actions on the species. The CRI was designed to address this deficiency by providing a standardized tool for characterizing risk and the magnitude of survival improvements necessary to achieve survival and recovery. Results from the current CRI analysis are considered in this opinion and will be relied on increasingly in the future. However, the CRI is not developed to the point that it explicitly defines a level of harvest that is clearly consistent with survival and recovery. Even with perfect foresight, there are tradeoffs between survival improvements made in one sector and those that would then be required in another. There are of course also substantial uncertainties inherent in any analysis that attempts to predict the future. Critical uncertainties have emerged related to future ocean survival rates, the magnitude of survival improvements that will result from actions in the hydro, hatcheries, and habitat sectors, and the relative productivity of naturally spawning hatchery fish. The anticipated FCRPS biological opinion and associated All-H paper will further refine our best science related to some of these points. That analysis was not available in time for use in this opinion; even when completed substantial uncertainties will remain. So, although the CRI analysis is used in this opinion to characterize extinction risk and the degree to which harvest can be used to minimize that risk, the jeopardy determination still must rely on best professional judgement to resolve uncertainties about the level of harvest that is consistent with a no jeopardy finding.

NMFS expects to rely on the findings characterized in the FCRPS opinion and All-H paper in future consultations and on subsequent developments from the CRI analysis as they become available.

A. Chinook Salmon

The tribes initially proposed in their biological assessment to manage their fall season fishery with the primary objective of catching 50% of the harvestable surplus of upriver fall chinook, a share that is calculated as described in the CRFMP. They further indicated that the expected incidental catch of listed fish would be within NMFS' guidelines. For planning purposes, the tribes assumed that the primary management constraint would be Snake River fall chinook and that the incidental take would be limited, as it has in recent years, to 31.29% which represents a 30% reduction from the 1988-1993 base period harvest rate. The tribes also proposed, among other things, to minimize steelhead harvest to the extent possible without disrupting their ability to meet their chinook objective and that there would be no new mainstem coho fisheries as has been the case in recent years that would likely result in higher incidental impacts to steelhead. These latter management objectives would preclude targeting steelhead or implementing late season fisheries that would have much greater impacts to steelhead (Jamison 2000).

Given the preseason forecast and relative abundance of stocks in 2000, it would have been necessary for the tribes to take all of the available harvest of Snake River fall chinook in order to achieve, or nearly so, their objective to catch 50% harvestable surplus. If the tribes manage their fisheries to take all of the available impact limits to Snake River fall chinook, there would have been none left for non-Indian fisheries in the lower river thus precluding any non-Indian fisheries that were likely to impact Snake River fall chinook. As a compromise, the tribes offered an alternative allocation that would have split the Snake River fall chinook impact limits 7.25% with the remainder going to the tribes (Sampson 2000). The states initially declined this offer (Koenings and Greer 2000).

In proposing fisheries for 2000, the states of Oregon and Washington also presumed that the harvest rate for the combined treaty and non-treaty fisheries would have to be managed subject to the 31.29% harvest rate limit for Snake River fall chinook. The state initially proposed fisheries in their Section 10 permit application that would result in an incidental harvest rate on SR fall chinook of 12%. The states proposed that the remainder of the allowable impacts to SR fall chinook (19.3%) be taken by the tribes (Greer and Koening 2000a).

The outstanding issues related to allocation were subsequently resolved through by an agreement among the U.S. v Oregon parties that allocated the 31.29% harvest rate limit 8.25% to the states and 23.04% to the tribes (U.S. v. Oregon 2000). The respective parties have thereby committed to manage their fisheries within these prescribed limits.

The fall tribal fisheries are not likely to affect any of the components of the LCR ESU which return primarily to tributaries below Bonneville Dam. The proposed state fisheries are not likely to affect the spring component of the LCR ESU. The anticipated harvest rate on LCR hatchery-origin tule stocks is 13.7%. The harvest rate on natural-origin tules will presumably be the same. The anticipated harvest rate on the bright component of the ESU in the proposed non-Indian fisheries is 4.9%.

B. Steelhead

The tribes now propose to manage their fisheries within the constraints of the SR fall chinook harvest rate limit (23.04% for the tribes) and further that fisheries would be managed to minimize impacts to steelhead. However, the tribes did not propose any specific caps on steelhead harvest rates. The incidental impact of proposed fisheries to steelhead depends on how much fishing the tribes do in Zone 6. The estimated incidental harvest rates on natural-origin SR A and B-run steelhead associated with the proposed fisheries are 9.5% and 14.8%, respectively.

Summer steelhead returning to the other ESUs are all A-run fish. The expected harvest rate in tribal fisheries on UCR steelhead is 9.5% for both the listed hatchery and natural-origin fish. The expected harvest rate on natural-origin MCR and LCR steelhead are 6.2% and 1.5%, respectively (Table 6).

The states proposed to manage their fisheries subject to a 2% harvest rate limit for all natural-origin steelhead. The expected harvest rates associated the states' proposed fisheries are actually less than the proposed 2% cap and vary slightly by ESU. The expected harvest rates for natural-origin UCR, SRB A and B-run, MCR, and LCR are 1.4%, 1.3, 1.8, 1.2%, and 0.3%, respectively. The expected harvest rate on listed hatchery-origin steelhead from the UCR ESU is 11.2% (Table 6).

C. Chum Salmon

Chum salmon are not caught in tribal fisheries since the remaining populations are all located below Bonneville Dam.

Retention of chum salmon in recreational fisheries is prohibited. The catch of chum is relatively rare in any case since chum do not actively take sport gear generally used to target other species. The incidental catch and release of chum salmon in the recreational fishery averages about 20 fish per year with an expected mortality of 2 fish (Greer and Koenings 2000a).

The migration timing of chum salmon is late enough that they are missed by most of the lower river commercial fisheries. There is some incidental catch during fisheries in late September and October directed primarily at coho. Commercial landings of chum have averaged 38 fish over the last 5 years. Harvest rates have averaged less than 2%. Greer and Koenings (2000a) estimated that the harvest rate of chum would not exceed 5% in 2000, but that projection was conservative in that it was based on the maximum harvest observed in recent years and the minimum run size.

Table 6. Harvest rates on listed salmonids in proposed 2000 fall season fisheries in the Columbia River Basin by ESU.

ESU	Non-Indian fisheries	Treaty Indian fisheries	Total
Snake River fall chinook	8.25%	23.04%	31.29
Lower Columbia River chinook			
Spring component	0%	0%	0%
Tule component	13.7%	0%	13.7%
Bright component	4.9%	0%	4.9%
Snake River steelhead			
A-run	≤2% (1.3%)[a]	9.5%	11.5% (10.8%)
B-run	≤2% (1.8%)[a]	14.8%	16.8% (16.6%)
Upper Columbia River steelhead			
Naturally-produced	≤2% (1.4%)[a]	9.5%	11.5% (10.9%)
Hatchery-produced	≤15% (11.2%)[a]	9.5%	24.5% (20.7%)
Mid-Columbia River steelhead	≤2% (1.2%)[a]	6.2%	8.2% (7.4%)
Lower Columbia River steelhead	≤2% (0.3%)[a]	1.5%	3.5% (1.8%)
Columbia River chum	5% (3%)[a]	0%	5% (3%)
Snake River sockeye	0%	0%	0%

[a] Maximum proposed harvest rates with the actual expected harvest rates associated with the proposed fisheries shown in parenthesis.

V. Cumulative Effects

Cumulative effects are defined as the "effects of future state or private activities, not involving federal activities, which are reasonably certain to occur within the action area of the federal action subject to consultation" (50 CFR 402.02). No such effects are anticipated. Future Federal actions, including the ongoing operation of hydropower systems, hatcheries, fisheries, and land management activities are being or will be reviewed through separate section 7 consultation processes. In addition, non-Federal actions that require authorization under section 10 of the ESA will be evaluated in section 7 consultations. Therefore, these actions are not considered cumulative to the proposed action.

VI. Integration and Synthesis of Effects

During the course of the fall season consultation, NMFS indicated early on that it would again assess jeopardy for the fall fisheries using the harvest rate limits for SR fall chinook and B-run steelhead that were applied during the 1999 fall season consultation. NMFS chose to specify the jeopardy limits in this way for two reasons. First, from a practical perspective, fishery planning can not proceed past generalities until the year-specific management constraints are defined. It was apparent from past experience that these stocks were likely to be limiting. Absent direction from NMFS on the jeopardy limits, essential negotiations related to critical allocation issues, in particular, would be stymied. Second, analysis of the best available scientific information, including available CRI information, indicates that the 1999 jeopardy standards are adequate to avoid jeopardy for 2000.

Additional information on extinction risk and the impact of harvest will be available in the near future and will be used in future harvest consultations . Updated CRI analysis will provide a standardized measure of extinction risk not previously available, and will further quantify the degree to which survival must be improved to meet survival and recovery objectives. The All-H paper will serve as a conceptual recovery plan which will address the critical question of how necessary survival improvements will be allocated among the various H's, including harvest.

Although we can look forward to a more inclusive analysis of harvest standards in the near future, NMFS still must make a jeopardy determination with respect to the proposed 2000 fisheries for each of the affected ESUs. In the first step, NMFS considers whether the proposed fisheries are consistent with the specified limits for SR fall chinook and SR B-run steelhead. In fact the proposed fishery plans were all designed to fit within those prescribed constraints. NMFS then considers whether the standards themselves, when applied to the 2000 fisheries, are sufficiently protective for all of the other ESUs to warrant a no jeopardy conclusion. The qualitative considerations used in past consultations are still applicable, but in addition we consider the CRI information that is currently available to evaluate the prescribed harvest rate limits. Although the CRI analysis is not yet complete, it does provide some insight about the existing standards and possible direction for changes in the future.

A. Chinook Salmon

1. Snake River Fall Chinook

Snake River fall chinook are expected to be the limiting stock in the fall season fisheries. The 2000 Management Agreement specifically allocates the harvest rate limit of 31.29% between the proposed state and tribal fisheries 8.25% and 23.04%, respectively. The respective proposed fisheries will be managed within these limits.

NMFS first implemented the 30% base period reduction criterion as a standard for evaluating fall season fisheries in 1996 associated with its review of the 1996-1998 Fall Season Agreement (NMFS 1996b). The 1999 fall season opinion again (NMFS 1999c) reviewed the history and considerations used in developing the 30% base period reduction standard. As indicated, this standard was derived largely based on best professional judgement of fishery biologists regarding the level of harvest rate reduction that was necessary and sufficient to avoid appreciably reducing the likelihood of survival and recovery of the species in the wild. The reduction standard relied on professional judgement because there were, at the time, no quantitative analyses available that could determine the effect of harvest impacts, in combination with other mortality factors on the likelihood of survival and recovery. It was clear, however, that the species had declined to low levels under the existing baseline conditions and that survival improvements were required across all sectors, including harvest. The 30% reduction, in combination with an analogous reduction in ocean fisheries, was considered a significant reduction to address, at least initially, the need for survival improvements given the current status of the stock. Incorporated into that consideration was a willingness to accept some increase in the risk to the species associated with higher harvest rates and fishery needs that were primarily related to the tribes' treaty fishing rights. The judgement made at the time was that the 30% base period reduction standard provided the appropriate balance without putting the species at undue risk. The standard was adopted with the explicit provision that it would be reviewed and revised if necessary based on best available information (NMFS 1996b). In fact, in the 1999 opinion, NMFS removed a provision in the 1996-1998 Agreement that allowed for a higher harvest rate under certain conditions, and rejected a proposal that argued for a higher harvest rate based on new information which purportedly demonstrated an improvement in the status of the stock.

A further consideration in evaluating the status of SR fall chinook has been the existence of the Lyons Ferry Hatchery program which holds a substantial reservoir of fall chinook that are part of the ESU. Although hatchery fish are not a substitute for recovery, they do provide a further safeguard against catastrophes or continuing failures of the natural system that reduces the risk of species extinction. In this case, the Lyons Ferry Hatchery is used to maintain a brood stock, and is also used as a source for a very substantial supplementation program. The supplementation program has been scaled up over the last several years to provide both fingerling and yearling outplants that are acclimated and released in areas above LGD. The immediate objective of the supplementation program is to increase the number of natural-origin spawners. The return of adults to LGD from the supplementation program was 479 in 1998 and 882 in 1999 (this is in addition to the adults returning from natural production, see Table 2) and the immediate prospects are for equal or greater returns in the future. As NMFS has pointed out in the past (NMFS 1999c), the return of fish from the supplementation program is not a substitute for recovery which depends on the return of self-sustaining populations in the wild. However, supplementation can be used to mitigate the risk of extinction by boosting the initial abundance of spawners while other actions are taken to increase the productivity of the system to the point where the population is self sustaining and supplementation is no longer required.

In considering the proposed 2000 fisheries it is also appropriate to review the magnitude of harvest reductions and the change in spawner escapement in recent years. The average harvest rate of Snake River fall chinook in the Columbia River since 1996 is 28.7%, actually lower than the 31.29% limit. Taken from a broader perspective we can look at the combined impact of ocean and inriver fisheries and how that has changed over the last 20 years. The exploitation rate on SR fall chinook in the ocean and inriver fisheries combined has declined from an average of 68% from 1980-1994 to 45% since 1995 representing a 33% reduction in the overall exploitation rate. The abundance of SR fall chinook has increased in recent years significantly if not dramatically. The return of natural-origin chinook to LGD averaged 410 adults from 1980-1994 (range 78-745) including a low in 1990 of just 78 fish. The return to LGD over the last five years is 599 (range 306-905, Table 2). The returns can be compared to the previously identified lower abundance threshold of 300 and recovery escapement goal of 2,500 which are the kinds of benchmarks suggested in the Viable Salmonid Populations paper (McElhany et.al., 1999) for evaluating populations status. Escapements are well below goal, but also consistently above the lower abundance threshold. (This lower threshold is considered indicative of increased relative risk to a population in the sense that the further and longer a population is below the threshold the greater the risk; it was clearly not characterized as a "redline" below which a population must not go (BRWG 1994).) The increase in escapement can not be solely attributed to decreased harvest, but it does support the initial judgement that the prescribed harvest rates are consistent with survival and recovery.

The available CRI analysis now allows us to extend the qualitative biological arguments and policy considerations used to date in making jeopardy determinations. The CRI analysis used here was released publically in April 2000 through the NWFSC website (NWFSC 2000). The analysis continues to evolve and will be updated in conjunction with the FCRPS opinion and associated All-H paper, but at this writing the new analysis was not completed. By necessity the April analysis is considered the best available information.

Before reviewing the results of the CRI analysis it is first important to put the analysis in context. The CRI analysis relies on available abundance estimates from 1980 to the present. It therefore characterizes recent trends and projects the future status of the ESUs (or stocks) if trends continue as they have for the last twenty years. If factors affecting species survival change, than the estimates of extinction risk will also change. For example, the possibility that ocean conditions may improve relative to the past, or decline further, will change the relative risk of extinction. Also, actions taken to improve survival in recent years (such as recent harvest reductions) have, for the most part, not had time to express themselves in the data. It is therefore appropriate to consider whether changes made in recent years relative to the long-term average are sufficient or if additional survival improvements are likely to be required.

The CRI analysis provides several pertinent metrics. For both ESUs and individual stocks the CRI estimates the annual average rate of population change or “lambda.” This summary statistic indicates how fast a populations is growing or shrinking. A lambda less then 1.0 means the population is declining; a lambda greater than 1.0 means the population is increasing. Two additional metrics of population status are considered here; the probability of absolute extinction and the probability of a 90% decline in abundance. Both of these are estimated for periods of 24 and 100 years. In some cases, the analysis also provides estimates of the percent change in lambda that is required such that the probability of extinction or decline by 90% for the specified time period is reduced to less than 5% which is a standard benchmark in the CRI analysis across the various ESUs.

The estimated growth rate or lambda for SR fall chinook is 0.931 confirming that the ESU has undergone a period of decline since 1980. The probabilities of extinction and 90% decline in abundance over the next 24 years are relatively low, 0.00 and 0.06, respectively indicating that there is little short-term risk of extinction. However, the probabilities for the 100 year time frame are both close to 1.00 (Table 3) strongly suggesting that the ESU will go extinct eventually if actions are not taken to improve past survival conditions. The analysis further suggests that by increasing lambda by 2.5% or 6.5%, respectively the probabilities associated with the extinction and 90% decline risk metrics will be met.

For the SR fall chinook ESU, the CRI also provides a sensitivity analysis which shows the percent change in lambda that would result from various levels of total exploitation rate (Table V-8, NWFSC 2000). The analysis assumes that the total exploitation rate averaged 0.53 for “the 1980s to early 1990s.” This estimate is not documented and is low compared to estimates derived from the PSC chinook model and inriver harvest rates reported by the Columbia River TAC. The total exploitation rate for the period 1980-1994 averaged 68%; in recent years the total exploitation rate has been reduced by one third to 45% (Table 7). If the base exploitation rate used in the CRI sensitivity analysis is reduced by a third, lambda would increase by 5.6%.

This analysis, though tentative, suggests that harvest reductions made in recent years contribute significantly in meeting the extinction risk reduction requirements. The analysis tends to confirm the qualitative considerations that suggest that harvest reductions made to date, including those in the Columbia River fisheries, are consistent with expectations of survival and recovery and supports their continued use for 2000.

Table 7. Annual total adult equivalent exploitation rates for selected stocks of fall chinook in the Columbia River.

Return Year	Snake River Fall Chinook	Lower Columbia River tules (Coweeman River)	Lower Columbia River brights (North Fork Lewis River)
1980	61%	84%	69%
1981	63%	73%	40%
1982	60%	73%	46%
1983	64%	65%	41%
1984	73%	74%	58%
1985	63%	59%	56%
1986	76%	70%	66%
1987	75%	78%	85%
1988	83%	85%	70%
1989	77%	66%	45%
1990	79%	66%	40%
1991	66%	66%	58%
1992	62%	64%	58%
1993	64%	58%	51%
1994	49%	35%	39%
1995	44%	32%	38%
1996	38%	23%	17%
1997	49%	34%	26%
1998	43%	30%	19%
1999	52%	42%	15%
mean 80-94	68%	68%	55%
mean 95-99	45%	32%	23%

2. Lower Columbia River Chinook

The spring component of LCR fall chinook are not harvested in the proposed fall season fisheries. Nearly all of the tule and bright stocks of the LCR ESU return to tributaries located below Bonneville Dam. LCR fall chinook are therefore largely unaffected by fall season tribal fisheries which do not extend below Bonneville.

Proposed non-Indian fisheries will not affect the spring component of the LCR ESU because of their earlier return timing. Both tule and bright stocks are harvested in the fall season fisheries. Of these the greatest harvest impacts occur to the tule stocks. As described in section II.D.1 there are likely only two or three self-sustaining populations of tule chinook in the lower Columbia River that are not substantially influenced by hatchery strays and these have been used as indicators for tule stocks in the ESU. The average escapement on the Coweemen has been near goal over the last five or ten years although it has declined over the last two years. The return of earlier timed tules to the East Fork Lewis has been relatively stable and averaged about 125 over the last five years compared to an escapement goal in this relatively small system of 300. The status of the Clackamas population is uncertain.

The expected harvest rate of the lower river tule stocks in the non-Indian fisheries is 13.7%. This compares to an average inriver harvest rate for 1980-1994 of 31.9% and an average over the last five years of 10.4%. The total exploitation rate including ocean fishery impacts has declined from 67.7% during 1980-1994 to 32.2% since 1995.

Although the discussion to this point has focused on the few remaining stocks that are thought to be largely independent of hatchery influence, there is also a large component of hatchery-origin tules returning in 2000, most of which are part of the ESU although not listed. Over 26,000 tule chinook are expect to return to the area below Bonneville Dam with an additional 27,000 chinook destined for the Spring Creek National Fish Hatchery above Bonneville. Although the hatchery-origin stocks are not a substitute for natural-origin fish, they do provide opportunities to implement recovery efforts through supplementation so that the fate of the tule component is not tied solely to that of the few remaining natural-origin stocks.

Three natural-origin bright stocks have also been identified. There is a relatively large and, at least until recently, healthy stock on the North Fork Lewis River. The escapement goal for this system is 5,700. That goal has been met, and often exceeded by a substantial margin, every year since 1980 except for 1999 and likely 2000. Escapement shortfalls this year and in 1999 are at least partly the result of severe flooding during the 1995 and 1996 brood years. However, recent observations suggest that the decline in recent years may also be related to a more pervasive decline in survival rates which would have longer-term implications for the stock (R. Kope, NMFS, pers. comm., April 4, 2000, w/ P. Dygert, NMFS). These recent observations will warrant further review if projected returns continue to fall below the goal.

The Sandy and East Fork Lewis stocks are smaller. Escapements to the Sandy have been stable and on the order of 1,000 fish per year for the last 10-12 years. Less is known about the East Fork stock, but it too appears to be stable in abundance.

The expected harvest rate on LCR bright stocks in the proposed non-Indian fisheries is 4.9%. This compares to an average inriver harvest rate for 1980-1994 of 34.7% and an average over the last five years of 9.0%. The total exploitation rate including ocean fishery impacts has declined from 54.8% during 1980-1994 to 23.0% since 1995 again representing a 58% reduction in overall harvest.

The available CRI analysis provides perspective on whether the large harvest reduction in the LCR ESU is sufficient. The estimated lambda value for the ESU as a whole is 1.074 indicating that the aggregate of populations is growing. However, this analysis is based on a combination of spring, tule, and bright stocks, many of which are substantially influenced by hatchery strays. Consideration of the available CRI metrics for some of the previously discussed tule and bright indicator stocks are easier to interpret.

The estimated lambda for the East Fork Lewis tule stock is 0.975. The probabilities of extinction and 90% decline in 24 years are 0.00 and 0.02, respectively; the extinction and 90% decline probabilities in 100 years are 0.05 and 0.82 indicating that at least the near term risk of extinction and significant decline are low (Table 3).

Lambda for the bright stocks on the North Fork Lewis and Sandy rivers are 1.006 and 0.946, respectively. The extinction and decline probabilities again indicate that there is little risk of short-term extinction for these key indicator stocks (Table 3). There are no stock specific sensitivity analyses that relate changes in harvest to the CRI metrics as there were for the SR fall chinook ESU. However, recall that the CRI risk metrics are calculated using average exploitation rates since 1980 and assuming that those will continue in the future. The fact that total exploitation rates for tules and brights have been reduced by 50% or more in recent years compared to the 1980-1994 time frame suggests that these stocks should be able to recover under these more constrained harvest levels so long as actions taken in other sectors are adequately addressed. Table V-8 from the current CRI analysis suggests that lambda for the LCR ESU as a whole would be increased by 10-15% if the total exploitation rate is reduced to the 20-30% range (NWFSC 2000).

The recovery planning process has also been initiated with the formal appointment of a Technical Recovery Team. In this case, the broader objective of the ESA, which requires survival and recovery of self-sustaining, naturally spawning populations, can best be achieved through focused recovery planning efforts that identify habitats that can be rehabilitated, coupled with supplementation and harvest management programs that provide the necessary protections that will allow for rebuilding. Until then harvest of tule and bright stocks needs to be sufficiently constrained to protect the few remaining naturally spawning populations. The fact that these populations have been stable in recent years and that overall harvest mortality has declined by more than half suggests that the 2000 fall season fisheries do not pose a substantial risk to those populations nor limit the potential for longer-term recovery efforts.

Forthcoming results from the hatchery consultation, All-H paper, updated CRI analysis, and recovery planning efforts will help clarify critical questions related to population structure, recovery objectives, and the role of hatcheries in the recovery effort. Whether additional reductions are needed in harvest will depend on these efforts. But for now, based on the best available information, NMFS concludes that the impacts associated with the proposed 2000 fisheries are not likely to appreciably reduce the likelihood of survival and recovery of LCR chinook.

B. Steelhead

As was the case with SR fall chinook it was necessary for NMFS, during the course of consultation, to propose a jeopardy standard for steelhead. It is not possible to plan fisheries without first knowing the conservation constraints that must be met. NMFS proposed to again apply the standards used during the 1999 consultation. In establishing steelhead conservation limits for the fall season fisheries, NMFS focused on SR B-run steelhead. As discussed in section II.D.2 in some detail, B-run steelhead are a large and important component of the SRB ESU that is at risk because of its current depressed status. B-run steelhead are also the component that is most vulnerable to the fisheries due to their later timing, larger size, and upstream location which requires them to pass through the full range of fall season fisheries. A-run steelhead, whether from the SRB or other ESUs, benefit from the protections provide to B-run steelhead because they are subject to relatively lower harvest rates, again because of their smaller size, earlier timing, and, for the LCR and MCR ESUs, their downstream location. B-run steelhead were therefore considered the most constraining of the steelhead stocks.

The proposed harvest rate caps on B-run steelhead in non-Indian mainstem fisheries and treaty Indian fisheries are 2% and 15%, respectively. In fact, we find that the expected impacts associated with the proposed fisheries will be somewhat less than the specified limits (1.8% vs. 2.0% and 14.8% vs. 15%) because SR fall chinook are the primary limiting stock.

Having proposed the above described standard it is appropriate in this opinion to again consider how it relates to the status of the species and whether it remains consistent with a no jeopardy conclusion for SRB steelhead and other ESUs as well. Initial results from the CRI analysis that were not previously available provide some further insight into the status of the steelhead ESUs and the possible need for additional actions in the future.

As an initial matter in considering whether expected impacts to B-run steelhead are acceptable it is important to acknowledge that SR B-run steelhead and thus the ESU is at risk of extinction as is indicated by their status as part of the listed ESU. This has come about as a result of the effects of a broad range of past and ongoing human activities and natural factors that comprise the environmental baseline which in aggregate have contributed to their decline and led to the current status of the species. The fisheries being considered here are not the last in a chain of sequential events that have put these species at risk. They are instead one action in a continuous cycle of actions that have contributed to the decline of the species. Clearly, if the aggregate effect of all mortalities are not significantly reduced and maintained at lower levels for the foreseeable future, the species will continue to decline to extinction.

Any harvest, or any action that involves take for that matter, involves some increase in the level of risk to the species. The tribes' views regarding the assumption of risk associated with their fisheries has substantial merit. The tribes have both a right and priority to conduct their fisheries within the limits of conservation constraints. Because of the Federal governments trust relationship with the tribes, NMFS is committed to consider the tribes' judgement and expertise when it comes to the conservation of trust resources. However, the opinion of the tribes and their immediate interest in fishing must be balanced against NMFS' responsibility pursuant to the ESA to ensure the survival and recovery of listed species and its trust responsibility which requires consideration of the long-term interests of the tribes as well. The tribes' long-term interests clearly require that the fishery resources be conserved even if it requires compromising short-term fishing objectives.

Although we can now reasonably anticipate a broader framework for making jeopardy determinations once the FCRPS biological opinion and All-H paper are finalized, we still will not precisely know the measure of survival improvements that must be achieved for SR B-run steelhead, or how much of that must come from harvest. However, it is apparent from the review of the species' status that substantial improvements in survival relative to the environmental baseline are required. In analyzing the jeopardy question from a biological perspective, particularly during a period of species decline, it is reasonable to assume that all actions should be expected to demonstrate and maintain some substantial measure of reduced mortality until such time that a more comprehensive and objective analysis of risk can be developed that better informs that decision. It is unavoidable that the determination of jeopardy under these circumstances will be a matter of judgement based on the available data. The magnitude of harvest reductions made to date are therefore relevant.

Steelhead impacts associated with fall season fisheries were managed from 1985 to 1997 pursuant to the guidelines contained in the now expired CRFMP. That Plan allowed for a tribal harvest rate on B-run steelhead during the fall season of 32%. The average harvest rate since 1985 was 24.2% (Jamison 2000). (In the above analysis for the chinook ESUs we considered the 1980-present time series to be consistent with the time frame adopted in the CRI analysis. Harvest rate estimates for upriver summer steelhead stocks are available only since 1985.) Over the last five years the average harvest rate has been 18.6%. Over the last two years when ESA constraints specific to B-run steelhead were first applied the harvest rate in the tribal fall season fishery has averaged 12.7%. The 15% harvest rate cap would represent a 38% reduction from the long-term average harvest rate for the tribal fishery and a 47% reduction from the CRFMP allowed harvest rate of 32%. The expected harvest rate on B-run steelhead in the tribes' 2000 fall season fisheries is 14.8% which is a 39% reduction from the long-term average.

The most significant reductions in non-Indian fisheries occurred earlier. Commercial harvest of steelhead by non-Indians has been prohibited since 1975 and time, area, and gear restrictions limit handling and mortality of steelhead by the non-Indian gillnet fishery to < 1% of the run. In addition, all sport harvest is restricted to fin-clipped hatchery steelhead only. Anglers have been required to release natural-origin steelhead in the Columbia River since 1986. Of the fish that are caught and released, it is assumed that 10% will die from resulting injuries. Because of these conservation related management actions, non-Indian fisheries are being managed under a 2% harvest rate cap. The expected harvest rate on SRB A and B-run steelhead in the proposed 2000 non-Indian fisheries are 1.3% and 1.8%, respectivley.

At this point, we can consider what additional insight can be gleaned from the CRI analysis that was not previously available. The most striking outcome suggested by this preliminary analysis is that the other steelhead ESUs may actually be subject to greater risk than SRB steelhead (Table 3). For the LCR and MCR ESUs the risk metrics are tabulated only for the summer run stocks since the winter run components of these ESUs are not affected by the proposed fall season fisheries. The estimated 24 year extinction risk for all of the stocks is 0, but the probability of 90% decline for many of the stocks is quite high suggesting that even the short-term risks are significant. The risk metrics for at least some of the stocks from each ESU suggest a very high probability of extinction over 100 years if actions are not taken to improve survival.

The CRI risk metrics are again calculated based on trends in abundance and assuming that the average harvest rates and other mortality factors will continue into the future. The risk metrics will improve to the degree that survival improvements related to harvest or other factors occur. As indicated above, the expected harvest rate on B-run steelhead in tribal fisheries in 2000 will be reduced to 14.8%, 39% less than the long-term average. The expected harvest rate for UCR and SRB A-run steelhead will be 9.5% which is 36% less than the 1985-1998 average. We do not have a similar time series of harvest rate estimates for LCR or MCR summer run steelhead. However, harvest rates are generally lower for these ESUs, particularly the LCR ESU, because their placement in the lower river causes them to be subject to fewer fisheries (Table 6). It is reasonable to assume that the proportional reductions in harvest rates from past years for the LCR and MCR ESUs are comparable to those of the upriver A-run stocks.

There is one additional action that will be implemented during the 2000 fishery that is designed to further reduce impacts to steelhead in the tribal fishery. Past research has indicated that the catch rate of steelhead can be reduced by using larger mesh gillnets. A recent agreement was concluded between tribal, state, and federal parties to purchase and distribute 9 inch mesh gillnets to tribal fisherman who choose to participate. If a fishermen takes one or more nets, he commits to using the nets during the course of the fishery. There is sufficient material to make up over 300 gillnets. The distribution program could therefore substantially affect the overall fleet profile. The nets are just now being distributed pursuant to the agreement so it is too early to tell what proportion of the fleet will switch to the larger mesh gear. Past studies suggest that the catch rate of steelhead in 9 inch nets is reduced by 13 - 38% compared to 7 or 8 inch gear (Bosch et al. 1998). Projected catch of B-run steelhead in the tribal fishery was calculated without trying to account for the greater use of 9 inch nets, in part because it is too early to tell how many nets will be deployed. However, the net distribution program is designed to reduce the incidental catch of steelhead and increases the likelihood that the harvest rate of B-run steelhead will be below the 15% cap. The harvest rate reductions for A-run steelhead will likely be even greater since the smaller A-run fish are even less vulnerable to the larger mesh gillnets.

For now NMFS is satisfied that steelhead harvest rates have been substantially reduced in recent years, that further actions are being taken to reduce harvest, and that the expected impacts associated with this years' fisheries are sufficiently low to avoid jeopardizing the species. However, the available CRI analysis underscores the precarious status of all of the steelhead ESUs. Based on this preliminary analysis NMFS questions whether the current standard for SR B-run steelhead is appropriate for continued long-term implementation. The standard effectively allows a harvest rate of 17% for B-run steelhead in the fall season fisheries. If the fisheries were routinely managed up to the cap, the resulting impacts to the other ESUs would be less than 17%, but still proportionally higher than the expected impacts from the 2000 fisheries. Based on the preliminary CRI results, NMFS now expects to reconsider the current standard prior to next years' fisheries using the updated information related to the CRI analysis and All-H paper and any other pertinent information available at the time.

NMFS, as a matter of policy, has not sought to eliminate harvest and as discussed in this opinion and elsewhere has accepted a certain measure of increased risk to the species to provide limited harvest opportunity particularly to the tribes in recognition of their treaty rights and the Federal government's trust responsibility. Non-treaty fisheries are second in priority to tribal fisheries when it comes to fisheries that are limited by conservation constraints. But here too NMFS will seek, as a matter of policy, to provide some opportunity to access harvestable fish if the states and tribes can resolve critical questions related to allocation and with the proviso that the impacts are very limited and all possible measures are taken to minimize the incidental impacts to listed species. The implementation of steelhead mass marking and selective, non-retention fisheries by the northwest states serves as an example, although even so the associated impacts must be accounted for and held to acceptable levels. NMFS will again rely on the anticipated updated CRI analysis and any other pertinent information or further analysis suggested by the All-H paper to refine the guidance related to impact limits and allocation priorities both between treaty and non-treaty fisheries and among the other mortality sectors.

NMFS believes that the harvest needs of the states and tribes during an interim period of recovery can best be achieved through a transition to selective fishery methods that can minimize the impacts to listed species and other weak stocks that require protection. NMFS' acceptance of the harvest rate standards for this year provides an opportunity to make necessary adjustments in the fisheries with a minimum of disruption. But ultimately fisheries will be managed, and catch will continue to be limited, based on the needs of the listed fish.

C. Chum Salmon

Chum salmon are not caught above Bonneville dam in tribal fisheries. Chum are caught occasionally in non-Indian fisheries below Bonneville. However, catch rates are quite low. There are no fisheries targeted at hatchery or natural-origin chum. There are also no chum hatchery production programs in the Columbia Basin except for those design to supplement natural production. The later fall return timing of chum is such that they are vulnerable to relatively little potential harvest in fisheries that target primarily chinook and coho. Chum rarely take the kinds of sport gear that is used to target other species.

Harvest rates are difficult to estimate since we do not have good estimates of total run size. Spawning surveys focus on index areas and so provide estimates for only a portion of the run. However, the incidental catch of chum amounts to a few 10's of fish per year. The harvest rate is almost certainly less than 5% and likely substantially less. Lambda estimates from the available CRI analysis indicates that the population levels are increasing and that there is little short or long-term risk of extinction or significant decline.

VII. Conclusion

In analyzing the question of jeopardy Federal agencies must consider whether proposed actions are likely to (1) jeopardize the continue existence of any listed species, or (2) result in the destruction or adverse modification of critical habitat. The phrase "jeopardize the continued existence" is defined as "to engage in an action that would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species." 50 CFR 402.02.

A. Chinook Salmon

Snake River Fall Chinook

As discussed in the previous section, NMFS has determined that a 30% reduction in the 1988-1993 base period harvest rate is an appropriate jeopardy standard for managing SR fall chinook in the proposed 2000 fall season fisheries. The maximum allowable harvest rate under this standard is 31.29%. The agreed to harvest rate limits for SR fall chinook in the proposed treaty Indian and non-Indian fisheries are 23.04% and 8.25%, respectively. This distribution of impacts may change inseason, but the parties have proposed during the course of consultation to take management actions necessary to stay within the prescribed limit.

After reviewing the current status of the Snake River fall chinook salmon, the environmental baseline for the action area, the effects of the proposed 2000 treaty and non-treaty fall season fisheries, and the cumulative effects, it is NMFS' biological opinion that the action, as proposed, is not likely to jeopardize the continued existence of listed SR fall chinook or result in the destruction or adverse modification of their critical habitat.

Lower Columbia River Fall Chinook

The spring component of LCR fall chinook are not harvested in the proposed fall season fisheries. Nearly all of the tule and bright stocks of the LCR ESU return to tributaries located below Bonneville Dam. LCR fall chinook are therefore largely unaffected by fall season tribal fisheries which do not extend below Bonneville.

Proposed non-Indian fisheries will not affect the spring component of the LCR ESU. The greatest harvest impacts occur to the tule stocks. NMFS considered the status of the remaining tule stocks that are apparently not substantially influenced by hatchery-origin strays. Harvest impacts to these stocks have declined substantially in recent years. The average inriver harvest rate over that last five years is down 67% from the 1980-1994 average. The total exploitation rate including ocean fishery impacts is down 52% over the same time period. Similar harvest rate reductions are expected in 2000. The CRI analysis suggests that there is little risk of extinction or significant decline thus providing the time to take necessary remedial action of which harvest reductions is just one. NMFS also considered the abundance of hatchery-origin fish that are part of the ESU. Although the adverse impacts associated with the hatchery programs need to be addressed, the fish themselves provide the necessary opportunity to develop a plan through the recovery program that integrates habitat actions with supplementation and necessary harvest management constraints. Until then NMFS will limit harvest sufficiently to preserve the existing populations and thus the opportunity to implement a comprehensive recovery plan.

The LCR bright stocks are also harvested in the proposed fisheries. A review of the status of the remaining natural-origin stocks suggests that they are relatively healthy. Harvest impacts have been reduced substantially. For example, the average inriver harvest rate for the 1980-94 period was 34.7% compared to a proposed harvest rate in 2000 of 4.9%. The CRI analysis indicates that there is little near term risk of extinction or significant decline. The recent harvest rate reductions will further reduce the calculated risk associated with this initial CRI analysis.

After reviewing the current status of the Lower Columbia River fall chinook salmon, the environmental baseline for the action area, the effects of the proposed 2000 treaty Indian and non-Indian fall season fisheries, and the cumulative effects, it is NMFS' biological opinion that the proposed fall season fisheries are not likely to jeopardize the continued existence of listed Lower Columbia River fall chinook or result in the destruction or adverse modification of their critical habitat.

B. Steelhead

During this consultation, NMFS indicated that it would evaluate the proposed fisheries with respect to jeopardy using the same standards articulated in the 1999 opinion. The harvest rate on SR B-run steelhead is limited to no more than 2% in the non-Indian fisheries and 15% in the treaty Indian fisheries. NMFS focused on B-run steelhead because of their relatively depressed status and because their relative size, run timing, and upstream origin made them the stock most susceptible to the fisheries. Harvest rate limits for B-run steelhead therefore provided necessary protections to A-run stocks returning to the other ESUs. Because of impact limits associated with SR fall chinook, the expected impacts to steelhead are less than the specific harvest rate limits. The expected harvest rate in non-Indian and treaty Indian fisheries will be 1.8% and 14.8%, respectively. The expected harvest rate in the tribal fisheries which account for most of the impacts compares to an average harvest rate from 1985-1999 of 24.2%. The expected harvest rates to natural-origin A-run steelhead returning to the SRB and UCR ESUs in non-Indian fisheries are 1.3% and 1.4%, respectively, and in treaty Indian fisheries, 9.5% for both ESUs. Harvest rates to summer-run steelhead returning to the LCR and MCR ESUs will generally be lower still because of their downstream origin. The expected harvest rates to LCR and MCR ESUs in non-Indian fisheries are 0.3% and 1.2% and in treaty Indian fisheries are 1.5% and 6.2%, respectively. Although there are no harvest rate estimates for these from earlier years, the proportional reductions are presumably comparable to those of the upriver stocks.

The expected harvest rates on listed UCR hatchery-origin fish are generally higher in the non-Indian fishery (11.2 %) because these hatchery fish are marked and therefore retained in the sport fisheries. The hatchery fish are relatively abundant to the point that NMFS is considering delisting the hatchery component of the ESU as the escapement often exceeds hatchery and supplementation program needs. The harvest rates on hatchery fish associated with the proposed fisheries are therefore not considered a risk and at the anticipated level actually provides some benefit in that it reduces the potential for hatchery strays.

The available CRI analysis indicates that steelhead are generally at greater risk than other Columbia Basin ESUs. NMFS expects to revisit management controls for steelhead based on the updated CRI analysis and All-H paper prior to next year. However, NMFS expects that the impacts to steelhead resulting from the proposed fisheries will be below the specified limits and in any case will result in significant reductions compared to past years. Whether further reductions will be required as part of the process of securing necessary survival improvements and allocating those improvements among the various sectors will be a critical determination that may affect future management decisions.

After reviewing the current status of the steelhead, the environmental baseline for the action area, the effects of the proposed 2000 treaty Indian and non-Indian fall season fisheries, and the cumulative effects, it is NMFS' biological opinion that the proposed fall season fisheries are not likely to jeopardize the continued existence of listed SRB, UCR, MCR, or LCR steelhead or result in the destruction or adverse modification of their critical habitat.

C. Chum Salmon

Chum salmon are not caught in the proposed tribal fisheries above Bonneville Dam. Their fisheries are therefore not likely to adversely affect the LCR chum ESU.

There are three known populations of chum salmon in the LCR. Two are considered depressed, though not critical and the third is considered healthy. Recent recovery initiatives and remedial habitat programs are underway in all of the basins. Although current abundance is only a small fraction of historical levels, the total spawning run of chum salmon to the Columbia River has been relatively stable since the mid 1950s, and total natural escapement for the ESU is probably at least several thousand fish per year. The available CRI analysis shows that the ESU is increasing with little risk of near or long-term extinction or significant decline. The harvest rate on chum is estimated conservatively to be 5%, but has averaged only about 2% in recent years. After reviewing the current status of Lower Columbia River chum salmon, the environmental baseline for the action area, the effects of the proposed 2000 treaty Indian and non-Indian fall season fisheries, and the cumulative effects, it is NMFS' biological opinion that the proposed fall season fisheries are not likely to jeopardize the continued existence of CR chum salmon.

INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulation pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the USFWS to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the USFWS as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are non-discretionary; they must be undertaken by the action agency so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, in order for the exemption in section 7(o)(2) to apply. The action agencies have a continuing duty to regulate the activity covered in this incidental take statement. If the action agencies (1) fail to assume and implement the terms and conditions or (2) fail to require the applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the agencies must report the progress of the action and its impact on the species to NMFS as specified in the incidental take statement. [50 CFR §402.14(I)(3)]

An incidental take statement specifies the impact of any incidental taking of endangered or threatened species. It also provides reasonable and prudent measures that are necessary to minimize impacts and sets forth terms and conditions with which the action agency must comply in order to implement the reasonable and prudent measures.

I. Amount or Extent of Incidental Take

The amount of anticipated take is expressed in terms of harvest rates since it is the harvest rates rather than estimates of individual mortalities that limit the extent of allowable take.

A. Chinook Salmon

The expected harvest rates on SR fall chinook in proposed treaty Indian and non-Indian fisheries are 8.25% and 23.04%. The distribution of harvest impacts may vary, but may not exceed 31.29%.

The tribal fisheries are not expected to affect the LCR chinook ESU. There will be no effect to the spring component of the LCR ESU in the proposed non-Indian fisheries. The expected harvest rates in the non-Indian fisheries on the tule and bright components are 13.7% and 4.9%, respectively. Harvest rates to the LCR stock components may vary inseason. The non-Indian fisheries will be constrained by the harvest rate limits for SR fall chinook and steelhead.

B. Steelhead

The combined harvest rate of all proposed treaty Indian fisheries on LCR, MCR, and UCR (hatchery and natural-origin) steelhead are 1.5%, 6.2%, and 9.5%, respectively. The expected harvest rates on SR A and B-run steelhead are 9.5% and 14.8%. These harvest rates may increase or decrease in season, but are limited by the harvest rate on SR B-run steelhead that may not exceed 15%.

The catch of natural-origin steelhead from of the LCR, MCR, UCR, and SRB ESUs in the proposed non-Indian fisheries is subject to a harvest rate limit of ≤2% and for hatchery-origin UCR steelhead a harvest rate of ≤15%. The actual harvest rates are expected to be lower than the prescribed limits (Table 6).

C. Chum Salmon

The expected take of LCR chum in the proposed treaty Indian fisheries is zero. The harvest rate proposed on LCR chum for the non-Indian fishery is ≤5% with an expected harvest rate of 2%.

II. Effect of the Take

In this biological opinion, NMFS has determined that the level of anticipated take under the reasonable and prudent alternative is not likely to jeopardize the continued existence of listed salmonid species or result in the destruction or adverse modification of designated critical habitat.

III. Reasonable and Prudent Measures

NMFS concludes that the following reasonable and prudent measures are necessary and appropriate to minimize the impacts from fisheries considered in this opinion to listed steelhead and salmon ESUs.

1. The Washington Department of Fish and Wildlife (WDFW) shall monitor the passage of salmonids at Columbia River dams. The TAC shall provide necessary inseason estimates of run size.

2. WDFW and Oregon Department of Fish and Wildlife (ODFW) shall monitor the catch for recreational and commercial fisheries in Zones 1-6.

3. WDFW and ODFW shall sample the recreational and commercial fisheries in Zones 1-6 for stock composition.

4. The Columbia River Inter-tribal Fish Commission (CRITFC) and its member tribes shall monitor the catch in all tribal ceremonial and subsistence (C&S) fisheries.

5. CRITFC and its member tribes shall sample the Zone 6 C&S fishery for stock composition.

6. The TAC shall account for the catch of each fishery as it occurs through the season and report to NMFS the results of these monitoring activities and, in particular, any anticipated or actual increases in the incidental harvest rates of listed species from those expected preseason.

IV. Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, the tribes and states must comply with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms and conditions are non-discretionary.

1. WDFW shall obtain daily counts of all salmonids passing Bonneville, The Dalles, John Day, and McNary dams. The TAC shall use dam counts and other available information to develop inseason updates to run size estimates for fall chinook and steelhead.

2. Monitoring of catch in the recreational and Zone 1-6 commercial fisheries by WDFW and ODFW shall be sufficient to provide statistically valid estimates of the salmon and steelhead catch. Sampling of the commercial catch shall entail daily contact with buyers regarding the catch of the previous day. The recreational fishery shall be sampled using effort surveys and suitable measures of catch rate.

3. WDFW and ODFW shall monitor the stock composition of the recreational fisheries and Zone 1-6 commercial fisheries using a target sampling rate of 20%.

4. Monitoring of catch in the Zone 6 fisheries by CRITFC and its member tribes shall be sufficient to provide statistically valid estimates of the catch of salmon and steelhead. The catch monitoring program shall be stratified to include platform, hook-and-line, and gillnet fishery components.

5. CRITFC and its member tribes shall monitor the stock composition of the Zone 6 C&S fisheries using a target sampling rate of 20%.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of threatened and endangered species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. NMFS believes the following conservation recommendations should be implemented:

1. The current methods available for stock separation of natural-origin steelhead are limited to information related to fish length or passage timing. The ability to assess harvest mortality to different components of the composite steelhead return is critical. The U.S. v Oregon parties have rejected the date-based method previously used to assess steelhead run composition and composition of the harvest in favor of a revised length-based method. The current method, as developed and applied by the TAC uses a fork length cut-off of 77.5cm to approximate a division between smaller, "A-run-like" fish and larger steelhead assumed to represent B-run fish. This approximation is determined to be sufficiently representative of the actual A-run vs. B-run separation to be appropriate for inseason management.

However, the revised length method must be considered interim. The revised length method does not fully portray detailed impacts to A-run or B-run fish, nor does it allow further segregation of impacts among listed ESUs which are composed of A-run fish or any further subdivision of those ESUs.

Efforts have been undertaken in recent years to collect biological samples at adult passage facilities and in fisheries to develop information databases necessary to evaluate and implement other, more specific steelhead stock composition techniques. It is generally anticipated, pending additional refinement and analysis of baseline data, that Genetic Stock Identification (GSI) methodology, or methods based on reading of scales, will provide the level of detail necessary to sufficiently assess impacts to wild steelhead in a timely manner and at the appropriate level of stock resolution. Therefore, the fishery co-managers should concentrate effort and available resources on:

a. A review of methods available to further delineate the stock composition of the run and harvest, based on observations or samples taken and analyzed inseason.

b. The collection and analysis of samples taken in sufficiently large numbers, from the requisite number of sites or areas, over a long enough time period to enable development of potential stock identification methods.

2. Restrictions on harvest for protection of natural-origin steelhead will reduce the tribes' ability to access harvestable fall chinook and hatchery steelhead using traditional fishing methods. The U.S. v Oregon parties, including the federal government, the tribes, and the states, should work to develop alternative fishing methods that reduce impacts to wild steelhead while more selectively targeting harvestable stocks. The alternative is to limit mixed stock fisheries according to the conservation needs of the weak stocks and thereby forego the catch of otherwise harvestable fish. Methods to be evaluated should include, but not necessarily be limited to:

a. Modifications to net types used in the mainstem Columbia River, with the intent to either avoid the encounter of certain species through maximum or minimum mesh size regulations, or to increase the ability to release nontarget fish unharmed through use of tangle nets, tooth nets, or other similar gear. A multi-year fishery evaluation by the YIN suggests that the use of minimum mesh size regulation may be quite effective in selecting larger chinook salmon over steelhead in mainstem fisheries. Recent studies on the use of tooth nets for selective commercial harvest indicate catch-and-release survival rates of 98% and 100% for chinook salmon and steelhead, respectively. These and other similar approaches should be evaluated. Funding needs for research and, if warranted, implementation, and appropriate funding sources, should be identified.

b. Catch-and-release of unmarked steelhead should be implemented in tribal dipnet and hoopnet fisheries. In the 1998 mainstem Columbia River fall season fishery, an estimated 42 wild-A and 380 wild-B steelhead were taken in the treaty Indian platform ceremonial and subsistence fishery. Had the platform fishery been implemented with a regulation requiring live release of unmarked steelhead, a savings of approximately 2½ percentage points in the overall wild-B steelhead harvest rate would have resulted. Additional opportunities for dipnet and hoopnet fisheries in tributary areas, particularly in areas with runs dominated by hatchery returns, should be sought or developed, with the additional benefit that such sites are likely to be much closer to or actually on tribal lands.

c. The potential use of fish traps and fish wheels or other live capture methods in the mainstem Columbia River, in off-mainstem areas, and in tributaries should be carefully considered. In some cases, both technical and regulatory constraints to the use of such gear exist. In particular, the potential catch of traps and fish wheels is highly site-specific, and appropriate locations in the mainstem may not exist. However, the high selectivity of such gear, including the extremely low mortality rates apparently associated with catch-and-release of nontarget species indicate that such gear types merit further evaluation.

3. The mortality risks associated with the handling and live release of salmonids in fisheries are exacerbated by stresses associated with warm water conditions. At water temperatures above approximately 70˚ F, biological functions are impaired and fish die as a direct result of high temperatures (Environmental Protection Agency (EPA) 1971). Even at somewhat lower temperatures, while salmon may not suffer significant mortalities as a direct result of handling, metabolic stresses increase the susceptibility of individuals to other adverse effects, and additional stresses from other sources which cumulatively increase the likelihood of mortality (Wilkie *et al.* 1996; Wydoski *et al.* 1976; Bell 1990). The probability of hooking mortality of adult summer steelhead angled in the Mad and North Fork Trinity Rivers increased markedly (from less than 5% to nearly 45%) when water temperatures increased from 18˚C to 25˚C (G. Taylor, ODFW, pers. comm., to H. Pollard, NMFS, August 17, 1998). Mortality of rainbow trout played to exhaustion has been shown to significantly increase with increases in water temperature (Dotson 1982).

An additional concern associated with high mainstem water temperatures involves fisheries in cold water refugia, such as the mouths of Herman Creek and the Klickitat River and Drano Lake. Current recreational fishery regulations based on average estimated encounter rates may be substantially in error when actual encounter rates in fisheries with significant effort are much higher. When water temperatures in larger river main stems increase, upstream-migrating adult salmonids "dip in" to the mouth of tributaries, where temperatures are lower. The fish concentrate in these areas and hold until mainstem temperatures begin to decrease. As a result of the assemblages of fish, fisheries also tend to intensify in these tributary areas, with several potential adverse effects: the fisheries are more concentrated; the hooking rate per fish may increase; and the fish are already likely to be debilitated from warm water effects. The resultant damage to migrating stocks of salmonids is potentially high, and may require significant reduction of fishing in these refugia areas during adult migration to protect spawning escapements upstream.

The extent to which warm water actually increases mortality rates in Columbia River fisheries is unclear, but significant benefits to salmonid rebuilding and recovery may be available through additional fishery management actions designed to address to high water temperatures. For example, in response to similar concerns, the State of Maine's Conservation Plan recommends that catch-and-release fisheries on Atlantic salmon be closed during periods of water temperatures in excess of 68˚F (20˚C) (The Maine Atlantic Salmon Task Force 1997). The U.S. v. Oregon federal, tribal, and state fishery co-managers should explore and develop actions addressing the following concerns.

a. The federal, tribal, and state fishery agencies should compile and evaluate existing data on temperature effects on salmonid survival, and identify and implement additional research needed to identify whether fishery constraints during warm water periods are warranted, and, if so, at what temperature such constraints should be applied.

b. The states of Oregon, Washington, and Idaho should explore criteria for application and the potential for recreational fishery regulations restricting fisheries during periods of excessively high water temperatures. The tribes should explore similar criteria for tribal gillnet restrictions during periods of warm water, to decrease mortalities accruing to non-target steelhead encountering but escaping from gillnets, particularly large-mesh nets used to reduce impacts to steelhead.

c. The tribes and states should consider closing all cold water refugia to fishing activities during periods of excessively high mainstem water temperatures.

d. The parties should develop information outreach programs to instruct fishers on the implications of fishing during warm water conditions. This education should address the need to reduce fight time and other undue sources of fishing stress by landing fish quicker, using gear of greater strength, and by leaving in the water any fish intended to be released.

REINITIATION OF CONSULTATION

This concludes formal consultation on the 1999 fall season fisheries in the Columbia River Basin. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered; (3) the identified action is subsequently modified in a manner that causes an effect to listed species or critical habitat that was not considered in the biological opinion; (4) a new species is listed or critical habitat designated that may be affected by the identified action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

NMFS finds the management constraints contained in this opinion necessary for the conservation of the affected listed species. In arriving at these management constraints, NMFS has been mindful of affected treaty rights and its Federal trust obligations. NMFS will reconsider the management constraints in this opinion that affect treaty rights in the event new information indicates such reconsideration is warranted.

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ENVIRONMENTAL ASSESSMENT OF THE NATIONAL MARINE FISHERIES SERVICE ACTION OF ISSUANCE OF A BIOLOGICAL OPINION AND INCIDENTAL TAKE STATEMENT UNDER THE ENDANGERED SPECIES ACT FOR TREATY-INDIAN AND NON-INDIAN FISHERIES IN THE COLUMBIA RIVER DURING AUGUST THROUGH DECEMBER 2000.

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1 Purpose of and Need for Action

1.1 Description of Action

Four native American treaty tribes propose to conduct tribal fisheries in the Columbia River between August 1 and December 31, 2000. The Bureau of Indian Affairs (BIA), on behalf of these four Columbia River treaty tribes — the Yakama Indian Nation (YIN), the Confederated Tribes of the Umatilla Indian Reservation (CTUIR), the Confederated Tribes of the Warm Springs Reservation of Oregon (CTWSRO), and the Nez Perce Tribe(NPT) — submitted a biological assessment to the National Marine Fisheries Service (NMFS) for the purpose of consultation under the Endangered Species Act (ESA). The details of the proposed fisheries are described in the biological assessment (Jamison 2000).

On May 5, 2000, absent an agreement with the Columbia River treaty tribes, the Oregon Department of Fish and Wildlife/Washington Department of Fish and Wildlife (ODFW/WDFW) submitted an application to NMFS for an ESA section 10(a)(1)(B) permit for incidental take of ESA-listed anadromous fish species associated with four commercial, six recreational, two test/assessment, and one non-treaty Indian subsistence fishery programs to be conducted in and around the Columbia River and its tributaries between August1- December 31, 2000. The details of the proposed fisheries are described in the permit application (Greer and Koenings 2000a).

June 26, 2000, the States of Washington and Oregon filed a new lawsuit, Oregon Department of Fish and Wildlife v. Daley, Civ. No. 00-880-KI, in the District of Oregon. On July 13, 2000, the court convened a status conference concerning disputes over the fall chinook harvest on the Columbia River. On July 13, 2000, the parties reached an agreement regarding fall season fisheries in the form of a motion or stipulated agreement filed with the court (U.S. v. Oregon 2000). The form of the agreement and federal action is the same as in the fall of 1999. The agreement creates a federal nexus with state fisheries. As a result, both the state and tribal fisheries can be authorized under the Incidental Take Statement of a single opinion; the section 10 permit for the states is not required.

The fisheries are described in the permit application (Greer and Koenings 2000a) and biological assessment (Jamison 2000). The fisheries primarily target non-listed fall chinook salmon, non-listed hatchery-produced steelhead, and sturgeon. The implementation of these fisheries allows fishing for non-treaty recreational purposes and provides economic opportunity for tribal and non-tribal communities through the sale of fish, licences, equipment, and the conduct of other financial transactions related to the recreational fisheries. The implementation of these fisheries allows fishing for treaty-Indian ceremonial and subsistence (C&S) and commercial fisheries and provides cultural and economic benefits to the tribes.

The purpose of this environmental assessment is to evaluate the potential environmental effects as a consequence of the conduct of the proposed non-Indian commercial and recreational fisheries, non-treaty Indian subsistence fishery programs and treaty-Indian fishery programs and the NMFS action of issuing an incidental take statement to the states and tribes for the incidental take of ESA-listed anadromous fish under the jurisdiction of NMFS associated with the proposed fisheries.

1.2 Decisions Involved in this NEPA Analysis

NMFS must determine whether to accept the proposals for fall season fisheries in 2000, based in part on the potential environmental impacts resulting from the structuring of fall season fisheries in the Columbia River in 2000. This decision must include consideration of possible adverse impacts to fish and other organisms and their habitats from fishing activities, degradation or improvement of the human environment as a result of various alternative fishing regimes, and possible implementation of mitigatory actions. In brief, the options NMFS considered include:

• **Alternative 1- Proposed Action Alternative**: Federal agreement to the initial proposals for 2000 state and tribal fisheries programs in the Columbia River as described in the Permit application (Greer and Koenings 2000a) and the biological assessment (Jamison 2000) and illustrated in Appendix 1 (Table A for the states proposal and Table B for the tribes proposal);

• **Alternative 2- Status Quo Alternative**: Federal agreement to the modified proposal for 2000 fisheries in the Columbia River as described in the modification to the biological assessment (Greer and Koenings 2000b and Overberg 2000), as described in Appendix 1, Table C. This alternative is consistent with the 1999 management agreement and represents the agreement reached for 2000; and

• **Alternative 3- No Action Alternative:** Rejection of proposed fisheries with impact to listed ESUs, leaving most fisheries unauthorized under the ESA.

1.3 Scoping and Significant Issues

The scope of the action considered here are proposed fall 2000 fisheries in the Columbia River (Table 1), most of which have impacts on salmonids listed under the ESA. Other activities in the Columbia River Basin, and other harvest activities outside the Columbia River Basin, might have impacts on the numbers of fish available to in-river fisheries. Those other activities have been discarded from detailed analysis in this environmental assessment because their planning, regulation, and implementation fall outside the scope of the proposed action which is the focus of this environmental assessment. Those other activities, considered but determined to be outside this document's scope, include:

- ocean fisheries off the west coast of California, Oregon, Washington, Canada, and Alaska that might affect Columbia River salmonids;
- Columbia River recreational tributaries fisheries in Washington, Oregon and Idaho
- modification of the federal Columbia River hydropower system to increase fish survival;
- alterations in land management practices to provide better quality habitat and/or more beneficial river and stream flows for salmonid upstream and downstream migration and spawning and rearing survival; and
- elimination or modification of hatchery management practices, either to decrease adverse impacts on natural-origin fish, and to provide greater numbers of hatchery-origin salmonids for exploitation by fisheries.

1.4 Federal Permits, Licenses, and Entitlements Necessary to Implement the Project

For state and treaty-Indian fisheries in the Columbia River taking place in the fall of 2000, the biological opinion itself constitutes the primary document allowing, describing, and limiting the setting of harvest and related activities in the lower Columbia River, as determined by the Ninth Circuit Court. No other federal actions are required to implement these fisheries. Regulations for treaty Indian fisheries are promulgated directly by the Columbia River treaty tribes, and enforced by the tribes and the Columbia River Intertribal Fishery Enforcement Agency. Fishery regulations related to the states' 2000 fall fisheries in the Columbia River mainstem are issued by the States of Oregon and Washington.

2 Proposed Action Alternative and Other Alternatives

This chapter describes three alternatives and summarizes the environmental consequences of each alternative.

2.1 Description of Alternatives

For the purpose of this document, NMFS determines that there are three alternatives requiring consideration:

- *Alternative 1 (Proposed Action Alternative)* - Federal agreement to the initial proposals for fall 2000 state and tribal fisheries programs in the Columbia River as described in the Permit application (Greer and Koenings 2000a) and the biological assessment (Jamison 2000) and illustrated in Appendix 1 (Table A for the states proposal and Table B for the tribes proposal);

- *Alternative 2 (Status Quo Alternative)* - Federal agreement to the modified proposal for fall 2000 fisheries in the Columbia River as described in the modification to the biological assessment (Greer and Koenings 2000b and Overberg 2000), as described in Appendix 1, Table C. This alternative is consistent with the 1999 management agreement and represents the agreement reached for 2000; and

- *Alternative 3 (No-Action Alternative)*- rejection of proposed fisheries with impact to listed ESUs, leaving most fisheries unauthorized under the ESA., effected by NMFS issuance of a jeopardy opinion without Reasonable and Prudent Alternative for the 2000 fall fishing season.

2.1.1 Alternative 1 - Proposed Action Alternative — Federal agreement to the initial proposals for fall 2000 state and tribal fisheries programs in the Columbia River as described in the Permit application (Greer and Koenings 2000a) and the biological assessment (Jamison 2000) and illustrated in Appendix 1 (Table A for the states proposal and Table B for the tribes proposal).

Fisheries in the Columbia River possibly impacting salmonids listed under the ESA are listed in Table 1. The fishery proposals in this environmental assessment were submitted independently by the states and tribes and rely on forecasts for 2000 returns (Table 2) of sturgeon, spring/summer chinook, fall chinook and sockeye salmon and steelhead. Spring/summer chinook are not affected by the proposed fall season fisheries. Alternative 1 represents a lack of agreement on allocation of SR fall chinook incidental impacts between the states and the tribes. The combined impacts to the threatened Snake River fall chinook, resulting from the proposed state and tribal fisheries is ≤43.29%, which is substantially greater than the allowed 31.29% harvest rate impact to that ESU. NMFS would not be able to approve the combined set of fisheries as proposed separately under Alternative 1.

2.1.2 Alternative 2 - Status Quo Alterative -Federal agreement to the modified proposal for fall 2000 fisheries in the Columbia River as described in the modification to the permit application by the states (Greer and Koenings 2000b) and in the modification to the biological assessment by the tribes (Overberg 2000), as described in Appendix 1, Table C. This alternative is consistent with the 1999 management agreement and represents the agreement reached for 2000.

Alternative 2 is the Status Quo Alternative and the Preferred Alternative. It is the Status Quo alternative in that it includes provisions designed to provide fishing opportunity for state and tribal fisheries similar to 1999, and is consistent with the previous (NMFS 1999) incidental harvest rate limit of Snake River fall chinook and Group B steelhead of 31.29% and 17% respectively (Appendix 1, Table C). This alternative represents the agreement reached for 2000 between the tribes and the states and it is described in the modification to the permit application by the states (Greer and Koenings 2000b) and in the modification to the biological assessment by the tribes (Overberg 2000).

2.1.3 Alternative 3. No-Action Alternative - Closing all fisheries in the Columbia Basin that may affect Columbia River species listed under ESA.

The no-ESA-impact fisheries option is as the name implies: no fisheries with any likelihood of directed or incidental harvest of listed fish would be authorized. Any fishery resulting in the incidental take of a listed fish would be in violation of the taking prohibitions of the ESA. Only fisheries not resulting in the potential take of listed species would be able to proceed; this would effectively close nearly all state and tribal fall fisheries in the Columbia River. Only limited tributary fisheries in the Snake River and Deschutes River could take place (Table 2).

3 Affected Environment

3.1 Resources Excluded from Detailed Analysis

The following resources were considered in the preparation of this environmental assessment, but were not selected for detailed analysis: terrestrial organisms, riparian habitat, and water quality. The reasons for excluding these resources from further consideration are summarized here.

Table 1. Columbia River non-Indian , non-treaty Indian and treaty-Indian subsistence fisheries anticipated to occur in 2000 and considered in this EA.

Non-Indian Commercial Fisheries
Mainstem Commercial Salmon/Sturgeon Fisheries Fall Commercial Fishery - Select Areas *Smelt Commercial Fishery/Test Fishery** *Commercial anchovy and herring bait fishery**
Non-Indian Recreational Fisheries
Mainstem Salmon/Steelhead Recreational Fishery Warmwater Recreational Fishery Columbia River Tributary Recreational Salmon and Steelhead Fisheries *Select Area Recreational fisheries** *Sturgeon Recreational Fishery** *Steelhead Recreational Fishery - Ringold**
Non-Indian Test/Assessment Fisheries

Sturgeon tagging stock assessment *Fall Selective Gear Test Fishery**
Non-Treaty Indian Subsistence Fishery
Wanapum Tribe Subsistence Fishery
Treaty Indian Fisheries
Zone 6 Fishery Hanford Reach Fishery Tributary fisheries Little White Salmon River Klickitat River Deschutes River John Day River Umatilla River Walla Walla River Yakima River Snake River Basin
**No anticipated impacts to ESA-listed salmonids*

3.1.1 Terrestrial Organisms

Table 2. Forecast of 2000 salmonid returns at the Columbia River Mouth. a_/

Species	Stock		Forecast
Spring Chinook	Willamette		59,900
	Sandy		3,800
	Cowlitz		2,000
	Kalama		1,400
	Lewis		2,600
	Upriver		134,000
	Columbia River		203,700
	Leaburg (McKenzie)	Total	2,100
	North Fork Clackamas		1,800
	Wind		16,900
	Drano		8,100
	White Salmon		400
	Klickitat		2,300
	Snake River	Total	58,000
	Snake River	Wild	5,800
	Upper Columbia	Total	28,000
	Upper Columbia	Wild	4,500
Summer Chinook	Upriver		33,300
	Snake River	Total	7,600
	Snake River	Wild	2,000
Fall Chinook b_/	LRH - Lower River Hatchery		26,400
	LRW - Lower River Wild		2,700
	BPH - Bonneville Pool Hatchery		26,900
	URB - Upriver Bright		208,200
	BUB - Bonneville Upriver Bright		17,900
	PUB - Pool Upriver Bright		40,500
	Total		322,600
Sockeye	Wenatchee		5,500
	Okanogan		25,500
	Snake		168
	Total		31,000
Steelhead c_/	Group A index	Hatchery	157,300
		Wild	52,700
		Total	210,000
	Group B index	Hatchery	22,800
		Wild	11,000
		Total	33,800
	Upriver Combined	Hatchery	188,400
	(includes Skamania)	Wild	65,600
		Total	254,000

a_/ Source: ODFW 2/22/2000
b_/ Preliminary forecast adjusted for the PFMC option 1 (55,000 N of Cape Falcon)
c_/ Bonneville Dam forecast.

Because activities associated with the proposed fisheries would likely only make use of existing facilities (boat ramps and other access points), no significant additional impacts to terrestrial organisms, ESA-listed or unlisted, are anticipated. The closure of tribal fisheries in the lower Columbia River in 2000 would provide additional fish available for use by terrestrial organisms. However, because fisheries are held to low levels, the number of additional fish that would be available is small, and the benefits accruing to terrestrial piscivores and scavengers are negligible.

3.1.2 Riparian Habitat

Possible impacts to riparian vegetation and habitat would occur primarily through bank fishing, movement of boats and gear to the water, and other streamside usages. Construction activities directly related to fisheries remain limited to maintenance and repair of existing facilities, and are not expected to result in additional impacts to riparian habitats in 2000. The facilities used in association with river fisheries are essentially all in place, and no reduction in the construction of new facilities would result from the closure of Columbia River fisheries. Some access points to the river might experience a reduction in traffic, but in most cases would continue to be used in association with other similar river activities, such as boating and windsurfing.

3.1.3 Water quality

Water quality could be adversely affected by the proposed fisheries as a result of the release of boat engine products, trash, and other effluents into the water. However, because fishing effort has been low in recent years as a result of sharply constrained fisheries, the effects to water quality resulting from the preferred alternative are expected to be negligible.

An alternate effect on water quality is related to the presence of salmonid carcasses in the water, as a result of dying after spawning, or dying during unsuccessful upstream migration. The historical amounts of nutrients available to the ecosystem from these carcasses was large, and contributed to the enhancement of many forms of aquatic life, including the organisms juvenile salmon feed upon during rearing. However, because fisheries in recent years have been conducted at reduced levels, the additional contribution of nutrients from decaying carcasses and other fish wastes as a result of fishery closures is negligible.

3.2 Physical Environment

The Columbia River is the fourth largest river in North America. Its basin, including its tributaries, covers 258,500 square miles in seven U.S. states and British Columbia in Canada. It is the dominant water system in the Pacific Northwest. The Columbia River originates in the Rocky Mountains in British Columbia, flowing 1,214 miles to enter the ocean near Astoria, Oregon. Major tributaries of the Columbia River in the U.S. are the Kootenai, the Clark Fork-Pend Oreille, the Snake, and the Willamette Rivers.

The Columbia River serves the Pacific Northwest in a number of ways, including navigation, irrigation and other water supply, and electrical power generation. Detailed information on the importance of the river to the region can be found in the Columbia River System Operation Review (U.S. Department of the Interior et al. 1991).
The Columbia River also produces some of the region's most important and well-known runs of

salmon and other anadromous fish. The lower Columbia River (defined here as downstream of McNary Dam) primarily serves as a migration corridor for adult anadromous fish destined for tributaries of the lower river, the upper Columbia River, and the Snake River. Because of the abundance of fish passing through the lower Columbia River, a wide array of non-Indian commercial and recreational fisheries, and Indian commercial, ceremonial and subsistence fisheries, has historically taken place.

3.3 Biological Environment

3.3.1 Anadromous Fish Listed Under the ESA

Since 1991, NMFS has identified twelve populations of Columbia River Basin salmon and steelhead as requiring protection under the ESA. In addition bull trout were listed and SW Washington cutthroat trout were proposed for listing by the US Fish and Wildlife Service (USFWS). The populations expected to be impacted by fisheries covered in this environmental assessment and their current listing status are described below. Unless otherwise noted, the ESA-listed component includes wild/natural populations only. Take prohibitions are in effect for Snake River spring/summer, fall chinook and sockeye salmon, and upper Columbia River spring chinook salmon and steelhead. There are no take prohibitions for the other ESA-listed salmonid ESUs at this time.

a) Lower Columbia River chinook salmon, *Oncorhynchus tshawytscha*, threatened, March 24, 1999. Both spring and fall chinook salmon are included in this ESU. This ESU includes all native populations from the mouth of the Columbia River to, but not including, the Klickitat River. This includes natural spring chinook salmon, excluding populations above Willamette Falls and Sandy River.

b) Snake River fall chinook, *Oncorhynchus tshawytscha*, threatened, April 22, 1992. This ESU includes tributaries to the Snake River upstream of the Snake and Columbia River's confluence. It includes all natural-spawning populations of fall chinook salmon in the mainstem Snake River and the following subbasins: Tucannon River, Grand Ronde River, Imnaha River, and Salmon River and Clearwater River.

c) Lower Columbia River steelhead, *Oncorhynchus mykiss*, threatened, March 19, 1999. This coastal steelhead ESU occupies tributaries to the Columbia River between the Cowlitz and Wind Rivers (inclusive) in Washington and the Willamette and Hood Rivers (inclusive) in Oregon. Excluded are steelhead in the upper Willamette River Basin above Willamette Falls.

d) Middle Columbia River Basin steelhead, *Oncorhynchus mykiss*, threatened, March 25, 1999. This inland steelhead ESU occupies the Columbia River Basin from Mosier Creek, Oregon, upstream to the Yakima River, Washington, inclusive.

e) Upper Columbia River Basin steelhead, *Oncorhynchus mykiss*, endangered, August 18, 1997. This inland steelhead ESU occupies the Columbia River Basin upstream from the Yakima River, Washington, to the United States/Canada Border. The ESA-listed component includes Wells Hatchery steelhead.

f) Snake River Basin steelhead, *Oncorhynchus mykiss*, threatened, August 18, 1997. This inland steelhead ESU occupies the Snake River Basin of southeast Washington, northeast Oregon, and Idaho.

g) Upper Willamette steelhead, *Oncorhynchus mykiss*, threatened, May 24, 1999. The Upper Willamette River steelhead ESU includes the Willamette River and its tributaries from Willamette Falls up to and including the Calapooia River. Native steelhead in the Upper Willamette River ESU are known as late-run winter steelhead.

h) Columbia River chum, *Oncorhynchus keta*, threatened, May 24, 1999. This ESU includes all native populations in the mainstem Columbia River and its tributaries.

i) Cutthroat Trout - Southwest WA, proposed threatened, May 24, 1999. This ESU includes coastal cutthroat downstream from the Klickitat River in WA and Fifteen mile Creek in OR (inclusive), and Willamette River tributaries downstream of Willamette Falls. Also includes coastal populations north to Grays Harbor.

j) Bull Trout, threatened, June 10, 1998. This ESU includes all native populations in the Snake and Columbia rivers.

Seasonal Distribution/Migration

Chinook -- Fall chinook generally enter the Columbia River from late July through October, peak in the lower river from mid-August to mid-September, and peak at Bonneville Dam in early September. Columbia River fall chinook are comprised of five major components; Lower River Hatchery (LRH), Lower River Wild (LRW), Bonneville Pool Hatchery (BPH), Upriver Brights (URB), and Mid-Columbia Brights (MCB). The LRH and BPH stocks are referred as tules and the LRW, URB, and MCB are referred to as brights. Minor run components include Lower River Brights (LRB) and Select Area Brights (SAB). Many of the fall chinook originate from hatcheries while others were spawned naturally throughout the Columbia River Basin and in the mainstem of the Columbia River between McNary and Priest Rapids Dams and below Bonneville Dam. The Lower Columbia ESU includes naturally spawning fish in the LRH and LRW management.

The LRH management stock is currently produced from hatchery facilities in Washington and Oregon. Some natural spawning occurs in most lower Columbia River tributaries and are a mixed stock of composite production. The overall result of straying fall chinook and egg transfer between hatcheries is the development of a widely mixed stock. There appear to be three self-sustaining populations of tule fall chinook in the lower Columbia that have had little or no hatchery influence (Coweeman, East Fork Lewis, and Clackamas rivers). Some natural spawning occurs in streams with hatcheries on or near them and is thought to be mostly hatchery strays. Ocean distribution of tule fall chinook (LRH) is primarily off the Washington coast. They return to the Columbia River in August and early September and are mature soon after they enter freshwater. Peak spawning time is in late September and early October.

The LRW management stock is comprised of wild/naturally produced fish from the North Lewis, East Fork Lewis, and Sandy rivers (brights). These populations are self-sustaining with no significant hatchery influence. The population in the North Lewis River has been healthy with escapements exceeding the goal of 5,700 in all years except 1999. Ocean distribution of LRW fall chinook is more northerly and they contribute to Alaska and Canadian fisheries. They return to the Columbia River from August through December, with peak spawning in mid-November.

The BPH management stock is currently produced from Spring Creek Hatchery above Bonneville Dam. Some natural spawning occurs in the Wind and White Salmon rivers and is thought to be mostly hatchery strays. Timing and distribution of BPH fall chinook is similar to LRH chinook, with peak passage over Bonneville Dam in early September.

The listed Snake River Wild (SRW) fall chinook ESU is considered a subcomponent of the URB stock. Most of the URB stocks are wild fish destined for the Hanford Reach section of the Columbia River. Smaller URB components are destined for the Deschutes, Snake, and Yakima rivers. The MCB chinook originated from, and are considered a component of the URB stock. The upriver MCB component (Pool Upriver Brights, or PUB stock) is comprised of brights reared at Bonneville, Little White Salmon, Irrigon, and Klickitat hatcheries and released in areas between Bonneville and McNary dams.

The MCB production below Bonneville Dam (Bonneville Upriver Brights, or BUB stock) occurs at Bonneville Hatchery in Oregon. Natural production of brights derived from PUB stock is also believed to occur in the mainstem Columbia below John Day Dam, and in the Wind, White Salmon, Klickitat, and Umatilla rivers.

The LRB's are a self-sustaining natural stock that spawns in the mainstem Columbia approximately three miles downstream from Bonneville Dam. The stock is closely related to Upriver Brights and is thought to have originated from MCB or URB stock. Prior to 1998, LRB's were classified as BUB's, and therefore were considered to be a component of the MCB stocks. Beginning in 1998, LRB's are identified as a separate stock. The SAB's are a local hatchery stock that originated from the Rogue River fall chinook stock and are currently being reared at Klaskanine Hatchery for release into Youngs Bay.

Chum-- Chum salmon return to the Columbia River in October and November, with spawning in November and December. Chum returns are almost entirely from natural/wild production and age of returns are three, four and five year olds, but most return as 4-year olds. Chum are produced primarily in the Grays River in Washington and in smaller tributaries downstream from Bonneville Dam. Chum salmon spawn in the lower reaches of streams, which increases their susceptibility to environmental degradation. Juveniles migrate to saltwater soon after emerging from the gravel in the spring. Lower Columbia River chum salmon production occurs primarily in Washington tributaries below Bonneville Dam including Grays River, Hamilton Creek, and Hardy Creek.

Steelhead-- Winter steelhead return to the Columbia River from November through April and spawn from December through June. Wild fish peak in March and April while hatchery fish predominate in the early portion of the run. Winter steelhead use most major tributaries in the Columbia River from Fifteenmile Creek downstream. Major spawning areas include the Hood, Sandy, Clackamas, and upper Willamette rivers in Oregon, and the Klickitat, Wind, Lewis, Kalama, Cowlitz, and Grays rivers in Washington.

The Columbia River summer steelhead run includes populations from lower river and upriver tributaries. Summer steelhead enter fresh water over a protracted time period (March through October) each year. The lower river component of the run is primarily hatchery produced, derived from Skamania stock, and tends to be earlier timed than the upriver stocks. Peak timing of lower river returns is in May and June. Lower river summer steelhead return to the Cowlitz, Kalama, Lewis, and Washougal rivers in Washington and the Willamette system and Sandy River in Oregon. In addition, hatchery fish of the Skamania stock are released annually in Bonneville Pool tributaries of both states. Summer steelhead caught on the main-stem lower Columbia River through June each year are classified and counted as lower river stock.
Summer steelhead enter the Columbia River from March through October, with most of the run entering from late June through mid-September. The upriver steelhead run has historically been separated into A and B groups which pass Bonneville Dam before and after August 25. Group A steelhead include early-returning Skamania stock which pass Bonneville Dam before July and are primarily destined for Bonneville Pool tributaries. Group A steelhead also include non-Skamania stock which pass Bonneville Dam from late June through August 25 on their way to tributaries throughout the Columbia and the Snake basins. Group B steelhead return to the Clearwater and Salmon rivers in Idaho and pass Bonneville Dam from August 26 through October. Group B steelhead are generally larger than group A steelhead.

Group A and B steelhead cannot be distinguished based on run timing above Bonneville Dam where groups mix as fish seek temporary refuge in cooler tributaries. Steelhead counts at dams above Bonneville surge as mainstem water temperature declines in the fall. Counts peak at John Day, McNary, and the Snake River dams in September and October. During years of above average September-October flows and lower temperatures, steelhead move readily past lower Snake River dams during the fall counting period (June-December) and fewer fish are delayed until the spring count period (March-May). Snake River steelhead experience higher Bonneville to Lower Granite Dam survival rates in run years with lower spring count percentages.

Since 1984, summer steelhead passing Bonneville Dam have been randomly sampled throughout the run (April-October) to ascertain age and size composition, and hatchery to wild ratio of each year's return. In 1999, the TAC completed a review of steelhead assessment methods for Bonneville Dam and Zone 6 fisheries. While the bi-modal run timing distribution at Bonneville Dam has not been as distinct in recent years as it was historically, the TAC reviewed data showing that smaller steelhead still have earlier timing at Bonneville Dam while larger steelhead are later timed.

Since 1989, an average of 78% of steelhead less than 78 cm fork length crossed Bonneville Dam before August 25 and 75% of steelhead greater than or equal to 78 cm fork length crossed Bonneville Dam after August 25. Although about 85% of steelhead found in certain Idaho streams are large (>78 cm), the data are insufficient to make any definitive conclusions regarding the proportion of late-timed larger steelhead crossing Bonneville Dam that are destined for Idaho streams. The TAC concluded that separation using a 78 cm fork length criteria can be used as an index of historic Group A and Group B steelhead stock components. Based on these results, the TAC adopted a revised method of estimating fishery impacts to Group A and Group B steelhead using sampling data from Bonneville Dam and fisheries for large (>78cm) and small (<78 cm) groups of steelhead passing Bonneville Dam after June 30. Steelhead passing Bonneville Dam before July 1 are considered an index of Skamania stock steelhead.

Cutthroat Trout-- Cutthroat trout enter the Columbia River during July through November. Entry into the tributaries occurs during the same time frame with some entering immediately and some holding in the mainstem Columbia before moving into the tributaries to spawn.

Bull Trout-- Native char are found in freshwater streams throughout the Columbia River Basin. Bull trout populations in the Columbia River are either resident, or migratory fluvial or adfluvial forms. Some bull trout migrate to salt water for a portion of their lives but this life history stage is rare south of Canada and Alaska. Bull trout prefer clear, cold tributary streams. Spawning occurs in fall when temperatures fall below 8 C. Adults often remain on the spawning grounds until spring. Adfluvial bull trout often move into larger river-reservoir systems in spring. Resident fish remain in higher order streams. By late spring-early summer, adfluvial fish migrate upstream to reach spawning grounds before water temperatures become prohibitively high for transit. Significant bull trout populations occur in the Lewis, Hood, Deschutes, and Wind river subbasins. These populations are primarily of the resident form although adult bull trout from these populations occasionally move back and forth between tributaries and the Columbia River mainstem, primarily during winter.

Biological Requirements

Chinook Salmon-- The following descriptions are excerpts from NOAA Technical Memorandums on, "Status Review of Chinook Salmon from Washington, Idaho, Oregon and California", "Status Review for Snake River Spring and Summer Chinook Salmon" and "Status Review of Mid-Columbia River Summer Chinook Salmon."

Chinook salmon exhibit the most diverse and complex life history strategies. Healey (1986) described sixteen age categories for chinook salmon, seven total ages with three possible freshwater ages. The generalized life history of chinook salmon involves incubation, hatching, and emergence in freshwater, migration to the ocean, and subsequent initiation of maturation and return to freshwater for completion of maturation and spawning. Two freshwater life-history types were described by Gilbert (1912); "stream-type" chinook salmon reside in freshwater for a year or more following emergence, and "ocean-type" chinook salmon migrate to the ocean within their first year. Juveniles migrate to saltwater several months after emerging from the gravel in early spring.

Runs are designated on the basis of adult migration timing; however, distinct runs also differ in the degree of maturation at time of river entry, thermal regime and flow characteristics of their spawning site, and actual time of spawning. Adult chinook salmon migrating upstream past

Bonneville Dam from March through May, June through July, and August through October are categorized as spring-, summer-, and fall-run fish, respectively (Burner 1951). In general, the habitats utilized for spawning and early juvenile rearing are different among the three forms (Chapman et al. 1991). Fall chinook salmon tend to use large, lower elevation stream, or main-stem areas, and with smolt migration moving seaward slowly as subyearling.

All stocks and especially those that migrate into freshwater well in advance of spawning, utilize resting pools. These pools provide an energetic refuge from river currents, a thermal refuge from high summer and autumn temperatures and a refuge from potential predators (Berman and Quinn 1991, Hockersmith et al. 1994).

Fall chinook salmon in the Columbia River Basin can be divided into two physiological distinct types: "tules" and "brights". Tules, which are confined to the lower tributaries (generally, those below Bonneville Dam), are sexually mature when they enter fresh water as adults, as indicated by their dark coloration. In contrast, fall-run fish destined to spawn in upriver areas are known as "brights" because they mature more slowly (having a greater distance to travel upriver before spawning) and therefore retain their silvery oceanic coloration well into their freshwater migration.

The most significant process in the juvenile life history of chinook salmon is smoltification, the physiological and morphological transition from a freshwater to marine existence. Distance of migration to the marine environment, stream stability, stream flow and temperature regimes, stream and estuary productivity and general weather regimes have been implicated in the evolution and expression of specific emigration timing. Freshwater entry and spawning timing are generally thought to be related to local temperature and water flow regimes (Miller and Brannon 1982). Temperature has a direct effect on the development rate of salmonids. Juvenile stream- and ocean-type chinook salmon have adapted to different ecological niches. Ocean-type chinook salmon tend to utilize estuaries and coastal areas more extensively for juvenile rearing. Stream-type juveniles are much more dependent on freshwater stream ecosystems because of their extended residence in these areas.

The diet of out migrating ocean-type chinook salmon varies geographically and seasonally and feeding appears to be opportunistic (Healey, 1991). Aquatic insect larvae and adults, Daphnia, amphipods, and Neomysis have been identified as important food items (Kjelson et al. 1982, Healey 1991). Food items once in the ocean comprises of fish larvae, squids, copepods, euphasiids, amphipods and pteropods.

Chum Salmon -- The following descriptions are excerpts from NOAA Technical Memorandum on "Status Review of Chum Salmon from Washington, Oregon and California."

Chum salmon belong to the family Salmonidae and are one of eight species of Pacific salmonids in the genus *Oncorhynchus*. Chum salmon are semelparous, spawn primarily in freshwater, and apparently exhibit obligatory anadromy, as there are no recorded landlocked or naturalized freshwater populations (Randall et al. 1987). The species is best known for the enormous canine-like fangs and striking body color of spawning males (a calico pattern, with the anterior two-thirds of the flank marked by bold, jagged, reddish line and the posterior third by jagged black line). Females are less flamboyant and lack the extreme dentition of the males.

The species has the widest natural geographic and spawning distribution of any Pacific salmonid, primarily because its range extends farther along the shores of the Arctic Ocean than other salmonids (Groot and Margolis 1991). Chum salmon also grow to be among the largest of Pacific salmon, second only to chinook salmon in adult size.

Chum salmon spend more of their life history in marine waters than other Pacific salmonids. Chum salmon like pink salmon, usually spawn in coastal areas, and juveniles outmigrate to seawater almost immediately after emerging from the gravel that covers their redds (Salo 1991). This means that survival and growth in juvenile chum salmon depend less on freshwater conditions than on favorable estuarine conditions. Another behavioral difference between chum salmon and species that rear extensively in freshwater is that chum salmon form schools, presumably to reduce predation (Pitcher 1986), especially if their movements are synchronized to swamp predators (Miller and Brannon 1982).

In the Columbia River Basin chum salmon are produced primarily in the Grays River and in smaller tributaries downstream from Bonneville Dam. Present -day populations in the Columbia River represent only a small portion of the historic chum salmon abundance and diversity. Substantial habitat loss in the Columbia River, its tributaries, and estuary was presumably an important factor in the decline.

Steelhead -- The following descriptions are excerpts from NOAA Technical Memorandum on "Status Review of West Coast steelhead from Washington, Oregon and California.", and the "Lower Columbia Steelhead Conservation Initiative."

Steelhead exhibit anadromy (steelhead) or freshwater residency (rainbow trout or redband trout). They migrate to marine waters after two years in fresh water, reside in marine waters typically for two or three years prior to returning to their natal springs to spawn as four or five year olds.

Steelhead are divided into two reproductive ecotypes, based on their state of sexual maturity at the time of river entry and the duration of their spawning migration. The stream maturing ecotypes enter fresh water in a sexually immature condition and require several months to mature and spawn. The ocean maturing steelhead enter freshwater with well developed gonads and spawn shortly after river entry.

The Columbia River Basin steelhead are of two inherent stocks; winter steelhead returning during November through May, and are usually near final stages of maturity upon entry. Summer- run steelhead generally return as immature fish between April and October. Most adult steelhead spend about two to four years in the ocean before returning to their natal streams to complete the life cycle. Both races spawn in the tributaries and mainstem areas from January to May in the calendar year following return to freshwater.

Juvenile wild steelhead usually rear in freshwater for one to three years before undergoing a physiological change to become smolts and out migrating to sea. Wild steelhead smolts migrate from freshwater to saltwater from March through June.

The life history of steelhead trout, the sea-run form of rainbow trout, is highly variable. Two races of steelhead exist, winter run and summer run, defined by the timing of adult returns to natal spawning streams and by the extent of sexual maturity upon entering freshwater. Both races spawn in tributaries and mainstem areas from January to May. Substrate composition, cover, water quality and water quantity are important habitat elements for steelhead before and after spawning. Steelhead spawn in clear, cool, well oxygenated streams with suitable gravel and water velocities. Adult fish waiting to spawn or in the process of spawning are vulnerable to disturbances and predation in areas without suitable cover. Cover types include overhanging vegetation, undercut banks, submerged vegetation, submerged objects deep water and turbulence.

Some factors that influence juvenile survival in freshwater include the number of eggs deposited, siltation, dissolved oxygen, temperature, barriers, pollution, predation, angling mortality and competition with other fish. Like other salmonids, the juvenile steelhead are visual predators, feeding on zooplankton and insect larvae. Steelhead in marine waters feed mainly on fish and squid, but also utilize euphausiids, amphipods, pteropods, and pelagic polychaetes.

Cutthroat trout-- The following descriptions are excerpts from NOAA Technical Memorandum on "Status Review of Coastal Cutthroat Trout from Washington, Oregon and California."

In Washington and Oregon, coastal cutthroat trout are widespread west of the crest of the Cascade Mountains. Historically, the range of anadromous *Oncorhynchus clarkii* may have extended past the Cascade Crest into tributaries of the Columbia River, as far eastward as the Klickitat River (Bryant 1949). The current distribution of sea-run fish appears to be confined to tributaries downstream from Bonneville Dam. Anadromous cutthroat trout spawning typically starts in December and continues through June, with peak spawning in February. Generally, spawning occurs upstream of coho salmon and steelhead spawning zones, although some overlap may occur (Lowry 1965, Edie 1975, Johnston 1982).

Cutthroat trout are iteroparous, and the incidence of repeat spawning appears to be higher than in steelhead. In general, coastal cutthroat trout exhibit considerable variation in age and size maturity. Nonmigratory coastal cutthroat trout typically mature at an early age (2 to 3 years) whereas sea-run cutthroat trout rarely spawn before age 4.

Coastal cutthroat trout are found in streams with channel gradients that vary from low (2%)to moderate (2-3%) or steep (>4%) with narrow widths (0.7-3.0 m) (Hartman and Gill 1968, Edie 1975, Glova 1978, Jones and Siefert 1997) and often in small watersheds with drainage areas under 13 km2 (Hartman and Gill 1968). This choice of spawning sites that are at the upper limit of spawning and rearing sites of coho and steelhead will reduce competitive interactions between young-of-the-year coastal cutthroat trout and other salmonids. Coastal cutthroat trout parr generally remain in upper tributaries until they are 1 year of age, when they may begin moving more extensively throughout the river system.
Researchers have found that coastal cutthroat trout that enter the sea generally do so after 2-4

years in the freshwater environment (Sumner 1962, Lowry 1965, Giger, 1972, Michael 1980, Fuss 1982). Studies by Giger (1972) in Oregon and Jones (1973, 1974, 1975) in Alaska indicated that coastal cutthroat trout, whether initial or seasoned migrants, remained at sea an average of 91 days, with a range of 5 to 158 days. It is believed that the marine phase can be very important to sea-run cutthroat trout in enhancing opportunities for growth and dispersal to neighboring drainages, the freshwater phase may be relatively more important for juvenile growth and survival in sea-run cutthroat than for other anadromous salmonids, at least in some populations where estuaries are small or nearshore habitat are limited.

Like other salmonids species the cutthroat trout feeding habits appears to be opportunistic. In their freshwater life stage important food items are insect larvae, Daphnia and amphipods. Food items once in the ocean are comprised of fish larvae, squids, copepods, euphasiids, amphipods and pteropods.

Bull trout --The following descriptions are excerpts from a U.S. Fish and Wildlife Service Fact Sheet on Bull Trout.

Bull trout are members of the char subgroup of the salmon family (salmonids), which also includes the Dolly Varden, lake trout and Arctic char. Bull trout living in streams grow to about four pounds while those in the lake environment can weigh more than 20 pounds. Biologist distinguish char from other salmonids such as trout and salmon by the absence of teeth in the roof of the mouth; the presence of light colored spots on dark background; the absence of spots on the dorsal fin; their smaller scales; and differences in skeletal structure. Char species such as bull trout live farther north than any other group of freshwater fish except Alaskan blackfish and are well adapted for life in very cold water.

Bull trout reach sexual maturity between four and seven years of age and are known to live as long as twelve years. They spawn in the fall after temperature drop below 48 Fahrenheit, in streams with cold, unpolluted water, clean gravel and cobble substrate, and gentle stream slopes. Many spawning areas are associated with cold water springs or areas where stream flow is influenced by groundwater. Bull trout eggs require a long incubation period compared to other salmon and trout (four to five months), hatching in late winter or early spring. Fry remain in the stream bed for up to three weeks before emerging. Juvenile fish retain their fondness for the stream bottom and are often found at or near it.

Some bull trout live near areas where they were hatched. Others migrate from streams to lakes or reservoirs (or, in the case of coastal populations, salt water) a few weeks after emerging from the gravel. The ability to migrate or move within stream systems is important for healthy bull trout populations to maintain local fish numbers, facilitate gene flow among subpopulations and reestablish extirpated groups.

Bull trout are vulnerable to many of the same threats that have reduced salmon populations in the Snake River Basin. They are sensitive to increased water temperatures, poor water quality and low flow conditions. Past and continuing land management activities such as timber harvest and livestock grazing have degraded stream habitat, especially those along large river systems and stream areas located in valley bottoms, to the point where bull trout can no longer survive or reproduce successfully.

Small bull trout eat terrestrial and aquatic insects but shift to preying on other fish, as they grow larger. Large bull trout primarily prey on fish such as whitefish, sculpins and other trout.

3.3.2 Non-listed Fish Species

Sturgeon – Two species of sturgeon are found in the Columbia River, the white (Acipenser transmontanus) and the green (*A. medirostris*). Green sturgeon are more marine-associated than white sturgeon, and are harvested almost exclusively in the fall season commercial gill-net fishery in the lower Columbia River. Very few green sturgeon are caught in the estuary sport fishery in the summer.

The white sturgeon is the more valuable species in river fisheries because of its larger size and higher-quality flesh. The white sturgeon population below Bonneville Dam is considered healthy and productive, while the health of those populations above Bonneville Dam are considered to be improving but still depressed due to their segmented nature resulting from reservoir impoundments. Recreational and commercial fisheries in the lower Columbia River were constrained in the late 1980's to prevent overharvest and allow additional recruitment into the legal-sized portion of the population. Increased abundance, and adjustments in the size limits in recent years, have allowed harvest to increase for both recreational and commercial fisheries.

3.3.3 Other Living Resources

Shad, eels, and other warmwater species are not targeted or caught in significant numbers by the parties in the proposed Columbia River fall season fisheries. Impacts on birds from fall season fisheries is minimal, if any. Information suggests that occurrence of accidental bird encounters are a rare event for both commercial and recreational fall fisheries in the Columbia River.

3.4 Treaty Indian and Non-Indian Fisheries

Salmon served as one of the primary food sources for Indians of the Columbia Basin before European settlers arrived. Native Americans occupied the Columbia Basin region for thousands of years before Europeans arrived. It has been estimated that as many as 50,000 Indians inhabited the Columbia Basin before 1800. Indians may have taken up to 18 million pounds of salmon and steelhead annually, using a variety of fishing methods (Craig and Hacker 1940). In addition to its importance as a food source, salmon serve as a fundamental part of the Indian tribal culture.

The U.S. government has trust responsibilities to tribes. The U.S. government also has treaty-related responsibilities associated with preserving tribal fishing rights. In the mid-1880s, the U.S. government signed treaties with the Yakama Indian Nation, the Confederated Tribes of the Warm Springs Reservation of Oregon, the Confederated Tribes of the Umatilla Indian Reservation, and the Nez Perce Tribe, in which those tribes reserved the right, among others, to fish in "usual and accustomed places." The Shoshone-Bannock Tribes also signed a treaty with the U.S., preserving its on-reservation fishing and hunting rights. Several landmark court cases, among them U.S. v. Washington and U.S. v. Oregon, have affirmed and clarified the U.S. duty with respect to treaty Indian fishing rights.

The early history of non-Indian use of fishery resources in the Columbia River Basin is described in Craig and Hacker (1940). Early traders, trappers, and settlers began arriving around 1800. These early immigrants began taking salmon for their own use and consumption, often trading for fish with the Indians. Early attempts at commercial taking of salmon began in 1829, with salmon harvest as a commercial industry beginning in earnest by the mid-1880s. The first cannery on the Columbia River produced its first pack of canned salmon in 1866. By 1887, the number of canneries in the basin peaked at 39. Salting, mild-curing, and other methods of salmon preparation were also taking place, and Columbia River salmon were becoming well-known internationally. The total production of canned, mild-cured, and frozen salmon and steelhead in the Columbia River Basin rose from 272,000 pounds in 1886 to annual productions between 20 and 50 million pounds from 1874 through 1936.

The gear used to fish commercially for Columbia River salmon included gill nets, purse seines, traps, dip nets, fish wheels, and a variety of other methods (Craig and Hacker 1940). The combined gear types were landing an average of 24,477,370 pounds of salmon and steelhead annually between 1927 and 1934.

The increased use of gasoline engines on boats enhanced the development of trolling as a commercial salmon harvest method after about 1905, predominantly for chinook and coho salmon. Between 1926 and 1934, the average annual troll catch in the Columbia River was 894,000 pounds of chinook and 2.6 million pounds of coho salmon (Craig and Hacker 1940).

In the early 1900s, increased agriculture, industry, and land development began to reduce the amount of suitable habitat for salmon spawning and rearing. In that period, the annual catch of chinook salmon fluctuated widely. As chinook salmon abundances began to decline, starting around 1911, the focus of commercial harvest operations began to shift more to other species. As total salmonid abundances in Columbia River fisheries continued to decline, concerns for the continued health of salmonid stocks increased. Management actions began to be developed and implemented to slow the decline of salmon abundances, including the elimination of fish wheels and purse seines on the Columbia River, and reduced commercial gillnets seasons. In recent years, with severely reduced salmonid numbers due primarily to habitat degradation and hydropower development in the mainstem river, commercial fisheries have been considerably cut back from earlier levels. Tribes have also voluntarily restricted their fisheries.

There has been recreational fishing in the Columbia River and its tributaries since the late 1800s. The bulk of this fishery was generally in the estuary through the early 1950s. As larger, safer boats became available, the fishery shifted from the estuary into the ocean at the mouth of the river. The increase in ocean harvest rates all along the west coast hastened the decline of coho salmon stocks, resulting in Federal court decisions and fishery management actions reducing ocean harvest rates. As a result, after the mid-1970s, a large part of the recreational fishery shifted back into the Columbia River.

A list of proposed fall fisheries in the Columbia river is presented in Table 1. Detailed descriptions of the proposed fisheries are included in the states' permit application (Greer and Koenings 2000a) and in the tribes' biological assessment (Jamison 2000). The states have 620 outstanding commercial gillnet permits, of which about 100 are active for any given commercial fishery. The number of angler trips for the 2000 fall season in the states of Oregon and Washington combined is estimated at 120,000 to150,000. It is estimated that each angler spends about $100-$150 per trip. The treaty Indian tribes have 200 head fishers participating in commercial gillnet fisheries. In addition, each head fisher employs 3 to5 people for activities related to the fishery and the sale of fish. The tribes also have about 100 people participating in scaffold fisheries.

4 Environmental Consequences of the Alternatives

The NEPA defines effects to include "...ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historic, cultural, economic, social, or health, whether direct, indirect, or cumulative. Effects may also include those resulting from actions which may have both beneficial and detrimental effects, even if on balance the agency believes the effect will be beneficial". (40 CFR 1508.8)

A list of the resources possibly affected by the three alternatives is presented in Table 3. The effects of the three alternatives differ in their respective impacts on listed species and on social aspects and traditional cultural resources. Alternatives 2 has the short-term effect of reducing the total harvest for tribes compared to Alternative 1, affecting the economies of tribes and treaty Indian cultural practices associated with the harvest reduction. Alternative 2 also has the short-term effect of reducing the total harvest for the states compared to Alternative 1, affecting the economies of the states and decreasing the recreational benefits associated with the harvest reduction.

Table 3. Resources addressed in consideration of impacts by fisheries proposed for fall season 2000 in the lower Columbia and Snake Rivers, and the potential effects of the proposed alternative and other alternatives on those resources

	Potential Impact Under...		
Affected Resource	Alternative 1 (Proposed Action Alternative). Federal agreement to the initial proposals for Columbia River 2000 fall fisheries	Alternative 2 (Status Quo-Preferred Alternative). Federal agreement to the modified Columbia River 2000 fall fisheries proposals (preferred alternative)	Alternative 3 (No-Action Alternative). Closing all fisheries in the Columbia Basin that may affect Columbia River species listed under ESA (No_Action Alternative)
Salmonids listed under ESA	Tribal Harvest - Jeopardy determination state fisheries impacting ESA listed species	State and Tribal Harvest - No Jeopardy determination	Limited Harvest - No Jeopardy determination
Sturgeon	No Harvest	Harvest	No Harvest
Shad	No Harvest	Harvest	No Harvest
Treaty Indian Economics	Commercial Harvest	Commercial Harvest	No Commercial Harvest
Treaty Indian Cultural Resources	Ceremonial & subsistence (C&S) fisheries	C&S fisheries	Limited C&S fisheries

Non-Indian fisheries	No Harvest in Zones 1-5	Commercial and recreational fisheries in Zones 1-5	Limited recreational fisheries
Other Aquatic Organisms	[No Impact]	[No Impact]	[No Impact]
Terrestrial Organisms	[No Impact]	[No Impact]	[No Impact]
Riparian Habitat	[No Impact]	[No Impact]	[No Impact]
Water Quality	[No Impact]	[No Impact]	[No Impact]

Alternative 3 (No-Action Alternative), in allowing only those fisheries with no impact on listed fish, would severely limit the times and locations available for the scheduling of fall fisheries. Treaty Indian and state cultural and economic values associated with the ceremonial and subsistence fisheries would be foregone under Alternative 3. State economic values associated with recreational fisheries would be foregone under Alternative 3. These sectors of the human environment have already been adversely impacted by actions taken to reduce impacts to listed fish populations. The elimination of harvest impacts under Alternative 3 would increase escapement in proportion to the expected harvest rate. However, the elimination of harvest impacts is not a remedy that addresses other factors of decline and therefore can not be relied on as a singular solution towards recovery.

4.1 Alternative 1 - Proposed Action Alternative: Federal agreement to the initial proposals for 2000 fall fisheries in the Columbia River as described in the biological assessments and in Appendix 1, Table A (states) and Table B (tribes). The States and the tribes initially submitted proposals requiring a harvest rate of 12% and 31.21%, respectively, for threatened Snake River fall chinook. The combined harvest rate proposed in 43.29% which greatly exceeds he allowed harvest rate of 31.29%

4.1.1 Effects to the Physical Environment

The effects to the physical environment resulting from implementation of the fisheries as proposed would include impacts to riparian vegetation and habitat through bank fishing, movement of boats and gear to the water, and other streamside usages. Water quality could be adversely affected by the proposed fisheries as a result of the release of boat engine products, trash, and other effluents into the water. However, the effects to the physical environment associated with these types of activities would be expected to be negligible.

4.1.2 Effects to the Biological Environment

Given the preseason run size forecast, the initial proposal's combined incidental harvest rates (state and tribes) on listed Columbia River salmonid ESUs resulting from the fall fisheries and harvest regulations was to harvest a of 143,600 chinook and 42,380 steelhead. The corresponding harvest impacts on listed ESUs are listed in Table 4

Expanded tributary fishing to target on the larger runs of hatchery-reared chinook is not expected this year. If tributary fishing were expanded, some of the fisheries might target only on surplus hatchery-reared fish and would require the safe release of all unmarked and presumably wild fish.

4.1.3 Effects to the Tribal and State Fisheries

A summary of expected harvest for chinook salmon and steelhead in the proposed 2000 fall season Columbia River fisheries is given in Table 4. Fall chinook tribal harvest during the 2000 fall season in the Columbia River at a proposed harvest rate impacts to SRW of 31.29% would result in the harvest of 92,732 chinook which is a substantial increase over an annual average of

Table 4 . Estimated total harvest of chinook and steelhead in the **initial** proposals for fall season fisheries and ESU

		Treaty Indian Fall Season Fisheries			State fisheries Fall Season Fishe			
Total Harvest		Zone 6	Hanford Reach [1]	Tributaries	Mainstem sport fishery	Mainstem commercial fishery	Fall commercial fisheries - Select Areas	Wanapum Triba subsistence fishery
Chinook								
Steelhead								
ESU	Status				Incidental harvest by ESU			
Snake River Wild Fall Chinook	Threatened	552	0	0	106	106	1	0
Lower Columbia River Chinook	Threatened	0	0	0	3,000	1,270	280	0
Lower Columbia River steelhead	Threatened	23	0	3	23	0	0	0
Middle Columbia River steelhead	Threatened	1,613	0	157	352	12	1	0
Upper Columbia River steelhead	Endangered	1,534	86	0	1,540	13	0	30
Snake River steelhead	Threatened	3,490	0	0	406	113	0	0
Snake River Spring/Summer chinook	Threatened	5	0	0	0	0	0	0
Snake River sockeye	Endangered	0	0	0	0	0	0	0
Columbia River Chum Salmon	Threatened	0	0	0	2	67	3	0
Coastal Cutthroat Trout	Proposed Threatened				6	0		0

[1] The Hanford Reach fishery may not occur

[2] An estimated 20 fall chinook jacks may be harvested

58,821 chinook harvest from 1995-1999. The expected steelhead harvest for the fall 2000 season is 26,290 fish compared to an annual average of 18,388 steelhead harvest from 1995-1999. Fall chinook harvest for state fisheries as initially proposed during the 2000 fall season in the Columbia River would result in the harvest of 50,630 chinook and 7,900 steelhead which would represent an increase over recent years average.

4.2 Alternative 2 - Status Quo and Preferred Alternative: Federal agreement to the modified proposal for 2000 fisheries in the Columbia River as described in the modification to the biological assessment (Greer and Koenings 2000b and Overberg 2000), and illustrated in Appendix 1, Table C. The proposals were modified through an agreement that allocated 8.25% of the allowed SR fall chinook incidental harvest rate limit to the states and 23.04% to the tribes, for a total of 31.29%.

4.2.1 Effects to the Physical Environment

The effects to the physical environment resulting from the modified proposal for 2000 fisheries in the Columbia River as described in the modification to the biological assessments (ODFW/WDFW 2000b and Overberg 2000) are less than those described under Alternative 1. Both state and tribal harvest are reduced under this alternative and the combined harvest in the area of concern is less than that of Alternative 1. Alternative 2 provides for reduced fishing levels similar to those observed in recent years. Impacts to the physical environment include impacts to riparian vegetation and habitat through bank fishing, movement of boats and gear to the water, and other streamside usages. Water quality could be adversely affected by the proposed fisheries as a result of the release of boat engine products, trash, and other effluents into the water. However, the effects to the physical environment associated with these types of activities are expected to be negligible.

4.2.2 Effects to the Biological Environment

The expected impact of the Status Quo-Preferred Alternative on Columbia River fish species resulting from the combined fisheries and harvest regulations are presented in Table 5. Given the preseason run size forecast for 2000, the modified proposals result in a combined harvest (states and tribes) of 106,970 chinook and 34,430 steelhead. The resulting harvest impact on listed salmonid ESUs are also provided in Table 5. The combined fishery proposals are consistent with jeopardy standards described in the fall 2000 biological opinion.

Expanded tributary fishing to target on the larger runs of hatchery-reared chinook is not expected this year. If tributary fishing were expanded, some of the fisheries might target only on surplus hatchery-reared fish and require the safe release of all unmarked and presumably wild fish.

Table 5. Estimated total harvest of chinook and steelhead in the **modified** proposals for fall season fisheries a

Total Harvest		Treaty Indian Fall Season Fisheries: Zone 6	Hanford Reach [1]	Tributaries	State fisheries Fall Season Fishe: Mainstem sport fishery	Mainstem commercial fishery	Fall commercial fisheries - Select Areas	Wanapum Tribal subsistence fishery
Chinook								
Steelhead								
ESU	Status				Incidental harvest by ESU			
Snake River Wild Fall Chinook	Threatened	406	0	0	92	53	1	0
Lower Columbia River Chinook	Threatened	0	0	0	2,410	1,070	280	0
Lower Columbia River steelhead	Threatened	22	0	3	23	0	0	0
Middle Columbia River steelhead	Threatened	1,517	0	157	351	13	1	0
Upper Columbia River steelhead	Endangered	1,322	86	0	1,540	14	0	30
Snake River steelhead	Threatened	3,687	0	0	403	71	0	0
Snake River Spring/Summer chinook	Threatened	5	0	0	0	0	0	0
Snake River sockeye	Endangered	0	0	0	0	0	0	0
Columbia River Chum Salmon	Threatened	0	0	0	2	67	3	0
Coastal Cutthroat Trout	Proposed Threatened				6	0		0

[1] The Hanford Reach fishery may not occur

[2] An estimated 20 fall chinook jacks may be harvested

4.2.3 Effects to the Tribal and State Fisheries

Under alternative 2, treaty Indian and non-Indian economic, social and cultural resources will continue to benefit in a manner similar to recent years even though it represents a reduction from the benefits offered by Alternative 1. The tribes and the states have agreed on allocation of the allowable harvest rate for SRW fall chinook that reduces the tribal allocation from 31.29% to 23.04% and the state allocation from 12% to 8.25%. Given preseason forecast for 2000, the states will harvest 36,610 chinook and 17,900 steelhead and the tribes will harvest 70,360 chinook and 16,530 steelhead. This represents a reduction of (51,420 - 36,610) 14,810 chinook and (17,900 - 17,900) zero steelhead for the states and a reduction of (92,732 - 70,766) 21,966 chinook and (24,480 - 16,530) 7,950 steelhead for the tribes, compared to Alternative 1.

Fall chinook tribal harvest during the 2000 fall season in the Columbia River at the agreed harvest rate impacts to SRW of 23.04% would result in the harvest of 70,766 chinook which is a substantial increase over an annual average of 58,821 chinook harvest from 1995-1999. The expected tribal harvest of steelhead for the fall 2000 season as modified by the agreement is 16,530 fish compared to an annual average of 18,388 steelhead harvest from 1995-1999.

Fall chinook harvest during state fisheries during the 2000 fall season in the Columbia River at the agreed harvest rate impacts to SRW of 8.25% would result in the harvest rates similar to those of recent years.

4.3 Alternative 3 - No-Action Alternative: Closing all fisheries in the Columbia Basin that may affect Columbia River species listed under ESA.

4.3.1 Effects to the Physical Environment

The effects to the physical environment would be reduced as a result of the closure of the proposed fisheries impacting ESA listed fish in fall 2000. Such closure would reduce impacts to riparian vegetation and habitat due to the lack of bank fishing, movement of boats and gear to the water, and other streamside usages. Possible effects to water quality from the proposed fisheries as a result of the release of boat engine products, trash, and other effluents into the water, would be avoided by the closure of proposed fisheries with impacts to ESA listed ESUs. Therefore closing all fisheries in 2000 would reduce the risk of possible adverse effects to water quality. However, the effects to the physical environment associated with these fishery activities are already expected to be negligible.

4.3.2 Effects to the Biological Environment

Closing all fisheries in the Columbia Basin that affect Columbia River species listed under ESA would result in increasing spawning escapements in the wild. Table 6 lists the harvest rates of listed salmonids in the modified proposals for 2000 fall fisheries in the Columbia River Basin by ESU. The effects of closing tribal and state fisheries on runsize and resulting spawning escapement varies among ESUs. The closure of proposed 2000 fall season fisheries would result in an increase in spawning escapement for Lower Columbia River and Snake River fall chinook and for Lower, Middle, Upper Columbia River and Snake River steelhead ESUs proportional to the harvest rate reductions for each ESU under Alternative 3. However, increases to spawning escapement for these ESUs are not the same as the number of unharvested fish under Alternative 3. There is substantial inriver mortality and pre-spawning mortality between the fisheries locations and the spawning grounds. Nevertheless, the increase in spawning escapement would be substantial for Snake River chinook and steelhead and moderate for Upper Columbia River and Middle Columbia River steelhead ESUs. However, the proposed fisheries already represent a reduction of 30% in the harvest rate for Snake River fall chinook from the baseline period and conform to current no jeopardy harvest guidelines for all listed ESUs in the Columbia River Basin.

The complete curtailment of all fisheries potentially taking listed fish in the Columbia River would therefore result in an increase in escapements for these populations, but the gain from such an action in 2000 would not be determinant to the conservation of listed salmon or steelhead.

4.3.3 Effects to the Tribal and State Fisheries

The No-ESA-impact fisheries option would have significant adverse impacts on state and tribal resources and culture. The closure of treaty Indian commercial, ceremonial and subsistence fisheries and state commercial and recreational fisheries would represent a loss of fishing opportunity estimated at 70,766 chinook, and 16,530 steelhead for the tribes and 36,610 chinook, and 17,900 steelhead for the states. This loss of fishing opportunity and associated sales of fish, licences and other fishing related products would represent a large economic loss to tribal and state economies. Of all the fisheries proposed for fall season 2000, only two tributary tribal fisheries do not have associated incidental impacts on listed fish. A closure of fisheries with ESA impacts in 2000 would not preclude the option of allowing such fisheries in future years, but the states and tribes would have irreversibly lost the economic and cultural benefits in 2000.

4.4 Preferred Alternative

The NMFS has analyzed the range of alternatives from no-ESA impacts to fisheries programs with impacts to Snake River fall chinook of 43.29% and selected Alternative 2 as the preferred alternative.

Table 6. Harvest rates on listed salmonid in proposed (modified proposals) 2000 fall season fisheries in the Columbia River basin.

ESU	Non-Indian Fisheries	Treaty Indian fisheries
Snake river fall chinook	8.25%	23.04%
Lower Columbia fall chinook		
Spring component	0%	0%
Tule component	13.7%	0%
Bright component	4.9%	0%
Snake River steelhead		
A-run	≤2%(1.3%)[a]	9.5%
B-run	≤2%(1.8%)[a]	14.8%
Upper Columbia River steelhead		
Natural-origin	≤2%(1.4%)[a]	9.5%
Hatchery-origin	≤15%(11.2%)[a]	9.5%
Middle Columbia River steelhead	≤2%(1.2%)[a]	6.2%
Lower Columbia River steelhead	≤2%(0.3%)[a]	1.5%
Columbia River chum	5%(3%)	0%
Snake River sockeye	0%	0%

[a] Maximum allowed harvest rates with actual expected harvest rates with the proposed fisheries shown in parenthesis.

5 Finding of No Significant Impact

The National Marine Fisheries Service (Northwest Regional Office) has issued a biological opinion addressing impacts of treaty Indian and non-Indian fisheries in the fall of the year 2000 to species of salmonids listed under the Endangered Species Act. Accordingly, consistent with the Ramsey v. Kantor 9th Circuit Court decision, an environmental assessment (EA) has been prepared to evaluate effects of this management action on components of the human environment. Three alternatives were considered in arriving at a preferred alternative. These alternatives and their effects are discussed in detail in the EA, and are summarized here:

The expected impacts of Alternative 1 (Proposed Alternative), in conjunction with cumulative effects of proposed States' fisheries, exceed the jeopardy standards for SR fall chinook salmon that have articulated in the associated biological opinion, but are not likely to jeopardize the continued existence of other Columbia River chinook and sockeye salmon or steelhead ESU's.

The expected impacts of Alternatives 2 (preferred alternative) are consistent with jeopardy standards articulated in the associated biological opinion for Columbia River chinook and sockeye salmon and steelhead ESU's. Alternative 2 decreases considerably the expected treaty-Indian catches while providing additional opportunity for state fisheries. The shift in a portion of the fishery from the tribes to the states who fish primarily below Bonneville Dam reduces impacts to Steelhead ESUs originating higher in the basin (Middle Columbia River, Upper Columbia River , Snake River Basin), but increases impacts to ESUs in the Lower Columbia River (LCR), most notably to some components of the LCR chinook ESU.

Alternative 3 (No-ESA-impact fisheries option) would have significant adverse impacts on treaty-Indian commercial, ceremonial and subsistence fisheries, and as a result would have very significant adverse impacts to tribal culture. This Alternative would result in additional escapement of listed salmonids, but the additional escapement is not considered essential for survival and recovery.

Based on this summary of effects (as discussed in the EA), I have determined that Alternative 2, which I have selected, will not have significant effect on the human environment, and the preparation of an environmental impact statement is not required by Section 102(2)(C) of NEPA or its implementing regulations.

Penelope D. Dalton — 7/31/00

Assistant Administrator for Fisheries
National Marine Fisheries Service
National Oceanic and Atmospheric Administration

Date

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Appendix 1, Table A

COLUMBIA RIVER FISHERY MODEL SUMMARY **2000** **MR-4A**

Non-Indian impacts based on full sport fishery & equal sport:commercial chinook impact / Treaty Indians balance of impacts up to limit

Fishery Descriptions

Ocean Fisheries:	PFMC Final NOF: Chinook 50,500, Coho 120,000		
Inriver Fisheries:			
Buoy 10 sport	100%	Aug 1 for chinook & marked coho	
Mainstem sport	100%	Aug 1 for chinook & marked coho, Lewis R mouth sanc	
Lower R. Commercial	1	day	August week 1 sturgeon fishery, B-10 to LVB
	6	day	2S commercial fishery late August
	2	day	Sept chinook
	20	day	Sept/Oct coho
	1	month	late Oct/Nov sturgeon
Upriver sport	100%	August 1	
	Hanford sport open August 16	catch:	5,000
Treaty Indian	64%		

Management Benchmarks

		Non-Ind.	Tr. Ind.	Total	Limit or Goal
Chinook:					
	Projected SRW impacts:	12.04%	19.25%	31.29%	31.29%
	% of Total	*38%*	*62%*	*100%*	
	% of Harvestable Surplus	26.3%	31.8%		50.0%
	McNary Escapement:			91,760	43,500
	LRW Ocean & Inriver Harvest Rate			9.2%	< 10%
	LRH Inriver Harvest Rate			18.4%	
	NI Catch	*Sport:*	23,900	*Comm.*	27,600
B Index Steelhead:					
	Constraint	2.0%	15.0%	17.0%	
	Projected impact	2.2%	7.2%		
Coho:					
	% of Upriver Run to Bonn. Dam			52%	50%
	Unmarked Harvest Rate (Ocean & Inriver)			29%	30%
	OR Wild Harvest Rate				15%
Chum:	*(Harvest Index)*			3%	5%

	Chinook									Snake R Wild		Upriver Steelhead						Coho				Chum
													Skam.	Upriver A Index		Upriver B Index			Un-	Up-	OR	
	Total	BPH	URB	LRH	LRW	BUB	PUB	LRB	SAB	Num.	%	Total	Total	*Hatch.*	*Wild*	*Hatch.*	*Wild*	Total	marked	river	Wild	Total
Ocean Catch/Mortality	13,080	3,090	4,440	4,180	130	380	860	70				–						135,100	3,800	27,600		
Columbia River Run	328,850	26,910	208,180	26,420	2,670	17,890	40,520	3,160	3,100	1,764		260,740	10,470	162,410	52,890	23,830	11,140	450,160	46,866	109,225		2,400
Non-Indian (Total)	56,420	4,450	30,070	4,860	150	6,750	6,790	1,190	2,160	212.4	12.04%	24,641	1,048	19,524	669	3,122	242	165,650	11,622	37,758		70
Early August Stgn/Salm	290	10	70	60	0	0	60	0	90	0.6	0.04%	3	0	2	1	0	0					0
Select Areas	1,820	70	60	280	0	10	10	0	1,390	0.5	0.03%	4	0	2	1	0	0					3
Buoy 10 Sport	12,940	1,920	5,740	1,930	80	790	1,790	140	550	48.6	2.76%	78	0	0	0	75	3	58,200	1,048	11,079		0
Lower River Sport	9,670	390	6,070	940	50	1,130	820	200	70	51.4	2.91%	6,140	268	4,956	166	718	35	1,000	23	187		0
2S Mid - Late August	12,490	1,380	7,480	280	0	1,320	1,800	230	0	63.4	3.59%	244	0	0	0	165	79	150	25	42		0
Sept. chin, 2S, 8" min	4,690	470	2,370	80	0	1,390	130	250	0	20.1	1.14%	12	0	0	0	8	4					0
Sept/Oct coho	6,950	210	2,240	800	20	1,240	2,160	220	60	19.0	1.07%	260	0	153	21	65	21	105,000	10,456	25,190		67
	0	0	0	0	0	0	0	0	0	0.0	0.00%											0
Late Fall sturgeon	1,320	0	310	30	0	830	0	150	0	2.6	0.15%	0	0	0	0	0	0					0
Tributary Sport	460	0	0	460	0	0	0	0	0	-	-											0
Lower River Subtotal	***50,630***	***4,450***	***24,340***	***4,860***	***150***	***6,710***	***6,770***	***1,190***	***2,160***	***206.2***	***11.69%***	***6,741***	***268***	***5,114***	***189***	***1,032***	***142***	***164,350***	***11,552***	***36,498***		***70***
Sport (Bonn-Hwy 395 Br	***790***	0	730	0	0	40	20	0	0	6.2	0.35%	17,900	780	14,410	480	2,090	100	1,300	70	1,260		0
Treaty Indian (Total)	59,900	10,820	40,070	-	-	2,700	6,310	-	-	*339.5*	*19.25%*	*16,530*	0	*10,730*	*2,910*	*2,100*	*790*					*0*
Dam Counts																						
(Bonneville Trap)		0																				
Bonneville Dam Passage	229,270	21,900	168,570	-	-	5,050	33,750	-	-	1,557.8		254,000	10,200	157,300	52,700	22,800	11,000	72,727	27,678	72,727		100
McNary Dam	91,760	-	91,760	-	-	-	-	-	-													
Lower Granite Dam		-		-	-	-	-	-	-	564												
Escapement																						
Hatchery	-	7,000	-	13,140	-	5,968	7,377	-		2,900	(LFH)											
(WA only)	-		-	10,340	-	-	-	-	-													
Natural (WA)	-	-	-	-	2,150	-	-	-	-	1,800	(suppl.)											
Natural (OR)	-	-	-	-	290	-	-	-	-													
Surplus		0	48,260	-760	-3,550	220	5,380	-	-													
(WA only)				-556																		

Appendix 1, Table B

COLUMBIA RIVER FISHERY MODEL SUMMARY	2000	MR-1
Tribes harvesting up to 50% of harvestable surplus or SRW Impact		

Fishery Descriptions

Ocean Fisheries:	PFMC Final NOF: Chinook 50,500, Coho 120,000				
Inriver Fisheries:					
Buoy 10 sport	0%	Aug 1 for chinook & marked coho			
Mainstem sport	0%	Aug 1 for chinook & marked coho, Lewis R mouth sanc			
Lower R. Commercial	0	day	August week 1 sturgeon fishery, B-10 to LVB		
	0	day	2S commercial fishery late August		
	0	day	Sept chinook		
	0	day	Sept/Oct coho		
	0	month	late Oct/Nov sturgeon		
Upriver sport	0%	August 1			
	Hanford sport open August 16		catch:	4,920	
Treaty Indian	99%		23-Aug	26-Aug	
			30-Aug	02-Sep	
			05-Sep	09-Sep	
			12-Sep	16-Sep	
			19-Sep	23-Sep	
			28-Sep	30-Sep	

Management Benchmarks

		Non-Ind.	Tr. Ind.	Total	Limit or Goal
Chinook:					
	Projected SRW impacts:	0.00%	31.29%	31.29%	31.29%
	% of Total	*0%*	*100%*	*100%*	
	% of Harvestable Surplus	6.1%	49.3%		50.0%
	McNary Escapement:			90,220	43,500
	LRW Ocean & Inriver Harvest Rate			3.7%	< 10%
	LRH Inriver Harvest Rate			2.1%	
	NI Catch	*Sport:*	600	*Comm.*	0
B Index Steelhead:					
	Constraint	2.0%	15.0%	17.0%	
	Projected impact	1.2%	11.9%		
Coho:					
	% of Upriver Run to Bonn. Dam			80%	50%
	Unmarked Harvest Rate (Ocean & Inriver)			7%	30%
	OR Wild Harvest Rate				15%
Chum: (Harvest Index)				0%	5%

	Chinook									Snake R Wild		Upriver Steelhead	Skam.	Upriver A Index		Upriver B Index		Coho				Chum
	Total	BPH	URB	LRH	LRW	BUB	PUB	LRB	SAB	Num.	%	Total	Total	*Hatch.*	*Wild*	*Hatch.*	*Wild*	Total	Un-marked	Up-river	OR Wild	Total
Ocean Catch/Mortality	13,080	3,090	4,440	4,180	130	380	860	70				–						135,100	3,800	27,600		
Columbia River Run	328,850	26,910	208,180	26,420	2,670	17,890	40,520	3,160	3,100	1,764		260,140	10,470	162,260	52,870	23,520	11,030	450,160	46,866	109,225		2,400
Non-Indian (Total)	5,470	0	4,920	550	0	0	0	0	0	0.0	0.00%	24,040	1,048	19,366	646	2,808	135	0	0	0		0
Early August Stgn/Salm	0	0	0	0	0	0	0	0	0	0.0	0.00%	0	0	0	0	0	0					0
Select Areas	0	0	0	0	0	0	0	0	0	0.0	0.00%	0	0	0	0	0	0					0
Buoy 10 Sport	0	0	0	0	0	0	0	0	0	0.0	0.00%	0	0	0	0	0	0	0	0	0		0
Lower River Sport	0	0	0	0	0	0	0	0	0	0.0	0.00%	6,140	268	4,956	166	718	35	0	0	0		0
2S Mid - Late August	0	0	0	0	0	0	0	0	0	0.0	0.00%	0	0	0	0	0	0	0	0	0		0
Sept. chin, 2S, 8" min	0	0	0	0	0	0	0	0	0	0.0	0.00%	0	0	0	0	0	0					0
Sept/Oct coho	0	0	0	0	0	0	0	0	0	0.0	0.00%	0	0	0	0	0	0	0	0	0		0
	0	0	0	0	0	0	0	0	0	0.0	0.00%											0
Late Fall sturgeon	0	0	0	0	0	0	0	0	0	0.0	0.00%	0	0	0	0	0	0					0
Tributary Sport	550	0	0	550	0	0	0	0	0	-	-											0
Lower River Subtotal	***550***	***0***	***0***	***550***	***0***	***0***	***0***	***0***	***0***	***0.0***	***0.00%***	***6,140***	***268***	***4,956***	***166***	***718***	***35***	***0***	***0***	***0***		***0***
Sport (Bonn-Hwy 395 Br	*0*	0	0	0	0	0	0	0	0	0.0	0.00%	17,900	780	14,410	480	2,090	100	0	0	0		0
Treaty Indian (Total)	92,180	15,140	65,140	-	-	4,320	7,580	-	-	*552.0*	*31.29%*	*24,480*	0	*14,360*	*4,050*	*4,760*	*1,310*					*0*
Dam Counts																						
(Bonneville Trap)		0																				
Bonneville Dam Passage	265,710	26,230	190,890	-	-	8,070	40,520	-	-	1,764.0		254,000	10,200	157,300	52,700	22,800	11,000	109,225	35,372	109,225		100
McNary Dam	90,220	-	90,220	-	-	-	-	-	-													
Lower Granite Dam		-		-	-	-	-	-	-	564												
Escapement																						
Hatchery	-	7,010	-	15,770	-	9,550	8,863	-		2,900	(LFH)											
(WA only)	-		-	12,410	-	-	-	-	-													
Natural (WA)	-	-	-	-	2,270	-	-	-	-	1,800	(suppl.)											
Natural (OR)	-	-	-	-	320	-	-	-	-													
Surplus		10	46,720	1,870	-3,430	3,800	6,860	-	-													
(WA only)				1,512																		

Appendix 1 , Table C

COLUMBIA RIVER FISHERY MODEL SUMMARY 2000 MR-13

Non-Indian impacts based on 8.25% URB impacts & 9,000 B-10 sport catch; Treaty Indians balance of impacts up to limit.

Fishery Descriptions

Ocean Fisheries:	PFMC Final NOF: Chinook 50,500, Coho 120,000		
Inriver Fisheries:			
Buoy 10 sport	70%		Aug 1 for chinook & marked coho / 1 chinook daily bag limit
Mainstem sport	100%		Aug 1 for chinook & marked coho, Lewis R mouth sanctuary
Lower R. Commercial	1.0	day	August week 1 sturgeon fishery, B-10 to LVB
	2.8	day	2S commercial fishery late August
	0.0	day	Sept chinook
	1.5	month	Sept/Oct coho
	1	month	late Oct/Nov sturgeon
Upriver sport	100%		August 1
	Hanford sport open August 16	catch:	4,980
Treaty Indian			

Management Benchmarks

	Non-Ind.	*Tr. Ind.*	*Total*	*Limit or Goal*
Chinook:				
Projected SRW impacts:	8.25%	23.04%	31.29%	31.29%
% of Total	*26%*	*74%*	*100%*	
% of Harvestable Surplus	19.8%	37.3%		50.0%
McNary Escapement:			91,260	43,500
LRW Ocean & Inriver Harvest Rate			8.4%	< 10%
LRH Inriver Harvest Rate			15.6%	
NI Catch	*Sport:*	20,100	*Comm.*	16,900
B Index Steelhead:				
Constraint	2%	15.0%	17.0%	
Projected impact	2%	14.9%		
Coho:				
% of Upriver Run to Bonn. Dam			52%	50%
Chum: (Harvest Index)			3%	5%

	Chinook									Snake R Wild	
	Total	BPH	URB	LRH	LRW	BUB	PUB	LRB	SAB	Num.	%
Ocean Catch/Mortality	12,370	3,090	3,880	4,180	130	330	760	60			
Columbia River Run	328,850	26,910	208,180	26,420	2,670	17,890	40,520	3,160	3,100	1,764	
Non-Indian (Total)	41,990	2,690	22,150	4,110	130	4,790	5,270	840	2,010	145.6	8.25%
Early August Stgn/Salm	290	10	70	60	0	0	60	0	90	0.6	0.04%
Select Areas	1,820	70	60	280	0	10	10	0	1,390	0.5	0.03%
Buoy 10 Sport	8,990	1,330	3,990	1,340	60	550	1,240	100	380	33.9	1.92%
Lower River Sport	9,780	400	6,120	960	50	1,140	830	200	80	51.8	2.94%
2S Mid - Late August	5,890	660	3,520	130	0	620	850	110	0	29.8	1.69%
Sept. chin, 2S, 8" min	0	0	0	0	0	0	0	0	0	0.0	0.00%
Sept/Oct coho	7,440	220	2,330	830	20	1,450	2,260	260	70	19.8	1.12%
	0	0	0	0	0	0	0	0	0	0.0	0.00%
Late Fall sturgeon	1,500	0	320	30	0	980	0	170	0	2.7	0.15%
Tributary Sport	480	0	0	480	0	0	0	0	0	-	-
Lower River Subtotal	*36,190*	*2,690*	*16,410*	*4,110*	*130*	*4,750*	*5,250*	*840*	*2,010*	*139.2*	*7.89%*
Sport (Bonn-Hwy 395 Br.)	820	0	760	0	0	40	20	0	0	6.5	0.37%
Treaty Indian (Total)	70,240	12,520	47,950	-	-	3,170	6,600	-	-	*406.3*	*23.04%*
Dam Counts											
(Bonneville Trap)		0									
Bonneville Dam Passage	240,630	23,600	175,830	-	-	5,930	35,270	-	-	1,624.8	
McNary Dam	91,260	-	91,260	-	-	-	-	-	-		
Lower Granite Dam		-		-	-	-	-	-	-	564	
Escapement											
Hatchery	-	7,000	-	13,600	-	7,009	7,709	-			
(WA only)	-		-	10,700	-	-	-	-	-		
Natural (WA)	-	-	-	-	2,170	-	-	-	-		
Natural (OR)	-	-	-	-	300	-	-	-	-		
Surplus		0	47,760	-300	-3,530	1,260	5,710	-	-		
(WA only)				-197							

	Upriver Steelhead						Coho				Chum
		Skam.	Upriver A Index		Upriver B Index			Un-	Up-	OR	
	Total	Total	*Hatch.*	*Wild*	*Hatch.*	*Wild*	Total	marked	river	Wild	Total
Ocean Catch/Mortality	–						135,100	3,800	27,600		
Columbia River Run	260,600	10,470	162,420	52,890	23,720	11,100	450,160	46,866	109,225		2,400
Non-Indian (Total)	24,495	1,048	19,535	670	3,009	197	165,570	11,609	37,736		72
Early August Stgn/Salm	3	0	2	1	0	0					0
Select Areas	4	0	2	1	0	0					3
Buoy 10 Sport	54	0	0	0	52	2	58,200	1,048	11,079		0
Lower River Sport	6,140	268	4,956	166	718	35	1,000	23	187		2
2S Mid - Late August	115	0	0	0	78	38	70	12	20		0
Sept. chin, 2S, 8" min	0	0	0	0	0	0					0
Sept/Oct coho	279	0	164	23	70	23	105,000	10,456	25,190		67
											0
Late Fall sturgeon	0	0	0	0	0	0					0
Tributary Sport											0
Lower River Subtotal	*6,595*	*268*	*5,125*	*190*	*919*	*97*	*164,270*	*11,539*	*36,476*		*72*
Sport (Bonn-Hwy 395 Br.)	17,900	780	14,410	480	2,090	100	1,300	70	1,260		0
Treaty Indian (Total)	*19,720*	0	*12,170*	*3,810*	*2,100*	*1,640*					0
Dam Counts											
(Bonneville Trap)											
Bonneville Dam Passage	254,000	10,200	157,300	52,700	22,800	11,000	72,749	27,690	72,749		100
McNary Dam											
Lower Granite Dam											
Escapement											
Hatchery											
(WA only)											
Natural (WA)											
Natural (OR)											
Surplus											
(WA only)											