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Endangered Species Act - Reinitiated Section 7 Consultation

BIOLOGICAL OPINION AND INCIDENTAL TAKE STATEMENT

Effects of the Pacific Coast Salmon Plan and
U.S. Fraser Panel Fisheries on
Upper Willamette River chinook
Lower Columbia River chinook
Lower Columbia River chum

Agency: National Marine Fisheries Service,
Sustainable Fisheries Divisions;

Consultation Conducted by
National Marine Fisheries Service
Protected Resources Division

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INTRODUCTION

The National Marine Fisheries Service (NMFS) is required under section 7 of the Endangered Species Act (ESA) to conduct consultations which consider the impacts of salmon fisheries to species listed under the ESA. This biological opinion considers the effects of Pacific coast ocean salmon fisheries conducted under the Pacific Coast Salmon Plan (PFMC Fisheries) and U.S. Fraser Panel fisheries (U.S. Fraser Panel Fisheries) in northern Puget Sound conducted under the Pacific Salmon Treaty (PST) on listed salmon and steelhead not already covered by existing opinions: Lower Columbia River chinook, Upper Willamette River chinook, Upper Columbia River spring chinook, Columbia River chum, Ozette Lake sockeye and ten steelhead ESUs.

CONSULTATION HISTORY

NMFS has considered the effects on salmon species listed under the ESA resulting from PFMC fisheries in several previous biological opinions (Table 1). In a biological opinion dated March 8, 1996, NMFS considered the impacts to salmon species then listed under the ESA resulting from implementation of the FMP including spring/summer chinook, fall chinook, and sockeye salmon from the Snake River and Sacramento River winter chinook. Provisions of the March 8, 1996, opinion regarding Sacramento River winter chinook were revised in a reinitiated section 7 biological opinion dated February 18, 1997. Three subsequent biological opinions dated April 30, 1997, April 29, 1998, April 30, 1999 and April 28, 2000 considered the effects of PFMC fisheries on the growing catalogue of listed species (Table 1). However, these latter opinions were specific to the annual regulations adopted pursuant to implementation of the FMP and therefore were limited in duration to the year in question. In another opinion dated April 28, 1999 NMFS considered the effect of implementing Amendment 13 to the salmon FMP on the three listed coho ESUs. This last opinion was programmatic in that it considered the amendment itself rather than just the annual regulations. It therefore provides long-term coverage for PFMC fisheries regarding the three listed coho ESUs. The most recent opinion related to PFMC fisheries considered the effect of PFMC fisheries on newly listed Central Valley Spring-Run chinook and California Coastal chinook (NMFS 2000a).

In December, 1999 and April, 2000, NMFS considered the effects of the Pacific Salmon Treaty Agreement (NMFS 1999c) and the 2000 Puget Sound fisheries (NMFS 2000c) on listed salmonids.

In its biological opinion on the 2000-2001 cycle fisheries, NMFS combined its consultation on Pacific coast salmon fisheries with those that occurred in Puget Sound for reasons of efficiency, because of the interrelated nature of the preseason planning processes, and to provide a more inclusive assessment of harvest-related impacts to the listed species. In April, 2001, NMFS applied take limits to Pacific coast ocean and Puget Sound fisheries impacting listed Puget Sound chinook and Hood Canal summer chum Evolutionarily Significant Units (ESUs) under the recently implemented 4(d) rule (65 FR 42422, July 10, 2000). Therefore, take prohibitions described in section 9 of the ESA for Puget Sound chinook and Hood Canal summer chum do not apply to these fisheries, as long as they are conducted in accordance with the joint resource management plans (RMP) provided by the Puget Sound treaty tribes and Washington Department of Fish and Wildlife (WDFW) (WDFW/PNPTT 2000, WDFW/PSTT 2001) and approved under the 4(d) rule (NMFS 2001a, NMFS 2001b). Exploitation rates in Pacific coast ocean fisheries on Puget Sound chinook historically have been low, averaging 0 - 14%. In recent years, as ocean catches have been reduced to protect weak stocks, exploitation rates have averaged 0 - 4% depending on the stock (NMFS 2000c). U.S. fisheries, including the Pacific coastal ocean fisheries, will be managed to meet the Puget Sound chinook and Hood Canal summer chum harvest management objectives described in the RMPs.

This consultation history provides a mix of long and short-term coverage for the various ESUs with respect to PFMC ocean salmon fisheries. The effects of implementing the FMP on the Snake River fall chinook, Snake River spring/summer chinook, and Snake River sockeye, Sacramento River winter chinook, Puget Sound chinook, Hood Canal summer chum, the three coho ESUs, and Central Valley Spring-Run chinook and California Coastal chinook ESUs are covered by either long-term biological opinions or 4(d) rules (see Table 1). These ESUs will not be discussed further in this opinion. The effects of PFMC fisheries on the remaining ESUs have been considered previously, but only in opinions with an annual duration. This biological opinion therefore considers the effects of PFMC fisheries on those ESUs that are not covered by an existing opinion: Lower Columbia River chinook, Upper Willamette River chinook, Upper Columbia River spring chinook, Columbia River chum, Ozette Lake sockeye and ten steelhead ESUs.

Table 1. NMFS ESA coverage of ESUs effected by ocean fisheries implemented under the FMP and duration of the coverage.

Date (Coverage)	Duration	Citation	ESU covered
March 1, 1991 (BO)	superseded	NMFS 1991	Sacramento River winter chinook
March 8, 1996 (BO)	until reinitiated 5 years	NMFS 1996c	Snake River chinook and sockeye Sacramento River winter chinook
February 18, 1997 (BO)	4 years	NMFS 1997a	Sacramento River winter chinook
April 30, 1997 (BO)	1 year 1 year 1 year 1 year	NMFS 1997b	S. Oregon/Northern California Coastal coho, Central California Coastal coho, Umpqua River cutthroat trout all steelhead ESUs proposed for listing
April 29, 1998 (BO)	1 year 1 year 1 year 1 year	NMFS 1998a	S. Oregon/Northern California Coastal coho Cental California Coastal coho Umpqua River cutthroat trout eight listed steelhead ESUs
April 28, 1999 (BO)	until reinitiated	NMFS 1999a	S. Oregon/Northern California Coastal coho Central California Coastal coho Oregon Coastal Natural coho
April 30, 1999 (BO)	1 year 1 year 1 year 1 year 1 year 1 year 1 year 1 year 1 year	NMFS 1999b	Puget Sound chinook Lower Columbia River chinook Upper Willamette River chinook Upper Columbia River spring chinook ten steelhead ESUs Ozette Lake sockeye Hood Canal summer chum Columbia River chum Umpqua River cutthroat trout (under USFWS)
April, 2000 (BO)	until reinitiated	NMFS 2000a	Central Valley Spring-Run chinook California Coastal chinook
April, 2000 (BO)	1 year 1 year 1 year 1 year 1 year 1 year 1 year 1 year 1 year	NMFS 2000c	Puget Sound chinook Lower Columbia River chinook Upper Willamette River chinook Upper Columbia River spring chinook ten steelhead ESUs Ozette Lake sockeye Hood Canal summer chum Columbia River chum Umpqua River cutthroat trout (under USFWS)
April, 2001 (4(d) Limit)	2 years until withdrawn	NMFS 2001b NMFS 2001c	Puget Sound chinook Hood Canal summer chum

BIOLOGICAL OPINION

I. Description of the Proposed Action and Action Area

A. Proposed Action

This opinion considers the effects of two actions on listed salmonid and steelhead ESUs not covered in existing opinions or 4(d) rules: NMFS' promulgation of ocean fishing regulations within the Exclusive Economic Zon (EEZ) of the Pacific Ocean and NMFS' authority for U.S. Fraser Panel fisheries in northern Puget Sound under the PST. Pursuant to the Magnuson-Stevens Act, NMFS proposes to promulgate ocean salmon fishing developed in accordance with the FMP as amended by Amendments 13 and 14. (Annual regulations apply to the period from May 1 of the current year through April 31 of the following year.) These regulations govern ocean fisheries off the coasts of Washington, California and Oregon within the EEZ (3-200 nautical miles offshore)(see Review of 2000 Ocean Salmon Fisheries (PFMC 2001b) for details on the specific fishery locations and historical catch and effort data). They are generally sport and troll fisheries targeting chinook and coho. The ocean salmon fisheries in the EEZ off Washington, Oregon, and California are managed under authority of the Magnuson-Stevens Act. Annual management recommendations are developed according to the "Pacific Coast Salmon Plan" (FMP) of the Pacific Fishery Management Council (PFMC). The PFMC provides its management recommendations to the Secretary of Commerce, who implements the measures in the EEZ if they are found to be consistent with the Magnuson-Stevens Act and other applicable law. Because the Secretary, acting through NMFS, has the ultimate authority for the FMP and its implementation, NMFS is both the action agency and the consulting agency with respect to PFMC fisheries.

NMFS has authority to regulate U.S. Fraser Panel fisheries in northern Puget Sound and annually decides whether to relinquish control to the bilateral Fraser Panel pursuant to the PST. The Fraser Panel controls sockeye and pink fisheries conducted in the Strait of Juan de Fuca and San Juans region (northern Puget Sound), the Georgia Strait and Fraser River in Canada, and certain high seas and territorial waters westward from the western coasts of Canada and the U.S. between 48 and 49 degrees latitude (a detailed description of U.S. panel waters can be found at CFR 300.91, Definitions). The Fraser Panel assumes control from July 1 through September, although the fisheries generally occur between late July and August.

The two actions have been grouped into this single biological opinion for efficiency and in compliance with the regulatory language of section 7 which allows NMFS to group similar, individual actions within a given geographic area or segment of a comprehensive plan (50 CFR 402.14(b)(6)).

B. Action Area

In developing the management recommendations, the PFMC analyzes several management options for ocean fisheries occurring in the EEZ. The analysis includes assumptions regarding the levels of harvest in state marine, estuarine, and freshwater areas, which are regulated under authority of the states. The States of Washington, Oregon and California generally manage their marine waters consistent with the management scheme approved by the Secretary of Commerce. NMFS establishes fishery management measures for ocean salmon fisheries occurring in the EEZ (3-200 nautical miles off shore). In the case where a state's actions substantially and adversely affect the carrying out of the FMP, the Secretary may, under the Magnuson-Stevens Act, assume responsibility for the regulation of ocean fishing in state marine waters; however that authority does not extend to a state's internal waters. For the purposes of this consultation, for the PFMC fisheries the action area is the EEZ which is directly affected by the federal action, and the coastal marine waters of the states of Washington, Oregon and California, which may be indirectly affected by the federal action. .

For the purposes of this opinion, for the U.S. Fraser Panel fisheries, the action area is the U.S. waters of the Strait of Juan de Fuca and the San Juans in northern Puget Sound and certain high seas and territorial waters westward from the western coast of the U.S. between 48 and 49 degrees latitude during the period of Fraser Panel control (a detailed description of U.S. panel waters can be found at CFR 300.91, Definitions).

Table 2. Summary of salmon species listed under the Endangered Species Act. Those shown in bold are the subject of the consultation in this biological opinion.

Species	Evolutionarily Significant Unit	Present Status	Federal Register Notice
Chinook Salmon (*O. tshawytscha*)	Sacramento River Winter Snake River Fall Snake River Spring/Summer Puget Sound **Lower Columbia River** **Upper Willamette River** Upper Columbia River Spring Central Valley Spring California Coastal	Endangered Threatened Threatened Threatened Threatened Threatened Endangered Threatened Threatened	54 FR 32085 8/1/89 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 64 FR 14308 3/24/99 64 FR 50394 9/16/99 64 FR 50394 9/16/99
Chum Salmon (*O. keta*)	Hood Canal Summer-Run **Columbia River**	Threatened Threatened	64 FR 14570 3/25/99 64 FR 14570 3/25/99
Coho Salmon (*O. kisutch*)	Central California Coastal S. Oregon/ N. California Coastal Oregon Coastal	Threatened Threatened Threatened	61 FR 56138 10/31/96 62 FR 24588 5/6/97 63 FR 42587 8/10/98
Sockeye Salmon (*O. nerka*)	Snake River **Ozette Lake**	Endangered Threatened	56 FR 58619 11/20/91 64 FR 14528 3/25/99
Steelhead (*O. mykiss*)	**Southern California** **South-Central California** **Central California Coast** **Northern California** **Upper Columbia River** **Snake River Basin** **Lower Columbia River** **California Central Valley** **Upper Willamette River** **Middle Columbia River**	Endangered Threatened Threatened Threatened Endangered Threatened Threatened Threatened Threatened Threatened	62 FR 43937 8/18/97 62 FR 43937 8/18/97 62 FR 43937 8/18/97 65 FR 6960 2/11/00 62 FR 43937 8/18/97 62 FR 43937 8/18/97 63 FR 13347 3/19/98 63 FR 13347 3/19/98 64 FR 14517 3/25/99 64 FR 14517 3/25/99

II. Status of the Species and Critical Habitat

NMFS has determined that the actions being considered in this biological opinion may adversely affect the following species provided protection under the Endangered Species Act of 1973 (16 U.S.C. 1531 *et seq*.; ESA): Columbia River (CR) chum, Lower Columbia River (LCR) chinook, and Upper Willamette River (UWR) chinook (see Table 2).

In past opinions, NMFS reviewed in more detail the potential effects to Ozette Lake sockeye, Upper Columbia River spring chinook and the ten listed steelhead ESUs (NMFS 2000c). Based on its review, NMFS concluded that the expected take from the PFMC ocean and Fraser Panel salmon fisheries of listed Ozette Lake sockeye salmon, Upper Columbia River Spring chinook salmon and the ten listed steelhead ESUs is at most an occasional event. NMFS believes it would be impossible to measure or detect potential effects of the proposed action on these species (which, according to the Interagency Section 7 Handbook, is considered an "insignificant effect") and concludes that the proposed action is not likely to adversely affect these species. Consequently, these species will not be considered further in this opinion.

Critical habitat has now been designated for all of the affected ESUs. Critical habitat designations for the listed species considered in this opinion do not include the offshore marine areas that are under the jurisdiction of the PFMC, and the northern Puget Sound areas where the U.S. Fraser Panel fisheries occur (65 FR 7764).

A. Species Description

1. Columbia River chum

The CR chum ESU occupies the Lower Columbia River and its tributaries. Historically, chum salmon were abundant in the lower reaches of the Columbia River and may have spawned as far upstream as the Walla Walla River (Johnson *et al.* 1997). Current abundance is less than 1% of historic levels, and the ESU has undoubtedly lost some of its original genetic diversity. Presently only three chum salmon populations are recognized and monitored in the Columbia River (Grays River, Hardy and Hamilton Creeks). Each of these populations may have been influenced by hatchery programs and/or introduced stocks. At present, only a single hatchery produces chum for the Columbia River and it is not considered essential for recovery.

2. Upper Willamette River chinook

The UWR chinook ESU occupies the Willamette River and tributaries upstream of Willamette Falls. Historically, access above Willamette Falls was restricted to the spring when flows were high. In autumn low flows prevented fish from ascending past the falls. The Upper Willamette spring chinook are one of the most genetically distinct chinook groups in the Columbia River Basin. Fall chinook salmon spawn in the Upper Willamette but are not considered part of the ESU because they are not native. None of the hatchery populations in the Willamette River are listed although the spring-run hatchery stocks were included in the ESU.

3. Lower Columbia River chinook

The LCR ESU includes all native populations from the mouth of the Columbia River to the crest of the Cascade Range, excluding populations above Willamette Falls. Celilo Falls, which corresponds to the edge of the drier Columbia Basin Ecosystem and historically may have presented a migrational barrier to chinook salmon at certain times of the year, is the eastern boundary for this ESU. 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 this 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. Some spring chinook stocks remain in the LCR, but these are supported primarily by hatchery programs. There is discussion among some co-managers as to whether any natural-origin spring chinook salmon persist in this ESU. Fourteen hatchery stocks were included in the ESU; one was considered essential for recovery (Cowlitz River spring chinook) but was not listed.

B. Life History

General life history information is presented below for chinook salmon and chum salmon. More specific information regarding species status and recent population trends are provided in the following section for the ESUs that are the focus of this opinion.

1. 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 depends 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).

2. Chinook Salmon

Chinook salmon is the largest of the Pacific salmon species. 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).

C. Population Dynamics and Distribution

This section provides more specific information about the ESUs that are the focus of this opinion. Included here is information regarding the distribution and population structure of the

ESUs, and size, variability, and trends of the components (stocks or populations) of the ESUs.

1. Chum Salmon

Columbia River chum

Historically, chum salmon were abundant in the lower reaches of the Columbia River and may have spawned as far upstream as the Walla Walla River (Johnson *et al.* 1997). However, chum in the Columbia River are currently limited to tributaries below the Bonneville Dam. Current abundance is less than 1% of historic levels, and the ESU has undoubtedly lost some of its original genetic diversity. The information on ocean migration patterns and distribution is limited and no region-specific information on chum migration to Washington and Oregon is available (Johnson *et al.* 1997). There is some speculation that Columbia River chum had a more southerly ocean distribution similar to the present-day distribution and migration pattern of Columbia River coho (Sandercock 1991).

Presently only three chum salmon populations are recognized and monitored in the Columbia River (Grays River, Hardy and Hamilton Creeks), although chum have been reported in other areas (Salo 1991, Kostow 1995). 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). Information from stream surveys of these three populations suggests that there may be a few thousand up to 10,000 chum spawning annually in the Columbia River basin. Information on run size suggests abundance has been relatively stable since the run collapsed in the mid-1950s (Johnson *et al.* 1997). Hatchery fish have had little influence on the wild component of the CR chum salmon ESU. NMFS estimates a median population growth rate (lambda) over the base period[1], for the ESU as a whole, of 1.04 (Tables B-2a and B-2b in McClure *et al.* 2000b). Because census data are peak counts (and because the precision of those counts decreases markedly during the spawning season as water levels and turbidity rise), NMFS is unable to estimate the risk of absolute extinction for this ESU.

The Columbia River estuary provides important juvenile rearing habitat for Columbia River chum. Significant changes in morphology have occurred as a result of navigational improvements and by diking and filling wetland areas (Sherwood *et al.* 1990). Significant erosion and sediment deposition, and changes in the seasonal flow cycle have also occurred from a variety of causes. The changes have resulted in reductions in the amount of wetland habitat

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[1] Estimates of median population growth rate, risk of extinction, and the likelihood of meeting recovery goals are based on population trends observed during a base period from 1980 through 1998 adult returns for the Grays River mainstem and the West Fork, Crazy Johnson, and Hamilton Creek spawning aggregations and including the 1999 adult returns for Hardy Creek and Hamilton Springs. Population trends are projected under the assumption that all conditions will stay the same into the future.

and changes in the food web composition and community structure (Sherwood *et al.* 1990).

Because of the well-known aversion of chum salmon to surmounting in-river obstacles to migration, the effects of the mainstem Columbia River hydropower system have probably been significant for chum salmon (Johnson *et al.* 1997). Recovery, and restoration of Columbia River chum to its historic distribution, will depend largely on improvements in habitat and resolving barriers to migration associated with Bonneville Dam.

2. Chinook Salmon

Upper Willamette River Chinook

Upper Willamette River chinook are one of the most genetically distinct groups of chinook in the Columbia River Basin. This may be related in part to the narrow time window available for passage above Willamette Falls. Chinook populations in this ESU have a life history pattern that includes traits from both ocean- and stream-type life histories. Smolt emigrations occur as young of the year and as age-1 fish. Ocean distribution of chinook in this ESU is consistent with an ocean-type life history with the majority of chinook being caught off the coasts of British Columbia and Alaska. Spring chinook from the Willamette River have the earliest return timing of chinook stocks in the Columbia Basin with freshwater entry beginning in February. Historically, spawning occurred between mid-July and late October. However, the current spawn timing of hatchery and wild chinook in September and early October is likely due to hatchery fish introgression.

The abundance of naturally-produced spring chinook in the ESU has declined substantially from historic levels. Historic escapement levels may have been as high as 200,000 fish per year. The production capacity of the system has been reduced substantially by extensive dam construction and habitat degradation. From 1946-50, the geometric mean of Willamette Falls counts for spring chinook was 31,000 fish (Myers *et al*. 1998), which represented primarily naturally-produced fish. The most recent 5 year (1995-2000) geometric mean escapement above the falls was 32,500 fish, comprised predominantly of hatchery-produced fish (Table 3). Nicholas (1995) estimated 3,900 naturally spawning adults[2] in 1994 for the ESU, with approximately 1,300 of these spawners being naturally produced. There has been a gradual increase in naturally spawning fish in recent years, but it is believed that many of these are first generation hatchery fish. The long-term trend for total spring chinook abundance within the ESU has been approximately stable although there was a series of higher returns in the late-80s and early-90s that are associated with years of higher ocean survival. The great majority of fish returning to the Willamette River in recent years have been of hatchery-origin. For the UWR chinook salmon ESU as a whole, NMFS estimates that the median population growth rate (lambda) over

[2]Naturally spawning adults include all adults on the spawning grounds without regard to origin. Natural spawners include only those spawners whose parents spawned in the wild.

the base period[3] ranges from 1.01 to 0.63, decreasing as the effectiveness of hatchery fish spawning in the wild increases compared to that of fish of wild origin (Tables B-2a and B-2b in McClure *et al.* 2000a).

Historically, there were five major basins that produced spring chinook including the Clackamas, North and South Santiam Rivers, McKenzie, and the Middle Fork Willamette. However, between 1952-1968 dams were built on all of the major tributaries occupied by spring chinook, blocking over half the most important spawning and rearing habitat. Dam operations have also reduced habitat quality in downstream areas due to thermal and flow effects. Dams on the South Fork Santiam and Middle Fork Willamette eliminated wild spring chinook in those systems (ODFW 1998a). Although there is still some natural spawning in these systems below the dams, habitat quality is such that there is probably little resulting production and the spawners are likely of hatchery origin. Populations in several smaller tributaries that also used to support spring chinook are believed to be extinct (Nicholas 1995).

The available habitat in the North Fork Santiam and McKenzie rivers was reduced to 1/4 and 2/3, respectively, of its original capacity. Spring chinook on the Clackamas were extirpated from the upper watershed after the fish ladder at Faraday Dam washed out in 1917, but re-colonized the system after 1939 when the ladder was repaired. NMFS was unable to determine, based on available information whether this represents a historical affinity or a recent, human-mediated expansion into the Clackamas River. Regardless, NMFS included natural-origin spring chinook as part of the listed populations and considers Clackamas spring chinook as a potentially important genetic resource for recovery.

The McKenzie, Clackamas, and North Santiam are therefore the primary basins that continue to support natural production. Of these the McKenzie is considered the most important. Prior to construction of major dams on Willamette tributaries, the McKenzie produced 40% of the spring chinook above Willamette Falls and it may now account for half the production potential in the Basin. Despite dam construction and other habitat degradations, the McKenzie still supports substantial production with most of the better quality habitat located above Leaburg Dam. The interim escapement objective for the area above the Dam is 3,000-5,000 spawners (ODFW 1998a). Pristine production in that area may have been as high as 10,000, although substantial habitat improvements would be required to again achieve pristine production levels. Estimates of the number of natural-origin spring chinook returning to Leaburg Dam are available since 1994 when adults from releases of hatchery reared smolts above the dam were no longer present. The number of natural-origin fish at the Dam has increased steadily from 800 in 1994 to about 1,400 in 1999 and 2,000 in 2000 (Table 3). Additional spawning in areas below the Dam accounts for about 20% of the McKenzie return. NMFS has estimated the risk of absolute extinction for the aggregate UWR chinook salmon population in the McKenzie River, above Leaburg, using the same range of assumptions about the relative effectiveness of hatchery fish.

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[3] Estimates of median population growth rate, risk of extinction, and the likelihood of meeting recovery goals are based on population trends observed during a base period beginning in 1980 and including 1998 adult returns. Population trends are projected under the assumption that all conditions will stay the same into the future.

At the low end, assuming that hatchery fish spawning in the wild have not reproduced (i.e., hatchery effectiveness = 0), the risk of absolute extinction within 100 years is 0.01 (Table B-5 in McClure *et al.* 2000a). At the high end, assuming that the hatchery fish spawning in the wild have been as productive as wild-origin fish (hatchery effectiveness = 100%), the risk of absolute extinction within 100 years is 0.85 (Table B-6 in McClure et al. 2000a).

The Clackamas River currently accounts for about 20% of the production in the Willamette Basin. The production comes from one hatchery and natural production areas located primarily above the North Fork Dam. The interim escapement goal for the area above the Dam is 2,900 adults (ODFW 1998a). This system is heavily influenced by hatchery production so it is difficult to distinguish natural from hatchery-origin spawners. Most of the natural spawning occurs above the North Fork Dam with 900 -2,200 adults crossing the Dam in recent years. There were 380 redds counted above the dam in 1998 and similar counts in 1997 (Lindsay *et. al.* 1998). In 1999, 177 redds were counted above the Dam, but not all tributaries surveyed in 1996-1998 were surveyed in 1999, so the 1999 count is probably an underestimate of the total number of redds above the Dam. There is some spawning in the area below the Dam as well although the origin and productivity of these fish is again uncertain. There were 48 spring chinook redds counted below the North Fork Dam in 1998.

Over 70% of the production capacity of the North Santiam system was blocked by the Detroit Dam. There are no passage facilities at the Dam so all of the current natural production potential remains downstream. The remaining habitat is adversely affected by warm water and flow regulation. The system is again influenced substantially by hatchery production, although the original genetic resources have been maintained since Marion Forks Hatchery stock has been derived almost exclusively from North Santiam brood sources (ODFW 1998a). Despite these limitations there continues to be natural spawning in the lower river. The number of redds counted in the area below Minto Dam (the lower-most dam) has steadily increased in the last several years. There were 194 redds counted in this area in 1998, 221 in 1999 and 345 in 2000, compared to an average of 140 in the 1996 and 1997 years (ODFW/WDFW 2000, ODFW 2001). The origin of the spawning adults or their reproductive success has not been determined.

Mitigation hatcheries were built to offset the substantial habitat losses resulting from dam construction and, as a result, 85%-95% of the production in the basin is now hatchery origin fish. On the one hand these hatchery populations represent a risk to the ESU. The genetic diversity of the ESU has been largely homogenized due to the past practice of broodstock transfers within the basin. Domestication is also a risk given the predominance of hatchery fish. Nevertheless, the hatchery populations also represent a genetic resource. All five of the hatchery stocks were included in the ESU and therefore are available to support recovery efforts. Given the extensive network of dams in the basin and other pervasive habitat degradations, it is clear that most, if not all, of the remaining populations would have been eliminated had it not been for the hatchery programs.

NMFS is currently engaged in a consultation to consider the future operation of the hatchery facilities in the Willamette Basin. This will reduce future risks associated with hatchery operations. Substantial efforts have already been taken to remedy some of the past hatchery practices including limiting the proportion of hatchery spawners in some natural production areas and reincorporating local-origin wild fish into the hatchery broodstock (ODFW 1998a). All hatchery produced fish in the Basin are now externally marked. Once these fish are fully recruited in 2002, the mass marking will greatly improve the managers' ability to monitor and control hatchery straying and production. In February, a Fishery Management and Evaluation Plan was approved under Take Limit 4 of the 4(d) rule for Upper Willamette chinook (February 9, 2001). The FMEP implements mark-selective fisheries in terminal areas. The new selective fishing regime will substantially reduce fishery mortality to natural origin fish while increasing the overall fishing opportunity on hatchery fish.

The fall chinook hatchery production program was also noted as a risk to the species since fall chinook were not historically present above Willamette Falls. The fall production program at Stayton Ponds has now been closed with the last release made in 1995. The last adults from these releases returned in 2000. It is reasonable to expect that the return of fall chinook will diminish rapidly as a result.

Table 3. Run size of spring chinook at the mouth of the Willamette River and counts at Willamette Falls and Leaburg Dam on the McKenzie River (Nicholas 1995; ODFW and WDFW 1998; ODFW/WDFW 2000, Frazier 2001). The Leaburg counts show wild and hatchery combined and wild only since 1994.

Return Year	Estimated number entering Willamette River	Willamette Falls Count	Leaburg Dam Count	
			Combined	Wild Only
1985	57,100	34,533	825	
1986	62,500	39,155	2,061	
1987	82,900	54,832	3,455	
1988	103,900	70,451	6,753	
1989	102,000	69,180	3,976	
1990	106,300	71,273	7,115	
1991	95,200	52,516	4,359	
1992	68,000	42,004	3,816	
1993	63,900	31,966	3,617	
1994	47,200	26,102	1,526	825
1995	42,600	20,592	1,622	933
1996	34,600	21,605	1,445	1,105
1997	35,000	26,885	1,176	991
1998	45,100	34,461	1,874	1,415
1999	53,900	40,400	1,909	1,383
2000	56,100	39,073	2,652	1,986
*2001**	*61,000*			

*preliminary

Lower Columbia River Chinook

The LCR ESU includes spring stocks and fall tule and bright components. The abundance of fall chinook greatly exceeds that of the spring component. The remaining spring chinook stocks in the LCR ESU are found in the Sandy on the Oregon side and Lewis, Cowlitz, and Kalama on the Washington side. Spring chinook in the Clackamas River are considered part of the UWR ESU. Naturally spawning spring chinook in the Sandy River are included in the LCR ESU despite substantial influence of Willamette hatchery fish from past years since they likely contain all that remains of the original genetic legacy for that system. Recent escapements above Marmot Dam on the Sandy River average 2,800 and have been increasing (ODFW 1998b). Hatchery-origin spring chinook are no longer released above Marmot Dam; the proportion of first generation hatchery fish in the escapement is relatively low, on the order of 10-20% in recent years.

On the Washington side spring chinook were present historically in the Cowlitz, Kalama, and Lewis rivers. Spawning areas were blocked by dam construction in the Cowlitz and Lewis. The native Lewis run became extinct soon after completion of Merwin Dam in 1932. Production in the Kalama was limited by the dams and by 1950 only a remnant population remained. Spring chinook in the Cowlitz, Kalama, and Lewis are currently all hatchery fish. There is some natural spawning in the three rivers, but these are believed to be primarily from hatchery strays (ODFW 1998b). The recent averages (1994-2000) for naturally spawning spring chinook adults in the Cowlitz, Kalama, and Lewis are 237, 198, and 364, respectively (LeFleur 2000, LeFleur 2001). The amount of natural production resulting from these escapements is unknown, but is presumably small since the remaining habitat in the lower rivers is not the preferred habitat for spring chinook. The Lewis and Kalama hatchery stocks have been mixed with out of basin stocks, but are nonetheless included in the ESU. The Cowlitz stock is largely free of introductions and is considered essential for recovery although not listed. The number of spring chinook returning to the Cowlitz, Kalama, and Lewis rivers have declined in recent years, but still number several hundred to a few thousand in each system (Table 4). Hatchery escapement goals have been consistently met in the Cowlitz and Lewis Rivers. The goal has not been met in all years in the Kalama, but WDFW continues to use brood stock from the Lewis to meet production goals in the Kalama. Although the status of hatchery stocks are not always a concern or priority from an ESA perspective, in situations where the historic spawning habitat is no longer accessible, the status of the hatchery stocks is pertinent. The expected returns in 2001 will exceed escapement objectives for each of the three Washington tributary systems.

Table 4. Estimated Lower Columbia River spring chinook tributary returns, 1992-2001. (ODFW/WDFW 1998, ODFW/WDFW 2000, LeFleur 2001, PFMC 2001a)

Year	Sandy R.	Cowlitz R.	Lewis R.	Kalama R.	Total Returns Excluding the Willamette System
1992	8,600	10,400	5,600	2,400	27,200
1993	6,400	9,500	6,600	3,000	25,500
1994	3,500	3,100	3,000	1,300	10,900
1995	2,500	2,200	3,700	700	9,100
1996	4,100	1,800	1,700	600	8,200
1997	5,200	1,900	2,200	600	9,900
1998	4,200	1,100	1,600	400	7,300
1999	3,300	1,600	1,000	1,000	7,600
2000	3,800	2,000	2,300	1,500	9,500
2001	*4,000*	*1,000*	*2,800*	*1,000*	*8,800*

There are apparently three self-sustaining natural populations of tule chinook in the Lower Columbia River (Coweeman, East Fork Lewis, and Clackamas) that are not substantially influenced by hatchery strays. Returns to the East Fork and Coweeman have been generally stable. East Fork returns have been near interim escapement goals in recent years. Recent 5 and 10 year average escapements to the East Fork Lewis have been about 300 compared to an interim escapement goal of 300. Recent 5 and 10 year average escapements to the Coweeman are 768 and 607, respectively compared to an interim natural escapement goal of 1000 (data provided by C. LeFleur, WDFW to S. Bishop NMFS, April 9, 2000). Escapements since 1998 have been the lowest observed since 1990, although returns in 2000 increased over those observed in 1999. Although the population has generally been stable at low levels, the lower escapements in recent years may be related to a more pervasive decline in survival rates which will have longer-term implications for the stock. The populations should be closely watched to see if escapements increase in the next several years as has occurred with other populations, or whether they remain at these very low levels. Natural escapement on the Clackamas has averaged about 350 in recent years. There have been no releases of hatchery fall chinook in the Clackamas since 1981 and there are apparently few hatchery strays. The population is considered depressed, but stable and self-sustaining (ODFW 1998b). 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 among the few healthy natural chinook stocks in the Columbia River Basin. Escapement to the North Fork Lewis River has exceeded its escapement goal of 5,700 by a substantial margin every year since 1980, except 1999, with a recent five year average escapement of 8,400. The forecast in 1999 was for an exceptionally low return of about 2,500. The actual return was about 3,300. The low return in 1999 was attributed, at least in part, to severe flooding that occurred in 1995 and 1996. The forecast in 2000 again predicted a low return of 3,500, but the actual return was 9,820, well in excess of goal. The low returns in 1999 and predicted low return in 2000 had raised concerns about a more pervasive decline in survival rates (R. Kope, NMFS, pers. comm. to P. Dygert, NMFS, 4/4/2000). However, the strong return in 2000 does not appear to support a continued decline. Nevertheless, escapements will continue to be evaluated for patterns in survival. This population is currently considered healthy.

There are two smaller populations of LCR brights in the Sandy and East Fork Lewis River. Run sizes in the Sandy have averaged about 1000 and been stable for the last 10-12 years. The fall chinook hatchery program in the Sandy was discontinued in 1977, which has certainly reduced the number of hatchery strays in the system. There is also a late spawning component in the East Fork Lewis that is comparable in timing to the other bright stocks. The escapement of these fish is less well documented, but it appears to be stable and largely unaffected by hatchery fish (ODFW 1998b).

For the LCR chinook salmon ESU as a whole, NMFS estimates that the median population growth rate (lambda) over the base period[4] ranges from 0.98 to 0.88, decreasing as the effectiveness of hatchery fish spawning in the wild increases compared to that of fish of wild origin (Tables B-2a and B-2b in McClure *et al.* 2000a). NMFS estimated the risk of absolute extinction for nine spawning aggregations[5], using the same range of assumptions about the relative effectiveness of hatchery fish. At the low end, assuming that hatchery fish spawning in the wild have not reproduced (i.e., hatchery effectiveness = 0), the risk of absolute extinction within 100 years ranges from zero for the Sandy River late run and Big Creek to 1.00 for Mill Creek (Table B-5 in McClure et al. 2000a). At the high end, assuming that the hatchery fish spawning in the wild have been as productive as wild-origin fish (hatchery effectiveness = 100%), the risk of absolute extinction within 100 years is $\geq$0.99 for all but one of the nine spawning aggregations (zero for the Sandy River late run; Table B-6 in McClure et al. 2000a). 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. Historically, fish migrations were synchronized with periods of high rainfall or snowmelt to provide access to upper reaches of most tributaries where spring stocks would hold until

[4] Estimates of median population growth rate, risk of extinction, and the likelihood of meeting recovery goals are based on population trends observed during a base period beginning in 1980 and including 1997 adult returns for most spawning aggregations. Population trends are projected under the assumption that all conditions will stay the same into the future.

[5] McClure *et al* (2000b) have calculated population trend parameters for additional LCR chinook salmon stocks.

spawning (Fulton 1968, Olsen *et al*. 1992, WDF *et al*. 1993). Fall run fish do not begin entry to the Columbia River until August.

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). The impacts considered in this and the following sections include the estimated fishing-related mortality associated with direct, indirect, and inter-related and inter-dependent effects of the action. Fishing activities may also result in non-lethal (harassment, pursue, etc) take associated with the operation of certain gear types or fishing methods, e.g., effects on fish behaviour. However, these effects are unknown and unquantifiable at this time.

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

The assessments of the size, variability and stability of chinook and chum populations, described in the previous sections, are made in fresh water spawning and migratory environments and closely reflect the status of the species.

Designated critical habitat for the two chinook and one chum ESUs that are the focus of this opinion includes the marine and freshwater areas in the Columbia River, but does not include the offshore marine areas under the jurisdiction of the PFMC, or the northern Puget Sound areas where the Fraser Panel fisheries occur (65 FR 7764).

Marine and freshwater areas in the Columbia River have been affected by a variety of factors. In addition to the impact of harvest that is considered in detail in this opinion, the species of concern are affected by impacts related to habitat degradation, hatchery programs, and hydro-development. The relative effect of each H to the ESUs, and to each stock within an ESU, differs. However, in general, human development associated with forestry, farming, grazing, road construction, mining, and urbanization have all contributed to the decline of the species. Habitat restoration actions are expected to improve productivity by restoring habitat to proper function (NMFS 1996a). However, in most cases, it will be a decade or more before the effects are demonstrable. The harvest standards discussed in this opinion were developed under assumptions of current habitat productivity and capacity.

B. Harvest Activities Affecting Listed Species Outside the Action Area

1. Bering Sea/Aleutian Islands Groundfish Fisheries

Salmon are taken incidentally in the Bering Sea/Aleutian Islands (BSAI) and the Gulf of Alaska (GOA) groundfish fisheries off of the coast of Alaska. NMFS has conducted section 7 consultations on the impacts of fishing conducted under the Bering Sea and Aleutian Islands and Gulf of Alaska Fishery Management Plans (BSAI/GOA FMP) of the North Pacific Fisheries Management Council (NPFMC) on ESA listed species and concluded that impacts were not likely to jeopardize the LCR chinook, UWR chinook and CR chum ESUs (NMFS 1994, NMFS 1995, NMFS 1998, NMFS 1999e, NMFS 2000e). The catch of listed UWR spring chinook in the BSAI groundfish fishery is likely to be only a rare event, and the annual catch of LCR tules is estimated to be extremely low. The estimated exploitation rate (ER) on UWR in the GOA groundfish fishery was estimated to be about 0.3%, and the ER on the LCR ESU to be about 0.7%. However, much of the bycatch of the groundfish fishery is further north and west along the Aleutian Islands. These are therefore likely substantial overestimates of the actual ERs for UWR chinook and the bright component of the LCR chinook ESU in the GOA groundfish fishery. Because of their more southerly distribution, LCR tules are even less likely to be caught in the GOA groundfish fishery. These conclusions were based on an average total incidental catch of all chinook in the groundfish fisheries of 40,985 and 0.01 chinook/metric ton groundfish (range = 0 to 6 chinook/metric ton groundfish) (1990-2000)(NMFS 1999b, NMFS 2001a). Should the amount of salmon bycatch change substantially, these conclusions should be revisited.

The bycatch in the Canadian groundfish fisheries has been considered in previous consultations on groundfish and salmon fisheries (NMFS 1992, NMFS 1999d). The conclusion was that the bycatch of listed species was not likely to be significant assuming that the total annual salmon bycatch in Canadian groundfish fisheries was approximately 28,000 fish per year[6] (NMFS 1999d). Should the amount of salmon bycatch change substantially, these conclusions should be revisited.

2. Alaskan and British Columbia Salmon Fisheries

Salmon fisheries off the coast of Southeast Alaska (SEAK) and British Columbia also impact the listed salmon ESUs considered in this opinion. Historical impacts to the listed ESUs and their component stocks in these fisheries are summarized in Tables 5-7. The SEAK chinook fisheries and the sockeye, pink, chinook and chum fisheries off the coasts of British Columbia will be managed under the terms of the most recent agreement under the PST. NMFS' assessment of the current PST agreement (Treaty) as it applied to the SEAK and Canadian BC fisheries concluded that it did not pose jeopardy to the listed ESUs (NMFS 1999c). The terms of the agreement will be effective through 2008 (2010 for Fraser Panel fisheries). NMFS' assessment involved a retrospective analysis comparing the total observed exploitation rate against the exploitation rate that would have occurred had the agreement been in place and southern U.S. were held to the minimum observed. The retrospective modeling assumed that the SEAK and Canadian fisheries would harvest up to the limit allowed under the treaty. In addition, the Treaty also includes a general obligation for each country to reduce exploitation rates in Individual Stock-Based Management (ISBM) fisheries on certain stocks if they are not meeting escapement goals. The

[6] Assumes bycatch in other gears is similar to that of whiting which is estimated to be approximately 14,000.

fisheries as proposed in 2001 meets the general obligation for U.S. fisheries.

NMFS' assessment found that there would have been little change in exploitation rates as a result of the Treaty agreement for UWR and LCR bright chinook. Ocean exploitation rates on LCR spring chinook would be reduced from 30 to 18%, and for LCR tule chinook from 45 to 30%. (NMFS 1999c). It should be noted that the basic assumptions in the retrospective analysis of maximum Treaty harvest and minimum southern fisheries may have been overly conservative for the near term. Although SEAK chinook fisheries are expected to harvest up to the maximum allowed under the agreement, Canadian fisheries have been and will most likely continue to be curtailed at least for the next several years due to the severely depressed status of its stocks. In addition, changes in southern U.S. terminal area harvest strategies for some ESUs may result in exploitation rates below those assumed in the PST assessment.

Listed sockeye or chum salmon, in general, are unlikely to be caught or encountered given the huge numbers of chum and sockeye from regions outside the listed ESUs migrating through the same area. The majority of chum catch in SEAK summer fisheries occurs beginning in late July through early September in terminal area (near shore) net fisheries targeted on local stocks of maturing adults.

The ocean distributions for listed steelhead are not known in detail, but steelhead are caught only rarely in ocean salmon fisheries and are, therefore, not likely to be caught in Alaskan fisheries. The total catch of steelhead in Canadian fisheries is low and consideration of the likely stock composition suggests that the catch of listed steelhead is less than 10 per year from all the steelhead ESUs combined (NMFS 1999c).

C. Harvest Activities Affecting Listed Species Inside the Action Area

1. Washington, Oregon, California Coast Groundfish Fisheries

Salmon are taken incidentally in the groundfish fishery off Washington, Oregon, and California. NMFS has conducted section 7 consultations on the impacts of fishing conducted under the Pacific Coast Groundfish Fishery Management Plan (PCGFMP) on ESA listed species and concluded that impacts on species listed at that time were low and not likely to jeopardize the listed species (NMFS 1996b, NMFS 1999a, NMFS 1999d). Most salmon caught incidental to the whiting fishery are chinook. (The 1991-2000 average annual catches of pink, coho, chum, sockeye, and steelhead in the whiting fishery are approximately 607, 254, 132, 13 and 0, respectively out of an annual average catch of 209 metric tons of whiting). The incidental total catch of all chinook in the groundfish fisheries is generally low. The estimated catch of chinook in the whiting fishery for example has averaged 7,158 annually from 1991 to 2000 (NMFS 2001a, ODFW 1997, Weeks and Hutton 1998). The incidental catch of chinook in other components of the groundfish fishery are comparable in magnitude to those in the whiting fishery (NMFS 1996b). This compares to a catch of chinook in the ocean salmon fisheries off the Oregon and Washington coast that has averaged 166,000 annually during the same 1991 to 2000 time frame (PFMC 2001b).

Because the chinook ESUs considered here include north and far-north migrating stocks, the potential for incidental catch of listed chinook in the groundfish fisheries is limited largely to that which occurs off the Washington coast, although some components of the Lower Columbia River ESU are distributed off the Oregon coast as well. The most recent groundfish opinion (NMFS 1999d) estimates the catch of LCR brights and UWR chinook to be an occasional event in these fisheries based on an average of 3-5 coded-wire tags (CWTs) recovered per year. The catch rates of LCR spring and tule stocks are probably somewhat higher based on their higher incidence of catch in PFMC salmon fisheries. However, given the generally low total bycatch of chinook, the ER on these stocks was estimated to be <1% (NMFS 1999d). In 2001, NMFS re-initiated consultation on the Pacific whiting fishery when the 2000 whiting fisheries exceeded the chinook bycatch amount specified in the 1999 biological opinion by approximately 500 fish. NMFS expects that the consultation will be complete by May 2001. Until consultation is complete, fishing under the FMP is within the scope of the 1999 biological opinion, so long as the annual incidental take of chinook stays under the 11,000 fish bycatch limit.

2. Southern U.S. Salmon Fisheries

Until recently the exploitation rates on most of the chinook ESUs being considered here have been too high for many of the component stocks and have contributed to their decline particularly because of what we now know about the long-term decline in ocean productivity (see following section).

The following series of tables shows the magnitude and distribution of exploitation rates for the chinook ESUs or components of the ESUs. The tables show the total adult equivalent exploitation rates by brood year as well as how that exploitation was distributed across the major fisheries. The estimates are based on CWT recoveries which provides the most direct estimates of exploitation rates. The adult equivalent calculation is a procedure that discounts catch for expect future natural mortality which would occur prior to spawning. The estimates are reported by brood year. For example, the exploitation rate of the 1992 brood year accounts for harvest mortality that occurred on age 2-5 fish in years 1994-97. The data are complete through the 1994 brood and 1999 fishery. The 1995 brood year is reported, but is incomplete in that the five year old recoveries from the 2000 fishery are not yet available. There is generally a year-long time lag in updating the coast-wide CWT data base necessary to provide these estimates. The averages in the following tables correspond to significant shifts in fishing regimes: (1) pre-Pacific Salmon Treaty (PST) implementation (1975-1984), (2) post-PST implementation but prior to the implementation of fishery restrictions seen in recent years (1985-1990); (3) recent years when fisheries have been significantly constrained (1991-1995).

Exploitation rates can also be calculated using harvest management models by catch year. These models use the same CWT data to model exploitation rates that occurred in past years. However, once the models are calibrated, they can also be used for management planning purposes to estimate exploitation rates that would be associated with a given fishery structure in a particular year. Because the models are projections, they can be used to characterize exploitation rate trends from past years relative to the most recent years - through 2000 in this case - that are not available when using the more direct brood year, CWT estimates. Model estimates of ER for the 2001 fisheries are also reported.

The total brood year exploitation rate of UWR chinook has declined over the years, averaging 0.54 from 1985 through 1990 and 0.27 for the more recent brood years 1991-1995 (Table 5). Upper Willamette River chinook are a far-north migrating stock. The ocean harvest occurs primarily in the Alaskan and northern Canadian fisheries. Because of their northerly distribution and earlier return timing, the exploitation rate of UWR chinook in PFMC fisheries is low, averaging 0.01 during 1985-1990 and 0.00 in the most recent years (Table 5). The exploitation rate in the river fishery is higher, averaging 0.42 in 1985-1990. Harvest in the river fisheries has declined substantially in recent years because of concerns for Snake River spring/summer chinook and other upriver spring stocks. Commercial harvest in the mainstem has been largely eliminated since 1992. The lower river sport fishery has been closed since 1995. Sport fisheries in the Willamette River and the tributaries have been increasingly restrictive as the return of hatchery and wild fish has declined through the 1990s. In February, NMFS approved a Fishery Management and Evaluation Plan (FMEP) developed by the Oregon Department of Fish and Wildlife (ODFW) for Upper Willamette spring chinook under the 4(d) rule. The plan implements a mass marking and selective fishery program that is expected to reduce in-river recreational harvest rates on natural fish by 75% relative to the 1980-96 average (43%) once fully implemented in 2002 (ODFW 2001). Under the FMEP, freshwater mortality rates are anticipated to be in the range of 8-11% depending on the population. UWR chinook are caught only rarely in Puget Sound and other coastal terminal marine fisheries (Table 5).

The Lower Columbia River chinook ESU has three components including spring stocks, tule stocks, and far-north migrating bright stocks. These components have different distributions and are subject to different rates of harvest. The time series of ER for the spring component is not currently available, but the model base period (1979-82) ER for Cowlitz spring chinook in PFMC fisheries was 12%.

The total brood year exploitation rates on tule stocks have also declined since 1976, averaging 0.69 from 1976-1984, and 0.58 from 1985 through 1990 (Table 6). Total exploitation rates for the 1991-1995 broods averaged 0.34 (Table 6). The distribution of the tule stocks is more southerly with the ocean harvest concentrated in Canadian and PFMC fisheries. Exploitation rates in the PFMC fishery averaged 0.24 in the 1985 through 1990 time period and 0.10 for the 1991-95 brood years. The 1985-1990 exploitation rate in the river fisheries averaged 0.10 (Table 6). The most recent five year average is 0.06. Tules are caught in the Strait of Juan de Fuca and San Juan fisheries, but it is a rare occurrence (D. Simmons, NMFS, pers. comm. to S. Bishop, NMFS, March 28, 2001)(Table 6).

North Fork Lewis River fall chinook are the primary representative of the bright component of the Lower Columbia River ESU. As noted above this is one of the few healthy wild stocks in the Lower Columbia River. Total exploitation rates averaged 0.55 from 1975 through 1984 and 0.43 from 1985 through 1990. This is a far-north migrating stock so the ocean harvest occurs primarily in Alaska and Canada. The long term average exploitation rate in PFMC fisheries is

0.05. The more recent average ER is 0.01. In-river ERs have averaged 0.24 from 1977 through 1984, 0.21 from, 1985-1995, and 0.14 in recent years (Table 7). Encounters of North Fork Lewis fall chinook in Puget Sound and other terminal marine area fisheries is a rare occurrence. The exploitation rate in these fisheries has averaged 0.00 since 1977, including the most recent brood years (1991-1995).

Table 5. Summary of total adult equivalent exploitation rates for the Upper Willamette River chinook ESU (CTC 2001).

	Willamette Spring Hatchery					
Brood Year	Total	SEAK	Canada	PFMC	Columbia R.	Other
1971						
1972						
1973						
1974						
1975	0.45	0.05	0.12	0.01	0.26	0.00
1976	0.47	0.09	0.17	0.03	0.17	0.00
1977	0.55	0.09	0.14	0.02	0.30	0.00
1978	0.48	0.10	0.12	0.01	0.24	0.00
1979	0.55	0.13	0.11	0.03	0.28	0.01
1980	0.46	0.06	0.07	0.01	0.32	0.00
1981	0.47	0.14	0.04	0.01	0.28	0.00
1982	0.48	0.09	0.05	0.00	0.34	0.01
1983	0.77	0.16	0.11	0.02	0.48	0.00
1984	0.54	0.09	0.08	0.02	0.36	0.00
1985	0.51	0.05	0.05	0.01	0.40	0.00
1986	0.54	0.10	0.05	0.01	0.39	0.00
1987	0.59	0.09	0.03	0.01	0.47	0.00
1988	0.54	0.07	0.03	0.02	0.42	0.00
1989	0.60	0.11	0.03	0.02	0.45	0.00
1990	0.48	0.05	0.02	0.00	0.40	0.00
1991	0.40	0.06	0.02	0.00	0.32	0.00
1992	0.19	0.04	0.01	0.00	0.14	0.00
1993	0.25	0.05	0.01	0.00	0.18	0.00
1994	0.22	0.06	0.00	0.00	0.16	0.00
1995	0.29	0.09	0.01	0.00	0.19	0.00
1975-1984	0.52	0.10	0.10	0.02	0.30	0.00
1985-1990	0.54	0.08	0.04	0.01	0.42	0.00
1991-1995	0.27	0.06	0.01	0.00	0.20	0.00

Table 6. Summary of total adult equivalent exploitation rates for an aggregate of tule stocks from the Lower Columbia River chinook ESU (CTC 2001).

	Tule (Oregon hatcheries, Cowlitz)					
Brood Year	Total	SEAK	Canada	PFMC	Columbia R.	Other
1971						
1972						
1973						
1974						
1975						
1976	0.43	0.01	0.18	0.15	0.09	0.00
1977	0.76	0.03	0.29	0.35	0.09	0.01
1978	0.71	0.03	0.32	0.27	0.10	0.00
1979	0.77	0.03	0.29	0.33	0.12	0.00
1980	0.69	0.02	0.38	0.16	0.13	0.00
1981	0.66	0.03	0.43	0.08	0.13	0.00
1982	0.69	0.03	0.32	0.18	0.17	0.00
1983	0.74	0.02	0.24	0.23	0.26	0.00
1984	0.75	0.02	0.26	0.18	0.29	0.00
1985	0.74	0.03	0.27	0.28	0.18	0.00
1986	0.57	0.03	0.18	0.27	0.09	0.00
1987	0.50	0.05	0.19	0.21	0.03	0.02
1988	0.52	0.03	0.26	0.16	0.08	0.00
1989	0.66	0.03	0.20	0.37	0.07	0.00
1990	0.53	0.02	0.18	0.18	0.14	0.00
1991	0.29	0.03	0.25	0.01	0.01	0.00
1992	0.27	0.02	0.04	0.14	0.07	0.00
1993	0.26	0.06	0.10	0.03	0.07	0.00
1994	0.48	0.00	0.15	0.23	0.09	0.00
1995	0.42	0.03	0.17	0.07	0.16	0.00
1976-1984	0.69	0.02	0.30	0.21	0.15	0.00
1985-1990	0.58	0.03	0.21	0.24	0.10	0.00
1991-1995	0.34	0.03	0.14	0.10	0.08	0.00

Table 7. Summary of total adult equivalent exploitation rates for the North Fork Lewis River bright stock from the Lower Columbia River chinook ESU (CTC 2001).

	Bright (Lewis River)					
Brood Year	Total	SEAK	Canada	PFMC	Columbia R.	Other
1971						
1972						
1973						
1974						
1975						
1976						
1977	0.51	0.08	0.19	0.06	0.18	0.00
1978	0.56	0.15	0.14	0.09	0.17	0.01
1979	0.50	0.10	0.16	0.07	0.18	0.00
1980						
1981						
1982	0.59	0.09	0.16	0.02	0.31	0.00
1983	0.68	0.06	0.20	0.05	0.35	0.00
1984	0.46	0.04	0.15	0.03	0.23	0.00
1985	0.45	0.07	0.12	0.07	0.19	0.00
1986	0.41	0.04	0.15	0.05	0.16	0.00
1987	0.38	0.05	0.14	0.05	0.15	0.00
1988	0.48	0.06	0.17	0.04	0.21	0.00
1989	0.41	0.00	0.07	0.05	0.29	0.00
1990	0.45	0.07	0.10	0.01	0.27	0.00
1991	0.31	0.12	0.07	0.02	0.10	0.00
1992	0.26	0.13	0.03	0.01	0.10	0.00
1993	0.43	0.14	0.07	0.00	0.23	0.00
1994	0.44	0.24	0.09	0.00	0.11	0.00
1977-79, 1982-84	0.55	0.09	0.17	0.05	0.24	0.00
1985-1990	0.43	0.05	0.13	0.05	0.21	0.00
1991-1994	0.36	0.16	0.07	0.01	0.14	0.00

D. Influence of Artificial Production

Hatcheries have both positive and negative effects. Hatcheries are playing an increasingly important role in conserving natural populations in areas where the habitat can no longer support natural production or where the numbers of returning adults are now so low that intervention is required to reduce the immediate risk of extinction. However, there are also negative consequences associated with hatchery programs, particularly as they were developed and managed in the past. There are genetic interactions associated with the interbreeding of hatchery and wild fish. There are a number of ecological interactions such as predation of wild fish by larger hatchery fish, competition for food and space, and disease transmission. In addition, fisheries that target hatchery fish may over harvest less productive wild populations. Hatchery reform efforts have been ongoing for several years, and state and tribal co-managers have begun to implement mitigation provisions as part of conservation initiatives (WDFW/PNPTT 2000). Hatchery activities in Puget Sound and the Columbia Basin are currently the subject of section 7 consultations that are designed to address the adverse effects of ongoing hatchery programs.

E. Natural Factors Causing Variability in Population Abundance

Changes in the abundance of chinook populations are a result of variations in freshwater and marine environments. For example, 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 returns of Lewis River bright fall chinook in 1999 is attributed, at least in part, to flood events during both 1995 and 1996.

Chinook salmon 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, chinook 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 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.

A key factor that has substantially affected many west coast salmon 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 CWT recoveries at age 2 relative to the number of CWTs released from that brood year. Indices are available for Upper Willamette River spring chinook and Lewis River fall chinook (LCR). The patterns differ between stocks, but each shows a highly variable or declining trend in early ocean survival with very low survivals in recent years (Figures 1-2).

Recent evidence suggests that marine survival of salmon species fluctuates in response to 20-30 year long periods of either above or below average survival that is driven by long-term cycles of climatic conditions and ocean productivity (Cramer 1999) . This has been referred to as the Pacific Decadal Oscillation (PDO). It is apparent that ocean conditions and resulting productivity affecting many of northwest salmon populations have been in a low phase of the cycle for some time. Smolt-to-adult return rates provide another measure of survival and the effect of ocean conditions on salmon stocks. The variation in ocean conditions has been an important contributor to the decline of many stocks. However, the survival and recovery of these species depends on the ability of these species to persist through periods of low ocean survival when stocks may depend on better quality freshwater habitat and lower relative harvest rates.

The extraordinary drought conditions in 2001 warrant additional consideration. The available water in the upper Columbia River Basin is 50-60% of normal and will result in some of the lowest flow conditions on record. These conditions will have the greatest effect on upriver stocks that will have to migrate through the mainstem Columbia and Snake rivers past many dams. The juveniles that must pass down river during the 2001 spring and summer out-migration will likely be significantly affected. This will affect adult returns primarily in 2003 and 2004 depending on the stock and species. This opinion focuses on UWR chinook and LCR chinook and chum. Generally speaking stocks in the lower river will be less affected by the drought. Neither the juveniles or adults have to pass any mainstem dams with the exception of a few stocks that return to areas above Bonneville Dam. Lower river tributaries are less dependent on snow pack for flow. UWR spring chinook do have to migrate further upriver into tributary areas and, therefore, may be more subject to low water conditions. However, as discussed elsewhere in this opinion, the impacts from the PFMC and U.S. Fraser Panel fisheries on these early return timing spring stocks is close to zero. The harvest rate of chum salmon in the these fisheries is also close to zero. So, although the low flow conditions in 2001 are a general concern for stocks returning to the basin, the effect on stocks that return to the lower river below the mainstems dams is expected to be low.

Although it is not possible to review here the relative importance of each of these factors on each ESU or stocks within the ESUs, it is clear that it is the combined effect of all of the H's (hatchery, habitat, hydropower and harvest) that has led to the decline and resulting current status of the species of concern. In this opinion, NMFS focuses on harvest, in the context of the environmental baseline and the current status of the species. Although harvest can be reduced in response to the species' depressed status and the reduced productivity that results from the degradations related to other human activities, the recovery of the listed species depends on improving the productivity of the natural populations in the wild. These improvements can only be made by addressing the factors of decline related to all of the H's that will be the subject of future opinions and recovery planning efforts.

Figure 1. Early ocean survival rate index for Lewis River wild chinook (LCR ESU)

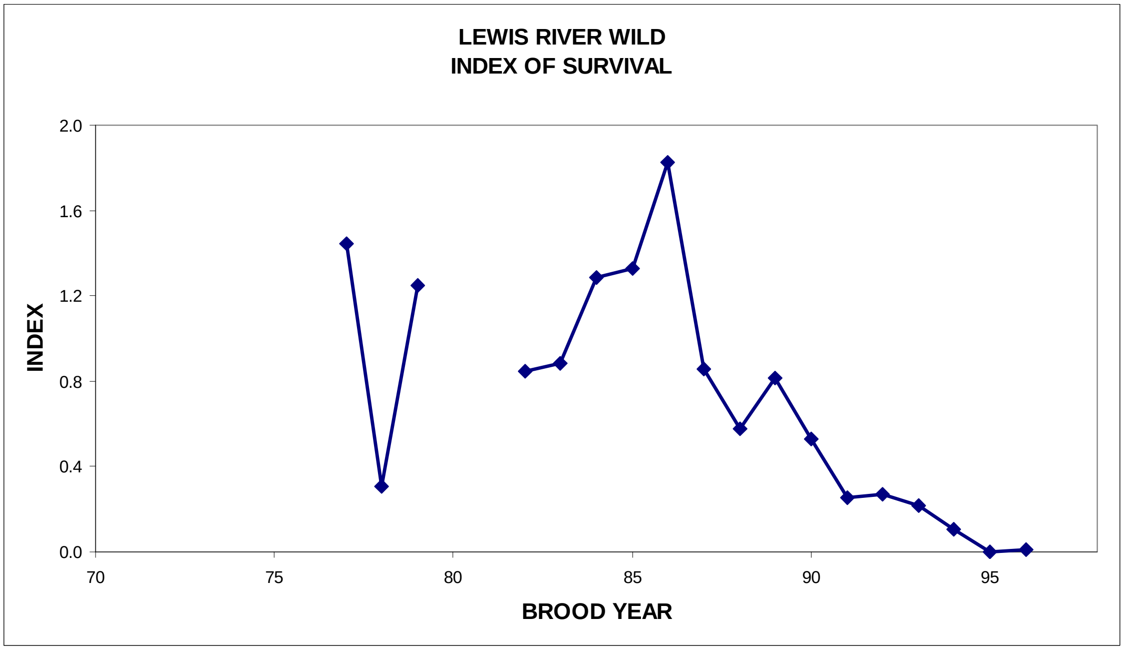
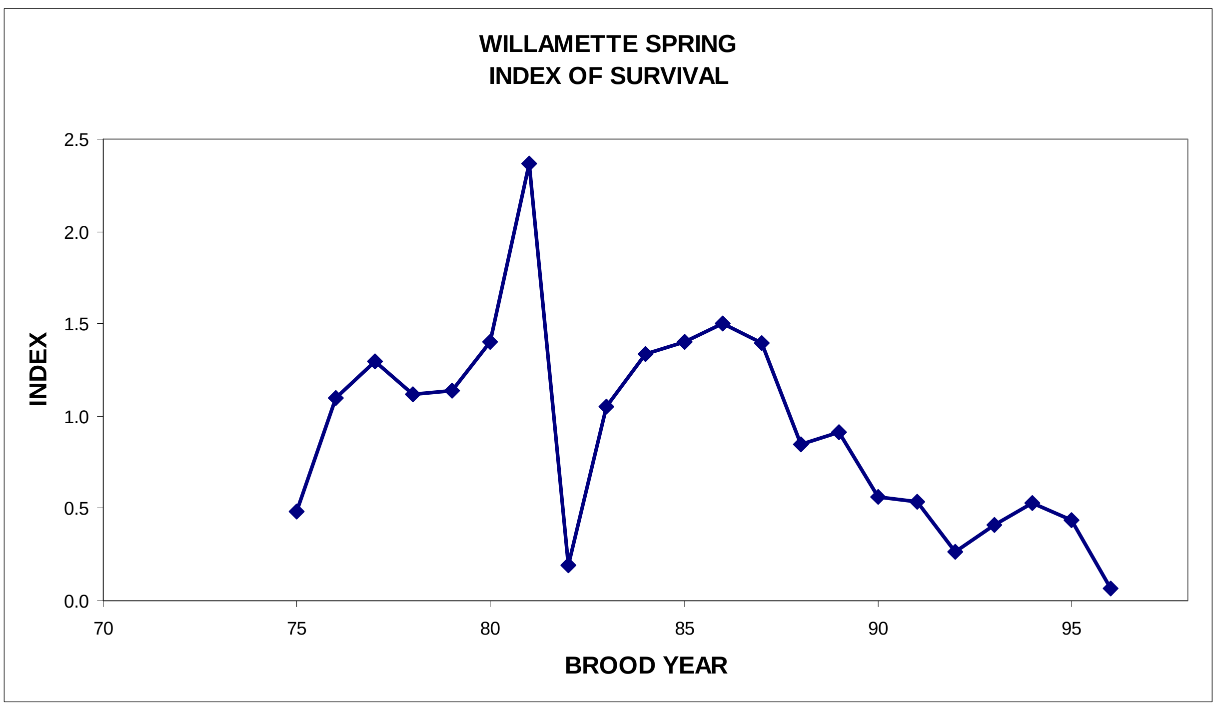


Figure 2. Early ocean survival rate index for Willamette River spring chinook (UWR ESU).



IV. Effects of the Action

The standards for determining jeopardy are set forth in Section 7(a)(2) of the ESA as defined at 50 CFR §402.02. This section of the Biological Opinion applies those standards in determining 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, or adversely impact critical habitat. 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. Fishing activities may also result in non-lethal take associated with the operation of certain gear types or fishing methods, e.g., effects on fish behaviour. However, these effects are unknown and unquantifiable at this time.

Assessment Approach

The jeopardy determinations in this opinion are based on the consideration of the proposed management actions taken to reduce the catch of listed fish, the magnitude of the remaining harvest, particularly in comparison to the period of decline, and in some cases estimates of target exploitation rates which were derived to be consistent with recovery, i.e., rebuilding exploitation rates (RER). NMFS also paid particular attention to the population structure of each ESU by reviewing both the status and impacts to components that were considered representative or important to the ESU as a whole. The jeopardy determinations are based on quantitative assessments where possible and more qualitative considerations where necessary. Different methods and different types of information were used for the various ESUs and populations within ESUs, reflecting what was available or could be developed as part of this consultation. NMFS expects that more quantitative and holistic analyses and risk assessments will become available in time, and that standards may change as new information becomes available. In the meantime, NMFS must rely on the best available information in making its judgement about the risk of the proposed action to the listed species.

The LCR and UWR chinook ESUs are the subjects of more detailed analyses in this Effects of the Action section. The method used to assess the effects of fishing activities on the LCR chinook ESU was developed with three objectives in mind. First, NMFS sought to evaluate the proposed fisheries using biologically-based measures of the total exploitation rate that occurred across the full range of the species. Second, NMFS sought to use an approach that was consistent with the concepts developed by the Northwest Fisheries Science Center (NWFSC) for the purpose of defining the conservation status of populations and ESUs, i.e.,Viable Salmonid Populations (VSP) (McElhaney *et al.* 1999). Finally, NMFS sought to develop an approach for defining target ERs that could be related directly to the regulatory definition of jeopardy. The product of this approach is a RER for representative stocks within each ESU (NMFS 2000d). NMFS can then evaluate the proposed fisheries, in part, by comparing the RERs to stock-specific ERs that can be anticipated as a result of the expected fishing-related mortality from the FMP, recognizing that the jeopardy determination must be made with respect to the overall ESU.

More qualitative considerations were used to extrapolate where necessary from the available stocks-specific RER analyses. To date, RERs have been developed for a limited set of populations in the Puget Sound chinook ESU and for the Coweeman population in the LCR ESU. RERs were used as part of the assessment in the 1999 PST opinion (NMFS 1999c), the 2000 opinion on PFMC fisheries (NMFS 2000c) and the application of take limits under the 4(d) Rule (NMFS 2001b). These opinions contain a more detailed discussion of the Coweeman RER. There are no total mortality objectives for the UWR chinook ESU, but the majority of harvest occurs in-river, and these fisheries must now be managed to meet the in-river harvest rate objectives defined in the Upper Willamette FMEP (ODFW 2001).

Because RER objectives are expressed in terms of a total exploitation rate and some of the associated impacts occur in Canadian and Alaskan fisheries, it is necessary to make assumptions about anticipated impacts in the northern fisheries. In general, Alaskan fisheries will be managed up to the limits allowed under the PST agreement, but Canadian fisheries will be substantially more restrictive because of domestic conservation concerns for Canadian stocks. Assumptions about fishing levels in these northern fisheries were incorporated into the modeling analysis of impacts (PFMC 2000a, PFMC 2000b, PFMC 2001c).

Determinations about population structure have not been made for any of the ESUs that are of immediate concern in this opinion. The status discussions in section II.C. describe the existing stock structure for the UWR and LCR chinook ESUs. The stock structure of the UWR is relatively simple with only three naturally-reproducing stocks. The LCR ESU is intermediate in terms of its complexity with three distinct life history types, but with relatively few representative stocks for each. Whether or to what degree these stocks will be aggregated to form populations is not known at this time. However, the intent of the VSP approach is clearly to recognize and protect the diversity of populations that may exist within an ESU and, in assessing the effect of an action, to stratify the ESU adequately to represent the unique population characteristics of the ESU. This should include, for example, unique life history or genetic characteristics, and geographic distributions. Although the analysis in this opinion was limited to a degree by available data and time, the importance of population structure within each ESU provided the focus for the analysis and discussion.

A. Columbia River Chum

Chum salmon in the Columbia River 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.

PFMC fisheries are closest to the terminal area. However, chum salmon are neither targeted or caught in PFMC fisheries. The available information suggests that the overall ocean impact on CR chum is negligible. Retention of chum salmon in in-river 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 2000). 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 (2000) 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.

In Puget Sound fisheries, chum are intercepted incidentally in fisheries targeted at other species and in fisheries targeted on non-listed chum. Although no information is available for the presence of Columbia River chum in Puget Sound fisheries, per se, some inferences may be made from the marine distribution of other Columbia River salmonids and the presence of similarly timed fall chum stocks in the Fraser Panel fisheries. There has also been some speculation based on past catch patterns (Henry 1953) that Columbia River chum ocean distribution may be more southerly than other fall chum stocks, similar to the present distribution of Columbia River coho salmon (Sandercock 1991). Puget Sound fisheries accounted for less than 1% of the all the Columbia River coho CWTs recovered between 1979 and 1993 (Weitkamp *et al.* 1995).

Although Puget Sound, Washington Coastal and Columbia River fall chum share similar run timing, the contribution of Washington coastal fall chum is the best surrogate for Columbia River chum since Puget Sound chum are returning to their region of origin and would be expected to be greater contributors to Puget Sound fisheries. The presence of Washington coastal fall chum stocks in the August and early September Canadian Area 20 fishery has been intermittent, comprising 0-8% of the catch sampled in 1995-1997 (LeClair 1999). They have been detected at generally similar levels during October and November in the Washington Commercial Catch Area 5 fall chum fisheries (1985-1996) (Beattie 1999), with no apparent trends in contribution either within or among years. Contribution rates were higher than 9% in 3 of the 62 weeks sampled, but were also not detected in a substantial number of weeks sampled. Using this stock composition estimate would result in an average annual catch of approximately 9 (range 0-21) Columbia River chum in northern Puget Sound fisheries.

B. Chinook Salmon

1. Upper Willamette River Chinook

There are three spring chinook stocks in the Willamette River that are still supported to varying degrees by natural origin production. These are found in the McKenzie, North Santiam, and Clackamas Rivers. There has been no formal determination by NMFS to date regarding the population structure of the ESU. All of these systems have been substantially influenced by hatchery production and in past years there was substantial exchange of brood stock among the hatcheries with the possible exception of the North Santiam system. The McKenzie River stock is the harvest indicator stock for Willamette spring chinook and, absent other information, it is assumed that the other components have similar distributions and are subject to the same rates of harvest in ocean and pre-terminal fisheries.

Exploitation rates in the other ocean fisheries have been significantly reduced in recent years due to substantial reductions in Canadian fisheries. The conservative harvest regime that was first implemented in 1994, and particularly 1995, is expected to continue for the next several years as Canada continues to constrain its fisheries for domestic concerns and manage them consistent with the PST agreement signed in 1999. The total estimated ocean harvest rate has declined by more than 50%, averaging 0.07 since brood year 1992 compared with the brood year 1975-1990 average of 0.18. Given these constraints, ocean impacts are expected to remain at these lower levels. The total ocean exploitation rate for UWR spring chinook from the model for 2001 is projected to be 12% (Table 8) compared to a range of 5-29% observed from 1981-1999.

PFMC ocean fisheries off the Washington coast do not start until May 1, while the lower river spring stocks enter the river from January through May, with a peak entry timing in late March and early April (ODFW/WDFW 1998). Mature adults migrating through PFMC waters from the north are therefore largely out of the ocean before the fishery begins. The total brood year ER on UWR chinook in PFMC fisheries is estimated to be 1.0% in both the past and near-term time series (Table 5). Estimates of the exploitation rate during the model base period (1979-82) were 0.7% (Scott 1999). This reflects the ocean distribution of the species to the far north. Given their timing and migration pattern, exploitation rates in PFMC fisheries are expected to remain very low. The model estimate for the ER in 2001 PFMC fisheries is 1.7% (Table 8). Because of their timing and distribution, UWR chinook will rarely be taken in Puget Sound fisheries. The estimated ER in Puget Sound, including the U.S. Fraser Panel fisheries, for 2001 is 0.2% (Table 8).

Until recently UWR chinook were subjected to relatively intense commercial and recreational fisheries in the lower Columbia and Willamette rivers that were directed primarily at the hatchery origin fish. Terminal area ERs have been on the order of 40-50% in past years. Over the last few years, fishery objectives in the Willamette River have changed to emphasize the protection of natural-origin fish. A Fishery Management and Evaluation Plan (FMEP) for the Willamette River spring chinook developed by the State of Oregon was approved by NMFS in February of 2001 under the 4(d) Rule for UWR chinook (Darm 2001). Take prohibitions under section 9 of the ESA and applicable 4(d) Rule therefore do not apply to fisheries, including those in the mainstem, that are managed consistent with the provisions of the FMEP.

The FMEP covers the expected take associated with all state mainstem and tributary recreational fisheries. Under the FMEP, Oregon has implemented a mass-marking program and requires release of all unmarked fish from its terminal area recreational fisheries. (Commercial fisheries in the Willamette have long since been disallowed.) The marked fish will fully recruit to the terminal fishery in the year 2002. Once the marked fish are fully recruited to the fishery, Oregon will manage the fisheries using selective harvest to limit mortality of natural-origin fish to 15% or less until the abundance of natural-origin fish allows for an increase in harvest. Under the

FMEP regime, the average freshwater mortality rates in the recreational fishery for the McKenzie, Clackamas, and North Santiam are expected to be 8.7%, 10.3%, and 10.5%, respectively. The only other potential sources of harvest mortality would be what little may occur in the limited fisheries in the lower Columbia that may target sturgeon for example (Table 5).

2. Lower Columbia River Chinook

The LCR chinook ESU is composed of spring run, and fall run tule and bright stocks. There are three spring stocks, three self-sustaining natural-origin tule stocks, and likewise, three identified bright stocks that rely primarily on natural production. The population structure of the ESU has not been determined, but it is intuitively obvious that the spring, tule, and bright life history types warrant independent review with respect to their status and the effect of the proposed action. The effects analysis therefore treats each life history type independently and, where possible, also considers the status of and presumed effect on each stock.

The three remaining spring stocks within the ESU include those on the Cowlitz, Kalama, and Lewis rivers. Although some spring chinook spawn naturally in each of these rivers, the historic habitat for spring chinook is now largely inaccessible. For the time being, the remaining spring stocks depend on the associated hatchery production programs. The hatcheries have met their escapement objectives in recent years thus insuring that what remains of the genetic legacy is preserved. Harvest constraints for other Columbia Basin stocks will provide additional protection for the hatchery programs until such time that a more comprehensive recovery plan is implemented.

These spring stocks have a wider ocean distribution than most stocks originating in the lower Columbia River, and are impacted by ocean fisheries off Alaska, Canada, and the southern U.S. They were also subject, in past years, to significant sport and commercial fisheries inside the Columbia. Exploitation in PFMC fisheries has been low. The chinook management model base period (1979-82) ER for the Cowlitz River spring chinook was 12% for the PFMC fisheries. The 2001 model estimates are for a PFMC ER of 13.4% and a total ocean fishery ER of 18.1% (Table 8). This suggests that LCR spring stocks have a more southerly distribution than the upriver spring stocks which is consistent with the ocean-type juvenile life history that is characteristic of all LCR chinook. Harvest in mainstem fisheries in the LCR will also be low, on the order of 1% or less in recent years, as they have benefitted from the very low harvest rates implemented for the protection of upriver stocks and because they are not subject to tribal ceremonial and subsistence fisheries that occur above Bonneville Dam.

Exploitation rates on Lower Columbia River spring stocks in U.S. Fraser Panel fisheries are extremely low. Cowlitz River spring chinook are the harvest indicator for LCR spring stocks. The estimated exploitation rate for these fisheries in 2001 is 0.2% (Table 8).

The three tule stocks in the ESU include those on the Coweeman, East Fork Lewis, and

Clackamas rivers. These are apparently self-sustaining natural populations without substantial influence from hatchery-origin fish. These stocks are all relatively small. The interim escapement goals on the Coweeman and East Fork Lewis are 1,000 and 300, respectively. Escapements have been below these goals nine of the past ten years for the Coweeman, and six of the past ten years for the East Fork Lewis. The 10 year average escapement for the Coweeman is 607, compared to a recent 5 year average of 768 (range= 90-2,100). In the East Fork Lewis, the 10 year average escapement is 300, compared to a recent 5 year average of 279. There is currently no escapement goal for the Clackamas where escapements have averaged about 350 per year.

Until recently tule hatchery production has been prioritized to support PFMC and Lower Columbia River fisheries thus providing the potential for very high ERs. The tule stocks are north migrating, but are most vulnerable to catch in fisheries off the Washington coast, in West Coast Vancouver Island (WCVI) fisheries, and in the lower river. In recent years, ESA and other unrelated conservation constraints have substantially limited these fisheries, in particular, even though there have been no specific limits set for natural-origin tule stocks. Exploitation rates in the PFMC fisheries averaged 23% through the 1990 brood year, but declined to 10% more recently (Table 6). Model estimates for the 2001 PFMC fisheries are for an ER of 23.7%. Exploitation rates in Canadian fisheries have been reduced by approximately 50% in recent years (27% to 12%)(Table 6). Canadian fisheries will continue to be substantially constrained for the foreseeable future.

Escapement information from the Coweeman was used to estimate an RER of 0.65 for natural origin tule stocks (NMFS 1999c). Estimates of RERs are sensitive to assumptions about future survival. The survival rates for LCR tules have varied substantially over the years, but are without apparent trend. The estimated RER value for LCR chinook seems high intuitively and merits further review, especially given the low returns in the last three years. Along with review of the RER, the Coweeman stock should be monitored closely over the next several years to see whether the low returns in recent years represent a more pervasive decline and longer-term ramifications for the stock. Until further information is available, the current RER criteria represents the best available scientific data for evaluating whether harvest actions are consistent with survival and recovery. Fisheries, including PFMC fisheries, will be managed to meet the RER. The expected total ER in 2001 for the Coweeman stock is 0.54. The ER of 0.52 in 2000 and the expected ER in 2001 are both well below the RER. Since the 2001 ER was well below the RER even in a year when fisheries were taking advantage of more plentiful Columbia River hatchery stocks, the ER may well continue to be well below the RER itself. This should provide an element of conservatism until more information is available to reassess the RER objective.

Harvest impacts to LCR tule stocks in Puget Sound and other terminal marine areas are very low, averaging a 0.00 exploitation rate since brood year 1975 (Table 6). Rates are expected to remain low, since this pattern reflects fishing mortality in years when Puget Sound fisheries were much larger. The estimated ER from the model for the Columbia River tule stocks in Puget Sound in 2001 is 0.7% (Table 8).

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. The stock rebounded in 2000, again exceeding the escapement goal. However, the stock should continue to be monitored for patterns in survival. The states of Oregon and Washington have managed the combined southern U.S. ocean and in-river fisheries for an ER of less than 10% in 1999 and 2000 in response to the recent year concerns. 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.

Exploitation rates on Columbia River bright stocks in PFMC and Puget Sound fisheries have been low even in years when fisheries were relatively unconstrained, therefore, exploitation rates on LCR brights in these fisheries are expected to remain low. The total brood year ER on bright stocks averaged 49% through 1990 with only about 5% taken in PFMC fisheries (Table 7). The average ER for the more recent broods was 36% including 1% in PFMC fisheries. Exploitation rates in Puget Sound and other coastal terminal fisheries have averaged less than 1% since 1977 (Table 7). The model estimates for the 2001 fisheries are for a total ER in ocean fisheries of 16.3% including 6.9% in PFMC fisheries, and 0.2% in Puget Sound and other terminal marine area fisheries (Table 8).

Table 8. Total 2001 FRAM adult equivalent exploitation rates on Columbia River stocks in various fisheries (FRAM 1501).

Stock	SE Alaska (all gear)	Canada (all gear)	PFMC (troll/sport)	Puget Sound	Washington Coastal Net	Columbia R. (sport/commercial)	Total
Lower CR Tule	0.017	0.144	0.237	0.007	0.000	0.118	0.523
Lower CR brights	0.056	0.038	0.069	0.002	0.001	0.152	0.317
Lower CR Spring	0.013	0.034	0.134	0.001	0.000	0.328	0.510
Upper Willamette Spring	0.066	0.036	0.017	0.002	0.000	0.088	0.209

V. Cumulative Effects

Cumulative effects are defined as the "effects of future state [tribal, local] 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). For the purposes of this analysis, the action area includes ocean fishing areas off the coast of Washington and the marine areas of northern Puget Sound under the jurisdiction of the U.S. Fraser Panel. The production of salmon and steelhead by state hatchery programs will likely continue at some level and has the potential to add cumulative impacts to listed populations in these areas, through competition and predation. Hatchery salmon production also provides targeted harvest opportunity through increasing salmon abundance above that which would occur naturally, although harvest mortality associated with these fisheries is specifically considered in this opinion. At this time, the extent of cumulative impacts from hatchery salmon production is not known. Further evaluation is warranted but this can best be done as part of an overall assessment of species specific hatchery programs. The impacts of hatchery production from Columbia River and Puget Sound hatchery facilities are currently under review through separate consultations.

Recreational fisheries targeting on non-salmonid species have the potential to take chinook salmon. (Commercial fisheries on non-salmonid species have been discussed in the Environmental Baseline section of this opinion) Within the action area these are primarily fisheries for groundfish species. In general these species occupy different habitats and strata in the water column. The greatest potential for interaction occurs in a limited number of areas where chinook and the target species exist at similar depths. Chinook may also encounter groundfish gear as it is deployed. At this time the extent of these impacts are unquantified. However, an assessment of these impacts will be included in an FMEP currently under development by WDFW.

VI. Synthesis and Integration

The jeopardy determinations in this opinion are based on the consideration of the proposed management actions taken to reduce the catch of listed fish, the magnitude of the remaining harvest, particularly in comparison to the period of decline, and the Coweeman RER representing the LCR chinook ESU which was derived to be consistent with recovery of the ESU.

A. Columbia River Chum

The available information suggests that chum are rarely, if ever, caught in PFMC fisheries. The annual catch of listed Columbia River chum in U.S. Fraser Panel fisheries is low, averaging less than nine (range 0-21) per year out of several thousand returning adults. The proposed actions are therefore, not likely to jeopardize the continued existence of CR chum.

B. Chinook Salmon

1. Upper Willamette River Chinook

The available information indicates that the mortality on UWR chinook in PFMC or U.S. Fraser Panel fisheries is very low. The timing and northerly distribution of UWR chinook minimize their vulnerability to the proposed fisheries. The estimated ER in PFMC fisheries averaged 1-2% over the last 21 brood years. Exploitation rates in Puget Sound fisheries, including U.S. Fraser Panel fisheries, are estimated to be 0.1%. Implementation of mass marking and selective fisheries are expected to lead to even further reductions in freshwater harvest mortality in the future. Whether these changes in harvest management policy, coupled with improvements in other sectors, are sufficient to provide for long-term recovery has not been fully analyzed.

However, a Population Viability Analysis provided with the FMEP, assessed the quasi-extinction risk on the McKenzie River spring chinook at less than 0.1% under the selective harvest regime using the most pessimistic assumptions of low stock productivity and low habitat capacity. Based on the substantial reductions in harvest mortality anticipated in ocean and freshwater fisheries and the fact that harvest mortality in the combined PFMC and Puget Sound fisheries is estimated to be 1.5% or less, NMFS concludes that the proposed fisheries considered in this opinion are not likely to jeopardize the continued existence of UWR chinook.

2. Lower Columbia River Chinook

What remains of the spring component of the LCR chinook ESU is now confined to the Sandy, Cowlitz, Lewis, and Kalama rivers. There are no natural-origin, self-sustaining populations of LCR spring chinook as all are integrated with and largely dependent on the associated hatchery programs in each basin. Although some natural spawning occurs, most is likely the result of hatchery straying, and it is unlikely that any of the populations would persist given the current habitat conditions absent the existing hatchery programs. The population in the Sandy above Marmot Dam is increasing. Those in the Cowlitz, Lewis, and Kalama are lower than the early 90's but have been stable for the last 6-8 years (Table 4). The expected return to the tributary areas in 2001 is 8,800 fish, well above escapement goals. Reductions in fisheries to the north will likely benefit LCR spring chinook, and there is very little harvest in the mainstem river fisheries. Terminal fisheries are managed to meet hatchery escapement goals. Exploitation in PFMC and U.S. Fraser Panel fisheries continues to be low. The chinook management model base period (1979-82) ER for the Cowlitz River spring chinook, the harvest indicator for LCR spring chinook, was 12% for the PFMC fisheries. The 2001 model estimates are for a PFMC ER of 13.4% and a total ocean fishery ER of 18.1% (Table 8). The combined ER in Puget Sound and other terminal marine areas is expected to be less than 1%.

Lower Columbia River tule stocks have been subject to habitat degradation due to the familiar litany of factors related to resource exploitation and land use development. Hatchery programs have been pervasive throughout the LCR, in particular, for over a hundred years. As a result, 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. Although the status of the Clackamas population is uncertain, escapement in the East Fork Lewis River has been relatively stable. Escapement to the Coweeman has averaged over 700 in recent years, although returns in the last three years have been the lowest since 1990.

There is no shortage of hatchery fish including many that are part of the ESU (although not listed) that can be used for recovery efforts. Harvest mortality on tule stocks has been reduced substantially in recent years. Given the circumstances, it seems unlikely that the anticipated harvest in PFMC or Puget Sound fisheries pose a significant risk to the tule component. 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 harvest management programs that provide the necessary protections that will allow for rebuilding. Until then harvest of tule stocks needs to be sufficiently constrained to protect the few remaining naturally spawning populations. The fact that these populations have been relatively stable and that overall harvest mortality has declined in recent years suggests that the PFMC and Puget Sound fisheries do not pose a substantial risk to those populations nor limit the potential for longer-term recovery efforts.

The estimated RER for the Coweeman stock is 0.65. Fisheries, including PFMC and U.S. Fraser Panel fisheries in northern Puget Sound will continue to be managed to ensure that all fishing-related mortality is consistent with this objective.

The LCR bright component is one of the few healthy wild stocks in the Columbia River Basin. The Lewis River bright stock has exceeded its escapement goal of 5,700 by a substantial margin every year since at least 1980, except 1999. Although the 1999 return was poor, concerns about a more pervasive decline in survival was alleviated with the strong return in 2000. However, the population will continue to be monitored for patterns in survival. Given the relative health of this stock and the pattern of low mortality in PFMC and Puget Sound fisheries, NMFS does not believe that PFMC or U.S. Fraser Panel fisheries pose a substantial risk to the LCR bright populations.

As described in section II.C.2 and IV.D.3, the LCR chinook ESU is a complex ESU comprised of several distinct life history types including spring, tule and bright fall-timed stocks. NMFS considered status and stock structure, as currently defined, of each life history component of the ESU and impacts from the proposed fisheries on each. Based on the above considerations, NMFS concludes that the proposed PFMC and U.S. Fraser Panel fisheries in northern Puget Sound fisheries are not likely to jeopardize the continued existence of LCR chinook ESU in total.

VII. Conclusion

After reviewing the current status of the listed steelhead and sockeye ESUs, and the chum and chinook salmon ESUs considered in this opinion, the environmental baseline for the action area, the effects of the proposed fisheries, and the cumulative effects, it is NMFS' biological opinion that the proposed PFMC and U.S. Fraser Panel fisheries are not likely to adversely effect Lake Ozette sockeye, Upper Columbia River spring chinook or the ten listed steelhead ESUs (NMFS 2000c). NMFS also concludes that the PFMC and U.S. Fraser Panel fisheries are not likely to jeopardize the continued existence of the CR chum, UWR chinook, or LCR chinook salmon ESUs.

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. 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, and must be undertaken by NMFS. This agency has a continuing duty to regulate the activity covered by this incidental take statement in consultation with the affected states and tribes. If this agency fails to assume and implement the terms and conditions of this incidental take statement, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of take, NMFS must document the progress of the action and its impact on the species as specified in the incidental take statement. [50CFR §402.14(i)(3)]

I. Amount or Extent of Incidental Take

A. Columbia River Chum

The available information suggests that chum are rarely, if ever, caught in PFMC fisheries. U.S. Fraser Panel fisheries in northern Puget Sound are expected to result in a catch of approximately 9 CR chum (range= 0-21), or less than 1% of the estimated current abundance. The expected annual mortality of CR chum in future PFMC and U.S. Fraser Panel fisheries is 1% or less of the estimated adult return.

B. Chinook Salmon

1. Upper Willamette River Spring Chinook

The available information indicates that UWR chinook are not significantly affected by PFMC or Puget Sound fisheries. The long term average estimated brood year ER in PFMC and U.S. Fraser Panel fisheries has been 1% or less (range = 0-3%). The brood year exploitation rate on UWR spring chinook in future PFMC and U.S. Fraser Panel fisheries is expected to remain within the range observed, with the 5-year average brood year exploitation rate no greater than 1%.

2. Lower Columbia River Chinook

The spring component of the LCR chinook ESU differ from upper Columbia River spring stocks in that they have a more southerly distribution and are subject to somewhat higher harvest rates in PFMC fisheries. The chinook management model base period (1979-82) ER for the Cowlitz River spring chinook is 12% for the PFMC fisheries. The recent year preseason model estimates for exploitation rates in PFMC fisheries have been of a similar magnitude. The combined exploitation rate in Puget Sound and other terminal marine areas is expected to be less than 1%.

Exploitation rates on the LCR tule stocks averaged 23% through the 1990 brood year, but declined to 10% more recently. Brood year exploitation rates on LCR tule stocks in Puget Sound and other terminal area fisheries have been less than 1%.

Brood year exploitation rates on LCR bright stocks in PFMC fisheries have averaged 5% in past years (range = 0%-9%). Brood year exploitation rates in Puget Sound and other coastal terminal fisheries have averaged less than 1%.

Brood year exploitation rates on LCR spring and bright stocks in future U.S. Fraser Panel fisheries are expected to be no greater than 1%. The brood year exploitation rates on LCR spring and bright stocks in future PFMC fisheries are expected to remain within the range observed in recent years, i.e., 15% or less for spring stocks and 5% or less for bright stocks. PFMC and U.S. Fraser Panel fisheries must be managed such that the total brood year exploitation rate for the Coweeman stock, in all fisheries combined, does not exceed 0.65.

II. Effect of the Take

In the accompanying biological opinion, NMFS determined that the level of anticipated take of the Lake Ozette sockeye (NMFS 2000c), ten listed steelhead (NMFS 2000c), CR chum, and the UCR spring, UWR spring and LCR chinook ESUs in the proposed PFMC and U.S. Fraser Panel fisheries is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat.

III. Reasonable and Prudent Measures

There are two reasonable and prudent measures included in this incidental take statement for the ESUs considered in this opinion. These were also included in the March 8, 1996, biological opinion and hereby remain in effect for the ESUs covered in this biological opinion: 1) in-season management actions taken during the course of the fisheries shall be consistent with the take limits defined in section I of the Incidental Take Statement above, and 2) harvest impacts of listed salmon stocks shall be monitored using best available measures.

IV. Terms and Conditions

In order to be exempt from the prohibitions of sections 9 and 4(d) of the ESA, the NMFS must continue to comply with all of the terms and conditions listed in the March 8, 1996, biological opinion, as amended by the February 18, 1997, opinion concerning Sacramento River winter chinook. In addition, the NMFS must comply with the following terms and conditions to implement the reasonable and prudent measures described above. These terms and conditions are non-discretionary.

1. NMFS shall confer with the affected states and tribes, and the PFMC chair prior to the start of fishing each year to produce a summary table showing that the harvest targets and fishing regimes adopted preseason are consistent with the take expectations specified in section I of the Incidental Take Statement (ITS) above for each of the ESUs. The

exploitation rates in the ITS define the limits of expected annual take.

2. The NMFS shall confer with the affected states and tribes, the PFMC chair and the U.S. Fraser Panel, as appropriate, to ensure that in-season management actions taken during the course of the fisheries are consistent with the take specified in the effects section of the ITS above for each of the ESUs.

3. The NMFS, in cooperation with the affected states and tribes, the PFMC chair, and U.S. Fraser Panel, as appropriate, shall monitor the catch and implementation of other management measures, e.g., non-retention fisheries, at levels that are comparable to those used in recent years. The monitoring is to ensure full implementation of, and compliance with, management actions specified to control the various fisheries within the scope of the action.

4. The NMFS, in cooperation with the affected states and tribes, the PFMC chair, and U.S. Fraser Panel, shall sample the fisheries for stock composition including the collection of CWTs in all fisheries and other biological information to allow for a thorough post-season analysis of fishery impacts on listed species.

5. NMFS shall confer with the affected states and tribes, and the PFMC chair prior to the start of preseason planning to produce a summary table showing that the brood year exploitation rates, as assessed post-season, are consistent with the take specified in section I of the Incidental Take Statement above for each of the ESUs.

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, in addition to those included in the March 8, 1996, biological opinion, are consistent with these obligations, and therefore should be implemented by the NMFS.

1. The NMFS, in collaboration with the affected states and tribes should evaluate the ability of each listed ESU to survive and recover, given the totality of impacts affecting each ESU during all phases of the salmonid's life cycle, including freshwater, estuarine and ocean life stages. For this effort, NMFS should collaborate with the affected co-managers to evaluate available life cycle models or initiate the development of life cycle models where needed.

2. The NMFS in collaboration with the affected states and tribes should evaluate where possible improvement in gear technologies and fishing techniques that reduces mortality of listed species.

3. The NMFS in collaboration with the affected states and tribes should continue to evaluate the impacts of selective and non-retention fishing techniques in commercial and recreational fisheries on listed species

4. NMFS in collaboration with the affected states and tribes should gather better information on ocean rearing and migration patterns to improve its understanding of the utilization and importance of these areas to listed ESUs.

REINITIATION OF CONSULTATION

This concludes formal consultation on the Pacific Salmon Plan as it relates to the Ozette Lake sockeye, ten listed steelhead, UCR spring, LCR and UWR chinook and CR chum ESUs. As provided in 50 CFR §402.16, re-initiation 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 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 take is exceeded, NMFS must immediately reinitiate formal section 7 consultation on the proposed fisheries.

SUPPLEMENTAL A

ESSENTIAL FISH HABITAT

"Essential fish habitat" (EFH) provisions of the Magnuson-Stevens Act (MSA) require heightened consideration of fish habitat in resource management decisions. EFH is defined in section 3 of the MSA as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." The NMFS interprets EFH to include aquatic areas and their associated physical, chemical and biological properties used by fish that are necessary to support a sustainable fishery and the contribution of the managed species to a healthy ecosystem.

The MSA and its implementing regulations at 50 CFR 600.920(j) require that before a Federal agency may authorize, fund or carry out any action that may adversely effect EFH, it must consult with NMFS and, if requested, the appropriate Regional Fishery Management Council. The purpose of consultation is to develop a conservation recommendation that addresses all reasonably foreseeable adverse effects to EFH. Further, the action agency must provide a detailed response in writing to NMFS and the appropriate Council within 30 days after receiving an EFH conservation recommendation. The response must include measures proposed by the agency to avoid, minimize, mitigate, or offset the impact of the activity on EFH. If the response is inconsistent with conservation recommendations of NMFS, the agency must explain its reasons for not following the recommendations, including the scientific justification for any disagreements over the anticipated effects of the proposed action and the measures needed to avoid, minimize, or mitigate such effects.

This consultation requirement does not distinguish between actions which occur within EFH and actions outside EFH. Any reasonable attempt to encourage the conservation of EFH must take into account actions that occur outside EFH, such as upstream and up slope activities that may have an adverse effect on EFH. Therefore, EFH consultation with NMFS is required by Federal agencies undertaking permitting or funding activities that may adversely affect EFH, whatever its location.

The objective of this consultation is to determine whether the proposed action, NMFS approval of salmon fishing activities managed under the Pacific coast salmon plan and the U.S. Fraser Panel, is likely to adversely affect EFH. If the proposed action is likely to adversely affect EFH, conservation recommendations will be provided.

Identification of Essential Fish Habitat

The Pacific Fisheries Management Council (PFMC) is one of eight Regional Fishery Management Councils established under the MSA. The PFMC develops and carries out fisheries management plans for Pacific coast groundfish, coastal pelagic species and salmon off the coasts of Washington, Oregon and California, and recommends Pacific halibut harvest regulations to the International Pacific Halibut Commission.

Pursuant to the MSA, the PFMC has designated freshwater and marine EFH for chinook and coho salmon (PFMC 1999b), EFH for five species of coastal pelagic species (PFMC 1998a), and a "composite" EFH for 62 species of groundfish (PFMC 1998b). For purposes of this consultation, marine EFH for chinook and coho in Washington and Oregon includes all estuarine, nearshore and marine waters within the western boundary of the U.S. Exclusive Economic Zone (EEZ), 200 miles offshore. EFH for coastal pelagic species and composite EFH for groundfish in Washington and Oregon includes all waters, substrates and associated biological communities from the mean higher high water line, the upriver extent of saltwater intrusion in river mouths, and along the coast extending westward to the boundary of the EEZ. The PFMC has not identified EFH for chum salmon, but the areas used by chum for "spawning, breeding, feeding, or growth to maturity" overlap with those identified for coho and chinook salmon as encompassed by the actions considered in this consultation.

Proposed Action

The proposed action area includes the U.S. marine waters of the Strait of Juan de Fuca and San Juan under the jurisdiction of the Pacific Salmon Commission Fraser Panel, as well as the estuaries and marine waters offshore of Washington and Oregon. The estuarine and offshore marine waters are designated EFH for various life stages of 62 species of groundfish and five coastal pelagic species. A detailed description and identification of EFH for groundfish is found in the Final Environmental Assessment/Regulatory Impact Review for Amendment 11 to The Pacific Coast Groundfish Management Plan (PFMC 1998b) and the NMFS EFH for West Coast Groundfish Appendix (Casillas *et al.* 1998). A detailed description and identification of EFH for coastal pelagic species is found in Amendment 8 to the Coastal Pelagic Species Fishery Management Plan (PFMC 1998a). The proposed action area also encompasses the Council-designated EFH for chinook salmon (*Onchorhyncus tshawytscha*) and coho salmon (*Onchorhyncus kisutch*). A description and identification of EFH for salmon is found in Appendix A to Amendment 14 to the Pacific Coast Salmon Plan (PFMC 1999b).

The objective of this EFH consultation is to determine whether the adoption of the proposed fishing activities by NMFS may adversely affect EFH for any of the species for which EFH has been identified. Another objective of this EFH consultation is to recommend conservation measures to avoid, minimize, or otherwise offset potential adverse impacts to EFH resulting from the proposed activities discussed in the biological opinion above.

Effects of the Proposed Action

The harvest-related activities of the proposed actions considered in this consultation occur from boats using hook-and-line gear and commercial purse seines, reef nets and gill nets. The use of these gears affects the water column and the shallower estuarine substrates, rather than the deeper water, offshore habitats. The PFMC assessed the effects of fishing on salmon EFH and provided recommended conservation measures in Appendix A to Amendment 14 to the Pacific Coast Salmon Plan (PFMC 1999b). The PFMC also assessed the effects of fishing activities, including ghost fishing by gillnets, on EFH for groundfish and provided recommended conservation measures in the Final Environmental Assessment/Regulatory Impact Review for Amendment 11 to The Pacific Coast Groundfish Management Plan (PFMC 1998b) and the NMFS EFH for West Coast Groundfish Appendix (Casillas *et al.* 1998).

Conclusion

The PFMC concluded fishing activities of the type included in the proposed actions considered in this consultation was likely to adversely affect EFH and provided recommended conservation measures (Casillas *et al.* 1998, PFMC 1998b, PFMC 1999b). The PFMC adopted these conservation measures for fishing activities under its jurisdiction at the June 2000 Council meeting, and they were approved by the Secretary of Commerce as part of the package on Amendment 14 on September 27, 2000. NMFS recommends the conservation measures described in these documents, pertaining to marine waters and the gears listed above, be adopted for the Fraser Panel fisheries in northern Puget Sound as well. Adoption of these EFH recommended conservation measures would minimize potential adverse impacts to EFH.

Consultation Re-initiation

NMFS must re-initiate consultation if plans for this action are substantially revised in a way that may adversely affect EFH, or if new information becomes available that affects the basis for NMFS' EFH conservation recommendations (50 CFR §600.920(k)).

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