STATE OF ALASKA REVIEW COMMENTS CONCERNING NMFS MARCH 9, 1998, PROPOSED RULE REGARDING ENDANGERED AND THREATENED SPECIES FOR WEST COAST CHINOOK SALMON

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PREFACE

On March 9, 1998, the National Marine Fisheries Service (NMFS) published a Federal Register (notice) announcing the results of their coast-wide review of chinook salmon *Oncorhynchus tshawytscha* populations in California, Oregon, Washington, and Idaho: *Endangered and Threatened Species: West-Coast Chinook Salmon Listing Status Change, 63 Federal Register 11482-11520 (to be codified at 50 CFR Parts 222, 226, and 227) (proposed March 9, 1998) ("63 FR 11482").* Based on the review and through the federal register, NMFS has proposed defining 15 evolutionary significant units (ESUs) for chinook salmon in the lower 48 states and has proposed listing or not listing these ESUs under the federal Endangered Species Act (ESA). Of these 15 ESUs, three are already listed under the ESA as "threatened" or "endangered". Through the proposed rule, NMFS has announced its intention to list additional populations of chinook salmon as "endangered" or "threatened" species and to alter the makeup of one of the already listed ESUs. The cumulative effect of the proposed actions would be as follows:

1. Sacramento River Winter-Run ESU, already listed under the ESA as "endangered",
2. Central Valley Spring-Run ESU, add to the ESA list as "endangered",
3. Central Valley Fall/Late Fall-Run ESU, add to the ESA list as "threatened",
4. Southern Oregon and California Coastal ESU, add to the ESA list as "threatened",
5. Upper Klamath and Trinity Rivers ESU, not list under the ESA,
6. Oregon Coast ESU, not list under the ESA,
7. Washington Coast ESU, not list under the ESA,
8. Puget Sound ESU, add to the ESA list as "threatened",
9. Lower Columbia River ESU, add to the ESA list as "threatened",
10. Upper Willamette River ESU, add to the ESA list as "threatened",
11. Middle Columbia River Spring-Run, not list under the ESA,
12. Upper Columbia River Summer- and Fall-Run ESU, not list under the ESA,
13. Upper Columbia River Spring-Run ESU, add to the ESA list as "endangered"
14. Snake River Fall-Run ESU, add the Deschutes fall population into the earlier defined ESU and retain the ESU under the ESA list as "threatened", and
15. Snake River Spring- and Summer-Run ESU, already listed under the ESA as "endangered".

The proposed rule also identifies critical habitat for the ESUs that NMFS is proposing to list under the ESA. The federal register requests public comments concerning these proposed rules.

This document was prepared by staff of the Alaska Department of Fish and Game with review by staff of the Alaska Department of Law. It is intended to serve as State of Alaska comments concerning the proposed rules being announced by NMFS through 63 FR 11482.

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FOCUS OF ALASKA COMMENTS CONCERNING NMFS PROPOSED CHINOOK ESA RULES

Staff of the Alaska Department of Fish and Game (ADF&G) and staff of the Alaska Department of Law (ADL) have reviewed the document entitled: *Status Review of Chinook Salmon from Washington, Idaho, Oregon, and California* (Myers et al. 1998) and the March 9, 1998, proposed rule regarding changes in the listing status of West Coast Chinook Salmon evolutionary significant units (ESUs) under the Endangered Species Act (ESA) (63 FR 11482). This document is intended to provide the National Marine Fisheries Service (NMFS) with the State of Alaska comments concerning these issues.

The State of Alaska is not providing comments on the proposed rules regarding chinook populations endemic to California and the southern portions of Oregon, specifically populations included in the following proposed ESUs: (1) Sacramento River Winter-Run chinook, (2) Central Valley Spring-Run chinook, (3) Central Valley Fall/Late-Run chinook, (4) Southern Oregon and California Coastal chinook, and (5) Upper Klamath and Trinity Rivers chinook. Because NMFS is not proposing to take any actions with regard to Snake River Spring- and Summer-Run chinook, the State of Alaska also has no comments relative to this set of chinook populations endemic to the Snake River basin.

The State of Alaska is providing NMFS with comments on the proposed rules regarding the other proposed ESUs, and provides, where appropriate, data analysis, figures and tables. Alaska's comments largely address two issues central to ESA decision making: (1) the "species" question, or relative merits of designating a group of chinook salmon as an ESU based upon the best available scientific and commercial information; and (2) the "listing" question, or relative merits of listing proposed ESUs under the ESA based upon the best available scientific and commercial information. The State of Alaska is also providing comments on proposed critical habitat for ESUs being proposed for listing under the ESA. **As explained below, Alaska generally agrees with the proposed actions concerning the Oregon Coast ESU, the Washington Coast ESU, the Middle Columbia River Spring-Run ESU, and the Upper Columbia Summer- and Fall-Run ESU. Alaska disagrees in whole or in part with the proposed actions concerning the Puget Sound ESU, the Lower Columbia ESU, the Upper Willamette River ESU, the Upper Columbia River Spring-Run ESU, and the Snake River Fall-Run ESU.**

OREGON COAST ESU

Fishery scientists with the ADF&G have reviewed the genetic and life history information available for chinook salmon endemic to the Oregon Coast that are included in the proposed NMFS Oregon Coast ESU. **The State of Alaska agrees that the chinook salmon stocks in this area represent an identifiable group of chinook that merit definition as a separate ESU.** Staff of ADF&G have reviewed abundance data associated with this group of chinook and based upon their recommendations, the State of Alaska agrees that these stocks are not in danger of becoming extinct throughout all or a significant portion of their range ("endangered") nor are these stocks likely to become endangered within the foreseeable future throughout all or a significant portion of their range ("threatened"). **The available scientific and commercial data**

indicate to Alaska that the Oregon Coast stocks of chinook salmon are healthy and that listing under the ESA is not warranted.

WASHINGTON COAST ESU

Fishery scientists with the ADF&G have reviewed the genetic and life history information available for chinook salmon endemic to the coast of Washington that are included in the proposed NMFS Washington Coast ESU. **The State of Alaska agrees that the chinook salmon stocks in this area represent an identifiable group of chinook that merit definition as a separate ESU.** Staff of ADF&G have reviewed abundance data associated with this group of chinook and based upon their recommendations, the State of Alaska agrees that these stocks are not in danger of becoming extinct throughout all or a significant portion of their range ("endangered") nor are these stocks likely to become endangered within the foreseeable future throughout all or a significant portion of their range ("threatened"). **The available scientific and commercial data indicate to Alaska that the Washington Coast stocks of chinook salmon are healthy and that listing under the ESA is not warranted.**

MIDDLE COLUMBIA RIVER SPRING-RUN ESU

Fishery scientists with the ADF&G have reviewed the genetic and life history information available for chinook salmon that return during the spring to the middle Columbia River and are included in the proposed NMFS Middle Columbia River Spring-Run ESU. **The State of Alaska agrees that the chinook salmon stocks that return in the spring to the middle Columbia River represent an identifiable group of chinook that merit definition as a separate ESU.** Staff of ADF&G have reviewed abundance data associated with this group of chinook and based upon their recommendations, the State of Alaska agrees that these stocks are not in danger of becoming extinct throughout all or a significant portion of their range ("endangered") nor are these stocks likely to become endangered within the foreseeable future throughout all or a significant portion of their range ("threatened"). **The available scientific and commercial data indicate to Alaska that the spring-run stocks of chinook that return to the middle Columbia River are healthy and that listing under the ESA is not warranted.**

UPPER COLUMBIA RIVER SUMMER- AND FALL-RUN ESU

Fishery scientists with the ADF&G have reviewed the genetic and life history information available for chinook salmon that return during the summer and fall to the upper Columbia River and are included in the proposed NMFS Upper Columbia River Summer- and Fall-Run ESU. The State of Alaska previously submitted comments concerning a segment of this overall proposed ESU (Clark et al. 1995a) and those prior comments are incorporated herein by reference. **The State of Alaska agrees that the chinook salmon stocks that return in the summer and fall to the upper Columbia River represent an identifiable group of chinook that merit definition as a separate ESU.** Staff of ADF&G have reviewed abundance data associated with this group of chinook and based upon their recommendations, the State of Alaska agrees that these stocks are not in danger of becoming extinct throughout all or a significant portion of their range ("endangered") nor are these stocks likely to become endangered within the foreseeable future throughout all or a significant portion of their range ("threatened"). **The available scientific and commercial data indicate to Alaska that the summer- and fall-run stocks of chinook that return to the upper Columbia River are healthy and that listing under the ESA is not warranted.**

UPPER COLUMBIA RIVER SPRING-RUN ESU

Fishery scientists with the ADF&G have reviewed the genetic and life history information available for chinook salmon that return during the spring to the upper Columbia River and are included in the proposed NMFS Upper Columbia River Spring-Run ESU. The State of Alaska agrees that these populations contain the genetic remnants of what was once a very important chinook run that spawned in the headwaters of the Columbia River system before construction of the Grand Coulee Dam prevented these fish from accessing their historic spawning grounds. **Because this was once a very important stock of chinook, and because they are sufficiently different from other conspecific stocks, the State of Alaska agrees that these fish merit designation as a separate ESU. However, the State of Alaska recommends that the spring-run chinook populations associated with the Methow Fish Hatchery Complex and with the Rock Island Fish Hatchery Complex also be included in the Upper Columbia River Spring-Run ESU.** These two hatchery complexes were designed to supplement the Methow and Wenatchee populations of chinook, they use brood stock returning to these rivers and progeny are released in these rivers. These two hatchery facilities have not imported the "Carson" stock. There is no scientific basis for excluding the spring-run chinook populations used by these two hatcheries.

Staff of ADF&G have reviewed abundance and life history data associated with spring-run chinook in the upper Columbia River and, based upon their recommendations, the State of Alaska disagrees with the proposal to list this ESU as "endangered". The spring-run chinook returning to the upper Columbia River today are likely to be predominantly descended from spring-run stocks that originally spawned well upstream of Grand Coulee Dam with gene flow from spring-run stocks that originally spawned below Grand Coulee Dam (the habitat available to chinook today). The installation of Grand Coulee Dam and the subsequent substantial habitat alterations that have occurred since then including construction of additional dams have massively altered the habitat accessible to chinook in the upper Columbia River system. These major development activities continued from the late 1930s until the late 1960s. The chinook stocks remaining after these major habitat upheavals have only had about 25 years to adapt to this revised habitat. The fact that chinook still return to spawn in these rivers is testimony to their persistence. Given the level of habitat alteration over such a long period of time, one would expect abundance of chinook in this area to show significant fluctuation.

Escapement abundance data are available for ten populations of spring-run chinook in the upper Columbia River. All ten of these stocks show negative abundance trends with short term trends being more severe than long term trends, likely due to the recent period of lower marine survival observed for other chinook salmon stocks. Average total annual escapements on an individual stream basis for these ten stocks ranged from about 25 to 134 spawners in the most recent 5-year period. The average escapement aggregated for all ten of these naturally reproducing populations is about 800 spawners per year. Estimated abundance of the cumulative natural escapement based upon dam counts minus hatchery returns has averaged about 5,000 spawners; this estimate would account for chinook spawning in areas included and not included in the ten individual streams discussed earlier, but would also include prespawning mortality. Thus, the natural spawning population abundance averages somewhere between 800 and 5,000 spawners per year at the current time. The State of Washington is using the Methow Fish Hatchery Complex and the Rock Island Fish Hatchery Complex to supplement these naturally spawning populations; however, they are both relatively new endeavors initiated in 1989 and 1992, respectively, and success of these programs cannot yet be completely ascertained.

Based upon these factors (population still adapting to revised habitat, moderate abundance, long-term general decline, recent objective supplementation program), fishery scientists with the State of Alaska have concluded that the spring-run chinook populations in the Upper Columbia River are not in danger of becoming extinct throughout all or a significant portion of their range ("endangered"); however, these stocks are somewhat likely to become endangered within the foreseeable future throughout all or a significant portion of their range ("threatened"). **The available scientific and commercial data indicate to the State of Alaska that the Upper Columbia River Spring-Run ESU should be listed as "threatened", not "endangered".** The State of Alaska concurs with the proposed critical habitat designation for Upper Columbia River spring-run chinook salmon.

SNAKE RIVER FALL-RUN ESU

The question of the relationship between Snake River fall chinook salmon and chinook salmon spawning in the Deschutes River has been an issue since Snake River fall chinook were first designated as an ESU in the early 1990s. Genetic data summarized and presented by Waples, Jones, Beckman, and Swan (1991) showed that the two populations, from a genetic distance perspective, were almost indistinguishable. More recent data, as summarized and presented by Myers et al. (1998), confirms this conclusion. Available life history data provide further support for this conclusion. Although it may not be apparent why these two chinook populations that spawn in distinct and separate areas are virtually indistinguishable from a genetic perspective, the available scientific and commercial data clearly support the conclusion that they are from the same evolutionary lineage and therefore should be considered together as one ESU. The State of Alaska concurs with the findings of NMFS as presented in the Myers et al. (1998) document and the March 9, 1998, federal register with regard to including the Deschutes River population of chinook salmon in the Snake River Fall-Run ESU.

In comments previously submitted on a proposal to reclassify Snake River fall chinook from "threatened" to "endangered", Alaska urged the NMFS to redefine the Snake River Fall-Run ESU (Clark et al. 1995b). While the current proposed rule to expand the Snake River Fall-Run ESU by including the Deschutes River population is a step in the direction that Alaska has advocated, the proposed rule does not go far enough. Alaska has provided the NMFS with various scientific analyses in support of the view that the ESU should be expanded to include the Lyons Ferry Hatchery chinook salmon population. Alaska has made serious efforts to quantitatively evaluate this issue. In addition to other conclusions, the results strongly indicated that the Lyons Ferry brood stock is likely more similar to the prior "natural" stock than is the current population of fall chinook salmon spawning in the Snake River. This result has occurred because of the scientifically oriented efforts at the hatchery to protect the genetic integrity of the brood stock. The State of Alaska's arguments concerning the inclusion of Lyons Ferry Hatchery chinook salmon into the Snake River Fall-Run ESU as presented in the Clark et al. (1995b) document are incorporated into these comments by reference. Alaska once again urges the NMFS to include the Lyons Ferry Hatchery chinook salmon population into the ESU and submits that the best available scientific and commercial data demonstrate that it is appropriate.

While the State of Alaska agrees that the Deschutes chinook population should be considered as part of the Snake River Fall-Run ESU because of their evolutionary similarity, the analyses and considerations that NMFS has given to the "listing" question of the newly defined ESU are incomplete and inadequate. As in several past ESA related proposed rules affecting the Snake River Fall-Run ESU, NMFS has considered only a portion of the available scientific and commercial data. Data presented, considered, and used in the Myers et al. (1998) report and in the March 9, 1998, federal register consist of only very summary statistics for the Deschutes and Snake River fall chinook populations. Not considered in these analyses were jack returns, inriver returns, nor data concerning these statistics for the most recent year available, 1997. As a result of considering only a portion of the scientific and commercial information available concerning abundance statistics for these two chinook salmon populations, NMFS has presented a biased view of stock health and has failed to give adequate considered thought and rationale to the "listing" question.

Relative to current stock health of the Deschutes River population of chinook salmon, the 1997 return to the river and escapement were the highest statistics on record for this population of chinook salmon. The 1997 estimate of escapement in the Deschutes River was over 20,000 chinook salmon in contrast to escapements estimated at around 5,000 per year from the mid to late 1970's through the early 1990s (Figure 1). The 1997 return to the river and the 1997 escapement continued a trend of increasing abundance since the early 1990s (Figure 1). Further, the escapements since 1993 have all exceeded all previous estimates of escapement for large fish. Thus, the annual abundances of spawning Deschutes River chinook salmon in the most recent cycle (5-year period) are the highest on record. Sophisticated extinction models or other quantitative types of analyses are not needed to readily determine that this population of chinook salmon is healthier now than anytime in the historic record. There is nothing in the available abundance statistics for this population of chinook salmon that gives any indication that this population is at risk of extinction either now, or in the foreseeable future. Given that this stock is obviously healthy as evidenced by the available scientific and commercial data, the State of Alaska wonders how the population can now, in 1998, be considered by the NMFS to be likely to become an endangered species within the foreseeable future, and be classified as "threatened". The State of Alaska believes that the proposed listing of the Deschutes River population of chinook salmon as "threatened" is not based upon the best available scientific and commercial data.

As previously stated in Clark et al. (1995b) in the context of the proposed reclassification of the Snake River chinook salmon ESU, the State of Alaska is concerned by ESA listing determinations that fail to consider the best available scientific and commercial information. Further, Alaska remains concerned with the genetic manipulation of the Snake River Fall-Run ESU at Lower Granite Dam. Alaska has repeatedly objected to the genetic control measures that NMFS has used in the past at Lower Granite Dam and has provided quantitative analyses demonstrating the negative results that accrue to the population as a result of these practices.

Relative to the Snake River fall chinook salmon component of the Snake River Fall-Run ESU, NMFS has once again only considered a very limited amount of information while reiterating its position that this ESU should remain listed under the ESA as "threatened". Not considered by the Myers et al. (1998) report nor the March 9, 1998, federal register are: (1) the jack returns to the Snake River through 1996, (2) the 1997 returns of both jacks and adults, (3) the currently available projections of the 1998 returns of Snake River fall chinook to the river and resultant escapement, nor (4) the status of returns of Snake River fall chinook to Lyons Ferry Hatchery which are currently not included in the ESU.

The 1997 natural escapement of fall chinook to the Snake River is estimated to have been 797 adult fish (Sands and Koenings 1998; TACS 1998). This makes the 1997 escapement the largest since 1975 when the Snake River dams were completed (Figure 2). The 1997 escapement was over twice as large as the 1995 escapement and was about 25% larger than the 1996 escapement of 639 adult chinook. The 1998 escapement is projected to come in at 992 adult fish (TACS 1998). Thus, since 1995, the escapement trend has been an ever increasing escapement and the rate of change is markedly large, averaging over a 40% increase per year since 1995 for the adult segment of the population that spawns in the Snake River above Lower Granite Dam. Further, the 1995–1998 four year cumulative escapement (2,778 adult spawners) is anticipated to be the largest 4-year cumulative escapement during any 4-year period since the Snake River dams were completed in 1975. Although these recent spawner abundance statistics are impressive relative to past such statistics, current stock health as depicted in Figure 2 is underestimated because: (1) discounting of the escapement to account for hatchery fish did not begin until 1983 and as a result the natural spawning estimates before this time were over-estimated, and (2) Lyons Ferry Hatchery did not come on line until the mid-1980s and, thus, the stock strength since then is under-estimated as this component of the population is not included. As a result of these data twists and because jacks are not included in Figure 2, overall health of the Snake River fall chinook population is substantially better than indicated in Figure 2.

The Myers et al. (1998) report and the March 9, 1998, federal register do not consider recent escapements of the Snake River fall chinook salmon population. Nor do these reports or prior NMFS stock status determinations consider the bias in 1975 to 1982 adult natural spawner estimates, estimates of jacks spawning in the Snake River, nor abundance of Lyons Ferry Hatchery chinook salmon. An objective analysis of the status of the Snake River fall chinook salmon population should consider all these factors in reaching a conclusion concerning the risk of extinction.

An objective analysis would find that the Snake River population of chinook salmon is, in fact healthier than it has been since 1975, when completion of the four lower Snake River dams and Hells Canyon Dam prevented access to the vast majority of the historic spawning grounds and inundated much of the remaining habitat in the lower portion of the Snake River. It is the State of Alaska's contention that this population of chinook salmon was likely in some danger of becoming extinct in 1975 due to these massive reductions in available habitat and resultant passage difficulties. However, since that time, the population has exhibited fairly normal stock dynamics given the available habitat remaining after the extensive development of the Snake River hydroelectric system through the mid-1970s. The Snake River fall chinook salmon population has likely evolved to some extent to better fit the ecological niche remaining after the major development activity reduced and altered substantially the stocks prior habitat. Stock status is better than one would have predicted given the magnitude of habitat changes that occurred through the mid-1970s. Given that the majority of the habitat once available to this stock of chinook salmon is no longer available and is not being made available through the auspices of ESA protection granted since listing in 1992, it would be prudent to make stock status determinations consistent with habitat available at the present time, not some predam era. As shown by Clark et al. (1995b), the numbers of fall chinook in escapements above Lower Granite Dam that fishery scientists would associate with a healthy stock are the escapement levels that would produce maximum, or near maximum, sustained yield. Clark et al. (1995b) developed an initial spawner-recruit relationship and analysis of this relationship indicated that the current habitat will support far less spawning chinook than the NMFS recovery plan uses as a delisting criterion and indicated that the Snake River fall chinook salmon stock is healthy.

The NMFS listed the Snake River fall chinook salmon population under the ESA in 1992 as a result of a petition to list in 1990 which in turn came about due to the supposedly very low escapement of 78 adult spawners in 1990. However, even in 1990, the supposed "natural" escapement of 78 adult spawners was augmented by supposed "hatchery" fish that spawned in the wild (mostly Lyons Ferry Hatchery fish) and by jacks making the actual escapement count over Lower Granite Dam 385 adult sized fish and 190 jacks for a total spawning escapement of 575 fish (Clark et al. 1995b). In addition, the naturally spawning component of the run was significantly augmented by hatchery chinook at Lyons Ferry Hatchery. To better clarify these comparisons and help the reader better understand the considerable biases in past accounting of the number of reproducing Snake River fall chinook salmon, a data table contrasting 1975 (the supposed year of record high abundance since dam counting) and 1990 (the supposed year of record low abundance since dam counting) was developed (Table 1). As can be seen in Table 1, the strict definition of "natural spawners" that NMFS used in making reproductive strength comparisons provides an extremely biased estimate of stock status. In contrast to the NMFS estimates of 1,000 natural spawners in 1975 and 78 natural spawners in 1990, Table 1 shows that there were actually more chinook salmon spawning in 1990 than in 1975.

Given recent escapement patterns of the Snake River portion of the ESU and the patterns of escapement associated with the newly designated Deschutes portion of the ESU, the best available scientific and commercial data do not support the March 9, 1998, NMFS determination that the redefined ESU is likely to become an endangered species within the foreseeable future. The two NMFS documents point to extinction risk to the current stocks in the ESU primarily based on the past extirpation of fall chinook in the John Day, Umatilla, and Walla Walla rivers after making the conjecture that these stocks would have or should have been included in the ESU. The State of Alaska considers this to be a very weak argument to classify the current populations in the ESU as "threatened". The populations of chinook in these three rivers became extinct, but a different set of forces worked toward their demise than is the current situation faced by Snake River fall chinook or by Deschutes River chinook. The facts are that both components of the ESU have demonstrated abundance trends that indicate risk of extinction is minimal; the Deschutes chinook population is at an all time high in abundance and the Snake River chinook population is similarly at an all time high since the Lower River and Hells Canyon Dams blocked the majority of the rearing and spawning habitat for this segment of the overall ESU.

Table 1. A comparison of the number of Snake River fall chinook salmon that reproduced (either naturally or through the Lyons Ferry Hatchery) in 1975 and 1990.

	1975	1990	1990 as % of 1975
NMFS Natural Spawning Numbers	**1,000**	**78**	**7.8%**
Number of Snake River Fall Chinook:			
Snake R. Fall Chinook Natural Spawning:			-
"Natural" Escapement - Adults	not est.	78	-
Lyons Ferry Hatchery Strays - Adults	not est.	174	-
Columbia River Strays - Adults	not est.	83	-
Lower Granite Dam Count of Adults	1,000	335[a]	
Lower Granite Dam Count of Jacks	1,200	190	
Total Natural Spawners:	**2,200**	**525**	**23.9%**
Lyons Ferry Hatchery Fish:			
Lyons Ferry Hatchery Volunteers - Adults	0	521	
Ice Harbor Dam Collection - Adults	0	1,092	
Lower Granite Dam Collection - Adults	0	49	
Lyons Ferry Hatchery Volunteers - Jacks	0	602	
Total Fish Used for Hatchery	0	2,264	
Total Fall Chinook Reproducing	**2,200**	**2,789**	**126.8%**

[a] The dam count in the Table is listed as 335 rather than 385 because 50 fish were removed from the trap after being counted and were subsequently transferred to Lyons Ferry Hatchery where all but one were used as brood stock.

NMFS identifies straying by nonnative hatchery fish as an additional risk to the Snake River Fall-Run ESU. NMFS has extensively addressed the issue of genetic effects of straying of nonnative hatchery fish into natural populations, and the wealth of evidence suggests that hatchery strays which are genetically dissimilar to natural populations have a potential of causing detrimental effects to both the diversity and the fitness of the natural populations (Grant 1997). The State of Alaska agrees with this position which is consistent with the State of Alaska's own genetic policy (ADF&G 1985). However, there is substantial uncertainty associated with determining the detrimental effects of hatchery straying when the hatchery and wild populations have exchanged genes over long periods of time or when much of the genetic resources reside in the hatchery. NMFS recognizes elsewhere that the hatchery fish may be important in conserving the genetic resources that represent the evolutionary legacy of the ESU (Hard et al. 1992). For the Snake River Fall ESU, NMFS has continually failed to make a scientific case that the hatchery fish that spawn in the wild are somehow inferior to the "natural" fish that spawn in the wild. Firstly, the Lyons Ferry Hatchery population of fall chinook salmon has a better genetic pedigree than the ESA protected natural spawning population that passes upstream of Lower Granite Dam. Secondly, the Deschutes River population has a low documented rate of straying. In this regard, the State of Alaska has recommended a review of the decisions concerning Lyons Ferry Hatchery population and reiterates its position that the Lyons Ferry Hatchery population be included in the ESU.

In conclusion, the State of Alaska agrees that the Snake River Fall-Run ESU should be redefined to include the Deschutes River population. Alaska disagrees, however, with the proposal to list the redefined ESU as "threatened". Alaska submits that the ESU should be expanded further to include the Lyons Ferry Hatchery population as well as the Deschutes population, and that the resulting ESU should be considered for delisting under the ESA.

In the event the redefined Snake River/Deschutes Fall-Run ESU is listed as "threatened" over Alaska's objections, Alaska would support the NMFS critical habitat determination for the newly defined Snake River Fall-Run ESU.

UPPER WILLAMETTE RIVER ESU

Fishery scientists employed by the State of Alaska have reviewed the genetic and life history data presented in the Myers et al. (1998) document and the March 9, 1998, federal register with regard to the question of ESU status for spring chinook salmon in the upper Willamette River. The scientific data demonstrate that spring chinook salmon sampled from Willamette <u>hatcheries</u> are distinct and should be considered as discrete from other chinook salmon stocks under the existing policy used by NMFS to make ESU designations for salmon. All chinook sampled for genetic testing were hatchery fish; no chinook salmon spawning in the wild have been genetically sampled and genetically compared to other chinook populations in defining ESUs. As Myers et al. (1988) point out, a large production hatchery program has been in place in the Willamette River system for many decades. The vast majority of the Upper Willamette River spring-run of chinook salmon are fish resulting from this production hatchery program. A large proportion of the fish spawning in the wild are hatchery strays indicating that homogenization of hatchery and naturally spawning chinook salmon has taken place over the past 50 years or more. As a result, there is no reason to believe that the fish spawning in the wild are genetically any different than hatchery fish. Therefore, the State of Alaska agrees that the conclusions reached concerning distinctiveness of Willamette hatchery fish should be applied to those fish that spawn in the wild in the upper Willamette River.

While the State of Alaska agrees with the NMFS that an Upper Willamette River ESU should be defined, the State of Alaska is opposed to the proposed NMFS definition of what is to be included in this ESU. The NMFS proposed ESU is limited to only *naturally spawning spring-run populations above Willamette Falls.* **The NMFS ESU definition should be expanded to include the spring chinook hatchery populations of the Marion Forks Hatchery, the McKenzie Hatchery, the Willamette Hatchery, and the South Santiam Hatchery.**

Available scientific and commercial data support the contention that these hatchery fish are, for all practical purposes, identical to the fish that spawn in the wild, most of which are strays from these production hatcheries. It is fish from these hatcheries that were sampled and the results of this sampling is what has led NMFS and others to conclude that the Upper Willamette River spring-run chinook population is distinct and thereby worthy of definition as an ESU of chinook salmon. These production hatcheries were built and are operated to mitigate for the large-scale loss in spawning and rearing habitat that was concurrent with the hydroelectric development of the Upper Willamette River. There is no biological reason or other basis to exclude these hatchery fish from the ESU and in fact the NMFS policy concerning what constitutes a salmon species (NMFS 1991; Hard et al. 1992) provides for inclusion of hatchery fish in an ESU. Excluding the hatchery fish from the ESU makes no sense from a biological point of view and is not in conformance with the best available scientific and commercial data. The fate, stock health, and likelihood of persistence of the population of spring chinook that spawns in the wild in the Upper Willamette is inseparably intertwined with the fate, stock health, and likelihood of persistence of the production hatchery population. The Upper Willamette River ESU is a situation wherein the past practice of NMFS not giving ESA recognition to hatchery fish represents poor policy and is not based upon the best available scientific and commercial data. The State of Alaska urges the NMFS in the final rule to define the proposed ESU so that it specifically includes the hatchery populations in the Upper Willamette River system.

Fishery scientists employed by the State of Alaska have reviewed available abundance data for the spring-run of chinook salmon that returns to the Upper Willamette River with regard to the "listing" question. Alaska considers the analyses and considerations that NMFS has given to the "listing" question for the Upper Willamette River ESU to be inadequate. Some of the inadequacy is due to the problems associated with the definition of the ESU itself and the failure to include the hatchery fish as discussed above.

High head dams constructed in the Willamette River (completed from 1952–1968) resulted in the loss of most of the spawning and rearing habitat for the spring-run of chinook salmon returning to the upper river. However, even before 1952, significant spawning habitat losses in the Upper Willamette River were occurring due to other hydroelectric development. Some residual spawning and rearing habitat remains; however, these are affected by upstream dams through alteration of flows and temperature. Two thirds of the human population of Oregon resides in the Willamette Basin. The mainstem Willamette was originally a vast, complicated network of channels, sloughs, and backwaters. Now much of this diverse waterway has been channeled, diked, drained, or otherwise modified. These instream modifications together with other habitat modifications due to logging and road building, agriculture and irrigation diversions, as well as discharges from pulp and paper mills, food processing plants, and towns and cities have greatly altered the watershed from its pristine state. The spring-run of chinook salmon returning to the upper Willamette River currently is, and has been over the past 50 years, supported almost entirely by hatcheries, including the Willamette Hatchery constructed in 1911, the South Santiam Hatchery constructed in 1923, the McKenzie Hatchery constructed in 1930, and the Marion Forks Hatchery constructed in 1950. It is believed that 85–95% of the Willamette spring chinook production is from the hatchery system, with the small remaining naturally spawning stock production (5–15%) coming from the remaining accessible areas of the McKenzie Basin.

High quality annual abundance data are available since 1946 for the aggregate hatchery and naturally spawning spring-run of chinook salmon to the upper Willamette River and this data consist of the Willamette Falls fishway count plus the lower Willamette River catches (Figure 3). This database is not a complete run reconstruction since it does not include catches of Willamette spring-run chinook in ocean and lower Columbia River fisheries. However, because, on average, only 20% of the estimated inriver run is composed of inriver catches, the trends in this database reflect annual reproductive patterns over the past 50 years or so. The time series reflects a period after major hydroelectric development and the time series reflects a period long enough to adequately take into account natural variation in marine survivals and changes in exploitation.

Current abundance (1993–1997) is fairly typical of abundance since 1946 being about 46,300 chinook per year in the recent period as compared to the 52-year average abundance of about 57,100 chinook per year. Although it is true that recent abundance is less than that observed 10 years ago, the abundance observed during the years of 1988–1991 were the highest on record (recent 5-year average abundance is about 35% of the peak abundance). The lowest annual runs of upper Willamette River spring-run chinook over the past 52 years were just over 20,000 chinook per year and these runs occurred in 1950 and in 1960. Current abundance is about double these low runs and is very typical of the long-term average. The pattern observed for inriver abundance of Willamette River spring-run chinook salmon is typical of healthy salmon runs, being relatively stable over a long period of time with a few years being about double the long-term average and a few years being about one half the long term average. There is nothing in this data set to indicate that the Upper Willamette River spring-run of chinook salmon is in danger of becoming extinct throughout all or a significant portion of its range ("endangered") or to suggest that it is likely to become endangered within the foreseeable future throughout all or a significant portion of its range ("threatened"). Instead, the available scientific and commercial data indicate that the Upper Willamette River spring-run of chinook salmon is healthy.

As stated above, almost all historic spawning habitat in the upper Willamette River was lost due to construction of high head dams being constructed and completed during the period 1952–1968. These dams were placed on three of the four first order tributaries of the river (Middle Fork of the Willamette River, North Santiam River, and South Santiam River). In the Middle Fork and South Santiam, these dams blocked access to historic spawning habitat and there is no suitable spawning habitat below these dams. In the North Santiam, a small portion of the original spawning habitat may remain; however, it is unknown whether a self-sustaining natural spawning population exists in the North Santiam. The only known, self-sustaining natural population is in the McKenzie River, the fourth first order tributary to the Willamette River. However, even in the McKenzie River, roughly one-third of the of the historic spawning and rearing habitat was lost with the construction of Cougar Dam in 1964 and Blue Ridge Dam in 1968. These dams were placed in tributaries of the McKenzie River. A low head dam (Leaburg Dam), equipped with fish passage facilities, was constructed in the McKenzie River in 1930. The McKenzie Hatchery was built in 1930 and was sited downstream of Leaburg Dam.

Inriver run reconstruction of the spring-run chinook salmon return to the McKenzie River was developed and is presented in Figure 4. Like the overall inriver run to the upper Willamette River, the McKenzie River inriver returns peaked in the late 1980s and early 1990s with the average annual return during 1988–1991 time period being about 11,700 chinook salmon. This average is about double the long-term average of about 6,200 chinook salmon during the 28-year period of 1970–1997. And, similar to the overall inriver run to the upper Willamette River, the most recent 5-year average is about 35% of the peak abundance observed in the 1988–1991 time period. Also similar to the overall upper Willamette River run, catches represent a small component of the inriver run and hence the reconstruction provides a good description of the overall reproductive patterns over the past 30 years or so for the McKenzie River spring-run of chinook salmon. Lower returns of McKenzie River spring-run chinook salmon of about 3,000 fish per year occurred in 1972, 1983, and in 1994. These lower returns were about one-half the 28-year long-term average. The most recent 5-year period return (1993–1997) averaged about 4,200 chinook salmon and is intermediate between the long-term average and the years with lower returns, but closer to the long-term average than to the lowest observed levels. These data, which represent both the McKenzie Hatchery returns and the fish spawning in the wild in the McKenzie River, show a reproductive pattern that is typical of healthy salmon runs, being relatively stable over a reasonably long period of time with a few years being about double the long-term average and a few years being about one half the long term average. There is nothing in this data set to indicate that the McKenzie River spring-run of chinook salmon is in danger of becoming extinct throughout all or a significant portion of its range ("endangered") or to suggest that it is likely to become endangered within the foreseeable future throughout all or a significant portion of its range ("threatened"). Instead, the available scientific and commercial data indicate that the McKenzie River spring-run of chinook salmon is healthy.

This reconstruction (Figure 4) includes annual returns of chinook salmon to the McKenzie Hatchery, counts of chinook salmon over the Leaburg Dam fishway which is located upstream of the hatchery, estimates of the number of chinook salmon spawning in the river below Leaburg Dam, and catches of spring-run chinook salmon in the sport fishery in the McKenzie River. The existing database for chinook salmon spawning below Leaburg Dam consists of redd counts, these redd counts were expanded by a factor of 4.5 to convert redd counts into annual estimates of the number of chinook salmon spawning in this stretch of the river. Sport fishery catches are available for the McKenzie River both above and below the dam. Coded-wire-tag sampling at the Leaburg Dam fishway since 1994 provides direct estimates of the proportion of the fishway count that is composed of hatchery strays, and the three-year average proportion is 34%, substantially less than the figure of 67% assumed for the stock in the Myers et al. (1998) report. This suggests there is a sizable and relatively stable naturally reproducing population in the McKenzie River.

Estimates of the minimum number of naturally spawning spring-run chinook salmon in the McKenzie River (Figure 4) were developed by multiplying the Leaburg Dam fishway counts (after subtracting upstream sport fishery catches) by 34% for the years 1977–1993. In 1970–1976, the McKenzie Hatchery returns were much lower than the Leaburg Dam counts, so the assumption used was that the number of hatchery strays in the fishway counts was equal to the hatchery returns. Because not all of the fish spawning below Leaburg Dam are hatchery strays, the estimates developed are minimum estimates of the number of naturally spawning chinook salmon in the McKenzie River.

The minimum natural produced escapement trend in the McKenzie River since 1970 (Figure 4) mirrors trends previously described for the overall upper Willamette River spring-run inriver returns and the overall McKenzie River spring-run inriver returns. Abundance peaked during the late 1980s and early 1990s, averaging about 3,700 from 1988–1991. The long-term average was about 2,000 chinook salmon, or about one-half the peak abundance. Low abundance was observed in 1984 and 1985 at about 600 chinook salmon. The most recent 5-year average (1993–1997) was about 1,250 about double the lowest levels and intermediate between the long-term average and the years with lower returns, but closer to the long-term average than to the lowest observed levels. These data, which represent minimum numbers of naturally spawning spring-run chinook salmon in the McKenzie River, show a reproductive pattern that is typical of healthy salmon runs, being relatively stable over a reasonably long period of time with a few years being about double the long-term average and a few years being about one third the long term average.

Figure 5 provides an examination of the relationship between the estimated minimum number of McKenzie River spring-run chinook salmon of natural origin to: (1) the overall inriver run of McKenzie River spring-run chinook salmon; and (2) the overall inriver run of Upper Willamette River spring-run chinook salmon. The proportion of the annual runs to both the McKenzie River and the upper Willamette River that is composed of natural origin McKenzie River spring-run chinook salmon has been reasonably stable over the past 29 years. This indicates that the natural origin spring-run chinook salmon run to the McKenzie River is not being negatively affected by the large scale hatchery production program, contrary to opinions set out by NMFS in the Myers et al. (1998) document and as presented in the March 9, 1998, federal notice. There is nothing in these data that indicates that the natural origin McKenzie River spring-run of chinook salmon is in danger of becoming extinct throughout all or a significant portion of its range ("endangered") or to suggest that it is likely to become endangered within the foreseeable future throughout all or a significant portion of its range ("threatened"). Instead, the available scientific and commercial data indicate that the McKenzie River spring-run of chinook salmon of natural origin is healthy and existing in harmony with hatchery chinook of the same lineage.

On close examination of abundance data associated with the Upper Willamette River spring-run of chinook salmon, there is no basis for listing of the ESU under the ESA. The abundance of the naturally reproducing McKenzie River run is reasonably stable. The natural variation in abundance observed in the two time series (1946–1997 and 1970–1997) is likely due to marine survivals because abundance trends for the McKenzie River chinook of natural origin mirrors the overall McKenzie River chinook salmon inriver returns as well as the overall upper Willamette River inriver returns. Current abundance is well within historic levels and should be considered normal given recent downturns in marine survival for chinook salmon stocks since the late 1980's. Chinook salmon of natural origin in the McKenzie River have persisted in the face of the hatcheries located in close proximity almost 70 years (10 to 15 generations). There is no evidence for reduced natural escapements due to hatchery influence. Instead, the production hatchery program has substantially (i.e., the pristine abundance may have exceeded 200,000 during years of high marine survival; Mark Wade, ODFW, personal communication) mitigated the loss of the majority of the spawning habitat in the upper Willamette River, thus, successfully buffering the population as a whole from this large scale hydroelectric development.

The Oregon Department of Fish and Wildlife (ODFW) has developed a comprehensive Willamette Basin Fish Management Plan (ODFW 1998). In basins where spring chinook populations are thought to exist (Clakamas, North Santiam and McKenzie) efforts will be made to improve stock assessment and determine health of each population and implement fishery management, habitat protection, and hatchery management policies to protect them. The plan calls for achievement of full mitigation of lost spring chinook production through increasing production of natural and hatchery populations of spring chinook. Increases in hatchery populations would occur in areas that do not pose risk to naturally spawning populations. All hatchery releases will be externally marked and this will increase the ability to monitor the status of wild populations and to limit the level of hatchery/wild stock interbreeding, if appropriate, and to incorporate wild fish into hatchery brood stocks to maintain genetic compatibility with local wild populations.

The plan also calls for re-establishment of naturally spawning populations in areas that are capable of sustaining them. Basins in which naturally spawning spring chinook salmon are no longer found may still have the potential to support self-sustaining populations. These include habitat above dams that currently block access, areas where habitat conditions have improved, and areas that where habitat conditions could be improved. The plan identifies several new reservoir release strategies and water temperature controls necessary to increase chinook survival in downstream habitat. The U.S. Army Corps of Engineers has acknowledged these temperature problems and is considering installing temperature control structures on the Cougar Dam (South Fork McKenzie) and Blue River Dam (McKenzie River). The State of Alaska supports the implementation of the ODFW Willamette Basin Fish Management Plan, believing that this plan of action will further strengthen the Willamette River stock of chinook salmon.

In conclusion, the State of Alaska submits that the NMFS March 9, 1998, proposed determination that the Upper Willamette River ESU of chinook salmon be listed as "threatened" under the ESA is not based on the best available scientific and commercial data and that the proposed listing is not warranted.

In the event that the Upper Willamette River ESU is listed as "threatened" under the ESA over Alaska's objections, Alaska supports the NMFS critical habitat determination for the Upper Willamette River ESU.

LOWER COLUMBIA RIVER ESU

Fishery scientists employed by the State of Alaska have reviewed the genetic and life history data presented in the Myers et al. (1998) document and in the March 9, 1998, federal notice with regard to the question of ESU status for chinook salmon returning to the lower Columbia River. Available scientific data clearly demonstrate that chinook salmon sampled from the Lower Columbia River are distinct and should be considered as discrete from other chinook salmon stocks under the existing policy used by NMFS to make ESU designations for salmon. The State of Alaska notes that of the eight samples used for genetic testing of lower Columbia River chinook salmon, all but two of the samples were collected from Lower Columbia River hatchery populations of chinook salmon. The genetic samples collected from nonhatchery chinook in the lower Columbia River were taken from the Lewis River and from the Sandy River. The available genetic data indicate that chinook salmon sampled from these two naturally spawning populations are virtually indistinguishable from chinook salmon sampled from the hatchery populations of the Cowlitz, Kalama, Lewis, Spring Creek, and Big Creek hatcheries. It is important to note that a large production hatchery program has been in place in the Lower Columbia River system for many decades. The vast majority of the Lower Columbia River run of chinook salmon consists of fish resulting from this production hatchery program. A large proportion of the fish spawning in the wild are hatchery strays and available data indicate that homogenization of hatchery and naturally spawning chinook salmon has taken place. As a result, there is no reason to believe that the fish spawning in the wild are any different than hatchery fish and the available genetic data confirm this belief. Therefore, the State of Alaska agrees that the conclusions reached concerning distinctiveness of Lower Columbia River fish, which has its basis predominantly in sampling of hatchery fish, should also be generally applied to those fish that spawn in the wild in the lower Columbia River.

While the State of Alaska agrees that a Lower Columbia River ESU for chinook salmon should be defined, the State of Alaska is opposed to the proposed NMFS definition of what is to be included in this ESU. The proposed ESU is limited to: "*all naturally spawned chinook populations from the mouth of the Columbia River to the crest of the Cascade Range, excluding populations above Willamette Falls*". **The NMFS ESU definition should be expanded to include the chinook hatchery populations of the lower Columbia River.**

Available scientific and commercial data support the contention that these hatchery fish are for all practical purposes identical to the fish that spawn in the wild, many of which are strays from the Lower Columbia River production hatcheries. It is predominantly fish from these hatcheries that led NMFS and others to conclude that the Lower Columbia River chinook population is distinct and thereby worthy of definition as an ESU of chinook salmon. These production hatcheries were built and are operated to mitigate for the large-scale loss in spawning and rearing habitat that was concurrent with the hydroelectric development of the Columbia River. There is no biological reason or other basis to exclude these hatchery fish from the ESU, and the NMFS policy concerning what constitutes a salmon species (NMFS 1991; Hard et al. 1992) provides for inclusion of hatchery fish in an ESU. Excluding the hatchery fish from the ESU makes no sense from a biological point of view and is not in conformance with the best available scientific and commercial data. The fate, stock health, and likelihood of persistence of the population of chinook that spawns in the wild in the Lower Columbia River is inseparably intertwined with the fate, stock health, and likelihood of persistence of the production hatchery population. The Lower Columbia River ESU is another very clear cut case wherein the past practice of NMFS not giving ESA recognition to hatchery fish represents poor policy and is not based upon the best available scientific and commercial data. The State of Alaska urges the NMFS in the final rule to define the proposed ESU so that it specifically includes the production hatchery populations of the lower Columbia River system.

Fishery scientists employed by the State of Alaska have reviewed available abundance data for the run of chinook salmon that returns to the Lower Columbia River with regard to the "listing" question. Alaska considers the analyses and considerations that NMFS has given to the "listing" question for the Lower Columbia River ESU to be inadequate.

Escapements of naturally spawning chinook salmon and hatchery returns of chinook salmon to the Lower Columbia River have been variable since 1979, but the trend is stable (Figure 6). The naturally spawning escapements have ranged from a low of about 30,000 spawning chinook salmon in 1993 and 1995 to a high of about 75,000 spawning chinook salmon from 1987–1989; this level of variation (about 2–3 fold) over an almost 20-year period is natural and commonplace for chinook salmon populations. The two most recent escapements are just a little below average with the 1996 escapement being about 45,000 spawning chinook salmon and the 1997 escapement being about 40,000 spawning chinook salmon (Figure 6). The trend in chinook salmon returns to hatcheries is similar with the lowest return occurring in 1993 at about 30,000 chinook salmon and the highest return occurring in 1987 at about 90,000 chinook salmon; again the variation is about 3 fold, a typical level of variability for chinook salmon returns given variability in marine survivals. The four most recent annual hatchery returns are about average for the 20-year historical record. In combination, the numbers of Lower Columbia River chinook salmon annually spawning have averaged about 80,000 animals per year over the past 20 years or so. Recent escapements and hatchery returns have exceeded the lower abundance of naturally spawning chinook salmon and the lower hatchery returns observed in the early 1990s. These data indicate that the abundance of reproducing chinook salmon in the Lower Columbia River is relatively stable with typical annual variation. These data do not suggest that the Lower Columbia River run of chinook salmon are in danger of becoming extinct throughout all or a significant portion of their range ("endangered") nor do these data suggest that these runs are likely to become endangered within the foreseeable future throughout all or a significant portion of their range ("threatened"). Instead, the available scientific and commercial data indicate that the Lower Columbia River run of chinook salmon is stable and reasonably healthy.

The largest naturally spawning stock of chinook salmon that returns to the lower Columbia River drainage is the Lewis River chinook salmon stock. Escapements of chinook salmon in the Lewis River have consistently met or exceeded the annual management target levels since 1979. Since 1964, the Lewis River chinook salmon escapements have ranged from a level of about 4,000 spawners in 1976 to a level of about 23,000 spawners in 1990 (Figure 7). Escapements during the last five years have ranged from about 7,500 spawners to about 14,000 spawners, double to quadruple the historic low level. Escapement trends in the Lewis River (Figure 7) track the aggregate abundance of chinook salmon in the Lower Columbia River (Figure 6). Also presented in Figure 7 is the relationship between the Lewis River escapements and the hatchery returns to the Lower Columbia River expressed as the Lewis River escapements divided by the hatchery returns. That relationship tracks with the Lewis River escapements indicating that the hatchery returns show no negative effects on the naturally spawning population in the Lewis River. Figure 8 shows the Lewis River natural spawning runs over the past 18 years divided by the total hatchery and natural spawning escapements of fall chinook in the Lower Columbia River. A decreasing trend in this relationship would be an indication of deterioration in the naturally spawning run due to the influence of hatchery fish. However, as can be seen, this relationship is variable and fluctuates in harmony with abundance of the Lewis River natural spawners (Figure 7). The trend is stable and supports the view that the large production hatchery program has provided partial, if not substantial mitigation of loss in production associated with hydroelectric development, while the production from the naturally spawning stocks has been sustained in the face of the potential genetic loss of fitness due to hatchery strays, or the effects of higher fisheries exploitation rates that have occurred to harvest the hatchery runs. There is nothing in the database available for the Lewis River chinook salmon stock to suggest that the stock is in danger of becoming extinct throughout all or a significant portion of its range ("endangered") nor do these data suggest that this stock is likely to become endangered within the foreseeable future throughout all or a significant portion of its range ("threatened"). Instead, the available scientific and commercial data indicate that the Lewis River stock of chinook salmon is fully healthy.

A second major naturally spawning population of chinook salmon in the Lower Columbia River basin is the stock that returns to the Sandy River of Oregon; escapement data for this stock are available since 1984 (Figure 7). During the past 14 years the escapement of chinook salmon in the Sandy River has averaged about 1,700 spawners. The highest escapement occurred in 1987 when about 4,400 chinook spawned and the lowest escapement occurred in 1990 when about 500 chinook spawned. In the years 1994, 1995, 1996, and 1997, naturally spawning chinook escapements in the Sandy River were about 1,000, 1,100, 700, and 2,300 spawners, respectively. These most recent four escapements all fell between the record lows and highs in the available database. Again, there is nothing in the database available for the Sandy River chinook salmon stock to suggest that the stock is in danger of becoming extinct throughout all or a significant portion of its range ("endangered") nor do these data suggest that this stock is likely to become endangered within the foreseeable future throughout all or a significant portion of its range ("threatened"). Instead, the available scientific and commercial data indicate that the Sandy River stock of chinook salmon is reasonably healthy.

In conclusion, the State of Alaska submits that the NMFS March 9, 1998, proposed determination that the Lower Columbia River ESU of chinook salmon be listed as "threatened" under the ESA is not based on the best available scientific and commercial data and that the proposed listing is not warranted.

In the event that the Lower Columbia River ESU is listed as "threatened" under the ESA over Alaska's objections, Alaska supports the NMFS critical habitat determination for the Lower Columbia River ESU.

PUGET SOUND ESU

Fishery scientists employed by the State of Alaska have reviewed the genetic and life history data presented in the Myers et al. (1998) document and as presented in the March 9, 1998, federal notice with regard to the question of ESU status for Puget Sound chinook salmon. Although the NMFS has determined in the proposed rule that Puget Sound chinook are discrete from British Columbia chinook, the available scientific data do not support this determination. Results of various genetic comparisons such as that presented by Myers et al. (1998, figures 21 & 22) demonstrate that there is significant overlap between Puget Sound and British Columbia chinook salmon populations. Contrary to the Myers et al. (1998) conclusion, the State of Alaska concludes that the Puget Sound evolutionary lineage does include some British Columbia populations of chinook salmon.

The State of Alaska also notes the differences in the Puget Sound ESU definition in the two NMFS documents. The status review document (Myers et al. 1998) states: "*This ESU encompasses all runs of chinook salmon in the Puget Sound region from the North Fork Nooksack River to the Elwha River on the Olympic Peninsula*". On the other hand, the March 9, 1998, federal notice states: "*This ESU encompasses all naturally spawned spring, summer, and fall runs of chinook salmon in the Puget Sound region from the North Fork Nooksack River to the Elwha River on the Olympic Peninsula*". The State of

Alaska contends that the Myers et al. (1998) approach is most appropriate and that, the ESU should include <u>all</u> runs of chinook salmon, not just the naturally spawning runs of chinook salmon. Exclusion of the hatchery runs is inappropriate for several reasons. First, the history of the Puget Sound hatchery program for chinook salmon indicates this ESU has one of the lowest documented uses of nonlocal brood stock, indicating that brood stock used in Puget Sound hatcheries are from virtually the same lineage as the naturally spawning fish. The nonlocal percent of brood stock used in the Puget Sound chinook salmon hatchery program since the early 1950s is a mere 1%. In contrast, 24% nonlocal stocks have been used in the chinook hatchery program associated with the Oregon Coastal ESU and 19% nonlocal stocks have been used in the chinook hatchery program associated with the Washington Coastal ESU, both of which NMFS has determined to be healthy and not in need of listing under the ESA. Second, the Puget Sound hatchery program has a long history (started in the late 1800s) and has been operated on a major production level basis with over one-half of the Puget Sound population being of hatchery origin for decades even while many of the hatchery fish stray and enter the naturally spawning populations. Thus, the hatchery chinook and the naturally spawned chinook are largely indistinguishable from each other, from a genetic and life history standpoint. Third, the State of Washington adopted hatchery brood stock practices intended to protect naturally spawned chinook and the program has demonstrated success in benefiting natural runs such as the White River chinook run. And, fourth, there has been no credible scientific rationale given to exclude these fish from the ESU. Thus, the State of Alaska submits that the ESU definition as provided in the March 9, 1998, federal notice is not based on the best available scientific and commercial data, nor does it conform with the NMFS status report. **The State of Alaska recommends that this ESU be defined to include appropriate southern British Columbia chinook salmon populations and defined to include Puget Sound hatchery chinook salmon populations.**

Fishery scientists employed by the State of Alaska have reviewed available abundance data for chinook salmon that return to Puget Sound with regard to the "listing" question. Alaska considers the analyses and considerations that NMFS has given to the "listing" question for the Puget Sound ESU to be inadequate. A majority of the Biological Review Team (BRT) formed by NMFS (Myers et al. 1998) concluded that status of this proposed ESU was such that it was "likely to become endangered in the foreseeable future". A minority of the BRT concluded that the proposed ESU was not at risk. Rationale for conclusions reached by the majority consisted of: (1) declines from historic levels, (2) concerns over habitat in the upper reaches of streams, (3) trends in abundance, (4) widespread use of hatchery fish in Puget Sound, and (5) harvest rates considered excessive. While the State of Alaska believes in strong habitat protection measures, it has little to comment on concerning the specifics of chinook habitat in Puget Sound. Undoubtedly, available habitat for chinook salmon in the fresh waters of the Puget Sound basin have been affected by development and the large human population living in the basin. On the other hand, chinook escapements to the Puget Sound watershed have not changed significantly over the past 30 years indicating habitat is still capable of supporting chinook salmon spawning and rearing. On the other hand, the State of Alaska takes specific issue with the other rationales used by the BRT concerning status of the proposed Puget Sound chinook salmon ESU.

The "*decline from historic levels*" rationale used by the NMFS BRT (Myers et al. 1998) cannot be substantiated from available scientific and commercial data. It has much of its basis in historic case pack estimates which undoubtedly included large numbers of chinook landed at Puget Sound ports that were caught elsewhere (Columbia River fisheries for instance). Data available for 27 naturally spawning and hatchery stocks of Puget Sound chinook salmon, summarized in Table 2 and Figure 9, indicate that the current reproducing population of chinook in Puget Sound is in excess of 60,000 fish and that the abundance of reproducing chinook salmon in Puget Sound has changed but little over the past 30 years. Although abundance of the cumulative spawning stocks during the period 1992–1996 are about 25% less than that of the period 1987–1991, abundance during that period was the highest since reliable escapement data have been collected from the late 1960s onward. Recent abundance of reproducing chinook in Puget Sound is considerably higher than during the mid-1970s, the historic low abundance years, and recent abundance is within 8% of the 29 year average of 1968–1996. Thus, the available scientific and commercial data available indicate that the reproducing population of chinook salmon in Puget Sound is currently at an approximate average level, above historic lows and below historic highs. Because the historic case pack data are undoubtedly biased considerably high, the State of Alaska does not consider this to be the best available scientific and commercial data. Instead, the State of Alaska considers the reliable escapement data available over the past 30 years to be the best available scientific and commercial data, and this more reliable information does not support the "decline from historic levels" rationale used by the BRT of NMFS.

The "*trends in abundance*" rationale used by the BRT of NMFS (Myers et al. 1998) cannot be substantiated from available scientific and commercial data. Of the 27 reproducing populations of Puget Sound chinook salmon summarized in Table 2, current abundance is below the long-term average for 18 of the stocks and above the long-term average for abundance for 11 of the stocks (Figure 10). A higher proportion of the hatchery stocks is above the long-term average than is the case for the naturally reproducing stocks. However, of the 17 naturally reproducing stocks, recent abundance is above the long-term average for four stocks while another four of these stocks have recent escapements that are less than 50% of the long-term average. While status of the four stocks with escapements less than 50% of the long-term average indicates the need for added conservation by the agencies responsible for management, these data hardly make a case for ESA listing. Instead, the available scientific and commercial data indicate that the agencies currently responsible for management of Puget Sound chinook salmon stocks need to take conservation measures to increase escapements of these four stocks.

The "*widespread use of hatchery fish*" rationale used by the BRT of NMFS (Myers et al. 1998) cannot be substantiated from available scientific and commercial data. Hatcheries have been used in Puget Sound since the last century to augment the naturally spawning component of the run. The naturally spawning component of the run has persisted in the face of the release of billions of hatchery chinook released in this area for over 100 years. The naturally spawned proportion of the run has remained remarkably stable over the past 30 years when reliable information has been gathered to document escapement of both naturally spawned and hatchery spawned chinook runs in Puget Sound (Figure 9). The available data do not support the contention that widespread hatchery releases have hurt or currently threaten the naturally spawned population of chinook salmon in Puget Sound; instead, the available information indicates to the contrary that the production hatchery program has assisted the naturally spawned populations. The NMFS BRT even documented this to be the case in paragraphs 1 and 2 on page 161 of the stock status report (Myers et al. 1998). It is illogical for NMFS to conclude that hatcheries have assisted natural stocks of Puget Sound chinook salmon in one part of the stock status document, and then to later conclude that this factor represents a threat of such a degree that the proposed Puget Sound ESU of chinook salmon needs to be listed under the ESA. NMFS has presented no credible data suggesting that the Puget Sound hatchery program represents a risk to the natural stocks. To the contrary, the available scientific and commercial data demonstrate that the production hatchery program of Puget Sound is beneficial to the naturally spawning stocks of chinook salmon.

The last rationale used by the NMFS BRT (Myers et al. 1998) that "*harvest rates considered excessive*", cannot be substantiated from available scientific and commercial data. The only reference to harvest rates of Puget Sound chinook salmon in the NMFS stock status document is as follows (Myers et al. 1998 p.222):

> *"Harvest impacts on Puget Sound chinook salmon have been quite high. Ocean exploitation rates on natural stocks average 56–59%; total exploitation rates average 68–83% (1982–89 brood years) (PSC 1994). Total exploitation rates on some stocks have exceeded 90% (PSC 1994)."*

This is not much analysis on this subject (i.e., two sentences) in a report that is in excess of 400 pages long. The harvest rates cited are for hatchery stocks of chinook salmon; naturally spawning stocks of chinook salmon typically demonstrate lower harvest rates than their Pacific Salmon Commission (PSC) hatchery stock indicator. It is unclear what standards, if any, NMFS utilizes to determine what is an acceptable harvest rate. The State of Alaska makes such determinations based on the sustained yield principle, mandated by our constitution. The reproductive population of Puget Sound chinook salmon has remained remarkably constant over the past 30 years (Figure 9), even in the face of the supposedly excessive harvest rates that concern the NMFS BRT, and that are discussed on page 222 of the stock status document (Myers et al. 1998). Given that the reproductive population has remained relatively constant, it is obvious that the harvest rates have been fully sustainable. Although lower harvest rates might lead to greater escapements, it is obvious that the current harvest rates are fully sustainable and therefore are not excessive. If the harvest rates were excessive, the reproducing population would have greatly decreased from the levels that have been documented over the past 30 years and which represent six or more complete chinook salmon life history cycles. Thus, the available scientific and commercial data do not support the NMFS contention with regard to harvest rates. Instead, the best available data indicate that the harvest rates incurred by Puget Sound chinook salmon over the past 30 years are fully sustainable.

In conclusion, the State of Alaska submits that the NMFS March 9, 1998, proposed determination that the Puget Sound ESU of chinook salmon, as defined under the proposed rule, meets the criteria for "threatened" status under the ESA is not based on the best available scientific and commercial data and that the proposed listing is not warranted.

In the event that the Puget Sound ESU is listed as "threatened" under the ESA over Alaska's objections, Alaska supports the NMFS critical habitat determination for the lands and waters of Puget Sound proper. However, if appropriate stocks of British Columbia chinook salmon are included in the Puget Sound ESU as Alaska recommends, designation of additional critical habitat in British Columbia may be appropriate through some type of intergovernmental agreement between the U.S. and Canada.

CONCLUSIONS - ALASKA'S RECOMENDATIONS

Alaska generally agrees with the proposed actions concerning the Oregon Coast ESU, the Washington Coast ESU, the Middle Columbia River Spring-Run ESU, and the Upper Columbia Summer- and Fall-Run ESU. Alaska disagrees in whole or in part with the proposed actions concerning the Puget Sound ESU, the Lower Columbia ESU, the Upper Willamette River ESU, the Upper Columbia River Spring-Run ESU, and the Snake River Fall-Run ESU.

Upper Columbia River Spring-Run ESU: Because this was once a very important stock of chinook, and because they are sufficiently different from other conspecific stocks, the State of Alaska agrees that these fish merit designation as a separate ESU. However, the State of Alaska recommends that the spring-run chinook populations associated with the Methow Fish Hatchery Complex and with the Rock Island Fish Hatchery Complex also be included in the Upper Columbia River Spring-Run ESU. The available scientific and commercial data indicate to the State of Alaska that the Upper Columbia River Spring-Run ESU should be listed as "threatened", not "endangered".

Snake River Fall-Run ESU: While the State of Alaska agrees that the Snake River Fall-Run ESU should be redefined to include the Deschutes River population, Alaska disagrees with the proposal to list the redefined ESU as "threatened". Alaska submits that the ESU should be expanded further to include the Lyons Ferry Hatchery population as well as the Deschutes population, and that the resulting ESU should be considered for delisting under the ESA.

Upper Willamette River ESU: The NMFS ESU definition should be expanded to include the spring chinook hatchery populations of the Marion Forks Hatchery, the McKenzie Hatchery, the Willamette Hatchery, and the South Santiam Hatchery. The State of Alaska submits that the NMFS March 9, 1998, proposed determination that the Upper Willamette River ESU of chinook salmon be listed as "threatened" under the ESA is not based on the best available scientific and commercial data and that the proposed listing is not warranted.

Lower Columbia River ESU: The NMFS ESU definition should be expanded to include the chinook hatchery populations of the lower Columbia River. The State of Alaska submits that the NMFS March 9, 1998, proposed determination that the Lower Columbia River ESU of chinook salmon be listed as "threatened" under the ESA is not based on the best available scientific and commercial data and that the proposed listing is not warranted.

Puget Sound ESU: The State of Alaska recommends that this ESU be defined to include appropriate southern British Columbia chinook salmon populations and defined to include Puget Sound hatchery chinook salmon populations. The State of Alaska submits that the NMFS March 9, 1998, proposed determination that the Puget Sound ESU of chinook salmon, as defined under the proposed rule, meets the criteria for "threatened" status under the ESA is not based on the best available scientific and commercial data and that the proposed listing is not warranted.

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Table 2. Natural escapements and hatchery returns to various Puget Sound stream systems, 1968–1996 (page 1 of 6).

Years	Skagit Natural	Skagit Hatchery	Duamish Natural	Duamish Hatchery	Snohomish Natural
1968	12,330	259	3,110	8,114	5,214
1969	9,613	346	4,035	6,650	3,700
1970	18,872	1,995	11,171	10,714	5,724
1971	18,760	801	5,832	8,387	7,822
1972	23,234	758	4,343	7,200	3,128
1973	17,809	924	3,180	8,275	4,841
1974	12,901	782	5,095	3,783	6,030
1975	11,555	1,107	3,394	3,759	4,485
1976	14,479	606	3,140	2,299	5,315
1977	9,497	238	3,804	7,993	5,565
1978	13,209	251	3,304	7,975	7,931
1979	13,605	215	9,704	14,985	5,903
1980	20,345	1,010	7,743	12,175	6,460
1981	8,670	441	3,606	11,001	3,368
1982	10,439	845	1,840	3,824	4,379
1983	9,080	831	3,679	2,888	4,549
1984	13,239	1,576	3,353	4,070	3,762
1985	16,298	240	2,908	4,253	4,873
1986	18,127	769	4,792	10,782	4,534
1987	9,647	307	10,338	13,376	4,689
1988	11,954	1,291	7,994	11,095	4,513
1989	6,776	414	11,512	18,972	3,138
1990	17,206	1,295	7,035	9,284	4,209
1991	6,014	915	10,548	4,855	2,783
1992	7,671	2,212	5,267	4,428	2,708
1993	5,916	1,184	2,476	3,656	3,866
1994	6,231	4,026	4,078	4,784	3,626
1995	7,155	2,576	7,939	10,518	3,176
1996	12,025	1,193	6,026	13,414	4,851
Average:	12,505	1,014	5,560	8,052	4,660
68–71 Avg.	14,894	850	6,037	8,466	5,615
72–76 Avg.	15,996	835	3,830	5,063	4,760
77–81 Avg.	13,065	431	5,632	10,826	5,845
82–86 Avg.	13,437	852	3,314	5,163	4,419
87–91 Avg.	10,319	844	9,485	11,516	3,866
92–96 Avg.	7,800	2,238	5,157	7,360	3,645

<u>Data Source</u>: *Jennifer Gutmann, Northwest Indian Fisheries Commission, 6730 Martin Way East, Olympia, Washington, 98516 (personal communication).*

Table 2. (Cont. page 2 of 6).

Years	Snohomish Hatchery	Puyallup Natural	Puyallup Hatchery	Elwha Natural	Elwha Hatchery
1968	884	890	901	1,000	
1969	1,342	850	627	1,000	
1970	2,221	5,110	1,519	1,000	
1971	767	2,220	540	1,000	
1972	1,223	925	672	1,000	
1973	2,371	630	248	1,000	
1974	466	1,480	260	1,000	
1975	535	1,396	535	1,000	
1976	815	1,120	274	1,000	275
1977	1,709	793	1,878	1,000	503
1978	2,856	962	837	1,000	379
1979	1,606	2,359	2,553	1,000	469
1980	3,499	2,553	2,344	1,137	527
1981	3,660	518	2,264	424	425
1982	2,305	851	1,096	1,735	926
1983	1,172	1,184	1,959	1,060	711
1984	1,174	1,258	807	817	1,380
1985	936	1,147	1,438	1,207	613
1986	931	740	977	1,842	1,285
1987	1,170	925	780	4,610	1,283
1988	1,122	1,332	1,128	5,784	2,089
1989	1,461	2,442	762	4,352	1,135
1990	984	3,515	1,651	2,594	586
1991	550	1,702	1,273	2,499	970
1992	943	3,034	1,718	3,762	97
1993	1,929	1,999	1,546	1,404	165
1994	3,904	2,526	2,533	1,181	365
1995	4,403	2,701	2,023	1,667	145
1996	5,598	2,444	2,499	1,661	214
Average:	1,812	1,707	1,298	1,715	692
68–71 Avg.	1,304	2,268	897	1,000	–
72–76 Avg.	1,082	1,110	398	1,000	275
77–81 Avg.	2,666	1,419	1,975	912	461
82–86 Avg.	1,304	1,036	1,255	1,332	983
87–91 Avg.	1,057	1,983	1,119	3,968	1,213
92–96 Avg.	3,355	2,541	2,064	1,935	197

<u>Data Source</u>: *Jennifer Gutmann, Northwest Indian Fisheries Commission, 6730 Martin Way East, Olympia, Washington, 98516 (personal communication).*

Table 2. (Cont. page 3 of 6).

Years	Stillaguamish Natural	Skokomish Natural	Skokomish Hatchery	Nisqually Natural	Nisqually Hatchery
1968	1,108	2,400	2,076	600	
1969	382	1,700	1,478	300	
1970	432	2,100	1,356	900	
1971	362	2,666	757	800	
1972	322	1,066	1,053	700	
1973	3,638	1,572	1,521	700	
1974	1,013	674	105	500	
1975	1,198	1,673	163	550	
1976	2,140	1,134	244	450	
1977	1,475	1,427	634	220	
1978	1,232	164	321	178	
1979	1,042	1,251	50	1,665	
1980	821	479	518	1,124	
1981	630	117	305	439	
1982	773	248	75	848	28
1983	387	1,007	271	1,066	223
1984	374	1,394	1,456	313	163
1985	1,409	2,974	2,057	112	50
1986	1,277	2,643	3,233	302	233
1987	1,321	2,112	3,337	85	117
1988	717	2,666	4,930	1,342	738
1989	811	1,204	2,556	2,332	798
1990	842	642	2,186	994	700
1991	1,632	1,684	3,068	953	201
1992	780	825	294	106	325
1993	928	960	612	1,655	1,372
1994	954	657	495	1,730	2,104
1995	822	1,398	5,196	817	3,623
1996	1,384	995	3,100	606	2,701
Average:	1,042	1,374	1,498	772	892
68–71 Avg.	571	2,217	1,417	650	-
72–76 Avg.	1,662	1,224	617	580	-
77–81 Avg.	1,040	688	366	725	-
82–86 Avg.	844	1,653	1,418	528	139
87–91 Avg.	1,065	1,662	3,215	1,141	511
92–96 Avg.	974	967	1,939	983	2,025

Data Source: *Jennifer Gutmann, Northwest Indian Fisheries Commission, 6730 Martin Way East, Olympia, Washington, 98516 (personal communication).*

Table 2. (Cont. page 4 of 6).

Years	L Washington Natural	L Washington Hatchery and Off-Station	Dosewallips Natural	Hamma Hamma Natural	Hood Canal Natural
1968	1,363	7,440	200	400	600
1969	466	8,260	300	300	425
1970	1,745	8,804	600	300	525
1971	471	6,159	654	425	667
1972	419	5,437	262	171	267
1973	1,025	4,282	386	252	393
1974	560	3,333	165	108	169
1975	656	6,848	410	268	418
1976	719	5,615	20	252	284
1977	675	4,330	260	317	357
1978	890	2,447	5	36	85
1979	1,289	6,049	280	278	313
1980	1,360	6,541	107	106	120
1981	721	6,109	102	26	29
1982	885	7,219	56	55	62
1983	1,332	6,751	225	224	252
1984	1,252	3,577	312	309	349
1985	949	3,189	666	660	744
1986	1,470	6,733	15		114
1987	2,038	5,069	60	21	45
1988	792	2,474	30	66	60
1989	1,011	5,353	30	26	108
1990	787	7,474		35	37
1991	767	2,751	42	30	53
1992	790	2,283	41	52	19
1993	245	6,097	97	28	41
1994	888	6,557	297	78	30
1995	930	3,165	76	25	491
1996	336	2,828		11	1
Average:	925	5,282	204	174	243
68–71 Avg.	1,011	7,666	439	356	554
72–76 Avg.	676	5,103	249	210	306
77–81 Avg.	987	5,095	151	153	181
82–86 Avg.	1,178	5,494	255	312	304
87–91 Avg.	1,079	4,624	41	36	61
92–96 Avg.	638	4,186	102	39	116

Data Source: *Jennifer Gutmann, Northwest Indian Fisheries Commission, 6730 Martin Way East, Olympia, Washington, 98516 (personal communication).*

Table 2. (Cont. page 5 of 6).

Years	Duckabush Natural	Carr Inlet Natural	Carr Inlet Hatchery	Nooksack Natural	Nooksack Hatchery
1968	227	310	3,317	2,700	1,070
1969	174	147	4,551	1,600	598
1970	227	135	10,913	3,200	970
1971	125	59	1,589	4,600	1,849
1972	115	101	5,496	3,000	1,284
1973	170	420	6,219	3,500	484
1974	73	240	902	2,000	1,243
1975	181	9	290	3,030	504
1976	73	14	320	2,200	912
1977	91	6	254	1,480	448
1978	11	57	262	2,061	409
1979	80	27	126	2,122	199
1980	31	17	238	3,174	502
1981	18	41	498	1,352	392
1982	16	37	173	1,628	148
1983	64	272	599	1,416	212
1984	89	103	345	2,065	4,904
1985	190	223	500	2,542	774
1986		100	641	2,828	747
1987	16	52	817	1,540	363
1988	31	591	693	1,940	770
1989	57	210	2,132	1,197	1,540
1990	10	1,446	2,813	2,684	1,151
1991	14	1,163	3,113	200	872
1992	3	1,305	1,984	192	942
1993	17	682	2,003	245	720
1994	9	1,063	2,500	59	363
1995	2	247	1,029	197	1,198
1996	13	241	235	78	614
Average:	76	321	1,881	1,891	903
68–71 Avg.	188	163	5,093	3,025	1,122
72–76 Avg.	122	157	2,645	2,746	885
77–81 Avg.	46	30	276	2,038	390
82–86 Avg.	90	147	452	2,096	1,357
87–91 Avg.	26	692	1,914	1,512	939
92–96 Avg.	9	708	1,550	154	767

<u>Data Source</u>: *Jennifer Gutmann, Northwest Indian Fisheries Commission, 6730 Martin Way East, Olympia, Washington, 98516 (personal communication).*

Table 2. (Cont. page 6 of 6).

Years	Samish Natural	Samish Hatchery	All Natural Stocks	All Hatchery Stocks	All Stocks
1968	844	4,039	33,296	28,100	61,396
1969	500	2,954	25,492	26,806	52,298
1970	1,000	1,862	53,041	40,354	93,395
1971	1,400	2,447	47,863	23,296	71,159
1972	800	1,022	39,853	24,145	63,998
1973	1,200	2,031	40,716	26,355	67,071
1974	1,200	4,130	33,208	15,004	48,212
1975	950	2,473	31,173	16,214	47,387
1976	1,500	5,303	33,840	16,663	50,503
1977	610	3,570	27,487	21,557	49,044
1978	644	4,475	31,769	20,212	51,981
1979	1,263	4,723	42,181	30,975	73,156
1980	1,932	8,198	47,509	35,552	83,061
1981	2,200	9,767	22,261	34,862	57,123
1982	4,000	14,796	27,852	31,435	59,287
1983	6,000	19,419	31,797	35,036	66,833
1984	7,500	13,842	36,489	33,294	69,783
1985	4,000	15,307	40,902	29,357	70,259
1986	2,503	9,457	41,287	35,788	77,075
1987	1,180	5,429	38,679	32,048	70,727
1988	800	4,428	40,612	30,758	71,370
1989	740	16,383	35,946	51,506	87,452
1990	5,224	12,680	47,260	40,804	88,064
1991	508	8,699	30,592	27,267	57,859
1992	355	7,410	26,910	22,636	49,546
1993	768	10,871	21,327	30,155	51,482
1994	852	6,019	24,259	33,650	57,909
1995	278	6,956	27,921	40,832	68,753
1996	866	8,412	31,538	40,808	72,346
Average:	1,780	7,486	34,933	30,189	65,122
68–71 Avg.	936	2,826	39,923	29,639	69,562
72–76 Avg.	1,130	2,992	35,758	19,676	55,434
77–81 Avg.	1,330	6,147	34,241	28,632	62,873
82–86 Avg.	4,801	14,564	35,665	32,982	68,647
87–91 Avg.	1,690	9,524	38,618	36,477	75,094
92–96 Avg.	624	7,934	26,391	33,616	60,007

Data Source: *Jennifer Gutmann, Northwest Indian Fisheries Commission, 6730 Martin Way East, Olympia, Washington, 98516 (personal communication).*

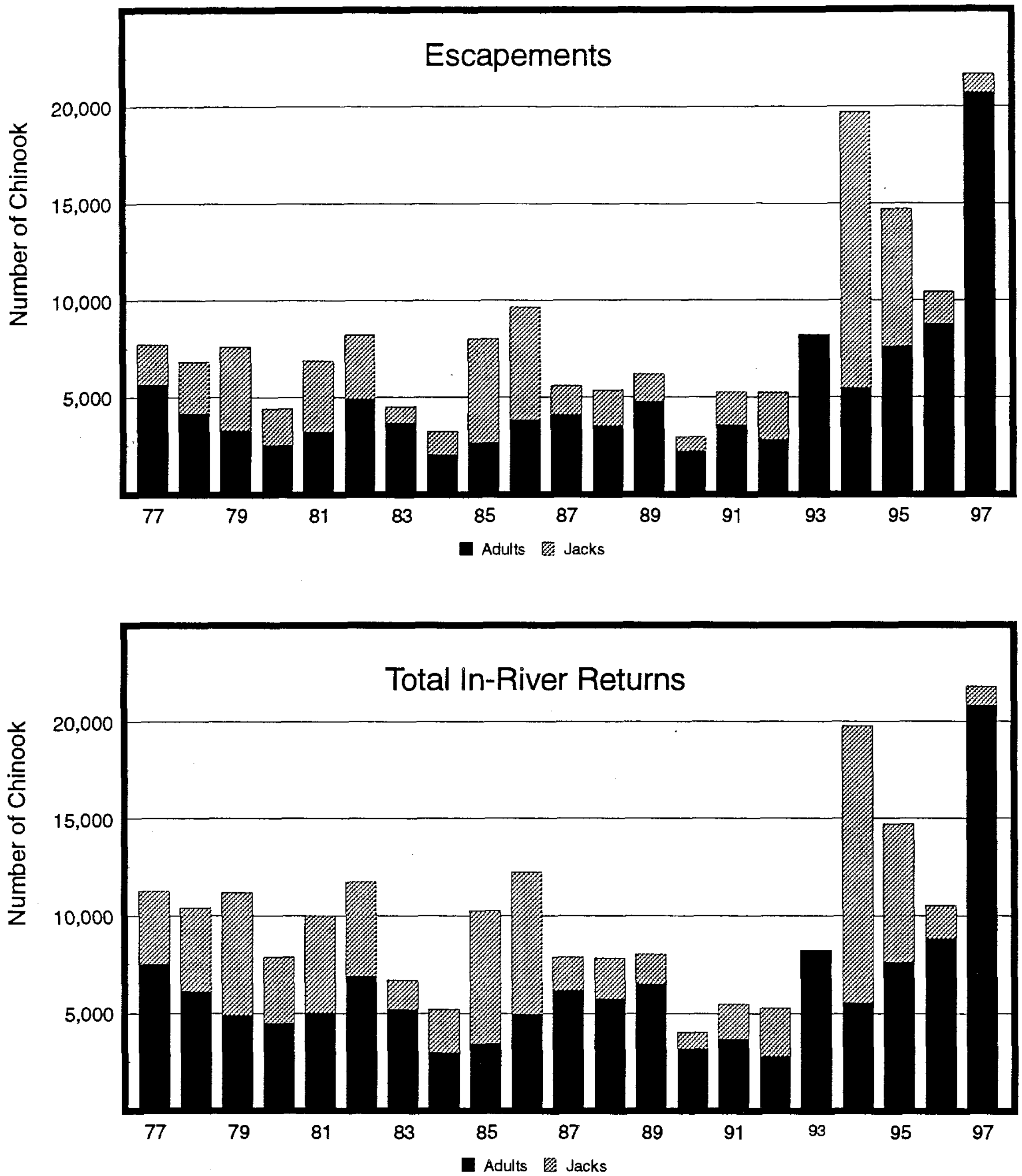

Figure 1. Estimated escapements and total inriver returns of jack and adult fall chinook salmon to the Deschutes River, 1977–1997.

Note: Estimates of the jack escapement and inriver return in 1993 were not made due to insufficient tag returns of jacks.

Data Source: Colleen Fagan of the Confederated Tribes of the Warm Springs Reservation of Oregon, P.O. Box C, Warm Springs, Oregon 97761 (personal communication).

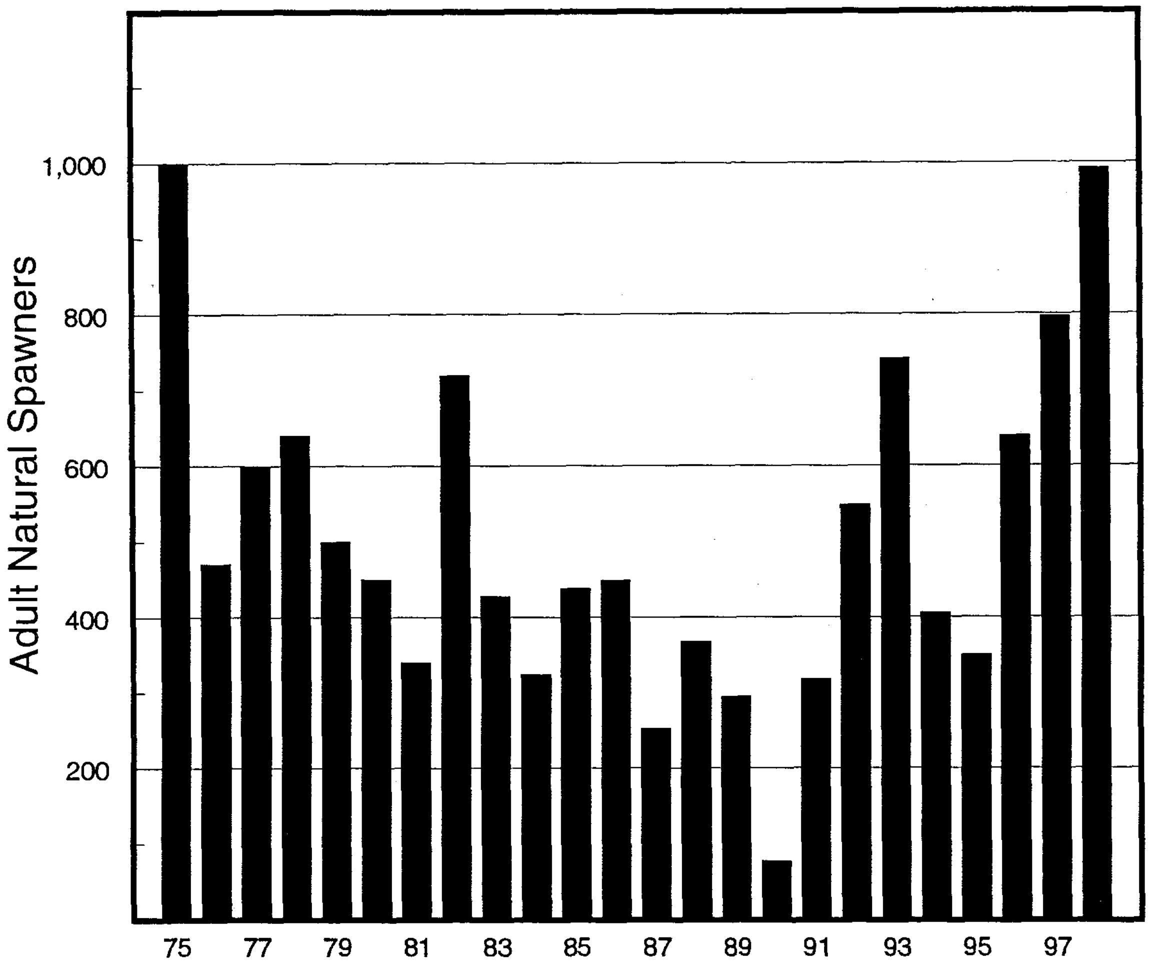

Figure 2. Estimated natural escapements of adult Snake River fall chinook salmon upstream of Lower Granite Dam, 1975–1997 and the projected 1998 escapement.

Data Sources: *The 1975–1993 data are from Clark et al. (1995b), the 1994–1997 data are from Sands and Koenings (1998), and the projected estimate of the escapement in 1998 is from TACS (1998).*

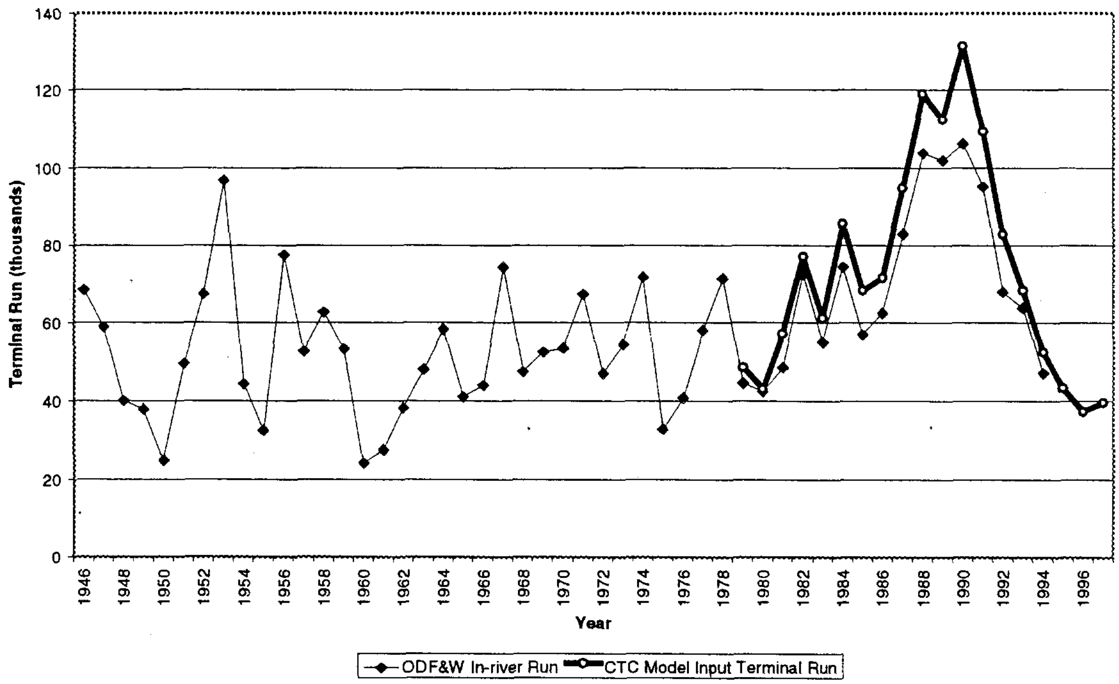

Figure 3. Inriver return of Willamette River spring-run chinook salmon, 1946–1997

<u>Note</u>: *Inriver run consists of Willamette Falls fishway count plus the lower Willamette River sport fish catch (1946–1994), Chinook Technical Committee chinook model input terminal run data are also provided for the years 1979–1997. The two data sets mirror each other for the years 1979–1994 and provide a good projection of the inriver run strength for the years 1995–1997.*

<u>Data Sources</u>: *Status Report, Columbia River Fish Runs and Fisheries, 1938–1994; Myers et al. 1998; Steve King, Oregon Department of Fish and Wildlife, 17330 S. E. Evelyn Street, Clackamas, Oregon 97015 (personal communication); Mark Wade, Oregon Department of Fish and Wildlife, 3150 E. Main Street, Springfield, Oregon 97478 (personal communication).*

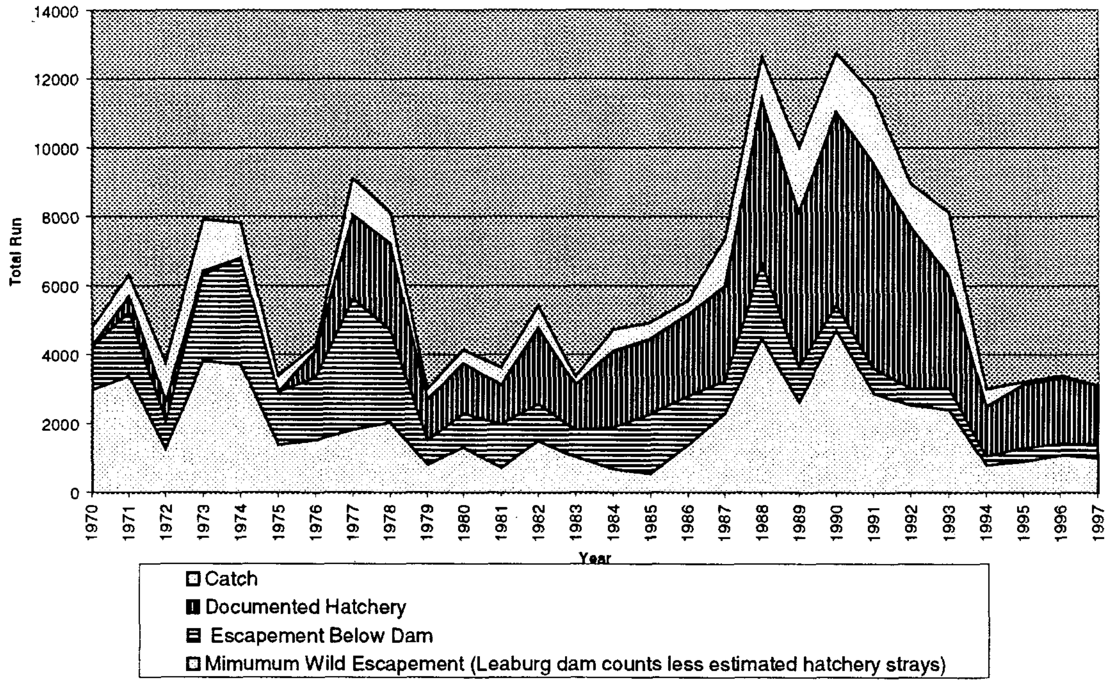

Figure 4. Inriver return of McKenzie River spring-run chinook salmon, 1970–1997.

<u>Note</u>: *Inriver run consists of sport fishery catch inriver (catch); returns of hatchery fish consisting of the return of chinook to McKenzie Hatchery and documented strays of hatchery fish above Leaburg Dam (documented hatchery), estimated number of chinook spawning in the wild below Leaburg Dam based on redd counts multiplied by a factor of 4.5 (escapement below dam), and a minimum estimate of fish spawning in the wild upstream of Leaburg Dam and not of hatchery origin.*

<u>Data Sources</u>: *Status Report, Columbia River Fish Runs and Fisheries, 1938–1994; Steve King, Oregon Department of Fish and Wildlife, 17330 S. E. Evelyn Street, Clackamas, Oregon 97015 (personal communication); Mark Wade, Oregon Department of Fish and Wildlife, 3150 E. Main Street, Springfield, Oregon 97478 (personal communication).*

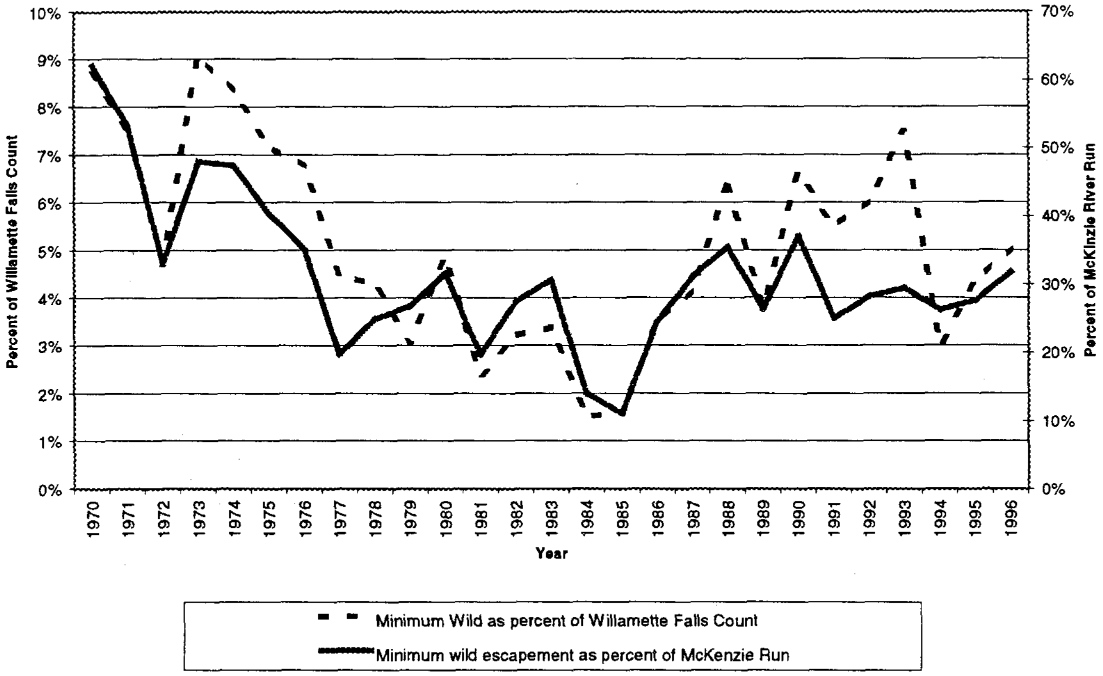

Figure 5. Minimum percent of nonhatchery McKenzie River spring-run chinook salmon in the overall Willamette Falls count (left axis) and in the overall McKenzie River run (right axis), 1970–1997

Data Sources: *Minimum estimates of nonhatchery chinook in McKenzie River spring-runs and overall McKenzie River runs taken from Figure 4. Willamette Falls count from: Status Report, Columbia River Fish Runs and Fisheries, 1938–1994; Steve King, Oregon Department of Fish and Wildlife, 17330 S. E. Evelyn Street, Clackamas, Oregon 97015 (personal communication); Mark Wade, Oregon Department of Fish and Wildlife, 3150 E. Main Street, Springfield, Oregon 97478 (personal communication).*

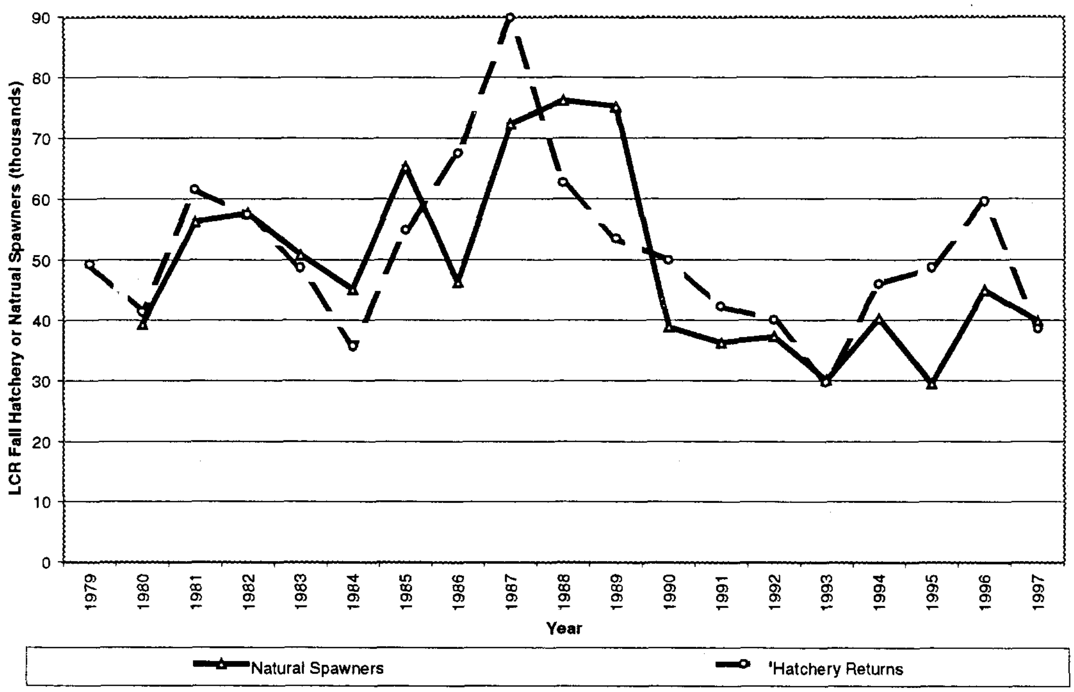

Figure 6. Number of naturally spawning fall chinook salmon in escapements to the lower Columbia River and fall chinook salmon returns to Lower Columbia River hatcheries, 1979–1997.

Data Source: *Data presented were taken from WDFW/ODFW (1997).*

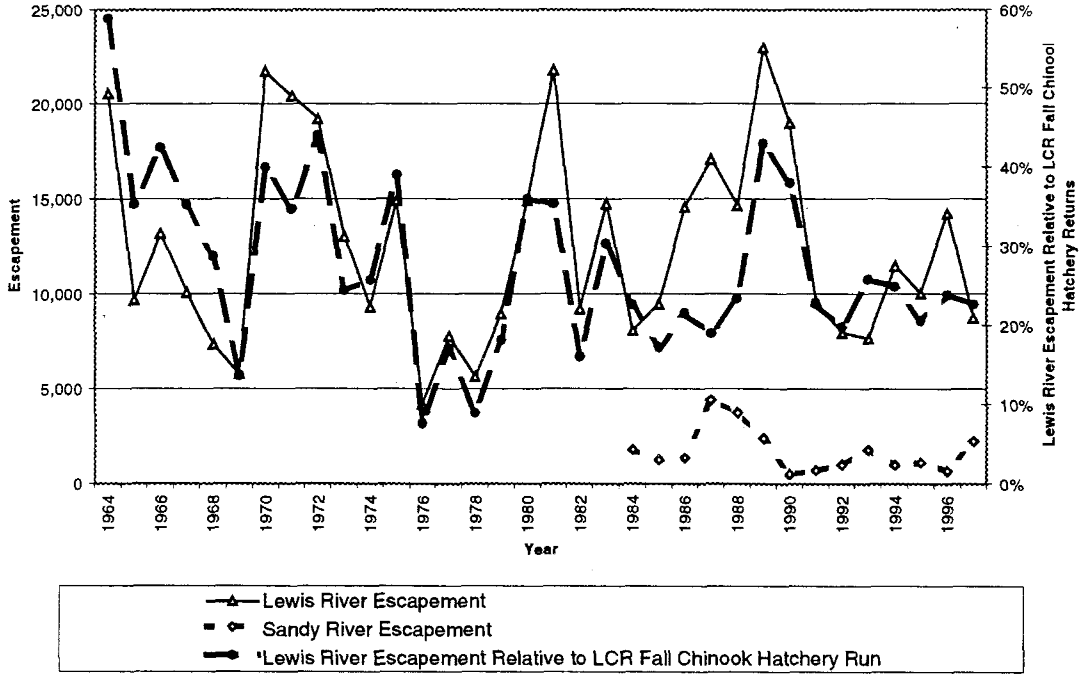

Figure 7. Chinook salmon escapements to the Lewis and the Sandy Rivers, 1964–1996 (left axis) and the proportion of Lewis River escapement relative to Lower Columbia River chinook salmon hatchery returns, 1964–1997 (right axis).

Data Source: *Lewis River escapement data from Washington Department of Fish and Wildlife unpublished survey data on the Streamnet Web Site (www.streamnet.org.); Sandy River escapement data from Oregon Department of Fish and Wildlife unpublished survey data on the Streamnet Web Site (www.streamnet.org.); and Lower Columbia River chinook salmon returns to hatcheries were taken from WDFW/ODFW (1997).*

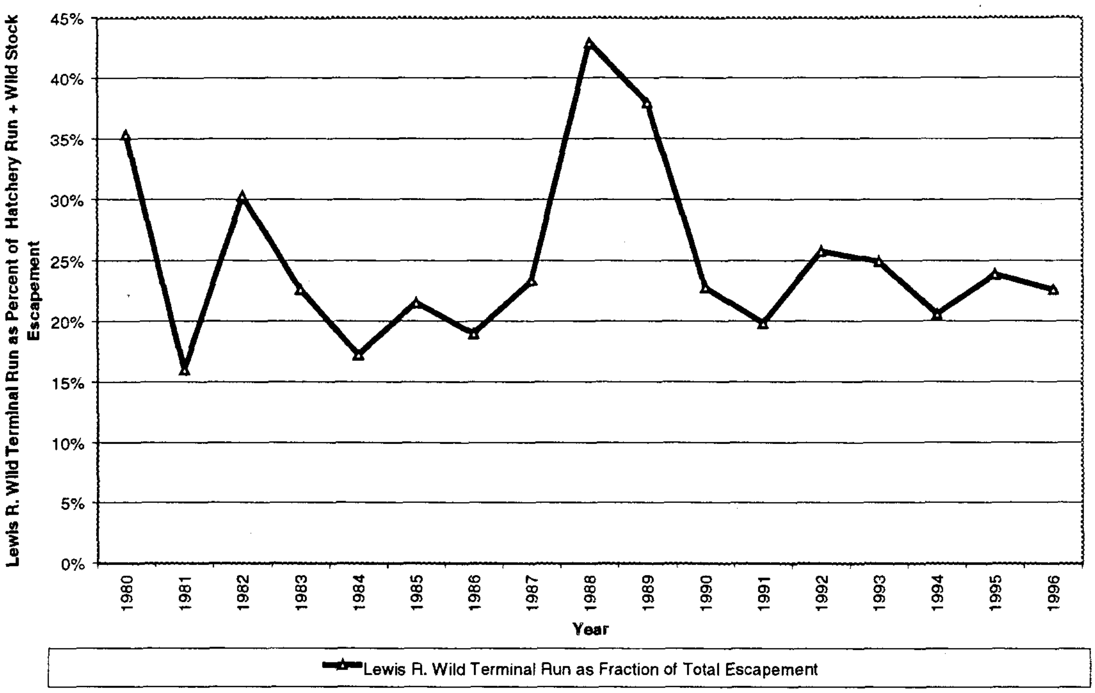

Figure 8. Lewis River naturally spawning chinook salmon escapements as a percent of the total hatchery and naturally spawning escapements of fall chinook salmon in the Lower Columbia River, 1980–1996.

Data Source: *From Tables 6 and 7.*

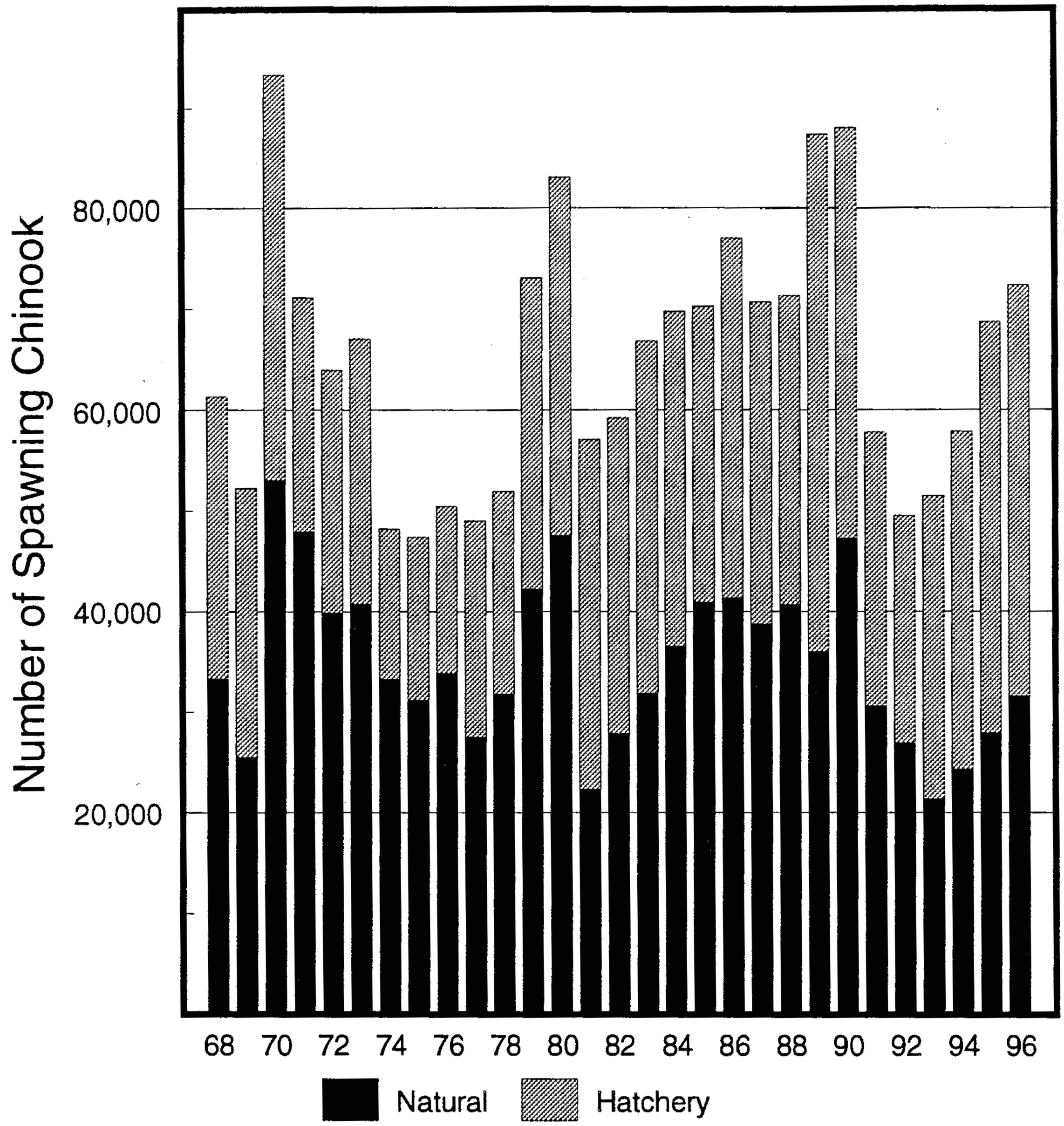

Figure 9. Cumulative natural escapements and cumulative hatchery returns to various Puget Sound stream systems, 1968–1996.

Data Source: *From Table 2.*

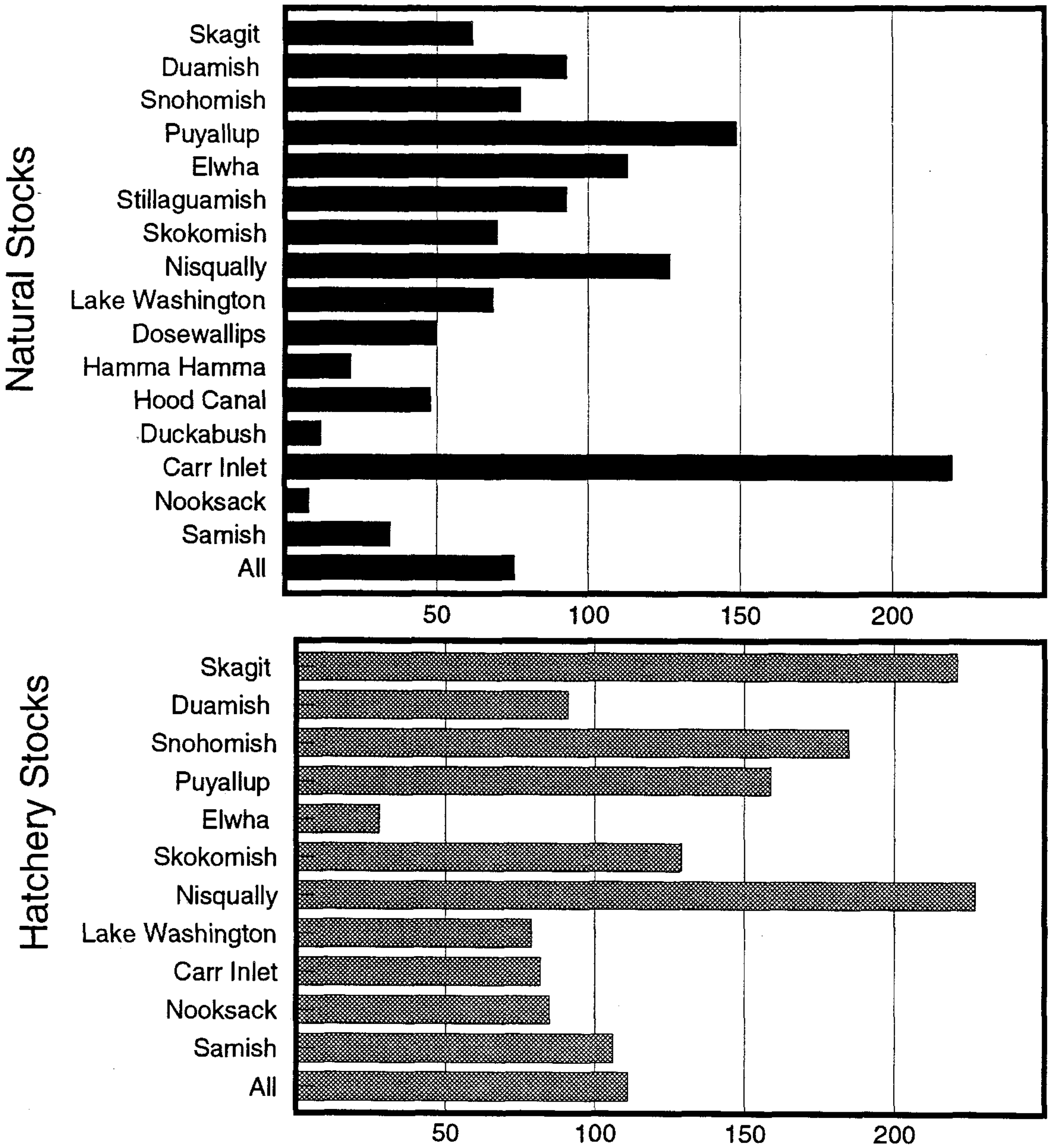

Figure 10. Average number of reproducing chinook salmon in the recent five-year period (1992–1996) divided by the long-term average number of reproducing chinook salmon (1968–1996) in various natural escapements and in various hatchery returns of Puget Sound, expressed as percentages.

Data Source: *Table 2 provides 1992–1996 and 1968–1996 average values.*