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## Part II

# Department of Commerce

**National Oceanic and Atmospheric Administration**

**50 CFR Parts 223 and 224**

**Endangered and Threatened Species: Threatened Status for Three Chinook Salmon Evolutionarily Significant Units in Washington and Oregon, and Endangered Status of One Chinook Salmon ESU in Washington; Final Rule**

**Partial 6-Month Extension on Final Listing Determinations for Four Evolutionarily Significant Units of West Coast Chinook Salmon; Proposed Rule**

**DEPARTMENT OF COMMERCE**

**National Oceanic and Atmospheric Administration**

**50 CFR Parts 223 and 224**

**[Docket No. 990303060–9071–02; I.D. 022398C]**

**RIN 0648–AM54**

## Endangered and Threatened Species; Threatened Status for Three Chinook Salmon Evolutionarily Significant Units (ESUs) in Washington and Oregon, and Endangered Status for One Chinook Salmon ESU in Washington

**AGENCY:** National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

**ACTION:** Final rule.

**SUMMARY:** NMFS is issuing final determinations to list four ESUs of west coast chinook salmon as threatened or endangered species under the Endangered Species Act (ESA) of 1973, as amended. Previously, NMFS completed a comprehensive status review of west coast chinook salmon (*Oncorhynchus tshawytscha*) which resulted in proposed listings for eight ESUs. After reviewing additional information, including biological data on the species' status and an assessment of protective efforts, NMFS now concludes that four chinook salmon ESUs warrant protection under the ESA. NMFS has determined that Puget Sound chinook salmon in Washington, Lower Columbia River chinook salmon in Washington and Oregon, and Upper Willamette spring-run chinook salmon in Oregon are at risk of becoming endangered in the foreseeable future and will be listed as threatened species under the ESA. NMFS also has determined that Upper Columbia River spring-run chinook salmon in Washington are in danger of extinction throughout all or a significant portion of their range and will be listed as an endangered species.

With respect to the Central Valley spring-run, Central Valley fall/late fall-run, and Southern Oregon and California Coastal chinook salmon ESUs proposed for listing, NMFS has found that substantial scientific disagreement precludes making final determinations and has extended the deadline for an additional 6 months to resolve these disagreements. Similarly, the proposed revision of the currently listed Snake River fall-run chinook salmon ESU to include fall-run chinook salmon in the Deschutes River, Oregon, is still under review in order to resolve substantial scientific disagreements about the information relevant to that determination. The findings regarding substantial scientific disagreement and extension of final determination for the 4 chinook salmon ESUs published in the Proposed Rules section in this **Federal Register** issue.

**DATES:** Effective May 24, 1999.

**ADDRESSES:** Branch Chief, NMFS, Northwest Region, Protected Resources Division, 525 N.E. Oregon St., Suite 500, Portland, OR 97232–2737; Salmon Coordinator, Office of Protected Resources, NMFS, 1315 East-West Highway, Silver Spring, MD 20910.

**FOR FURTHER INFORMATION CONTACT:** Garth Griffin at (503) 231–2005, or Chris Mobley at (301) 713–1401.

**SUPPLEMENTARY INFORMATION:**

### Previous Federal Actions

West coast chinook salmon have been the subject of many Federal ESA actions, which are summarized in the proposed rule (63 FR 11482, March 9, 1998). NMFS initially announced its intention to conduct a coastwide review of chinook salmon status in response to a petition to list several Puget Sound chinook salmon stocks on September 12, 1994 (59 FR 46808). After receiving a more comprehensive petition from the Oregon Natural Resources Council and Dr. Richard Nawa on February 1, 1995, NMFS reconfirmed its intention to conduct a coastwide review (60 FR 30263, June 8, 1995). During that review, NMFS requested public comment and assessed the best available scientific and commercial data, including technical information from Pacific Salmon Biological Technical Committees (PSBTCs) and other interested parties. The PSBTCs consisted primarily of scientists (from Federal, state, and local resource agencies, Indian tribes, industries, universities, professional societies, and public interest groups) possessing technical expertise relevant to chinook salmon and their habitats. The NMFS Biological Review Team (BRT), composed of staff from NMFS' Northwest, Southwest, and Auke Bay Fisheries Science Centers, as well as from the National Biological Survey, reviewed and evaluated scientific information provided by the PSBTCs and other sources. Early drafts of the BRT review were distributed to state and tribal fisheries managers and peer reviewers who are experts in the field to ensure that NMFS' evaluation was accurate and complete. The BRT then incorporated tribal and state co-manager comments into the coastwide chinook salmon status review.

Based on the results of the completed status report on west coast chinook salmon (Myers *et al.*, 1998), NMFS has identified fifteen ESUs of chinook salmon from Washington, Oregon, Idaho, and California, including 11 new ESUs, and one redefined ESU (63 FR 11482, March 9, 1998). After assessing information concerning chinook salmon abundance, distribution, population trends, and risks, and after considering efforts being made to protect chinook salmon, NMFS determined that several chinook salmon ESUs did not warrant listing under the ESA. The chinook salmon ESUs not requiring ESA protection included the Upper Klamath and Trinity River ESU, Oregon Coast ESU, Washington Coast ESU, Middle Columbia River spring-run ESU, and Upper Columbia River summer/fall-run ESU.

Also based on this evaluation, and after considering efforts being made to protect chinook salmon, NMFS proposed that seven chinook salmon ESUs warranted listing as either endangered or threatened species under the ESA. The chinook salmon ESUs proposed as endangered species included California Central Valley spring-run and Washington's Upper Columbia River spring-run chinook salmon. The chinook salmon ESUs proposed as threatened species included California Central Valley fall/late fall-run, Southern Oregon and California Coastal, Puget Sound, Lower Columbia River, and Upper Willamette River spring-run chinook salmon. Additionally, NMFS found that fall-run chinook salmon from the Deschutes River in Oregon shared a strong genetic and life history affinity to currently listed Snake River fall-run chinook. Based on this affinity, NMFS proposed to revise the existing listed Snake River fall-run ESU to include fall-run chinook salmon in the Deschutes River. The resulting revised ESU would be listed as threatened.

During the year between the proposed rule and this final determination, NMFS conducted 21 public hearings within the range of the proposed chinook salmon ESUs in California, Oregon, Washington and Idaho. NMFS accepted and reviewed public comments solicited during a 112-day public comment period. Based on these public hearings, comments, and additional technical meetings with Indian tribes and the states, NMFS has found that substantial scientific disagreements exist concerning the information relevant to making final determinations for California's Central Valley spring-run and Central Valley fall/late fall-run, Southern Oregon and California Coastal,

and Snake River fall-run ESUs. As a result, NMFS has extended the period for making final determinations for these ESUs by not more than 6 additional months. The findings regarding substantial scientific disagreement and extension of final determination for the 4 chinook salmon ESUs published in the Proposed Rules section in this **Federal Register** issue.

Also during the comment period, NMFS solicited peer and co-manager review of NMFS' proposal and received comments and new scientific information concerning the status of the chinook salmon ESUs proposed for listing. NMFS also received information regarding the relationship of existing hatchery stocks to native populations in each ESU. This new information was evaluated by NMFS' BRT and published in an updated status review for these chinook salmon entitled ''Status Review Update for West Coast Chinook Salmon (*Oncorhynchus tshawytscha*) from Puget Sound, Lower Columbia River, Upper Willamette River, and Upper Columbia River Spring-run ESUs.'' (NMFS, 1998a). This updated status review report draws conclusions about those specific ESU delineations and risk assessments. Based on the updated NMFS status review and other information, NMFS now issues its final listing determinations for those four proposed ESUs. Copies of NMFS' updated status review report and related documents are available upon request (see **ADDRESSES**).

## Species Life History and Status

Biological information for west coast chinook salmon can be found in species' status assessments by NMFS (Matthews and Waples, 1991; Waples *et al.*, 1991; NMFS, 1995; Waknitz *et al.*, 1995; Myers *et al.*, 1998; NMFS, 1998a), Oregon Department of Fish and Wildlife (ODFW, 1991; Nickelson *et al.*, 1992; Kostow *et al.*, 1995), species life history summaries (Miller and Brannon, 1982; Healey, 1991), and in previous **Federal Register** documents (56 FR 29542, June 27, 1991; 63 FR 11482, March 9, 1998).

## Summary of Comments and Information Received in Response to the Proposed Rule

NMFS held 21 public hearings in California, Oregon, Idaho, and Washington to solicit comments on this and other salmonid listing proposals (63 FR 16955, April 7, 1998; 63 FR 30455, June 4, 1998). During the 112-day public comment period, NMFS received nearly 300 written comments regarding the west coast chinook salmon proposed rule. A number of comments addressed issues pertaining to the proposed critical habitat designation for west coast chinook salmon. NMFS will address these comments in a forthcoming **Federal Register** document announcing the agency's conclusions about critical habitat for the listed ESUs.

NMFS also sought new data and analyses from tribal, state, and Federal co-managers and met with them to formally discuss technical issues associated with the chinook salmon status review. This new information and analysis was considered by NMFS' BRT in its re-evaluation of ESU boundaries and species' status; this information is discussed in an updated status review report for these chinook salmon, and a summary follows.

In addition to soliciting and reviewing public comments, NMFS must seek peer review of its listing proposals. On July 1, 1994, NMFS, jointly with the U.S. Fish and Wildlife Service (FWS), published a series of policies regarding listings under the ESA, including a policy for peer review of scientific data (59 FR 34270). In accordance with this policy, NMFS solicited 13 individuals to take part in a peer review of its west coast chinook salmon proposed rule. All individuals solicited are recognized experts in the field of chinook salmon biology, and represent a broad range of interests, including Federal, state, and tribal resource managers, and academia. Four individuals took part in the peer review of this action; new information and comments provided by the public and comments from peer reviewers were considered by NMFS' BRT and are summarized in the updated status review document (NMFS, 1998a). Copies of these documents are available upon request (see **ADDRESSES**).

A summary of comments received in response to the proposed rule follows.

*Issue 1: Sufficiency and Accuracy of Scientific Information and Analysis*

*Comment*: Some commenters questioned the sufficiency and accuracy of data NMFS employed in the listing proposal. In contrast, peer reviewers commented that the agency's status review was both credible and comprehensive, even though they may not have concurred with NMFS' conclusions.

*Response*: Section 4(b)(1)(A) of the ESA requires that NMFS make its listing determinations solely on the basis of the best available scientific and commercial data after reviewing the status of the species and taking into account any efforts being made to protect such species. NMFS believes that information contained in the agency's status review (Myers *et al.*, 1998), together with more recent information obtained in response to the proposed rule (NMFS, 1998a), represent the best scientific information presently available for the chinook salmon ESUs addressed in this final rule. NMFS has made every effort to conduct an exhaustive review of all available information and has solicited information and opinion from all interested parties, including peer reviewers as described previously. If new data become available to change these conclusions, NMFS will act accordingly.

*Comment*: Several of the comments received suggested that the ESA does not provide for the creation of ESUs, and that ESUs do not correspond to species, subspecies, or distinct population segments (DPSs) that are specifically identified in the ESA. Further, NMFS'' use of genetic information (allozyme- or DNA-derived) to determine ESU boundaries was criticized by several commenters. It was argued that allozyme-based electrophoretic data cannot be used to imply evolutionary significance, nor does it imply local adaptation. Other commenters indicated that NMFS used genetic distances inconsistently in determining the creation of ESUs. Several commenters argued that there was insufficient scientific information presented to justify the establishment of the chinook salmon ESUs discussed. Information was lacking concerning a number of ''key'' criteria for defining ESUs, such as phenotypic differences, evolutionary significance, or ecological significance of various chinook populations. Commenters contended that NMFS did not find any life history, habitat, or phenotypic characteristics that were unique to any of the ESUs discussed. Disagreement within the BRT regarding ESU delineations was also given as a reason for challenging the proposed listing decision.

*Response*: General issues relating to ESUs, DPSs, and the ESA have been discussed extensively in past **Federal Register** documents as described in this paragraph. Regarding application of its ESU policy, NMFS relies on its policy describing how it will apply the ESA definition of ''species'' to anadromous salmonid species published in 1991 (56 FR 58612, November 20, 1991). More recently, NMFS and FWS published a joint policy, which is consistent with NMFS'' policy, regarding the definition of ''distinct population segments'' (DPSs) (61 FR 4722, February 7, 1996). The earlier policy is more detailed and applies specifically to Pacific salmonids and, therefore, was used for this determination. This policy indicates that one or more naturally reproducing salmonid populations will be

considered to be distinct and, hence, a species under the ESA, if they represent an ESU of the biological species. To be considered an ESU, a population must satisfy two criteria: (1) It must be reproductively isolated from other population units of the same species, and (2) it must represent an important component in the evolutionary legacy of the biological species. The first criterion, reproductive isolation, need not be absolute but must have been strong enough to permit evolutionarily important differences to occur in different population units. The second criterion is met if the population contributes substantially to the ecological or genetic diversity of the species as a whole. Guidance on applying this policy is contained in a NOAA Technical Memorandum entitled ''Definition of 'Species' Under the Endangered Species Act: Application to Pacific Salmon'' (Waples, 1991) and in a more recent scientific paper by Waples (1995).

The National Research Council (NRC) has recently addressed the issue of defining species under the ESA (NRC, 1995). Their report found that protecting DPSs is soundly based on scientific evidence, and recommends applying an ''Evolutionary Unit'' (EU) approach in describing these segments. The NRC report describes the high degree of similarity between the EU and ESU approaches (differences being largely a matter of application between salmon and other vertebrates), and concluded that either approach would lead to similar DPS descriptions most of the time.

ESUs were identified using the best available scientific information. As discussed in the status review, genetic data were used primarily to evaluate the criterion regarding reproductive isolation, not evolutionary significance. In some cases, there was a considerable degree of confidence in the ESU determinations; in other cases, more uncertainty was associated with this process. Similarly, the risk analysis necessarily involved a mixture of quantitative and qualitative information and scientific judgement. NMFS' process for conducting its risk assessment has evolved over time as the amount and complexity of information has changed, and NMFS continues to seek and incorporate comments and suggestions to improve this process. NMFS believes that there is evidence to support the identification of DPSs for chinook salmon. The chinook salmon status review describes a variety of characteristics that support the ESU delineations for this species, including ecological and life history parameters. NMFS also assessed available allozyme data for the proposed ESUs and concludes that sufficient genetic differences existed between these and adjacent ESUs to support separate delineations.

*Issue 2: Description and Status of Chinook Salmon ESUs*

*Comment:* Some comments suggested that risk assessments were made in an arbitrary manner and that NMFS did not rely on the best available science. Several commenters questioned NMFS' methodology for determining whether a given chinook salmon ESU warranted listing. In some cases, such commenters also expressed opinions regarding whether listing was warranted for a particular chinook salmon ESU.

*Response:* Section 3 of the ESA defines the term ''endangered species'' as ''any species which is in danger of extinction throughout all or a significant portion of its range.'' The term ''threatened species'' is defined as ''any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.'' NMFS has identified a number of factors that should be considered in evaluating the level of risk faced by an ESU, including: (1) Absolute numbers of fish and their spatial and temporal distribution; (2) current abundance in relation to historical abundance and current carrying capacity of the habitat; (3) trends in abundance; (4) natural and human-influenced factors that cause variability in survival and abundance; (5) possible threats to genetic integrity (e.g., from strays or outplants from hatchery programs); and (6) recent events (e.g., a drought or changes in harvest management) that have predictable short-term consequences for abundance of the ESU. A more detailed discussion of status of individual ESUs is provided later in this document under ''Status of Chinook Salmon ESUs.''

*Issue 3: Factors Contributing to the Decline of West Coast Chinook Salmon*

*Comment:* Comments identified factors for decline that were either not identified in the status review or which they believed were not given sufficient weight in the risk analysis. For example, one commenter submitted a report to support their contention that NMFS had not addressed specific harvest regime effects on Puget Sound chinook salmon. This report (Mathews, 1997) noted that harvest of immature fish in non-terminal mixed stock fisheries results in a decrease in the average age of spawning, and causes substantial incidental mortalities in mixed stock fisheries. Other commenters contended that recent declines in chinook salmon abundance were related to natural factors such as predation and changes in ocean productivity. Furthermore, these commenters contend that NMFS did not show how the present declines were significantly different from natural variability in abundance, nor that abundances were below the current carrying capacity of the marine environment and freshwater habitat.

*Response:* The status review did not attempt to comprehensively identify factors for decline, except insofar as they contributed directly to the risk analysis. Comments on these issues will be considered carefully in the recovery planning process. Nevertheless, NMFS agrees that a multitude of factors, past and present, have contributed to the decline of west coast chinook salmon. Many of the identified factors were specifically cited as risk agents in NMFS's status review (Myers *et al.*, 1998) and listing proposal (63 FR 11482, March 9, 1998). NMFS recognizes that natural environmental fluctuations have likely played a role in the species' recent declines. However, NMFS believes other human-induced impacts (e.g., harvest in certain fisheries and widespread habitat modification) have played an equally significant role in the decline of these chinook salmon.

NMFS' status review briefly addressed the impact of adverse marine conditions and climate change, but concluded that there is considerable uncertainty regarding the role of these factors in chinook salmon abundance. At this time, we do not know whether these climate conditions represent a long-term shift in conditions that will continue into the future or short-term environmental fluctuations that can be expected to reverse soon. A recent review by Hare *et al.* (1999) suggests that these conditions could be part of an alternating 20- to 30-year long regime pattern. These authors concluded that, while at-risk salmon stocks may benefit from a reversal in the current climate/ocean regime, fisheries management should continue to focus on reducing impacts from harvest and artificial propagation and improving freshwater and estuarine habitats.

NMFS believes there is ample evidence to suggest that degradation of freshwater habitats has contributed to the decline of these chinook salmon ESUs. The past destruction, modification, and curtailment of freshwater habitat was reviewed in a recent NMFS assessment for steelhead (NMFS, 1996), and, more recently, for chinook salmon (NMFS, 1998b). Many of the identified risks and conclusions

apply specifically to these chinook salmon. Examples of habitat alterations affecting chinook salmon include: Water withdrawal, conveyance, storage, and flood control (resulting in insufficient flows, stranding, juvenile entrainment, and increased stream temperatures); logging and agriculture (resulting in loss of large woody debris, sedimentation, loss of riparian vegetation, and habitat simplification)( Spence *et al.*, 1996; Myers *et al.*, 1998). These human-induced impacts in freshwater ecosystems have likely reduced the species' resiliency to natural factors for decline such as drought and poor ocean conditions. A critical next step in restoring listed chinook salmon will be identifying and ameliorating specific factors for decline at both the ESU and population level.

With respect to predation issues raised by some commenters, NMFS has recently published reports describing the impacts of California sea lions and Pacific harbor seals upon salmonids and on the coastal ecosystems of Washington, Oregon, and California (NMFS, 1997 and 1999a). These reports conclude that in certain cases where pinniped populations co-occur with depressed salmonid populations, salmon populations may experience severe impacts due to predation. An example of such a situation is at the Ballard Locks, Washington, where sea lions are known to consume significant numbers of adult winter steelhead. These reports further conclude that data regarding pinniped predation are quite limited, and that substantial additional research is needed to fully address this issue. Existing information on the seriously depressed status of many salmonid stocks is sufficient to warrant actions to remove pinnipeds in areas of co-occurrence where pinnipeds prey on depressed salmonid populations (NMFS, 1997 and 1999a).

A discussion of the relationship between various hatchery stocks and native chinook salmon, and their potential role for recovery of specific ESUs follows in ''Status of Chinook Salmon ESUs''.

*Issue 4: ESU Delineation and Status of Puget Sound Chinook Salmon*

*Comment:* Some commented that chinook salmon within Puget Sound are too diverse to be combined into a single ESU. They urged that specific major river basins and life history types should be recognized as distinct chinook salmon ESUs. Conversely, other commenters believed that the Puget Sound ESU should include populations in southern British Columbia.

Several commenters were unsure of the accuracy of historical and present estimates for Puget Sound abundances. Furthermore, they argued that the total abundance of Puget Sound chinook salmon was ''relatively'' high, even with current harvest levels, and although there have been recent declines in escapement, these have been within levels of historical variation in abundance and did not warrant a threatened listing. It was unclear to the respondents why hatchery-derived fish were not included in the risk determination, especially if the BRT noted that they could not differentiate between hatchery and naturally produced fish. Some comments stressed that the majority of the trends in Puget Sound were actually stable or upward, and this situation was compared to the Mid-Columbia River spring-run chinook salmon ESU, where there were an equal number of upward and downward trends and relatively low abundance, a situation where NMFS did not propose ESA listings. Some commenters provided further information on the interpretation of fish abundances, and they argued that many of the stock abundances and trends listed in the status review contain a high proportion of hatchery fish and should not be included. These sites include areas in south Puget Sound and the Kitsap Peninsula. Some abundances for rivers in this area are not based on spawning escapements, but on a proportion of neighboring river escapements. Additionally, Puyallup River estimates are of poor quality and based upon a single peak live and dead spawner count. One commenter expressed the opinion that none of the populations with a large hatchery stray component (e.g. Elwha, Nisqually, and Duwamish/Green Rivers) should be used in the risk analysis.

Some comments suggested that the status review indicated that introductions from outside of the ESU (from Lower Columbia River hatcheries) may have had a considerable impact on the genetic characteristics of Puget Sound fish, and that this may have reduced the fitness of the genetics of Puget Sound stocks. Alternatively, another commenter accentuated the genetic diversity that exists in the Puget Sound ESU, arguing that the status review was misleading in the way that it emphasized the homogenizing effects of hatchery releases on the diversity of wild stock life history characteristics. The Washington Department of Fish and Wildlife (WDFW) and the Northwest Indian Fish Commission (NWIFC) did not disagree with the risk conclusion made by the previous BRT that the Puget Sound ESU was likely to become endangered in the foreseeable future (B. Sanford, WDFW, 600 Capitol Way N, Olympia, WA 98501–1091 , and G. Graves, NWIFC, 6730 Martin Way E., Olympia, WA 98506. Pers. commun., November, 1998).

*Response:* The distribution of positive and negative trends is very uneven in Puget Sound. The increasing trends are associated with populations having high hatchery influence, while downward trends are found in populations supported primarily by natural production. These data and others (e.g., declining recruit/spawner ratios in Skagit River populations) raise serious concerns about the sustainability of natural chinook salmon populations in Puget Sound. Since 1991 NMFS has made clear that although hatchery populations may be part of a salmon ESU, they are not a substitute for the conservation of natural populations in their native ecosystems. Therefore, risk analysis focuses on the health and sustainability of populations supported by natural production. This is consistent with the approach that FWS has taken under the ESA for terrestrial and freshwater species and is mandated by the ESA's focus on conserving species in their ecosystems.

New information on these issues, and on the historical and current abundance of Puget Sound chinook salmon is discussed in further detail in ''Status of Chinook Salmon ESUs''.

*Issue 5: ESU Delineation and Status of the Lower Columbia River Chinook Salmon*

*Comment:* Commenters argued that, in light of NMFS' prior determination that the Lower Columbia River coho salmon ESU did not represent a distinct species, a similar determination should have been made for Lower Columbia River chinook salmon. Other commenters concurred with NMFS' designation of the Lower Columbia River chinook salmon ESU.

*Response:* Even though there are uncertainties concerning the delineation and status of chinook salmon in this ESU, NMFS concludes that the available information, presented by other co-managers, meets thresholds for determining distinctness and evolutionary significance of these chinook salmon. Since at least several demonstrably native, natural populations of chinook salmon remain in the Lower Columbia River, there is no basis for concluding that the ESU does not exist.

*Comment:* A number of comments suggested that the abundance of some

hatchery stocks should be included in the risk determination, especially in light of the fact that many of these hatcheries contain the only representative populations from a number of river systems (which were blocked to migratory passage). A peer reviewer argued that although NMFS believes there is a potential for hatcheries to pose a risk to naturally spawning populations, there was no evidence for this to be the case. Finally, it was asserted that population abundances in this ESU are well above historical lows, and do not indicate that this ESU is in danger of extinction.

ODFW (1998) recommended that this ESU be given candidate status rather than the proposed threatened listing. Specifically, they disputed NMFS's exclusion of spring-run chinook salmon in the Sandy and Clackamas Rivers. Although these systems have received substantial introductions of fish from the upper Willamette River, ODFW (1998) argued that there is no *a priori* reason to assume that the genetic resemblance between naturally spawning fish in the Sandy and Clackamas Rivers and hatchery fish from the upper Willamette River is due to these introductions. Additionally, they also consider the several thousand upriver bright fall chinook salmon that are spawning below Bonneville Dam as part of this ESU. This population was apparently founded by strays from the upriver bright fall-run chinook salmon program at Bonneville Hatchery and are viewed by ODFW as a source of new genetic diversity. ODFW also outlined efforts to reduce the straying of Rogue River fall-run chinook salmon from the Big Creek Hatchery program. New information was provided to document the abundance of naturally spawning populations in Oregon river basins in this ESU. In all, ODFW estimated that there are some 20,000 to 30,000 natural spawners in the entire ESU.

*Response:* The pattern of abundance and trends in this ESU depends heavily on which populations are considered. Since 1991 NMFS has made clear that, although hatchery populations may be part of a salmon ESU, they are not a substitute for the conservation of natural populations in their native ecosystems. Therefore, risk analysis focuses on the health and sustainability of populations supported by natural production. This is consistent with the approach that FWS has taken under the ESA for terrestrial and freshwater species and is mandated by the ESA's focus on conserving species in their ecosystems. These issues are further addressed in detail in ''Status of Chinook Salmon ESUs'.

*Issue 6: ESU Delineation and Status of Upper Willamette River Chinook Salmon*

*Comment:* Commenters agreed with NMFS that an Upper Willamette River ESU should be defined, but argued that the hatchery populations should be included in the ESU and used in assessing the extinction risk. Given that NMFS had very little genetic or life history data from naturally spawning fish, and relied on information obtained from hatchery-produced fish to describe the ESU, commenters argued that hatchery fish should be considered part of the ESU for the determination of risk status. Finally, ODFW (1998) and one peer reviewer argued that hatchery abundances should be considered in the risk determination, because without hatchery operations the ESU might fail to persist. They also contend that total adult abundance is well above historical lows. Furthermore, it was suggested that the proposed ODFW Willamette Basin Fish Management Plan (WBFMP) would provide additional spawning habitat for naturally spawning fish and modify hatchery operations to minimize hatchery/wild interactions and loss of genetic integrity.

Information provided by ODFW (1998) indicated that the naturally spawning population in the McKenzie River Basin represents the last of five major populations in the ESU. Previously it had been suggested that a population in the North Santiam River existed; however, ODFW contended that the thermal profile of water releases from Detroit Dam significantly lowers the survival of any progeny from naturally spawning fish. ODFW concurred with the previous risk conclusion made by the BRT that the Upper Willamette River ESU is likely to become endangered in the foreseeable future (J. Martin, ODFW, 2501 SW First Avenue, P.O. Box 59, Portland, OR 97207. Pers. commun. November 1998).

*Response:* If it is true that the ESU would fail to persist without the hatchery populations, that is a strong indication that the natural populations need protection under the ESA. Also, there is no indication that the WBFMP has alleviated the risks facing these chinook salmon. In fact, Oregon's Independent Multi-disciplinary Science Team's preliminary review of the WBFMP expressed concerns related to the WBFMP's framework, effectiveness, and accountability. NMFS believes that it is too early to assess the effectiveness of this plan in reducing risks faced by spring-run chinook salmon in this ESU.

Other population-specific issues are further addressed in detail in ''Status of Chinook Salmon ESUs''.

*Issue 7: ESU Delineation and Status of the Upper Columbia River Spring-Run Chinook Salmon*

*Comment:* Several respondents agreed with NMFS that chinook salmon stocks in this ESU represent an identifiable group that merits definition as a separate ESU. A commenter contended that there was no scientific basis to exclude spring-run chinook salmon from the Rock Island Fish Hatchery Complex and Methow Fish Hatchery Complex from consideration in the risk assessment. Furthermore, commenters estimate that the total escapement of naturally spawning fish in this ESU averages around 5,000 fish, and that given the historical importance of these fish and the current ''moderate'' abundance level, a listing of ''threatened'' rather than endangered is warranted. A peer reviewer concurred with the proposed endangered listing, although he suggested that the impact of Carson National Fish Hatchery (NFH) spring-run introductions were much more limited than was indicated in the status review.

*Response:* Although there have been strays from the Leavenworth, Entiat, and Winthrop NFHs observed spawning naturally near the hatcheries, there is little evidence these fish have strayed into the upper portions of the watersheds or hybridized extensively with the natural populations. Marked strays from other, out-of basin, programs (e.g., Dworshak NFH) have been found on the natural spawning grounds. These issues are further addressed in detail in the ''Status of Chinook Salmon ESUs''.

*Issue 8: Consideration of Existing Conservation Measures*

*Comment:* Several comments expressed concerns about NMFS' reliance and characterization of the efficacy of the Northwest Forest Plan (NFP), citing significant differences in management practices between various Federal land management agencies.

*Response:* In the listing proposal, NMFS noted that the NFP requires specific management actions on Federal lands, including actions in key watersheds in Puget Sound, the Lower Columbia, and Upper Willamette Rivers that comply with special standards and guidelines designed to preserve their refugia functions for at-risk salmonids (i.e., watershed analysis must be completed prior to timber harvests and other management actions, road miles should be reduced, no new roads can be built in roadless areas, and restoration

activities are prioritized). In addition, the most significant element of the NFP for anadromous fish is its Aquatic Conservation Strategy (ACS), a regional-scale aquatic ecosystem conservation strategy that includes: (1) Special land allocations (such as key watersheds, riparian reserves, and late-successional reserves) to provide aquatic habitat refugia; (2) special requirements for project planning and design in the form of standards and guidelines; and (3) new watershed analysis, watershed restoration, and monitoring processes. These ACS components collectively ensure that Federal land management actions achieve a set of nine ACS objectives that strive to maintain and restore ecosystem health at watershed and landscape scales to protect habitat for fish and other riparian-dependent species and resources and to restore currently degraded habitats. NMFS will continue to support the NFP strategy and address Federal land management issues via ESA section 7 consultations in concert with this strategy.

*Comment:* Several comments expressed concern over the need to list these chinook salmon ESUs and the effects of these listings on Indian resources, programs, land management, and associated Trust responsibilities. Particular concern was expressed about the effects of listing Puget Sound chinook salmon on tribal fishing for this and other species, and further noted that the tribes had foregone significant harvest opportunities in the interest of protecting at-risk salmon stocks.

*Response:* NMFS believes that the best available scientific information supports listing these chinook salmon ESUs under the ESA. NMFS acknowledges that these listings may impact Indian resources, programs, land management and associated Trust responsibilities. NMFS will continue to work closely with affected Indian tribes as harvest and other management issues arise and will continue to support the development of strong and credible tribal and state conservation efforts to restore listed chinook salmon and other west coast salmon populations.

**Summary of Chinook Salmon ESU Determinations**

The following is a summary of NMFS' ESU determinations for the species. A more detailed discussion of ESU determinations is presented in the chinook salmon status review (Myers *et al.*, 1998) and the recent status review update (NMFS, 1998a). Copies of these documents are available upon request (see **ADDRESSES**).

NMFS also evaluated the relationship between hatchery and natural populations of chinook salmon in these ESUs. In examining this relationship, NMFS scientists consulted with hatchery managers to determine whether any hatchery populations are similar enough to native, naturally spawned fish to be considered part of the biological ESU (NMFS, 1999b).

*(1) Puget Sound Chinook Salmon ESU*

This ESU includes all naturally spawned chinook populations residing below impassable natural barriers (e.g., long-standing, natural waterfalls) in the Puget Sound region from the North Fork Nooksack River to the Elwha River on the Olympic Peninsula, inclusive. NMFS reviewed, and reiterates, its previous conclusions that chinook salmon in the Elwha, North Fork Nooksack, and South Fork Nooksack Rivers are part of the Puget Sound ESU, while chinook salmon populations from Southern British Columbia are not. The Puget Sound chinook salmon ESU corresponds closely to the Puget Lowland Ecoregion. Although the Elwha River chinook salmon population does fall outside this Ecoregion, its genetic and life history attributes show it is a transitional population between Washington Coast and Puget Sound ESUs. NMFS did not receive any new information that suggests its proposed determination was inaccurate.

As a result of the extensive history of artificial production in Puget Sound, it was difficult to clearly distinguish between some historic natural runs of chinook, and naturally spawning populations resulting from hatchery introductions. Based on comments received and technical meetings with co-managers, NMFS concludes that, unless there is sufficient evidence that they resulted from out-of-ESU introductions, naturally spawned populations within the geographic boundaries of the Puget Sound ESU generally should be considered part of the biological ESU. One exception is that naturally-spawning descendants from the spring-run chinook salmon program at the Quilcene National Fish Hatchery (Quilcene and Sol Duc stocks) and their progeny are not considered part of the Puget Sound ESU. NMFS believes that the inclusion of naturally spawning chinook populations founded by hatchery populations which originated from within the ESU (even if they may not be representative of the historical local stock or which may represent a mixture of within-ESU stocks) may play an important role in the recovery process. What role individual populations might play in recovery will be determined during the recovery process, taking into consideration the origin and status of the current population.

**Hatchery Populations Pertaining to the ESU**

NMFS identified 38 hatchery stocks associated with the Puget Sound ESU (NMFS, 1999b; Table 1).

TABLE 1.—STATUS OF PUGET SOUND CHINOOK SALMON HATCHERY STOCKS

| Hatchery population | Run | In/out of ESU? | Essential for recovery? | Listed? |
|---|---|---|---|---|
| Kendall Ck | Spring | In | Yes | Yes. |
| Kendall Ck./Samish R | Fall | In | No | No. |
| Clark Ck | Fall | In | No | No. |
| Marblemount (I) | Summer | In | No | No. |
| Marblemount (II) | Summer | In | No | No. |
| Marblemount | Spring | In | No | No. |
| N. Fk. Stillaguamish R | Summer | In | Yes | Yes. |
| May Ck./Wallace R | Summer | In | No | No. |
| Soos Ck | Fall | In | No | No. |
| Tulalip Tribal | Fall | In | No | No. |
| Tulalip Tribal | Spring | In | No | No. |
| Puyallup | Fall | In | No | No. |
| Minter Ck | Fall | In | No | No. |
| Coulter Ck | Fall | In | No | No. |
| Keta Ck | Fall | In | No | No. |
| Grover's Ck | Fall | In | No | No. |

TABLE 1.—STATUS OF PUGET SOUND CHINOOK SALMON HATCHERY STOCKS—Continued

| Hatchery population | Run | In/out of ESU? | Essential for recovery? | Listed? |
|---|---|---|---|---|
| Garrison Springs | Fall | In | No | No. |
| Kalama Ck | Fall | In | No | No. |
| Nisqually (Clear Ck.) | Fall | In | No | No. |
| McAllister Ck | Fall | In | No | No. |
| Deschutes R. (WA) | Fall | In | No | No. |
| Little Boston Ck | Fall | In | No | No. |
| George Adams | Fall | In | No | No. |
| Hoodsport | Fall | In | No | No. |
| Skokomish (Enetai) | Fall | In | No | No. |
| Big Beef Ck | Fall | In | No | No. |
| Samish R | Fall | In | No | No. |
| Lummi Sea Ponds | Fall | In | No | No. |
| Bellingham Heritage | Fall | In | No | No. |
| Glenwood Springs | Fall | In | No | No. |
| Univ. of Washington | Fall | In | No | No. |
| Issaquah Ck | Fall | In | No | No. |
| White R | Spring | In | Yes | Yes. |
| Sol Duc | Spring | Out | No | No. |
| Finch Ck | Fall | In | No | No. |
| Quilcene R | Spring | Out | No | No. |
| Dungeness R | Spring | In | Yes | Yes. |
| Elwha R | Fall | In | Yes | Yes. |

NMFS has revised the criteria used by the BRTs to decide whether or not a hatchery population is part of the biological ESU. Details of these new criteria are discussed in the ''Evaluation of the Status of Chinook and Chum Salmon and Steelhead Hatchery Populations for ESUs Identified in Final Listing Determinations'' memo (NMFS, 1999b). After reviewing the best available information regarding the relationship between hatchery and natural populations in this ESU, NMFS concludes that 36 hatchery stocks should be considered part of the ESU. The listing status of the hatchery stocks is described later in this document under ''Status of Chinook Salmon ESUs.''

*(2) Lower Columbia River Chinook Salmon ESU*

This ESU includes all naturally spawned chinook populations residing below impassable natural barriers (e.g., long-standing, natural waterfalls) from the mouth of the Columbia River to the crest of the Cascade Range just east of the Hood River in Oregon and the White Salmon River in Washington. This ESU excludes populations above Willamette Falls, and others as specifically noted in the discussion that follows. Within this ESU, there are historic runs of three different chinook salmon populations: spring-run, tule, and late-fall ''bright'' chinook salmon.

NMFS discussed at length the status of several chinook salmon populations in the Lower Columbia River. As discussed in the preceding ESU section, because of the extensive history of artificial production in the Lower Columbia River, it was difficult to clearly distinguish between historic natural runs of chinook, and naturally spawning populations resulting from hatchery introductions. Based on comments received and technical meetings with co-managers, NMFS concludes that, unless there is sufficient evidence that they resulted from out-of-ESU introductions, naturally spawned populations within the geographic boundaries of the Lower Columbia River ESU generally should be considered part of the biological ESU. NMFS believes that the inclusion of naturally spawned chinook populations founded by hatchery populations which originated from within the ESU (even if they may not be representative of the historical local stock or which may represent a mixture of within-ESU stocks) may play an important role in the recovery process. What role individual populations might play in recovery will be determined during the recovery process, taking into consideration the origin and status of the current population.

NMFS concludes that, based on new information received since the proposed rule, although fish introduced from the Upper Willamette River ESU have probably interbred with indigenous spring-run chinook salmon in the Sandy River, this population still retains some genetic characteristics from the native population. In light of the extirpation of the majority of the spring-run populations in this ESU and despite the history of introductions from outside of the ESU, this population may be an important genetic resource and is considered part of the Lower Columbia River ESU. In contrast, naturally spawned Clackamas River spring-run chinook salmon are considered part of the Upper Willamette River ESU, and the fall-run fish, descended from Upper Columbia River Bright hatchery stocks, that spawn in the mainstem Columbia River below Bonneville Dam and in other Bonneville Pool tributaries (Lower River brights) are considered part of the Upper Columbia River summer- and fall-run ESU. Not included in this ESU are spring-run chinook salmon derived from the Round Butte Hatchery (Deschutes River, Oregon) (and their progeny) and spawning in the Hood River, spring-run chinook salmon derived from the Carson NFH (and their progeny) and spawning in the Wind River, and naturally spawning fish originating from the Rogue River fall chinook program (and their progeny).

Hatchery Populations Pertaining to the ESU

NMFS identified 23 hatchery stocks associated with the Lower Columbia River ESU (NMFS, 1999b; Table 2).

TABLE 2.—STATUS OF LOWER COLUMBIA RIVER CHINOOK SALMON HATCHERY STOCKS

| Hatchery population | Run | In/out of ESU? | Essential for recovery? | Listed? |
|---|---|---|---|---|
| Sea Resources Net Pens | Fall | In | No | No. |
| Abernathy SCTC | Fall | In | No | No. |
| Grays R | Fall | In | No | No. |
| Elochomin | Fall | In | No | No. |
| Cowlitz R | Spring | In | Yes | No |
| Cowlitz R | Fall | In | No | No. |
| Toutle R | Fall | In | No | No. |
| Kalama R | Spring | In | No | No. |
| Kalama R | Fall | In | No | No. |
| Lewis R | Spring | In | No | No. |
| Washougal R | Fall | In | No | No. |
| Carson NFH | Spring | Out | No | No. |
| Little White Salmon R | Fall | Out | No | No. |
| Spring Ck. NFH | Fall | In | No | No. |
| Klickitat R | Fall | Out | No | No. |
| Youngs Bay | Spring | Out | No | No. |
| Big Ck. (13) | Fall | In | No | No. |
| Rogue R (52) | Fall | Out | No | No. |
| Klaskanine R | Spring | Out | No | No. |
| Klaskanine R (15) | Fall | In | No | No. |
| Bonneville H. URB (95) | Fall | Out | No | No. |
| Sandy R (Clackamas 19) | Spring | Out | No | No. |
| Hood River (66) | Spring | Out | No | No. |

After reviewing the best available information regarding the relationship between hatchery and natural populations in this ESU, NMFS concludes that 14 hatchery stocks should be considered part of the ESU and the remaining nine stocks not part of the ESU (Table 2). The listing status of the hatchery stocks is described later in this document under ''Status of Chinook Salmon ESUs.''

*(3) Upper Willamette River Chinook Salmon ESU*

NMFS reviewed its previous decision on the proposed designation of the Upper Willamette River ESU. Information provided by ODFW (1998) indicates that at present the only significant natural production of spring-run chinook salmon occurs in the McKenzie River Basin. Previously, Nicholas *et al.* (1995) had also suggested that a self-sustaining population may exist in the North Santiam River Basin. In general, NMFS considers that naturally spawned spring-run chinook salmon are part of the ESU, unless it can be shown to have originated from outside of the ESU. NMFS specifically excludes fall-run chinook salmon from this ESU. Fall-run fish are not native to the basin, having been introduced above Willamette Falls on several occasions throughout this century and, therefore, are not part of this ESU. NMFS did not determine to which ESU, if any, these fall-run fish belong.

As previously described, NMFS concludes that the presently naturally spawned population of spring-run chinook salmon in the Clackamas River derives from this ESU. NMFS could not determine, based on available information, whether this represents an historical affinity or a recent, human-mediated expansion into the Clackamas River. In any case, the current Clackamas River population represents a genetic resource that might be useful in the recovery of the Upper Willamette River ESU.

Hatchery Populations Pertaining to the ESU

NMFS identified 6 hatchery stocks associated with the Upper Willamette River ESU (NMFS, 1999b; Table 3).

TABLE 3.—STATUS OF UPPER WILLAMETTE RIVER CHINOOK SALMON HATCHERY STOCKS

| Hatchery population | Run | In/out of ESU? | Essential for recovery? | Listed? |
|---|---|---|---|---|
| N. Fk. Santiam R. (21) | Spring | In | No | No. |
| M. Fk. Willamette R. (22) | Spring | In | No | No. |
| McKenzie R. (23) | Spring | In | No | No. |
| S. Fk. Santiam R. (24) | Spring | In | No | No. |
| Clackamas R. (19) | Spring | In | No | No. |
| Stayton Ponds (14) | Fall | Out | No | No. |

After reviewing the best available information regarding the relationship between hatchery and natural populations in this ESU, NMFS concludes that all but the Stayton Ponds hatchery stock should be considered part of the ESU (Table 3). The listing status of the hatchery stocks is described later in this document under ''Status of Chinook Salmon ESUs.''

*(4) Upper Columbia River Spring-run Chinook Salmon ESU*

Although the spring-run chinook salmon populations in this ESU were effectively homogenized during the implementation of the Grand Coulee Fish Management Program (GCFMP) (1939–1943), NMFS concurs with its previous conclusion that this ESU contains the only remaining genetic resources of those spring-run chinook

salmon that migrated into the upper Columbia River Basin (including fish that would have spawned in Canada) and is distinct from other stream-type chinook salmon ESUs. After considering information provided by co-managers, NMFS determined that naturally spawning spring-run chinook salmon (and their progeny) derived from Carson NFH are not part of this ESU. Hatchery Populations Pertaining to the ESU

NMFS identified 10 hatchery stocks associated with the Upper Columbia River spring-run ESU (NMFS, 1999b; Table 4).

TABLE 4.—STATUS OF UPPER COLUMBIA RIVER SPRING-RUN CHINOOK SALMON HATCHERY STOCKS

| Hatchery population | Run | In/out of ESU? | Essential for recovery? | Listed? |
|---|---|---|---|---|
| Winthrop NFH | Spring | Out | No | No. |
| Entiat NFH | Spring | Out | No | No. |
| Leavenworth NFH | Spring | Out | No | No. |
| Chiwawa R. | Spring | In | Yes | Yes. |
| Methow R. | Spring | In | Yes | Yes. |
| Twisp R. | Spring | In | Yes | Yes. |
| Chewuch R. | Spring | In | Yes | Yes. |
| White R. | Spring | In | Yes | Yes. |
| Nason Cr. | Spring | In | Yes | Yes. |
| Ringold H. | Spring | Out | No | No. |

After reviewing the best available information regarding the relationship between hatchery and natural populations in this ESU, NMFS concludes that six hatchery stocks should be considered part of the ESU and the remaining four stocks not part of the ESU (Table 4). The listing status of the hatchery stocks is described later in this document under ''Status of Chinook Salmon ESUs.''

**Summary of Factors Affecting Chinook Salmon**

Section 4(a)(1) of the ESA and NMFS' listing regulations (50 CFR part 424) set forth procedures for listing species. The Secretary of Commerce (Secretary) must determine, through the regulatory process, if a species is endangered or threatened based upon any one or a combination of the following factors: (1) The present or threatened destruction, modification, or curtailment of its habitat or range; (2) overutilization for commercial, recreational, scientific, or educational purposes; (3) disease or predation; (4) inadequacy of existing regulatory mechanisms; or (5) other natural or human-made factors affecting its continued existence.

The factors threatening naturally spawned chinook salmon throughout its range are numerous and varied. The present depressed condition is the result of several long-standing, human-induced factors (e.g., habitat degradation, water diversions, harvest, and artificial propagation) that serve to exacerbate the adverse effects of natural environmental variability from such factors as drought, floods, and poor ocean conditions.

As noted earlier, NMFS received numerous comments regarding the relative importance of various factors contributing to the decline of chinook salmon. A summary of various risk factors and their roles in the decline of west coast chinook salmon was presented in NMFS' March 9, 1998, proposed rule (63 FR 11482), as well as in several ''Factors for Decline'' reports published in conjunction with proposed rules for steelhead and for chinook (NMFS, Factors Contributing to the Decline of Chinook Salmon: An Addendum to the 1996 West Coast Steelhead Factors for Decline Report, June, 1998 (NMFS 1998b); NMFS, Factors for Decline: A Supplement to the Notice of Determination for West Coast Steelhead Under the Endangered Species Act, 1996, NMFS, 1996).

**Efforts Being Made To Protect West Coast Chinook Salmon**

Under section 4(b)(1)(A) of the ESA, the Secretary of Commerce is required to make listing determinations solely on the basis of the best scientific and commercial data available and after taking into account efforts being made to protect a species. During the status review for west coast chinook salmon and for other salmonids, NMFS reviewed protective efforts ranging in scope from regional strategies to local watershed initiatives; some of the major efforts are summarized in the March 9, 1998, proposed rule (63 FR 11482). Since then, NMFS has received some new information regarding these and other efforts being made to protect chinook salmon. Notable efforts within the range of the chinook ESUs proposed for listing continue to be the NFP, PACFISH, Lower Columbia River National Estuary Program, Lower Columbia Steelhead Conservation Initiative, Oregon Plan for Salmon and Watersheds, Washington Wild Stock Restoration Initiative, and Washington Wild Salmonid Policy.

An additional Federal effort affecting the Upper Columbia River spring-run chinook salmon ESU, the Interior Columbia Basin, Ecosystem Management Project (ICBEMP), was not addressed in the proposed rule. The ICBEMP addresses Federal lands in this region that are managed under U.S. Forest Service (USFS) and Bureau of Land Management (BLM) Land and Resource Management Plans (LRMPs) or Land Use Plans which are amended by PACFISH. PACFISH provides objectives, standards and guidelines that are applied to all Federal land management activities such as timber harvest, road construction, mining, grazing, and recreation. USFS and BLM implemented PACFISH in 1995 and intended it to provide interim protection to anadromous fish habitat while a longer term, basin scale aquatic conservation strategy was developed in the ICBEMP. It is intended that ICBEMP will have a Final Environmental Impact Statement and Record of Decision by early 2000.

For other ESUs already listed in the Interior Columbia Basin (e.g., Snake River chinook, Snake River steelhead, Upper Columbia River steelhead), NMFS' ESA section 7 consultations have required several components that are in addition to the PACFISH strategy (NMFS, 1995; NMFS, 1998c). NMFS, USFS, and BLM intend these additional components to bridge the gap between interim PACFISH direction and the longterm strategy envisioned for ICBEMP. NMFS anticipates that these components will also be carried forward in the ICBEMP direction. These components include (but are not limited to) implementation monitoring and

accountability, a system of watersheds that are prioritized for protection and restoration, improved and monitored grazing systems, road system evaluation and planning requirements, mapping and analysis of unroaded areas, multi-year restoration strategies, and batching and analyzing projects at the watershed scale. Given the timeframe for ICBEMP, NMFS will likely conduct similar additional section 7 consultations for the LRMPs within the Upper Columbia River spring-run chinook salmon ESU and will then consult on ICBEMP when it is complete.

In the range of the Lower Columbia and Willamette River ESUs, several notable efforts have recently been initiated. Harvest, hatchery, and habitat protections under state control are evolving under the Oregon Plan for Salmon and Watersheds (Plan). The plan is a long-term effort to protect all at-risk wild salmonids through cooperation between state, local and Federal agencies, tribal governments, industry, private organizations and individuals. Parts of the Plan are already providing benefits including an aggressive program by the Oregon Department of Transportation to inventory, repair, and replace road culverts that block fish from reaching important spawning and rearing areas. The Plan also encourages efforts to improve conditions for salmon through non-regulatory means, including significant efforts by local watershed councils. An Independent Multi disciplinary Science Team provides scientific oversight to plan components and outcomes. A recent Executive Order from Governor Kitzhaber reinforced his expectation that all state agencies will make improved environmental health and salmon recovery part of their mission.

Protecting and restoring fish and wildlife habitat and population levels in the Willamette River Basin, promoting proper floodplain management, and enhancing water quality is the focus of the recently formed Willamette Restoration Initiative (WRI). The WRI creates a mechanism through which residents of the basin are mounting a concerted, collaborative effort to restore watershed health. In addition, habitat protection and improved water quality in the Portland/Vancouver metropolitan areas are getting unprecedented attention from local jurisdictions. The regional government, Metro, recently adopted an aggressive stream and floodplain protection ordinance designed to protect functions and values of floodplains, and natural stream and adjacent vegetated corridors. All jurisdictions in the region must amend their land use plans and implementing ordinances to comply with the Metro ordinance within 18 months. Metro also has a Green spaces acquisition program that addresses regional biodiversity, and is giving protection to significant amounts of land, some of it on the Sandy River or on tributaries to the Willamette River. The City of Portland has identified those activities which impact salmonids and is now using that information to reduce impacts of existing programs and to identify potential enhancement actions. The City will shortly be making significant improvements in its storm water management program, a key to reducing impacts on salmonid habitat.

Across the Columbia River in Washington State, critical riparian areas are being acquired and preserved under Clark County's Conservation Futures Open Space Program. This program is entirely locally funded and has already acquired more than 2,000 acres of habitat critical to numerous fish and wildlife species. Improvements to the county's Critical Areas Ordinance are also under consideration and an 18 member task force has been formed to develop a salmonid recovery plan. Also, an inventory of factors limiting salmonid survival is being compiled for individual lower Columbia River watersheds in Washington State by the Lower Columbia River Fish Recovery Board. Established by the State Legislature, the Board will begin using this information later this year to help prioritize and implement improved land-use regulations and habitat restoration activities over a five-county area.

In the lower Columbia River, salmonid populations were seriously depleted long before increasing predator populations posed any significant threat to their long-term survival. Various development and management actions have interrupted the natural balance between predator and prey populations, and this situation now poses a risk to struggling salmonid populations. For example, steps have already been taken this year by the U.S. Army Corps of Engineers (COE), FWS, Oregon and Washington Fish and Wildlife agencies and NMFS to relocate at least 90 percent of a Caspian tern colony away from areas in the lower Columbia where their primary food is juvenile salmonids.

NMFS and FWS are also engaged in an ongoing effort to assist in the development of multiple species Habitat Conservation Plans (HCPs) for state and privately owned lands in Oregon and Washington. While section 7 of the ESA addresses species protection associated with Federal actions and lands, Habitat Conservation Planning under section 10 of the ESA addresses species protection on private (non-Federal) lands. HCPs are particularly important since well over half of the habitat in the range of the Puget Sound, Lower Columbia River, and Upper Willamette spring-run chinook ESUs is in non-Federal ownership. The intent of the HCP process is to ensure that any incidental taking of listed species will not appreciably reduce the likelihood of survival of the species, reduce conflicts between listed species and economic development activities, and to provide a framework that would encourage ''creative partnerships'' between the public and private sectors and state, municipal, and Federal agencies in the interests of endangered and threatened species and habitat conservation.

NMFS will continue to evaluate state, tribal, and non-Federal efforts to develop and implement measures to protect and begin the recovery of chinook salmon populations within these ESUs. Because a substantial portion of land in these ESUs is in state or private ownership, conservation measures on these lands will be key to protecting and recovering chinook salmon populations in these ESUs. NMFS recognizes that strong conservation benefits will accrue from specific components of many non-Federal conservation efforts.

While NMFS acknowledges that many of the ongoing protective efforts are likely to promote the conservation of chinook salmon and other salmonids, some are very recent and few address salmon conservation at a scale that is adequate to protect and conserve entire ESUs. NMFS concludes that existing protective efforts are inadequate to preclude a listing for the Puget Sound, Upper Columbia River spring-run, Lower Columbia River, and Upper Willamette River ESUs. However, NMFS will continue to encourage these and future protective efforts and will work with Federal, state, and tribal fisheries managers to evaluate, promote, and improve efforts to conserve chinook salmon populations.

**Status of Chinook Salmon ESUs**

Section 3 of the ESA defines the term ''endangered species'' as ''any species which is in danger of extinction throughout all or a significant portion of its range.'' The term ''threatened species'' is defined as ''any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.'' Thompson (1991) suggested that conventional rules of thumb, analytical

approaches, and simulations may all be useful in making this determination. In previous status reviews (e.g., Weitkamp *et al.,* 1995), NMFS has identified a number of factors that should be considered in evaluating the level of risk faced by an ESU, including: (1) absolute numbers of fish and their spatial and temporal distribution; (2) current abundance in relation to historical abundance and current carrying capacity of the habitat; (3) trends in abundance; (4) natural and human-influenced factors that cause variability in survival and abundance; (5) possible threats to genetic integrity (e.g., from strays or outplants from hatchery programs); and (6) recent events (e.g., a drought or changes in harvest management) that have predictable short-term consequences for abundance of the ESU.

During the coastwide status review for chinook salmon, NMFS evaluated both quantitative and qualitative information to determine whether any proposed ESU is threatened or endangered according to the ESA. The types of information used in these assessments are described in the proposed rule, published March 9, 1998 (63 FR 11482). The assessments also considered whether any of the hatchery populations identified in ''Summary of Chinook Salmon ESU Determinations'' should be considered essential for the recovery of a listed ESU. The following summaries draw on these quantitative and qualitative assessments to describe NMFS' conclusions regarding the status of each chinook salmon ESU. A more detailed discussion of the status of these chinook salmon ESUs is presented in the updated status review (NMFS, 1998a).

*(1) Puget Sound Chinook Salmon ESU*

Updated abundance information through 1997–98 was obtained for almost all streams in the Puget Sound ESU. Recent estimated escapements of chinook salmon to rivers in this ESU ranged from 38 spring/summer-run chinook salmon in the Dungeness River to almost 7,000 summer/fall chinook salmon in the Skagit River Basin. Most of the 36 streams with data available continue to exhibit declines in estimated abundance. Seven of the 10 streams with positive trends in abundance are considered to be influenced by hatchery fish. Both long- and short-term trends for natural chinook salmon runs in North Puget Sound were negative, with few exceptions. In South Puget Sound, both long- and short-term trends in abundance were predominantly positive (NMFS, 1998a).

Estimating historic abundance is difficult. Bledsoe *et al.* (1989) estimated that the total Puget Sound catch in 1908 was approximately 670,000 fish (based on a catch of 2.1 million kg.), at a time when both ocean harvest and hatchery production were negligible. This estimate, as with other historical estimates, should be viewed cautiously. Puget Sound cannery pack probably included a portion of fish landed at Puget Sound ports but originating in adjacent areas, and cannery pack represents only a portion of the total catch. Also, the estimates of exploitation rates used in run-size expansions are not based on precise data. Recent mean spawning escapements totaling 71,000 correspond to a naturally spawning escapement entering Puget Sound of approximately 160,000 fish based on run reconstruction of escapement and commercial landings within Puget Sound (Big Eagle and LGL, 1995). Expanding this estimate by the fraction of 1982–1989 average total harvest mortalities of Puget Sound chinook salmon stocks in intercepting ocean fisheries (exclusive of U.S. net fisheries) and U.S. recreational fisheries would yield a recent average potential run size of 426,000 chinook salmon (both hatchery and wild adults) into Puget Sound (Pacific Salmon Commission (PSC) 1994, appendices F and G).

Currently, escapement to rivers in Puget Sound and Hood Canal is monitored by WDFW and the Northwest Indian tribes. The Nooksack River has spring/summer-runs in the north and south forks. Escapement to the South Fork is monitored by redd counts, and the stock is believed to have little hatchery influence. Both stocks were rated as ''critical'' by WDFW because of chronically low spawning escapements. The Skagit River supports three spring-runs, two summer-runs and a fall-run. Mean spawning escapement of the summer/fall-run has been almost 7,000 fish and has been declining (NMFS, 1998a). Of the six stocks in the Skagit River Basin identified by WDF *et al.* (1993), two are rated healthy, three depressed, and one of unknown status. On the Stillaguamish River, the combined escapement goal has been met only twice since 1978, and the most recent mean abundance consisted of just over 1,000 fish (NMFS, 1998a). Both runs were rated as ''depressed'' by WDFW (WDF *et al.,* 1993). Of four runs identified in the Snohomish River system, two are rated depressed, one unknown, and one as healthy. Although estimating Puget Sound chinook escapement is complicated by large numbers of naturally spawning hatchery fish, populations least affected by hatcheries are in the northern part of the sound in the Nooksack, Skagit, Stillaguamish, and Snohomish River systems.

In Hood Canal, summer/fall-run chinook salmon spawn in the Skokomish, Union, Tahuya, Duckabush, Dosewallips and Hamma Hamma Rivers. Because of transfers of hatchery fish, these spawning populations are considered to be a single stock (WDF *et al.,* 1993). Fisheries in the area are managed primarily for hatchery production and secondarily for natural escapement; high harvest rates directed at hatchery stocks have resulted in failure to meet natural escapement goals in most years (FWS, 1997). The 5-year geometric mean natural spawning escapement has been just over 1,000 (NMFS, 1998a), with negative short- and long-term trends.

The ESU also includes the Dungeness and Elwha Rivers, which have natural chinook salmon runs as well as hatcheries. The Dungeness River has a run of spring/summer-run chinook salmon with a 5-year geometric mean natural escapement of only 38 fish (NMFS, 1998a). WDFW maintains a captive broodstock program using offspring from local redds on the Dungeness River because of the severely depressed numbers (Crawford, 1998). The Elwha River has a 5-year geometric mean escapement of just over 1,500 fish (NMFS 1998a), but it contains two hatcheries, both lacking adequate adult recovery facilities. Egg take at the hatcheries is augmented from natural spawners, and hatchery fish are known to spawn in the wild. Consequently, hatchery and natural spawners are not considered discrete stocks (WDF *et al.,* 1993). Both the Dungeness and Elwha River populations exhibit severely declining recent trends in abundance (NMFS, 1998a). Furthermore, only limited accessible spawning habitat remains in the Elwha River Basin, and it is uncertain whether the existing population could persist without hatchery intervention.

As reported in the status review (Myers *et al.,* 1998), a substantial amount of habitat throughout the Puget Sound region has been degraded or blocked by dams and other barriers. In general, upper tributaries have been negatively affected by forest practices and lower tributaries and mainstem rivers have been impacted by agriculture and/or urbanization. Diking for flood control, draining and filling of freshwater and estuarine wetlands, and sedimentation due to forest practices and urban development are cited as problems throughout the ESU (WDF *et*

*al.,* 1993). Blockages by dams, water diversions, and shifts in flow regime due to hydroelectric development and flood control projects are major habitat problems in several basins (Bishop and Morgan, 1996; Puget Sound Salmon Stock Review Group, 1997). Increasing percentages of land in the Puget Sound area are composed of impermeable surfaces, and the reductions in habitat quality due to point-and non-point source pollutants have been widespread (McCain *et al.,* 1988; Puget Sound Water Quality Authority, 1988; Palmisano *et al.*, 1993), and the direct and indirect impacts of the reduction in habitat quality on chinook salmon have just begun to be explored. For example, recent research has shown that juvenile chinook salmon from a contaminated estuary in Puget Sound are more susceptible to disease pathogens than are juvenile chinook salmon from a non-urban estuary (Arkoosh *et al.,* 1998a and 1998b).

Harvest impacts on Puget Sound chinook salmon stocks have been quite high in the past. Ocean exploitation rates on natural stocks averaged 56–59 percent; total exploitation rates on some stocks have exceeded 90 percent (PSC, 1994). Although total exploitation rates averaged 68–83 percent for the 1982–89 brood years (PSC, 1994), there is some evidence they have decreased in the past 3 to 4 years (Peter Dygert, NMFS, 7600 Sand Point Way N.E. Seattle, WA 98115–0070. Pers. comm., February 18, 1998). Recent changes in hatchery management practices may include a program to mass mark hatchery chinook salmon with adipose fin clips (Bruce Sanford, WDFW, 600 Capitol Way N, Olympia, WA 98501–1091. Pers. comm., November, 1998). The mass marking program is designed to assist managers in implementing selective fisheries. The enhanced ability to visually identify chinook salmon of hatchery origin in fisheries and for spawning ground surveys may be a positive outcome of the mass marking program. However, there are questions about our ability to accurately measure hooking mortality of natural spawners in multiple hook and release fisheries.

Moreover, as a byproduct of a proposed mass-marking strategy, a small fraction of hatchery-origin chinook salmon would receive coded-wire tags but would not have their adipose fins removed, in order to estimate the behavior of naturally produced chinook salmon in selective fisheries. Therefore, NMFS believes that technical difficulties may increase in detecting coded-wire tagged chinook salmon as a result of changes in the adipose marking program. In addition, valuable stock-specific abundance and mortality schedule information for chinook salmon may be more difficult to obtain if recovery of coded-wire tags is compromised under the new management practices.

NMFS' concerns about the status of this ESU are related to risks associated with population trends and productivity. NMFS believes that widespread declines and outright losses of the spring- and summer-run chinook populations represent a significant reduction in the life history diversity of this ESU. Additionally, NMFS is concerned about the significant declines in abundance from historical levels in many streams in Puget Sound. The population sizes in many streams are small enough that stochastic genetic and demographic processes are important risk factors. Two of the three largest remaining chinook salmon runs in this ESU that are not heavily influenced by hatchery fish (Skagit and Snohomish Rivers) are declining in abundance. Indeed, in most streams for which abundance data are available, both long- and short-term trends in abundance are declining.

Degradation and loss of freshwater and estuarine habitat throughout the range of the ESU were additional sources of risk to chinook salmon in Puget Sound identified by NMFS. Furthermore, recent studies suggest that effects of pollutants on early life history stages of chinook salmon also contribute to the stress on fish in this ESU. Historically high harvest rates in ocean and Puget Sound fisheries were likely to be a significant source of risk in the past; NMFS is hopeful that recently established lower harvest targets for Puget Sound stocks will reduce threats to the persistence of the ESU due to reductions in direct mortality and size-selective fisheries.

Hatchery chinook salmon are widespread in the Puget Sound ESU, although there are no precise estimates of the proportion of natural spawners of hatchery origin. NMFS found that although chinook salmon are relatively well-distributed geographically in the Puget Sound region, the extensive transplanting of hatchery fish throughout the area makes identifying native, naturally self-sustaining runs difficult. Recent proposals to mass mark hatchery fish may be helpful in assessing the status and managing abundance of fish in this ESU. However, the resulting technical difficulties associated with detecting coded-wire tagged fish under the new marking design may hinder collection efforts for that important data base and compromise the management tools currently used to manage chinook salmon in Canadian and U. S. fisheries.

Listing Determination

Based on available information, NMFS concludes that chinook salmon in the Puget Sound ESU are not presently in danger of extinction, but they are likely to become endangered in the foreseeable future. Therefore, NMFS determines that Puget Sound chinook salmon warrant listing as a threatened species under the ESA. In this ESU, all naturally spawned populations of chinook salmon residing below impassable natural barriers (e.g., long-standing, natural waterfalls) are listed. This ESU does not include naturally spawning descendants from the spring-run chinook salmon program at the Quilcene National Fish Hatchery (Quilcene and Sol Duc stocks) and their progeny.

Status of Hatchery Populations

NMFS concludes that five of the hatchery chinook salmon stocks identified as part of this ESU (see ''Summary of Chinook Salmon ESU Determinations'') should be listed (as well as their progeny) since they are currently essential for the its recovery (NMFS, 1999b; Table 1). The listed hatchery stocks are: Kendall Creek (spring run); North Fork Stillaguamish River (summer run); White River (spring run); Dungeness River (spring run); and Elwha River (fall run).

*(2) Lower Columbia River Chinook Salmon*

Updated abundance information through 1997–98 was obtained for many streams in the Lower Columbia River ESU. Smaller tributary streams in the lower reaches of the Columbia River (e.g., Big, Skamokawa and Gnat Creeks, and Elochoman, Youngs, Klaskanine, and Grays Rivers) support naturally-spawning chinook salmon runs numbering in the hundreds of fish. The larger tributaries, such as the Cowlitz River Basin streams, contain natural runs of chinook salmon ranging in size from 100 to almost 1,000 fish (NMFS, 1998a). It is difficult to obtain precise estimates of natural escapements in many streams within the lower Columbia River Basin because of the presence of hatchery chinook salmon in many areas. Almost all of the streams with data available are exhibiting declines in estimated abundance. All of the streams considered to be influenced by hatchery fish in this ESU are declining in abundance.

Estimates of historic abundance are available for only a few streams in this ESU, but there is widespread agreement

that natural production has been substantially reduced over the last century. In addition to fall-run chinook salmon, this ESU also includes spring-run chinook salmon in the Cowlitz, Lewis, Kalama, and Sandy Rivers. Historical estimates of spring-run chinook salmon escapement into the Cowlitz River Basin are available for the early 1950s (WDF, 1951; Fulton, 1968). The estimated total escapement of spring-run chinook salmon was 10,400 to the Cowlitz River, and this total was distributed as 1,700 spring-run chinook salmon into the mainstem Cowlitz River, 8,100 into the Cispus River, and 200 and 400 fish into the Tilton and Toutle Rivers, respectively (WDF, 1951). The historical estimate of spring-run chinook salmon escaping into the Sandy River in the 1950s was 1,000 fish (Fulton, 1968), although it may have been as high as 12,000 fish historically (Mattson, 1955). Recent abundance of spawners through 1996–97 includes a 5-year geometric mean natural spawning escapement of only 3,600 spring-run fish in the entire ESU (NMFS, 1998a).

Historical estimates of fall-run chinook salmon in the Lower Columbia River ESU also are available for the early 1950s in the Cowlitz River Basin (WDF, 1951; Fulton, 1968). The estimated total escapement of fall-run chinook salmon to the Cowlitz River was 31,000 fish, of which 10,900 were estimated to escape to the mainstem Cowlitz River, 8,100 to the Cispus River, 6,500 to the Toutle River, 5,000 to the Coweeman River, and 500 to the Tilton River (WDF, 1951). In addition, estimates of fall-run chinook salmon into the smaller tributaries in the lower Columbia River (i.e., Klaskanine, Elochoman, Clatskanie Rivers and Big and Gnat Creeks) was a total of 4,000 fish (Fulton, 1968). Fulton (1968) also provided estimates of escapement of fall-run chinook into the Lewis (n=5,000), Washougal (n=3,000) and the Kalama (n=20,000) Rivers for the 1950s. Based on these reports, it is possible to estimate historical abundance in the ESU of at least 63,000 fall-run chinook salmon escaping to spawn in the lower Columbia River region in the 1950s. It is important to note that by the 1950s the Lower Columbia River chinook salmon stocks had already declined considerably from pre-European settlement levels, and hatchery production was already substantial.

Currently, spawning escapement to populations on the Washington side of the Columbia River are monitored primarily by peak fish counts in index areas (WDF *et al.*, 1993). Estimates of spring- and fall-runs to the mainstem Columbia River tributaries are routinely reported by fishery management agencies (WDFW and ODFW, 1994; (Pacific Fisheries Management Council (PFMC), 1996). Peak index area spawning counts are expanded to estimate total spawning escapement. In most lower Columbia River tributaries in Oregon, foot surveys are conducted and escapement estimates are based on peak spawner counts or redd counts (Theis and Melcher, 1995), and dam counts are available for the Sandy River. Data through 1996–97 indicate that the lower Columbia River fall-run currently includes 34,000 natural spawners (NMFS, 1998a), but according to the PFMC (1996b), approximately 68% of the natural spawners are first-generation hatchery strays. Long-term trends in escapement for the fall- and spring-run are mixed, with most larger stocks showing positive trends (NMFS, 1998a). Short-term trends in abundance for both runs are more negative. The only remaining spring-run chinook salmon populations that are not showing severe declines in abundance are those on the Sandy and Hood Rivers (NMFS, 1998a), and these are both heavily influenced by hatchery fish; in addition, the spring-run in the Hood River may not be representative of the native stock (Kostow *et al.*, 1995).

All basins are affected to varying degrees by habitat degradation. Major habitat problems are related primarily to blockages, forest practices, urbanization in the Portland and Vancouver areas, and agriculture in floodplains and low-gradient tributaries.

Hatchery programs to enhance chinook salmon fisheries in the lower Columbia River began in the 1870s, expanded rapidly, and have continued throughout this century. Although the majority of the stocks have come from within this ESU, over 200 million fish from outside the ESU have been released since 1930 (Myers *et al.*, 1998). Available evidence indicates a pervasive influence of hatchery fish on natural populations throughout this ESU, including both spring- and fall-run populations (Howell *et al.*, 1985; Marshall *et al.*, 1995). In addition, the exchange of eggs among hatcheries in this ESU apparently has led to extensive genetic homogenization of hatchery stocks (Utter *et al.*, 1989). A particular concern at the time the status review was prepared is the straying by Rogue River fall-run chinook salmon, large numbers of which are released into the lower Columbia River to augment harvest opportunities (Myers *et al.*, 1998). Beginning in 1997, ODFW began restricting the release sites of the Rogue River hatchery fall-run chinook salmon to Youngs Bay in the Lower Columbia River, where an intensive chinook salmon fishery occurs (ODFW, 1998). ODFW hopes that reducing the number of sites where the Rogue River fish are released and targeting those hatchery fish in an active chinook salmon fishery will reduce the incidence of straying of non-ESU fish into lower Columbia River tributaries (ODFW, 1998). There are no indications of the success of this mitigation at this time.

ODFW provided NMFS with an overview of the conservation status of Lower Columbia River chinook salmon stocks (ODFW, 1998). ODFW identified the chinook salmon populations in the Lower Columbia River ESU that were naturally self-sustaining and provided their best estimate of the conservation status of each population and the percentage of hatchery fish in natural spawning escapements. The list of populations included fall-run chinook salmon on the Sandy, Clackamas, White Salmon, Wind, North Fork Lewis, East Fork Lewis, Coweeman and mainstem Columbia Rivers. Estimated average minimum escapements over the last 5 years for fall-runs ranged from 100 to 11,600, and the estimated percentages of hatchery fish in natural spawning escapements ranged from 0 to 8 percent (ODFW, 1998). Spring-run chinook salmon populations identified were those in the Sandy and Clackamas Rivers. Estimated escapements ranged from 3,000 to 3,700 fish, and the estimated percentage of spawners of hatchery origin ranged from 10–50 percent (ODFW, 1998).

NMFS' concerns regarding the status of this ESU were evenly divided among the abundance/distribution, trends/productivity and genetic integrity risk categories. NMFS was concerned that there are very few naturally self-sustaining populations of native chinook salmon remaining in the lower Columbia River ESU. With input from co-managers, NMFS identified a list of streams containing primarily native runs of chinook salmon with minimal influence from hatchery fish to get a better understanding of the present distribution and population sizes of potentially self-sustaining chinook salmon runs in the lower Columbia River ESU (ODFW, 1998). Populations of ''bright'' fall-run chinook salmon identified included those on the North Fork and East Fork of the Lewis River and the Sandy River; ''tule'' fall-run chinook salmon populations identified as naturally reproducing were those on the Clackamas, East Fork of the Lewis and Coweeman Rivers. Estimated average escapements over the past 5–10 years for these populations ranged from 300 (tule fall-run chinook on the East

Fork of the Lewis River) to over 11,000 (fall-run chinook on the North Fork Lewis River). These are the only fall-run chinook salmon populations in the ESU with relatively high abundance and low hatchery influence. The populations identified by NMFS do not include some populations that ODFW suggested should be considered for risk evaluations. Some of the populations of fall-run chinook salmon suggested by ODFW as naturally self-sustaining are smaller, have extensive hatchery components, or were determined by NMFS to be in a different ESU (see ''Status of Chinook Salmon ESUs''). NMFS discussed the likely possibility that smaller streams draining into the Columbia River below the Cowlitz River historically had small populations of tule fall-run chinook salmon. It was not clear to NMFS whether these small populations of tule fall-run chinook historically were self-sustaining; the widespread presence of tule hatchery fish in this area makes their present status difficult to evaluate.

The few remaining populations of spring chinook salmon in the ESU were not considered to be naturally self-sustaining because of either small size, extensive hatchery influence, or both. NMFS felt that the dramatic declines and losses of spring run chinook salmon populations in the Lower Columbia River ESU represent a serious reduction in life-history diversity in the region.

Long-term trends in chinook salmon abundance are mixed in this ESU, but NMFS was concerned that short-term trends are predominantly downward, some strongly so. It is difficult to predict whether the high variability in abundance estimates for chinook salmon in many streams in this ESU reflect natural fluctuations in the numbers of wild fish or periodic influences from hatchery fish. Exceptions are the Coweeman and Green River (Cowlitz River tributary) tule fall-runs, where short-term trends in abundance are positive.

The presence of hatchery chinook salmon in this ESU poses an important threat to the persistence of the ESU and also obscures trends in abundance of native fish. At the time of the status review, approximately 68 percent of the naturally spawning chinook salmon in the lower Columbia River ESU were estimated to be first-generation hatchery fish; no new information was available to suggest that this percentage has appreciably changed. NMFS discussed the difficulty in ascribing ''native, naturally self-sustaining'' status to tule fall-run chinook salmon runs because of the extensive within-ESU transfers of these fish. Recent changes in hatchery release practices adopted by ODFW designed to reduce straying of introduced Rogue River fall-run chinook salmon into lower Columbia River streams are encouraging changes. Nevertheless, NMFS noted that straying of these out-of-ESU fish still could occur into lower Columbia River streams.

In summary, habitat degradation and loss due to extensive hydropower development projects, urbanization, logging and agriculture continue to threaten the chinook salmon spawning and rearing habitat in the lower Columbia River. Recent harvest levels in the mainstem Columbia River and tributary fisheries are reduced over historic practices. Nevertheless, NMFS concludes that documented extinctions in fall- and spring-run chinook salmon populations, the near complete demise of the spring-run life history form, extensive mixing of fall-run tule chinook salmon populations within the ESU and the widespread occurrence of hatchery fish have combined to pose significant threats to the persistence of chinook salmon in the lower Columbia River ESU.

Listing Determination

Based on available information, NMFS concludes that chinook salmon in the Lower Columbia River ESU are not presently in danger of extinction, but they are likely to become endangered in the foreseeable future. Therefore, NMFS determines that Lower Columbia River chinook salmon warrant listing as a threatened species under the ESA. In this ESU, all naturally spawned populations of chinook salmon residing below impassable natural barriers (e.g., long-standing, natural waterfalls) are listed. This ESU does not include spring-run chinook salmon derived from the Round Butte Hatchery (Deschutes River, Oregon) (and their progeny) and spawning in the Hood River, spring-run chinook salmon derived from the Carson NFH (and their progeny) and spawning in the Wind River, fall-run fish (and their progeny) that originated from the Upper Columbia River summer/fall-run ESU and spawning the mainstem Columbia River below Bonneville Dam and in other Bonneville Pool tributaries, and naturally spawning fish originating from the Rogue River fall chinook program (and their progeny).

Status of Hatchery Populations

The BRT concluded that one of the hatchery chinook salmon stocks identified as part of this ESU (Cowlitz River Hatchery spring-run; see Summary of Chinook Salmon ESU Determinations) was essential for the recovery of the ESU (NMFS, 1999b; Table 2). Like the natural population in the Cowlitz River, the hatchery stock has declined steadily for the past two decades and appeared to stabilize at depressed levels during the past five years. However, the hatchery run is still an order of magnitude greater than the natural run, averaging about 2,000 hatchery returnees during the past 5 years, (which is approximately double the number needed to maintain the hatchery run). NMFS has reviewed the state's hatchery and harvest efforts pertaining to the Cowlitz River Hatchery stock and determined that they are sufficiently protective of this stock and likely to continue producing surplus non-listed fish that could be made available for harvest in most years (NMFS, 1999c). In addition, supplementation and re-introduction efforts using this hatchery stock are already underway and will likely contribute to the recovery of the ESU. Therefore, NMFS has determined that listing the Cowlitz River Hatchery stock is not warranted because their future existence and value for recovery are not at risk (NMFS, 1999c). If new information indicates that the hatchery stock is at risk of extinction, NMFS will revise its listing status accordingly. NMFS has reviewed the state's hatchery and harvest efforts pertaining to the Cowlitz River hatchery stock and determined that they are sufficiently protective of this stock and likely to continue producing surplus non-listed fish that could be made available for harvest in most years (NMFS, 1999c). In addition, supplementation and re-introduction efforts using this hatchery stock are already underway and will likely contribute to the recovery of the ESU.

*(3) Upper Willamette River Chinook Salmon*

NMFS received updated abundance information for chinook salmon in the Upper Willamette River ESU through 1997–98, including total abundance estimates of spring chinook salmon at Willamette Falls and counts at Leaburg Dam on the McKenzie River (NMFS, 1998a). Spring chinook salmon runs at both sites continue to exhibit declines in estimated abundance. For fishery monitoring purposes, the Clackamas River spring-run chinook salmon are included with the Willamette River (ODFW, 1994). Consistent with ODFW's approach, NMFS concluded that the spring-run chinook salmon in the Clackamas River should be considered part of the Upper Willamette River ESU (see ''Status of Chinook Salmon ESUs''). Historical estimates of chinook salmon

abundance in the Clackamas River are available for the late-1800s. At least 100 tons of chinook salmon were harvested from the Clackamas River in both 1893 and 1894. Given an average of 22.8 pounds (10.3 kgs) per fish, an estimated 12,000 and 8,000 chinook salmon were caught in those 2 years (ODFW, 1992). ODFW (1992) reported that most of the chinook salmon caught in the Clackamas River fisheries were spring-run. Updated dam counts for spring-run chinook salmon on the Clackamas River were obtained by NMFS through 1997, and the resulting 5-year geometric mean estimate of naturally spawning spring-run chinook salmon is just over 6,000 fish (Streamnet, 1998). Because of the heavy influence of spring-chinook salmon of hatchery origin in the Clackamas River, NMFS did not weigh Clackamas River abundance estimates heavily in their risk determinations for the Upper Willamette River ESU.

The spring-run has been counted at Willamette Falls since 1946 (ODFW and WDFW, 1995), but counts were not differentiated into adults and jacks until 1952. In the first 5 years (1946–50), the geometric mean of the counts for adults and jacks combined was 31,000 fish. The most recent 5-year (1993–97) geometric mean escapement above Willamette Falls was 24,000 adults (NMFS, 1998a). Willamette River spring-run chinook salmon are targeted by commercial and recreational fisheries in the lower Willamette and Columbia Rivers. During the 5-year period from 1992–1996, the geometric mean of the run-size to the mouth of the Columbia River was 48,000 fish (PFMC, 1997b). Long-term trends in escapement of spring-run chinook salmon to the Upper Willamette River ESU are mixed, ranging from slightly upward to moderately downward (NMFS, 1998a). Short-term trends in abundance are all strongly downward.

Estimates of the naturally produced run have been made only for the McKenzie River from 1994 to 1998 (Nicholas, 1995; ODFW, 1998). Nicholas (1995) estimated the escapement of naturally produced spring-run chinook salmon in the McKenzie River to be approximately 1,000 spawners. Updated information using an estimation from counts at Leaburg Dam suggest that the most recent 5-year geometric mean escapement of naturally-spawning spring-run chinook salmon in the McKenzie River was 1,500 fish (ODFW, 1998; NMFS, 1998a). Until the 1940s, as many as 11 million chinook salmon fry and fingerlings were released into the McKenzie River and tributaries annually (Wallis, 1961; Howell *et al.*, 1988). Although returns from these releases were poor, they may have influenced the shift in the spawn timing in the McKenzie River Basin from historical times. In the early 1900s, peak spawning occurred during early September, and now peak spawning occurs during late September/early October (Wallis, 1961; Howell *et al.*, 1988). It is possible that the shift in spawn timing of chinook salmon in the McKenzie River Basin is due in part to influences from hatchery-derived fish. Alternatively, alterations in the thermal regime due to dam projects may have caused the shift in spawn timing.

Habitat blockage and degradation are significant problems in this ESU. Available habitat has been reduced by construction of dams in the Santiam, McKenzie, and Middle Fork Willamette River Basins, and these dams have probably adversely affected remaining production via thermal effects. Agricultural development and urbanization are the main activities that have adversely affected habitat throughout the basin (Bottom *et al.*, 1985; Kostow, 1995).

Historically, only spring-run fish were able to ascend Willamette Falls to access the upper Willamette River (Fulton, 1968). Following improvements in the fish ladder at Willamette Falls, some 200 million fall-run chinook salmon have been introduced into this ESU since the 1950s. In contrast, the upper Willamette River has received relatively few introductions of non-native spring-run fish from outside this ESU (Myers *et al.*, 1998). Artificial propagation efforts have been undertaken by a limited number of large facilities (McKenzie, Marion Forks, South Santiam, and Willamette (Dexter) Fish Hatcheries). These hatcheries have exchanged millions of eggs from various populations in the upper Willamette River Basin. The result of these transfers has been the loss of local genetic diversity and the formation of a single breeding unit in the Willamette River Basin (Kostow, 1995). Considerable numbers of hatchery spring-run strays have been recovered from natural spawning grounds, and an estimated two-thirds of natural spawners are of hatchery origin (Nicholas, 1995). There is also evidence that introduced fall-run chinook salmon have successfully spawned in the upper Willamette River (Howell *et al.*, 1985). Whether hybridization has occurred between native spring-run and introduced fall-run fish is not known. The majority of the Willamette River fish are hatchery produced.

Total harvest rates on stocks in this ESU are moderately high, with the average total harvest mortality rate estimated to be 72 percent in 1982–89, and a corresponding ocean exploitation rate of 24 percent (PSC, 1994). This estimate does not fully account for escapement, and ODFW is in the process of revising harvest rate estimates for this stock; revised estimates may average 57 percent total harvest rate, with 16 percent ocean and 48 percent freshwater components (Kostow, 1995). The in-river recreational harvest rate (Willamette River sport catch/estimated run size) for the period from 1991 through 1995 was 33 percent (PFMC, 1996). ODFW (1998) provided information indicating that total (marine and freshwater) harvest rates on upper Willamette River spring-run stocks have been reduced considerably for the 1991–93 broodyears to an average 21 percent.

NMFS' primary concerns regarding the status of the Upper Willamette River ESU focused on risks associated with low abundance and reduced distribution. NMFS was concerned about the few remaining populations of spring chinook salmon in the Upper Willamette River ESU, and the high proportion of hatchery fish in the remaining runs. The recent average total abundance of spring chinook salmon in this ESU has been 24,000 fish, of which only 4,000 are believed to be spawning naturally. In addition, it is estimated that two-thirds of the naturally spawning spring chinook salmon are first generation hatchery fish. In other words, the high proportion of hatchery fish in the total return and on spawning grounds indicate that populations of chinook salmon in this ESU are not self sustaining. ODFW was able to identify only one remaining naturally reproducing population in this ESU, spring chinook salmon in the McKenzie River. Severe declines in short-term abundance have occurred throughout the ESU, and the McKenzie River population declined precipitously until 1994. Since 1994, adult returns of naturally spawning spring-run chinook have increased slowly, although it is believed that a large portion of these chinook salmon are first generation hatchery fish.

As stated in the status review (Myers *et al.*, 1998), the potential for interactions between native spring-run and introduced fall-run chinook salmon has increased relative to historical times due to fall-run chinook salmon hatchery programs and the laddering of Willamette Falls. There is no direct evidence of interbreeding between the two forms, but they do exhibit overlap in spawning times and locations. No new evidence was presented indicating significant changes in the conditions that affect the potential for negative

interactions between native and hatchery spring-run chinook salmon in this ESU.

The declines in spring chinook salmon in the Upper Willamette River ESU can be attributed in large part to the extensive habitat blockages caused by dam construction. The overall reduction in available spawning and rearing habitat, combined with altered water flow and temperature regimes, have probably had a major deleterious effect on spring chinook salmon abundance in this ESU. Furthermore, historically high harvest levels have occurred on chinook salmon in this ESU in ocean and lower Columbia River fisheries. Recent efforts to reduce harvest of naturally produced spring chinook salmon in Upper Willamette River tributaries, and the increase in selective fisheries should help managers targeting specific populations of wild or hatchery chinook salmon.

Listing Determination

Based on available information, NMFS concludes that chinook salmon in the Upper Willamette River ESU are not presently in danger of extinction, but they are likely to become endangered in the foreseeable future. Therefore, NMFS determines that Upper Willamette River chinook salmon warrant listing as a threatened species under the ESA. In this ESU, all naturally spawned populations of spring-run chinook salmon residing below impassable natural barriers (e.g., long-standing, natural waterfalls) are listed. This ESU does not include fall-run chinook salmon.

Status of Hatchery Populations

NMFS concludes that none of the hatchery chinook salmon stocks identified as part of this ESU (''Summary of Chinook Salmon ESU Determinations'') should be listed since none are currently essential for the recovery of the ESU (NMFS, 1999b; Table 3).

*(4) Upper Columbia River Spring-run Chinook Salmon*

There are no estimates of historical abundance specific to this ESU. WDFW monitors nine spring-run chinook salmon stocks geographically located within this ESU. Escapements to most tributaries are monitored by redd counts, which are expanded to total live fish based on counts at mainstem dams. Updated abundance information for spring-run chinook salmon in the Upper Columbia River ESU through 1997–98 was obtained for redd counts on all streams monitored in this ESU (NMFS, 1998a). Escapements continue to be critically low in all rivers, and the redd counts are still declining severely. Individual populations within the ESU are all quite small, with none averaging over 150 adults annually in recent years (NMFS, 1998a). Long-term trends in estimated abundance are mostly downward, with annual rates of change ranging from −6 percent to +1 percent over the full data set. All ten short-term trends were downward, with five populations exhibiting rates of decline exceeding 20 percent per year (NMFS, 1998a). Harvest rates have been declining recently, and currently they are less than 10 percent (ODFW and WDFW, 1995).

Artificial propagation efforts have had a significant impact on spring-run populations in this ESU. Artificial propagation recently has focused on supplementing naturally spawning populations in this ESU (Bugert, 1996), although it should be emphasized that these naturally spawning populations were founded by the same GCFMP homogenized stock. Furthermore, the potential for hatchery-derived non-native stocks to adversely affect naturally spawning populations, especially given the recent low numbers of fish returning to rivers in this ESU. The hatchery contribution to escapement may be moderated by the homing fidelity of spring-run fish that could reduce the potential for hybridization (Chapman *et al.*, 1995). For example, the hatchery contribution to naturally spawning escapement was recently estimated as 39 percent in the mainstem Methow River (where the hatcheries are located), but averaged only 10 percent in the tributaries—Chewuch, Lost, and Twisp Rivers—that are upstream of the hatcheries (Spotts, 1995). In contrast, WDFW (1997) reported that in 1996 the Chewuch and Twisp runs were 62 percent and 72 percent hatchery fish, respectively. Utter *et al.* (1995) found that spring-run hatchery stocks from Leavenworth and Winthrop hatcheries were genetically indistinguishable from the Carson hatchery stock, but distinct from naturally spawning populations in the White and Chiwawa Rivers and Nason Creek. In 2 recent years (in 1996 and 1998), 100 percent of the production in the Methow River Basin has come from hatchery-reared fish. The returns to Methow River tributaries were so low in those years that all adults returning to Wells Dam were intercepted for emergency artificial propagation at the Methow Fish Hatchery and the Winthrop NFH (L. Brown, WDFW, 3860 Chelan Highway, Wenatchee, WA 98801. Pers. comm., November, 1998). In addition, captive broodstock programs are underway on the Twisp River and are just beginning on the White River and Nason Creek (NMFS *et al.*, 1998). Production of the non-native Carson hatchery stock will be discontinued at the Winthrop NFH (NMFS *et al.*, 1998).

Howell *et al.* (1985), Chapman *et al.* (1991), Mullan *et al.* (1992), and Chapman *et al.* (1995) have suggested that the prevalence of bacterial kidney disease (BKD) in upper Columbia and Snake River hatcheries is directly responsible for the low survival of hatchery stocks. These authors also suggest that the high incidence of BKD in hatcheries impacts wild populations, and reduces the survival of hatchery fish to such an extent that naturally spawning adults are ''mined'' to perpetuate hatchery stocks (Chapman *et al.*, 1991). There may also be direct horizontal transmission of BKD between hatchery and wild juveniles during downstream migration (specifically, in smolt collection and transportation facilities) or vertical transmission from hatchery-reared females on the spawning grounds.

Another recent risk evaluation for chinook salmon in this ESU was conducted by an interagency working group as part of the Mid-Columbia River HCP development (NMFS *et al.*, 1998). To determine the need for hatchery supplementation programs in the HCP region (an area including the Wenatchee, Entiat, and Methow River Basins), a panel of experts was asked to estimate (using best professional judgement) the probability that the spring-run chinook salmon populations in those 3 river basins would have a certain status (extinct, nearly extinct, <100 fish/year, 100–500 fish/year, and >500 fish/year) after 10–50 years under current conditions and without hatchery supplementation. In all river basins within this Upper Columbia River Spring-Run ESU geographic area, the experts estimated that there was a greater than 50 percent chance that the chinook salmon would be nearly extinct or extinct within 50 years, assuming current conditions continue into the future. Furthermore, the experts predicted that there was only a 4 to 17 percent chance that after 50 years there would be more than 100 spring-run chinook salmon in any river (NMFS *et al.*, 1998).

NMFS' primary concerns centered on very low abundance and distribution and strongly negative trends and stock productivity for this ESU. The average recent escapement to the ESU has been less than 5,000 hatchery and wild chinook salmon combined; all

individual populations consist of less than 100 fish. At these population sizes, negative effects of demographic and genetic stochastic processes are very likely to occur. Furthermore, both long- and short-term trends in abundance are declining, many strongly so. The abundance of the spring chinook salmon returning to the Methow River Basin has been so low that all fish returning in 1996 and 1998 were intercepted at Wells Dam and were incorporated into artificial propagation programs at Methow fish hatchery. In addition, the captive broodstock programs underway on the Twisp and White Rivers and Nason Creek indicate the severity of the population declines.

Plans to discontinue production of the non-native Carson hatchery stock at the Winthrop NFH are encouraging. Nevertheless, the extensive introductions of spring-run chinook salmon from outside the ESU and within-ESU egg transfers that occurred in the past have left their mark on the genetic legacy of the fish remaining in the ESU. Furthermore, as mentioned above, because of the extremely low population sizes in some streams in some years, 100 percent of the offspring for an entire basin were produced in a hatchery from a mixture of populations. That such extreme measures have been considered necessary speaks to the seriousness of the risks faced by the natural populations.

Habitat degradation, blockages and hydroelectric power system passage mortality all have contributed to the significant declines in spring chinook salmon production in this ESU. In addition to at least six known extinctions, all remaining populations are small and declining in number. Recently, a panel of fisheries experts convened to evaluate a management plan for a HCP in this region and concluded in their risk evaluations that the probability of extinction for spring-run chinook salmon was high. NMFS discussed the possible significance of a noted increase in non-migratory jacks in some areas, and was not able to conclude whether their presence represented a permanent change in age structure or merely a facultative shift in life history strategy due to changes in the selective environment. Finally, due to near elimination of in-river harvest during the last two decades and the absence of a significant marine harvest on these populations, NMFS is concerned that the remaining avenues for recovery would take years to implement and that the ESU may go extinct before any improvements could take effect.

**Listing Determination**

Based on available information, NMFS concludes that the Upper Columbia River spring-run chinook salmon ESU is in danger of extinction throughout all or a significant portion of its range. Therefore, NMFS determines that Upper Columbia River spring-run chinook salmon warrant listing as an endangered species under the ESA. In this ESU, all naturally spawned populations of spring-run chinook salmon residing below impassable natural barriers (e.g., long-standing, natural waterfalls) are listed. This ESU does not include naturally spawning spring-run chinook salmon derived from the Carson NFH spring-run chinook salmon stock, or other hatchery stocks derived from the Carson spring-run stock and their progeny.

**Status of Hatchery Populations**

NMFS concludes that 6 of the hatchery chinook salmon stocks identified as part of this ESU (see ''Summary of Chinook Salmon ESU Determinations'') should be listed (as well as their progeny) since they are currently essential for the recovery of the ESU (NMFS, 1999b; Table 4). The listed hatchery stocks are: Chiwawa River (spring run); Methow River (spring run); Twisp River (spring run); Chewuch River (spring run); White River (spring run); and Nason Creek (spring run).

**Determinations**

After reviewing the best available information, including general public and peer review comments, and biological data on the species' status and an assessment of protective efforts, as described in the previous sections of this document, NMFS has concluded that four chinook salmon ESUs warrant protection under the ESA. With respect to the four chinook salmon ESUs that are the subject of this rule, NMFS has determined that three ESUs are at risk of becoming endangered in the foreseeable future throughout all or a portion of their range. The threatened chinook salmon ESUs are Puget Sound chinook salmon in Washington, Lower Columbia River chinook salmon in Washington and Oregon, and Upper Willamette spring-run chinook salmon in Oregon. NMFS also has determined that Upper Columbia River spring-run chinook salmon in Washington are in danger of extinction throughout all or a significant portion of their range.

In all four ESUs, only naturally spawned populations of chinook salmon residing below impassable natural barriers (e.g., long-standing, natural waterfalls) are listed. Naturally spawning fish (and their progeny) from the following populations are not considered part of the specified ESUs and are not intended to receive ESA protection: (1) Naturally spawning descendants from the spring-run chinook salmon program at the Quilcene NFH (Quilcene and Sol Duc stocks) and their progeny are not considered part of the Puget Sound ESU; (2) spring-run chinook salmon derived from the Round Butte Hatchery (Deschutes, Oregon) (and their progeny) and spawning in the Hood River, spring-run chinook salmon derived from the Carson NFH (and their progeny) and spawning in the Wind River, fall-run fish (and their progeny) that originated from the Upper Columbia River summer/fall-run ESU and spawn in the mainstem Columbia River below Bonneville Dam and in other Bonneville Pool tributaries, and naturally spawning fish originating from the Rogue River fall chinook program (and their progeny) are not considered part of the Lower Columbia River ESU; (3) fall-run chinook salmon are not considered part of the Upper Willamette River ESU; and (4) naturally spawning spring-run chinook salmon derived from the Carson NFH (and their progeny) are not considered part of the Upper Columbia River spring-run ESU.

NMFS' intent in listing only ''naturally spawned'' populations is to protect chinook salmon stocks that are indigenous to (i.e., part of) the ESU. In this listing determination NMFS has identified various non-indigenous populations that co-occur with fish in the listed ESUs. NMFS recognizes the difficulty of differentiating between indigenous and non-indigenous fish, especially when the latter are not readily distinguishable with a mark (e.g., fin clip). Also, matings in the wild of either type would generally result in progeny that would be treated as listed fish (i.e., they would have been naturally spawned in the geographic range of the listed ESU and have no distinguishing mark). Therefore, to reduce confusion regarding which chinook salmon are considered listed within an ESU, NMFS will treat all naturally spawned fish as listed for purposes of the ESA. Efforts to determine the conservation status of an ESU would focus on the contribution of indigenous fish to the listed ESU. It should be noted that NMFS will take actions necessary to minimize or prevent non-indigenous chinook salmon from spawning in the wild unless the fish are specifically part of a recovery effort.

NMFS has evaluated the relationship between hatchery and natural populations of chinook salmon in these ESUs (described previously in ''Summary of Chinook Salmon ESU Determinations'' and ''Status of Chinook Salmon ESUs''). In the Puget Sound ESU, chinook salmon (and their progeny) from the following hatchery stocks are considered part of the ESU and listed: Kendall Creek (spring run); North Fork Stillaguamish River (summer run); White River (spring run); Dungeness River (spring run); and Elwha River (fall run). In the Lower Columbia and Upper Willamette River ESUs, none of the chinook salmon hatchery stocks considered part of the ESUs are being listed. Finally, in the Upper Columbia River spring-run ESU, chinook salmon (and their progeny) from the following hatchery stocks are considered part of the ESU and listed: Chiwawa River (spring run); Methow River (spring run); Twisp River (spring run); Chewuch River (spring run); White River (spring run); and Nason Creek (spring run). Other hatchery stocks identified as part of these four ESUs are not considered to be essential for their recovery; hence, they are not listed at this time.

The determination that a hatchery stock is not ''essential'' for recovery does not preclude it from playing a role in recovery. Any hatchery population that is part of the ESU is available for use in recovery if conditions warrant. In this context, an ''essential'' hatchery population is one that is vital to incorporate into recovery efforts (for example, if the associated natural population(s) were extinct or at high risk of extinction). Under such circumstances, NMFS would consider taking the administrative action of listing existing hatchery fish.

NMFS' ''Interim Policy on Artificial Propagation of Pacific Salmon Under the Endangered Species Act'' (58 FR 17573, April 5, 1993) provides guidance on the treatment of hatchery stocks in the event of a listing. Under this policy, ''progeny of fish from the listed species that are propagated artificially are considered part of the listed species and are protected under the ESA.'' In the case of hatchery chinook populations considered to be part of the Puget Sound ESU, Lower Columbia River ESU, Upper Willamette River spring-run ESU, or Upper Columbia River spring-run ESU, NMFS protective regulations may except take of naturally spawned listed fish for use as broodstock as part of an overall conservation program. According to the interim policy, the progeny of these hatchery-wild or wild-wild crosses would also be listed. Given the requirement for an acceptable conservation plan as a prerequisite for collecting broodstock, NMFS determines that it is not necessary to consider the progeny of intentional hatchery-wild or wild-wild crosses as listed (except in cases where NMFS has listed the hatchery population as well).

In addition, NMFS believes it is desirable to incorporate naturally spawned fish into these unlisted hatchery populations to ensure that their genetic and life history characteristics do not diverge significantly from the natural populations. NMFS therefore concludes that it is not inconsistent with NMFS'' interim policy, nor with the policy and purposes of the ESA, to consider these progeny as part of the ESU but not listed.

NMFS is not now issuing protective regulations under section 4(d) of the ESA for this species. NMFS will propose such protective measures it considers necessary for the conservation of chinook salmon ESUs listed as threatened in a forthcoming **Federal Register** document. Even though NMFS does not now issue protective regulations for this ESU, Federal agencies possess a duty under section 7 of the ESA to consult with NMFS if any activity they authorize, fund, or carry out may affect listed chinook salmon ESUs. The effective date for this requirement is May 24, 1999.

**Prohibitions and Protective Measures**

Section 9 of the ESA prohibits certain activities that directly or indirectly affect endangered species. These prohibitions apply to all individuals, organizations, and agencies subject to U.S. jurisdiction. Section 9 prohibitions apply automatically to endangered species, and will become effective for the Upper Columbia River spring-run chinook ESU 60 days after publication of this final rule.

Section 4(d) of the ESA directs the Secretary to implement regulations ''to provide for the conservation of [threatened] species,'' that may include extending any or all of the prohibitions of section 9 to threatened species. Section 9(a)(1)(g) also prohibits violations of protective regulations for threatened species implemented under section 4(d). NMFS will soon issue protective regulations pursuant to section 4(d) for the Puget Sound, Lower Columbia River, and Upper Willamette River chinook salmon ESUs.

In the case of threatened species, NMFS also has flexibility under section 4(d) of the ESA to tailor the protective regulations based on the contents of adequate available conservation measures. Even though existing conservation efforts and plans are not sufficient to preclude the need for listings at this time, they are nevertheless valuable for improving watershed health and restoring salmon populations. In those cases where well-developed and reliable conservation plans exist, NMFS may choose to incorporate them into the recovery planning process starting with protective regulations. NMFS has already adopted 4(d) protective regulations that except a limited range of activities from section 9 take prohibitions. For example, the interim 4(d) rule for Southern Oregon/Northern California Coasts coho salmon (62 FR 38479, July 18, 1997) excepts habitat restoration activities conducted in accordance with approved plans and fisheries conducted in accordance with an approved state management plan. In the future, 4(d) rules may contain limited take prohibitions applicable to such activities as forestry, agriculture, and road construction when such activities are conducted in accordance with approved conservation plans.

These are all examples where NMFS may apply modified section 9 prohibitions in light of the protections provided in a conservation plan that is adequately protective. There may be other circumstances as well in which NMFS would use the flexibility of section 4(d). For example, in some cases there may be a healthy population within an overall ESU that is listed. In such a case, it may not be necessary to apply the full range of prohibitions available in section 9. NMFS intends to use the flexibility of the ESA to respond appropriately to the biological condition of each ESU and to the strength of efforts to protect them.

Section 7(a)(4) of the ESA requires that Federal agencies consult with NMFS on any actions likely to jeopardize the continued existence of a species proposed for listing and on actions likely to result in the destruction or adverse modification of proposed critical habitat. For listed species, section 7(a)(2) requires Federal agencies to ensure that activities they authorize, fund, or conduct are not likely to jeopardize the continued existence of a listed species or to destroy or adversely modify its critical habitat. If a Federal action may affect a listed species or its critical habitat, the responsible Federal agency must enter into consultation with NMFS.

Examples of Federal actions likely to affect chinook salmon in the listed ESUs include authorized land management activities of the USFS and BLM, as well as operation of hydroelectric and storage

projects of the Bureau of Reclamation and COE. Such activities include timber sales and harvest, hydroelectric power generation, and flood control. Federal actions, including the COE section 404 permitting activities under the Clean Water Act, COE permitting activities under the River and Harbors Act, National Pollution Discharge Elimination System permits issued by the Environmental Protection Agency, highway projects authorized by the Federal Highway Administration, Federal Energy Regulatory Commission licenses for non-Federal development and operation of hydropower, and Federal salmon hatcheries, may also require consultation. These actions will likely be subject to ESA section 7 consultation requirements that may result in conditions designed to achieve the intended purpose of the project and avoid or reduce impacts to chinook salmon and its habitat within the range of the listed ESUs.

There are likely to be Federal actions ongoing in the range of the listed ESUs at the time these listings become effective. Therefore, NMFS will review all ongoing actions that may affect the listed species with Federal agencies and will complete formal or informal consultations, where requested or necessary, for such actions pursuant to ESA section 7(a)(2).

Sections 10(a)(1)(A) and 10(a)(1)(B) of the ESA provide NMFS with authority to grant exceptions to the ESA's ''taking'' prohibitions. Section 10(a)(1)(A) scientific research and enhancement permits may be issued to entities (Federal and non-Federal) conducting research that involves a directed take of listed species.

NMFS has issued section 10(a)(1)(A) research or enhancement permits for other listed species (e.g., Snake River chinook salmon, Sacramento River winter-run chinook salmon) for a number of activities, including trapping and tagging to determine population distribution and abundance, and collection of adult fish for artificial propagation programs. NMFS is aware of many sampling efforts for chinook salmon within these listed chinook salmon ESUs, including efforts by Federal and state fisheries agencies, and private landowners. These and other research efforts could provide critical information regarding chinook salmon distribution and population abundance.

ESA section 10(a)(1)(B) incidental take permits may be issued to nonfederal entities performing activities that may incidentally take listed species. The types of activities potentially requiring a section 10(a)(1)(B) incidental take permit include the release of artificially propagated fish by state or privately operated and funded hatcheries, state or university research on other species, not receiving Federal authorization or funding, the implementation of state fishing regulations, and timber harvest activities on nonfederal lands.

**Take Guidance**

On July 1, 1994, (59 FR 34272) NMFS and FWS published a policy committing the Services to identify, to the maximum extent practicable at the time a species is listed, those activities that would or would not constitute a violation of section 9 of the ESA. The intent of this policy is to increase public awareness of the effect of a listing on proposed and on-going activities within the species' range. NMFS believes that, based on the best available information, the following actions will not result in a violation of section 9: (1) Possession of chinook salmon from the listed ESUs acquired lawfully by permit issued by NMFS pursuant to section 10 of the ESA, or by the terms of an incidental take statement pursuant to section 7 of the ESA; and (2) federally funded or approved projects that involve activities such as silviculture, grazing, mining, road construction, dam construction and operation, discharge of fill material, stream channelization or diversion for which a section 7 consultation has been completed, and when such an activity is conducted in accordance with any terms and conditions provided by NMFS in an incidental take statement accompanied by a biological opinion pursuant to section 7 of the ESA. As described previously in this notice, NMFS may adopt 4(d) protective regulations that except other activities from section 9 take prohibitions for threatened species.

Activities that NMFS believes could potentially harm, injure or kill chinook salmon in the listed ESUs and result in a violation of section 9 of the ESA include, but are not limited to: (1) land-use activities that adversely affect chinook salmon habitat in this ESU (e.g., logging, grazing, farming, road construction in riparian areas, and areas susceptible to mass wasting and surface erosion); (2) destruction or alteration of chinook salmon habitat in the listed ESUs, such as removal of large woody debris and ''sinker logs'' or riparian shade canopy, dredging, discharge of fill material, draining, ditching, diverting, blocking, or altering stream channels or surface or ground water flow; (3) discharges or dumping of toxic chemicals or other pollutants (e.g., sewage, oil, gasoline) into waters or riparian areas supporting listed chinook salmon; (4) violation of discharge permits; (5) pesticide and herbicide applications; (6) interstate and foreign commerce of chinook salmon from the listed ESUs and import/export of chinook salmon from listed ESUs without an ESA permit, unless the fish were harvested pursuant to legal exception; (7) collecting or handling of chinook salmon from listed ESUs (permits to conduct these activities are available for purposes of scientific research or to enhance the propagation or survival of the species); and (8) introduction of non-native species likely to prey on chinook salmon in these ESUs or displace them from their habitat. This list is not exhaustive. It is intended to provide some examples of the types of activities that might or might not be considered by NMFS as constituting a take of listed chinook salmon under the ESA and its regulations. Questions regarding whether specific activities will constitute a violation of this rule, and general inquiries regarding prohibitions and permits, should be directed to NMFS (see **ADDRESSES**).

**Effective Date of Final Listing**

Given the cultural, scientific, and recreational importance of chinook salmon, and the broad geographic range of these chinook salmon ESUs, NMFS recognizes that numerous parties may be affected by this listing. Therefore, to permit an orderly implementation of the consultation requirements and take prohibitions associated with this action, this final listing will take effect on May 24, 1999.

**Conservation Measures**

Conservation benefits are provided to species listed as endangered or threatened under the ESA through increased recognition, recovery actions, Federal agency consultation requirements, and prohibitions on taking. Increased recognition through listing promotes public awareness and conservation actions by Federal, state, and local agencies, private organizations, and individuals.

Several conservation efforts are underway that may reverse the decline of west coast chinook salmon and other salmonids. NMFS is encouraged by these significant efforts, which could provide all stakeholders with an approach to achieving the purposes of the ESA—protecting and restoring native fish populations and the ecosystems upon which they depend—that is less regulatory. NMFS will continue to encourage and support these initiatives as important components of recovery planning for chinook salmon and other salmonids.

To succeed, protective regulations and recovery programs for chinook salmon will need to focus on conserving aquatic ecosystem health. NMFS intends that Federal lands and Federal activities play a primary role in preserving listed populations and the ecosystems upon which they depend. However, throughout the range of the listed ESUs, chinook salmon habitat occurs and can be affected by activities on state, tribal or private land.

Conservation measures that could be implemented to help conserve the species are listed here (the list is generalized and does not constitute NMFS' interpretation of a recovery plan under section 4(f) of the ESA). Progress on some of these is being made to differing degrees in specific areas.

1. Measures could be taken to promote practices that are more protective of (or restore) chinook salmon habitat across a variety of land and water management activities. Activities affecting this habitat include timber harvest; agriculture; livestock grazing and operations; pesticide and herbicide applications; construction and urban development; road building and maintenance; sand and gravel mining; stream channelization; dredging and dredged spoil disposal; dock and marina construction; diking and bank stabilization; dam construction/operation; irrigation withdrawal, storage, and management; mineral mining; wastewater/pollutant discharge; wetland and floodplain alteration; habitat restoration projects; and woody debris/structure removal from rivers and estuaries. Each of these activities could be modified to ensure that watersheds and specific river reaches are adequately protected in the short-and long-terms.

2. Fish passage could be restored at barriers to migration through the installation or modification of fish ladders, upgrade of culverts, or removal of barriers.

3. Harvest regulations could be modified to protect listed chinook salmon populations affected by both directed harvest and incidental take in other fisheries.

4. Artificial propagation programs could be modified to minimize negative impacts (e.g., genetic introgression, competition, disease, etc.) upon native populations of chinook salmon.

5. Predator control/relocation programs could be implemented in areas where predators pose a significant threat to chinook salmon.

6. Measures could be taken to improve monitoring of chinook salmon populations and their habitat.

7. Federal agencies such as the USFS, BLM, Federal Energy Regulatory Commission, COE, U.S. Department of Transportation, and U.S. Bureau of Reclamation could review their management programs and use their discretionary authorities to formulate conservation plans pursuant to section 7(a)(1) of the ESA.

NMFS encourages non-Federal landowners to assess the impacts of their actions on threatened or endangered salmonids. In particular, NMFS encourages state and local governments to use their existing authorities and programs, and encourages the formation of watershed partnerships to promote conservation in accordance with ecosystem principles. These partnerships will be successful only if state, tribal, and local governments, landowner representatives, and Federal and non-Federal biologists all participate and share the goal of restoring salmon to the watersheds.

## Critical Habitat

Section 4(a)(3)(A) of the ESA requires that, to the extent prudent and determinable, critical habitat be designated concurrently with the listing of a species. Section 4(b)(6)(C)(ii) provides that, where critical habitat is not determinable at the time of final listing, NMFS may extend the period for designating critical habitat by not more than one additional year.

In the proposed rule (63 FR 11482, March 9, 1998), NMFS described the areas that may constitute critical habitat for the proposed chinook salmon ESUs. Since then, NMFS has received numerous comments from the public concerning the process and definition of critical habitat for chinook salmon and other salmonids. Also, due to statutory time limitations, NMFS has not yet consulted with affected Indian tribes regarding the designation of critical habitat in areas that may affect tribal trust resources, tribally owned fee lands, or the exercise of tribal rights.

Given these remaining unresolved issues, NMFS determines at this time that a final critical habitat designation is not determinable for these ESUs since additional time is required to complete the needed biological assessments and evaluate special management considerations affecting critical habitat. NMFS, therefore, extends the deadline for designating critical habitat for 1 year until such assessments can be made and after appropriate consultations are completed.

## Classification

The 1982 amendments to the ESA, in section 4(b)(1)(A), restrict the information that may be considered when assessing species for listing. Based on this limitation of criteria for a listing decision and the opinion in *Pacific Legal Foundation* v. *Andrus*, 675 F.2d 825 (6th Cir., 1981), NMFS has categorically excluded all ESA listing actions from the environmental assessment requirements of the National Environmental Policy Act (NEPA) under NOAA Administrative Order 216–6.

As noted in the Conference Report on the 1982 amendments to the ESA, economic impacts cannot be considered when assessing the status of a species. Therefore, the economic analysis requirements of the Regulatory Flexibility Act (RFA) are not applicable to the listing process. In addition, this final rule is exempt from review under E.O. 12866.

This rule has been determined to be major under the Congressional Review Act (5 U.S.C. 801 *et seq.*)

At this time NMFS is not promulgating protective regulations pursuant to ESA section 4(d). In the future, prior to finalizing its 4(d) regulations for the threatened chinook salmon ESUs, NMFS will comply with all relevant NEPA and RFA requirements.

## References

A complete list of all references cited herein is available upon request (see **ADDRESSES**). Reference materials regarding this listing determination can also be obtained from the internet at www.nwr.noaa.gov.

## Change in Enumeration of Threatened and Endangered Species

In the proposed rule issued on March 9, 1998 (63 FR 11482), Upper Columbia river spring-run chinook salmon was added to paragraph (a) in § 222.23 and Puget Sound, Lower Columbia River and Upper Willamette spring-run chinook salmon were designated as paragraphs (s), (t) and (u) respectively in § 227.4. Since March 9, 1998, NMFS has issued a final rule consolidating and reorganizing existing regulations regarding implementation of the ESA. In this reorganization, § 222.23 has been redesignated as § 224.101, therefore, Upper Columbia River spring-run chinook salmon has been added in this final rule to paragraph (a) in § 224.101. Also in this reorganization, § 227.4 has been redesignated as § 223.102; therefore, Puget Sound, Lower Columbia River and Upper Willamette spring-run chinook salmon have been added in this final rule to paragraph (a) in § 223.102 as (16), (17), and (18), respectively.

## List of Subjects

*50 CFR Part 223*

Administrative practice and procedure, Endangered and threatened

species, Exports, Imports, Reporting and recordkeeping requirements, Transportation.

*50 CFR Part 224*

Endangered and threatened species, Exports, Imports, Marine mammals, Transportation.

Dated: March 15, 1999.

**Andrew A. Rosenberg,**

*Deputy Assistant Administrator for Fisheries, National Marine Fisheries Service.*

For the reasons set out in the preamble, 50 CFR parts 223 and 224 are amended as follows:

## PART 223—THREATENED MARINE AND ANADROMOUS SPECIES

1. The authority citation for part 223 continues to read as follows:

**Authority:** 16 U.S.C. 1531 *et seq.*; 16 U.S.C. 742a *et seq.*; 31 U.S.C. 9701.

2. In § 223.102, paragraphs (a)(16), (a)(17) and (a)(18) are added to read as follows:

### § 223.102 Enumeration of threatened marine and anadromous species.

* * * * *

(a) * * *

(16) Puget sound chinook salmon (*Oncorhynchus tshawytscha*). Includes all naturally spawned populations of chinook salmon from rivers and streams flowing into Puget Sound including the Straits of Juan De Fuca from the Elwha River eastward, including rivers and streams flowing into Hood Canal, South Sound, North Sound and the Strait of Georgia in Washington.

(17) Lower Columbia River chinook salmon (*Oncorhynchus tshawytscha*). Includes all naturally spawned populations of chinook salmon from the Columbia River and its tributaries from its mouth at the Pacific Ocean upstream to a transitional point between Washington and Oregon east of the Hood River and the White Salmon River, and includes the Willamette River to Willamette Falls, Oregon, exclusive of spring-run chinook salmon in the Clackamas River.

(18) Upper Willamette River chinook salmon (*Oncorhynchus tshawytscha*). Includes all naturally spawned populations of spring-run chinook salmon in the Clackamas River and in the Willamette River, and its tributaries, above Willamette Falls, Oregon.

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## PART 224—ENDANGERED MARINE AND ANADROMOUS SPECIES

3. The authority citation for part 224 continues to read as follows:

**Authority:** 16 U.S.C. 1531–1543 and 16 U.S.C. 1361 *et seq.*

4. In § 224.101, paragraph (a) is revised to read as follows:

### § 224.101 Enumeration of endangered marine and anadromous species.

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(a) *Marine and anadromous fish.* Shortnose sturgeon (*Acipenser brevirostrum*); Totoaba (*Cynoscian macdonaldi*), Snake River sockeye salmon (*Oncorhynchus nerka*), Umpqua River cutthroat trout (*Oncorhynchus clarki clarki*); Southern California steelhead (*Oncorhynchus mykiss*), including all naturally spawned populations of steelhead (and their progeny) in streams from the Santa Maria River, San Luis Obispo County, California (inclusive) to Malibu Creek, Los Angeles County, California (inclusive); Upper Columbia River steelhead (*Oncorhynchus mykiss*), including the Wells Hatchery stock and all naturally spawned populations of steelhead (and their progeny) in streams in the Columbia River Basin upstream from the Yakima River, Washington, to the United States—Canada Border; Upper Columbia River spring-run chinook salmon (Oncorhynchus tshawytscha), including all naturally spawned populations of chinook salmon in Columbia River tributaries upstream of the Rock Island Dam and downstream of Chief Joseph Dam in Washington (excluding the Okanogan River), the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) upstream to Chief Joseph Dam in Washington, and the Chiwawa River (spring run), Methow River (spring run), Twisp River (spring run), Chewuch River (spring run), White River (spring run), and Nason Creek (spring run) hatchery stocks (and their progeny); Sacramento River winter-run chinook salmon (*Oncorhynchus tshawytscha*).

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