Creek. Therefore, although artificial propagation of pink salmon in the past may have affected the population structure of odd-year pink salmon in Puget Sound, recent hatchery production has probably had little effect on this structure due in part to the use of native broodstocks.

ESU Determinations

Based on its evaluation of genetic, life-history, and ecological information pertaining to pink salmon, NMFS has determined that two ESUs exist for North American pink salmon in WA and southern British Columbia, Canada. These two ESUs include: (1) even-year pink salmon residing in the Snohomish River, Washington (and likely, evenyear pink salmon populations in southern British Columbia); and (2) oddyear pink salmon occurring in Washington as far west as the Elwha River and in southern British Columbia, Canada (including the Fraser River and eastern Vancouver Island) as far north as Johnstone Strait. A summary of the information that led to these conclusions is presented below.

Even-Year Pink Salmon ESU

A single population of even-year pink salmon occurs in the United States south of Alaska-in the Snohomish River, WA. Genetically, this population is much more similar to even-year pink salmon from British Columbia and Alaska than it is to odd-year pink salmon from Washington. In addition, a similar pattern is found in phenotypic and life-history traits such as body size and run timing. This result is consistent with numerous studies that have found large genetic differences between evenand odd-year pink salmon from the same area (e.g., Aspinwall, 1974; Beacham et al., 1985; Kartavtsev 1991).

The Snohomish River even-year pink salmon population is geographically isolated by several hundred kilometers from other even-year pink salmon populations of appreciable size. However, life-history features of the Snohomish River even-year population are similar to those in other even-year populations from central British Columbia. For example, time of peak spawning of even-year pink salmon in the Snohomish River is comparable to that of even-year British Columbia pink salmon and 3-4 weeks earlier than that of odd-year pink salmon in the Snohomish River. Genetic analyses are highly dependent upon standardization between laboratories, but available data indicate that even-year Snohomish River pink salmon are among the most distinctive of any pink salmon sample

from the United States or southern British Columbia.

At the present time, the Snohomish River even-year pink salmon population is relatively small, on the order of a few thousand adults per generation. In defining the term "species" as it applies to Pacific salmon, NMFS has previously stated that a population should not be considered an ESU if the historic size (or historic carrying capacity) is too small for it to be plausible to assume the population has remained isolated over an evolutionary important time period (Waples, 1991). The fact that small spawning populations are regularly observed may reflect the dynamic processes of extinction, straying, and recolonization (Waples, 1991). Therefore, the small size of the current Snohomish River even-year pink salmon population suggests that it may be part of a larger geographic unit on evolutionary time scales (hundreds or thousands of years). The odd-year Snohomish River pink salmon population, which has the same spawning habitat available, is 1-2orders of magnitude larger; therefore, it is possible that the even-year population was once much larger in the past. If that were the case, long-term persistence of this population in isolation would be easier to explain, since larger, isolated populations are likely to be more resilient to extinction than a small population such as this one.

Odd-Year Pink Salmon ESU

Genetic information indicates that odd-year pink salmon from southern British Columbia and Washington are clearly in a different evolutionary lineage than nearby even-year populations and more northerly oddyear populations. Within the southern British Columbia-Washington pink salmon group, there is also evidence of geographic population genetic structure, with detectable differences among groups of populations from the Dungeness River, Hood Canal, Puget Sound, and Fraser River, and southern and central British Columbia, Canada. In some analyses, Nisqually and Nooksack River populations in Puget Sound, WA are genetic outliers not similar to each other. Even so, none of the genetic differences within the southern British Columbia-Washington pink salmon group is very large in absolute magnitude.

Based on currently available information, NMFS concludes that the northern boundary of the odd-year ESU corresponds to the Johnstone Strait region of British Columbia, Canada. The ESU does not include northern British Columbia, Alaskan, or Asian

populations of pink salmon. In Washington, westernmost populations in this ESU are found in the Dungeness River, but the ESU presumably would also include the Elwha River population, if a remnant still exists (see Status of West Coast Pink Salmon ESUs). Some uncertainty exists whether populations in the Dungeness River (and possibly the Elwha River in Washington and southern Vancouver Island in British Columbia) belong in a separate ESU. Further, given the uncertainty associated with the presence of populations outside this range, NMFS believes that insufficient information presently exists to determine whether other populations of pink salmon on the Olympic Peninsula or locations further south should be included in this ESU.

Status of West Coast Pink Salmon ESUs

In considering whether these ESUs are threatened or endangered according to the ESA, NMFS evaluated both qualitative and quantitative information. Qualitative evaluations considered recent, published assessments by agencies or conservation groups of the status of pink salmon within the geographic area. Quantitative assessments were based on current and historical abundance information and time series data compiled from a variety of Federal, state, and tribal agency records.

Nehlsen et al. (1991) considered salmon stocks throughout Washington, Idaho, Oregon, and California and enumerated all stocks that they found to be extinct or at risk of extinction. Pink salmon stocks in the Klamath and Sacramento Rivers, located in California. were considered extinct. Three stocks were considered to be at high risk of extinction (Russian River, CA; Elwha River, WA; and Skokomish River, WA) and one at moderate risk of extinction (Dungeness River, WA). Pink salmon stocks that do not appear in their summary were either not considered to be at risk of extinction or there was insufficient information to classify them.

The WDF et al. (1993) categorized all salmon stocks in Washington on the basis of stock origin, production type, and status (healthy, depressed, critical, or unknown). Of the 15 pink salmon stocks identified by WDF et al. (1993), nine were classified as healthy, two as critical (lower Dungeness and Elwha Rivers), two as depressed (upper Dungeness and Dosewallips Rivers), and two as unknown (North and Middle Fork Nooksack, and South Fork Nooksack River). All runs were classified as wild production and all,