years are referred to as "odd-year" pink salmon (Aspinwall, 1974; Johnson, 1979; McGregor, 1982; Beacham et al., 1985).

The geographic distribution of the two pink salmon broodlines is not random. At the southern extent of the pink salmon range in North America, oddyear pink salmon are most abundant (Atkinson et al., 1967; WDF et al., 1993). Pink salmon populations in British Columbia are dominated by odd-year fish, whereas populations from the northern Queen Charlotte Islands and western Alaska are dominated by evenyear fish (Neave, 1952; Aro and Shepard, 1967; Ricker and Manzer, 1974). In Asia and North America, evenyear pink salmon generally become more abundant as latitude increases (Heard, 1991). The reasons for this variation in broodline dominance are not well understood (Ricker, 1962; Heard, 1991).

Consideration as a "Species" Under the ESA

To qualify for listing as a threatened or endangered species, Elwha River and lower Dungeness River pink salmon must constitute "species" under the ESA. The ESA defines a "species" to include any "distinct population segment of any species of vertebrate * * * which interbreeds when mature." On November 20, 1991, NMFS published a policy (56 FR 58612) describing how it will apply the ESA definition of "species" to Pacific salmonid species. This policy provides that a salmonid population will be considered distinct, and hence a species under the ESA, if it represents an ESU of the biological species. The population must satisfy two criteria to be considered an ESU: (1) It must be reproductively isolated from other conspecific population units, 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 be strong enough to permit evolutionarily important differences to accrue in different population units. The second criterion would be met if the population contributed substantially to the ecological/genetic diversity of the species as a whole. Further guidance on the application of this policy is contained in "Pacific salmon (Oncorhynchus spp.) and the Definition of Species under the ESA," which is available upon request (see ADDRESSES).

Reproductive Isolation

For this criterion, NMFS has considered available information

regarding geographic and life-history factors that may isolate pink salmon, as well as genetic factors which indicate reproductive isolation. The petitioners considered reproductive isolation with respect to eleven groups of pink salmon which have previously been identified in the State of Washington (WDF et al., 1993). In addition to those identified by the petitioner, previously identified pink salmon stocks include Snohomish River even-year pink salmon (the only even-year population in Washington, Oregon, Idaho, or California) and oddyear pink salmon populations in the following Washington rivers: (1) Nooksack, (2) Skagit, (3) Stillaguamish, (4) Snohomish, (5) Puyallup, (6) Nisqually, (7) Hamma Hamma, (8) Duckabush, (9) Dosewallips, and (10) upper Dungeness.

With respect to the two criteria established by NMFS to define a "species" of Pacific salmon, the petitioner contended that the lower Dungeness and Elwha River populations of pink salmon were both reproductively isolated from other pink salmon populations. Reproductive isolation was inferred primarily on the basis of distance to nearest neighboring population. For lower Dungeness River pink salmon, this distance is 10 km and for Elwha River pink salmon, this distance is 25 km. Genetic data, in the form of allozyme variation, support a hypothesis for at least partial reproductive isolation of the lower Dungeness River population (Shaklee et al., 1991), but no genetic data exist for the Elwha River population (WDF et al., 1993).

Considerable evidence exists that indicates that even- and odd-year pink salmon are reproductively isolated. As discussed above under Biological Background, pink salmon exhibit a rigid age structure that results in two separate broodlines, even- and odd-year pink salmon. Throughout much of the range of this species, many rivers which support pink salmon populations produce both even- and odd-year broodlines which have no opportunity for interbreeding. As a result, this life history characteristic yields in each of these rivers two temporally isolated populations with almost no prospect of genetic exchange.

Numerous genetic studies also support the belief that even- and oddyear pink salmon populations are reproductively isolated. Studies conducted by Okazaki (1984) and Reisenbichler (1992) found large genetic differences between even- and odd-year pink salmon from the same area, with the magnitude of the differences roughly comparable to that found between coastal and inland steelhead. Strong allozyme frequency differences between even- and odd-year broodlines spawning at the same locality have been reported in Alaska (Aspinwall, 1974; Johnson, 1979; McGregor, 1982), Canada (Beacham et al., 1985) and Russia (Salmenkova et al., 1981; Altukohov et al., 1983; Kartavstev, 1991) for many polymorphic enzyme coding loci. In addition, Shaklee and Varnavskaya (1994) reported a large genetic difference between even- and odd-year Snohomish River pink salmon.

Ecological/Genetic Diversity

For this criterion, NMFS considered environmental, ecological, and life history information in its assessment of potential pink salmon ESUs. Further, historic accounts of artificial propagation were considered to determine (1) How indigenous evenand odd-year west coast pink salmon populations have been altered, and (2) the relationship of historic populations to the presently defined ESUs.

Little information was provided by the petitioner regarding NMFS' evolutionary significance criterion. The petitioner believed that spatial and temporal isolation of the lower Dungeness River population from the upper Dungeness River population, due to differences in run timing and spawning location, contribute to the distinctiveness of the lower river population. No quantitative data are available to support a hypothesis for the distinctiveness of the Elwha River population.

Environmental, Ecological, and Life-History Information

Along the west coast of North America, climate varies primarily with latitude. As such, coastal regions exhibit north to south gradients of increasing average rainfall and decreasing average temperature. Streamflows in this region tend to be lowest in August and September, whereas water temperatures in northwestern Washington are generally highest in July and August (Hydrosphere Data Products, Inc., 1993). Run timing and spawn timing are sensitive to these factors. As a result, streamflow patterns determine the temporal availability and suitability of spawning and incubation habitat for pink salmon.

Pink salmon populations can vary considerably in run timing (Sheridan, 1962) and spawn timing within a single river system. This type of life-history variability can have consequences for a populations' fitness (Taylor, 1980; Mortensen et al., 1991) and therefore, is an important consideration when