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APR 08 2005

April 5, 2005

Chief, Protected Resources Division
National Marine Fisheries Service
525 NE Oregon Street, Suite 500
Portland, Oregon 97232-2737

Re: Proposed Listing Determination for California Central Valley *Oncorhynchus mykiss* ESU

Dear Sir or Madam,

The California-Nevada Chapter of the American Fisheries Society, the largest chapter of the organization, represents over 500 professional fisheries scientists in California and Nevada involved in research, management, and policy. The mission of the Chapter and our parent society is to use, and promote the use of, science to improve conservation and sustainable management of fishery resources and the aquatic ecosystems upon which they depend. Since its establishment, the California-Nevada Chapter has provided technical analyses, interpretation, and policy recommendations on many regional fishery issues, including endangered species.

We have reviewed the National Marine Fisheries Service's (NMFS) Proposed Listing Determinations for 27 ESUs of West Coast Salmonids (69 FR 33102) and have previously provided comments to you on the proposed revision of the listing status of the Sacramento River winter-run Chinook salmon ESU (letter dated November 2, 2004). At that time we did not provide comments on Central Valley *Oncorhynchus mykiss* (steelhead/rainbow trout) as we generally agreed with NMFS's analyses of this ESU's status and the proposal to continue to list it as threatened. However, since that time, we have obtained a copy of a letter sent to you by the California Department of Fish and Game (CDFG) in which they recommend redefining the Central Valley *O. mykiss* ESU into two ESUs and delisting the newly described Sacramento Valley portion of the ESU. Our review of this letter and the existing science, conducted by Chapter members who are well-known experts in salmonid biology, indicates that the CDFG letter contains several errors, incorrectly evaluates the effects on environmental conditions on gene flow within the ESU, uses inappropriate data to estimate population abundance, and does not reflect sound science for assessing extinction risk and ESU viability.

1. There is no evidence to support splitting the Central Valley *O. mykiss* ESU

Contrary to CDFG's contention, there is no evidence to suggest that *O. mykiss* populations in the San Joaquin Valley and eastside Delta tributaries should be considered a separate ESU from the Sacramento Valley populations. The recent comprehensive analysis of Central Valley

steelhead/rainbow trout genetic structure, conducted by Nielsen et al. (2003), found that less than 1% of Central Valley *O. mykiss* molecular genetic variance could be attributed to differences between the Sacramento and San Joaquin river basins and that much larger genetic differences exist between populations within the basins. The study found no evidence of genetic differentiation between populations of the two basins, indicating that they are not reproductively isolated. The findings support NMFS's conclusion that Central Valley *O. mykiss* comprise a single ESU.

2. Periodic low dissolved oxygen in the lower San Joaquin River is not an isolating barrier

The basis for CDFG's suggestion to split the Central Valley *O. mykiss* ESU is their argument that periodic low dissolved oxygen conditions in the lower San Joaquin River at the Stockton Deepwater Ship Channel ("Delta" in the CDFG letter) represent an isolating barrier that has resulted in reproductive isolation of the San Joaquin Valley *O. mykiss* from the Sacramento Valley populations. Our experts can find no references in the scientific literature or evidence in our review of available dissolved oxygen monitoring data that supports CDFG's assertion that the dissolved oxygen problem is so severe and long-standing as to constitute a complete reproductive barrier. Dissolved oxygen monitoring data from the Stockton Deepwater Ship Channel (available on the California Data Exchange Center [CDEC] website) indicate that the adverse environmental conditions (i.e., dissolved oxygen <5 mg/l) are ephemeral, varying seasonally, diurnally, and even spatially within the river channel. Even if intolerably low dissolved oxygen conditions persisted throughout the adult and juvenile migration periods for anadromous *O. mykiss*, there are other suitable migration routes through the Delta, including Middle and Old Rivers, that allow steelhead access to and from rivers in the San Joaquin Valley without traveling through the Stockton Deep Water Ship Channel.

According to Waples (1991), reproductive isolation between ESUs must be "substantial" and it must occur over a time frame that allows for independent population dynamics or extinction risks. Typically, a time frame of at least one hundred years is used (McElhany et al., 2000). Based both on the genetic analyses described above and on our brief analysis of the dissolved oxygen "barrier" hypothesized by CDFG, clearly this is not the case for the Sacramento and San Joaquin Valley *O. mykiss* populations.

3. Estimates of *O. mykiss* abundance are not based on sound science

The approach used by CDFG to estimate the abundance of *O. mykiss* in the upper Sacramento River system and the greater Central Valley is not based on sound science. Many assumptions and inferences are found throughout their analysis, which averages several *O. mykiss* density estimates, most measured in non-anadromous reaches (i.e., above dams) outside the ESU, and applies these to an estimate of habitat quantity in the Central Valley. Habitat quality and associated regional and local variations in abundance, age structure, migration patterns, carrying capacity, and density-dependent and density-independent mortality are neither described nor considered. For example, habitat quality information indicates that the habitat where the estimates were derived and the habitat to which the estimates were applied do not possess the same environmental characteristics (i.e., 500-750 cfs flows in the Sacramento River above

Shasta Lake compared with flows of 4,500-14,000 cfs in the Sacramento River below Keswick Dam). Given that multiple fish surveys have found that *O. mykiss* are not evenly distributed throughout the river but instead congregate in high-gradient, high-velocity areas (mostly bar-complex riffles and runs), this likely represents a large source of the error in CDFG's estimates.

CDFG's abundance estimate includes both juvenile and adult *O. mykiss* as well as the numbers of hatchery-produced smolts released each year. While in most cases salmonid population size is measured in terms of adults (e.g., escapement), it can be useful to make population size estimates for juvenile fish. However, given the large disparities in survival-to-spawning rates for the different life stages, it is not appropriate to estimate population size, particularly as a Viable Salmonid Population criterion (McElhany et al., 2000; see below), by combining all ages. It is also not appropriate to compare such an abundance estimate with that of another species measured for a single life stage, as CDFG does for Central Valley *O. mykiss* and San Joaquin basin fall-run Chinook salmon in their comment letter.

4. Viable Salmonid Population criteria are misinterpreted

The Viable Salmonid Population concept (VSP; McElhany et al., 2000) and its four VSP criteria (abundance, population growth rate, population spatial structure, and diversity) is the guiding framework for assessing extinction risk and ESU viability. Using these criteria, a viable salmonid population is defined as one with negligible risk of extinction over a 100-year time frame. In their analysis, CDFG has misinterpreted the VSP concept, failed to compare current conditions for the ESU to historical conditions for each of the VSP criteria, and failed to explain how the addition of resident and hatchery *O. mykiss* reduces the risk of extinction, which is presumably the basis for their suggestion that the ESU be delisted.

Abundance

Our experts agree with CDFG and NMFS's Biological Review Team (BRT) that the addition of resident *O. mykiss* to the ESU substantially increases abundance in the northern portion of the ESU (although CDFG's attempt to quantify population size is flawed, see above). However, despite this, the BRT found high risk associated with the abundance VSP criterion. CDFG does not provide any new or additional information regarding how the additional resident or hatchery-produced fish have reduced the threat of extinction to the ESU.

Population growth rate

CDFG contends that the rapid recovery of the resident *O. mykiss* population in the mainstem Sacramento River above Shasta Reservoir (a population not included in the ESU) after the 1991 Cantara chemical spill is evidence of the tremendous population growth rate of Central Valley *O. mykiss*. This example is largely irrelevant to an evaluation of the population growth rate VSP criterion for *O. mykiss* populations in the ESU and may instead be a better example of the importance of a broad spatial structure for species recovery following a local catastrophic event. The relatively rapid response of *O. mykiss* in the upper Sacramento River was not unexpected

because the chemical spill was confined to the mainstem, leaving the tributary populations unaffected and a substantial source for recolonizing the mainstem when conditions improved.

CDFG provides no information regarding overall population growth rates within the Central Valley *O. mykiss* ESU, or for either the anadromous or resident components of the populations. However, there is life stage-specific information available for the steelhead components of the populations from which some conclusions regarding overall ESU population growth and viability can be drawn. Natural steelhead adult escapement counted at Red Bluff Diversion Dam showed a substantial decline between 1967 and 1993 (McEwan, 2001). Naturally-produced juvenile steelhead measured in the lower Sacramento River from 1995 to 1999 also showed a decline (Snider and Titus, 1998; 2000a; 2000b; 2000c). These data suggest that the population growth rate as a whole is negative. Our experts are not aware of any data that indicate population growth rates are increasing or that the risk of extinction has been reduced.

Population spatial structure

The CDFG letter states that *O. mykiss* are widely distributed, occurring in the mainstem Sacramento River and over 20 tributaries, and concludes with no further analysis that the ESU is therefore not at risk for extinction on the basis of population spatial structure. However, correct application of this VSP criterion includes analysis of historical spatial structure, not just that measured during the past few years. Over the past century, the spatial structure of the Central Valley *O. mykiss* ESU has been adversely affected by dam construction and the resultant elimination of access to upstream habitat; Yoshiyama et al. (1996) estimated that steelhead spawning and rearing habitat in the Central Valley has been reduced by greater than 82%. Remaining accessible habitats are subject to severe and ongoing degradation by water diversion, barriers, poor water quality, and loss of spawning gravels. Our experts agree with the BRT's conclusion that a habitat reduction of this magnitude corresponds to a high risk of extinction and is not mitigated by the addition of resident or hatchery-produced *O. mykiss* to the ESU.

O. mykiss are broadly distributed throughout the Central Valley, but CDFG appears to discount the value of the San Joaquin basin for the ESU and suggest on the basis of recent abundance that these tributaries do not represent a substantial portion of the range of the ESU. However, factors other than present habitat quantity are important for assessing the significance of a portion of a species' range. Historically, both resident and anadromous *O. mykiss* were present in the San Joaquin basin (McEwan, 2001; Moyle, 2002). The basin was an important center of *O. mykiss* distribution and evolution, as evidenced by the presence of multiple endemic subspecies of rainbow trout (Behnke, 1992).

Diversity

The information provided by CDFG on the diversity criterion for Central Valley *O. mykiss* is a broad qualitative comment regarding run and spawn timing, an unsupported statement that *O. mykiss* are "genetically pre-disposed to migrate to the ocean throughout the Central Valley", and the acknowledgement that the abundance of the anadromous life history form has declined significantly. Given that anadromy is recognized as an important diversity trait by the VSP

approach (McElhany et al., 2000), it is unclear why CDFG should be uncertain in regards to the effects of continued steelhead declines to extinction risk for the ESU.

For Central Valley *O. mykiss*, the anadromous life history form is a critical component of the ESU's diversity and the resiliency of its populations (McEwan and Jackson, 1996; McEwan, 2001; Varanasi, 2004). The Central Valley is subject to both a high degree of environmental variability as well the threat of regional and local catastrophic events. Contrary to CDFG's contention, there is ample scientific literature to suggest that the anadromous life history characteristic reduces extinction risk in polymorphic salmonid populations that occur in variable environments (e.g., Jonsson, 1985; Titus and Mosegaard, 1992; Northcote, 1997; Moyle, 2002). Steelhead are important for providing gene flow and for recolonizing empty habitat patches. Clearly, the past and ongoing declines in the anadromous life history form have reduced the diversity and increased the risk of extinction for the ESU. Addition of resident and hatchery *O. mykiss* to the ESU have not reduced the risk of extinction associated with this VSP criterion.

In their discussion of the diversity of Central Valley *O. mykiss*, CDFG presents no information on genetic diversity, despite the recently completed analysis by Nielsen et al. (2003). Results of this study indicate that a recent reduction in abundance caused a genetic bottleneck and loss of genetic diversity. These data further support the BRT's and our conclusion that the extinction risk associated with diversity is likely still high.

5. Summary and Recommendations

On the basis of our lengthy expert review, CDFG's recommendation to split the Central Valley ESU into two ESUs and then to delist the newly formed Sacramento basin ESU is not based on sound science, appropriate analyses and full understanding of the VSP concept. Available science and monitoring data, when correctly applied to NMFS' VSP criteria, clearly indicate that Central Valley *O. mykiss* are at risk of extinction and merit listing under the Endangered Species Act. The California-Nevada Chapter of the American Fisheries Society recommends that you include our comments in the public record and carefully consider them when reviewing and analyzing the comments submitted to you by CDFG. Should you have additional questions regarding our comments, please contact me at 2128 Bueno Drive #13, Davis, CA 95616, (530) 756-9021, or at swanson@bay.org.

Sincerely,

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