

Currently there are four distinct populations of salmon in the Sacramento/San Joaquin river systems, each named for the season of their migration upstream as adults. The fall-run population is now the most numerous. The San Joaquin River system supports only a fall-run population; the San Joaquin River spring-run became extirpated in the 1940's. The Sacramento River system still supports small winter-run, spring-run and late fall-run populations, but these populations have all declined dramatically in recent years (USFWS 1992a, WRINT-USFWS-7; California DFG 1992a, WRINT-DFG-14). The winter-run population is now listed as threatened under the ESA. The spring-run population has recently reached low enough levels to be recognized as a species of special concern by the State of California, and NMFS has recently included the spring-run in its status review of salmon on the northwest coast of the United States (59 FR 46808 (09/12/94)).

Steelhead trout are also cold fresh-water migratory fish within the Sacramento River System. They have suffered a 90 percent decline since the late 1960's, and are supported largely by hatchery production (CDFG 1992a, WRINT-DFG-14).

Salmon and steelhead migrating through the Delta to the ocean are subject to increased mortality when exposed to high temperatures and low flows and when diverted out of the main channels of the Sacramento and San Joaquin Rivers into less suitable habitat. Those fish diverted from the main river channels into the central and south Delta are also subject to increased mortality because of several factors including higher temperatures, increased predation and increased entrainment at the State and Federal pumping plants in the south Delta (USFWS 1992a).

State and federal legislators have recognized the serious threat to the continued existence of migratory fishes in the Bay/Delta. In 1988, the California State legislature mandated a restoration goal of doubling natural salmon and steelhead production by the year 2000, and required development of a plan to meet this goal. Salmon, Steelhead Trout, and Anadromous Fisheries Program Act; codified at Cal. Fish & Game Code § 6900 et seq. (West 1991). Also, the United States Congress recently enacted the Central Valley Project Improvement Act (CVPIA), which requires that a program be developed and implemented to make "all reasonable efforts to ensure that * * * natural production of anadromous fish in Central Valley rivers

and streams will be sustainable, on a long-term basis, at levels not less than twice the average levels attained during the period 1967-1991. * * *" Central Valley Project Improvement Act § 3406(b)(1), P.L. 102-575.

(2) Proposed Rule. Many different factors affect the ability of salmon and steelhead to successfully migrate through the Delta to the ocean. These include water temperature, flow rates, diversions, operation of pumping facilities, and gate closures regulating the direction of water flows through the myriad channels and sloughs in the Delta. Clearly, any number of beneficial combinations of these factors could result in conditions that provide for successful migration and protection of the designated use. Accordingly, in formulating its Proposed Rule, EPA concluded that it would state its criteria generally, measuring the success of salmon in migrating through the Delta. That is, EPA would state goals that (1) called for a certain percentage of salmon to be able to survive their passage through the Delta, and (2) that could be achieved by any of a number of different management measures. In this way, the State Board would have maximum latitude to find combinations of management measures that would attain the salmon survival goal.

In order to quantify the success of migrating salmon in passing through the Delta, EPA relied on "salmon smolt survival models" developed by the USFWS, one for the Sacramento River and one for the San Joaquin River.²⁵ These salmon smolt survival models are mathematical equations stating the relationship between specific variables in the Delta (water flow rates, diversions into the central Delta, etc.) and salmon smolt survival.²⁶ To predict the effect of a particular set of management measures (for example, a specified minimum flow and a specified maximum export flow), EPA inserts the management measures into the model equation. The model equation then generates an "index value" representing the relative success of salmon migrating through the Delta while that set of management measures is being implemented.²⁷

²⁵ A "smolt" is a salmon in the process of acclimating to the change from a fresh water to a salt water environment. This occurs when young salmon migrate downstream through the Delta to the ocean.

²⁶ These salmon smolt survival index equations were based in large part on the results of tagged-fish release and recapture experiments designed to measure and compare salmon smolt survival under a number of different physical conditions of varying migration pathways, water temperatures, flow rates, and rates of water exports from the Delta.

²⁷ There was some disagreement among the commenters on the Proposed Rule as to whether

As its criteria, EPA proposed a set of index values representing successful salmon migration sufficient to protect the designated use. EPA established these target criteria index values by taking a set of USFWS recommendations of management measures that would protect the salmon resource, and translated (using the USFWS model equations) those protective management measures into index values. In other words, the criteria index values represented the level of salmon migration survival through the Delta that would occur if this particular set of protective management measures were adopted. The intent was not to mandate those particular management measures. Rather, it was to set a performance standard—measured by the criteria index value—for salmon survival. To attain the goal, the State Board would use either the specific management measures recommended by USFWS, or any other combination of measures that would yield the same level of survival of migrating salmon.

The Proposed Rule named its criteria index values "salmon smolt survival index criteria." For each of the Sacramento and San Joaquin River systems, the criteria provided a salmon smolt survival index equation (*i.e.* a USFWS model equation) and a set of index values to be attained. The index equation for each river quantified and predicted the survival of salmon smolt migrating through the Delta.

The USFWS equations and EPA's Proposed Rule both "scaled" the index values to a scale of 0 to 1. This was done by dividing experimental release results by a constant of 1.8 (the highest release result). In the final rule, EPA is not "scaling" its criteria values. It is important to realize that criteria index values in the final rule are not actual survival estimates (such as a percentage of smolt surviving), but indices showing survival relative to other index values.²⁸

In the Proposed Rule, the index values contained in the criteria varied according to the standard five water year types—each water year type had a

these USFWS models yield index values that are literally "percentages" of the salmon smolts surviving through the Delta. All parties appear to agree, however, that these index values do in fact represent the relative survival compared to other index values. This preamble and accompanying rule will generally refer to these values as index values rather than as percentages.

²⁸ For example, historically, the San Joaquin River index value has reached a number as high as 1.5 (which was attained in an experimental release at Jersey Point). For comparison, the average San Joaquin survival index value during low flow years is 0.09. This 0.09 index value represents approximately 5 smolt recoveries from a release of 50,000 fish at Mossdale, 55 miles upstream of the recovery site at Chippis Island.