

Reference No. 1

**DRAFT**

**A DESCRIPTION OF U.S. EPA PROPOSED "WATER QUALITY STANDARDS FOR  
SURFACE WATER OF THE SACRAMENTO RIVER, SAN JOAQUIN  
RIVER, AND THE SAN FRANCISCO BAY AND DELTA  
OF THE STATE OF CALIFORNIA"**

**and**

**THE U.S. FISH AND WILDLIFE SERVICE  
BIOLOGICAL OPINION FOR THE DELTA SMELT**

Prepared for

**California Urban Water Agencies  
Sacramento, California**

By

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**NOTICE**

This draft report was prepared as a technical document for reference use by California Urban Water Agencies and others in preparing their comments to the US Environmental Protection Agency on "Water Quality Standards for Surface Waters of the Sacramento River, San Joaquin River, and San Francisco Bay and Delta of the State of California, January 6, 1994." This draft technical report is not a part of the CUWA formal comment to EPA.

## Preface

This report was prepared for the California Urban Water Agencies (CUWA) as a part of a CUWA review of the U.S. Environmental Protection Agency's proposed "Water Quality Standards for Surface Waters of the Sacramento River, San Joaquin River, and San Francisco Bay and Delta of the State of California (40 CFR Part 131). CUWA commissioned this report as a part of its overall review and evaluation of this standard. This report describes the proposed standards and summarized the rationale for each.

The scope of the effort for CUWA/SLDMWA technical team included five tasks:

- Task 1: Prepare a description of the proposed standards
- Task 2: Prepare a description of the basis for the standards, and identify significant issues related to the scientific validity of the standards
- Task 3: Prepare an analysis of the probable water costs of the standards
- Task 4: Prepare a discussion of the effects of the standards on other species in the Bay/Delta
- Task 5: Based on Tasks 1-4, determine if there were refinements or alternatives to the proposed standards which would provide equivalent or better biological benefit with equivalent or lower water costs.

**CUWA/SLDMWA TECHNICAL TEAM**  
**for Evaluation of**  
**PROPOSED EPA WATER QUALITY STANDARD FOR THE**  
**BAY/DELTA ESTUARY**  
**and**  
**USF&WS DELTA SMELT BIOLOGICAL OPINION**

**Task 1. Description of the Standards**

**I. INTRODUCTION**

The Environmental Protection Agency (EPA) proposes to establish water quality standards for the Sacramento-San Joaquin Bay/Delta Estuary (Delta) under Section 303(c) of the Clean Water Act. Based on preliminary descriptions provided by EPA (Attachment 1), there are three proposed standards:

- An estuarine habitat standard, requiring outflows to maintain a 2-ppt salinity line at Roe Island, Chipps Island and/or the confluence of the Sacramento and San Joaquin rivers;
- A striped bass spawning standard, requiring maintenance of 0.44 mmhos/cm electric conductivity in designated reaches of the San Joaquin River;
- A cold water habitat standard for salmonids during the period April through June on the Sacramento River and April through May on the San Joaquin River.

The United States Fish and Wildlife Service (USF&WS) is simultaneously considering outflow and take standards for the Bay/Delta Estuary in its 1993 Biological Opinion for the endangered Delta smelt, including (Attachment 2):

- Year-round take limits for the CVP/SWP
- Minimum outflow requirements (5,800 cfs or 6,800 cfs) for the period February 1 through June 30, with increases to 12,000 cfs for the period April 15 through May 15.

## **II. THE ESTUARINE HABITAT STANDARD**

The estuarine habitat standard will establish requirements for the position of a 2-ppt salinity line (designated X2). This standard would be based on measurement at 1 meter above the bottom, averaged over the daily tidal cycle from February 1 through June 30. A variety of biologists believe that the X2 line acts as a surrogate for the position of the entrapment zone, which includes an area of turbulent mixing and increased food availability. Maintenance of X2 at this position will generally require additional releases from CVP and SWP reservoirs during this period to maintain sufficient outflow of fresh water from the Sacramento and San Joaquin Rivers into Suisun Bay.

An original justification for the Central Valley Project (CVP) and State water Project (SWP) was to prevent marine salt water intrusion into the Delta during dry summer months to protect agricultural, municipal, and industrial water uses in the Delta. Implementation of the EPA's proposed standard would limit salinity intrusion during the late winter and spring to control the location and spatial extent of brackish shallow water habitat for aquatic organisms dependent on lower salinity habitats. Also, some biologists believe that the position of X2 adjacent to shallow-water estuarine habitat, particularly in Suisun Bay and Marsh, provides the best opportunity for a variety of estuarine dependent species to increase their populations.

Historically, much of this shallow-water habitat occurred in the Delta above the confluence of the Sacramento and San Joaquin rivers as a series of wetland marshes and shallow channels. Diking and flood control levees have greatly reduced both the quality and quantity of this habitat. When X2 is upstream of the confluence of the two rivers, the available brackish habitat is limited to the relatively deep water channels defined by levees. Therefore, Suisun Bay and Marsh represent the most inland large marshland habitat available to shallow-water estuarine species.

The purpose of the standard is to maintain the extent of low salinity habitat in Suisun Bay at levels comparable to those occurring prior to 1976. EPA considered basing the standard on (1) the current location of X2, but rejected this as too lax a requirement and (2) on the location of X2 prior to implementation of the CVP and SWP, but rejected this as too stringent a requirement.

## **A. Formal Justification for the Estuarine Habitat Standard**

The formal justification for the proposed estuarine habitat standard is found in Schubel, JR, et. al (1993) *Managing Freshwater Discharge to the San Francisco Bay/Sacramento-San Joaquin Delta Estuary: The Scientific Basis for an Estuarine Standard*. San Francisco Estuary Project. This report justifies establishment of a salinity standard on the following rationale:

- The area and volume of low-salinity habitat in estuaries is important to success of a number of species (page i);
- Species requiring low-salinity habitat maintained large populations through the 1970's but have generally been in decline since the mid-1980's (page 1);
- Many biologists believe that this decline is related to changes in freshwater inflow to the Delta (page 1);
- Freshwater inflow to the Delta is related to the position of X2; that is, the position of X2 is a measure of freshwater inflow (page 1);
- The position of X2 in the Delta is therefore an indicator of the amount of shallow-water estuarine habitat available in Suisun Bay (page 2).
- The position of X2 in the Delta is a practical way of tracking changes in habitat and a standard based on the position of X2 is an index which can meet three practical criteria:
  - (1) it can be measured accurately, easily, and inexpensively;
  - (2) it has ecological significance;
  - (3) it has meaning for non-specialists.

The ecological significance of the X2 standard is the key issue in its evaluation. The basis for the statement that the position of X2 is ecologically significant is:

- The species selected for study (chosen because they are known to be affected by freshwater outflow; WRINT. SFEP 5, p. 15 & 18; WRINT, SFEP 6, p. 20), increased in abundance as a simple function of increased outflow and decreased salinity; the further X2 is displaced downstream, the greater the abundance or survival of these species (Jassby, Appendix B;)
- Most of the major concerns about reductions in freshwater input to the estuary are associated with loss of low-salinity habitat; therefore salinity is an ideal index for keeping track of the extent of low-salinity habitat (page 6);

- The position of X2 is an index of habitat conditions for estuarine resources at all trophic levels and models to predict species abundance based only on X2 perform as well as more complex models that incorporate other variables (page 9); this conclusion is, however, contradicted by Jassby (Appendix B, page B-7).

These conclusions are largely based on Jassby's Appendix B, which describes statistical relationships between:

- The average annual position of X2 and particulate organic carbon supply in Suisun Bay;
- The March-November position of X2 and March-November abundance of *Neomysis mercedis*;
- The March-May position of X2 and annual abundance of the shrimp *Crangon franciscorum*;
- The 3-year annual average of X2 and the annual abundance of molluscs in Grizzly Bay;
- The April-July position of X2 and striped bass egg survival;
- The March-June position of X2 and subsequent-year annual abundance of starry flounder;
- The January-June position of X2 and annual abundance of longfin smelt;
- The July-November position of X2 and striped bass fall midwater trawl index.

Jassby notes that the averaging periods for X2 were based on the biology of the species investigated; the analysis did not include data from 1983 (the wettest year on record) for *Neomysis*, starry flounder, and longfin smelt because their populations may have been seaward of the sampling stations; and that variables studied included various trophic levels.

The CUWA/SLDMWA Technical Team has discussed the statistical methods used to develop these correlations with Jassby and has independently reviewed the correlations developed by Jassby (Attachment 3). This independent analysis produced results very similar to those developed by Jassby, confirming the arithmetic behind salinity standard correlations. Review of the appropriateness of the analyses and the validity of the conclusions drawn from the data available is found in the following Section "Task 2: Basis of Standards." The biologists who provided the formal basis for the EPA standards note that they did not investigate causal relationships between X2 and estuarine habitat, and that the mechanism to explain the correlations identified is unknown.

## **B. Setting the Estuarine Habitat Standard**

According to EPA's Bruce Herbold, the number of days during which the position of X2 would be required to be downstream of the three measurement points was calculated based on the hydrologic record from 1940-1975. The median number of days that X2 was downstream of the three designated measurement points (for each water year type) was used to set the standard. The standard for critical years was estimated because there were no critical years in the period of hydrologic record selected.

## **III. THE STRIPED BASS SPAWNING STANDARD**

The proposed standard would provide freshwater (less than 0.44 mmhos/cm electric conductivity) in the San Joaquin River between Jersey Point and Vernalis during the striped bass spawning season. This is similar to, but more extensive than, the requirement proposed in D-1630.

Accomplishing this goal will require additional water releases, probably from New Melones Reservoir, which would be already heavily committed to supplying water for salinity protection in the southern Delta. The justification for this standard is:

- Striped bass eggs need freshwater to hatch. Therefore, spawning habitat in the San Joaquin River must be maintained as freshwater habitat (on average) for the spawning and incubation period.
- Striped bass eggs need adequate freshwater flows to prevent egg suffocation; larval state striped bass need these flows to prevent diversion and entrainment.

## **IV. THE FISH MIGRATION, COLD-WATER HABITAT STANDARD**

The Coldwater Habitat standard is based on State Water Resources Control Board testimony by the USF&WS (WRINT-USF&WS-7, July 6, 1992). It is intended to increase salmon smolt survival on both the Sacramento and San Joaquin rivers by a combination of outflow requirements and closures of channel gates to prevent entrainment of smolts.

The standard establishes target smolt survival indices for the Sacramento and San Joaquin rivers. There is no implementation scenario proposed; this will be the responsibility of the project operators and the State Water Resources Control Board (SWRCB).

In its testimony before the SWRCB, the USF&WS described a number of possible alternatives for accomplishing the desired smolt survival indices. Their preferred alternative (Alternative D, WRINT-USF&WS-7, July 6, 1992) is described below for background purposes only.

Alternative D would require closing the Delta cross channel and Georgiana slough from April 15 to June 15 in all years, combined with a set of export and outflow requirements which vary by water-year type. On the San Joaquin, a barrier would be required at the head of Old River from April 1 through May 31 and September 1 through November 30 in all year types. The export restrictions are intended to reduce reverse flows and other flow problems which result in both entrainment of smolts and in drawing smolts into the middle delta where they are subject to increased predation. Outflows would be intended to push smolts rapidly into the estuary, where they will not be affected by either pumping or an extended period of mid-delta predation.

The Alternative D export restrictions in mean daily averages, which apply to combined SWP and CVP operations, would apply for the period April 15 through May 15 and vary by water-year type:

<u>Water-Year Type</u>	<u>Maximum Export (cfs)</u>
Wet	6,000
Above-Normal	5,000
Below-Normal	4,000
Dry	3,000
Critically Dry	2,000

Outflow requirements at Vernalis, in mean daily average, apply to the period April 15 through May 15, and also vary by year:

<u>Water-Year Type</u>	<u>Flow required (cfs)</u>
Wet	10,000
Above-Normal	8,000
Below-Normal	6,000
Dry	4,000
Critically Dry	2,000

Alternative D outflow requirements at Jersey Point, in mean daily average, would apply to the period April 1 through June 30, and also vary by year:

<u>Water-Year Type</u>	<u>Flow required (cfs)</u>
	April 1 - April 14 and May 16 - June 30
Wet	1,000
Above-Normal	1,000
Below-Normal	1,000
Dry	1,000
Critically Dry	1,000



<u>Water-Year Type</u>	<u>Flow required (cfs)</u>
	April 15 - May 15
Wet	3,000
Above-Normal	2,500
Below-Normal	2,000
Dry	1,500
Critically Dry	1,000

Under Alternative D, the minimum flow at Rio Vista from April 1 - June 30 is 4,000 cfs for all water-year types.

The Alternative D mechanism for accomplishing the proposed striped bass indices were based on modeling of the relationship between smolt survival and exports/outflows, with and without barriers and cross channel closures. The relationships are not strong. For example, the relationship between smolt survival and flow at Vernalis is significant at the 90% confidence level. And regression coefficients were not improved by adding CVP and SWP exports to the equation. The justification for many aspects of the standard is professional judgment that there are flow/temperature and flow/survival relationships.

#### V. PROCEDURAL BASIS FOR THE EPA STANDARDS

Under Section 303(c) of the Clean Water Act (Act) EPA has the authority to approve state-proposed "water quality standards" and to propose its own standards if the state fails to adopt appropriate standards; however, Section 101(g) limits EPA's authority with respect to actions which would impair state water rights allocations. And Section 102(b) specifically excludes "salt water intrusion" from the definition of "water quality", stating:

"The need for and value of storage or regulation of streamflow (other than for water quality) including but not limited to navigation, salt water intrusion, recreation, esthetics, and fish and wildlife, shall be determined by the Corps of Engineers, Bureau of Reclamation, and other Federal agencies [emphasis added]."

Regardless of these express limitations on EPA authority over salt water intrusion issues, EPA would appear to be basing its promulgation of salinity standard on Section 303 (b), which provides for promulgation of water quality standard by the EPA Administrator if a state fails to promulgate appropriate and needed standards.

The procedure for this action is established in 40 CFR Ch. 1, Sections 131.1 through 131.21. Based on a review of this procedure and the applicable sections of the Act, the procedure for the EPA's action would appear to be:

- At least every 3 years, states are required to review applicable water quality standards and modify them as appropriate;
- Modifications are to be based on "new information" which would indicate that designated uses (identified in Section 101 (a) (2) of the body of water in question are now attainable;
- If such a determination is made, the state "shall revise its standard accordingly" (Section 131.20);
- States shall hold public hearings prior to making such determinations and shall submit the results of the review and supporting analysis to review within 30 days of final state action to adopt new standards;
- State submittals shall include methodologies used for site-specific criteria development which demonstrate that when the criteria are met, water quality will generally protect the designated use;
- Following state submittal, the Regional Administrator of the EPA notifies the state of approval (within 60 days) or disapproval (within 90 days)(Section 131.21);
- If the state does not adopt the changes specified by the Regional Administrator within 90 days after notification of disapproval, the Administrator must promptly propose and promulgate such standards (Section 131.22 (a));
- The Administrator may also independently propose and promulgate a new or revised water quality regulation to protect a designated use "upon determining such a standard is necessary to meet the requirements of the Act (Section 131.22 (b));
- In taking such action, the Administrator is subject to the same policies, procedures, analyses, and public participation requirements established for states (Section 131.22 (c)).

Under Section 303 (b) of the Act, the Administrator must promulgate any water quality standard published in a proposed regulation within 190 days after the date the standard is proposed, unless the state has adopted a standard which the Administrator determines is in accordance with the Act. It would appear that EPA is taking action to propose and promulgate the three habitat standards in response to the failure of the State of California to act following the SWRCB hearings of the past 6 years.

The procedural basis for the striped bass spawning and salmon coldwater habitat elements of the standard is similar. Here EPA would appear to be defining salinity as a pollutant, caused primarily by agricultural discharges (D-1630, page 44).

**EPA has not specifically sited its legal justification for the coldwater habitat standard, but it may be based on Section 24 of PL 97-117, which states:**

**"(D) Each State shall estimate for the waters identified in paragraph (1) (D) of this subsection the total maximum daily thermal load required to assure protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife. . . . Such estimates shall include a calculation of the maximum heat input that can be made into each such part and shall include a margin of safety . . ."**

**This requirement, generally used as a basis for point source discharge restrictions, may be the basis for a requirement that additional flows be released to reduce the impacts of such discharges, thereby protecting beneficial uses of the Bay/Delta estuary by flushing fish downstream and diluting thermal pollution.**

## **VI. THE 1993 DELTA SMELT BIOLOGICAL OPINION TAKE STANDARD AND OUTFLOW STANDARD**

### **A. Purpose and Scope of the Standard**

The take and outflow standards are intended to ensure that the operations of the CVP and SWP do not jeopardize the continued existence of the Delta smelt and to minimize the impacts of take associated with operations of these projects. The standard includes five elements: take limits, an outflow/downstream transport requirement, a late spawning requirement, a Montezuma Slough dispersal requirement, and an entrainment requirement

### **B. Take Limits**

The proposed take limit is intended to minimize take of the projects during all life history periods. The proposed take limits vary by year type, season, and location. There are two proposals:

- Proposal one bases take limits for juveniles on salvage thresholds developed by CDF&G, with less restrictive criteria for wet, above-normal, and below-normal water-year types. Summer townet surveys for juveniles are to be used to adjust take criteria in July; if the fall midwater trawl data indicate a high index, the take limit may be increased. All criteria will be based on a 14-day running average of combined daily salvage, incorporating a scaler.

#### **Proposal 1 Take Limit Calculations**

<b>Month</b>	<b>Wet, A-N, and B-N Years</b>	<b>Dry, Critical years</b>
<b>Dec-March</b>	Latest Fall MWT Index x Scaler	Latest Fall MWT Index x Scaler
<b>Apr-June</b>	Previous FMWT Index or 600	Previous FMWT Index or 400
<b>July</b>	Previous FMWT Index or 600, use lesser of townet survey shows low abundance	Previous FMWT Index or 600, use lesser of townet survey shows low abundance
<b>August</b>	Previous FMWT Index or 300, use lesser of townet survey shows low abundance	Previous FMWT Index or 200, use lesser of townet survey shows low abundance
<b>Sep-Nov</b>	Lesser of: Previous FMWT Index Latest FMWT Index Not less than 100	Greater of: 100 Latest FMWT Index

- Proposal Two would base adult take limits on the Fall Midwater Trawl Index modified with a scaling factor and juvenile take limits on 1980-1992 salvage values. For adults, the take limit would be calculated:

$$\text{Prior year's FMWT Index} \times 0.7$$

The juvenile take limit would be calculated:

April - November:	14-day average combined delta smelt salvage
April - June:	400
July:	300
August:	200
Sept-Nov. 1:	100

### C. Downstream Transport Requirements

Downstream transport requirements mandate a minimum flow of 5,800 cfs measured at Collinsville from February 1 through June 30 plus a certain number of days of additional flows to maintain a gross flow of 12,000 cfs at Chipps Island, depending on water-year type:

Water-Year Type	Number of days 12,000 cfs is required	Contribution from San Joaquin (April 15-May 15, at Vernalis)
Critical	90 days	2,000 cfs
Dry	116 days	4,000 cfs
Below-Normal	119 days	6,000 cfs
Above-Normal	144 days	8,000 cfs
Wet	148 days	10,000 cfs

### D. Late Spawning Requirement

If monitoring indicates that Delta smelt have spawned late (June or July) and townet surveys indicate they are not widely distributed, then a working group will consider additional operational measures: either pulse flows from Sacramento and San Joaquin Rivers, export curtailments, or other measures.

#### **E. Montezuma Slough Dispersal Requirement**

If real-time monitoring in December-June indicates presence of Delta smelt in Montezuma Slough, then the flashboards in the Suisun Marsh Salinity Control structure will be removed.

#### **F. Entrainment Requirement (Proposed)**

If FMWT index shows Delta smelt are not abundant or widely distributed, then radial gates at Clifton Court Forebay shall remain open at all times from February 15 through June 30 to decrease peak reverse flows in Old and Middle River.

#### **G. Basis for the Standards**

No rationale for the take limits is provided. The downstream transport requirement is based on the conclusion that 5,800 cfs will move and maintain Delta smelt at Collinsville, 12,000 cfs will move and maintain Delta smelt at Chippis Island and maintain adequate salinity levels, and therefore Delta smelt will remain in favorable habitat during rearing. High flows in the San Joaquin will move smelt away from CVP/SWP pumps and agricultural diversions. Fluctuating salinities among and between years will simulate natural conditions and prevent further incursions by asian clam, introduced copopods, and chameleon goby.

The late spawning requirement is based on conclusions that when spawning is late and smelt are not widely distributed, additional flows are needed to transport smelt to estuarine habitat and away from influence of the pumps.

The Montezuma Slough dispersal requirement is based on conclusions that it will allow movement of smelt into and out of Montezuma Slough, decrease predation at the control structure, and decrease diversion of smelt from Montezuma Slough.

The proposed entrainment requirement is based on conclusions that they will reduce entrainment by decreasing reverse flows in Old and Middle River and allow outmigration of predators from Clifton Court Forebay.

#### **H. Procedural Basis for the Biological Opinion**

Under the Endangered Species Act, the Bureau of Reclamation (Bureau) is required to enter into a Section 7 Consultation with the USF&WS regarding the effects of operation of the Central Valley Project on the Delta smelt. To address the impacts of State Water Project operations on the Delta smelt, the Department of Water Resources (DWR) would normally be required to request a Section 10(a) permit under a Habitat Conservation Plan, but the Bureau granted applicant status to DWR based on the existence of the Cooperative Operations Agreement between the Bureau and DWR. The Section 7 Consultation therefore covers both projects.

Under a Section 7 Consultation, USF&WS is required to issue a biological opinion regarding the potential for the project (operation of the CVP and SWP) to jeopardize the continued existence of the Delta smelt. If a jeopardy opinion is issued, the USF&WS is further required to discuss reasonable and prudent actions required to avoid, minimize, mitigate, or compensate impacts to the Delta smelt. The USF&WS will find that the operations of the projects do constitute a threat to the continued existence of the species, and they will issue a jeopardy opinion. The projects will be allowed to continue operations, as described in the Environmental Assessment developed for the projects, only if they take the recommended actions to minimize and mitigate for their impacts.

In terms of the reasonable and prudent actions recommended for the CVP and SWP operators, the Section 7 Consultation process is limited in scope. The USF&WS mandates take limits and changes in the operations of the projects, but generally does not mandate other forms of mitigative action. The focus of the mitigative actions required under the biological opinion is therefore on CVP and SWP operations. The range of alternatives considered will not be expanded unless the applicant proposes alternatives which would meet the tests of avoidance, minimization, mitigation, or compensation.

It is noteworthy that the Biological Opinion does not provide for avoidance of impacts (isolation of the pumps from the Delta) or for compensation (other actions which might offset the impacts of the projects such as screening of unscreened agricultural diversions).

#### **I. Relationship between the EPA Standards and the Delta Smelt Biological Opinion Requirements**

There is no official linkage between the two sets of standards, but there are some similarities. First, the purpose of the two standards is different. The EPA's standard is intended to protect a wide range of beneficial uses of the estuary. The Delta Smelt Biological Opinion requirements are intended to permit operations of the projects under a jeopardy opinion; the requirements are minimization and mitigation of impacts (take and outflow, respectively).

The similarities between the standards are:

- The period of outflow regulation is the same (February 1 through June 30);
- The number of days of required outflow is the same, for all water-year types; and
- Both standards require high San Joaquin River outflows from April 15 through June 30, the EPA striped bass survival and coldwater habitat standards impose virtually the same outflow requirements on the San Joaquin side as the Biological Opinion does.

There is one primary difference:

- The X2 standard would permit variation in outflow to meet a fixed X2 position; the Biological Opinion would lock in total outflow of 12,000 cfs at the confluence and outflows of from 2,000 cfs to 10,000 cfs for the San Joaquin River for a defined period, depending on water-year type; X2 involves variation in outflow primarily because it accounts for antecedent conditions;

The coincidence of the standards is logical in some ways. First, both the Delta Smelt Biological Opinion and the EPA Estuarine Habitat standard are intended to benefit estuarine species. Second, both are focused on flow/entrainment functions. Third, both are based on the same fundamental data base and monitoring program philosophy. Finally, both agencies staff have coordinated for years on D-1630 and other proposed regulations and share the philosophy that outflow and exports are the primary variables which have changed since population levels were "high" in the early 1970's. It is therefore not surprising that both sets of standards fix on outflows of approximately 12,000 cfs at the confluence, require the same number of days of compliance, and justify these on the basis of flow needed to move fish into the estuary of Suisun Bay.