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MAR 11 1994

Mr. Patrick Wright
Bay/Delta Program Manager
Water Quality Standards Branch, W-3
Water Management Division
United States Environmental Protection Agency
75 Hawthorne Street
San Francisco, CA 94105

Dear Mr. Wright:

PROPOSED CRITERIA FOR THE BAY-DELTA ESTUARY

Enclosed are the State Water Resources Control Board's (SWRCB) comments regarding the proposed rule published January 6, 1994 at 59 Fed. Reg. 810-852 pertaining to Water Quality Standards for Surface Waters of the Sacramento River, San Joaquin River, and San Francisco Bay and Delta of the State of California.

The SWRCB is planning to commence a triennial review of the 1991 Bay-Delta Plan in April. The SWRCB requests that the proposed rule be withdrawn for the reasons stated in the attached comments and to give the SWRCB time to prepare its triennial review. The proposed rule contains numerous flaws and should either be withdrawn altogether or should be revised and republished. Of the proposed criteria, only the salinity criteria for striped bass spawning fall within EPA's authority to promulgate standards under Section 303 of the Clean Water Act.

The SWRCB has numerous comments, but the primary comments can be summarized as follows:

1. To comply with the Clean Water Act EPA must follow additional procedures and take into consideration economic effects. The criteria substantially exceed EPA's targeted level of protection and exceed the level of protection designated by the SWRCB. Because the proposed criteria change the level of protection afforded to the beneficial uses, compared with the beneficial uses designated by the SWRCB, EPA must either change its criteria in accordance with the beneficial uses or designate its own beneficial uses.

2. The proposed criteria for estuarine habitat and salmon smolt survival are not water quality criteria. They actually regulate water flow and diversions. We believe that EPA lacks authority to regulate these matters and further is not authorized to adopt water quality standards for pollution caused by reductions in fresh water flow.

3. The estuarine habitat and smolt survival beneficial uses are subject to protection by the state, according to Clean Water Act Section 208, and should not be subjected to federal standard-setting.

4. Other alternatives which would provide approximately equivalent protection for fishery resources have less water cost.

5. EPA's water supply impact analysis of its draft standards is unrealistically optimistic.

Also enclosed are documents cited in the SWRCB's comments which may not be in EPA's administrative record. We request that you include these documents in the record.

If you have any questions, you may call Tom Howard, Senior Engineer, at (916) 657-1873 or Barbara J. Leidigh, Senior Staff Counsel, at (916) 657-2102.

Sincerely,

ORIGINAL SIGNED BY

Walt Pettit
Executive Director

Enclosures

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STATE WATER RESOURCES CONTROL BOARD

COMMENTS ON EPA'S DRAFT STANDARDS

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STATE WATER RESOURCES CONTROL BOARD
COMMENTS ON EPA'S DRAFT STANDARDS

I. INTRODUCTION

The State Water Resources Control Board (SWRCB) has numerous legal, regulatory and technical concerns regarding EPA's draft standards for the Bay-Delta Estuary and their accompanying Federal Register text. These concerns are expressed below in a comment/discussion format for EPA's convenience. The analysis is divided into three parts: comments on the draft standards and Federal Register text, comments on the water supply and economic impacts, and responses to specific issues for commenters to address.

A. HISTORY OF THIS PROMULGATION.

Comment: The 1991 water quality control plan adopted by the State Water Resources Control Board (SWRCB) should be approved by EPA. Additional requirements for salinity in the western Delta or for operation of facilities that would help the beneficial uses are not water quality matters within the meaning of the Clean Water Act. Adoption of salinity criteria for striped bass spawning in the San Joaquin River appears to be within EPA's authority, but would not be appropriate at this time. EPA should approve the SWRCB temperature objectives for salmon smolt survival.

Discussion: On May 1, 1991, the SWRCB adopted a Water Quality Control Plan for Salinity for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (Bay-Delta Plan) In September 1991, the EPA approved the salinity objectives for municipal/industrial and agricultural uses and the dissolved oxygen objective for fish and wildlife uses of the San Joaquin River. These approvals constituted final agency action by EPA under Section 303(c) of the federal Clean Water Act. EPA disapproved what it construed to be a failure of the water quality objectives to protect the Estuarine Habitat and other designated fish and wildlife uses of the estuary. EPA also disapproved salinity and temperature objectives for fish and wildlife. The disapprovals did not constitute final agency action by EPA.

EPA's basic criticism was that the Bay-Delta Plan did not contain enough objectives to protect fish and wildlife. EPA indicated that additional salinity standards were needed for the Suisun Bay and Marsh area and for the San Joaquin River, and that the temperature objectives for salmon were not adequate.

The SWRCB responded to EPA's disapproval by letter dated February 10, 1992. The response explained that the Bay-Delta Plan is a part of a larger package of protections for the Bay-Delta estuary, that water quality objectives could not protect all the beneficial uses, that instream flow and operational requirements needed to protect these uses are appropriately accomplished through State law, and that the SWRCB was proceeding toward a consideration of water rights to determine what additional protections should be provided in terms of flow and operational constraints. The SWRCB response explained that additional salinity standards for the Suisun Bay and Marsh area would not restore and protect the habitat because the primary effect on that area is caused by water project operations and their effect on water flow.

The SWRCB response also pointed out that the Clean Water Act extends only to regulation of water quality parameters to protect the beneficial uses, and that where other parameters such as water project operations and water flow affect the beneficial uses, these parameters cannot be the subject of water quality criteria under the Clean Water Act.

The SWRCB response points out that a salinity objective is an appropriate protection for fish spawning in the San Joaquin River, but that entrainment may be a primary cause of declines in striped bass. Therefore, the SWRCB believed it would be more appropriate to revisit the salinity objectives in this area after considering the entrainment problems. Meanwhile, the State is pursuing a program to control the salinity, which is caused by nonpoint source pollution from agricultural return flows.

B. THE AFFECTED AREA

Comment: Most of California would be impacted if the proposed criteria are adopted. The Bay-Delta Estuary is a highly modified area which is important not only for fish and wildlife but also for municipal, industrial, and agricultural uses in California.

Discussion: The San Francisco Bay/Sacramento-San Joaquin Delta Estuary where the proposed criteria would apply is the geographic area of the confluence of the Sacramento and San Joaquin Rivers and the San Francisco Bay. The geographic boundaries of the Delta are described in Water Code Section 12220. It extends roughly in a triangle from Sacramento to Stockton to Chipps Island in Suisun Bay and back to Sacramento. It is an area where several rivers come together to flow to the ocean, and it has many channels through low-lying lands. Much of the land in the Delta is below water level and is protected from flooding by levees, which form islands. The Delta is both a rich agricultural area and one of the most important estuarine areas for fishlife. The Suisun Marsh, downstream from the Delta, is one of the most important brackish water marshes for waterfowl production near the Pacific Coast. The San Francisco Bay includes the area surrounding the Bay and Suisun Marsh.

The Bay-Delta Estuary is highly modified from its natural state. Originally, the Delta was largely marshlands. Before man diverted substantial amounts of water, flows decreased substantially during the late spring and summer dry season, and did not increase until fall rains began. Since the Estuary is essentially at sea level, salt water intruded from the Pacific Ocean into the eastern parts of the Delta during the dry seasons when the river flows decreased. During the 1800's, levees were constructed and the land protected by the levees was dried for farming. Then, water storage and diversions upstream and in the Delta removed some of the flow and changed the times of year when some of the flow reaches the Delta. With the dams, water was released from storage during the summer, changing the timing of outflows from the Delta and preventing salt water from intruding as far upriver as previously in the dry season. The dams also stored some of the very high flows that naturally would reach the Delta in winter and early spring, allowing salt water to intrude into the western, downstream, part of the Delta during the winter and spring of dry years. To avoid exporting salt water at the water diversion pumps in the southern Delta, the State Water Project and the Central Valley Project release quantities of water from upstream reservoirs whenever necessary to push salt water downstream, away from the pumps.

The purpose of the proposed criteria is to protect beneficial uses by fish and wildlife in the Bay-Delta Estuary. The populations of fish which reside in the Delta or pass through it have been in decline for some time, and they obviously need additional protection. The primary question is whether the proposed criteria are the appropriate way to protect the fish, in light of the many uses of the limited water supply that is produced in the watersheds of the Delta. The proposed criteria are designed to be implemented only by increasing the flow of water into and through the Estuary. This substantially reduces the amount of water remaining for other uses. Another, less water intensive, solution should be developed to ensure balanced protections for all water uses.

The area affected by the criteria includes not only the Estuary but also most of the State, because water from the Delta and its tributaries supports much of California's population and economic activity. The Delta receives water from two major river systems, the Sacramento River and the San Joaquin River, and from several rivers flowing from the western slope of the Sierra Nevada into the Delta. The natural flow of water is through the Estuary to the Pacific Ocean. Water is diverted for consumptive uses including municipal, industrial, and agricultural uses along the length of the tributary rivers and from the Delta itself.

Exports of water from the southern Delta by the State Water Project and the Central Valley Project for uses south of the Delta and in the San Francisco Bay area account for a substantial portion of the water produced in the watersheds of the Delta. While the maximum export to date was 6.1 million acre-feet in 1989, the present demand for exported water in drier years is about 7.1 million acre-feet. With an increasing population in the southern part of California, the demand for water will increase.

A solution is necessary that will provide adequate water and habitat conditions for the fish without depriving other reasonable and beneficial uses of water that they depend upon. Because the major causes of the fishery declines are water project operations and changes in fresh water flows, it is not appropriate for EPA to set water quality criteria. Rather, this is a water supply and facilities operations problem the solution to which Congress has reserved to the states.

II. COMMENTS ON THE DRAFT STANDARDS AND FEDERAL REGISTER TEXT

A. ASSUMING THAT EPA HAS AUTHORITY TO ADOPT THE PROPOSED CRITERIA, THIS PROMULGATION DOES NOT COMPLY WITH THE FEDERAL CLEAN WATER ACT.

Comment: To comply with the federal Clean Water Act, EPA must take into consideration economics and the effects on other beneficial uses that are not addressed in this promulgation. Due to the way that the SWRCB Bay-Delta objectives were adopted, they should not be bifurcated into beneficial uses and criteria. The result is a hybrid standard which fails to take into consideration economic factors and other beneficial uses. Further, the level of protection required by the Clean Water Act should be expressed in quantitative terms and its regulatory basis should be clearly defined. The proposed criteria appear to establish new levels of protection without going through the process at 40 CFR 131.10 for designation of uses, including balancing economic effects of the standards.

Discussion:

1. To Make The Proposed Criteria Adequate Under The Clean Water Act, EPA Must Consider Economic Factors and other Beneficial Uses.

EPA stated in the Federal Register notice, at 59 FR 833, that "water quality criteria must be based solely on science." Consequently, while EPA performed an abbreviated analysis to disclose the effects of its criteria, it did not weigh the economic effects and the effects on the other beneficial uses, and it did not adjust its criteria to minimize the adverse effects of the criteria.

Under Clean Water Act Section 303(c)(2), water quality standards

> "shall be such as to protect the public health or welfare, enhance the quality of water and serve the purposes of this chapter. Such standards shall be established taking into consideration their use and value for public water supplies, propagation of fish and wildlife, recreational purposes, and agriculture, industrial, and other purposes, and also taking into consideration their use and value for navigation." (Emphasis added.)

In other words, adoption of standards must include all of these factors. For purposes of Section 303(c)(2) of the Clean Water Act, EPA in its regulations has divided standards promulgation into designation of uses and establishment of criteria. Under EPA's interpretation, designation of uses includes consideration of economic factors and feasibility of attaining the use. Mississippi Commission on

Natural Resources v. Costle 625 F.2d 1269, 1277 (5th Cir. 1980)[1]; 40 CFR Section 131.10.

EPA says that criteria must be based on sound scientific rationale, and mistakenly goes on to say that criteria do not include consideration of economic factors. See 59 FR 812, citing 40 CFR Section 131.11(a); see also EPA's promulgation of water quality standards for Alabama, at 45 FR 9911 (February 14, 1980)[2]. Notwithstanding EPA's statement in the Federal Register, the statute, regulations, and case law do not preclude EPA from considering economic and other factors when it adopts criteria, for the purpose of choosing among alternative criteria, when all of the alternatives are based on sound scientific rationale.

In the Bay-Delta Estuary, it is possible for protection of one beneficial use to harm another beneficial use. Therefore, criteria for one use should take into account the effects on the other uses. It is obvious that the proposed criteria will adversely affect uses of Bay-Delta water for public water supplies, industry, and agriculture. Other criteria could provide the same protection for the fishery resources with less effect on economics and other beneficial uses. Alternative criteria are discussed in other comments.

The SWRCB in adopting the objectives identified the beneficial uses and considered such factors as attainability of uses, the level of protection to be achieved, the quality of water available in the area, variations in flows, and the economic effects of protecting the beneficial uses at different levels. The result of EPA's dividing these objectives into designation of uses and establishment of criteria for purposes of

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1 *In adopting the Mississippi criteria, EPA stated that:*

"Consideration of economic factors occurs in a separate step in the water quality standards setting process. EPA's regulations at 40 CFR 130.17(c) provide for consideration of the environmental, technological, social, economic, and institutional factors in designating a particular use for individual waters. Therefore, economic considerations are not relevant in this rulemaking." 44 FR 25226 (April 30, 1979) (Emphasis added.)

2 *"The designated use component of a water quality standard involves a judgment as to what use is appropriate, given the water body's use and value for various purposes, and attainable, in light of economic, social and other considerations. The Act and EPA's regulations state that water quality standards shall be established taking into consideration the water's 'use and value' for various purposes such as public water supply, propagation of fish and wildlife, recreation, industry, agriculture and navigation [Section 303(c)(2); 40 CFR 35.1550(b)(2)]. In determining whether a standard is attainable, States should consider environmental, technological, social, economic, and institutional factors [40 CFR 35.1550(c)(1)]."*

"The criterion portion of a water quality standard, in contrast, involves a determination of the concentrations of various water constituents that must not be violated in order to support a particular use. Thus, the criterion is founded on scientific, technical considerations. If the criterion for a water constituent necessary to support a water use cannot be attained because of economic, environmental or other factors, the appropriate remedy is to designate the particular water body for a less restrictive use." (Emphasis added.) 45 FR 9911 (February 14, 1980)

review under Clean Water Act Section 303(c) is that there is no consideration of economic factors and the effects on other beneficial uses in the resulting standards.

EPA's action is unauthorized. Because of the manner in which the State's Bay-Delta standards were considered and adopted, the beneficial uses and water quality objectives are not separable. The Bay-Delta objectives are specifically linked to beneficial uses, and the SWRCB's determination that protection of these beneficial uses was attainable was based on its analysis of the objectives. Under the Clean Water Act, EPA has authority to approve or disapprove a state's standards and approve them as modified. Where, as in the case of the Bay-Delta, the State's beneficial uses and objectives are inextricable linked, separating the beneficial uses from the objectives is an impermissible modification of the State's standards.

Nevertheless, EPA is separating parts of the state action which are inextricably linked and approving only one part (i.e. EPA proposes to approve the beneficial uses but not the objectives). Since EPA considers economic considerations irrelevant in establishing criteria, EPA did not consider economic factors in proposing criteria. EPA is completely sidestepping, through a regulatory sleight of hand, consideration of economic factors and feasibility in setting Bay-Delta water quality standards. This is contrary to the Clean Water Act and EPA's regulations at 40 CFR 131.

If EPA does not wish to consider economic factors in connection with the criteria, it should complete these standards by designating beneficial uses. In designating beneficial uses, EPA by its own admission can consider other factors.

2. <u>EPA Should Explain Quantitatively What Level Of Protection Is Required By The Clean Water Act And The Regulatory Basis For This Level</u>

It is important for EPA to clearly identify in quantitative terms what it believes are the minimum Clean Water Act requirements for standards in the Delta. Such an identification process serves the principal purpose of assuring the people of the State of California, who must bear the economic costs of these standards, that EPA's action is not arbitrary.

EPA's water quality standards regulations at 40 CFR 131 specify the minimum requirements for water quality standards. Water quality standards must include, at a minimum, beneficial use designations and water quality criteria sufficient to protect the use designations, and they must be consistent with the antidegradation regulation. The antidegradation regulation requires that existing uses be maintained and protected. Existing uses are defined as uses that existed on or after November 28, 1975. 40 CFR Section 131.3(e).

EPA appears to rely on the requirement that criteria protect the use designations as the bases for its draft standards. There is no discussion of the use of the antidegradation regulation in the Federal Register notice and, as discussed in other comments, all of EPA's draft standards substantially exceed the level of protection that existed in 1975.

It can be difficult to quantitatively determine the conditions necessary to protect a beneficial use, depending on how the beneficial use designation is expressed. If a beneficial use designation is broadly stated, defining the type or magnitude of the criteria necessary to protect the use can be subjective, especially when dealing with parameters other than toxicity (such as salinity and salmon survival). This type of problem is discussed in EPA's Water Quality Standards Handbook, Second Edition, (page 2-5) and Appendix C of the handbook titled, Biological Criteria: National Program Guidance for Surface Waters which both state that

> "[D]etermination of non-attainment in waters with broad use categories may be difficult and open to alternative interpretations. If a determination of non-attainment is in dispute, regulatory actions will be difficult to accomplish."

The solution to this problem suggested in the handbook is for states to adopt more explicit subcategories of uses.

Full realization of all estuarine habitat and fish migration beneficial uses in the Bay-Delta Estuary has not existed since approximately the mid-1800's. Since that time, wetlands in the Estuary have been filled, levees have been constructed, and water development both upstream and within the Estuary has significantly reduced habitat values throughout the Estuary. The beneficial uses of estuarine habitat and fish migration have existed as declining continuums throughout this period, and the SWRCB never intended its beneficial use designation to encompass the full extent of uses which occurred under natural conditions. The selection of an historical period along these declining continuums to protect these beneficial uses is arbitrary. EPA has selected the late 1960's and early 1970's as its target reference period because EPA believes that this period "generally reflects conditions that occurred in the estuary before fish habitat and populations began to experience the most recent significant declines, and therefore serves as a useful definition of a healthy fishery resource" (page 819-820). However, EPA does not provide any substantiation for this observation, and it is uncertain how EPA measures "the most recent significant declines". (This issue is discussed in more detail in a subsequent comment.)

The problem of defining the use is potentially alleviated if the antidegradation regulation is relied upon for setting standards because the antidegradation regulation applies to uses that existed on or after a specific date. The antidegradation regulation was probably adopted, at least in part, to address this type of problem.

Fundamentally, we are unable to ascertain whether EPA believes that the draft standards represent the minimum Clean Water Act requirements. If EPA believes that the draft standards are the minimum Clean Water Act requirements, how it arrived at this conclusion is a mystery. EPA's conclusion should be presented in a quantifiable manner.

3. <u>To Change The Proposed Levels Of Protection EPA Must Follow The Process At 40 CFR 131.10 For Designation Of Uses</u>.

In proposing criteria, EPA may be changing the level of protection afforded to the beneficial uses. There is no explanation of the basis for the change or the relationship between the criteria and the beneficial uses to be protected. To change the level of protection, EPA must follow the procedures for designating beneficial uses, including consideration of economic effects and feasibility. 40 CFR Section 131.10.

The SWRCB's objectives protect beneficial uses at levels that the SWRCB believes meet the antidegradation policies of both EPA and the state. The EPA criteria change the level of protection. In explaining the proposed criteria, EPA says that the criteria for estuarine habitat were meant to establish habitat conditions that existed during the late 1960's to early 1970's but that EPA used the 1940-1975 hydrology to estimate these conditions. 59 F.R. 819-820. For salmon smolt survival, the criteria were meant to establish better protection than the late 1960's to early 1970's period. 59 F.R. 824-825. It is not clear what level of protection EPA intends for fish spawning in the specified reach on the San Joaquin River, or how it was estimated. See 59 F.R. 826-827. As is demonstrated elsewhere in these comments, the proposed criteria will at times restrict water diversions and outflows to levels that existed during a much earlier period of development than EPA says it intends to achieve. Presumably, EPA expects these flow changes to support beneficial uses at the levels that existed during these earlier periods.

Under the antidegradation policy EPA adopted for the Clean Water Act, at 40 CFR Section 131.12, existing uses shall be maintained and protected. Existing uses are defined in pertinent part as "those uses actually attained in the water body on or after November 28, 1975." 40 CFR Section 131.3(e). While increased protections can be required, such increases in protection are not necessary to protect the beneficial uses as designated by the State. By changing the target reference period, EPA is redefining the beneficial uses from those adopted by the State. Even assuming the State's beneficial uses can be separated from the objectives, EPA must base its criteria on the beneficial uses as designated by the State unless EPA promulgates its own beneficial use designations. Any beneficial use designations made by EPA, including modifications of the target reference period, must be supported by findings that include consideration of the factors listed at 40 CFR Section 131.10(a). The current promulgation does not include such a consideration.

The levels of protection that EPA intends the proposed criteria to meet differ from those established by the SWRCB in its 1991 objectives. Establishment of a level of protection is part of designation of uses under the federal Clean Water Act regulations at 40 CFR 131.10. Therefore, the EPA either should establish criteria for protection at the levels established by the State or should complete the process to designate beneficial uses in this promulgation.

B. EPA IS NOT AUTHORIZED TO ADOPT WATER QUALITY STANDARDS FOR POLLUTION[3] CAUSED BY REDUCTIONS IN FRESH WATER FLOW

1. EPA Should Explain In Detail Its Authority To Adopt The 2 PPT Criteria And The Salmon Smolt Survival Criteria

Comment: The Federal Register notice should include a detailed assessment of EPA's authority to regulate flows and diversions.

Discussion: The Federal Register notice states that EPA is

> "attempting to accommodate the State's interest substantively ..[by]..refraining from proposing direct revisions to the flow criteria. Instead, EPA is proposing criteria that describe the habitat conditions necessary to protect the designated uses of the Bay/Delta. The State Board still has full discretion to develop implementation measures attaining those habitat conditions." (page 813)

This statement is disingenuous. As discussed in other comments, the two ppt isohaline standards are outflow standards and the salmon smolt survival standards are flow and export standards. These standards take direct control of the heart of the State's water rights and water distribution system. EPA is well aware of this fact, but the Federal Register notice does not acknowledge it. Instead, the Federal Register notice makes repeated and inaccurate assertions that it is accommodating the State's water rights interests. The fact that EPA does not even acknowledge what it is doing is inexplicable in light of the exceptionally important legal and public policy issues involved. A detailed discussion of EPA's assessment of the limits of its authority under the Clean Water Act would be helpful to all parties.

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[3] *The term "pollution" is defined in the Clean Water Act as meaning the "...man-made or man-induced alteration of the chemical, physical, biolgical, and radiological integrity of water." Clean Water Act §502(19), 33 U.S.C. §1362(19). This is to be distinguished from "pollutant", which is defined in pertinent part in the Clean Water Act as meaning "...dredged spoil, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive material, heat, wrecked or discarded equipment, rock, sand, cellar dirt and industrial, municipal, and agricultural waste <u>discharged into water.</u>" Clean Water Act §502(6), 33 U.S.C. §1362(6). The difference between these definitions is important, because the Clean Water Act has different methods of regulating pollution and pollutants.*

2. EPA Lacks Authority To Adopt The Proposed Standards For A 2 PPT Isohaline And For Salmon Smolt Survival

Comment: Clean Water Act Section 303(c) regulates pollutants discharged into water. It is not intended to regulate pollution caused by reduction of fresh water flow. Only the state can decide whether it is appropriate to regulate flow-caused pollution including salinity intrusion and establish requirements for its regulation. California can without question adopt such requirements under state law. But EPA has no authority to adopt standards for flow or for pollution caused by reductions of fresh-water flow under its standard-setting authority for water quality planning. Therefore, EPA cannot adopt the proposed criteria for Estuarine Habitat and for Fish Migration and Cold-Water Habitat.

Discussion:

a. Streamflow Matters Are Not To Be Regulated By EPA.

The Clean Water Act makes clear that salt water intrusion, like that in Suisun Bay, is a streamflow matter, not a "water quality" matter, and that the regulation of streamflow is not to be determined by EPA. For purposes of the Clean Water Act the proposed criteria for 2 ppt salinity in Suisun Bay and for salmon smolt survival are streamflow requirements, not water quality criteria.

Section 102(b) of the Act, 33 U.S.C. §1252(b), helps establish the meaning of "water quality" under the Act. Section 102(b)(1) provides that in the survey or planning of any federal reservoir, consideration shall be given to the inclusion of water storage for regulation of streamflow. But this section divides the responsibilities to consider the need for and value of storage. EPA is to recommend to Congress matters regarding water storage for purposes of "water quality" (§102(b)(3)), but the federal dam operating agencies are to regulate streamflow matters, which specifically include "salt water intrusion."[4]

It is unlikely that Congress intended the term "water quality" to have an entirely different meaning in §102(b)(2) than it had in the rest of the Act, particularly when it was discussing "water quality" functions of the federal agency that was to implement the Act. Therefore, the plain language of Section 102(b)(2) establishes that the regulation of streamflow, including salt water intrusion, is not a "water quality" issue.

The language of §102(b)(2) was chosen deliberately. The Senate bill gave EPA authority to determine the need for storage for water quality purposes (see

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[4] *"The need for and value of storage for regulation of streamflow (other than for water quality) including but not limited to navigation, salt water intrusion, recreation, esthetics, and fish and wildlife... " §102(b)(2), 33 U.S.C. §1252(b)(2) (Emphasis added).*

S. 2770, §102(b)(2), reprinted in A Legislative History of the Water Pollution Control Act Amendments of 1972 ("1972 Legislative History"), Vol.2, p. 1537), whereas the House bill gave that authority to the federal dam operating agencies subject only to the "advice" of EPA. See H. R. 11896, §102(b)(2), reprinted in 1972 Legislative History, Vol.1, p.898. The Conference Committee split the difference, and gave EPA authority regarding "water quality" matters, and gave the dam operating agencies authority over streamflow, including salt water intrusion. See 1972 Legislative History, Vol. 1, p. 284.

If EPA cannot, under §102(b)(2), regulate streamflow for salt water intrusion when federal dams are concerned, it follows that EPA also cannot adopt water quality standards regulating streamflow from non-federal dams. The fact that the Conference Committee made §102(b) applicable only to federal dams and not to the broader category of federally-licensed dams (as was proposed in the Senate bill) means that Congress wanted to limit any streamflow regulation to federal facilities.[5]

The only means of meeting EPA's 2 ppt criteria and the salmon smolt survival criteria would be for the State to regulate water project operations and allocate water storage and streamflow for salt water intrusion and for instream flows. EPA was expressly denied such authority for federal dams, and Congress refused to extend federal regulation of streamflow in §102(b) to any entity other than federal developers of federal dams. Since EPA cannot regulate these matters, it cannot adopt criteria for them.

b. The Proposed Standards For Salt Water Intrusion And For Salmon Smolt Survival Would Regulate Changes In Fresh Water Flow In The Bay/Delta Estuary.

As is discussed in more detail in other parts of these comments, the proposed criteria that require 2 parts per thousand (ppt) salinity in Suisun Bay at specified times is a measure to regulate salt water intrusion from the ocean. Likewise, the Fish Migration and Cold-Water Habitat criteria ("smolt survival criteria") regulate temperature, San Joaquin River flow, and water project operations in the Bay-Delta Estuary. It is beyond dispute that outflow and water project

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[5] *The Senate bill made §102(b) applicable to any "reservoir or other impoundment project under other federal law." See S. 2770, §102(b)(1), reprinted in 1972 Legislative History, Vol.2, p. 1537. The House bill limited §102(b) to "any reservoir by the Corps of Engineers, Bureau of Reclamation, or other Federal agency", see H.R. 11896, §102(b)(1), reprinted in 1972 Legislative History, Vol.1, p.898. EPA favored the Senate bill wherein §102(b) was applicable to all reservoirs and impoundments "under other Federal law" because this resolved the ambiguity in the House bill of "whether federally licensed but privately constructed projects are to be covered." Letter of William D. Ruckelshaus, EPA Administrator to Honorable John A. Blatnik, Chairman, House Committee on Public Works, reprinted in 1972 Legislative History, Vol.2, p. 1192. Congress enacted the more limited language of the House bill. See §102(b)(1), 33 U.S.C. §1252(b)(1) ("any reservoir by the Corps of Engineers, Bureau of Reclamation, or other federal agency").*

operations are not water quality matters. Salt water intrusion and temperature, where they are not the result of a discharge to the water body, are included in the definition of pollution under Clean Water Act Section 502(6), at 33 U.S.C. Section 1362(6) (see footnote 3).

The Supplementary Information accompanying the proposed rule avoids discussion of the causes of pollution which these criteria are intended to remedy. Both beneficial uses are constrained primarily because of reductions in freshwater flow and diversions to export pumps causing either salt water intrusion or entrainment of fish. The problem of salt water intrusion and its relationship with outflows that repel it was recognized by the California Supreme Court as early as 1922 in Town of Antioch v. Williams Irrigation District (1922) 188 Cal. 451, 455. In 1986, the Court of Appeal in United States v. State Water Resources Control Board (1986) 182 Cal.App.3d 82,107, described the relationship as follows:

The major factor affecting water quality in the Delta is salt water intrusion. Delta lands, situated at or below sea level, are constantly subject to ocean tidal action. Salt water entering from San Francisco Bay extends well into the Delta, and intrusion of the saline tidal waters is checked only by the natural barrier formed by fresh water flowing out from the Delta (Emphasis added).

EPA itself recognized this relationship in its report on Legal and Institutional Approaches to Water Quality Management Planning and Implementation (March, 1977), stating: "The Delta of the San Joaquin and Sacramento Rivers is a rich agricultural and recreational region depending on the maintenance of adequate fresh water inflows during the low flow months to offset the intrusion of salt water from San Francisco Bay," Id., at VIII-11 (Emphasis added). The report also used the Bay-Delta as an illustration of how flow maintenance was handled as a water right issue.

c. Congress Did Not Intend To Regulate Pollution Caused By Reductions In Freshwater Flows Under Section 303(c).

Pollution caused by reductions in freshwater flows was never considered to be a part of the Section 303(c) water quality standards program. First, in discussing what became Section 208, Senate Report 414 stated that salt water intrusion was not covered by the existing federal water quality regulatory program.[6]

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[6] *"The present Federal water pollution control program does not consider degradation of water caused by reduction in fresh water flows which produce the intrusion of salt or brackish waters into estuaries and rivers. Salt water intrusion, no less than point sources of discharge, alters significantly the character of the water and the life system it supports.*

....

Fresh water flows can be reduced from any of a number of causes. The bill requires identification of those causes and establishment of methods to control them so as to minimize the impact of salt water

Significantly, the Section 303(c) water quality standards program merely continued the existing water quality standards program under the prior federal water pollution control legislation. See House Report 911, reprinted in 1972 Legislative History, Vol. 1, p. 791 ("Section 303 continues the use of water quality standards."); Conference Report 1236, 92d Cong., 2d Sess. reprinted in 1972 Legislative History, Vol. 1, p. 305 ("Section 303 of the House amendment continues the use of water quality standards contained in the existing law.").

There is no indication that in enacting the 1972 legislation Congress intended to alter or expand the notion of "water quality standard" from what it had been under pre-1972 legislation. Because pollution caused by reductions of fresh water flows was not covered by the pre-1972 legislation, it also does not come within the Section 303 water quality standards program enacted in 1972. Instead, Congress adopted the Section 208 nonpoint source pollution control program to cover salt water intrusion "[f]or the first time", 1972 Legislative History, Vol. 2, p. 1457.

The Senate bill did not have a Section 303 water quality standards provision. The Senate believed that effluent limitations were a better regulatory strategy than water quality standards. See Senate Report 414, reprinted in 1972 Legislative History, Vol. 2, p. 1425-1426; id. at 1274 (remarks of Sen. Eagleton). The Section 303 water quality standards provision originated in the House bill. See H.R. 11896, §303, reprinted in 1972 Legislative History, Vol. 1, p. 969. Since the Conference Committee adopted a version of the Senate bill, and gave no indication that it was altering this basic assumption of the Senate bill, salt water intrusion apparently is not covered by the water quality standards program of §303. Cf. Bethlehem Steel v. EPA, 538 F.2d 513, 516 (2d Cir. 1976) (where language in Section 509 of the 1972 Clean Water Act was included in the Senate Bill which did not contain Section 303, the language of Section 509 could not have been referring to water quality standards under Section 303).[7]

Not only did Congress specifically provide for regulation of salt water intrusion in the nonpoint source pollution provisions, i.e., Section 208 and Section 304, and not in the water quality standards provision of Section 303, but it required EPA to develop information, not criteria, for salt water intrusion and other pollution resulting from changes in the flow of water. See Section 304(f)(2)(E) and (F). The continuing planning process of Section 303(e) also separates

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intrusion." 1972 Legislative History, Vol. 2, p. 1458 (Emphasis added).

[7] *Since the Senate Bill also contained the §304 provision requiring information and guidelines for salt water intrusion (even though there was no §303 in the Senate Bill), the §304 guidelines for salt water intrusion were obviously not intended to be implemented via water quality standards adopted under §303.*

Section 208 nonpoint pollution control programs -- which are provided for in Section 303(e)(3)(B) -- from implementation of Section 303(c) water quality standards -- which are provided for in Section 303(e)(3)(F). The structure of the Act demonstrates that salt water intrusion is regulated exclusively as pollution, and is not to be regulated under water quality standards.

Finally, water quality standards were intended to serve as a basis for requiring further reductions in pollutants, i.e., water quality based effluent limitations under Section 302, 33 U.S.C. §1312 would supplement technology-based effluent limitations under Section 301, 33 U.S.C. §1311. See Conference Report 1236, reprinted in 1972 Legislative History, Vol. 1, pp. 304-305; House Report 911, reprinted in 1972 Legislative History, Vol. 1, p. 842. See also Clean Water Act Section 301(b)(1)(C), 33 Section 1311(b)(1)(C), which requires point source dischargers to meet water quality standards. There is nothing in the legislative history indicating that water quality standards could be used for salt water intrusion.

d. Adopting Water Quality Standards For Pollution Caused By Reduction Of Fresh Water Flows Is Contrary To EPA's Past Administrative Practice.

Apparently EPA has never before promulgated water quality standards for pollution caused by changes in fresh water flows. Using water quality standards in this fashion is contrary to EPA's past administrative practice.

When it promulgated final water quality standards regulations in 1983, EPA concluded that water quality standards could not be used to require more stringent regulatory controls for pollution. This issue came up in the context of attainability of designated uses in water quality standards. EPA's regulations provide that a state may not change a designated use if it can be attained by implementing effluent limitations and "by implementing cost-effective and reasonable best management practices for nonpoint source control." 40 C.F.R. §131.10(h)(2). Some commenters on this regulation expressed concern that water quality standards could be used to force states to adopt best management practices. EPA denied that this was the intention of the water quality standards regulation.

EPA should not set water quality standards for a level of protection that is better than existing conditions and cannot be attained with current best management practices, and then expect states to upgrade and adopt more stringent best management practices to control pollution caused by changes in fresh water flows..

EPA's 1993 Water Quality Standards Handbook, Second Edition, confirms this administrative interpretation with its discussion of "natural background" and "irreversible" pollution. As the *Handbook* states, "natural background contaminants to the water body ... may be a legitimate factor which effectively prevents a designated use from being met". Id., p. 2-12. "Natural background" pollution is then a "given" in setting (and determining attainability of) designated uses. In short, after the state has applied best management practices to pollution caused by changes in freshwater flows, any further pollution is considered for water quality standards purposes to be "irreversible", i.e.., also a "given" like natural background contaminants. Based on the Water Quality Standards Handbook, water quality standards cannot be used to further ratchet up best management practices for pollution caused by changes in fresh water flows.

Finally, EPA's guidance documents on salt water intrusion all indicate that salt water intrusion is handled by the States as an instream flow/water rights issue. For example, EPA's 1973 Salt Water Intrusion Report -- which EPA adopted pursuant to Section 304(f)(2)(E) -- nowhere states that water quality standards under Section 303 can or should be used to control salt water intrusion into estuaries. Instead, the Salt Water Intrusion Report stresses stream flow regulation through comprehensive water allocation management and planning as the control method for salt water intrusion, see id., pp. 48-50. The Report also notes that any such controls on diversion and water allocation "will probably involve vested water rights and usually will be in conflict with these water rights", id., p. 73, and that the federal government traditionally defers to the States in the area of water rights and water allocation, id., p. 75.

EPA's Report on Legal and Institutional Approaches to Water Quality Management Planning and Implementation also discussed salt water intrusion as a stream flow/water allocation issue, see id., pp. VIII-7 to VIII-13, which was handled under state water rights systems, id., pp. VIII-22 to VIII-24. The Report says nothing about using water quality standards under Section 303 to control nonpoint salt water intrusion. The Report states that States are best prepared, and have the legal authority to handle salt water intrusion. Id., p. VIII-14. In sum, both the Salt Water Intrusion Report -- which was EPA's main source document for salt water intrusion -- and EPA's Legal and Institutional Approaches to Water Quality Management Planning and Implementation portray salt water intrusion as a stream flow/water allocation issue which is to be handled by the States under their water rights law, not a water quality issue under Section 303.

C. THE CLEAN WATER ACT ESTABLISHES A SEPARATE REGULATORY SCHEME FOR POLLUTION CONTROL REGULATION, APART FROM STANDARD-SETTING AND REGULATION OF POLLUTANTS UNDER CLEAN WATER ACT SECTIONS 303(c) AND 402.

Comment: EPA has limited authority to regulate salinity intrusion under Clean Water Act Section 208. Salinity intrusion is addressed in the Clean Water Act only in Section 208 and in Section 304(f). The language and legislative history of the Clean Water Act make clear that: 1) salt water intrusion into estuaries and other pollution caused by changes in water flows was to be regulated as pollution under Sections 208, not Section 303; 2) the regulatory mechanism for controlling salt water intrusion was best management practices, not water quality standards (which makes sense because stream flow was the key variable which is best regulated by operational controls on water development projects); 3) regulation of salt water intrusion was left to the States, not the federal government because regulation of salt water intrusion directly affected water rights allocation which was a matter that had been traditionally left to the States; and, 4) the case that largely prompted and was to be accommodated by the salt water intrusion legislation was this very case -- the Bay-Delta of California.

Discussion: Control of Pollution Resulting From Changes in Fresh Water Flows is Implemented Pursuant to State Plans Adopted Under Section 208

EPA mistakenly says on page 2-8 of its Bay/Delta Draft Regulatory Impact Assessment that "[t]he ultimate purpose of water quality standards ... is to restore and maintain the chemical, physical, and biological integrity of the nation's waters." The citation is to Clean Water Act Section 101(a), but Section 101(a) states that "[t]he objective of this chapter is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters." (Emphasis added.) This distinction is important because the "chapter" is the entire Clean Water Act, which includes matters such as pollution that are regulated by the states. See National Wildlife Federation v. Gorsuch 693 F.2d 156, 178 (D.C. Cir. 1982) (Congress "explicitly chose not to completely federalize water pollution control, but instead directed the states to establish their own pollution control programs under EPA oversight.")

The federal legislation first established a regulatory program for nonpoint source pollution under the 1972 Federal Water Pollution Control Act. Section 208, together with Section 304(f) established an approach for controlling nonpoint source pollution using state planning processes. These sections contain the only mention in the Clean Water Act of salt water intrusion and changes in the flow of water, and they treat these matters differently from other nonpoint sources of pollution. The 1987 Clean Water Act amendments added Section 319, 33 U.S.C. §1329.[8]

Significantly, Congress deliberately wrote Section 208 to maximize California's autonomy in managing and regulating nonpoint source salt water intrusion in the Bay-Delta. This effectively prevented federal control over regulation of salt water intrusion caused by changes in fresh water flows. The Congressional debate between Congressmen Waldie and Johnson on March 27, 1972 makes it clear that

[8] *Section 319 requires states to adopt nonpoint source management programs which identify best management practices to reduce nonpoint source pollution, and a program to implement the best management practices. See §§319(b)(1), (2)(A),(B), 33 U.S.C. §§1329(b)(1), (2)(A),(B). Section 319 does not give EPA any direct regulatory authority over nonpoint source pollution. Section 319 regulates nonpoint sources, but does not does not mention salt water intrusion or other pollution caused by reductions in fresh water flow as a matter for regulation.*

Section 208(b)(2)(I) was intended to prevent federal regulation of salinity intrusion in the California Bay-Delta Estuary.[9]

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9 *"Mr. Waldie. I would like to ask a series of questions involving section 208 of the bill.*

The question I want to ask the gentleman from California on the committee, my colleague and my friend, Congressman Johnson, affects section 208 which is the areawide waste treatment program.

In the bill that the committee first considered, there were very, very strong provisions on page 53 involving the problem of saline intrusion, and those provisions say: "The plan shall include procedures to control salt water intrusion."

*There is no qualification. Yet I see when the bill was finally adopted that it was weakened immeasurably to the point where i[t] now says: :The plan shall include a process to identify, if appropriate, salt water intrusion * * *" And then: "They shall set forth procedures and methods to control * * *."*

Then it qualifies it even further by saying: "To the extent feasible and where such procedures and methods are otherwise a part of the waste treatment management plan."

You make no amendments in any of the other nonpoint pollution techniques except salt water intrusion.

Mr. Chairman, I have to conclude that this was a major weakening of this bill and that it was done at the request of someone who does not desire to have salt water intrusion, which is nonpoint pollution, controlled in the bill.

Particularly I have reference to estuaries in which salt water intrusion and reduced outflows are particularly destructive. I particularly have reference to the delta in California. Someone did not want those sources of pollution to be controlled. Can the gentleman tell me for what reason this amendment was placed in the bill to weaken this bill as drastically as it did -- and who proposed that amendment?" 1972 Legislative History, Vol. 1, p. 484. (Emphasis added).

In response, Congressman Johnson, who also was a member of the Conference Committee, stated:

"Mr. Johnson of California. I believe you referred to the introduced bill in your first reference.

During the hearings, we heard from representatives of California including the State water resources department and the State water pollution control board. We also were given the Governor's position. The language in the bill reflects their views. The committee report on page 96 states the following:

*"The Committee notes that in some States water resources development agencies are responsible for allocation of stream flow * * *." Id., p. 485.*

After a brief interruption, Congressman Johnson continued:

"Mr. Johnson of California. The gentleman well knows that in our State in the headwaters of the Sacramento and the San Joaquin Rivers we have developed dams and storage reservoirs up and down the Sierra Nevada Mountains and also minor diversion facilities in the coastal country. All this water flows through the delta, and this water has been controlled under a program in which the State and Federal agencies, including the Corps of Engineers and the Bureau of Reclamation, have participated. The fear was brought to the committee's attention when our State people testified that the State was losing control of its water resources programs under the introduced bill.

The State wanted assurance that this would not happen, and this particular provision on page 96 of the report points this up." Id. (Emphasis added).

In response, Congressman Waldie stated:

"The difficulty with this provision -- and I gather that it is a California provision -- the act was amended and weakened from its initial strong provisions controlling saline intrusion and water diversions to take care of a problem that the water resources people wanted to take care of to enable them to exert control, the control over the delta they had been exerting.

I suggest to the gentleman that the weakening amendment is not in the best interest of the delta in any way, regard, or respect. The problem of protecting the waters that are gathered in that delta from saline

Despite Congressman Waldie's concerns, the final legislation retained the language of the House bill. Compare H.R. 11896, Section 208(b)(2)(I), reprinted in 1972 Legislative History, Vol. 1, p. 955 with Section 208(b)(2)(I), 33 U.S.C. §1288(b)(2)(I).

As Congressman Johnson noted, California's major concern -- which was accommodated in the legislation -- was retaining discretion to regulate and manage salt water intrusion in the Bay-Delta Estuary because such regulation directly affected water rights allocation in California. That was why Congressman Johnson referred to page 96 of the House Report in his colloquy with Congressman Waldie. That portion of the Report specifically referred to preserving state authority over stream flow allocation.[10]

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intrusion and protecting that estuary from the consequences of saline intrusion, has been made much greater by the adoption of that weakening amendment.

I suggest to the gentleman that I will be offering an amendment tomorrow seeking to return this provision of the bill to where it was prior to the time the California water people started putting their hands into this national act to have it adopted and worked around to adversely affect California only and the part of California that the gentleman I represent in this particular issue." Id., pp. 485-486. (Emphasis added).

Congressman Johnson further replied to Congressman Waldie:

"Mr. Johnson of California. The gentleman asked me a question. I think it is well established in the record that California does have a very workable program under way at the present time. Our State water resources people, the Governor of the State, the Water Pollution Control Board, the Bureau of Reclamation, and the Corps of Engineers are working very carefully with the flow of the waters into the delta, and certainly under this measure the State will be given the opportunity to carry on that type of activity. The state will have a right to issue permits under that particular section. I see no harm in it whatsoever.

I point out to the gentleman that nonpoint sources are not controlled under this bill." Id., p. 1486. (Emphasis added).

Congressman Waldie then closed the debate on this subject with the following:

"Mr. Waldie. In response I would point out that the permits involved in this bill have nothing to do with nonpoint salt water intrusion, and there is no control within this bill for nonpoint pollution, and that control will only come about by the development and adoption of an areawide management program that controls. The fact of the matter is that the State of California has done a miserable job in terms of protecting the estuaries of California from salt water intrusion, and this amendment which was adopted to the national act at the request of California authorities, enables them to continue doing the miserable job they have been doing without any guidance and without any control from the Federal Government. I think it is a very, very unhappy situation for our State but also for other States which now find a major weakening of the control section which protects estuaries. That is what is at stake here -- the estuaries of the Nation. That provision has been weakened to the point where estuaries will be jeopardized." Id. (Emphasis added).

10 *"The Committee notes that in some States water resource development agencies are responsible for allocation of stream flow and are required to give full consideration to the effects on water quality. To avoid duplication, the Committee believes that a State which has an approved program for the handling of permits under section 402, and which has a program for water resource allocation, should continue to exercise the primary responsibility in both of these areas and thus provide a balanced management control system." House Report 911, reprinted in 1972 Legislative History, Vol. 1, p. 783. (Emphasis added).*

As the court noted in National Wildlife Federation v. Gorsuch, 693 F.2d 156, 179 n.67, the language of Section 208(b)(2)(I) "was intended to prevent water quality goals from interfering with state water allocation plans." (Emphasis added). Indeed, the Conference Committee, on which Representative Johnson served, even went so far as to weaken the already tenuous link between salt water intrusion and water quality in the Senate bill by deleting from the final legislation the Senate language referring to procedures to control salt water intrusion "to protect water quality." See S. 2770, Section 208(b)(2)(I), reprinted in 1972 Legislative History, Vol. 2, p.1598.

D. THE CLEAN WATER ACT DOES NOT EXTEND TO REGULATION OF WATER QUANTITIES

1. EPA's Proposed Standards Violate EPA Policy.

Comment: Assuming that EPA can properly set standards that regulate water flow and facility operations, the proposed standards violate EPA policy because they directly and materially affect California's water rights system even though reasonable alternatives are available.

Discussion: EPA's policy regarding the relationship between adoption of water quality standards and state water allocation authority is stated in EPA's Water Quality Standards Handbook, Second Edition, dated September, 1993, in Appendix G: Questions and Answers on: Antidegradation. The Water Quality Standards Handbook says it "provides guidance issued in support of the Water Quality Standards Regulation (40 CFR Part 131, as amended)" [See page iii], and Appendix G says it "provides guidance on the antidegradation policy component of water quality standards and its application." See Introduction.

Appendix G, Questions and Answers on: Antidegradation states at page 11, question 30:

> "30. What is the relationship between the antidegradation policy, State water rights use laws and section 101(g) of the Clean Water Act which deals with State authority to allocate water quantities?
>
> The exact limitations imposed by section 101(g) are unclear; however, the legislative history and the courts interpreting it do indicate that it does not nullify water quality measures authorized by CWA (such as water quality standards and their upgrading, and NPDES and 402 permits) even if such measures incidentally affect individual water rights; those authorities also indicate that if there is a way to reconcile water quality needs and water quantity allocations, such accomodation [sic] should be pursued. In other words, where there are alternate ways to meet the water quality requirements of the Act, the one with least disruption to water quantity allocations should be chosen. Where a planned diversion

would lead to a violation of water quality standards (either the antidegradation policy or a criterion), a 404 permit associated with the diversion should be suitably conditioned if possible and/or additional nonpoint and/or point source controls should be imposed to compensate." (Emphasis added.)

The General Counsel of EPA, in a memorandum to Regional Administrators dated November 7, 1978, interpreted Clean Water Act Section 101(g) in the context of the water quality standards program and concluded that "EPA should therefore impose requirements which affect water usage only where they are clearly necessary to meet the Act's requirements."

In 1979 EPA submitted a report to Congress in accordance with Clean Water Act Section 102(d), titled Water Quality/Water Allocation Report. The report discusses the issue of using water quality standards to set minimum water flows for instream uses. In Chapter V on "Instream Flows", the report emphasizes the States' primary authority over water allocation. The report rejects the idea of EPA adopting flow criteria.[11] The Report points out that "the decision between instream and offstream uses is primarily the States' responsibility." Id., p. V-19.

On July 10, 1979, EPA published a notice of proposed rulemaking soliciting comments regarding development of a a policy regarding control of changes in instream flows.[12] On October 29, 1982, after receiving comments, EPA published a proposed rule on water quality standards in which it disclaimed any intention of requiring States to set minimum flows in water quality standards, saying: "EPA is not requiring States to develop prohibitions against stream flow modifications. EPA is encouraging States to consider flow in setting uses, and in developing permit conditions for dischargers." 47 FR 49234, at 49251.

Based on EPA's previous administrative interpretations of Section 101(g), EPA's current unprecedented attempt to set minimum instream flows is inconsistent with and contrary to EPA's position on this issue. Also, the sources discussed above clearly show that if EPA adopts water quality standards for the Bay-Delta Estuary,

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11 *"EPA does not require that standards include flow criteria to protect the use included in the standards although States have the authority to establish such criteria. In June 1978, EPA published an advanced notice of proposed rule-making that raised the possibility of a change in this policy, while ruling out the option of promulgating flow criteria when the States choose not to do so." Id., p. V-18. (Emphasis added.)*

12 ***"EPA may therefore develop a policy to urge States to prohibit alteration or restriction of natural flows that would interfere with fishable, swimmable water quality. EPA does not at this time intend, however, for its policy to result in Federal promulgation of specific streamflow and quantity requirements in the event a state fails to take appropriate action. Whatever policy EPA develops will be consistent with new section 101(g) of the act, which recognizes each state's authority to allocate water quantities within its jurisdiction." 43 FR 29588, at 29591.***

it has a duty to select standards that are both protective of the use and cause the least disruption to the State's water rights system. Some of the proposed standards are exceptionally disruptive to the State's water rights system and are not consistent with this duty. The following discussion explains the effect of implementing each of the three proposed standards on water rights.

a. Suisun Bay Salinity Criteria

The two ppt salinity isohaline standard is a Delta outflow standard. The standard can be achieved only by increasing the Delta outflow. The standards were developed by using the daily estimates of net Delta outflow from October 1, 1939 to September 30, 1975 to calculate the frequency with which the two ppt isohaline was downstream of each of the specified locations in each year (See Appendix II of 59 FR, at 848-849.) The Federal Register notice states that "EPA expects that the State Board will develop an implementation plan for these Estuarine Habitat criteria by changing the volume and timing of water flows through the estuary." (See page 838.) From a water management perspective, there is no difference between EPA's draft salinity isohaline standard and its corresponding Delta outflow standard.

The Bay-Delta Estuary is the heart of California's water supply and distribution system. Water from thoughout the Central Valley flows into the Delta and a portion of this water is exported to water deficient areas in the State. Approximately 7,000 water right holders in the watersheds of the Central Valley hold approximately 14,000 water right permits. Considering the importance of the Delta to California's water supply system and the complexity and size of the water supply system, there is no other single standard that EPA could propose that would be more disruptive to California's water supply and to the water rights that support it than the proposed Delta outflow standard. The proposed standard violates the federal policies discussed above because other, less disruptive, options are available to EPA to protect estuarine habitat.

For example, EPA could have chosen to protect the estuarine habitat benficial use by proposing appropriate biological criteria. This approach would be consistent with EPA's Policy on the Use of Biological Assessments and Criteria in the Water Quality Program (Appendix R: Water Quality Standards Handbook, Second Edition). EPA states in its Federal Register notice that biological criteria for the Delta are scientifically defensible and approvable (59 FR 815) A number of well established biological indices exist for the Bay/Delta Estuary that could be used as biological criteria. Examples include striped bass populations, the striped bass index, and abundance indices for Delta smelt, Sacramento splittail, longfin smelt, Bay shrimp, and starry flounder. Biological criteria could be based on historical population levels or abundance indices. Healthy, sustainable populations of these indicator species are certain to adequately protect the estuarine habitat beneficial use, and this approach minimizes disruption to water quantity allocations, as required by federal policy. Biological criteria allow the State maximum flexibility in implementation. The State can implement the standards through habitat improvements, physical alterations to the Delta configuration, changes in points of diversion, or changes in the flow regime.

b. Salmon Smolt Survival Criteria on the Sacramento and San Joaquin Rivers

The salmon smolt survival criteria are proposed to protect the fish migration and cold fresh-water habitat beneficial use. It is presented as biological criteria. However, the criteria as drafted are inconsistent with federal policy because they will not both protect the fish migration beneficial use and cause the least disruption to the State's water quantity allocations.

The proposed salmon smolt survival criteria includes, as part of the criteria, the method of computation to determine compliance with the criteria. For the San Joaquin River, compliance is calculated with an equation whose variables are average CVP plus SWP exports and flow in the San Joaquin River at Stockton. Therefore, the San Joaquin River salmon smolt survival criteria are actually a combined standard for San Joaquin River flow and Delta exports.

For the Sacramento River, compliance is calculated with an equation whose variables are average water temperature at Freeport, average CVP plus SWP exports, diversions into the Delta Cross Channel and diversions into Georgiana Slough. The State has essentially no control over temperature in the Delta. Additionally, the Federal Register text explaining the proposed criteria states that putting a barrier at the head of Georgiana Slough may have deleterious effects on the Delta smelt and other native aquatic life in the central Delta, and possibly on adult salmon returning upstream. (59 FR 825) Therefore, the Sacramento River salmon smolt survival criteria are actually a combined standard for Delta Cross Channel gate operation and Delta exports. Delta Cross Channel gate operation has a substantial effect on the amount of water available for export at the CVP and SWP pumps. The proposed salmon smolt survival criteria will substantially disrupt the State's water rights system because they can only be implemented by regulating Cross Channel gate operation and Delta exports.

EPA could have chosen to protect the fish migration and cold fresh-water habitat beneficial use by adopting adult salmon population levels as biological criteria. The criteria could be based on historical salmon populations or on the goal of doubling natural production of anadromous fish. This goal has been adopted by both the State Legislature, at Fish and Game Code Section 6900 et seq., and the Congress, in the Central Valley Project Improvement Act of 1992. This approach is more comprehensive than EPA's proposal because it incorporates all of the factors that affect salmon survival in the Central Valley. The State already has prepared three habitat improvement plans for salmon and anadromous fish in the Central Valley: the Upper Sacramento River Fisheries and Riparian Habitat Management Plan prepared by the Resources Agency and dated January 1989; the Central Valley Salmon and Steelhead Restoration and Enhancement Plan prepared by the Department of Fish and Game and dated April 1990; and the San Joaquin River Management Program prepared by the San Joaquin River Management program Advisory Council and dated January 1993. The Comprehensive Conservation and Management Plan prepared by the San Francisco Estuary Project and dated June 1993 also includes recommendations for protection of anadromous fisheries in the Central Valley.

c. Striped Bass Spawning Criteria on the San Joaquin River

The proposed striped bass spawning criteria are fundamentally different from the other two sets of criteria. The salinity isohaline criteria and the salmon smolt survival criteria are designed to correct problems caused primarily by water flows, water operations, and pollution, while pollutant control is the focus of the striped bass spawning criteria. As such, the striped bass spawning criteria could be implemented without treading as heavily on the State's water rights system.

The salinity problem in the San Joaquin River is caused by agricultural drainage. Consequently, the SWRCB can use its pollution control authorities to implement appropriate management measures if EPA adopts the proposed striped bass spawning criteria. For the short term, the management measures in the plan titled A Management Plan for Agricultural Subsurface Drainage and Related Problems on the Westside San Joaquin Valley, dated September 1990 will provide the framework for SWRCB action. For the long term, control of the problem may require export of salts from the San Joaquin Valley through an isolated facility to a salt sink.

EPA's recommended approach to implementation of the proposed striped bass spawning criteria is significantly different than the approach outlined above. EPA "expects that the State Board would implement these criteria by making appropriate revisions to operational requirements included in water rights permits issued by the State Board" (59 FR 827) The State's high quality water supplies should not be used to dilute pollutants if reasonable alternatives exist. To do so appears contrary to EPA's regulation at 40 CFR Section 131.10(a), which provides in pertinent part: "In no case shall a State adopt waste transport or waste assimilation as a designated use for any waters of the United States."

Further, this implementation method is unnecessary in light of the Central Valley Improvement Act of 1992, which provides that the Bureau of Reclamation shall assist in restoring the striped bass fishery. See Section 3406(b)(18). The current approach to restoring the fishery is to control agricultural discharges to the San Joaquin River.

2. Clean Water Act Section 101(g) Reserves To The States The Authority To Allocate Water Supply Under State Water Laws

Comment: States have the authority to allocate quantities of water under state law, and the provisions of the Clean Water Act may not be applied to undermine this state authority. The proposed criteria have more than an incidental effect on California's water allocation authority and do not accommodate state water allocation authority.

Discussion: Clean Water Act Section 101(g), 33 U.S.C. Section 1251(g) was added in the Clean Water Act of 1977. It provides:

> "It is the policy of Congress that the authority of each state to allocate quantities of water within its jurisdiction shall not be superseded, abrogated or otherwise impaired by this Act. It is the further policy of Congress that nothing is this Act shall be construed to supersede or abrogate rights to quantities of water which have been established by any State. Federal agencies shall co-operate with State and local agencies to develop comprehensive solutions to prevent, reduce and eliminate pollution in concert with programs for managing water resources." (Emphasis added)

In explaining Section 101(g) to the Senate after the Conference Committee made some changes, the author, Senator Wallop, explained that the purpose of this section was to preserve state authority over water quantity allocation and water rights.[13]

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[13] *Senator Wallop stated in pertinent part:*

> *"This amendment ... is not intended to change present law, for a similar prohibition is contained in Section 510 of the act. This amendment does seek to clarify the proper role of Federal water quality legislation in relation to State water law. Legitimate water quality measures authorized by this act may at times have some effect on the method of water usage. Water quality standards and their upgrading are legitimate and necessary under this act. The requirements of section 402 and 404 permits may incidentally affect individual water rights. Management practices developed through State or local 208 planning units may also incidentally affect the use of water under an individual water right. It is not the purpose of this amendment to prohibit those incidental effects. It is the purpose of this amendment to insure that state allocation systems are not subverted, and that effects on individual rights, if any, are prompted by legitimate and necessary water quality considerations."*
>
> *"This amendment is an attempt to recognize the historic allocation rights contained in State constitutions."*
>
> *"It is designed to protect historic rights from mischievous abrogation by those who would use an act, designed solely to protect water quality and wetlands, for other purposes. It does not interfere with the legitimate purposes for which the act was designed."*
>
> *"The amendment speaks only -- but significantly -- to the rights of States to allocate quantities of their water and to determine priority uses. ...."*
>
> *****
>
> *"Water quality and interstate movement is an acceptable Federal role and influence. But the States historic rights to allocate quantity, and establish priority of usage remains inviolate because of*

Senator Wallop explained that Section 101(g) was a response to proposals published by the Water Resource Council on July 15, 1977 at 42 FR 36790. 1977 Legislative History, Vol. 3, pp.531. The Water Resource Council identified as a "problem" the "lack of coordination between water quality and water quantity planning efforts." It listed as one option centralizing water resource planning or project review in one federal agency. The Water Resource Council raised the possibility of federally-mandated minimum instream flows for environmental purposes. It indicated that State administration of water allocation might make water quality control programs ineffective by granting new water diversions rights.

EPA is proposing to do precisely what the Water Resource Council suggested in 1977. This is what Section 101(g) was intended to prevent. Consequently, the proposed criteria are contrary to and violate Section 101(g).

The fact that preserving state authority over water allocation is set forth as a "policy" in the Clean Water Act does not reduce the force of Section 101(g) in this case. Setting forth that requirement as a general "policy" merely indicates that it was to apply to the entire Clean Water Act, not just certain provisions. EPA's nondegradation policy was based entirely on the general goal of fishable/swimable waters in Section 101(a)(2), yet EPA found that general statutory "goal" capable of sustaining mandatory regulatory requirements.

Moreover, the court in National Wildlife Federation v. Gorsuch (1982) 693 F.2d 156, 178, 18 ERC 1105, 1122 said that "policies", like Section 101(g), have more force than "goals", like the fishable/swimmable goal of Section 101(a)(2). Insofar as the Bay-Delta Estuary issues involve accommodation between the goal in Section 101(a)(2) and the policy in Section 101(g), Section 101(g) is the more compelling and specific statutory command.

EPA's statement in the Federal Register notice at 59 FR 813 that "a general policy statement ... 'cannot nullify a clear and specific grant of jurisdiction'", citing Riverside Irrigation District v. Andrews (1985) 758 F.2d 508, 513, is unavailing because EPA has no "clear and specific" grant of jurisdiction in this case to control salinity intrusion, other pollution caused by reductions in fresh water flow, or operation of water diversion facilities using Section 303 water quality standards. In fact, the only clear and specific grant of jurisdiction applicable in this case is the explicit grant of authority to the States to regulate salt water intrusion under Section 208. See Section 208(b)(2)(I).

EPA's reliance on Riverside, supra, and United States v. Akers (1986) 785 F.2d 814 is misplaced because those cases do not support EPA's adoption of the proposed

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this amendment. The Water Pollution Control Act was designed to protect the quality of water and to protect critical wetlands in concert with the various States. In short a responsible Federal role." December 15, 1977 Senate Debate, reprinted in 1977 Legislative History, Vol. 3, pp. 531-532.

criteria. Both of those cases involve permits or regulation under Clean Water Act Section 404, 33 U.S.C. Section 1344, not water quality standards under Section 303. Section 404 regulates the discharge of dredged or fill material into navigable waters. Factors other than water quality are considered in issuing Section 404 permits such as impacts on municipal water supplies, shellfish beds, fishery areas, wildlife, and recreation. Both of these cases addressed construction of new projects; neither of these cases involved regulation of pollution caused by operation of existing facilities. Neither case had a direct and immediate impact on water rights comparable to this case.[14]

Further, the court in National Wildlife Federation v. Gorsuch, cited above, held that in the area of salt water intrusion state water supply concerns take precedence over water quality concerns. The Gorsuch court stated that Section 101(g) was not intended to take precedence over legitimate and necessary water quality considerations, except with respect to salt water intrusion. The court stated:

> "However, with respect to one area where quality and quantity are in conflict -- salt water intrusion caused by water diversion for drinking or irrigation -- Congress explicitly declined to require the states to control water quality." 693 F.2d at 179, n. 67. (Emphasis added.)

The court went on to say that the adoption of the Section 208(b)(2)(I) provision for salt water intrusion "was intended to prevent water quality goals from interfering with state water allocation plans", citing the colloquy between representatives Johnson and Waldie in the House debates. Id. Therefore, EPA's water quality standards are not "incidental" because they reverse the priority between water supply and water quality mandated by Section 208(b)(2)(I) and Gorsuch.

EPA's concept for implementing the proposed criteria is analogous to setting effluent limitations for water quality standards. In applying effluent limitations a regulatory agency takes a set water quality standard and then "works back" to determine what additional effluent limitations must be imposed on point sources (over and above the technology-based effluent limitations of Section 301) to attain the water quality standards. Here, EPA apparently wants the State to "work back" and cut back diversions to attain the water quality standards. This method is inappropriate for the Bay-Delta Estuary because the pollution EPA seeks to regulate is nonpoint source pollution, most of which is from salt water intrusion. With point source pollutants, EPA has authority to directly regulate the discharges. EPA has no such authority here. See Oregon Natural Resouce Council v. U.S. Forest

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[14] *A more recent decision, James City County, Virginia v. Environmental Protection Agency (1993) 12 F.3d 1330, approved EPA's veto of a Section 404 permit. The veto was based entirely on environmental impacts. It addressed a proposed project, not an existing project, and did not address pollution caused by an existing facility. While it mentioned Clean Water Act Section 101(g), it restricted EPA's role under this section, in the context of a Section 404 permit, to assuring water purity, not allocation of water quantities.*

Service, 834 F.2d 842, 849 (9th Cir. 1987) (water quality standards cannot be imposed as effluent limitations against nonpoint sources; Congress made point sources subject to direct federal regulation, but left regulation of nonpoint sources to the states).

3. Adoption Of The Proposed Criteria Would Be Inconsistent With Court Decisions Pertaining To Dam-Induced Pollution.

Comment: In several cases, the federal Courts of Appeals have addressed situations where pollution was caused by dams or other diversions of water. In each case, the courts refused to require the facilities to obtain discharge permits under Clean Water Act Section 402. In each case EPA opposed efforts to judicially extend the Clean Water Act to regulation of water diversion facilities that incidentally altered the quality of water. The courts recognized a dual system of regulation in the Clean Water Act, with some matters being regulated through the permit system and some being regulated through the nonpoint source planning system that was reserved to the states. In the Bay-Delta Estuary, however, EPA is acting inconsistently with the earlier cases by seeking to regulate the very matters that it previously argued it could not regulate.

Discussion: In National Wildlife Federation v. Gorsuch, cited above, EPA argued that it did not have authority to require a permit under Clean Water Act Section 402 when the pollution (i.e., low dissolved oxygen, cold, and supersaturation) was caused by operation of a dam and was not added to the waterway. The issue was whether EPA must require a permit for operation of the dam. The court agreed with EPA's distinction between "pollution" and "pollutant", holding that the adverse change in water quality was not a pollutant and did not come from a point source. EPA argued, and the court agreed, that the Clean Water Act divides the causes and control of water pollution into two categories: point sources of pollutants which are regulated through the Section 402 program, and nonpoint sources of pollution which are regulated by the states under Section 208. Id., at 18 ERC 1105, 1111. The court noted that Congress had explicitly chosen not to completely federalize water pollution control. Id., at 18 ERC 1105, 1122. As explained above, the court also noted that by adopting Section 101(g) Congress intended to minimize federal control over state decisions on water quantity. Id., at 18 ERC 1105, 1123.

In U.S. v. Tennessee Water Quality Control Board, 19 ERC 1826 (6th Cir. 1983), the court held that the state water pollution control agency could not require the Tennessee Valley Authority, a federal agency, to acquire a permit under Clean Water Act Section 402 for a hydroelectric dam, because the changes in water quality were not caused by the discharge of pollutants. In the Tennessee case, EPA appeared and argued that the project should be treated as a nonpoint source of pollution and regulated by the state under Section 208.

In National Wildlife Federation v. Consumers Power Co., 28 ERC 1572 (6th Cir. 1988), the court held that a hydroelectric power company did not require a permit under Section 402 because even though operation of the turbine resulted in discharge of dead fish and fish remains, there was no addition of pollutants to the water because the fish already were present. EPA appeared and argued that the effect of the facility on the fish did not constitute addition of a pollutant. EPA argued that dam-caused pollution should be regulated as a nonpoint source of pollution.

These cases demonstrate EPA's long-standing position that the states should regulate nonpoint sources of pollution under state law, and that changes in water quality caused by dams are the result of nonpoint sources of pollution. Standards do not have a specified role in the Section 208 scheme for regulating nonpoint sources of pollution. Further, standards should not have a role in regulating nonpoint pollution caused by changes in water flow, because the feasible regulatory mechanism involves the allocation of water supplies, which is reserved to the states. Where the predominant or sole cause of pollution in a water body is operation of water diversions, as is the case with the proposed salmon smolt survival criteria and the proposed 2 ppt salinity criteria, adoption of water quality standards under the Clean Water Act is not an appropriate method of regulation. The State, however, has authority under its own laws to establish enforceable requirements to control pollution caused by water diversions.

E. EPA IS OVERSTEPPING ITS AUTHORITY IN AN ATTEMPT TO FORCE CALIFORNIA TO ADOPT MORE STRINGENT FLOW REQUIREMENTS

Comment: Even though EPA is not authorized to regulate salt water intrusion and is not authorized to directly regulate nonpoint source pollution, EPA is attempting to do just that through the proposed criteria.

Discussion: Under the United States Constitution, the federal government cannot require a state to regulate individuals using federal standards that the state has not adopted. See New York v. United States (1992) 112 S.Ct. 2401. This case teaches that under the Tenth Amendment of the United States Constitution, if the federal government wants individuals to be regulated under federal standards, the federal government can pass laws to regulate them directly, but it cannot make a state regulate individuals using federal standards that the state has not adopted.

EPA lacks federal statutory authority to regulate individuals directly on the subject of the proposed criteria. Therefore, EPA essentially is trying to force California to adopt more stringent best management practices (i.e., changes in operational criteria for water projects) to reduce pollution caused by reduction of fresh water flows.

EPA's suggestion that it is preserving state water rights authority by giving the State "full discretion" for implementing the Bay-Delta standards is meritless. By setting the proposed Bay-Delta standards, EPA is necessarily reallocating water from consumptive uses to instream uses. The only method available to attain EPA's water quality standards is by increasing Delta outflow, San Joaquin River flow and cutting exports, and that means reducing diversions for consumptive uses. This means that the proposed criteria will reallocate water supplies; specifically, up to 2.3 MAF (assuming there is no need for a buffer or take restrictions) for instream use and fish habitat. Telling the State that it has "full discretion" to decide how to make up the difference leaves no discretion but to reduce water supplies for consumptive uses. EPA could promulgate alternative criteria that would achieve the same protections without long-term reductions in consumptive uses of water. EPA's notion that water quality is separate and distinct from water quantity in this case is fiction.

F. THE ACTUAL LEVEL OF PROTECTION DIFFERS FROM THE TARGETED LEVEL

Comment: EPA's draft standards exceed the targeted level of habitat conditions.

Discussion: EPA claims that its draft criteria are consistent with the Interagency Statement of Principles, dated June 15, 1992, which was signed by EPA, USFWS and NMFS (WRINT-USFWS-10) and submitted to the SWRCB during the SWRCB's 1992 Bay-Delta hearings (59 FR 813). This statement establishes both a long-term protection goal of offsetting water development effects fully and the following interim protection goal.

> "In the interim, the Board should establish standards sufficient to achieve a goal of restoring habitat conditions to levels which existed during the late 1960's and early 1970's. This goal is consistent with the mandates of State and Federal anti-degradation requirements, and generally reflects conditions that occurred in the Delta before fish habitat and populations began to experience the significant recent decline."

Inexplicably, the statement goes on to say that these interim standards should include a set of habitat protection measures sufficient to achieve an average fall-run salmon smolt survival index at levels characteristic of the period 1956 to 1970.

This goal statement can be interpreted a number of ways because the term "habitat conditions" can mean a number of things. For example, habitat conditions can be defined in terms of water quality, hydrology, biological populations or some other parameter. EPA has chosen to use hydrology to establish its estuarine habitat standard and salmon smolt survival standard, and water quality to establish its striped bass spawning standard. The choice of which parameter to use to establish a standard can make a significant difference. This issue is discussed in detail in a subsequent comment, and the entire basis for the legal validity of the EPA approach is discussed elsewhere in our comments.

The following section analyzes EPA's three sets of draft standards in terms of the targeted level of protection and the parameters EPA has selected to define this level of protection.

Draft Two PPT Isohaline Standard

EPA contends that its two ppt isohaline standard represents the flow conditions that existed in the late 1960's to early 1970's. This contention is analyzed below in three different ways. All three analyses support the conclusion that EPA has substantially exceeded its targeted level of habitat conditions.

The most accurate way to analyze whether EPA's draft two ppt isohaline standard exceeds the targeted level of protection is to compare the standard to historical flow conditions in February through June in order to ascertain when EPA's standards begin to consistently require additional outflow. Under a "perfect" set of standards that actually reflected late 1960's to early 1970's conditions, this type of analysis would yield a result in which the standards require no additional outflow until approximately the early 1970's. After that date, additional outflow would be required to offset water development that occurred since the early 1970's and resulted in the diversion of water from February through June. Of course, it is not possible to draft a "perfect" set of standards, but if this analysis shows that the draft standards consistently require additional outflow prior to the targeted period, the draft standards must have a bias toward a higher level of protection than the targeted period. Contra Costa Water District (CCWD) did this type of analysis for the period 1930 to 1991 and published it in a February, 1994 report titled "Report on Clean Water Act X2 Water Quality Standards". CCWD analyzed the historical water requirements of these draft standards a number of ways, and the water requirements of the draft two ppt isohaline standard, as proposed, are provided on Figure 1 and Table 1. Inspection of Table 1 shows that, excluding some wet year types, EPA's draft isohaline standard requires outflow in excess of historical levels for every year after 1949. Therefore, EPA's draft isohaline standard substantially exceeds the targeted level of protection.

The second way to analyze whether EPA has exceeded its targeted level of protection is to undertake regression analyses of the historical number of days the two ppt isohaline was downstream of the three locations versus the Sacramento River Index for the period 1964 to 1976 and compare the results to EPA's draft standards. The period 1964 to 1976 was selected because it brackets the targeted time period, and it includes one dry year (1964) and one critically dry year (1976). This comparison is provided in Figures 2 to 4. Inspection of these figures shows that EPA's draft standards far exceed the historical conditions in the targeted period. Both the regression lines and all of the individual data points lie well below EPA's draft standards in all but wet years.

The third way to determine whether EPA's draft isohaline standard exceeds the targeted level of protection is to compare the mean location of the two ppt isohaline from February through June in the targeted historical period with the calculated mean position from the DWRSIM operations study used to estimate the water supply impacts of the draft standards. The mean location of the two ppt isohaline at the targeted historical period was calculated two ways. First, the mean location for each year type was calculated by averaging the mean locations that actually occurred from 1964 to 1976. Second, the 1975 historical level of protection for each year type was estimated using regression analyses of the historical data from 1930-1992. These analyses are provided on Figures 5 to 9. The comparison of the historical mean position with the calculated mean position is made in Table 2. (The regression analyses indicate that there is little or no time dependence to the data in wet and above normal year types, but there is a strong time dependence in the other year types. Therefore, Table 2 does not include the wet and above normal year type mean locations at the 1975 level of development. There likely would be a time dependence to the mean locations throughout the historical period of record if a more appropriate year type classification system were used rather than the 40-30-30 system. This issue is discussed in a subsequent comment.) The table shows that EPA's draft standards will move the two ppt isohaline farther downstream than the 1975 level for all of the year types which show time dependent relationships. The problem is particularly acute in critically dry years where EPA's draft standards far exceed the targeted level of protection.

This third way to determine whether EPA has exceeded its targeted level of protection is less accurate than the first two methods because the first two approaches rely exclusively on historical data, but the third approach compares historical data to a DWRSIM model output. DWR, the agency that both developed DWRSIM and is its principal user, has in the past cautioned the SWRCB not to compare historical data to DWRSIM model outputs. The following DWR statement from the draft D-1630 proceedings makes this point (Comments of the Department of Water Resources on State Water Resources Control Board Draft D-1630, page 3, February 16, 1993).

> "DWR has consistently pointed out that DWRSIM is most appropriately used to compare model runs under different criteria. It is not appropriate to compare a DWRSIM run with actual historical operations. A model run uses monthly flows and fixed assumptions (e.g., demand, Trinity operations, in-basin depletions, etc.) which in actuality varied over that period for which the operation study is run."

Nonetheless, all three methodologies give the same result.

EPA has substantially exceeded its targeted level of protection. EPA's draft standards, as proposed, will require hundreds of thousands more acre-feet of water than is justified by EPA's targeted level of protection.

The conclusion that EPA has exceeded its targeted level of protection is expected because of the methodology EPA used to derive the draft isohaline standard, which was to average the number of days the isohaline was at or downstream of the three locations, Port Chicago, Chipps Island and the confluence, from 1940 to 1975. This methodology is certain to overestimate the number of days that the two ppt isohaline was downstream of the designated locations during the targeted period because a great deal of water development occurred between 1940 and 1975. For example, approximately 3.5 million additional acres of land was brought into agricultural production in these years (DWR Bulletin 160-87, page 9). In other words, the number of days the two ppt isohaline was downstream of the three locations has a strong time dependence. This conclusion is illustrated in Figures 10 to 12 in which the quadratic regressions for the number of days the isohaline is downstream of the three locations versus the Sacramento River Index are plotted for three periods between 1940 and 1975 (1940-1951, 1952-1963 and 1964-1976). This conclusion is also supported by Figures 7 to 9. DWR has also demonstrated this point by plotting the number of days at each of the three locations versus the time period 1930-1992 for each of the five year types (15 graphs). DWR is presenting its analysis to EPA in DWR's comments, and we will not repeat it here.

There are at least two alternative approaches for developing standards that more accurately estimate the number of days that the two ppt isohaline was downstream of the specified locations in the targeted period. The first approach is to use the regression analyses in Figures 2 to 4 to estimate the appropriate number of days at each location. This time period should reduce or eliminate the bias in EPA's approach caused by the long time period and the fact that all the years are on one side of the targeted period. The second approach is to use the DWR regression analyses cited in the previous paragraph, in which DWR plotted the number of days at each of the three locations versus the time period 1930-1992 for each of the five year types, to estimate the appropriate number of days at each of the three locations at the 1975 level of development. The results of these two analyses are provided in Table 3 along with EPA's draft standards. There are differences between the two analyses, but they both show that EPA's draft standards typically require one to two months more time at Port Chicago and Chipps Island, and consequently hundreds of thousands of acre-feet more water, than is justified by the conditions in the targeted period.

Finally, there is sufficient information available to estimate the approximate historical level at which EPA has established the isohaline standard. Figure 1 and Table 1 show that EPA's draft standards begin to consistently require water for all year types other than wet year types after 1949. Also, the regression analyses on Figures 10 and 11 show that the time period that best represents EPA's draft standards is 1952 to 1963. These observations lead to the conclusion that EPA's isohaline standard reproduces the February through June hydrology of the early 1950's.

Fall-Run Chinook Salmon Smolt Survival Standards

EPA's discussion regarding its fall-run Chinook salmon smolt standards is garbled. Detailed comments on this discussion and the standards are provided in a subsequent comment in this analysis. For the purposes of this comment, it is sufficient to note that EPA states that it is "relying primarily on the goal of restoring habitat conditions to those existing in the late 1960's to early 1970's." EPA then proceeds to propose standards that have no apparent connection to this targeted level of protection. In summary, the calculated salmon smolt survival (mean of water year types) at the targeted level of protection (1964-1976) in the Sacramento and San Joaquin rivers is 0.30 and 0.21, respectively. EPA has proposed a mean survival on the Sacramento and San Joaquin rivers of 0.36 and 0.29, respectively.

Striped Bass Spawning Standard

As discussed above, in general EPA contends that the targeted level of protection for the draft standards is late 1960's to early 1970's conditions. This targeted level of protection does not appear to apply to the striped bass spawning standard. Instead EPA proposes a standard that is intended to "fully protect the historic spawning range of striped bass on the lower San Joaquin River." (The standard does not achieve this level of protection, as discussed in a subsequent comment.) For completeness, a review of historical salinity conditions on the San Joaquin River at Vernalis was undertaken to determine whether EPA's draft standard exceeds the targeted level of protection. Figure 13 shows the maximum monthly average EC in April or May at Vernalis from 1930 to 1992 for wet, above normal and below normal year types, and Figure 14 provides a linear regression analysis of the EC at Vernalis versus the San Joaquin River Index for the targeted period. These graphs show that EPA's standards far exceed the targeted level of protection in all but the wettest years, and for above normal and below normal year types, EPA's striped bass spawning standard is probably more reflective of the conditions of the late 1940's and early 1950's.

G. THE ISOHALINE STANDARDS ARE OUTFLOW STANDARDS

Comment: The two ppt isohaline standards are Delta outflow standards.

Discussion: EPA has gone to some length to draw a distinction between its isohaline standards and the corresponding outflow standard, but it is a distinction without a difference. In the Bay-Delta Estuary, the salinity gradient is established by the interaction of fresh water outflow with incoming saline tides. Delta outflow is a determinant of and the only practical way to regulate the salinity gradient. This basic hydrologic fact has been recognized for decades by everyone familiar with the hydrology of the Bay-Delta Estuary.

The fact that the isohaline standard is an outflow standard is illustrated both by the method EPA used to derive the standard and by the method EPA assumes the SWRCB will use to implement the standard. EPA's draft two ppt isohaline standards were developed by using the daily estimates of net Delta outflow from October 1, 1939 to September 30, 1975 to calculate the daily location of the two ppt isohaline, as described in Appendix II of the Federal Register notice. This calculation has only two variables: daily net Delta outflow and the initial location of the two ppt isohaline on October 1, 1939. The actual location of the two ppt isohaline on October 1, 1939 was not known so EPA assumed it was located 75 kilometers upstream of the Golden Gate Bridge. Sensitivity analysis showed that by February 1 of the next year the calculated isohaline position was largely independent of this initial assumption. Therefore, the only relevant variable is net Delta outflow. In regard to implementation of the isohaline standards, the Federal Register notice states that "EPA expects that the State Board will develop an implementation plan for these Estuarine Habitat criteria by changing the volume and timing of water flows through the estuary" (59 FR 838). Increasing Delta outflow is the only means available to achieve the standard.

Considering the fact that EPA derived the standards by converting Delta outflow into salinity and EPA's expectation that the SWRCB will implement the standards by converting salinity into Delta outflow, EPA could have saved both itself and SWRCB staff substantial effort if EPA had simply proposed an outflow standard and eliminated all of the unnecessary intermediate calculations.

H. SMOLT SURVIVAL STANDARDS

Comment: The salmon smolt survival standards are combined export, flow and Delta Cross Channel gate operation standards.

Discussion: EPA has characterized its salmon smolt survival standards as the index values found in Table 4 of its draft rule. However, these index values cannot be directly measured, and there is no requirement that these index values actually be achieved. The criteria require that water project operations be consistent with the formulas used to calculate the index values. Therefore, the formulas specifying project operations in the Delta are the actual standards.

The variables in the two equations for the Sacramento River and the San Joaquin rivers are the year type indices, average water temperature at Freeport, combined CVP and SWP exports, Delta Cross Channel gate operation, proportion of flow through Georgiana Slough, and San Joaquin River flow at Stockton. There is no way to substantially control water temperature at Freeport or flow through Georgiana Slough. Therefore, the controllable factors in the equations are combined CVP and SWP exports, San Joaquin River flow and Delta Cross Channel gate operation.

The salmon smolt survival standards are, in short, a command to run the State's water projects a certain way to attain a projected level of fishery protection. EPA acknowledges this fact when it states that it "expects that the State Board would implement these criteria by making appropriate revisions to operational requirements included in water right permits issued by the State Board."

Figures 15 and 16 are provided to further illustrate this point. If EPA's draft standards are adopted, these graphs will become operational charts for the CVP and SWP. For example, when the Delta Cross Channel gates are closed and the target index is 0.4 on the Sacramento River, Figure 15 shows that the standard cannot be achieved when the temperature is above approximately 64 degrees fahrenheit. Below this temperature, the project operators will measure the temperature at Freeport, locate this temperature on the horizontal axis of the graph, move vertically up the graph to the 0.4 index level, and then locate the allowable exports on the vertical axis. Figure 16 shows that a similar procedure will be used on the San Joaquin River.

I. THE BIOLOGICAL GOALS SHOULD BE STATED

Comment: EPA should state its biological goals in quantitative terms.

Discussion: The Federal Register notice does not identify EPA's biological goals in quantitative terms. Instead, EPA talks in generalities about the need to return to habitat conditions that existed in the late 1960's and early 1970's. Habitat involves a huge array of factors, not just the couple of factors for which EPA has proposed draft standards.

Identifying biological goals in quantitative terms is important for a number of reasons. First, it allows all the parties to closely scrutinize the nub of the issue. Second, it provides guidance to the State on what alternative standards are approvable. The Federal Register notice says that "it is EPA's longstanding policy that the federal regulations will be withdrawn if a state adopts and submits standards that in the Agency's judgement meet the requirements of the Act" (59 FR 813). A process to adopt alternative standards would be lengthy and resource intensive, and this effort could be wasted if goals are not clearly defined. Third, clear expression of the biological goals provides a check on the effectiveness of the draft standards. The Federal Register notice states that during triennial reviews "the state has the opportunity to adjust criteria that are shown to be over or under protective of the uses" (59 FR 842). Without clear expression of the biological goals there is no way to make such a showing. In D-1485, the SWRCB identified an average striped bass index of 79 as its biological goal. This goal was not achieved, but its clear expression provided a simple method for checking on the effectiveness of the standards.

In order to provide some clarity to the subject of biological goals, historical biological data for a number of species have been compiled and graphed (Figures 17 to 27). The predicted response of estuarine species to different regulatory conditions has also been computed and graphed on Figures 28 and 29. The estuarine species on Figures 28 and 29 are the ones for which predictive models have been developed and presented in the SWRCB water right hearings. The models have been developed using regression analyses, and they have limited predictive ability if the conditions under which they are applied differ significantly from those under which they were developed, but they are provided to illustrate possible effects of the draft standards. The exports and outflows used in the regression equations are obtained from a DWRSIM output at six MAF demand over 71 years of historical hydrology.

Figures 28 and 29 illustrate an additional and substantial reason why EPA should quantify its biological goals. There are only two estuarine species for which both historical abundance data are available in the targeted period and predictive models exist: longfin smelt and striped bass. Figures 28 and 29 show that the predicted biological response to the draft standards for these two species over the 70 years of modeled hydroloogy is far below the historical level of the targeted period. This difference is due in part to the fact that the late 1960s and early 1970s were wetter than normal. However, these figures show that while EPA has substantially exceeded the conditions of its targeted period for the parameters it has selected to regulate, average biological populations may not return to the levels of the targeted period. The estuarine species models indicate that all of the Federal proposals combined may achieve an approximate biological goal of stopping the decline of estuarine species. It may be possible to achieve this goal at substantially lower water cost.

In light of this result, it is particularly important for EPA to quantitatively define its biological goal and to clarify whether its biological goal is to stop the decline of estuarine species or to return populations to some historical level. If EPA's goal is to return estuarine species to their late 1960's to early 1970's population levels, EPA's proposal is seriously flawed.

J. OTHER ALTERNATIVES CAN PROVIDE EQUIVALENT PROTECTION FOR FISHERIES AT A SUBSTANTIALLY LOWER WATER COST

Comment: The combined Federal proposal provides approximately equivalent protection to the fishery resources of the Bay-Delta Estuary as would have been provided by draft D-1630, but the Federal proposal has a substantially higher water cost.

Discussion: In evaluating the effects of draft D-1630, EPA concludes in its Federal Register notice that draft D-1630 "meets neither the procedural nor the substantive requirements of the Clean Water Act" (59 FR 812). However, based on a comparison of the biological model results for the estuarine species analyzed in draft D-1630, there is little difference between the biological response to draft D-1630 and the combined federal proposals. Figures 30 and 31 provide the predicted biological response of estuarine species to draft D-1630 in the period 1984 to 1989, and are copied from the decision. (D-1630-P is the predicted response to the standards in the decision.) Table 4 provides the predicted salmon smolt survival in the Delta over 70 years of modeled hydrology under draft D-1630 conditions, and Tables 5 and 6 provide historical smolt survivals and EPA's proposed criteria. As is evident from inspection of these figures and tables, direct comparison of the model results is not possible because the models have changed. Additionally, the flows and exports used as input to these models were obtained from different DWRSIM outputs with different export demands. (EPA incorrectly requested DWRSIM be run at an export demand of six MAF while draft D-1630 was run at a demand of 7.1 MAF. The lower demand will decrease the water supply impacts and increase the biological benefits of EPA's draft standards in comparison to model runs at the higher demand level of 7.1 MAF. This issue is discussed in a subsequent comment.)

The water supply impacts of draft D-1630 and the combined Federal proposals are substantially different. The projected water supply impacts of draft D-1630 at a 7.1 MAF demand in comparison to D-1485 over 70 years of modeled hydrology and the critically dry period would have been approximately 740 TAF and 650 TAF, respectively. The water supply impacts of the EPA and NMFS standards in comparison to D-1485 at a 7.1 MAF demand are 1.1 MAF over 71 years of modeled hydrology and 1.7 MAF in the critically dry period, assuming no buffer. (It is appropriate to compare the water supply impacts of the combined Federal proposals to the water supply impacts of draft D-1630 in this case because the NMFS standards are essentially a subset of the draft D-1630 standards.) The determination of water supply impacts of EPA's draft decision are discussed in detail in a subsequent comment. EPA has repeatedly asserted in meetings and public forums that it is committed to implementing the requirements of the Clean Water Act at the lowest possible water cost. If this assertion is true, EPA should adopt other requirements, assuming that EPA believes it has the authority to do so.

The proposed promulgation gives the appearance that EPA has given inadequate consideration to alternative standards in its proposal. The lack of discussion of alternatives is inappropriate in light of the fact that EPA is intending to take control of California's principal water supply and distribution system.

K. THE WATER SUPPLY IMPACT ANALYSIS SERIOUSLY UNDERESTIMATES THE WATER COSTS

Comment: EPA's water supply impact analysis of its draft standards is inappropriately optimistic.

Discussion: EPA's estimate of the water supply impact of its draft standards is based on optimism rather than responsible water supply analysis. EPA's water supply impact analysis is derived from a DWRSIM operations study. There are numerous assumptions incorporated into such a study, and the accuracy of the results are a subject of valid discussion, but EPA does not have control of the assumptions embedded in DWRSIM. There are, however, three principal assumptions incorporated into the water supply impact analysis over which EPA and the other federal agencies did have control and in each case EPA or the other federal agencies chose the most optimistic possible assumption from a water supply perspective. The assumptions are the demand level, the need for buffers to ensure compliance, and take limits under the Endangered Species Act.

EPA requested DWR to run the DWRSIM operations study at an export demand level of six MAF. This level of demand was probably selected because the maximum historical export level was approximately six MAF in 1989 and all requested deliveries were provided in that year. The use of a historical demand level to estimate future demands is inappropriate because demands are increasing over time. It would be irresponsible of the State's water supply planners to assume that demands will not be increasing in the future. Without substantial augmentation of the State's water supply, the State is facing chronic water shortages. (California Water Plan Update, Draft DWR Bulletin 160-93). Fundamentally, the problem with EPA's estimate of the demand level is that it is using the demand of the late 1980's to estimate the demand of the late 1990's and early Twenty First Century even though the best available information indicates that demands are increasing over time.

The best available information indicates that the export demand level at the 1995 level of development is 7.1 MAF, as estimated by DWR. EPA's use of a lower demand level is arbitrary and unsubstantiated.

In actuality, the export demand level fluctuates based on the hydrologic conditions. In wet years, the demand level decreases and in dry years it increases. For ease of computation, DWRSIM is usually run at a single demand level. Over the life of these standards, the demand level in dry years will exceed 7.1 MAF. The present demand level in dry years is approximately 7.1 MAF. The demand level in wet years has not yet reached 7.1 MAF.

Regardless of the demand level used to estimate the water supply impacts of EPA's draft standards, once a set of standards is adopted, the CVP and SWP will try to deliver all the water requested by their customers within the constraints of the standards as long as the requests are consistent with contractual agreements. Therefore, the practical effect of EPA's selection of an inappropriately low demand level is to decrease the projected water supply impacts and increase the projected biological benefits of EPA's draft standards, which in turn reduces the economic effects of the standards. (The predicted biological response to the proposed standards are derived by application of export/outflow levels obtained from a DWRSIM operations study to regression equations, and the biological response improves as demands decrease.)

The second optimistic assumption EPA used to estimate the water supply impact of its draft standards is that no buffer would be needed to ensure consistent compliance with the draft two ppt isohaline standard. In a draft September 24, 1993 report to EPA titled "Preliminary Results of Analysis and Model Studies of Proposed EPA Standards" DWR informed EPA that in DWR's opinion there are a number of uncertainties in estimating water supply impacts that would result in operationally trying to meet EPA's proposed two ppt isohaline standard. A significant problem in DWR's opinion is that the equation used by EPA to translate outflow to the location of the isohaline has considerable variance, and a buffer is needed to ensure that the two ppt standard is actually achieved approximately 95 percent of the time. EPA's response to this issue is that EPA will be flexible in approving an implementation program for the standard, and EPA will not require a buffer even if this results in the standard not being consistently met. There are two problems with this response. First, if EPA intends for the standard to be flexibly implemented, the flexibility should be incorporated into the standard, not promised at some future date. Second, even if EPA does provide the promised level of flexibility through an implementation program, a court could decide that the standards must be implemented fully. Fundamentally, the water supply impact should reflect the impact of the standard as written, not as promised at some future date.

The actual magnitude of a buffer required to consistently comply with EPA's draft standards is speculative. It is likely that some buffer will be required, and the only way to determine its magnitude will be through operational experience.

The third optimistic assumption does not deal with EPA standards, but rather standards adopted under the Endangered Species Act. The standards adopted by the USFWS and the NMFS include take limits for Delta Smelt and winter-run Chinook salmon, respectively. The federal agencies, in characterizing the water supply impacts of their combined sets of standards, assumed that the take limits would have no water supply impact. This assumption is incorrect. The take limits can have very substantial water supply impacts, and it is not possible to model these impacts. For example, in 1993 take limits accounted for reduced exports in the spring and early summer of over 800 TAF. The 800 TAF of reduced exports, however, did not translate directly into water supply impacts because 1993 was a wet year and the reductions could be made up, in part, later in the year. In a dry year, however, reductions in exports due to take limits could translate directly into water supply impacts.

The results of the DWRSIM operations studies under various regulatory conditions and at the two demand levels have been compiled in Tables 7 and 8. The contents of these tables are summarized in Figures 32 to 35. The purpose of these tables and figures is to provide a detailed description of the water supply impacts of the Federal proposals. EPA has summarized the water supply impacts of its draft decision at a six MAF demand level as 540 TAF on average and 1.1 MAF in the critical period. The best available information requires the use of the 7.1 MAF demand level, and using this demand level the water supply impacts increase to 780 TAF on average and remain approximately 1.1 MAF for the critical period. The additional water supply impacts caused by the take limits and the need for a buffer are speculative but could be substantial. EPA and the other Federal agencies should make an attempt to estimate these additional water supply impacts. The assumption that there are no water supply impacts due to these factors is inappropriate. Using the best information available, the effect of take limits in 1993, the take limits alone could increase the water supply impacts of the combined Federal proposals in drier years by 800 TAF from the numbers cited above.

Another factor that should be considered when characterizing water supply impacts is the effect of the standards on average reservoir storage levels. The DWRSIM operations studies showed that reservoir levels decreased significantly under EPA's draft standards, but no mention of this water supply impact was included in the Federal Register notice.

When discussing the impacts of a change in standards, the focus is usually on the incremental change in water supply impacts caused by the change in standards. It is also important to look at the total quantity of exports available under the new conditions. Figure 33 shows that, assuming no buffer is required, take limits have no effect, and the export demand is 7.1 MAF, the available annual exports under the combined federal proposals will be 5.4 MAF on the average and 3.6 MAF on the average during a critical period. These numbers will actually be lower due to take limits and the need to include a buffer.

While the best available information requires the use of the 7.1 MAF demand level to characterize water supply impacts, in order to minimize confusion, the output from the six MAF demand level DWRSIM operations study was used in the biological models to estimate the biological response to the draft standards. The use of this lower demand level will cause the biological benefits of EPA's draft standards to be overestimated.

L. SALINITY IS NOT THE PRINCIPAL CAUSE OF THE FISHERY DECLINES IN THE BAY-DELTA ESTUARY

Comment: The principal factors affecting fishery resources in the Bay-Delta Estuary are flow and diversions, not salinity.

Discussion: EPA has gone to substantial lengths in its Federal Register notice to characterize the cause of the estuarine fisheries problems in the Delta as the shift in the mean position of the two ppt isohaline a few kilometers upstream from February through June. (See Table 3 which estimates the mean location of the two ppt isohaline under different historical and regulatory conditions.) It is likely that EPA's focus on this issue is due to a belief that EPA has the authority to promulgate standards for salinity intrusion into the Bay-Delta Estuary but not flow.

Some of the major factors affecting fishery resources in the Bay-Delta Estuary are exports from the Delta and flows into, out of, and throughout the Delta. CDFG's assessment of the cause of the decline of Delta fisheries was summarized in the following statement from the SWRCB's hearing process (WRINT-DFG-8).

> "Most native fish species living within the brackish and freshwater portions of the Estuary exhibit a general pattern of increasing abundance in relation to the magnitude of Delta outflow during the winter and spring. The abundance of about 55 percent of the fish and large invertebrates using the Bay portion of the Estuary, however, does not change in relation to variations in freshwater flows. Most of the estuarine and anadromous fish species, however, are more abundant in wet than in dry years. In fact, as the current drought has progressed, the overall abundance of fish has

generally declined, particularly in San Pablo and Suisun bays. This suggests to DFG that increasing flows will have a positive effect on species abundance in the Delta, although DFG acknowledges that there may be viable, non flow related measures which when combined with flow measures may maximize abundance in the most efficient way.

"Superimposed on the effects of variations in water flows are the direct losses of fish entrained in water being diverted from the Estuary. A second effect of diversions is interference with fish migration and the use of the Delta as nursery habitat, due to changed flow patterns resulting from the CVP and SWP exporting water from the southern Delta, while most of their water supply comes from the Sacramento River.

"The result of these effects has been a widespread deterioration of fishery resources caused by water development and some other factors, as well."

The best scientific information supports a conclusion that flows and diversions are the causal factor for the decline of the fishery resource. High flows transport eggs and larvae outside the central Delta and the zone of influence of the export pumps. There is no evidence that the effects of the chemical characteristics of the water (salinity) have contributed to the fishery declines. EPA's discussion of the cause of the decline focusses on the chemical characteristics of the water. EPA states that,

"scientific evidence provides substantial support for the need for the proposed salinity criteria protecting the water quality necessary to sustain the ecological health of the estuary" (59 FR 816).

The estuarine species that EPA has identified as requiring low-salinity habitat are euryhaline[15]. No specific information is presented that these species require a specific salinity for survival or spawning with the exception of striped bass spawning for which a separate standard is proposed. The preference that some species exhibit for what EPA characterizes as low salinity habitat is actually an association with an area of high density of organisms, the entrapment zone. The entrapment zone is formed by the physical interaction of Delta outflow with incoming tides. Naturally, this area also has low salinities.

EPA also notes that good correlations exist between the salinity gradient and abundance of a number of species. These relationships were first developed using outflow, but because outflow establishes the salinity gradient, an outflow/abundance relationship can easily be transformed into an salinity/abundance relationship. The correlations were not improved by transforming outflow into salinity.

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[15] *"Euryhaline" means that the species are capable of tolerating a wide range of saltwater concentrations. American Heritage Dictionary, Second Edition, page 469.*

M. OUTFLOW IS THE MORE APPROPRIATE BASIS FOR A STANDARD IN THE WESTERN DELTA AND SUISUN MARSH

Comment: The Delta Outflow Index is a better parameter than the two ppt isohaline on which to base a standard in the western Delta and Suisun Marsh.

Discussion: EPA's choice of the two ppt isohaline as the most appropriate parameter on which to base a standard in Suisun Marsh is based on the report titled, "Managing Freshwater Discharge to the San Francisco Bay/Sacramento-San Joaquin Delta Estuary: The Scientific Basis for an Estuarine Standard". EPA has included all of the recommendations and conclusions of this report verbatim in the Federal Register notice. EPA notes that this report was agreed to by all parties who participated in a series of workshops with the exception of DWR, USBR, the SWRCB and the State Water Contractors. Significantly, the organizations that disagreed with the use of this unwieldy parameter as a standard are the ones that will be responsible for trying to make it work, if EPA is successful in requiring its implementation.

The report states that the factors that should be considered in selecting an index to manage and protect the Estuary are that the index "(1) can be measured accurately, easily and inexpensively; (2) has ecological significance; and (3) has meaning for nonspecialists." The report concludes that the salinity isohaline fulfills these factors better than the Delta Outflow Index. Presumably, the failing of the Delta Outflow Index is that it is a calculated index using flows, exports and depletions throughout the Delta. The problem with EPA's analysis is that it neglects consideration of the most important factor in managing the Estuary, specifically, the ability of the SWP and CVP to closely control the selected index. The projects have substantial experience controlling the Delta Outflow Index. The precise location of the salinity isohaline in Suisun Bay is largely outside the daily control of the projects. Suisun Bay is at sea level and is affected by the tidal action of the Pacific Ocean. Twice a day the Pacific Ocean tides cause water to move into and out of Suisun Bay and the Delta. The average tidal flow into and out of the Delta is 170,000 cfs. These tremendous tidal forces can change unpredictably with wind and barometric pressure. The salinity isohaline moves upstream and downstream many kilometers daily in response to these forces. Belatedly, EPA has apparently come to realize the problems with the isohaline standard, and it has suggested that the SWRCB implement the standard by translating the isohaline standard into its approximate Delta Outflow Index. It would be simpler to use the better parameter as a standard in the first place.

N. THE SALMON SMOLT SURVIVAL CRITERIA SHOULD BE REVISED

Comment: EPA's discussion on salmon smolt survival standards is garbled and contains many serious inaccuracies and shortcomings. Among the more serious concerns are: (A) the position of the Five Agency Chinook Salmon Committee is mischaracterized; (B) the logic in the development of the smolt survival index values is difficult to follow; (C) the smolt survival models are not sufficiently precise tools to use as standards; (D) the availability of a scientific basis for setting temperature criteria to protect salmon migration is mischaracterized; (E) the results of studies on the effects of temperature on smolt survival are mischaracterized; (F) the benefits of the proposed standards are mischaracterized; (G) comparisons among Tables 2 through 4 in the Federal Register text are inappropriate because the index values were derived by different methods; and (H) standards derived by the method EPA is proposing will result in higher survivals than occurred in the targeted period because the mean is now established as the minimum.

Discussion: A brief, separate discussion is provided for each of the concerns expressed above.

(A) The Federal Register text states that

> "EPA is proposing the use of target values derived from the recommendations and analyses carried out by the Delta Team of the Five Agency Chinook Salmon Committee. This interagency group consists of representatives from the USFWS, California DFG, California DWR, NMFS, and USBR. Its reports (Five Agency Delta Salmon Team, 1991a, 1991b) represent a consensus on the most effective and feasible implementation measures to protect downstream migrant salmon smolts in the Delta" (page 824).

The Five Agency Chinook Salmon Committee never reached consensus, and the text is not consistent with the references cited. A memorandum from CDFG to the Five Agency Group dated May 22, 1992 indicates that the entire group was not in support of any one alternative, and some parties were not in agreement with the entire range of alternatives considered.

The text implies the Five Agency Chinook Salmon Committee references (1991a and 1991b) provide a set of effective and feasible implementation measures developed by consensus to protect downstream migrant salmon smolts in the Delta. This is not the case. The document referred to as 1991a, "Evaluation of the Feasibility of Protecting Downstream Migrant Chinook Salmon Smolts in the Sacramento River and San Joaquin River with Physical Facilities", evaluates physical facilities, structures and technologies, not operation alternatives, to achieve protection. The second document, 1991b, "Benefit/Cost Evaluation of Alternative Salmon Protective Measure in the Sacramento-San Joaquin Delta", evaluates the cost to the projects of five operational alternatives, but no recommendation is provided. These five early alternatives are not the same as Alternatives A-E presented later by the USFWS in WRINT-USFWS-7.

The information and alternatives developed by the USFWS were presented by USFWS alone to the SWRCB (WRINT-USFWS-7). WRINT-USFWS-7 provided five sets of operational alternatives for SWRCB consideration, but it did not recommend a particular alternative. Alternative D from that document is the basis for the index values presented in Table 3. At no time did any of the Five Agency Chinook Salmon Teams submit either a draft or final document of any sort to the SWRCB as a consensus document or proposal for salmon protection. The one document that came close to that goal was the second draft of the Delta Salmon Team Scoping Report dated June 25, 1991, but it was never adopted by the Committee.

(B) The logic in the development of the smolt survival index values is difficult to understand. Examples of conflicting statements are as follows:

> Page 823: "In developing the goals or target index values for its proposal; EPA is relying primarily on the goal of restoring habitat conditions to those existing in the late 1960's and early 1970's as recommended in the Interagency Statement of Principles. Strict adherence to this recommendation would suggest using the index values associated with that historical period as the target index values."

> Page 824: "For a number of reasons, however, strict adherence to the late 1960's and early 1970 target is inappropriate."

> Page 824: "On the Sacramento River system, EPA believes salmon smolt migration will be protected if the long-term average survival over all water year types replicates the target historical period values."

> Page 824: "On the San Joaquin River system,....EPA is proposing index values that afford both better protection in drier years and overall index values that are higher than in the historical late 1960's to early 1970's period."

> Page 825: "EPA believes that these adjustments [of the Sacramento River survival indices] still provide protection consistent with the goal of restoring habitat conditions to those existing in the late 1960's to early 1970's..."

> Page 825: "The Sacramento River criteria provide overall protection at approximately the 1956-1970 historical level (.37 mean survival index). The San Joaquin River criteria provides (sic) better protection than the 1956-1970 historical level (.27 mean survival index)."

These statements are confusing. A clarification of the goal of the target index values would be helpful.

(C) The USFWS has never recommended the use of its salmon smolt survival indices as standards in the Bay-Delta Estuary. Instead, the USFWS has used the salmon smolt survival model to estimate the effects of operational changes on smolt survival in order to develop recommendations for standards dealing with operational issues such as export levels, Delta Cross Channel gate operation and San Joaquin River flows. EPA's direct use of the models as standards is an inappropriate use of the models.

The models are not sufficiently precise tools to predict actual smolt survivals. The model calculations can result in biologically meaningless values such as less than zero and greater than one. Also, there can be a great deal of variability between predicted versus observed survival index values. Examples of these discrepancies can be found in the following references: 1) WRINT-USFWS-9, page 36, Table 9; and 2) USFWS, Abundance and Survival of Juvenile Chinook Salmon in the Sacramento-San Joaquin Estuary, 1990 Annual Progress Report, page 59, Table 18. The index values in these examples, both predicted and observed, were calculated by USFWS. Another example of biologically suspect results from the models can be seen on Table 6. This table shows that, using the DWRSIM output for EPA's standards as input to the San Joaquin River smolt survival models, the smolt survival models predict increased survival without a barrier at the head of Old River compared to with barrier conditions. EPA's standards assume that a barrier will be constructed, but the models EPA bases its standards on predict that this expensive project will decrease smolt survival. Given the discrepancies between the expected versus calculated and observed results of the models, additional verification is necessary.

The models estimate smolt survival using mean monthly data. The implementation of the smolt survival models is not addressed; however, without further guidance, one would assume a direct, daily application of the model. Shorter term application of the model might lead to highly variable results in smolt survival. If a shorter time-step application of the model is proposed, verification will be required.

(D) EPA states that "EPA has not developed a scientific basis for precise temperature criteria" (page 823), and consequently it is proposing the smolt survival criteria to protect the designated uses. This statement is not true. There is an abundance of literature available on suitable temperatures for migrating Chinook salmon. One such document is "Water Temperature Effects on Chinook Salmon (Oncorhynchus tshawytscha) with Emphasis on the Sacramento River", DWR, January, 1988 (WQCP-SWRCB-7). EPA has in the past recommended that the SWRCB adopt a 65 degree fahrenheit criterion, based on the available scientific evidence.

The issue here is not the lack of scientific information available to develop a suitable temperature criterion, but rather the difficulty in implementing such a criterion. EPA hired a consultant to examine this issue, and the consultant's report shows that the water projects cannot effectively control temperatures in the Delta without an inordinately large cost to the State's water supply ("Water

Temperature Control in the Sacramento-San Joaquin Bay/Delta: Toward a Reasonable Strategy", Biosystems Analysis, Inc., 1992, pages 5-2 and 5-4).

EPA should approve the temperature objective adopted by the SWRCB in its 1991 Water Quality Control Plan.

(E) The Federal Register notice states that "USFWS results from spring tagged smolt releases into the central Delta showed that mortality was approximately 2 1/2 times greater at 67° than at temperatures of 63° and 64° F". This statement was taken out of context and does not represent the overall mortality rate and temperature relationship in the Sacramento River. It was the result of one test or sample within one month of one year in one reach in the Sacramento River. It is possible when examining these isolated experiments, given the highly variable results, to find almost any result desired to fit a policy position. For example on page 15 of WRINT-USFWS-7, the same table from which this statement originated, smolts released at Ryde, where one would assume temperature plays the greatest role in smolt mortality, on April 6 at 64°F, did not survive as well as those released on April 27 at 67° F (survival index of 1.36 and 1.67, respectively).

The entire paragraph from which this statement was taken reads as follows: "In 1992, releases made at Ryde and into Georgiana Slough, showed preliminarily that the greatest difference in survival between the two groups was at the higher temperature (67°F), where mortality was 2 1/2 times greater than at temperatures of 64°F (Table 3). This infers that being diverted into the Central Delta especially during times of relatively high temperatures causes high mortality to migrating smolts (Table 3)." (WRINT-USFWS-7) The significant information from this Table is not the difference in survival of the various groups at different temperatures, but the difference in survival between the groups released at Ryde (downstream of Georgiana Slough) and in Georgiana Slough.

(F) The Federal Register notice states that "[T]he index can be used to determine whether Fish Migration and Cold Fresh Water Habitat uses are impaired in the Bay/Delta. When applied in criteria, the index measures and can control the condition of the resource at risk by directly assessing and limiting the loss of salmon smolts within the Delta due to a variety of impaired water quality conditions."

This statement is not true. The only water quality parameter included in the models is temperature and that parameter is not within reasonable operational control. The other parameters in the models are flows, exports and Delta Cross Channel gate operations.

The smolt survival index cannot directly assess or limit the loss of salmon smolts due to a variety of possible impaired water quality conditions beyond those parameters addressed in the model. Water quality impairment such as agricultural runoff, toxins, etc., that may cause mortality to smolts are not controlled with these criteria. The model equations also do not address other physical conditions that may impair smolt survival such as numerous individual agricultural diversions and reverse flows.

The fish migration beneficial use designation means that the water body provides a migration route and temporary aquatic environment for anadromous or other fish species. The fish migration beneficial use applies to all runs of salmon, sturgeon, striped bass, etc. in the Sacramento and San Joaquin rivers. The salmon smolt survival model is applicable to fall-run Chinook salmon smolts only and provides no protection for other runs of Chinook salmon or other species of anadromous fish. In this regard, it is curious to note that of the four runs of salmon in the Sacramento River the only run that is not in substantial decline is the fall run, and this is the only run for which EPA is proposing specific protections.

The cold freshwater habitat beneficial use designation means that the water body provides a cold water habitat to sustain aquatic resources associated with a cold water environment. Only a temperature objective for both the Sacramento as well as the San Joaquin rivers would protect this beneficial use designation. The smolt survival index does not help insure suitable temperatures in either the Sacramento or the San Joaquin River. In the Sacramento River, measures such as closure of the gates and export reductions will be used to ameliorate conditions when water temperatures increase. In the San Joaquin River, the smolt model does not factor in water temperatures at all. Therefore, the model is not useful for determining whether cold water habitat is impaired, and it does nothing to insure or improve cold water habitat. The only way to protect the cold freshwater habitat beneficial use designation is to adopt a reasonable temperature objective in the Delta as the SWRCB did in its 1991 Water Quality Control Plan.

(G) Comparison of the index values among Tables 2, 3 and 4 in the Federal Register text is inappropriate because different temperature data bases, water year types and equations are used to derive the values in the tables. Appropriate comparisons are provided in Table 6.

Temperatures are a significant factor in the calculation of the Sacramento River smolt survival index. The estimated historic smolt survival indices in Table 2 of the Federal Register text were calculated using the mean monthly flows from the DAYFLOW database and the mean monthly temperatures both from the USGS gage at Freeport (1960-present) and from the Sacramento Water Treatment Plant in Sacramento (1939-1959). The survival index values in Tables 3 and 4 were calculated using the mean monthly flows from a DWRSIM output and a different temperature data base. The temperature data base is a combination of modeled and actual temperatures. The modeled data were calculated using USBR's temperature model (Rowell 1990) and the output from an old version of the

DWRSIM model called 75D (Kelley et al 1991) for water years 1922-1978. For the years from 1978 to 1992, the Freeport temperature data were used to complete the data base for the period from 1922-1992. The operation model 75D was run with a 1990 level of demand and 1990 level of development, whereas the model run used to generate the flow data for the values in Tables 3 and 4 utilized a 1995 level of development and 1989 level of demand. These different model runs provide significantly different hydrology. The application of modeled temperatures derived under one set of hydrology to a completely different set of hydrology is inappropriate.

There are at least a couple of solutions to this problem. First, use historic Freeport and Sacramento temperature data for the historic as well as modeled conditions. Second, the USBR temperature model could be run for the entire period 1922-1992 using the DWRSIM output for the draft standards. Because temperature is the most significant factor influencing the survival index for the Sacramento River, it is critical that thorough consideration is given to the temperatures used in the calculations. (See Table 6 of these comments for transitional calculations.)

An additional problem is that different equations were used to calculate the Sacramento River smolt survival index values in Table 2 of the Federal Register text and in Tables 3 and 4. In Table 2, Sacramento River index values are calculated using the old equations from WRINT-USFWS-7, whereas the values in Tables 3 and 4 are calculated using the new equations in WRINT-USFWS-9. The San Joaquin River equations did not change. The Sacramento River estimated historic index values in Table 2 should be recalculated using the new equations.

All of the survival values in the tables are sorted by water year type and then averaged over the five water year types. In Table 2, the annual survival indices for both the Sacramento and San Joaquin rivers are sorted by the D-1485 water year classification system. In Tables 3 and 4, the Sacramento and San Joaquin river indices are sorted by the 40-30-30 and 60-20-20 classification methods, respectively. As with the other differences, the methods of data manipulation should be consistent.

(H) EPA's use of mean survivals in some historical period to set minimum standards will result in a level of protection that exceeds the level that actually occurred in the targeted period. There is a great deal of variability in the calculated smolt survival indices even within year types. (See Table 9). The lower end of this variability is eliminated by making the mean the minimum enforceable standard.

This problem is especially acute on the Sacramento River where there are a number of unusually high indices in the targeted period of 1956-1970. Between the years 1930 and 1992, the four highest calculated survival indices, in order, occurred in 1967, 1956, 1963, and 1958. The use of the indices in these years results in an unusually high mean index in the wet year category as well as the above normal year category because it is derived by interpolation. The calculated mean of the five water year categories is also, therefore, unusually high.

O. THE STRIPED BASS CRITERIA SHOULD BE RECONSIDERED BECAUSE OF INACCURACIES IN THE ANALYSIS

Comment: EPA's discussion on striped bass and the standards necessary for its protection contain several serious inaccuracies. Examples include: (A) EPA's interpretation of the striped bass spawning index (SBI) is incorrect; (B) EPA has incorrectly interpreted striped bass spawning data; and (C) EPA's statement on the level of protection afforded by its proposed San Joaquin River spawning standard is incorrect.

Discussion: A brief, separate discussion is provided for each of the concerns expressed above.

(A) EPA states that the SBI has fallen far short of the 1978 Water Quality Control Plan without project goal and that "...during the 1980's, the SBI averaged approximately 7.5, and in 1983 and 1985 reached all-time lows of 1.2 and 2.2" (59 FR 811). These numbers do not represent the entire SBI, but only the Delta portion of the SBI. The Suisun Bay portion of the SBI is mistakenly ignored by EPA. Likewise, the statement that the highest SBI obtained since the 1978 Delta Plan was adopted was in the 20's is also incorrect: 1982 was 48.6 and 1986 was 64.9. The actual annual SBI is plotted in Figure 26. The average SBI for the period 1980-1989 was 22.7; the actual SBI for 1983 was 15.4, and in 1985 it was 6.3. The use of 1983 as an example of declining resources is particularly ironic, in that the 15.4 value is not used in most CDFG analyses because there was so much outflow that the young bass were carried beyond the sampling stations. The fall midwater trawl indicated that there was a substantial number of young bass produced in 1983.

(B) EPA states that "[a]ccording to the California DFG, striped bass spawn successfully only in freshwater with electrical conductivities less than 0.44 millimhos per centimeter electroconductivity [EC]..." (59 FR 826). This statement has not been proven. As discussed in the 1991 Water Quality Control Plan for Salinity (pages 5-32 and 33), CDFG has observed some spawning in ECs of 1.5 mmhos/cm, and laboratory studies indicate that egg survival is not affected adversely in water with ECs up to 1.5 mmhos/cm. The overall success of spawning at these high ECs has not been determined.

(C) EPA states that its proposed striped bass spawning criteria,

> "...will fully protect the historic spawning range of striped bass on the lower San Joaquin River, while reflecting the natural variability in salinity levels in different year types" (59 FR 827).

If the intent of the standard is, in fact, to fully protect striped bass spawning, the standard should apply in all years, not just wet, above normal and below normal years types. Additionally, the variability in salinity levels at Vernalis is not caused primarily by natural conditions but rather by the discharge of agricultural drainage to the San Joaquin River. It is also unclear why the standard should apply only up to Vernalis. Historical evidence indicates that spawning occurred upstream of Vernalis. Lastly, the standard does not protect the historic striped bass spawning range because the principal factor affecting the suitability of this area as spawning habitat is CVP and SWP exports.

P. IMPLEMENTATION OF THE STRIPED BASS STANDARDS SHOULD FOCUS ON NON POINT DISCHARGE REDUCTION

Comment: EPA's expectation that the SWRCB will implement the striped bass spawning standard by making revisions to operational requirements in water right permits is inconsistent with federal regulations.

Discussion: The Federal Register notice says that EPA expects the SWRCB to implement the striped bass criteria "by making appropriate revisions to operational requirements included in water right permits issued by the State Board" (59 FR 827). We interpret this statement to mean that EPA expects the SWRCB to order the release of high-quality water in excess of existing requirements to dilute water that has been polluted by agricultural drainage. This expectation is inconsistent with Federal regulations at 40 CFR 131.10(a) which state, in part, that "[I]n no case shall a state adopt waste transport or waste assimilation as a designated use for any waters of the United States." While EPA is not recommending a formal beneficial use designation of waste assimilation, that would be the practical effect of implementation of the recommendation.

If EPA chooses to adopt this standard, the SWRCB's program of implementation in the short term would probably focus on reduction of salt loading from agricultural drainage in April and May. In the long term, isolated discharge of agricultural drainage to a salt sink or to the ocean may be necessary.

Q. FURTHER DOCUMENTATION IS REQUIRED BEFORE MAKING CHANGES IN STANDARDS FOR SUISUN MARSH

Comment: Existing standards and ongoing studies provide appropriate protection for wetlands in Suisun Marsh.

Discussion: The wetlands in Suisun Bay fall into three general categories: interior managed wetlands within Suisun Marsh, wetlands along interior tidally-influenced channels within Suisun Marsh, and wetlands along the shores of Suisun Bay and Grizzly Bay. The largest amount of wetlands fall within the first two categories. The three categories are protected as brackish marsh by standards at Chipps Island and within Suisun Marsh channels. In 1987, the Suisun Marsh Preservation Agreement was signed by CDFG, DWR, USBR, and the Suisun Resource Conservation District. This agreement called for some relaxations of the D-1485 salinity standards within Suisun Marsh channels, but the SWRCB declined to make the changes without a detailed biological assessment of the impacts of the changes. This biological assessment is being done by CDFG under contract to DWR, and it will document the existing biological community in the three areas discussed above and their needs. Special emphasis is being placed on threatened and endangered species. It is likely that the existing biological community includes endangered species that require the existing salinity regime. The SWRCB stated in the 1991 Water Quality Control Plan for Salinity that it will consider adoption of new, appropriate water quality objectives for this area when the biological assessment is completed. Intervention by EPA to protect the wetlands of Suisun Marsh and Suisun Bay is unnecessary.

R. BASING THE LEVEL OF PROTECTION ON THE ASSUMPTION THAT THE MAJOR FISHERY DECLINES OCCURRED SINCE 1976 IS UNSUPPORTED

Comment: EPA's standards are based, in part, on the unsupported assertion that at about the mid 1970's "fish habitat and populations began to experience the most recent significant declines" (59 FR 820).

Discussion: EPA states its level of protection is based, in large part, on the assumption that the fishery populations took a significant decline around 1975. EPA goes so far as to say that "including the year 1976 is inappropriate, given that by 1976 the decline of certain aquatic resources was already apparent" (59 FR 840). EPA does not support this assumption with any data. Inspection of the plots of historical fishery abundances in Figures 17 to 27 can be used to qualitatively assess this assumption. Probably the most obvious feature of these graphs is the large variability of the data. However, for most species these graphs show a gradual decline in biological resources throughout the period of record, punctuated by significant declines in drought years and recoveries in wet years. The gradual decline probably began in the last century and is due to a myriad of factors throughout the watershed.

The decline that EPA is citing in 1976 is due to drought conditions. The years 1976 and 1977 constitute the worst recorded two year drought in California history. (Draft DWR Bulletin 160-93) In general, fishery resources rebounded when the drought ended. However, the extended drought of 1987 to 1992 caused significant damage to fishery resources.

S. THE USE OF AVERAGE FLOWS TO ESTABLISH THE TWO PPT ISOHALINE CRITERIA IS INAPPROPRIATE

Comment: EPA's two ppt isohaline standard inappropriately relies on reproducing average historical flow conditions even when such flows are not required to protect the beneficial use.

Discussion: There is tremendous variability in the amount and timing of flows through the Delta. EPA's draft standards will eliminate the low end of this variability by raising minimum outflows to average outflows in a particular year type. The elimination of this variability causes some strange results. For example, in 1970, a wet year, CCWD's draft analysis of actual hydrologic conditions in the Delta shows that an additional 2.88 MAF of water would have had to be released from storage to meet EPA's draft standards. Such large releases in a wet year are not necessary to protect beneficial uses, but that is the result of forcing the average conditions on all years.

T. EPA'S PROPOSAL TO "SPREAD THE BURDEN" OF MEETING THE PROPOSED CRITERIA IS NOT THE SAME CONCEPT USED BY THE SWRCB IN DRAFT WATER RIGHT DECISION 1630

Comment: EPA's proposal at 59 FR 822 that the SWRCB "spread the burden" of meeting the proposed criteria is not the same concept that the SWRCB proposed in draft Water Right Decision 1630. EPA's concept of allocating the water costs is unclear, but appears inconsistent with state law.

Discussion: At 59 FR 822, EPA urges the SWRCB to,

> "spread the burden across as broad a spectrum of water users as possible. The economic analysis prepared in conjunction with this proposal suggests that spreading the burden results in substantially lower costs than does imposing the burden on a particular geographic area or a narrowly defined group of water users. This is not just a matter of fairness. The federal agencies' preliminary discussions with water project managers indicated that increasing the pool of contributors substantially increases the operational flexibility of the water system, and thereby reduces the total impact of meeting the proposed criteria. For that reason, the federal agencies hope the State Board will continue the concept it adopted in its proposal for D-1630, and will allocate the burden of meeting these criteria across the broad range of the state's water users."

The referenced economic analysis suggests, at pages 3-6 and 3-7, that 80% of the water costs be applied to agriculture and 20 percent to urban water uses, and that a pro rata reduction for all Delta diverters would be appropriate. EPA implies that this is the same concept the SWRCB introduced in draft D-1630.

This is not the same concept. The concept in draft Water Right Decision 1630 for water cost allocation was to require parties to contribute according to the proportion of their adverse effects on the Bay-Delta Estuary. The draft D-1630 did not spread the burden by requiring the same responsibility per acre-foot from each of the affected water right holders. Instead, draft D-1630 sought to require the affected water rights each to mitigate the effects of their own diversions on the Estuary. Thus, a diversion that had a greater effect on the Estuary would have a greater mitigation responsibility, both to contribute water and to pay mitigation fees. Further, mitigation fees varied based on whether the water use was agricultural or urban. Affected water right holders who diverted the same water to storage and then from the Delta channels, entraining fish, had more responsibility than diverters who only diminished the natural flow. Within each tributary, the responsibilities among water right holders with the same effects were set proportionately and took into account the amounts of water needed from the tributary. However, the responsibility of a water right holder on one tributary would not necessarily be the same as the responsibility of a water right holder with the same size diversion on another tributary.

State law includes protections for the counties of origin (Water Code Sections 10505 and 10505.5) and for the watersheds of origin (Water Code Section 11460 et seq.). These protections are intended to ensure that exports of water from the protected areas (i.e., the watershed or the county of origin) do not deprive these areas of water they reasonably require. Draft D-1630 avoided interfering with these protections, but EPA's pro rata approach has the potential to interfere with these protections.

The EPA approach could result in inbasin water users being required to mitigate for the effects of exports from the Delta. For example, the 2 parts per thousand isohaline criteria could be viewed as requiring additional carriage water to carry organisms away from the effects of the export pumps. EPA should ask itself whether it would be fair to require upstream water users to provide extra water to make sure the export pumps do not entrain fish. Also, this approach could be seen as requiring the water users within the areas protected by the county of origin and watershed protection statutes to provide water so that water exports can be maintained or increased.

III. COMMENTS ON THE REGULATORY IMPACT ASSESSMENT (RIA)

Comment:: The validity of an analysis of this nature is based on the accuracy of its underlying assumptions. Unfortunately, the assumptions in this analysis are incorrect. The following incorrect, principal assumptions are found in this analysis.

Discussion:

1. The RIA assumes that the water supply impacts of the combined Federal proposals are 540 TAF on average and 1.1 MAF in the critically dry period. As discussed in a comment above, assuming there is no need for a buffer and the take limits are not

considered, the water supply impacts of EPA's draft standards alone will be 780 TAF on average and 1.1 MAF in the critically dry period. However, a buffer of some magnitude will be required. The water supply impacts of the combined Federal proposals will be substantially higher due to take limits. Based on experience in 1993, an assumption of additional water supply impacts of 800 TAF in drier years may be reasonable to account for the effects of take limits.

2. The RIA assumes that water supply reductions will be distributed between agricultural users and urban users at a relative amount of 80 percent and 20 percent. This assumption is unsupported.

3. The RIA assumes that water supply reductions will be dealt with through water marketing, water trading and crop shifts. The most likely near term response is actually increased ground water pumping.

   Despite the fact that the analysis appears incorrect from the outset due to incorrect principal assumptions, a review of the analysis was undertaken. The following technical comments summarize the results of that review.

Technical Analysis of the RIA

Comment: The RIA is intended to answer the question, "what is the cost of meeting the proposed standards and how does this cost compare with the benefits resulting from the proposed standards?" The RIA uses sound analytical techniques but is incomplete.

Discussion:

The main problems are as follows:

1. The RIA does not give enough information for the reader to judge whether the scenarios presented are realistic. The impacts on agriculture depend on the extent to which growers can trade water and change their cropping patterns. Not enough information is given on the cropping patterns and water exchanges in the scenario suggested to be the most likely outcome of the standards.

   The impacts on urban water users depend on the extent to which utilities can substitute reclaimed water for Delta water and use water from a drought water bank. The RIA does not demonstrate convincingly that water will be available from these sources.

2. The discussion of local economic impacts is inadequate. Local impacts are of critical importance in a situation where growers and water utilities can trade water after allocations have been reduced. Transfers of water benefit growers receiving payment for their water, but impose costs on workers and other businesses in the area.

3. The time horizon of the analysis is not clear. Eventually, costs may be lower than indicated in the analysis, as water users make long-run adjustments. However, other developments, such as the trend toward higher-valued crops, may tend to increase costs.

4. Many of the benefits resulting from the proposed standards are not quantified. Improving conditions for nonconsumptive use of the Delta would appear to be an important reason for introducing the standards. Nonuse benefits, such as the value to the public of the continued existence of a healthy Delta would also appear to be an important issue. These benefits are mentioned in the RIA, but no attempt is made to compare their value with the cost of meeting the standards.

Specific comments on parts of the RIA are as follows:

Page 3-6. The analysis assumes that agricultural users absorb 80 percent of the water supply reductions and urban water utilities absorb the remaining 20 percent. This assumption affects the direct losses to water users, but has less importance to the overall economic impacts if water users can trade.

Some comparisons of the cutbacks with existing water use in the affected area would be welcome.

Page 3-7. The analysis assumes that growers do not substitute ground water for Delta water. In reality, growers are likely to respond to cutbacks by pumping. In the short run, this would reduce losses to growers and local economic impacts, since land could be kept in production. However, in some locations, more pumping would increase the rate of overdraft, increasing costs to all water users in the area, not only those absorbing the cutbacks of Delta water. In some cases, eventual impacts might be greater than if there were no increased pumping, because the benefits to growers substituting ground water for Delta water might eventually be exceeded by higher pumping costs imposed on neighboring water users.

Page 3-8. The scenarios do not consider new water development by water utilities. Although the cost of water from most proposed water projects is more than the recent sales price of water from the drought water bank, utility managers may prefer water development for reasons such as reliability.

Page 4-5. Scenario 1 assumes that supply reductions occur within the CVP service area. This seems to be an optimistic no-trading scenario, with no reduction in fruit acreage and only a small reduction in vegetable acreage. Why was this allocation of reductions chosen? Are there other no-trading scenarios with more severe impacts?

Scenario 3 seems to be overoptimistic in terms of the ability of growers to trade water.

The RIA states that the average impacts were estimated by applying an average water cutback, rather that estimating the impacts of the cutbacks required in various water years and averaging these numbers. It is not clear what the effect of this approach is. The RIA states that it tends to overestimate impacts. However, since the least productive land is fallowed first, we would expect impacts to increase more than linearly with cutback level. In this case, average impacts averaged over all water years would exceed those of an average cutback.

Scenario 2 assumes transfers within the San Joaquin Valley and changes in cropping patterns. More information is needed to allow readers to judge if the cropping patterns implied by the analysis seem reasonable. Cropping patterns will also vary from year to year depending on water availability. The variation implied by the model should be discussed and compared with past fluctuations to assess whether it is realistic for growers to respond to varying water availability in this way.

Page 4-8. The terms "costs" and "impacts" are both used to mean drop in production value. This could be confusing, since there are many effects of the cutbacks which are measured in dollars

Page 4-9. More details on Scenario 2 are essential to judge the validity of the analysis.

Page 4-10. Some discussion is needed on the physical feasibility of water transfers.

The conclusion that the regulations would not affect food prices follows from the change in cropping patterns indicated by the agricultural model. A less favorable no-trading scenario could result in some increases in food prices.

Page 4-11. The change in producers' surplus is the correct measure of costs to growers. However, it needs to be made clearer exactly how it is defined. The discussion on this page implies that producers' surplus includes return to equipment, but page 4-13 implies that it does not.

The discussion of land values is confusing. It should be made clear whether the change in producers' surplus includes changes in the return to land.

Page 4-13. More discussion is needed on the effect of displacement of equipment. We recognize that idled equipment could be sold, that transaction costs would be a purchase from the region's economy, and that if prices of used equipment were depressed, the growers buying the equipment would benefit by the selling growers' losses. However, it is realistic to assume that there would be some losses because some equipment would be unused in dry years, some would be scrapped prematurely, and some would end up being underused.

More discussion on job losses resulting from the regulations is needed. Most of the areas that would be impacted by the regulations have weak economies, so it is likely that workers displaced by the reduction in acreage would be unemployed for many months. The effect of the fluctuation in cropping patterns on the labor market also should be analyzed.

Page 4-17. All of the urban scenarios hinge on the availability of water from new reclamation projects.

Page 4-20. Statements on this page and page 4-17 suggest that water use would be cut in dry years by pricing, but the table on page 4-25 states that consumer surplus losses would exceed out-of-pocket costs, implying that other methods would be used. In practice, water utilities would use some combination of rationing, pricing, and conservation measures. It should be made clear what is proposed.

Page 4-21. Consumer surplus is the correct measure of losses to consumers resulting from reduced water availability. However, not enough information is given to allow readers to judge whether the numbers presented give a realistic estimate of these losses.

The demand analysis is overly dependent on one study of water shortages. Given the lack of information, comparisons with other studies would be desirable.

It should be stated clearly how conservation fits into this analysis. Does conservation shift the demand for water, describe movement in response to price changes, or describe the movement from short-run to long-run demand?

Page 4-23. The secondary regional impacts of water transfers from agriculture are of critical importance and should be addressed.

Page 5-11. The retail sector should not be included in the benefits of increased salmon landings. Because the standards will not change total income in the state significantly, increased consumer spending on salmon must be offset by reductions in spending elsewhere in the economy. The only benefits are those to the salmon harvesting and salmon processing industries. Multipliers should be applied to these industries only. In the case of salmon marketed directly by producers, an adjustment to indirect benefits should be made to reflect reduced consumer spending elsewhere.

Page 5-19. The benefits of increased ocean fishing do not include those resulting from increased spending on fisheries. Although this spending must be offset by reduced consumer spending elsewhere in the economy, it benefits a particular industry in a particular region and should be identified.

Page 6-8. This analysis considers only backward linkages from the agricultural sector. Some assessment should be made of the effect of reduced acreage on industries processing agricultural products.

IV. RESPONSES TO SPECIFIC ISSUES FOR COMMENTERS TO ADDRESS

EPA has identified a number of specific issues for which they are requesting comments. The numbers of the following responses correspond to the numbers in the Federal Register notice. In several cases comments regarding the text of these issues are also provided.

1. The use of a smooth function rather than a step function as the basis for setting water quality criteria has been discussed for some time in California, and this general methodology is acceptable. However, EPA's specific proposal is poor.

   There are two major problems with EPA's proposal as drafted. First, the principal purpose of EPA's two ppt isohaline standards is to reproduce the February through June hydrology in the Delta. The 40-30-30 index is probably a poor index to use for this purpose because only a small portion of this index relates to rainfall that occurred in the period of interest. An example of this problem can be found in the wet year, 1970. Most of the rainfall occurred early in the water year; therefore, EPA's standards would have required huge releases of stored water because inadequate rainfall occurred from February through June. The best way to address this problem is to weight the hydrologic index more heavily toward the conditions in February through June. For example, the four rivers Sacramento Basin index from February through June could be used as the hydrologic index. Other indices that place the major emphasis on the February through June period may also be appropriate. Selection of the most appropriate index may take substantial effort.

   The second principal problem is that EPA has used average data from 1940 to 1975 to construct its smooth function. As discussed elsewhere in these comments, there is a strong time dependence in this data, and consequently, the use of the long time period to estimate the appropriate number of days at each location will provide a result that exceeds the targeted level of protection. There are two different ways to develop a more appropriate time period for constructing a smooth function. The first way is to use a shorter time period, for example, 1964-1976. Examples of a smooth function using this shorter time frame and the four rivers Sacramento Basin Index are provided in Figures 36 to 38. The correlation coefficients for Port Chicago and Chipps Island are quite good. The second way is to use a series of regression analyses to estimate the number of days at each location for the level of development in a single year. DWR is undertaking this analysis at the 1975 level of development, and the analysis is not repeated here.

   Regardless of how the smooth function is constructed, it is likely that the projects will occasionally encounter problems meeting the proposed standards because of lack of knowledge of future hydrology. Storms late in the year could push the required number of days at a certain location beyond the remaining period available to meet the standard. EPA should formulate the draft standard in such a way that this type of situation is not a violation.

Comments on Text of This Issue

a. EPA states that the smooth function would result in the same average number of days required for each year type. This statement is probably not true.

b. EPA states that it has discussed the use of the smooth function with the SWRCB and has thus far received a very positive response. No such discussions with the SWRCB Members have occurred. EPA has discussed this issue with SWRCB staff, and the response has been noncommittal.

c. EPA states that, fortunately, there is a very high correlation among the four points it uses to construct its smooth function. This high correlation is the result of eliminating most of the variability in the data by using averages within year types. If all of the data is used to develop the regressions instead of just the averages, the correlations are poor, as seen in Figures 39 to 41 (R squared of 0.57 at Port Chicago, 0.29 at Chipps Island, and 0.13 at the confluence). The poor correlations are largely due to the strong time dependence of the data.

2. Compliance with EPA's draft standards will require complex changes in CVP and SWP operation. The projects should be provided flexibility to help them achieve compliance with new standards. If the projects believe that increasing the averaging period of the standards to 28 days will increase their flexibility, this extension of the averaging period should be provided.

3. The draft isohaline standard, as proposed, will require the use of a substantial buffer to ensure consistent compliance. Anything less than a perfect level of compliance is unacceptable to some members of the public and will result in litigation, even if EPA is willing to be lenient. It is true that the SWRCB can develop an implementation program that would not require a buffer, but such an implementation program would probably be litigated as well. If, as stated in the Federal Register notice, "EPA believes that the use of these proposed confidence levels would require substantial additional outflows through the estuary without any corresponding ecological benefit to the Estuarine Habitat designated use" (59 FR 838), then EPA should redraft the standard to preclude the need for a confidence level. It is not appropriate for compliance with EPA's standards to require a waste of water.

4. The underlying assumption behind this issue is that EPA's standards do not provide adequate protection in wetter years because the mean position of the two ppt isohaline in wetter years under the draft standards is projected to be significantly upstream of the mean position that occurred in the targeted historical period. This assumption is illustrated in the table that accompanies the text. However, this assumption is incorrect and the table is misleading. The table does not provide the projected mean location of the two ppt isohaline under the draft standards; rather, the table lists the mean location of the two ppt isohaline assuming that the projects were able to operate precisely to the draft standards in all year types. This assumption is approximately correct in the driest years,

but it is decidedly incorrect in the wetter years. A more accurate representation of the situation can be found in Table 2. As discussed elsewhere in these comments, portions of Table 2 are constructed from a DWRSIM output, and their results should be viewed cautiously. There is no proposed project that could have a substantial effect on the mean locations over the next decade during wet and above normal year types. If some future development requires modification of the draft standard, this modification can be accomplished through the normal review process.

This issue illustrates a problem with EPA's approach to adopting standards. EPA's single-minded focus on reproducing some historical level of hydrology tends to obscure the principal objective of this effort which is to protect the beneficial uses. In the wettest years, the uses are protected. There is no need to require the release of stored water in these years because such releases will have only a very minor effect on the already very large flows moving through the Delta.

5. As discussed in detail in the comments above, the principal problem with EPA's use of the period 1940-1975 to develop its two ppt isohaline standard is that there is a strong time dependence to the data. Therefore, EPA overestimates both the number of days that the isohaline was downstream of the three locations and the mean location of the isohaline during the targeted period of the late 1960's to early 1970's.

   Assuming that EPA's goal is to achieve the 1960's to 1970's hydrology, there are two ways to deal with this problem. First, a regression analysis of the number of days at each of the three locations versus the Sacramento River Index using a shorter time period that actually brackets the targeted time period could be used to estimate the standard. The shorter time period will minimize the influence of the time dependency of the data, and bracketing the targeted period will eliminate the bias caused by having all years on one side of the targeted period. Second, regression analyses of the number of days at each of the three locations for each year type versus the Sacramento River Index using the entire historical record could be used to estimate the appropriate number of days at the 1975 level of development. The appropriate number of days at the three locations derived from these analyses are provided on Table 3. However, as we have stated elsewhere, the methodology employed by EPA in applying the Clean water Act to this situation, by developing Section 303 standards, is inappropriate.

Comments on Text of This Issue

a. EPA's assertion that there is not a strong time dependency to the data is wrong. This can be seen on Figures 7 to 12 and Figures 39 to 41. Figures 39 to 41 also show that the standards will be substantially different depending on the time period selected.

b. EPA believes that it is inappropriate to include the year 1976 in the analysis because "by 1976 the decline of certain aquatic resources was already apparent." This statement is not pertinent because the decline of aquatic resources was apparent decades earlier and there is no basis for drawing a line at 1976. In any event if the regressions of the number of days at each location versus the Sacramento River Index are recalculated using the period 1964 -1975 instead of 1964-1976, essentially the same lines are obtained, as can be seen by comparing Figures 2 to 4 with Figures 42 to 44.

6. There is no information available to analyze this question. The question proposes a number of changes to the draft standards, but there is no accompanying assessment of the biological benefits or water supply impacts.

7. This issue is discussed in a comment above.

8. This issue is discussed in a comment above. EPA provides no biological basis for the need to adopt standards in excess of existing controls to protect the Suisun Bay tidal marshes.

9. This issue illustrates a significant weakness in EPA's draft standards. The standards specify the number of days that the two ppt isohaline must be downstream of three locations from February through June, but no weight is given to the relative importance of higher flows within this period. The responsible parties may choose to meet the requirements early in the season, and water would not be available during periods of higher biological activity. This problem could be especially important in drier years when flow requirements are lower. The solution to this problem is to tie the flow requirements to biological monitoring, if possible, and require higher flows in the most critical period. This approach works both ways, however, high flow requirements should be eliminated if real-time monitoring indicates that they are not required.

   This issue also includes a request for comment on how implementation of these criteria will affect carryover storage requirements imposed on the projects for the benefit of the threatened winter-run Chinook salmon. The projects will increase reservoir drawdown in attempting to satisfy EPA's draft standards and to maximize deliveries to their customers. Consequently, carryover storage requirements may not be attainable in most years under EPA's draft standards.

   The impact of EPA's proposed criteria should be evaluated in light of endangered winter-run Chinook salmon and the duration and amount of cold water supplies required for their reproductive success in the Upper Sacramento River. It is extremely important for EPA to evaluate the reservoir carryover potential to support both their proposal as well as existing protective measures. It would serve little purpose to provide optimal habitat conditions in the Estuary during drought years at the risk of running out of water to sustain maintenance conditions upstream.

10. In discussed in a comment above, there is an abundance of literature available to set a temperature criterion for protection of migrating salmon.

11. We have insufficient information available to formulate a balance between the benefits and costs of a barrier at Georgiana Slough.

    Additional research is needed to determine the effectiveness of the sound barrier at the head of Georgiana Slough.

12. As discussed in a comment above, the salmon standards are actually the equations EPA identifies to define compliance. The USFWS has developed two separate equations for with and without barrier conditions, but EPA's standard includes only the with barrier equation. Therefore, the standard has to change if a barrier is not constructed.

    The assumption that smolt survival is improved if the barrier is installed is probably true, even though the US FWS smolt servival model indicates otherwise under some circumstances. If the barrier is not constructed, the only two variables available to improve smolt survival according to the models are flow in the lower San Joaquin River and exports. This, however, is not true.

    Other factors contribute to smolt mortality in the San Joaquin River during April and May such as water temperature, predation, in-Delta and upriver agricultural diversions and runoff. If water temperature in the lower Sacramento River affects smolt survival, then it follows that temperature affects smolt survival in the lower San Joaquin River. Even though it has not been possible to mathematically describe the relationship between these factors and smolt survival, it does not mean that these factors should be ignored or that efforts should not be made to control them. Efforts could be focused on the serious water quality issues affecting all aquatic resources in the lower San Joaquin River, and the survival of Chinook salmon smolts would no doubt be improved.

13. This question implies that there is a need to establish a minimum flow standard on the San Joaquin because the SWRCB may develop an implementation program that is consistent with the salmon migration standard but allows flows on the San Joaquin River that are inadequate to protect salmon migration. The SWRCB is unlikely to pursue such an unproductive course. Addition of another standard is not necessary.

14. A number of federal agencies are presently grappling with the definition of "doubling the production of anadromous fish species". Considering the time and effort that is going into the implementation of the CVPIA, EPA should rely upon what the agencies have developed.

    The USFWS has never attempted to link the Chinook salmon smolt models to changes in numbers of adult salmon over time. If EPA intends to make that connection, then its logic and bases should be thoroughly explained.

15. The CPOP models the entire life cycle of fall-run Chinook salmon in the Sacramento River; therefore if it is used alone, the lower San Joaquin River would not be addressed. EA Engineering, Science and Technology created a Chinook salmon model (EACH) for

the entire life cycle of Chinook salmon for the San Joaquin River system. For the segment describing smolt survival through the Delta, EA Engineering used the USFWS smolt survival models.

SWRCB staff has asked BioSystems, Analysis, Inc. in the past to run their CPOP model on different water operation scenarios and staff found that the analysis is both expensive and takes a long time to complete. If EPA is interested in the BioSystems' CPOP model, specifically the Delta smolt survival segment, then the practical application, appropriateness, usefulness and performance of the updated CPOP model should be presented for peer and agency review.

16. It seems likely that estuarine species are affected by estuarine conditions throughout the year. EPA's draft standards are likely to improve conditions in the Delta from February through June, but they may cause poorer conditions the rest of the year due to shifts both in releases from upstream reservoirs and in export periods. This problem can be addressed only by extending standards throughout the year. Focussing only on one time of the year is probably not the best answer for the Estuary. A more reasonable year-round approach would be more appropriate.

17. EPA should be concerned about the unforeseen environmental impacts of its draft standards because they may be substantial. EPA discusses in detail its perception of the potential benefits of its draft standards, but there is no discussion of their environmental costs. EPA's draft standards will result in reduced reservoir levels, hydropower benefit losses, higher instream water temperatures in the fall, higher instream flows in the fall, higher export rates in the fall, and higher risk of losing salinity and flow control in the Delta. These environmental costs need to be assessed against the environmental benefits of EPA's draft standards. The benefits of EPA's draft standards may not substantially exceed these environmental costs.

CCWD'S ANALYSIS OF ADDITIONAL OUTFLOW REQUIRED BETWEEN FEBRUARY 1 AND JUNE 30 TO MEET THE U.S. EPA'S X2 STANDARD

YEAR	YEAR TYPE	ADDITIONAL OUTFLOW (TAF)
1930	DRY	90
1931	CRITICAL	680
1932	DRY	50
1933	CRITICAL	0
1934	CRITICAL	340
1935	BELOW NORMAL	60
1936	BELOW NORMAL	40
1937	BELOW NORMAL	0
1938	WET	0
1939	DRY	580
1940	ABOVE NORMAL	0
1941	WET	0
1942	WET	0
1943	WET	0
1944	DRY	110
1945	BELOW NORMAL	20
1946	BELOW NORMAL	0
1947	DRY	250
1948	BELOW NORMAL	0
1949	DRY	0
1950	BELOW NORMAL	210
1951	ABOVE NORMAL	90
1952	WET	0
1953	WET	630
1954	ABOVE NORMAL	80
1955	DRY	170
1956	WET	0
1957	ABOVE NORMAL	1060
1958	WET	0
1959	BELOW NORMAL	1480
1960	DRY	430

YEAR	YEAR TYPE	ADDITIONAL OUTFLOW (TAF)
1961	DRY	470
1962	BELOW NORMAL	150
1963	WET	460
1964	DRY	920
1965	WET	410
1966	BELOW NORMAL	860
1967	WET	20
1968	BELOW NORMAL	1060
1969	WET	0
1970	WET	2880
1971	WET	790
1972	BELOW NORMAL	810
1973	ABOVE NORMAL	1220
1974	WET	410
1975	WET	300
1976	CRITICAL	1330
1977	CRITICAL	2470
1978	ABOVE NORMAL	90
1979	BELOW NORMAL	1130
1980	ABOVE NORMAL	370
1981	DRY	1090
1982	WET	0
1983	WET	0
1984	WET	2560
1985	DRY	650
1986	WET	1330
1987	DRY	920
1988	CRITICAL	1190
1989	DRY	1290
1990	CRITICAL	1330
1991	CRITICAL	1340

TABLE 1

TABLE 2

Mean Position, in km, from the Golden Gate Bridge, of the Febuary through June 2 ppt Isohaline by Year Type

Year Type	C	D	BN	AN	W
1940-75[1]	--	70.0	67.3	60.5	57.0
1964-76[1]	82.5	74.1	72.9	62.4	58.9
1975[2]	81.8	74.9	73.4	--	--
D1485 + EPA + NMFS[3]	76.4	73.5	69.7	63.5	58.6
D1485 + EPA[3]	76.6	73.9	70.1	63.5	58.6
Base Case (D1485)[3]	84.4	77.4	71.9	65.4	59.9

[1]Calculated by averaging historical positions by year type.

[2]Calculated from regression equations derived from 1930-1992 historical data. Wet and above normal year types are not included because there is little or no time dependence to the data.

[3]Mean Position calculated from DWRSIM study at 6 MAF demand over 71 years of historic hydrology.

Number of Days at the Three Locations of a Two PPT Isohaline Standard Derived by Different Methods

YEAR TYPE		WET	AN	BN	DRY	CRITICAL
Port Chicago	EPA[1]	133	105	78	33	0
	1964–76[2]	107	80	43	3	0
	1975[3]	118	96	25	8	0
Chipps Island	EPA[1]	148	144	119	116	90
	1964–76[2]	143	121	85	42	5
	1975[3]	140	142	89	68	30
Confluence	EPA[1]	150	150	150	150	150
	1964–76[2]	150	138	120	97	71
	1975[3]	150	150	150	150	150

[1]EPA draft standards– –Calculated by averaging the number of days at each location from 1940–75.
[2]Calculated from midpoints of regression lines for above normal, below normal, and dry year types and by estimation from graphs for wet and critically dry year types using 1964–76 data.
[3]Calculated from regression analyses using historical record from 1930–92 at the 1975 level of development. Locations provided by George Barnes, DWR (Personal Communication).

TABLE 3

TABLE D

CALCULATED SMOLT SURVIVAL INDEX
FALL–RUN CHINOOK SALMON

SACRAMENTO RIVER

STANDARD / WY	WET	AN	BN	DRY	CRIT	MEAN
D–1485	0.39	0.27	0.24	0.20	0.19	0.27
1984–1989	0.23	–	–	0.21	0.16	0.20
D–1630–P	0.41	0.34	0.32	0.29	0.26	0.34
D–1630–T	0.41	0.34	0.32	0.29	0.26	0.34

SAN JOAQUIN RIVER WITH BARRIER

STANDARD / WY	WET	AN	BN	DRY	CRIT	MEAN
D–1485	0.35	0.21	0.17	0.15	0.17	0.23
D–1630–P	0.41	0.30	0.25	0.23	0.21	0.29
D–1630–T	0.41	0.30	0.25	0.23	0.21	0.29

SAN JOAQUIN RIVER WITHOUT BARRIER

STANDARD / WY	WET	AN	BN	DRY	CRIT	MEAN
D–1485	0.13	0.07	0.06	0.05	0.12	0.09
1984–1989	0.26	–	–	0.03	0.07	0.11
D–1630–P	0.24	0.23	0.21	0.22	0.19	0.22
D–1630–T	0.24	0.23	0.21	0.22	0.19	0.22

NOTES

* Survival index values are based on USFWS Delta Smolt Model (WRINT–USFWS–7).
* D–1485 conditions were estimated using DWRSIM with a 7.1 MAF demand.
* 1984–1989 conditions were taken from DAYFLOW; no barrier was in place from 1984–1989.
* D–1630–P and D–1630–T conditions were estimated using a modified DWRSIM output with a 7.1 MAF demand.
* Barrier located at the head of Upper Old River

U.S. FISH AND WILDLIFE SERVICE
FALL-RUN CHINOOK SALMON
SMOLT SURVIVAL INDEX

SACRAMENTO RIVER

DATABASE/WATER YR	WET	ABOVE NORMAL	BELOW NORMAL	DRY	CRITICAL	MEAN OF WY TYPES
DAYFLOW						
Proposed Rule, p.72	D-1485 Water Year Types, Old Equations and Historic Temperatures					
1956-1970	0.56	0.45#	0.35	0.26	0.20#	0.36
from Table 2						
DAYFLOW	40-30-30 Water Year Types, New Equations and Historic Temperatures					
1956-1970	0.55	0.41*	0.29	0.34	0.20$	0.36
1964-1976	0.48	0.21*	0.26	0.30*	0.22*	0.30
1965-1985	0.47	0.33	0.27	0.21	0.24	0.30
DAYFLOW	40-30-30 Water Year Types, New Equations and Modeled Temperatures					
1956-1970	0.43	0.35*	0.24	0.28	0.20$	0.30
1964-1976	0.38	0.20*	0.20	0.28*	0.16*	0.25
1965-1985	0.39	0.33	0.22	0.21	0.21	0.27
EPA CRITERIA	0.45	0.38	0.36	0.32	0.29	0.36

SAN JOAQUIN RIVER
WITH BARRIER

DATABASE/WATER YR	WET	ABOVE NORMAL	BELOW NORMAL	DRY	CRITICAL	MEAN OF WY TYPES
EPA CRITERIA	0.46	0.30	0.26	0.23	0.20	0.29

SAN JOAQUIN RIVER
WITHOUT BARRIER

DATABASE/WATER YR	WET	ABOVE NORMAL	BELOW NORMAL	DRY	CRITICAL	MEAN OF WY TYPES
DAYFLOW						
Proposed Rule, p.72	D-1485 Water Year Types					
1956-1970	0.61	0.25#	0.18	0.17	0.15#	0.27
from Table 2						
DAYFLOW	60-20-20 Water Year Types (Equations were not changed)					
1956-1970	0.70	0.34	0.28	0.19	0.25	0.35
1964-1976	0.44	0.18	0.20	0.12	0.11*	0.21
1965-1985	0.51	0.13	0.20	0.06	0.19	0.22

Water year type not represented, values are interpolated or extrapolated.
* Water year type represented only once, actual value.
$ Critical water year did not occur in this period, value is an extrapolated value taken from Table 2 in EPA's Proposed Rule.
o Smolt survival using DAYFLOW are calculated using historical mean monthly flows.
o EPA criteria are those in Proposed Rule on Bay/Delta Standards, January, 6 1994.
o Index values calculated using USFWS smolt survival models (WRINT-USFWS-7 and -9).

TABLE 5

U.S. FISH AND WILDLIFE SERVICE
FALL–RUN CHINOOK SALMON
SMOLT SURVIVAL INDEX

SACRAMENTO RIVER

STNDARDS/WATER YR		ABOVE	BELOW			MEAN OF
DWRSIM–HIST. TEMPS.	WET	NORMAL	NORMAL	DRY	CRITICAL	WY TYPES
D–1485	0.43	0.28	0.26	0.22	0.19	0.28
D–1485+NMFS	0.45	0.30	0.30	0.25	0.21	0.30
D–1485+EPA	0.51	0.39	0.39	0.34	0.29	0.38
D–1485+NMFS+EPA	0.51	0.39	0.39	0.33	0.29	0.38
MODELED TEMPS.						
D–1485	0.38	0.27	0.24	0.21	0.18	0.26
D–1485+NMFS	0.40	0.29	0.27	0.24	0.21	0.28
D–1485+EPA	0.45	0.38	0.36	0.32	0.28	0.36
D–1485+NMFS+EPA	0.45	0.38	0.36	0.32	0.28	0.36
EPA CRITERIA	0.45	0.38	0.36	0.32	0.29	0.36

SAN JOAQUIN RIVER
WITH BARRIER

STNDARDS/WATER YR		ABOVE	BELOW			MEAN OF
DWRSIM	WET	NORMAL	NORMAL	DRY	CRITICAL	WY TYPES
D–1485	0.39	0.18	0.16	0.16	0.16	0.21
D–1485+NMFS	0.39	0.19	0.19	0.19	0.19	0.23
D–1485+EPA	0.53	0.35	0.32	0.27	0.23	0.34
D–1485+NMFS+EPA	0.53	0.35	0.32	0.26	0.23	0.34
EPA CRITERIA	0.46	0.30	0.26	0.23	0.20	0.29

SAN JOAQUIN RIVER
WITHOUT BARRIER

STNDARDS/WATER YR		ABOVE	BELOW			MEAN OF
DWRSIM	WET	NORMAL	NORMAL	DRY	CRITICAL	WY TYPES
D–1485	0.18	0.05	0.05	0.07	0.09	0.09
D–1485+NMFS	0.18	0.08	0.09	0.15	0.17	0.13
D–1485+EPA	0.48	0.36	0.35	0.31	0.31	0.36
D–1485+NMFS+EPA	0.48	0.36	0.35	0.31	0.30	0.36

The higher without barrier values calculated from the DWRSIM runs are due to a crossing of the slopes of the model regression equations.
- o DWRSIM is DWR's operations model; model runs use 6.0 MAF demand.
- o EPA criteria are those in Proposed Rule on Bay/Delta Standards, January 6, 1994.
- o Index values calculated using USFWS smolt survival models (WRINT–USFWS–9).
- o Water year types based on 40–30–30 index for the Sacramento and 60–20–20 index for the San Joaquin River.

TABLE 6

DWRSIM- MODELED WATER SUPPLY IMPACT OF NMFS AND/OR EPA STANDARDS COMPARED TO D-1485
AT 6.0 MAF DEMAND FOR WATER YEARS 1922-1992

O:\DWRSIM\VER5.44\STDS\PIM.WK1 02/07/94

YEAR	YEAR TYPE (1)	TOTAL EXPORTS FROM THE DELTA (TAF) BASE (D-1485)	NMFS	EPA	NMFS +EPA	NMFS +EPA W/BUFFER	WATER SUPPLY REDUCTION FROM BASE (TAF) (2) NMFS	EPA	NMFS +EPA	NMFS +EPA W/BUFFER (3)	% OF YEARS
1927	W	6,071	6,094	5,888	5,817	5,549	(23)	587	658	926	
1938	W	6,070	6,131	5,764	5,760	5,099	(61)	306	310	971	
1941	W	6,039	6,111	5,935	5,928	5,968	(72)	269	276	236	
1942	W	6,065	6,065	6,033	6,034	6,036	0	418	417	415	
1943	W	5,660	5,672	5,827	5,828	5,807	(12)	51	50	71	
1952	W	6,180	6,188	5,770	5,769	5,628	(8)	489	490	631	
1953	W	5,617	5,513	5,647	5,649	4,899	104	147	145	895	
1956	W	6,219	6,249	5,990	5,924	5,394	(30)	561	627	1,157	
1958	W	6,423	6,402	6,080	6,074	6,143	21	529	535	466	
1963	W	6,110	6,206	5,936	5,786	5,486	(96)	494	644	944	
1965	W	6,083	6,091	5,903	5,698	5,128	(8)	589	794	1,364	
1967	W	6,191	6,166	5,689	5,672	5,606	25	651	668	734	
1969	W	5,953	5,929	5,609	5,609	5,493	24	344	344	460	
1970	W	5,440	5,461	5,605	5,607	5,517	(21)	1	(1)	89	
1971	W	6,405	6,292	5,964	5,953	5,781	113	611	622	794	
1974	W	6,395	6,380	6,066	6,086	6,065	15	708	708	709	
1975	W	5,874	5,855	5,875	5,877	5,618	19	383	381	640	
1982	W	6,470	6,448	6,022	6,021	5,990	22	448	449	480	
1983	W	5,572	5,572	5,545	5,546	5,534	0	27	26	38	
1984	W	4,600	4,583	4,793	4,795	4,537	17	(94)	(96)	162	
1986	W	5,843	5,852	5,732	5,685	5,289	(9)	137	184	580	
Average W		**5966**	**5965**	**5794**	**5767**	**5551**	**1**	**365**	**392**	**608**	**30%**
1922	AN	6,070	6,013	5,734	5,740	5,428	57	649	643	955	
1928	AN	6,110	6,100	5,851	5,660	4,975	10	456	647	1,332	
1940	AN	6,132	6,042	5,742	5,694	5,635	90	509	557	616	
1951	AN	6,098	6,250	5,915	5,903	5,383	(152)	514	526	1,046	
1954	AN	5,960	6,086	5,939	5,872	4,793	(126)	33	100	1,179	
1957	AN	5,803	5,834	5,818	5,796	5,182	(31)	157	179	793	
1973	AN	5,999	5,990	5,943	6,038	6,031	9	197	102	109	
1978	AN	5,064	5,058	4,385	4,349	3,565	(4)	828	864	1,648	
1980	AN	5,843	5,823	5,651	5,635	5,679	20	374	390	346	
Average AN		**5897**	**5911**	**5664**	**5632**	**5186**	**(14)**	**413**	**445**	**892**	**13%**
1923	BN	6,017	6,024	5,997	5,820	5,050	(7)	59	236	1,006	
1935	BN	5,358	5,553	5,250	4,883	3,245	(195)	136	503	2,141	
1936	BN	6,080	5,970	5,733	5,633	4,080	110	489	589	2,142	
1937	BN	5,869	5,885	5,849	5,626	3,734	(16)	336	359	2,251	
1945	BN	6,179	6,167	6,025	5,990	5,619	12	261	296	667	
1946	BN	5,904	5,912	5,875	5,875	5,467	(8)	33	33	441	
1948	BN	6,192	5,667	5,740	4,630	4,556	525	459	1,569	1,643	
1950	BN	6,182	5,842	5,665	5,317	4,546	340	552	900	1,671	
1959	BN	5,571	5,584	5,581	5,579	4,961	(13)	114	116	734	
1962	BN	6,048	5,640	5,634	5,272	5,216	408	434	796	852	
1966	BN	5,990	5,991	5,984	5,885	5,412	(1)	184	263	736	
1968	BN	5,335	5,355	5,669	5,670	5,045	(20)	(315)	(316)	309	
1972	BN	5,889	5,991	5,950	5,674	5,434	(102)	(20)	256	486	
1979	BN	5,913	5,918	6,009	5,943	5,628	(5)	(64)	2	317	
Average BN		**5895**	**5821**	**5767**	**5557**	**4857**	**73**	**180**	**400**	**1100**	**20%**
1925	D	5,970	5,899	5,384	5,147	4,287	71	625	862	1,722	
1926	D	6,120	5,741	5,447	5,142	4,818	379	709	1,014	1,337	
1930	D	6,132	5,176	4,308	4,176	2,870	956	1,842	1,974	3,280	
1932	D	5,208	5,120	4,148	4,163	2,500	88	1,077	1,062	2,725	
1939	D	5,560	5,506	5,619	5,375	4,903	54	232	476	848	
1944	D	6,105	6,082	5,809	5,644	5,198	23	505	670	1,116	
1947	D	6,101	5,891	5,763	5,447	5,003	210	617	933	1,377	
1949	D	6,106	6,059	5,389	4,992	3,326	47	1,028	1,425	3,091	
1955	D	6,113	5,827	5,811	5,468	4,288	286	573	916	2,096	
1960	D	6,119	5,520	5,415	4,718	4,498	599	1,022	1,719	1,939	
1961	D	6,076	5,594	5,523	4,841	4,411	482	754	1,436	1,866	
1964	D	6,030	5,668	5,799	5,221	4,211	362	401	979	1,889	
1981	D	5,807	5,821	5,800	5,802	5,681	(14)	28	27	148	
1985	D	5,942	5,978	5,786	5,670	4,901	(36)	444	559	1,328	
1987	D	5,984	5,730	5,357	4,932	4,098	254	738	1,163	1,997	
1988	D	5,946	5,270	4,591	4,525	2,536	676	1,367	1,433	3,422	
Average D		**5957**	**5680**	**5372**	**5079**	**4221**	**277**	**748**	**1041**	**1899**	**23%**
1924	C	5,196	4,801	4,047	3,940	2,761	395	1,288	1,395	2,574	
1929	C	5,110	4,874	3,680	3,614	3,128	236	1,738	1,804	2,280	
1931	C	4,160	3,657	3,024	2,822	1,683	503	1,450	1,652	2,791	
1933	C	4,596	4,225	3,504	3,593	2,136	371	1,250	1,161	2,618	
1934	C	4,325	3,967	2,960	3,054	1,733	358	1,419	1,325	2,646	
1976	C	5,302	5,282	4,949	4,850	3,892	20	514	613	1,571	
1977	C	3,378	3,119	2,387	2,367	1,167	259	1,155	1,175	2,375	
1988	C	5,341	4,580	3,857	3,721	2,774	761	1,681	1,817	2,764	
1990	C	5,301	4,678	4,004	3,567	1,827	623	1,613	2,050	3,790	
1991	C	4,843	4,398	3,543	3,149	2,064	445	1,381	1,775	2,860	
1992	C	4,384	4,222	3,958	3,594	2,422	162	586	950	2,122	
Average C		**4721**	**4346**	**3628**	**3479**	**2326**	**376**	**1280**	**1429**	**2582**	**15%**
AVG.		5,748	5,615	5,342	5,199	4,568	134	584	707	1,338	
MAX.		6,470	6,448	6,080	6,074	6,143	956	1,842	2,050	3,790	
MIN.		3,378	3,119	2,387	2,367	1,167	(195)	(315)	(316)	38	

(1) D-1630 YEAR TYPES
(2) CALCULATED BY ADDING EXPORT REDUCTIONS FROM THE BASE CASE TO INCREASES IN SAN JOAQUIN RIVER FLOW FROM THE BASE CASE
(3) DWR'S ESTIMATE OF BUFFER NECESSARY TO ENSURE COMPLIANCE WITH STANDARD 95% OF THE TIME

TABLE 7

DWRSIM- MODELED WATER SUPPLY IMPACT OF NMFS AND/OR EPA STANDARDS COMPARED TO D-1485
AT 7.1 MAF DEMAND FOR WATER YEARS 1922-1992

[illegible] 03/07/94

YEAR	YEAR TYPE (1)	TOTAL EXPORTS FROM THE DELTA (TAF) BASE (D-1485)	NMFS	EPA	NMFS + EPA	NMFS + EPA W/BUFFER	WATER SUPPLY REDUCTION FROM BASE (TAF) (2) NMFS	EPA	NMFS + EPA	NMFS + EPA W/BUFFER (3)	% OF YEARS
1927	W	6,727	6,644	6,032	6,036	6,050	83	1,098	1,094	1,080	
1938	W	6,578	6,583	6,257	6,161	5,863	(5)	(162)	(66)	232	
1940	W	6,726	6,563	5,791	5,553	5,194	163	989	1,227	1,586	
1941	W	6,786	6,821	6,092	6,090	5,933	(35)	897	899	1,056	
1942	W	7,033	7,021	6,651	6,519	6,519	12	791	923	923	
1943	W	6,959	6,968	6,595	6,548	5,808	(9)	597	644	1,384	
1951	W	7,049	6,759	6,120	5,993	5,259	290	749	876	1,610	
1952	W	6,823	6,865	6,243	6,215	5,628	(42)	555	583	1,170	
1953	W	6,892	6,707	6,621	6,325	5,603	185	550	846	1,568	
1956	W	6,790	6,582	6,040	5,991	5,671	208	855	904	1,224	
1958	W	7,040	7,158	6,350	6,299	5,936	(118)	786	837	1,200	
1963	W	6,841	6,792	6,305	6,272	5,981	49	1,030	1,063	1,354	
1965	W	6,745	6,619	5,980	5,881	5,321	126	1,123	1,222	1,782	
1967	W	6,720	6,671	6,155	6,065	6,049	49	699	789	805	
1969	W	6,599	6,558	6,111	6,100	5,971	41	488	499	628	
1970	W	6,723	6,592	6,287	6,285	5,335	131	702	704	1,654	
1971	W	7,147	6,826	6,209	6,118	4,980	321	1,104	1,195	2,333	
1973	W	6,984	6,707	6,259	6,166	5,250	277	1,081	1,174	2,090	
1974	W	7,085	7,162	6,412	6,417	5,761	(77)	1,056	1,051	1,707	
1978	W	5,261	5,279	5,132	5,223	4,336	(18)	355	264	1,151	
1980	W	6,582	6,729	6,396	6,388	5,175	(147)	340	348	1,561	
1982	W	6,957	6,811	6,216	6,161	6,110	146	729	784	835	
1983	W	6,657	6,686	6,408	6,449	6,391	(29)	249	208	266	
1984	W	5,895	5,877	5,831	5,831	5,282	18	185	185	734	
1986	W	6,689	6,586	6,049	5,917	5,476	103	719	851	1,292	
	Average W	**6732**	**6663**	**6182**	**6120**	**5635**	**69**	**703**	**764**	**1249**	**33%**
1922	AN	6,914	6,662	6,169	6,170	6,091	252	1,181	1,180	1,259	
1925	AN	6,109	5,621	4,500	4,546	4,658	488	1,956	1,910	1,798	
1928	AN	7,013	6,754	6,211	5,934	5,484	259	832	1,109	1,559	
1935	AN	5,881	5,907	5,312	4,484	3,122	(26)	888	1,716	3,078	
1936	AN	6,959	6,561	5,911	5,436	4,111	398	1,329	1,804	3,129	
1946	AN	6,798	6,543	6,275	6,093	5,910	255	647	829	1,012	
1948	AN	6,729	5,636	5,220	4,933	4,824	1,093	1,890	2,177	2,286	
1954	AN	7,166	7,002	6,527	6,287	5,385	164	875	1,115	2,017	
1975	AN	7,091	6,980	6,627	6,622	6,238	111	853	858	1,242	
	Average AN	**6740**	**6407**	**5861**	**5612**	**5091**	**333**	**1161**	**1411**	**1931**	**12%**
1923	BN	7,158	6,630	5,925	5,903	5,982	528	1,539	1,561	1,482	
1930	BN	6,250	4,997	4,607	4,216	2,909	1,253	1,774	2,165	3,472	
1932	BN	5,280	5,122	4,082	4,063	2,918	158	1,641	1,660	2,805	
1937	BN	6,530	6,382	5,838	5,895	3,818	148	919	862	2,939	
1945	BN	6,803	6,652	6,080	6,120	5,876	151	1,068	1,028	1,272	
1950	BN	6,617	5,872	5,725	5,295	5,346	745	1,119	1,549	1,498	
1957	BN	7,058	6,694	6,555	6,438	5,507	364	662	779	1,710	
1960	BN	6,528	5,678	5,803	4,991	4,570	850	770	1,582	2,003	
1962	BN	6,247	5,683	5,717	5,450	5,378	564	999	1,266	1,338	
1966	BN	7,037	6,629	6,438	6,143	5,684	408	399	694	1,153	
1968	BN	6,624	6,454	6,462	6,362	6,167	170	174	274	469	
1972	BN	7,098	6,476	6,447	6,076	5,257	622	732	1,103	1,922	
1989	BN	6,207	5,352	4,315	3,877	4,172	855	1,904	2,342	2,047	
	Average BN	**6572**	**6048**	**5692**	**5448**	**4891**	**524**	**1054**	**1297**	**1856**	**17%**
1926	D	6,370	5,710	5,472	5,210	5,356	660	1,233	1,495	1,349	
1944	D	6,721	6,302	6,095	5,832	5,091	419	902	1,165	1,906	
1947	D	6,550	5,888	5,926	5,605	4,901	662	736	1,057	1,761	
1949	D	6,480	6,059	5,392	5,325	4,522	421	1,440	1,507	2,310	
1955	D	6,676	5,915	5,847	5,347	4,606	761	1,200	1,700	2,441	
1959	D	6,759	6,395	6,478	6,181	5,767	364	303	600	1,014	
1961	D	6,264	5,552	5,631	5,239	4,761	712	667	1,059	1,537	
1964	D	6,775	5,659	6,029	5,385	4,982	1,116	908	1,552	1,955	
1979	D	7,051	6,892	6,475	6,355	5,777	159	804	924	1,502	
1981	D	6,910	6,511	6,379	6,097	5,440	399	586	868	1,525	
1985	D	6,916	6,507	6,035	5,874	5,378	409	973	1,134	1,630	
	Average D	**6679**	**6126**	**5978**	**5677**	**5144**	**553**	**887**	**1187**	**1721**	**15%**
1924	C	5,135	4,116	3,730	3,224	2,724	1,019	1,451	1,957	2,457	
1929	C	5,626	4,426	3,871	3,752	2,980	1,200	1,892	2,011	2,783	
1931	C	4,142	3,613	2,944	2,684	1,728	529	1,220	1,480	2,436	
1933	C	4,506	4,007	3,509	3,465	2,118	499	1,327	1,371	2,718	
1934	C	4,361	3,974	3,017	3,098	1,859	387	1,363	1,282	2,521	
1939	C	6,638	6,120	6,136	5,427	5,698	518	514	1,223	952	
1976	C	6,261	5,905	5,568	5,443	4,138	356	655	780	2,085	
1977	C	3,504	3,007	2,182	2,217	1,578	497	1,365	1,330	1,969	
1987	C	6,460	5,866	5,835	5,460	5,147	594	577	952	1,265	
1988	C	5,544	4,284	4,603	3,328	3,608	1,260	988	2,263	1,983	
1990	C	5,149	4,609	3,585	3,270	2,749	540	1,610	1,925	2,446	
1991	C	4,922	4,353	3,534	3,328	2,298	569	1,409	1,615	2,645	
1992	C	4,609	4,408	4,362	3,754	2,366	129	196	804	2,192	
	Average C	**5143**	**4514**	**4087**	**3727**	**2899**	**623**	**1121**	**1461**	**2189**	**17%**
AVG.		6,404	6,041	5,632	5,425	4,871	362	930	1,137	1,692	
MAX.		7,166	7,162	6,651	6,622	6,519	1,260	1,956	2,342	3,472	
MIN.		3,504	3,007	2,182	2,217	1,578	(147)	(162)	(66)	232	

(1) D-1485 WATER YEAR TYPES
(2) CALCULATED BY ADDING EXPORT REDUCTIONS FROM THE BASE CASE TO INCREASES IN SAN JOAQUIN RIVER FLOW FROM THE BASE CASE
(3) DWR'S ESTIMATE OF BUFFER NECESSARY TO ENSURE COMPLIANCE WITH STANDARD 95% OF THE TIME

TABLE 8

SMOLT SURVIVAL INDEX				
DAYFLOW				
Water Year	Year Type	Sacramento River	Year Type	San Joaquin without barrier
1930	D	0.44	C	0.47
1931	C	0.22	C	0.42
1932	D	0.38	AN	0.61
1933	C	0.41	D	0.44
1934	C	0.26	C	0.42
1935	BN	0.41	AN	0.78
1936	BN	0.39	AN	0.77
1937	BN	0.40	W	0.83
1938	W	0.49	W	0.97
1939	D	0.27	D	0.46
1940	AN	0.37	AN	0.78
1941	W	0.51	W	0.87
1942	W	0.57	W	0.77
1943	W	0.40	W	0.80
1944	D	0.38	BN	0.48
1945	BN	0.42	AN	0.69
1946	BN	0.41	AN	0.64
1947	D	0.26	D	0.45
1948	BN	0.49	BN	0.49
1949	D	0.35	BN	0.48
1950	BN	0.39	BN	0.53
1951	AN	0.39	AN	0.52
1952	W	0.54	W	0.95
1953	W	0.47	BN	0.35
1954	AN	0.33	BN	0.44
1955	D	0.33	D	0.28
1956	W	0.63	W	0.63
1957	AN	0.41	BN	0.31
1958	W	0.58	W	0.95
1959	BN	0.23	D	0.26
1960	D	0.42	C	0.26
1961	D	0.30	C	0.24
1962	BN	0.42	BN	0.29
1963	W	0.58	AN	0.49
1964	D	0.30	D	0.23
1965	W	0.52	W	0.44
1966	BN	0.29	BN	0.23
1967	W	0.71	W	0.73
1968	BN	0.23	D	0.09
1969	W	0.54	W	0.76
1970	W	0.29	AN	0.19
1971	W	0.52	BN	0.17
1972	BN	0.28	D	0.03
1973	AN	0.21	AN	0.17
1974	W	0.38	W	0.16
1975	W	0.40	W	0.13
1976	C	0.22	C	0.11
1977	C	0.27	C	0.28
1978	AN	0.38	W	0.68
1979	BN	0.27	AN	0.09
1980	AN	0.39	W	0.34
1981	D	0.22	D	0.10
1982	W	0.50	W	0.41
1983	W	0.57	W	0.98
1984	W	0.24	AN	0.07
1985	D	0.21	D	0.04
1986	W	0.26	W	0.38
1987	D	0.11	C	0.09
1988	C	0.22	C	0.03
1989	D	0.25	C	0.04
1990	C	0.22	C	0.13
1991	C	0.26	C	0.15
1992	C	0.15	C	0.18

SUMMARY						
SACRAMENTO RIVER						
	WET	AN	BN	D	C	MEAN
1956–1970	0.55	0.41*	0.29	0.34	0.20$	0.36
1964–1976	0.48	0.21	0.26	0.30*	0.22*	0.30
1965–1985	0.47	0.33	0.27	0.21	0.24	0.30
SAN JOAQUIN RIVER						
	WET	AN	BN	D	C	MEAN
1956–1970	0.70	0.34	0.28	0.19	0.25	0.35
1964–1976	0.44	0.18	0.20	0.12	0.11*	0.21
1965–1985	0.51	0.13	0.20	0.06	0.19	0.22

Sacramento River sorted by 40–30–30 water year classification.
San Joaquin River sorted by 60–20–20 water year classification.
* Water year type represented only once.
$ Critical water year did not occur in this period, value is an extrapolated value taken from Table 2 of EPA's Proposed Rule.

TABLE 9

CCWD'S ANALYSIS OF ADDITIONAL OUTFLOW REQUIRED BETWEEN FEB. 1 AND JUNE 30 TO MEET THE U.S. EPA'S X2 STANDARD

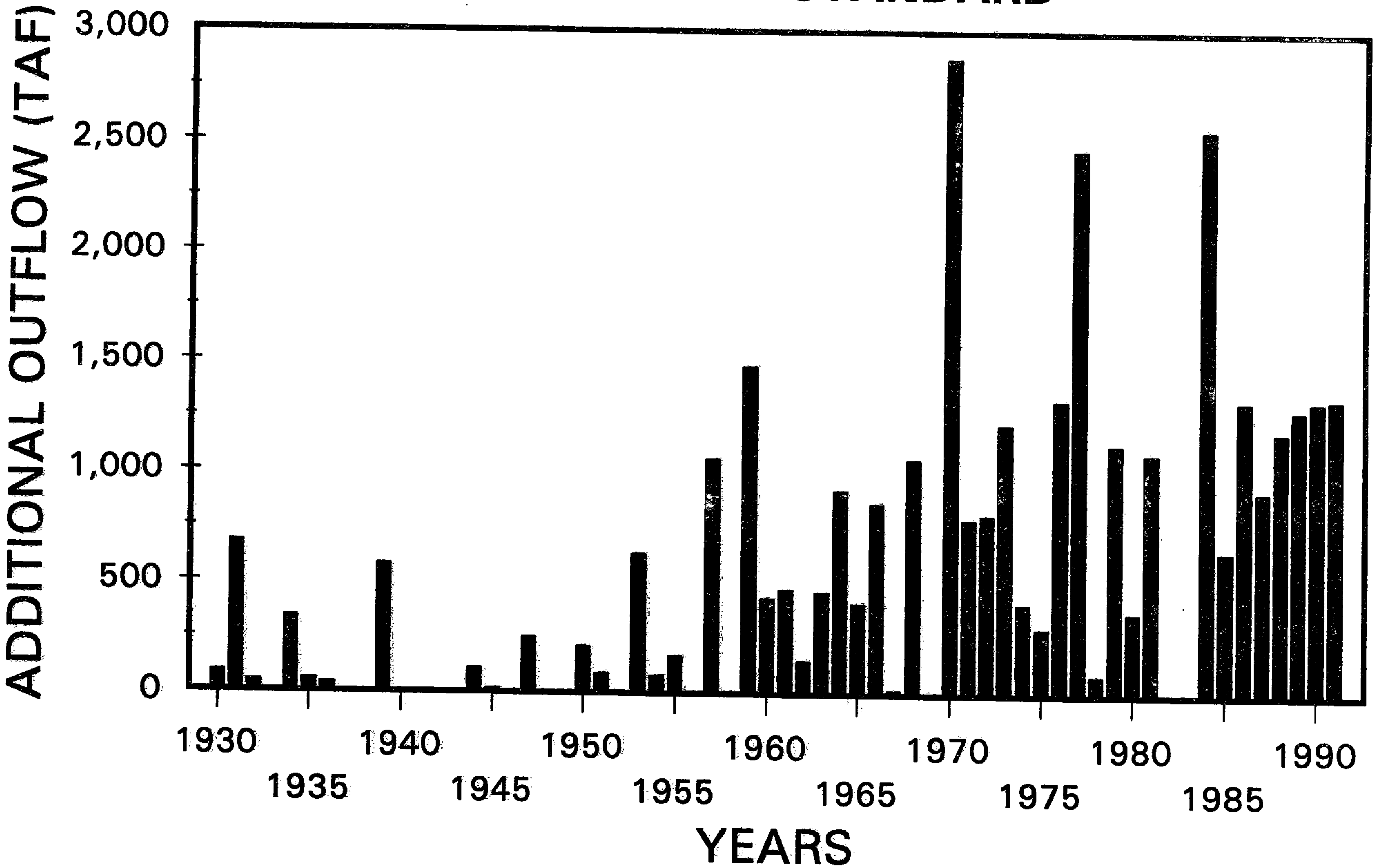


FIGURE 1

No. of days 2ppt is at or below Port Chicago from Feb through June (1964-76) Versus the Sacramento River Index (SRI)

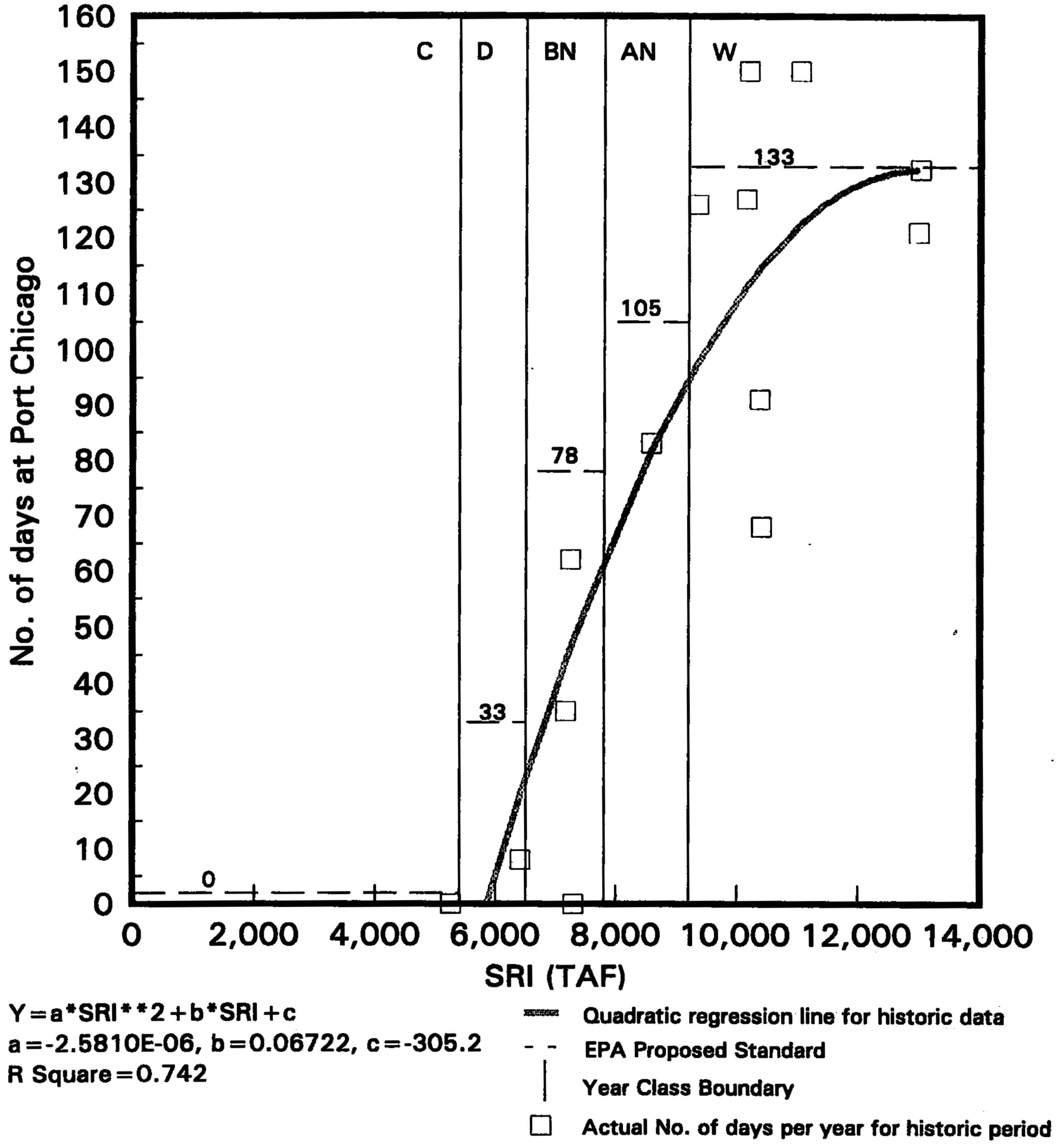
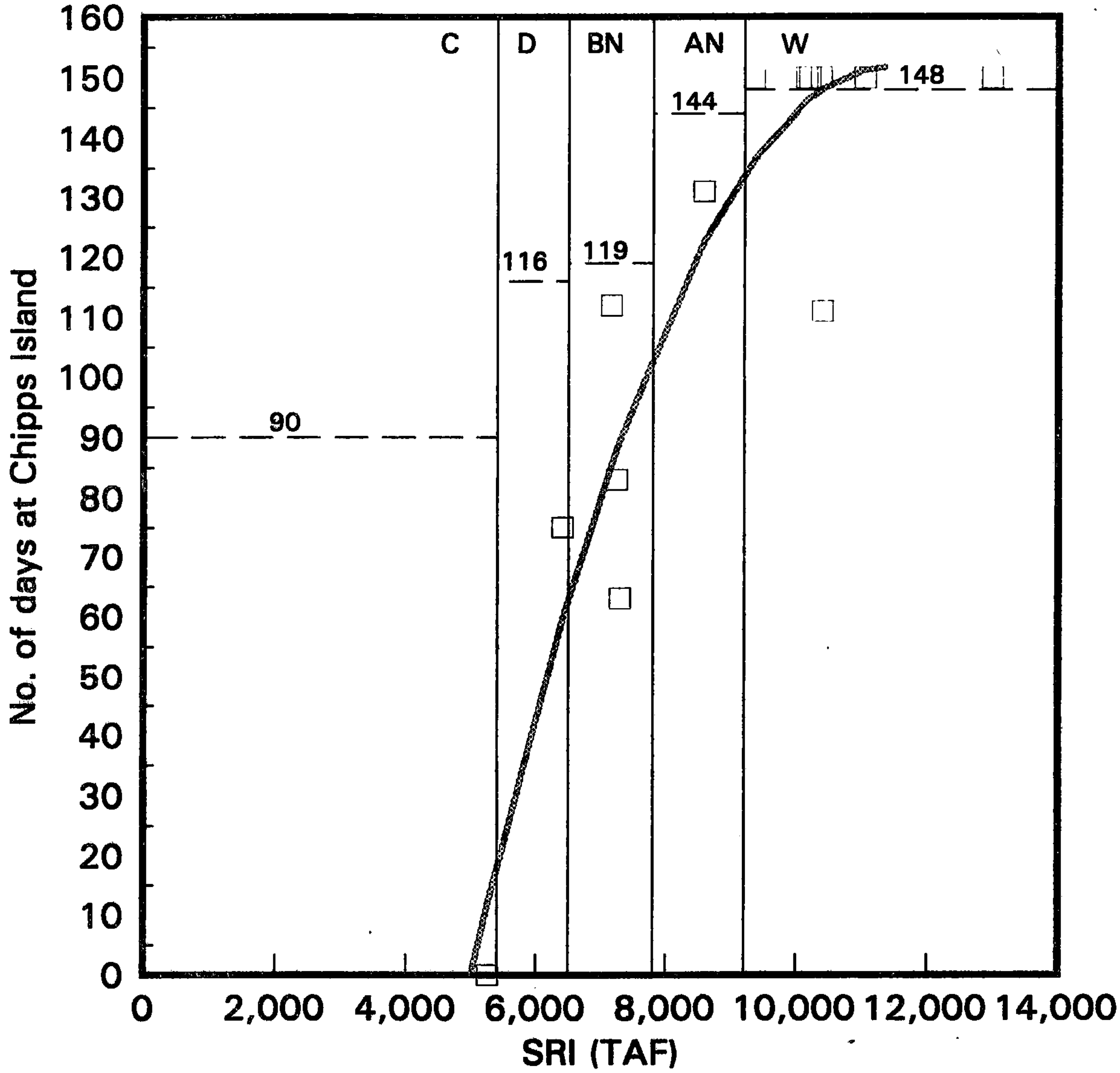


FIGURE 2

No. of days 2ppt is at or below Chipps Island from Feb through June (1964-76) Versus the Sacramento River Index (SRI)

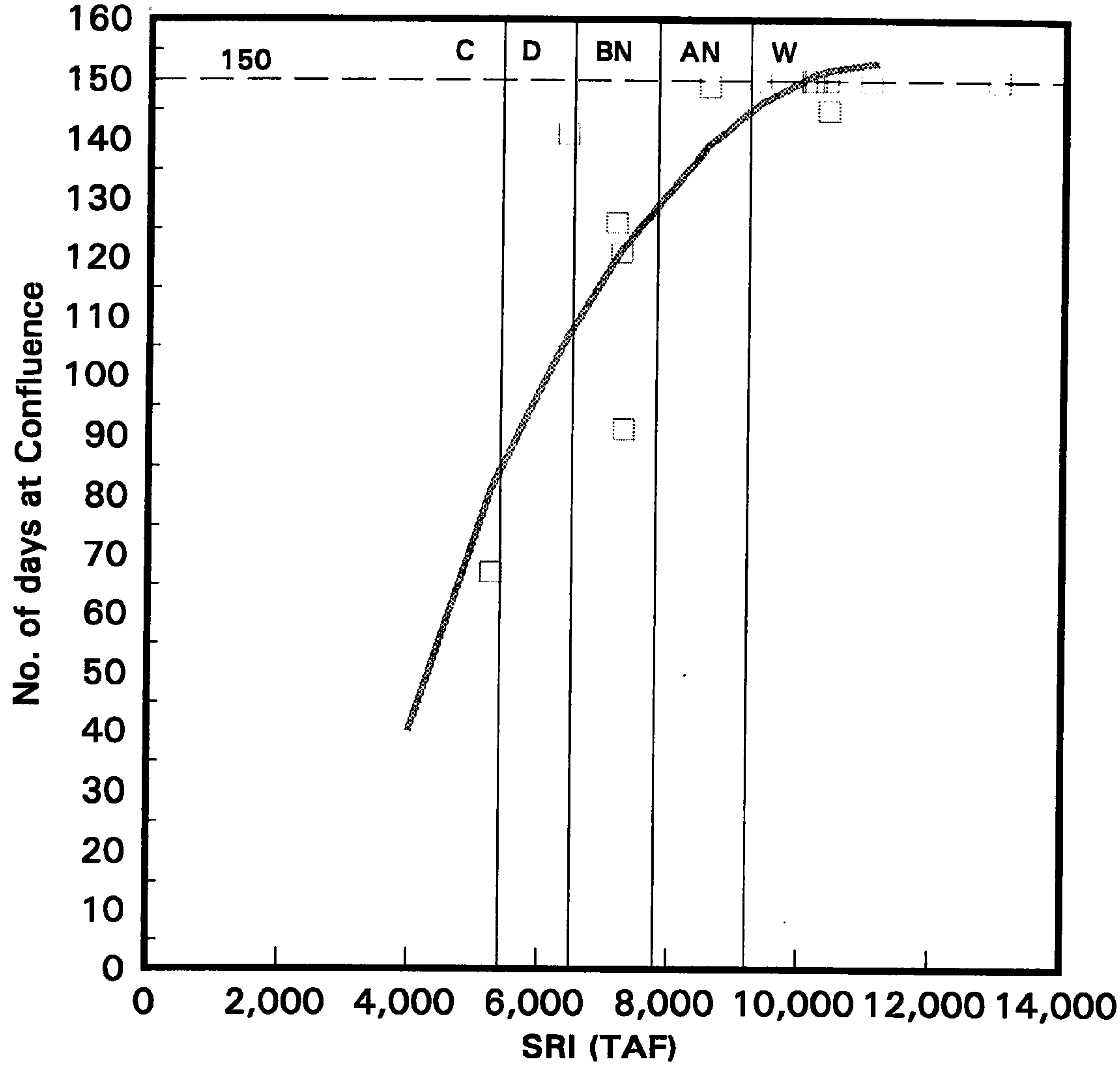


Y=a*SRI**2+b*SRI+c
a=-3.7280E-06,b=0.084844,c=-331.04
R Square = 0.864

- Quadratic regression line for historic data
- - - EPA Proposed Standard
- | Year Class Boundary
- □ Actual No. of days per year for historic period

FIGURE 3

No. of days 2ppt is at or below Confluence from Feb through June (1964-76) Versus the Sacramento River Index (SRI)

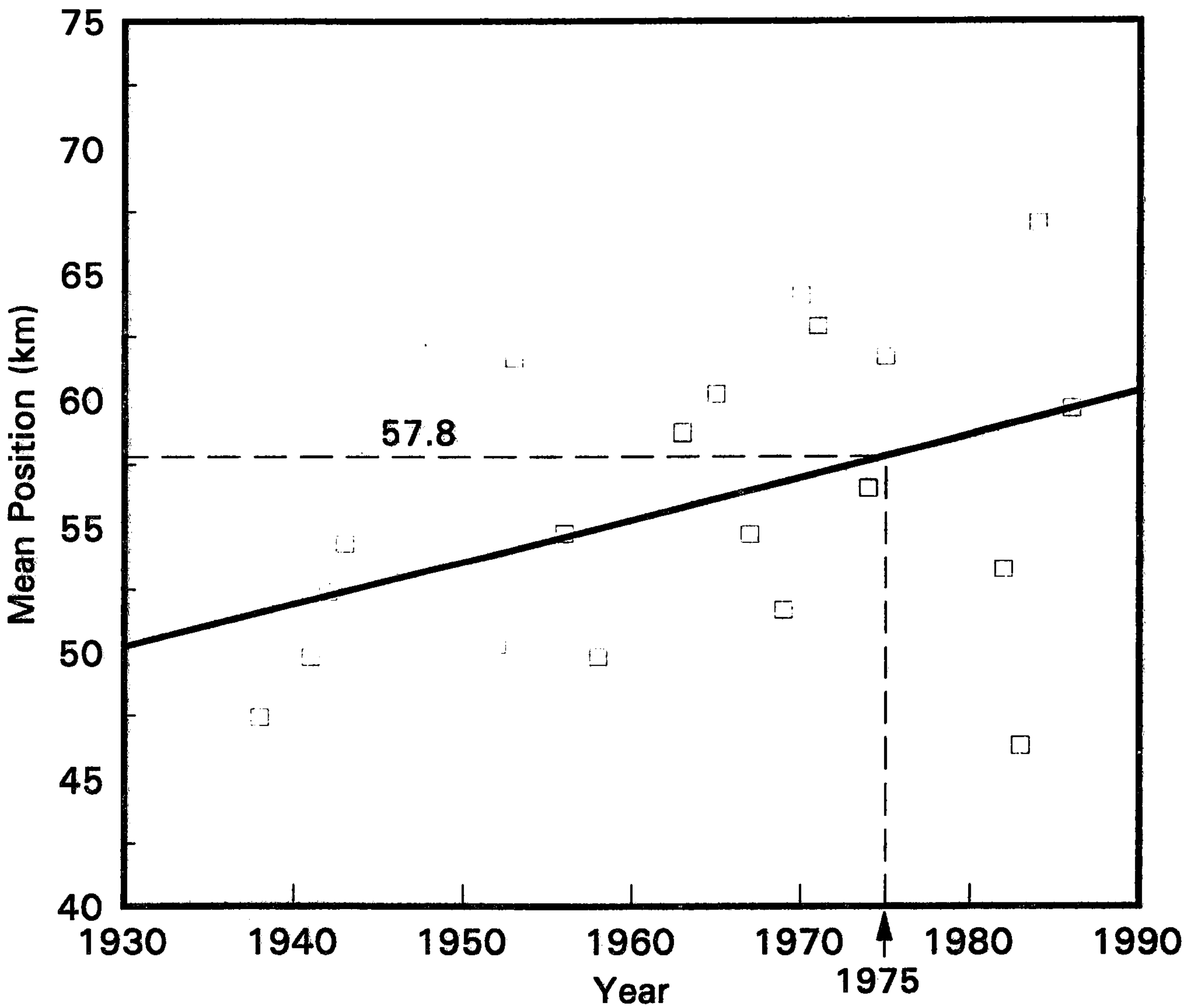


Y=a*SRI**2+b*SRI+c
a=-2.0620E-06, b=0.045997, c=-103.71
R Square=0.696

Quadratic regression line for historic data
EPA Proposed Standard
Year Class Boundary
Actual No. of days per year for historic period

FIGURE 4

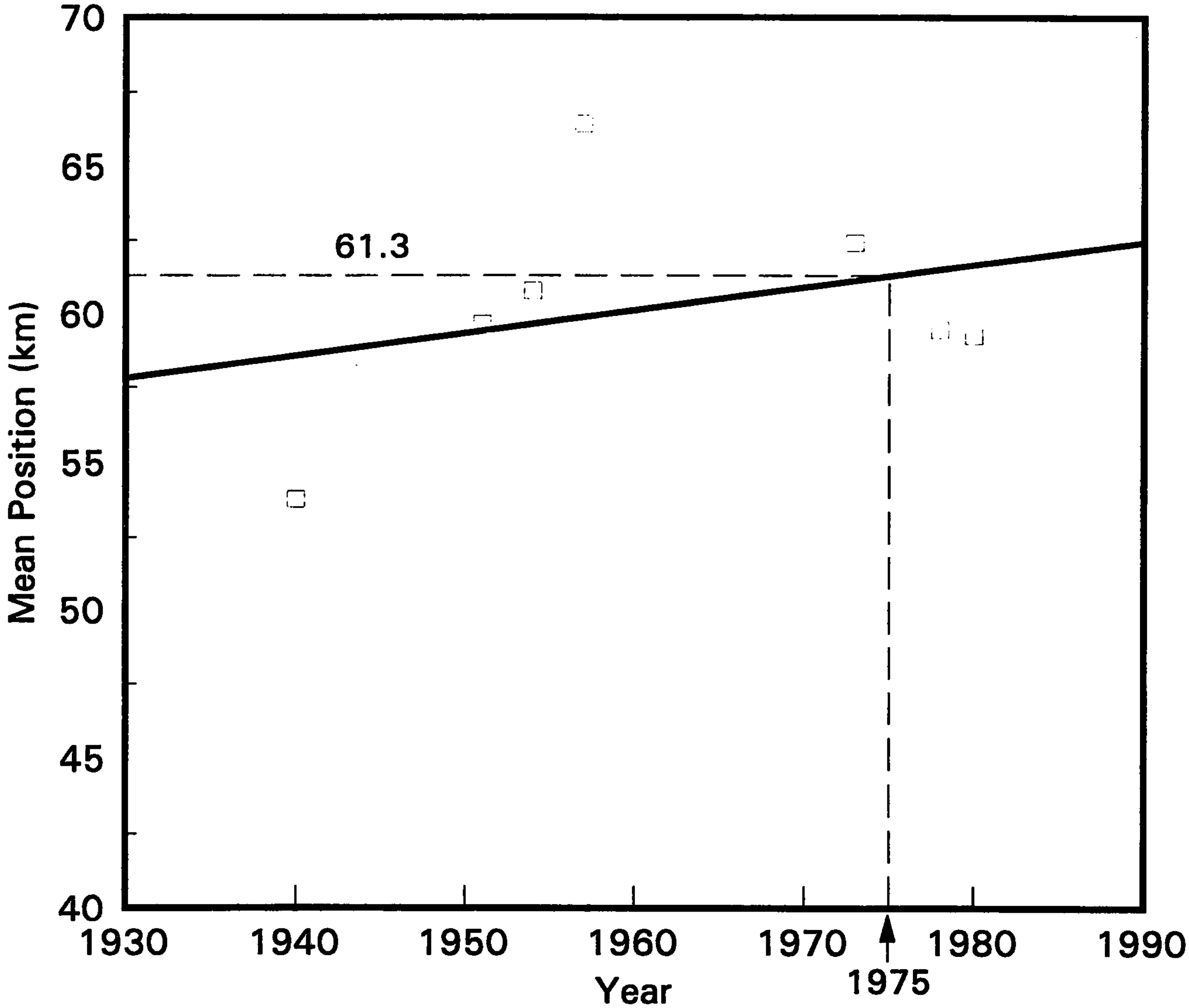
Historical Mean Position, in km, from the Golden Gate Bridge of the February through June 2ppt Isohaline in Wet Years (40-30-30) from 1930-92



$R^2 = 0.1894$
$Y = mX + b$
$m = 0.1684$, $b = -274.79$

FIGURE 5

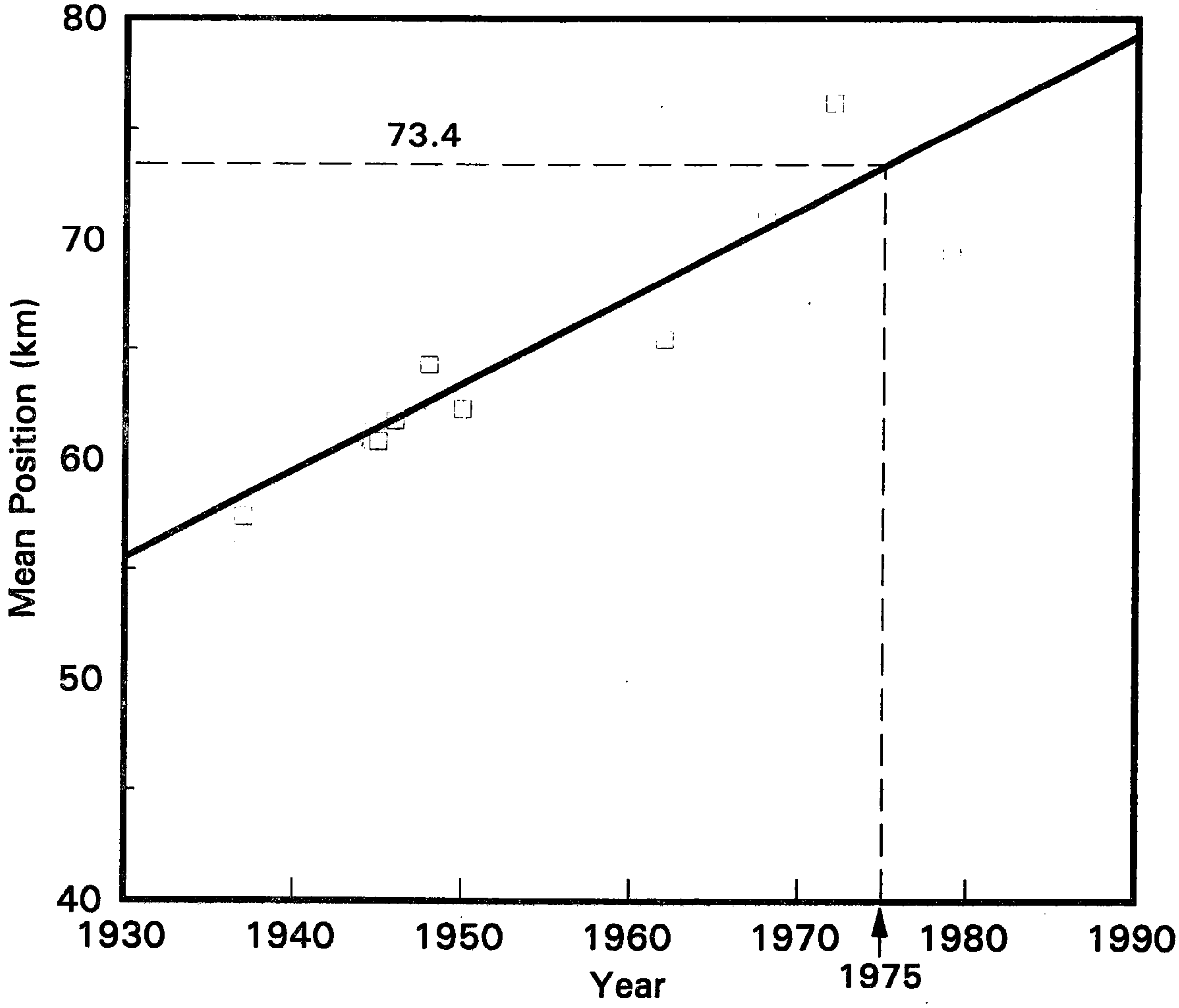
Historical Mean Position, in km, from the Golden Gate Bridge of the February through June 2ppt Isohaline in Above Normal Years (40-30-30) from 1930-92



$R^2 = 0.0951$
$Y = mX + b$
$m = 0.0770$, $b = -90.80$

FIGURE 6

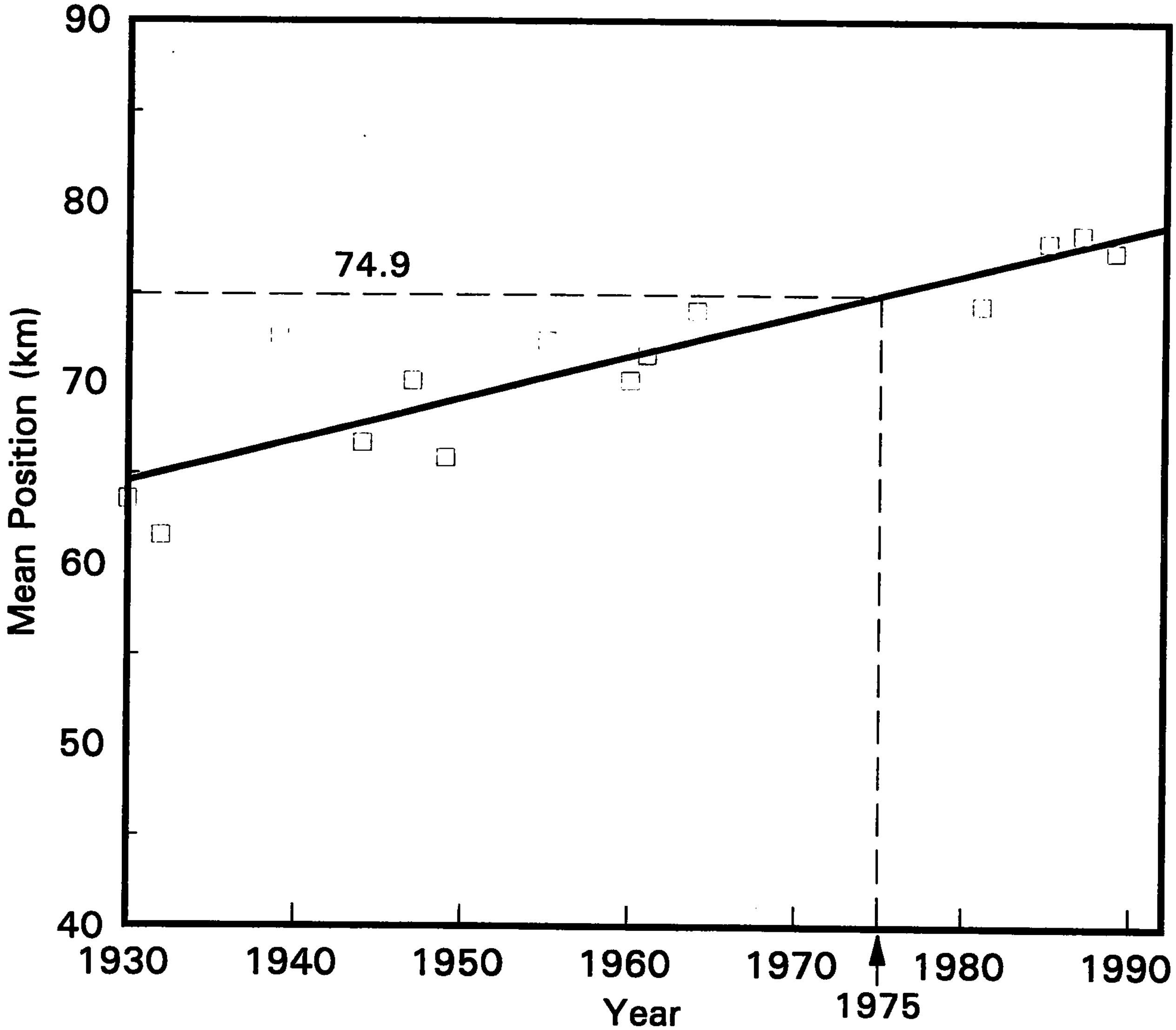
Historical Mean Position, in km, from the Golden Gate Bridge of the February through June 2ppt Isohaline in Below Normal Years (40-30-30) from 1930-92



$R^2=0.8233$
$Y=mX+b$
$m=0.3945$, $b=-705.78$

FIGURE 7

Historical Mean Position, in km, from the Golden Gate Bridge of the February through June 2ppt Isohaline in Dry Years (40-30-30) from 1930-92



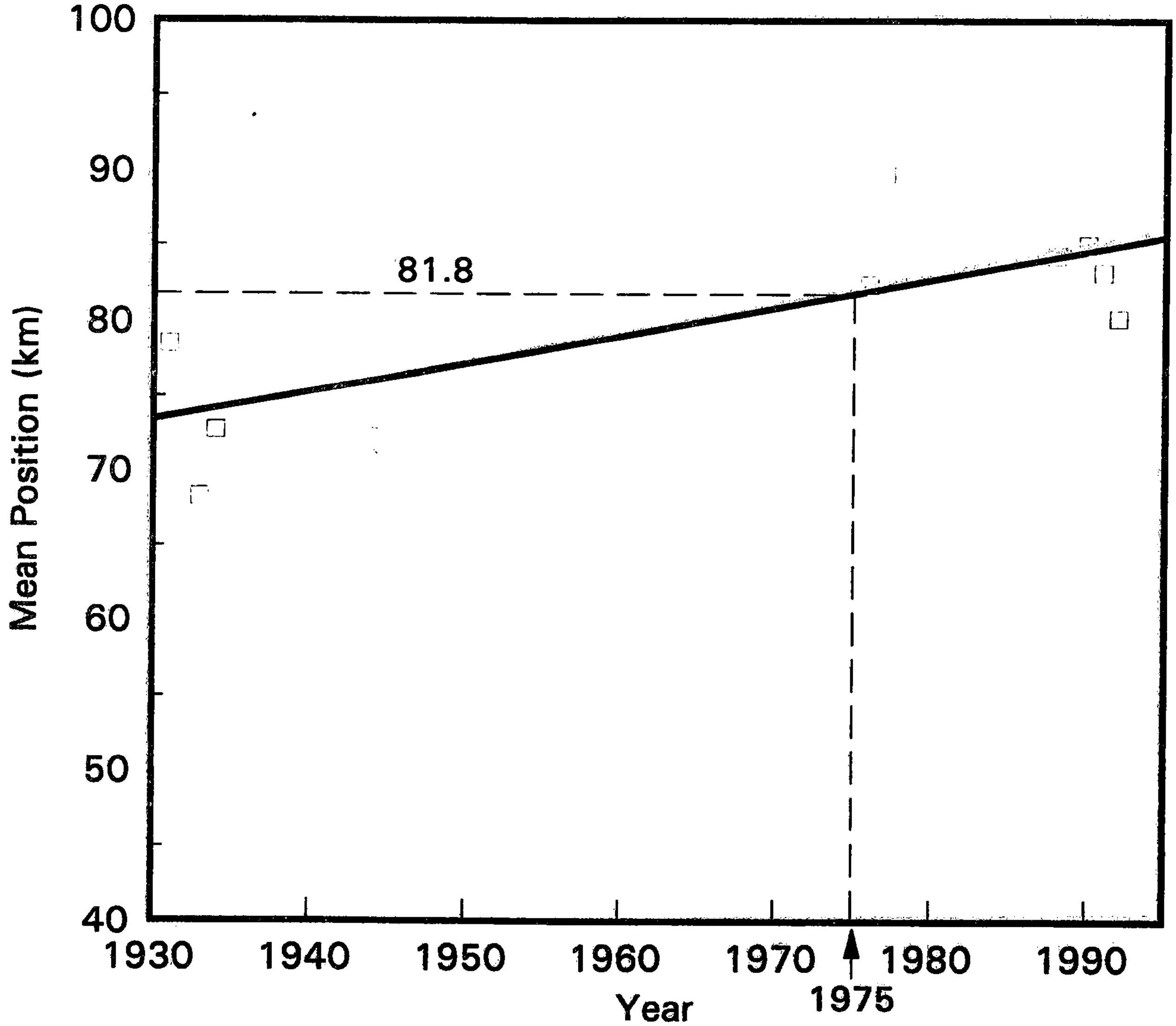
$R^2 = 0.7884$

$Y = mX + b$

$m = 0.2300$, $b = -379.35$

FIGURE 8

Historical Mean Position, in km, from the Golden Gate Bridge of the February through June 2ppt Isohaline in Critical Years (40-30-30) from 1930-92



$R^2=0.5919$
$Y=mX + b$
$m=0.1865$, $b=-286.52$

FIGURE 9

No. of days 2ppt is at or below Port Chicago from Feb through June Versus the Sacramento River Index (SRI)

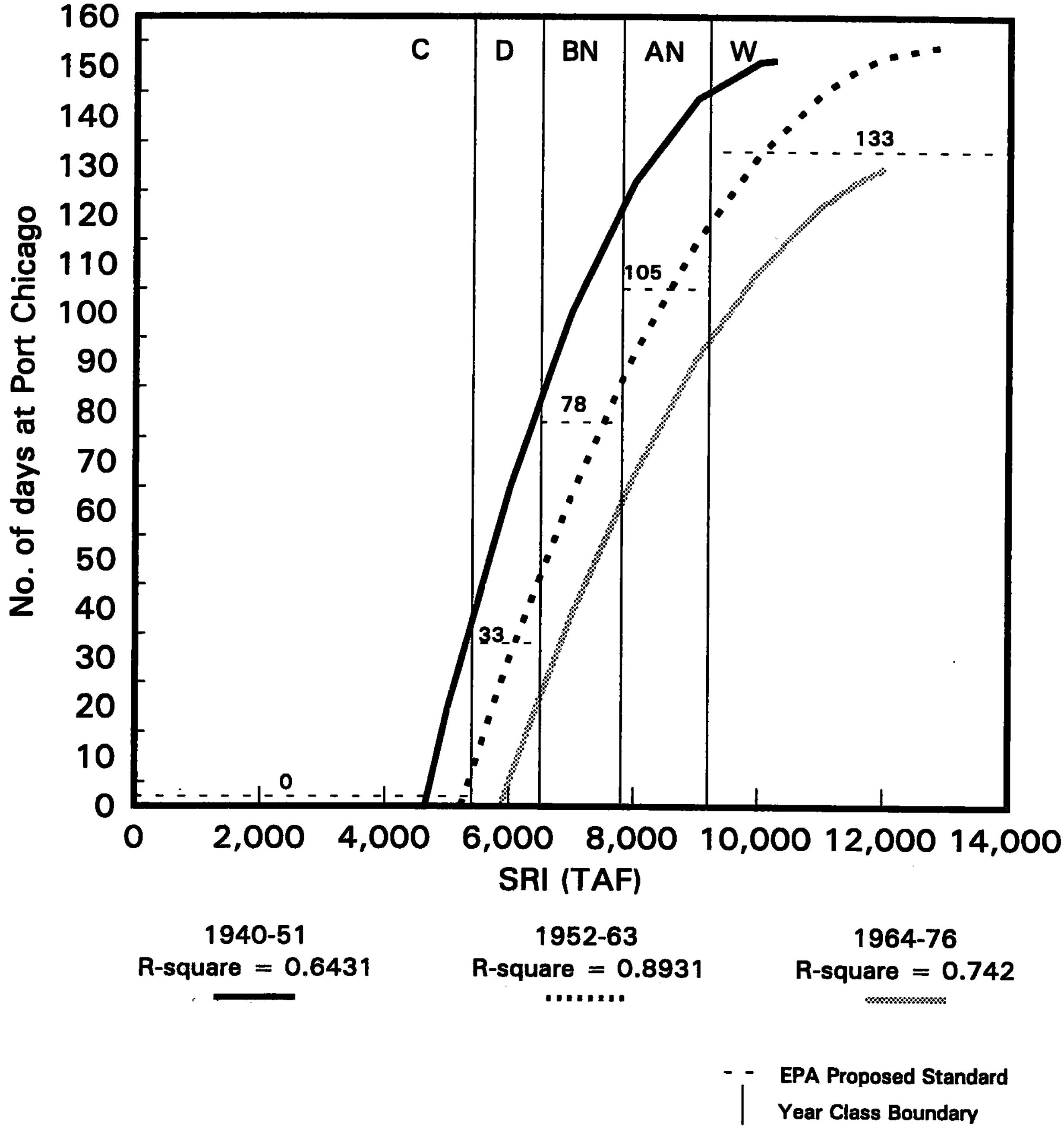
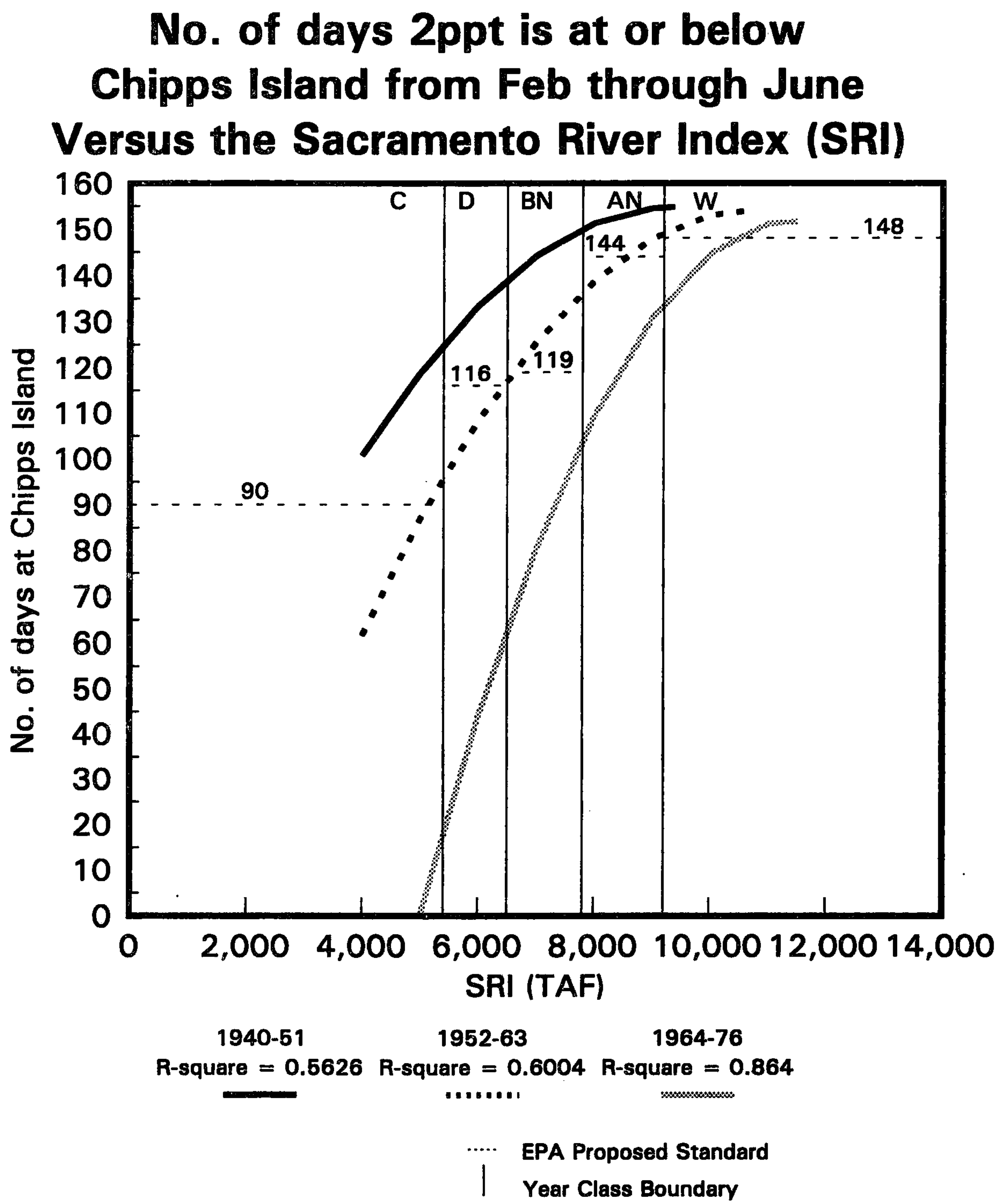


FIGURE 10



No. of days 2ppt is at or below
Chipps Island from Feb through June
Versus the Sacramento River Index (SRI)
No. of days at Chipps Island
SRI (TAF)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
2,000
4,000
6,000
8,000
10,000
12,000
14,000
C
D
BN
AN
W
90
116
119
144
148
1940-51
R-square = 0.5626
1952-63
R-square = 0.6004
1964-76
R-square = 0.864
EPA Proposed Standard
Year Class Boundary

FIGURE 11

No. of days 2ppt is at or below Confluence from Feb through June Versus the Sacramento River Index (SRI)

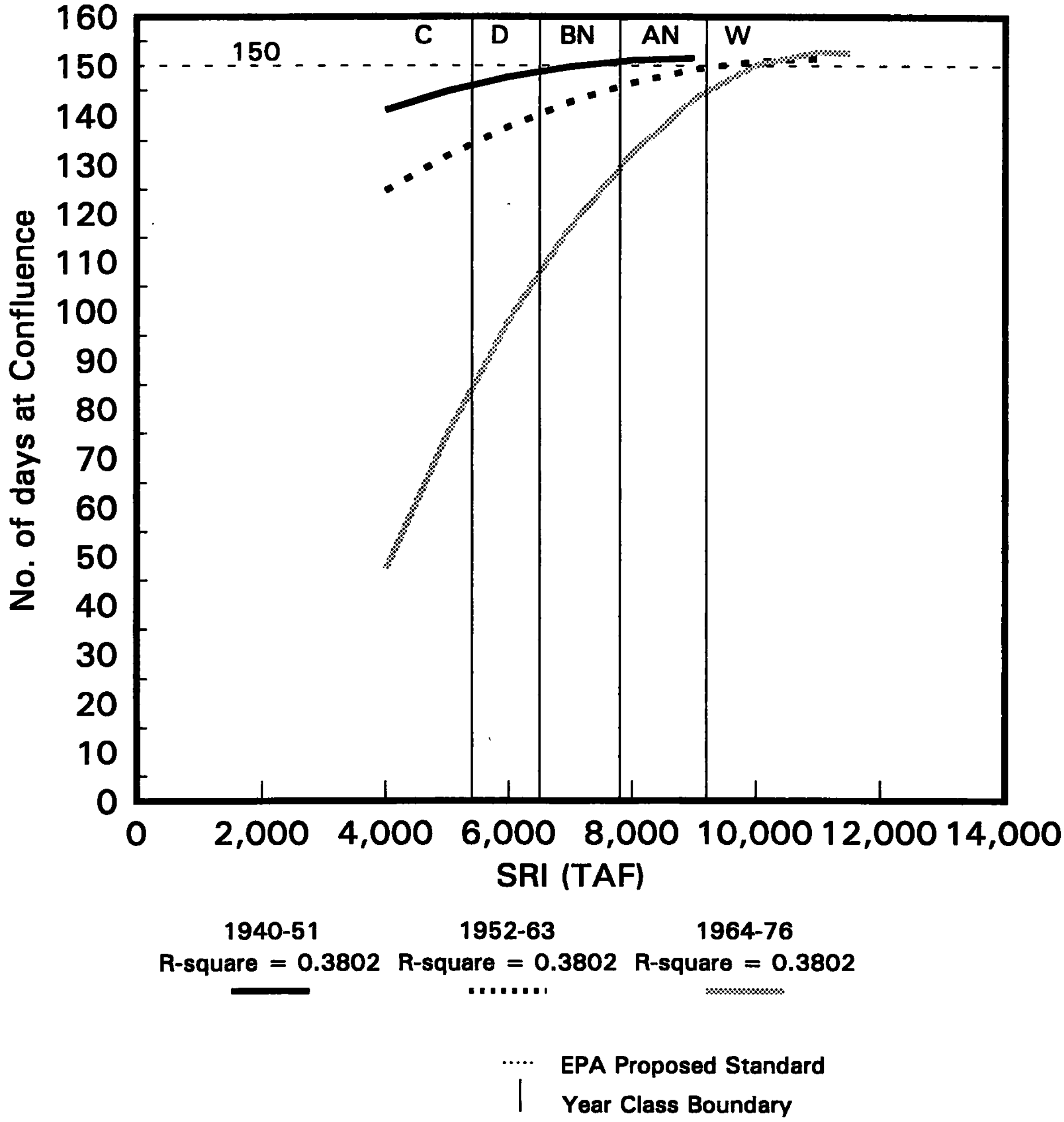
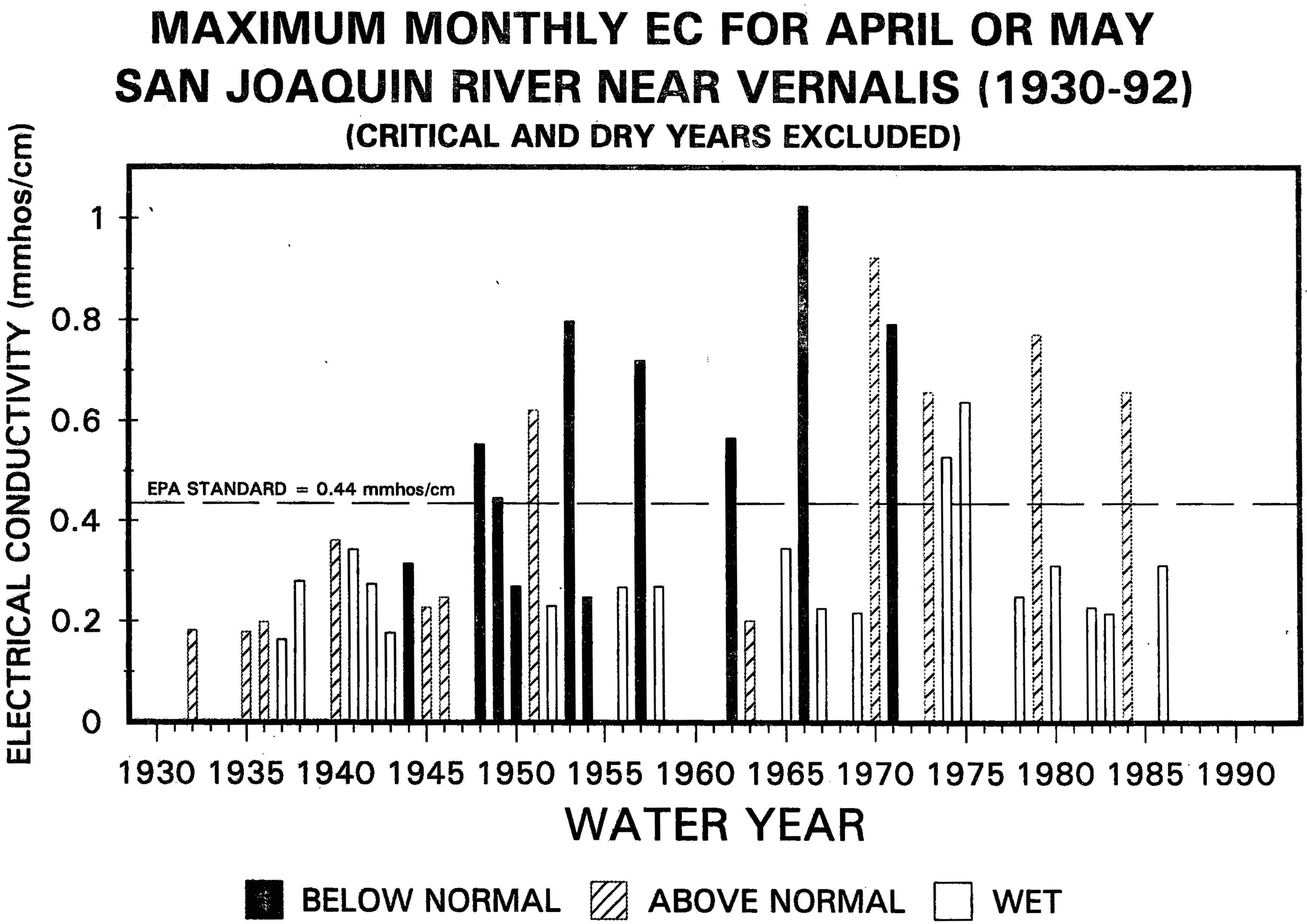


FIGURE 12



Ref.; EXHIBITS I-CVPWA-113 & I-DWR-61

G:\LOTUS\VERNALIS\TDSEC6 1/21/94

FIGURE 13

Mean Monthly EC for April and May San Joaquin River Near Vernalis (1964-76)

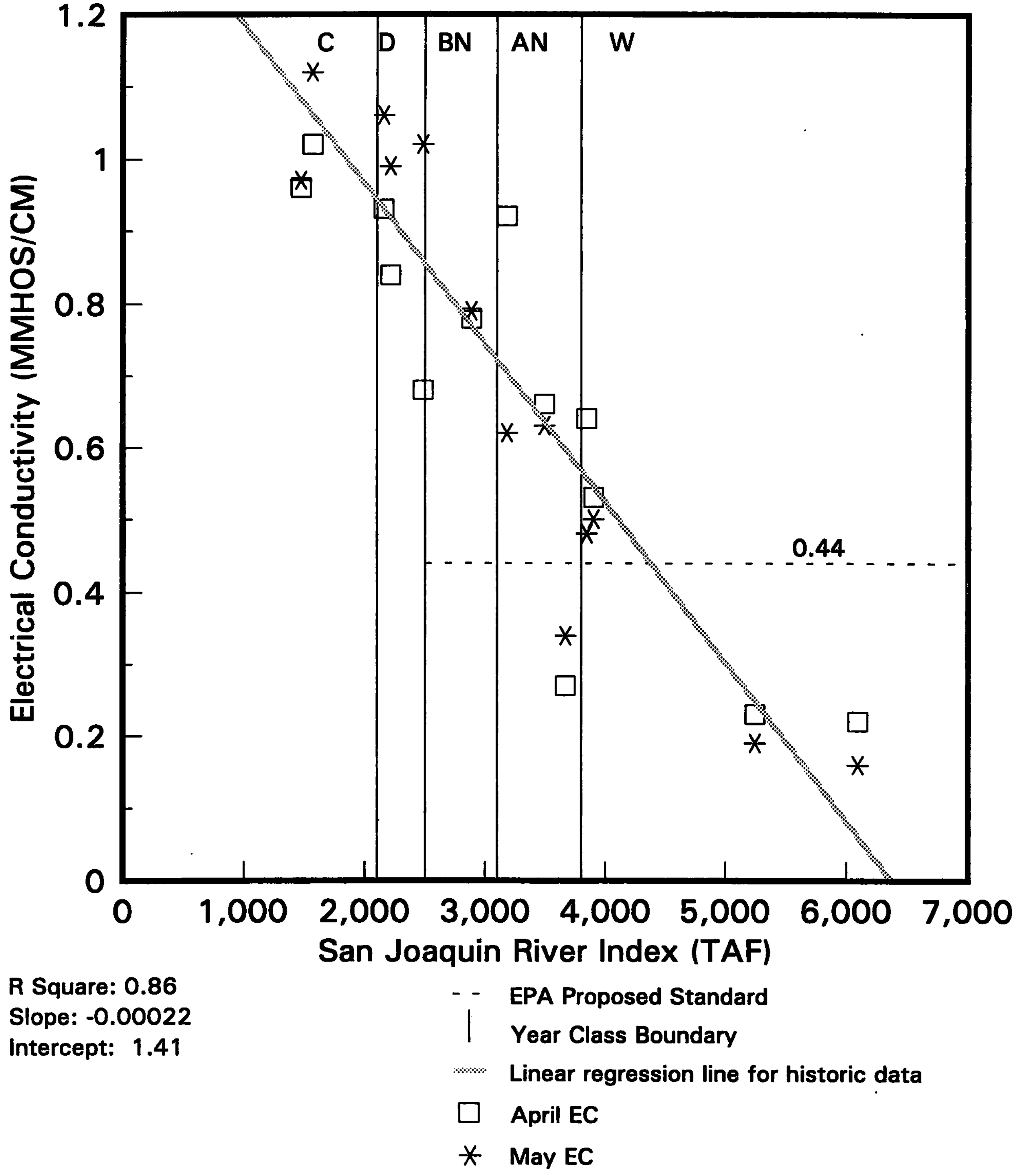
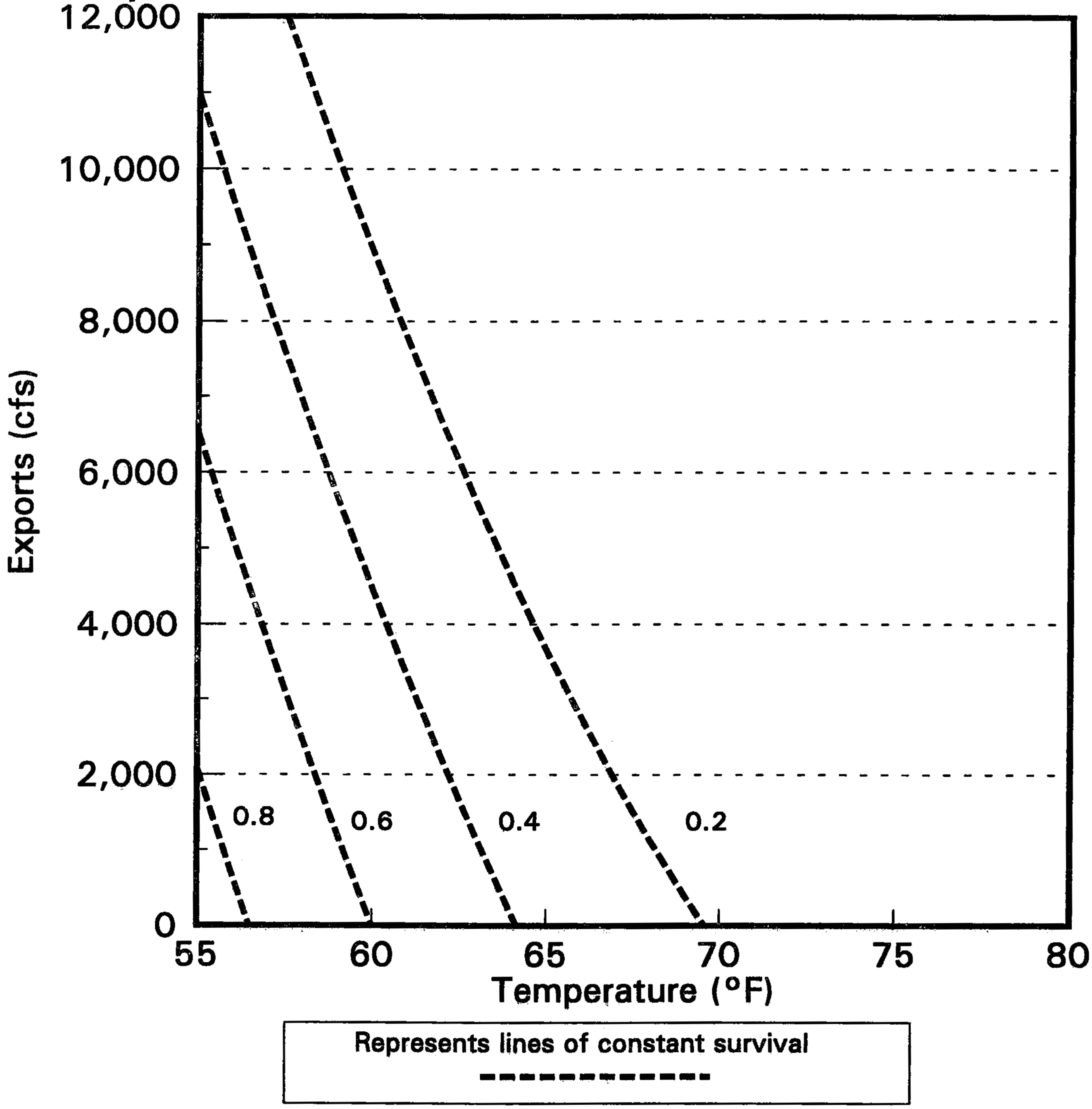


FIGURE 14

Sacramento Smolt Survival Index

Delta Cross Channel Closed and Georgiana Slough Open; Sacamento R. Flow 10,000 cfs at Sacramento



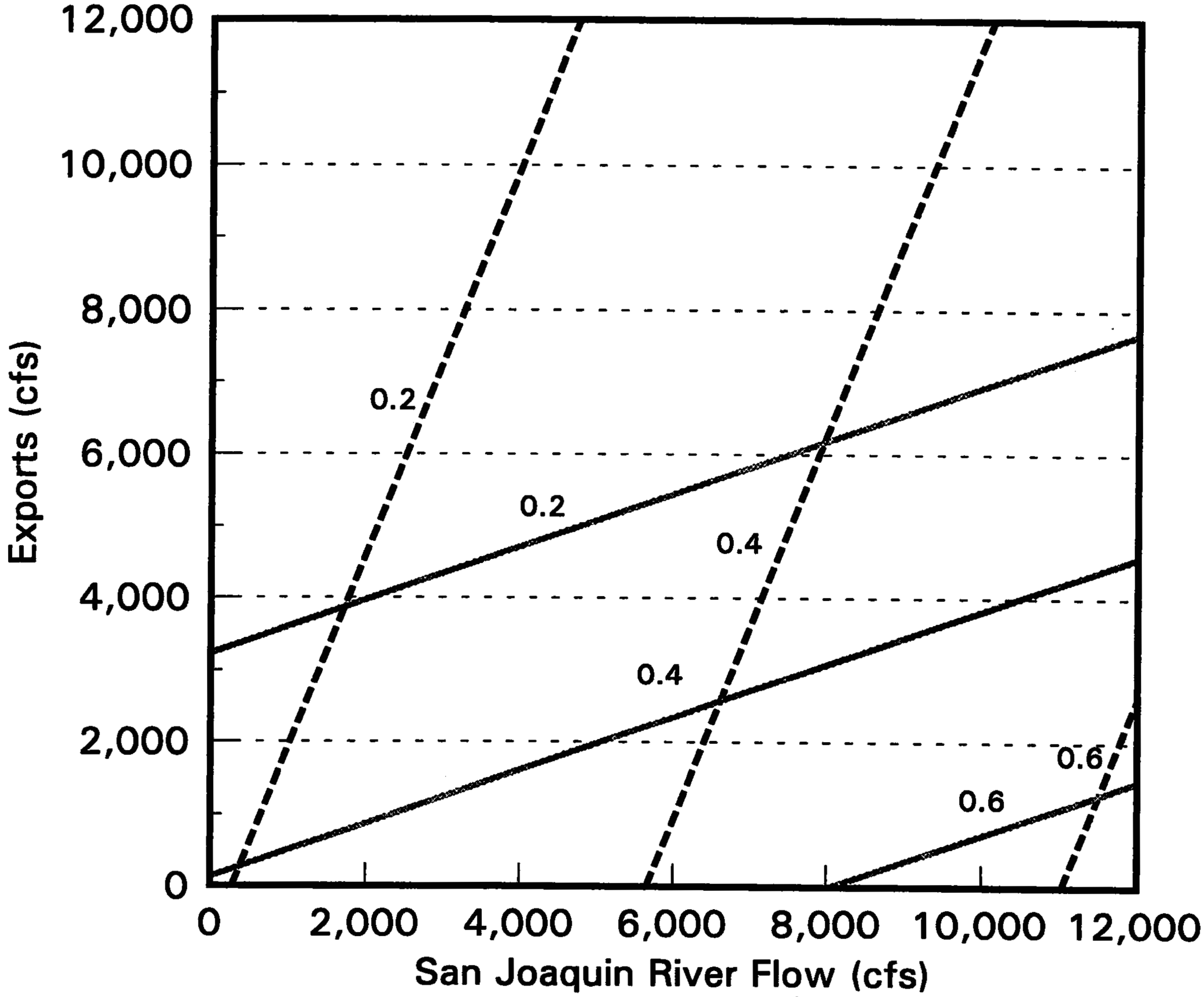
$$Y = 1-((-2.45925+0.0420748T)+(-0.5916024+0.017968T+0.0000434E)(P1) +(-1.613493+0.0319584T)(P2)-(-2.45925+0.0420748T) *(-0.5916024+0.017968T+0.0000434E)(P1) -(-2.45925+0.0420748T)*(-1.613493+0.0319584T)(P2))$$

Y = Sacramento River Salmon Smolt Survival Index
T = Mean monthly water temperature at Freeport (°F)
E = Mean monthly CVP+SWP exports (cfs)
P1 = Percent of water diverted into Delta Cross Channel and Georgiana Slough at Walnut grove (flow at Sacramento-Steamboat and Sutter Sloughs
P2 = Percent of water remaining in Sacramento River downstream of Walnut Grove (1-P1)

FIGURE 15

San Joaquin River Chinook Salmon Smolt Survival

With and Without a Barrier At Head Of Old River



Represents lines of constant survival

With Barrier — Without Barrier

With a barrier installed at the head of Old River, flow at Vernalis is nearly equivalent to flow at Stockton.

Survival with Barrier = (0.341271-0.000025(exp)+0.000067(flow))/1.8
Survival without Barrier = (4.90106+0.000286(flow)-(0.000774(exp)))/12
exp = CVP+SWP exports (cfs)
flow = San Joaquin River flow at Vernalis (cfs)

FIGURE 16

SACRAMENTO RIVER

Annual Estimated Chinook Salmon Run Size Above Red Bluff Diversion Dam (DFG)

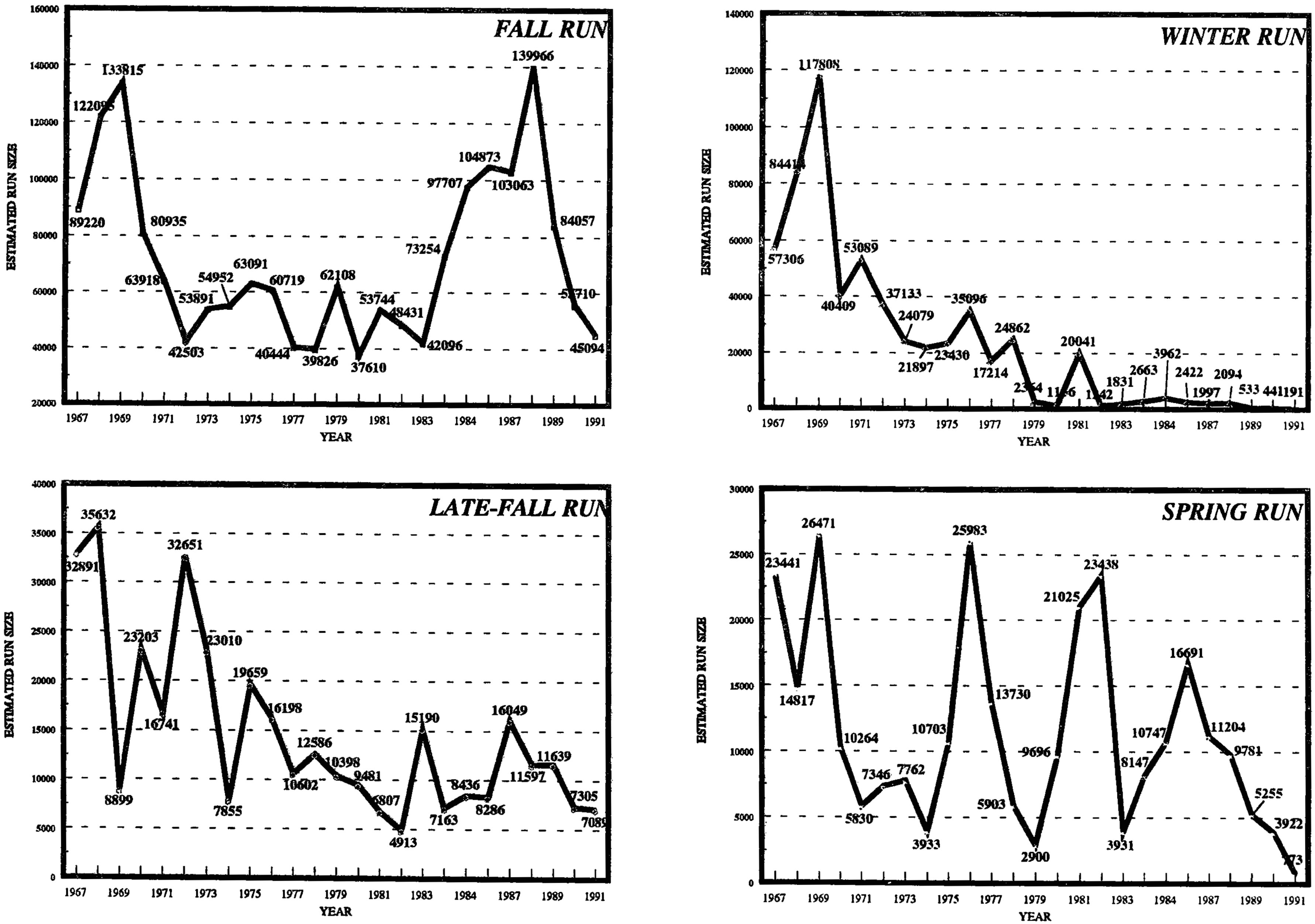


FIGURE 17

SAN JOAQUIN BASIN

Annual Estimated Chinook Salmon Run Size (DFG)

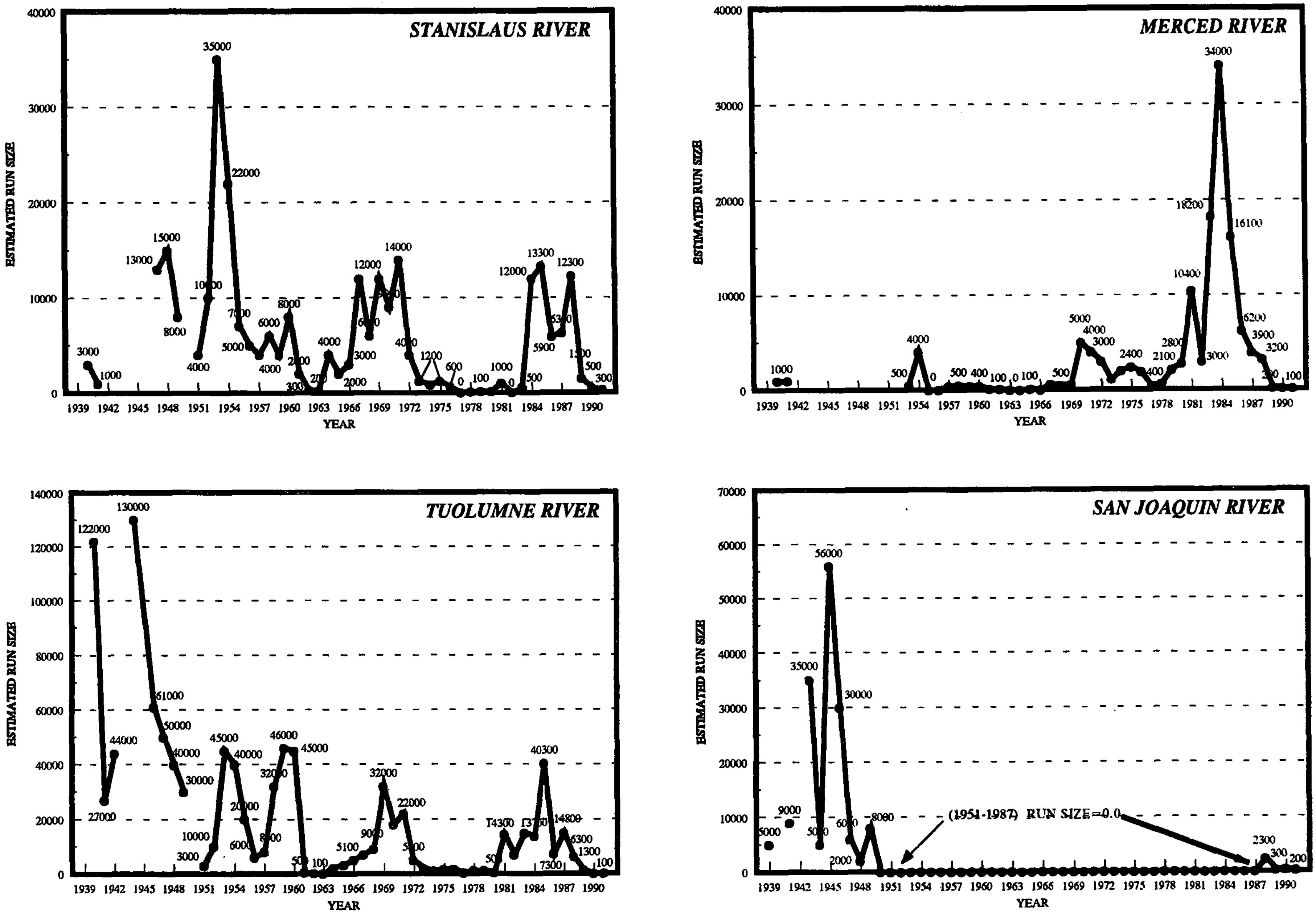


FIGURE 18

DELTA SMELT ABUNDANCE INDEX

SUMMER TOWNET SURVEY; HISTORICAL DATA

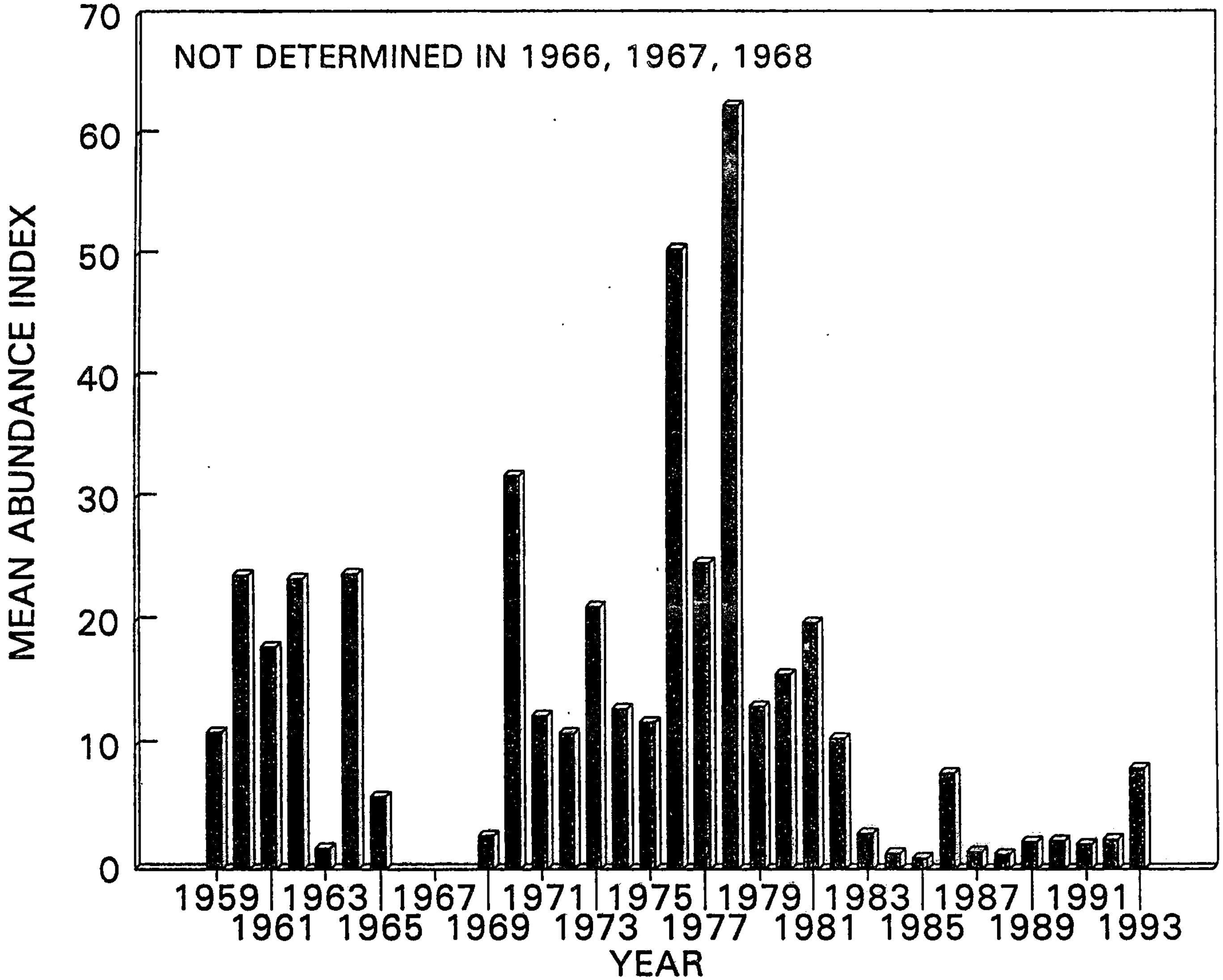


FIGURE 19

DELTA SMELT MIDWATER TRAWL INDEX

CUMULATIVE MONTHLY ABUNDANCE INDICES

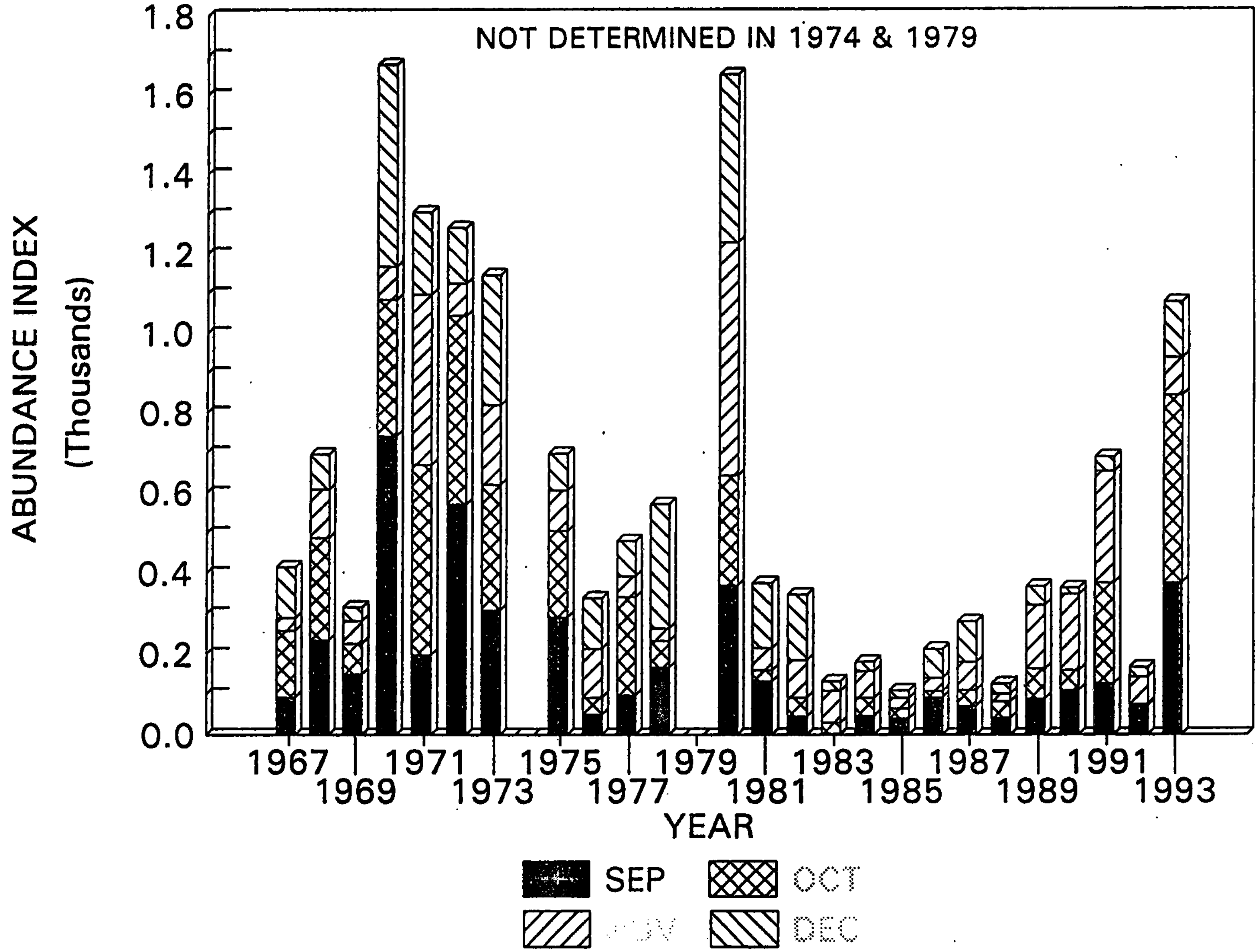


FIGURE 20

DELTA SMELT MIDWATER TRAWL INDEX

ANNUAL ABUNDANCE INDEX; HISTORICAL DATA
(SUM OF SEP + OCT + NOV + DEC INDICES)

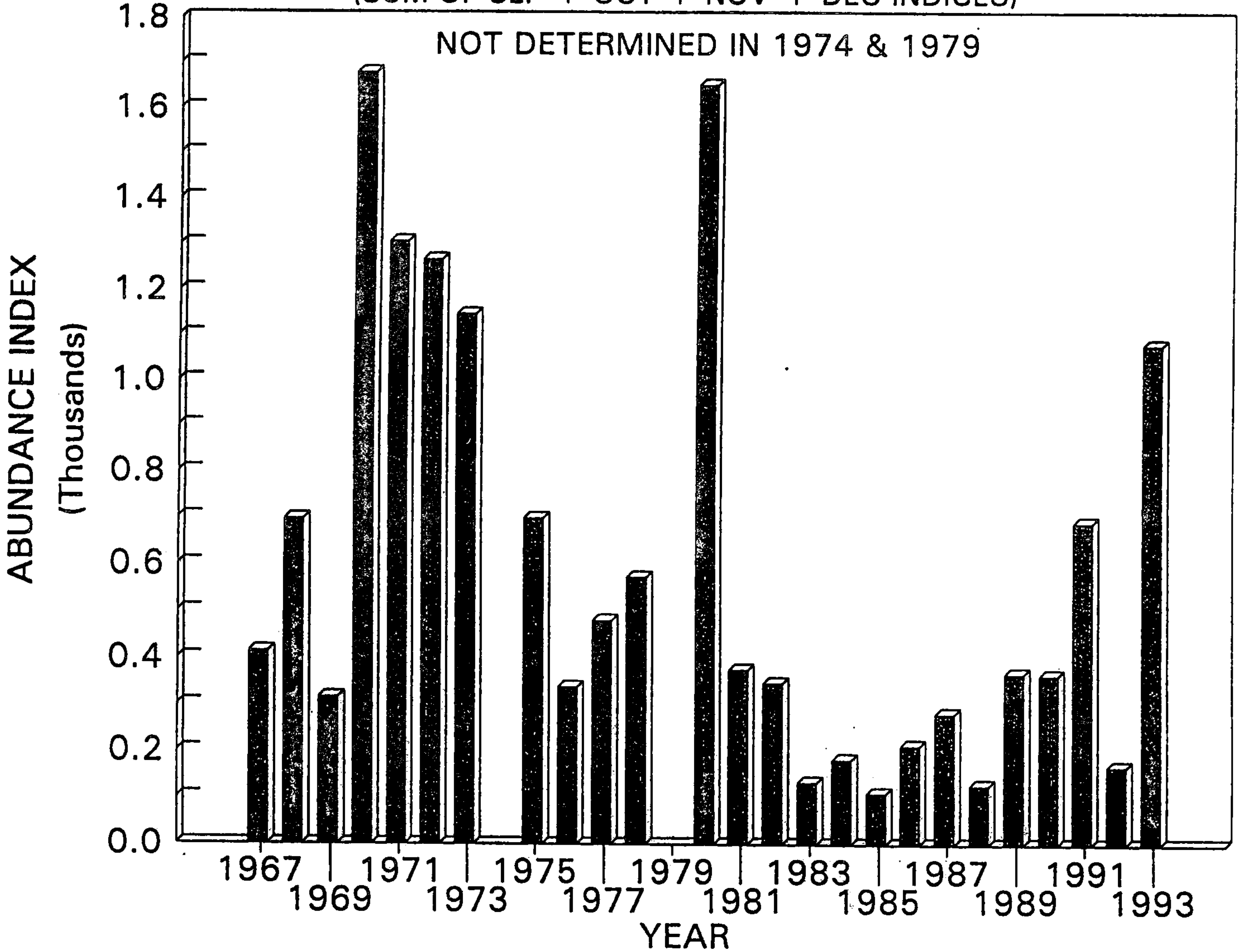


FIGURE 21

PACIFIC HERRING ABUNDANCE INDEX

CUMULATIVE APRIL-SEPTEMBER YOUNG OF THE YEAR

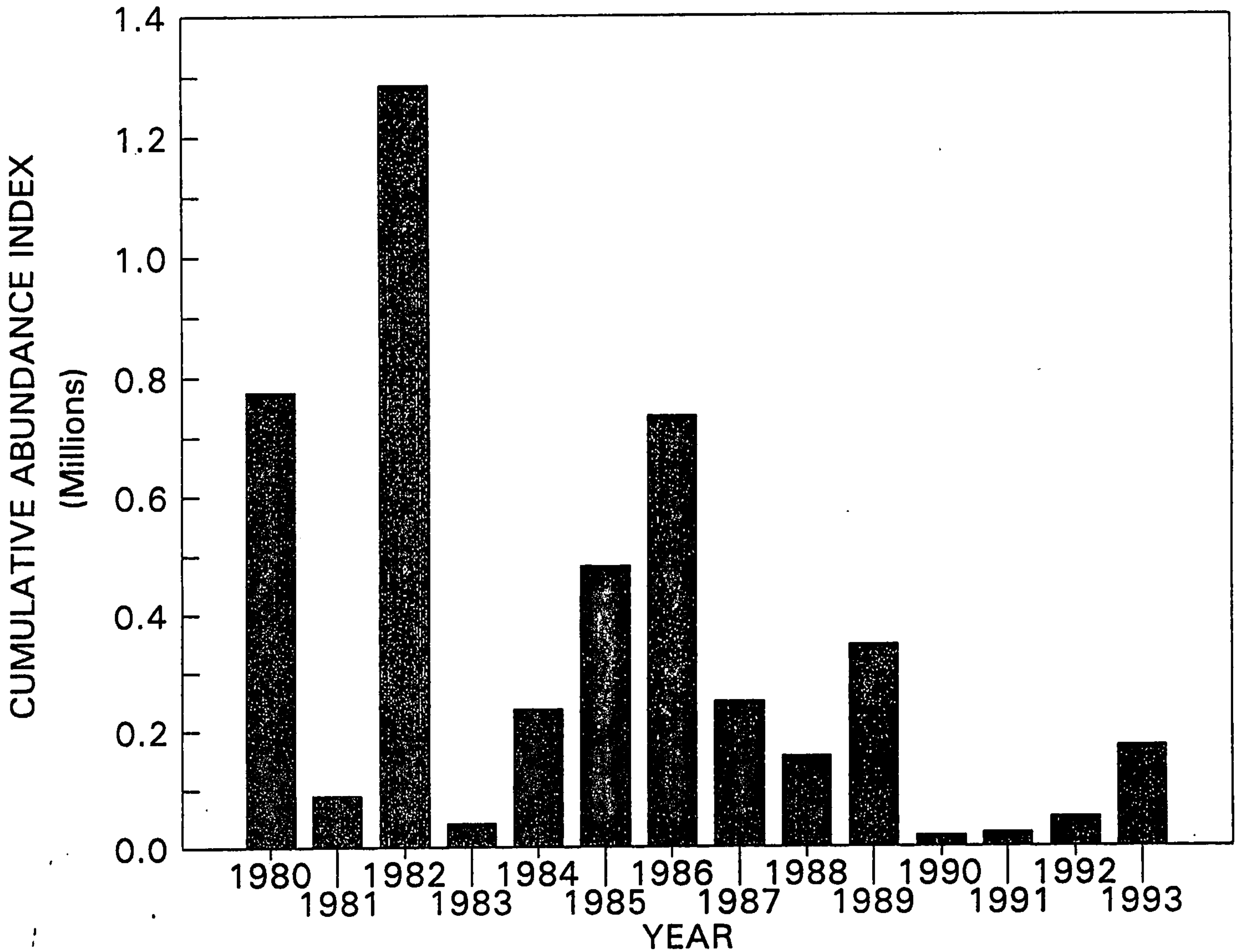


FIGURE 22

LONGFIN SMELT ABUNDANCE INDEX

FROM FALL MIDWATER TRAWL SAMPLING

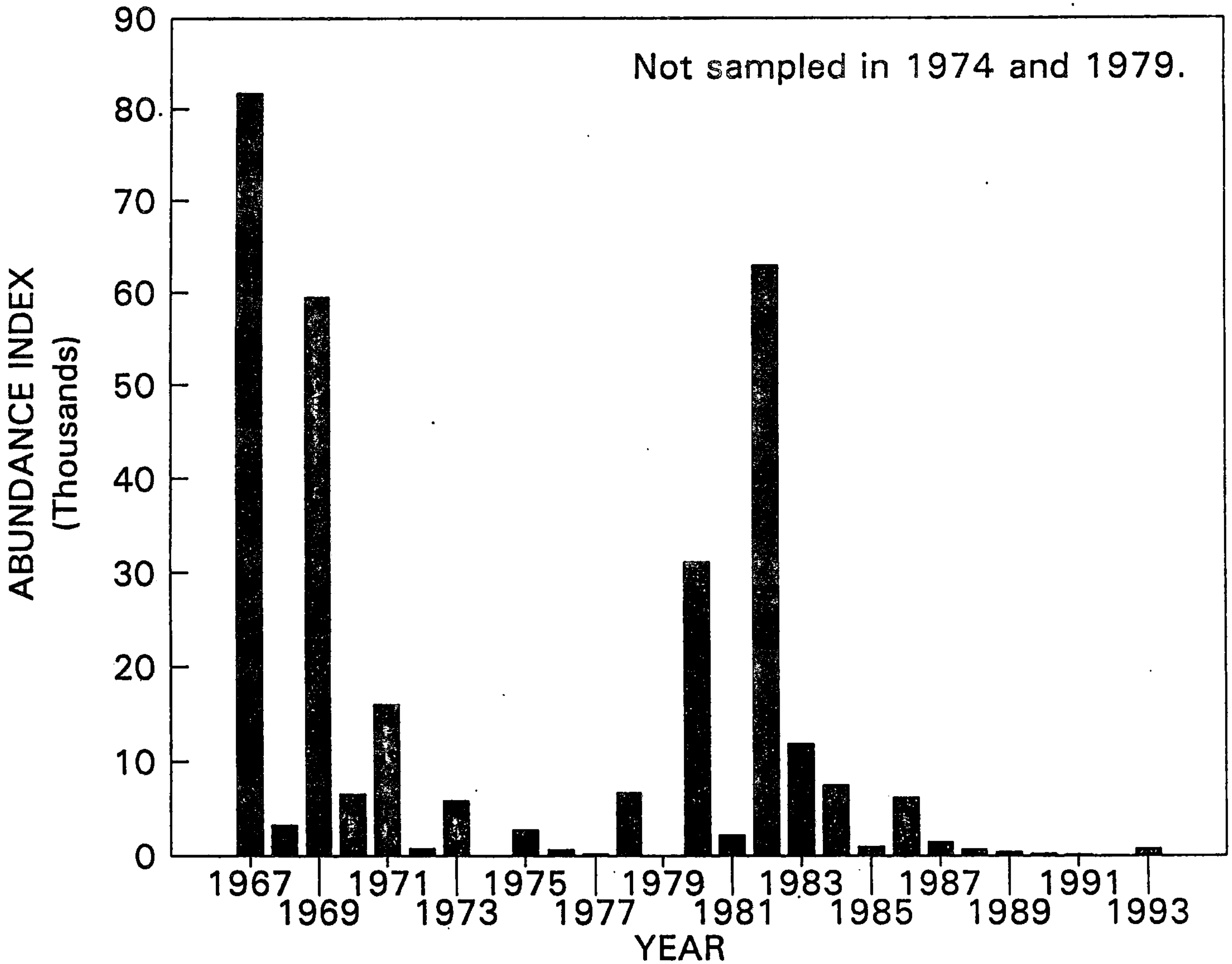
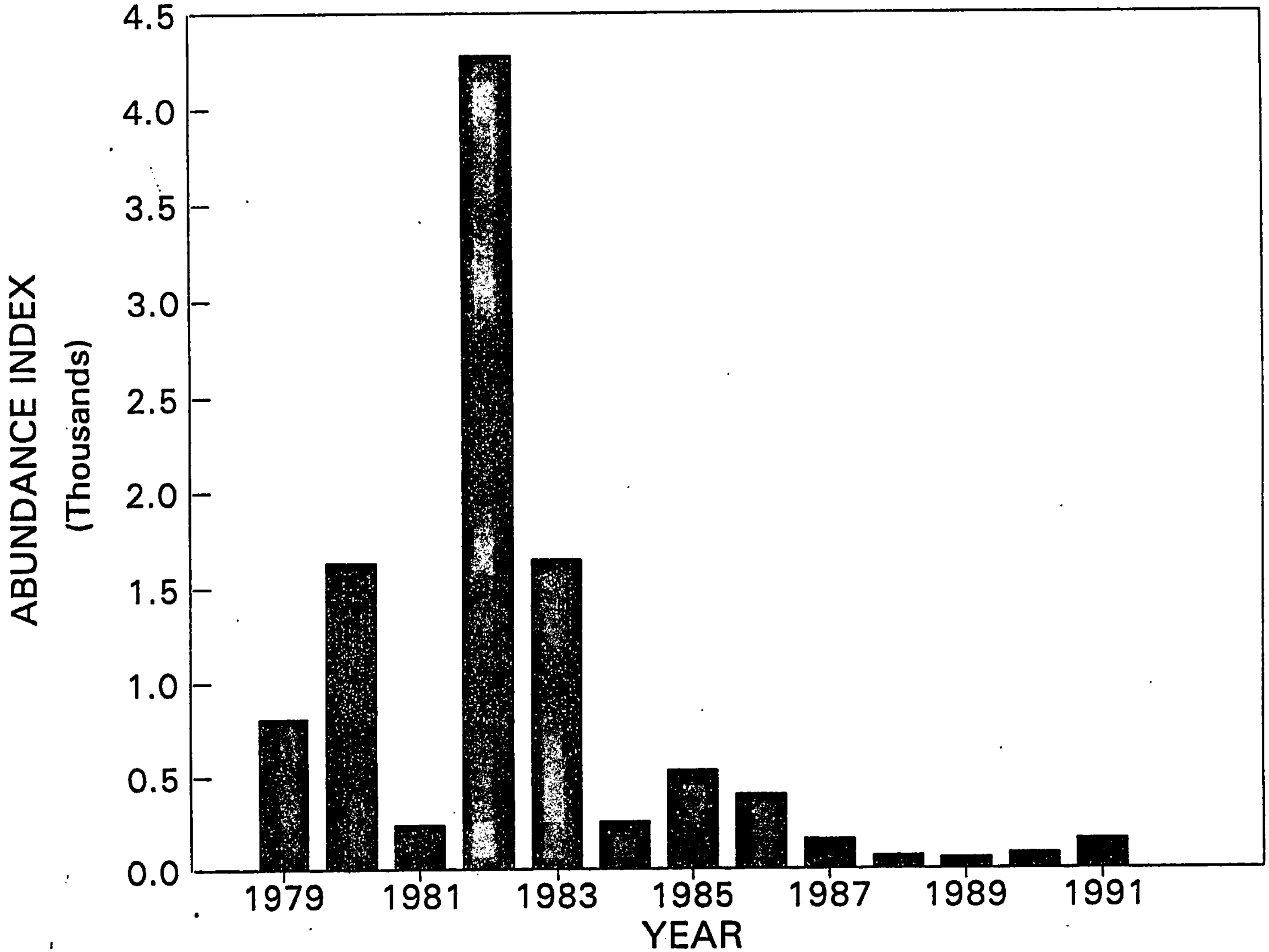


FIGURE 23

STARRY FLOUNDER ABUNDANCE INDEX

HISTORICAL ABUNDANCES; ACTUAL DEMAND



VALUES SHOWN ARE ABUNDANCES OF 1-YEAR-OLD FISH
COLLECTED IN YEAR FOLLOWING YEAR SHOWN.

FIGURE 24

IMMATURE BAY SHRIMP ABUNDANCE INDEX

HISTORICAL ABUNDANCE; ACTUAL DEMAND

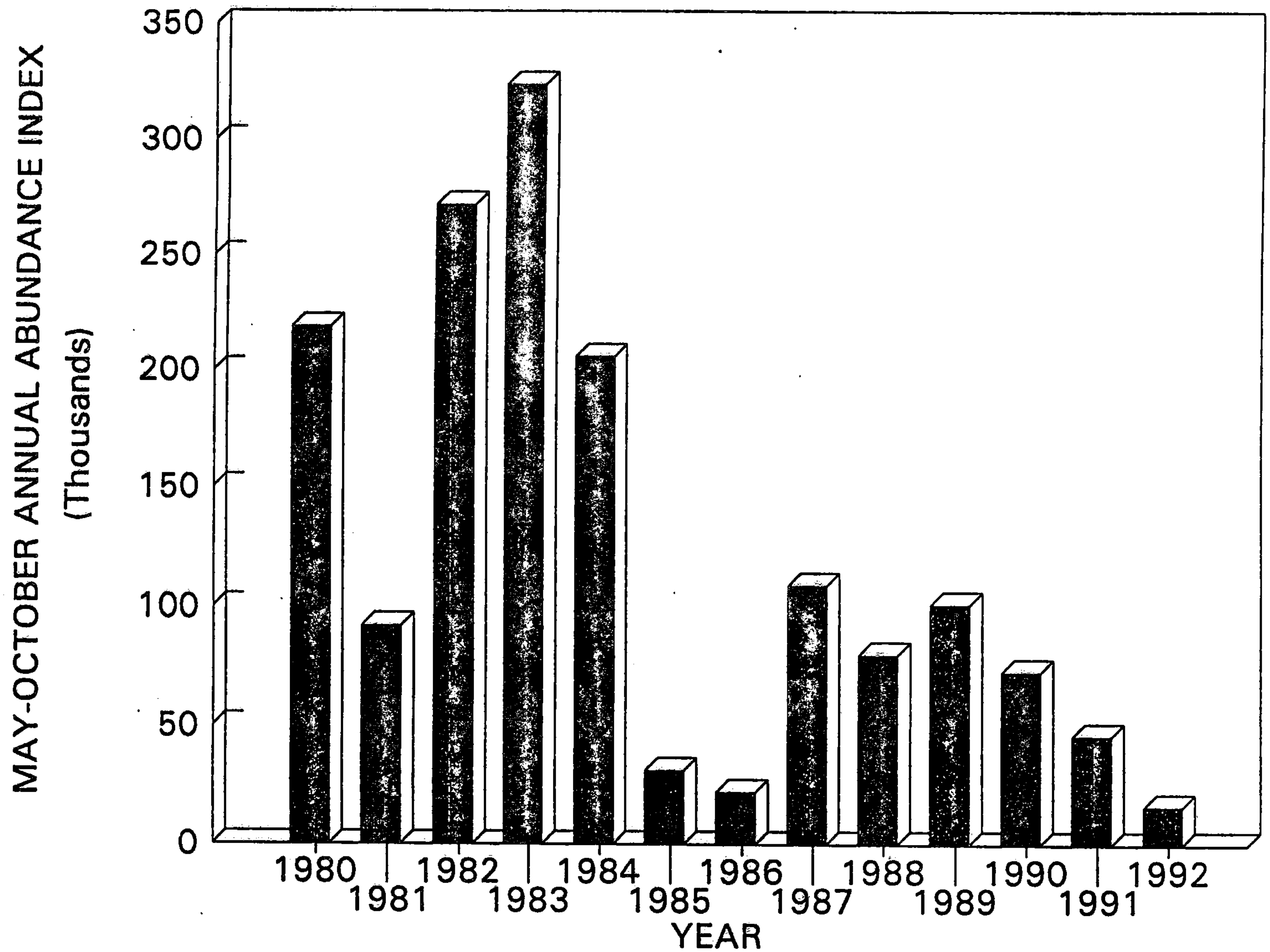
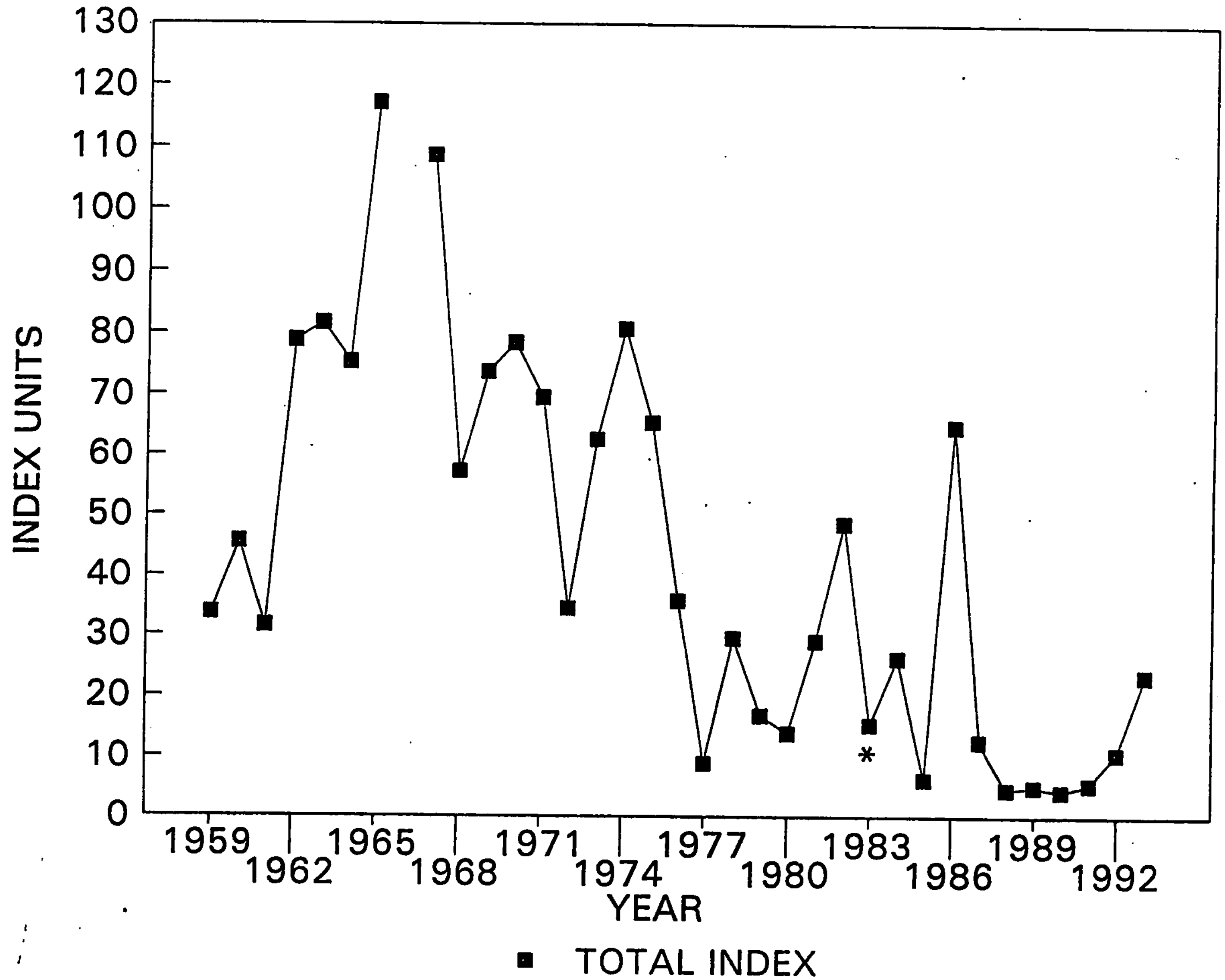


FIGURE 25

FIGURE 26

STRIPED BASS INDEX

Not Sampled in 1966



* 1983 underestimated due to very high Delta outflows

HISTORICAL STRIPED BASS LEGAL ADULTS

Petersen Population Estimates without Hatchery Fish

(1969-91)

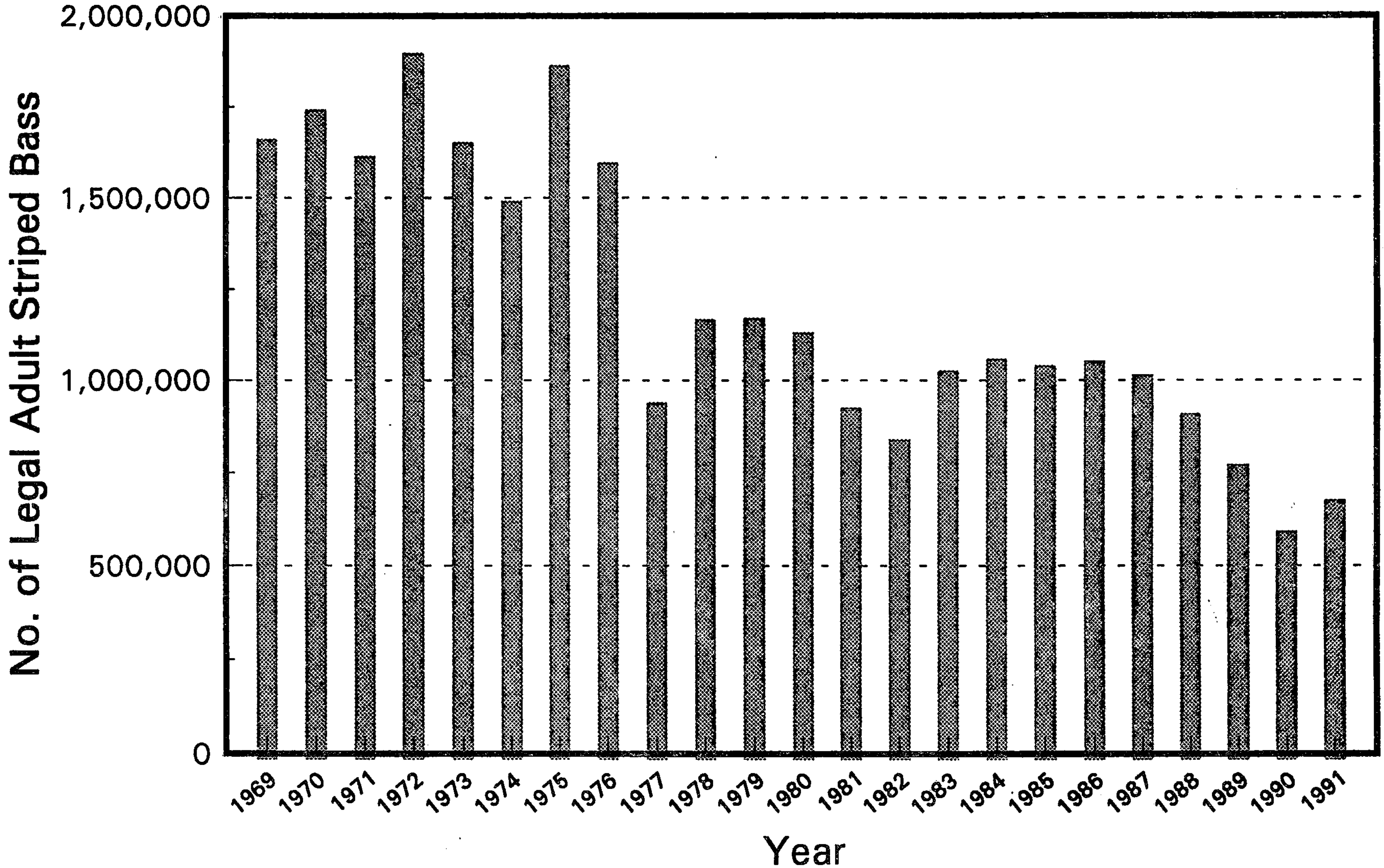
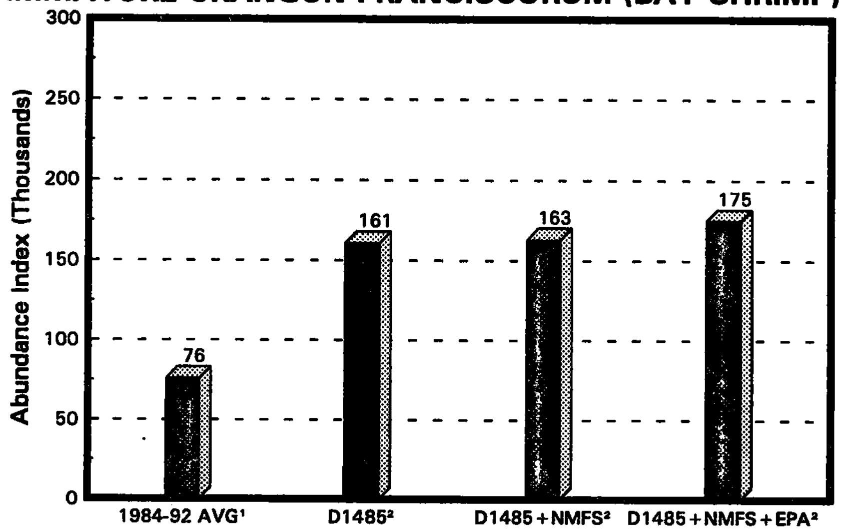


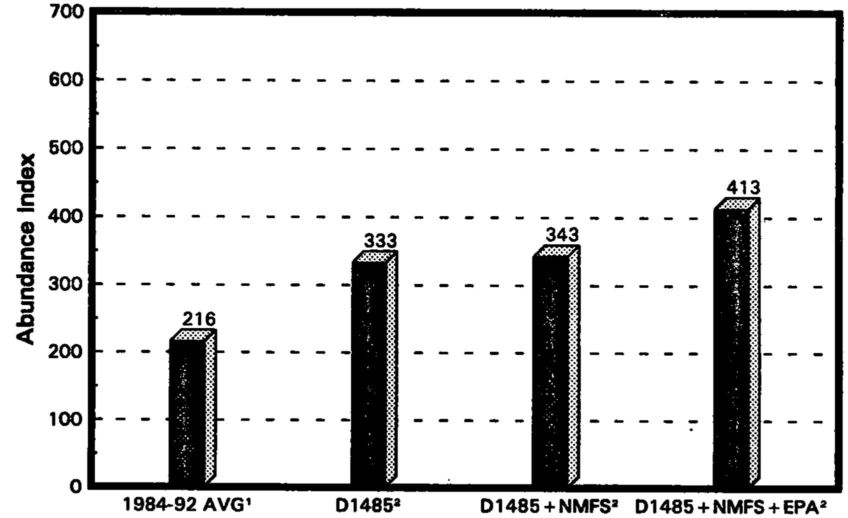
FIGURE 27

ESTUARINE SPECIES ABUNDANCE COMPARISONS

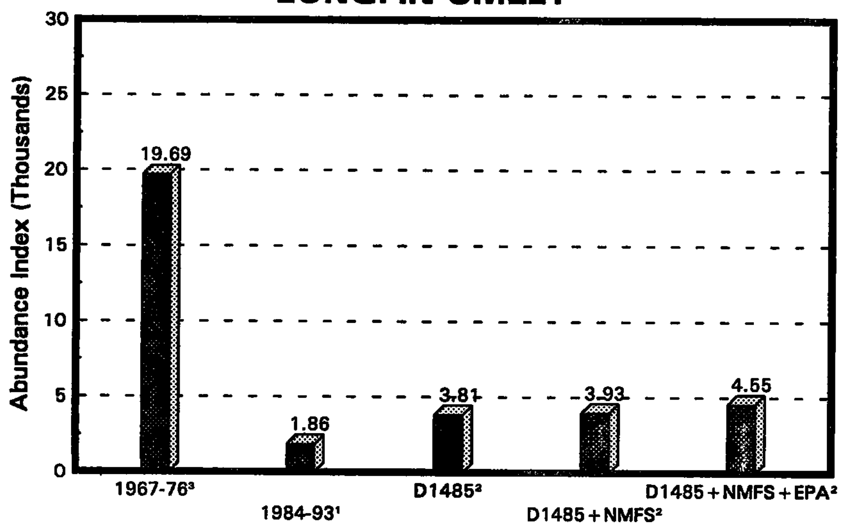
IMMATURE CRANGON FRANCISCORUM (BAY SHRIMP)



STARRY FLOUNDER



LONGFIN SMELT



Note: Data are not available for the historical reference period (1964-76) except for longfin smelt where data began at 1967

References

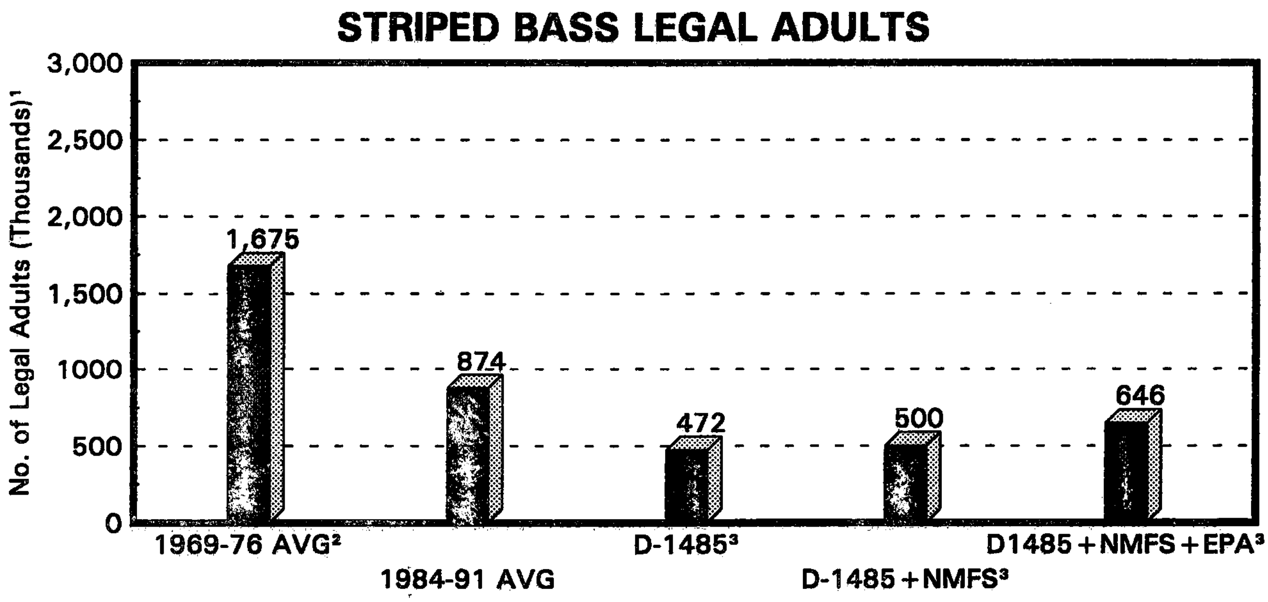
[1]Historical abundance

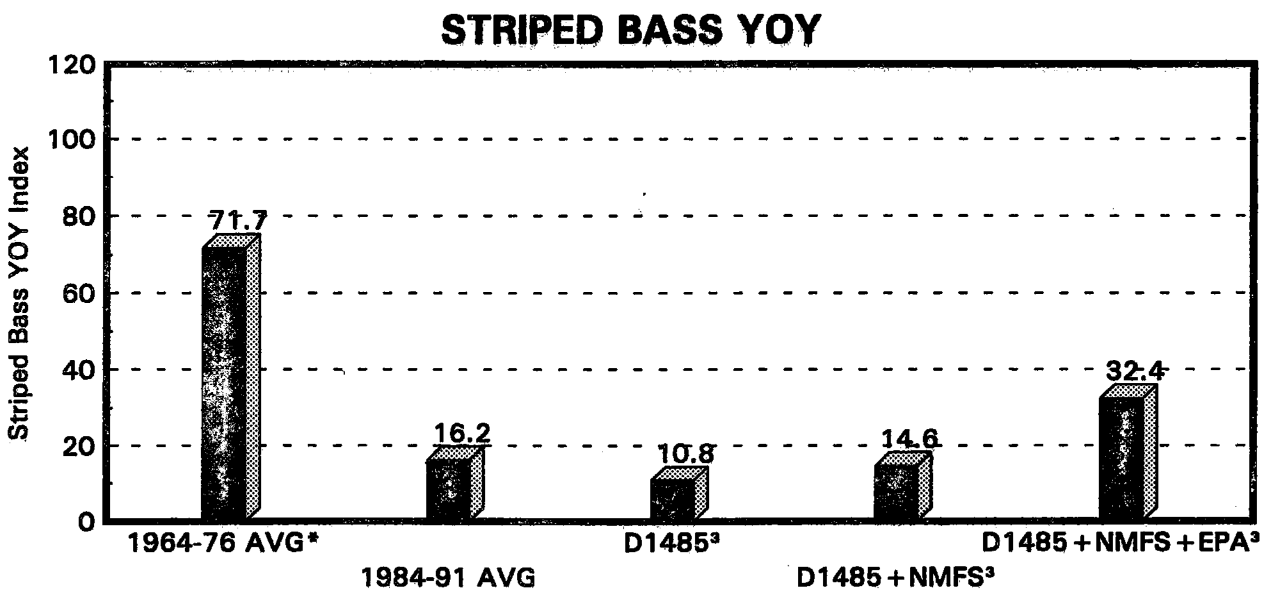
[2]Calculated using DFG Regression; Flows obtained from DWRSIM at 6.0 MAF demand; 1922-1992 hydrology

[3]Historical abundance without 1974 data

FIGURE 28

STRIPED BASS ABUNDANCE COMPARISONS





[1]Data obtained from Petersen Population Estimates with Hatchery Fish Removed

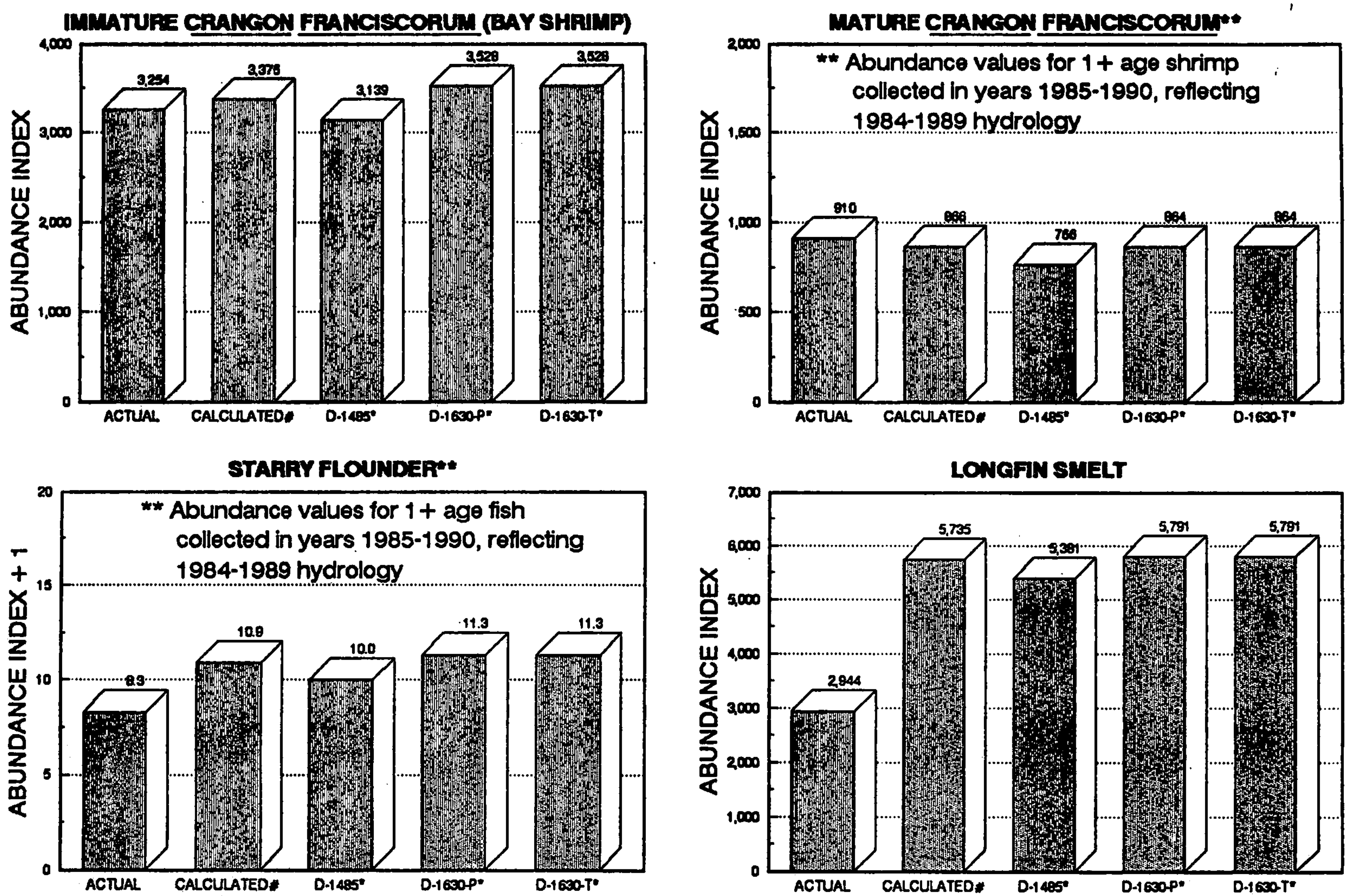
[2]Data not available prior to 1969

[3]Calculated using DFG Regression; Flows obtained from DWRSIM at 6.0 MAF demand; 1922-1992 hydrology

*1966 datum not available

FIGURE 29

FIGURE D. ESTUARINE SPECIES ABUNDANCE COMPARISONS
Averages for 1984-1989



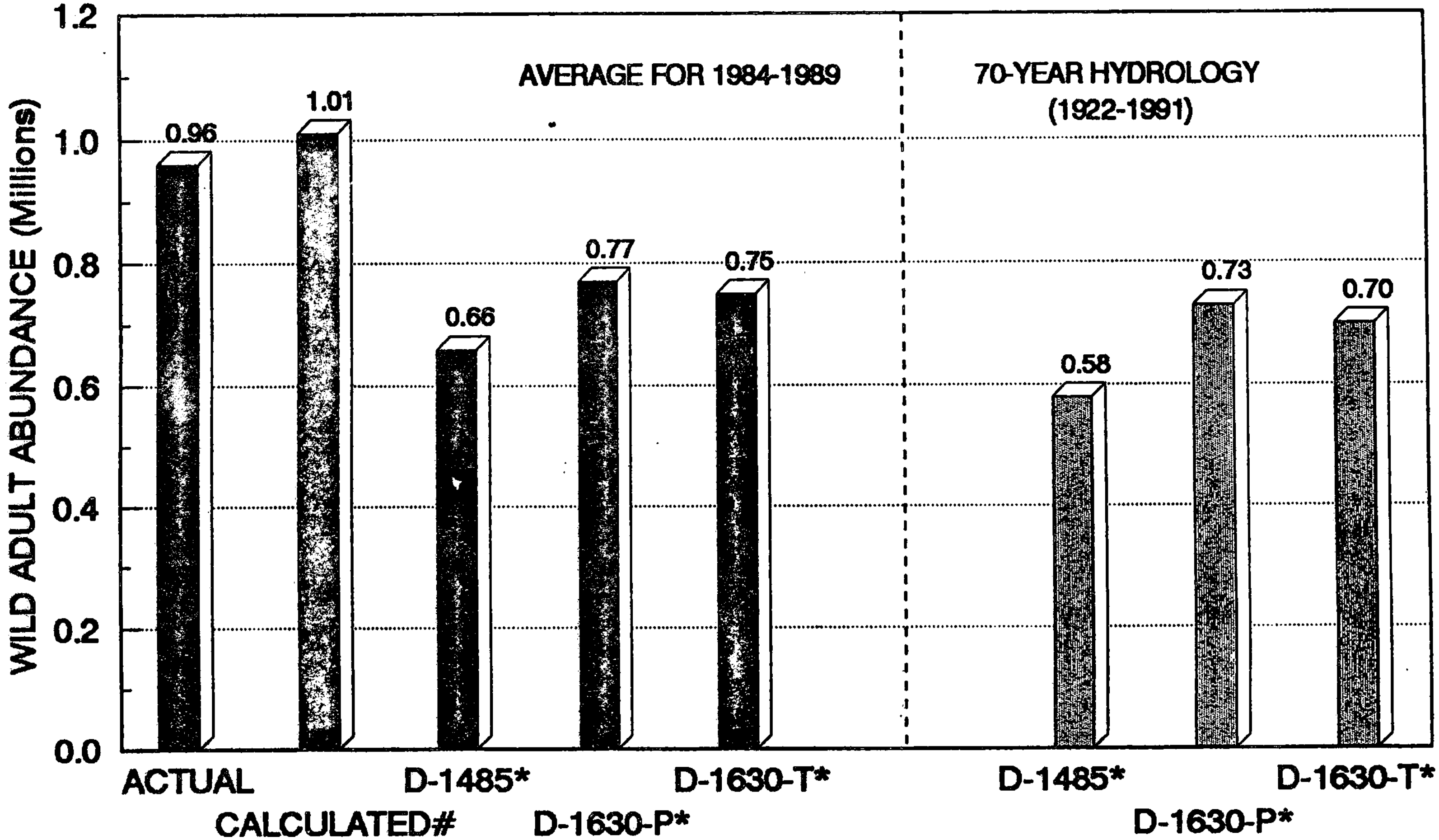
= Historical 1984-1989 hydrology applied to DFG estuarine species models

* = DFG estuarine species models run with 7.1 MAF demand

FIGURE 30

FIGURE C

STRIPED BASS WILD ADULT COMPARISON



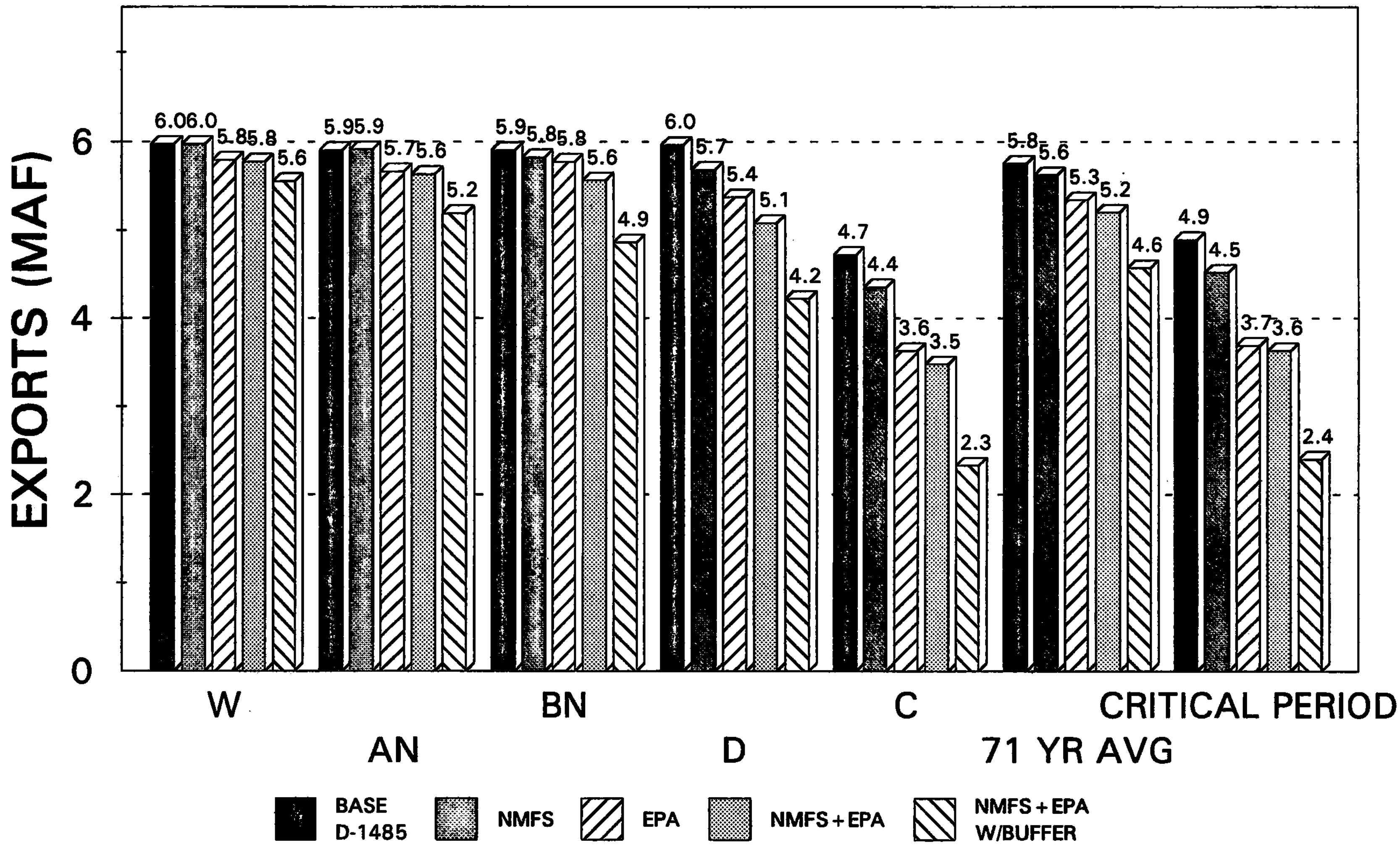
= Historical 1984-1989 hydrology applied to DFG striped bass model

* = DFG striped bass model run with 7.1 MAF demand

FIGURE 31

FIGURE 32

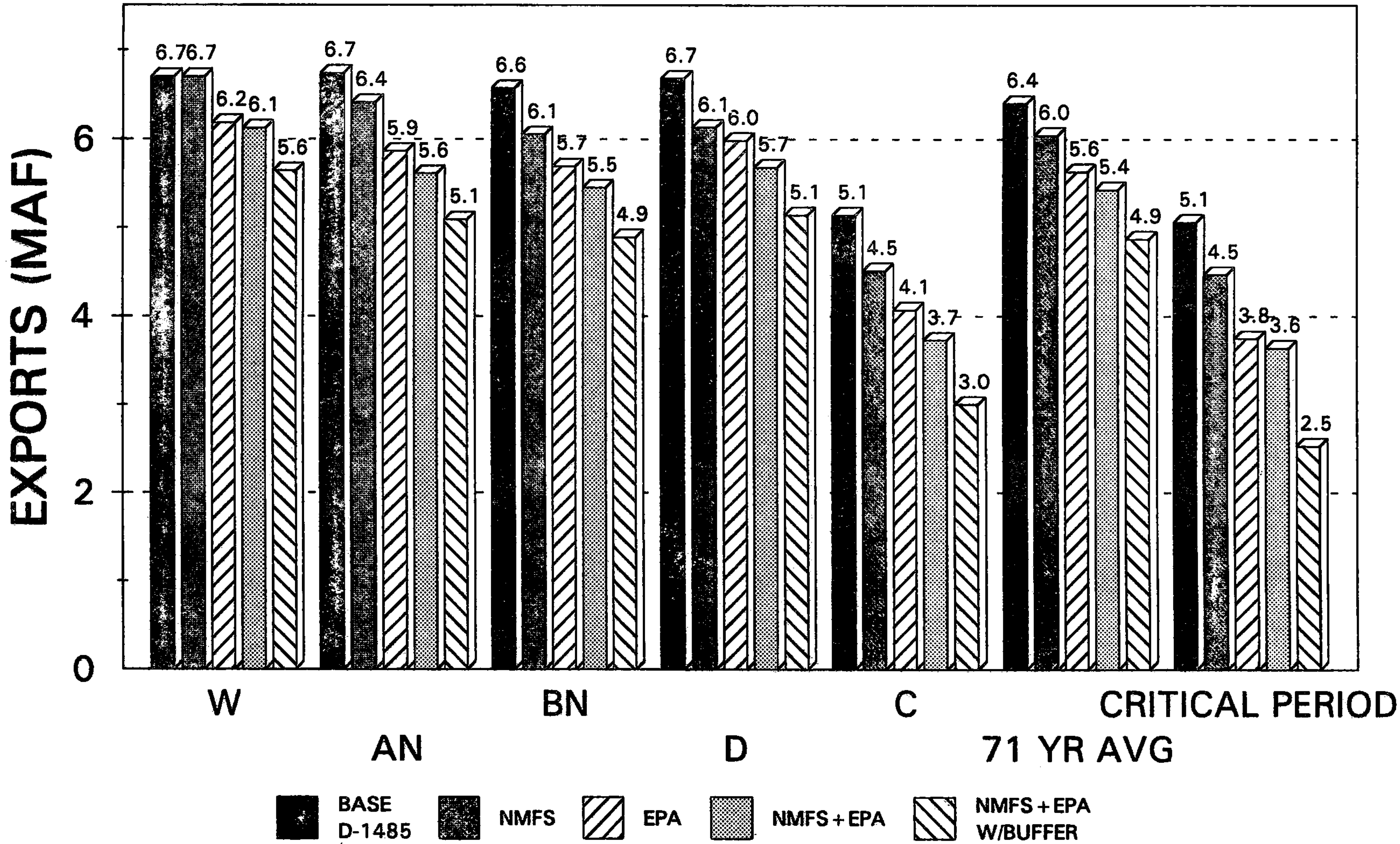
AVAILABLE EXPORTS FROM DELTA AT 6.0 MAF DEMAND UNDER DIFFERENT REGULATORY CONDITIONS AS MODELED BY DWRSIM



CRITICAL PERIOD Extends from May 1928-Oct 1934

FIGURE 33

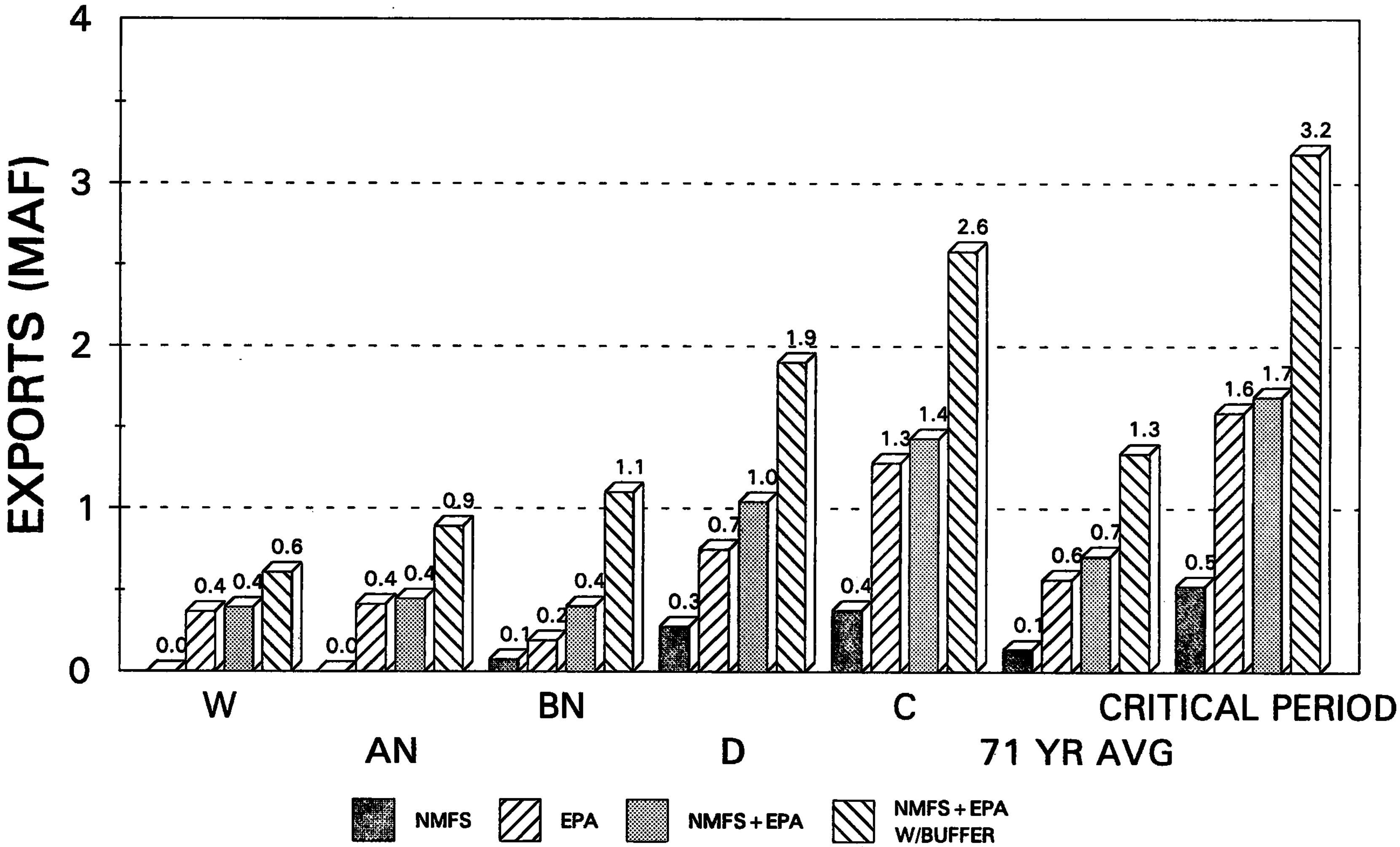
AVAILABLE EXPORTS FROM DELTA AT 7.1 MAF DEMAND UNDER DIFFERENT REGULATORY CONDITIONS AS MODELED BY DWRSIM



CRITICAL PERIOD Extends from May 1928-Oct 1934

FIGURE 34

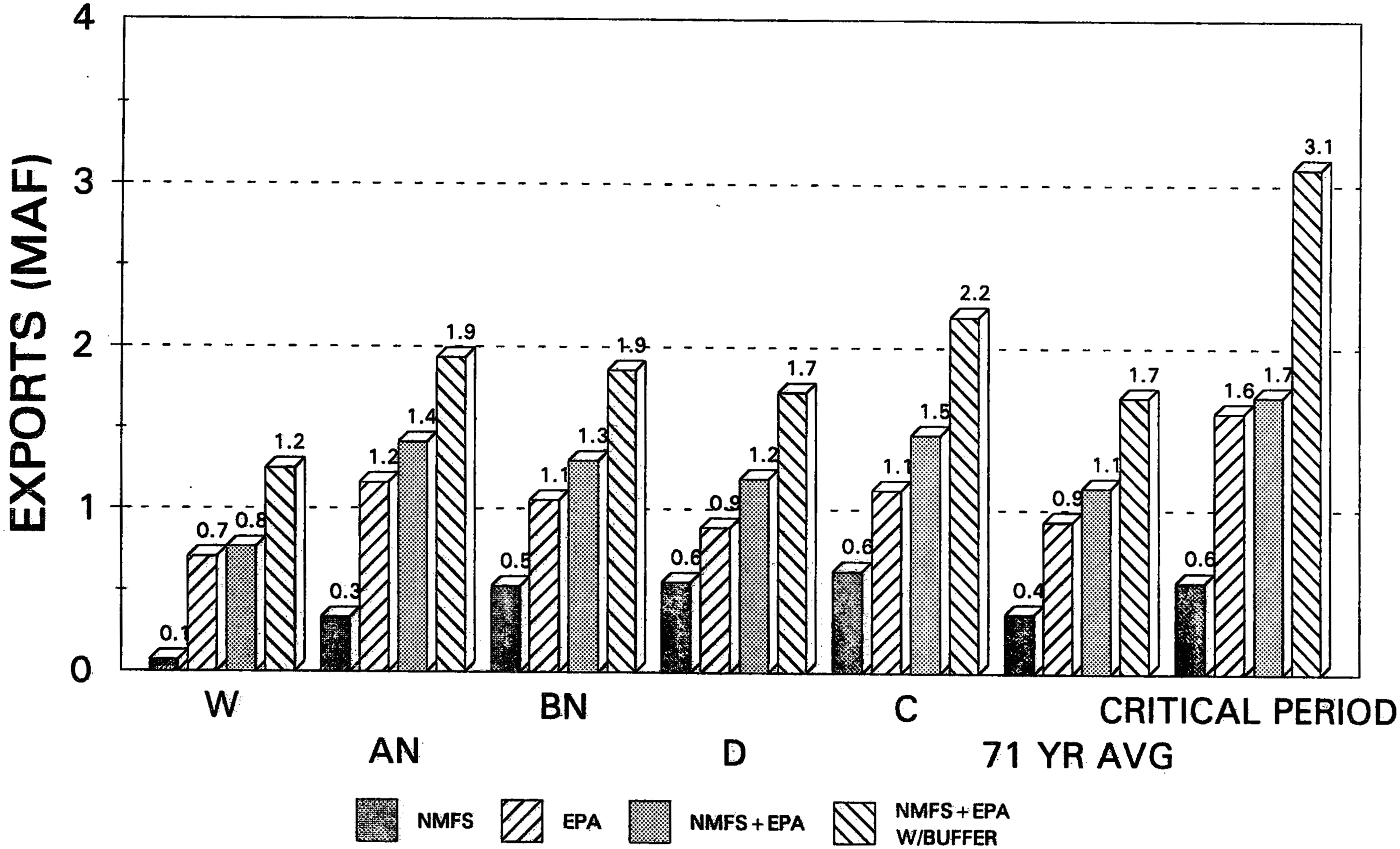
WATER SUPPLY IMPACTS AT 6.0 MAF DEMAND UNDER DIFFERENT REGULATORY CONDITIONS AS MODELED BY DWRSIM



CRITICAL PERIOD Extends from May 1928-Oct 1934

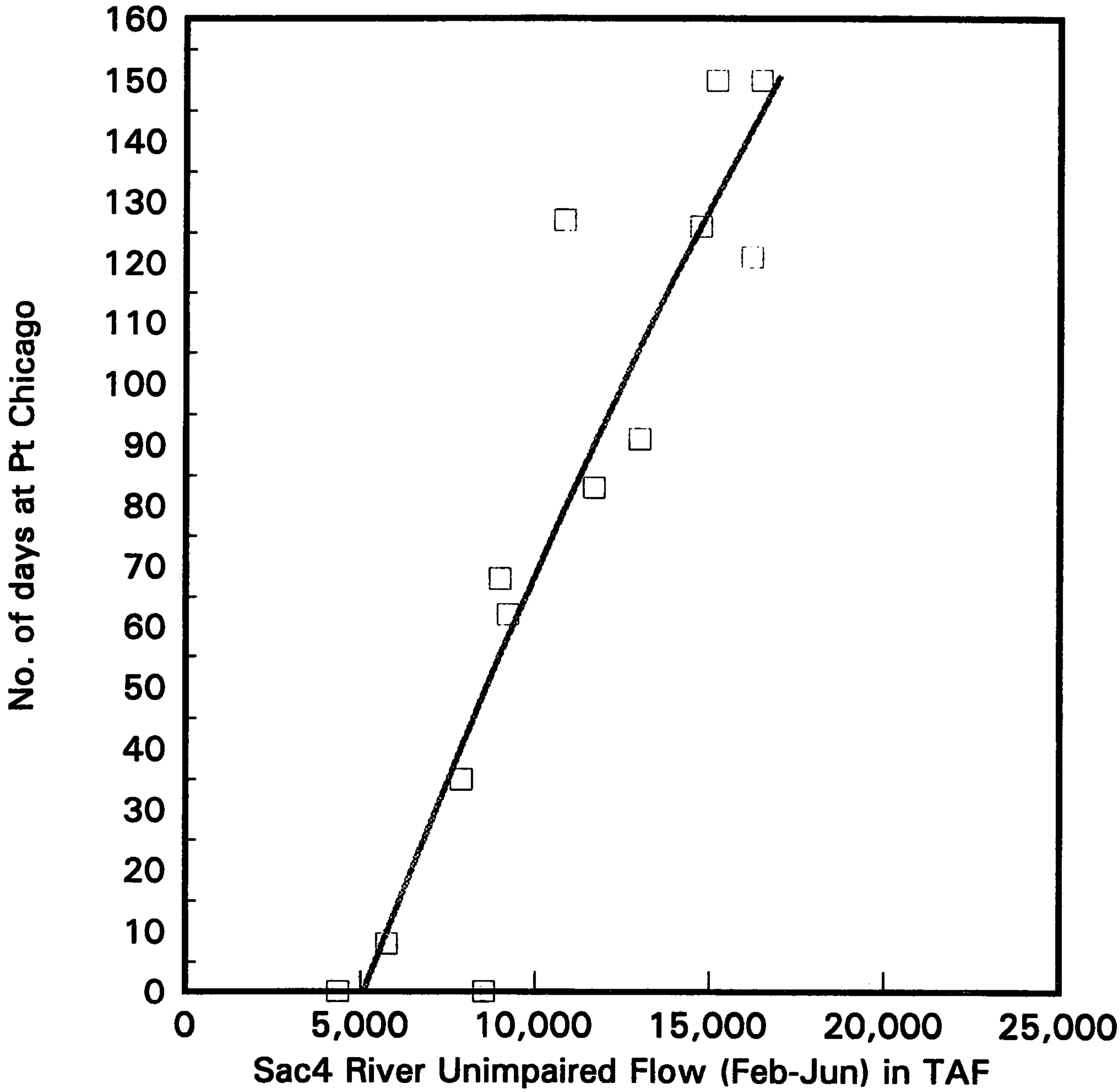
FIGURE 35

WATER SUPPLY IMPACTS AT 7.1 MAF DEMAND UNDER DIFFERENT REGULATORY CONDITIONS AS MODELED BY DWRSIM



CRITICAL PERIOD Extends from May 1928-Oct 1934

No. of days 2ppt is at or below Port Chicago from Feb through June (1964-76) Versus the Unimpaired Flow



Y=a*FEJU**2+b*FEJU+c
a=-1.89E-07, b=.0168, c=-80.306
R Square = 0.8319

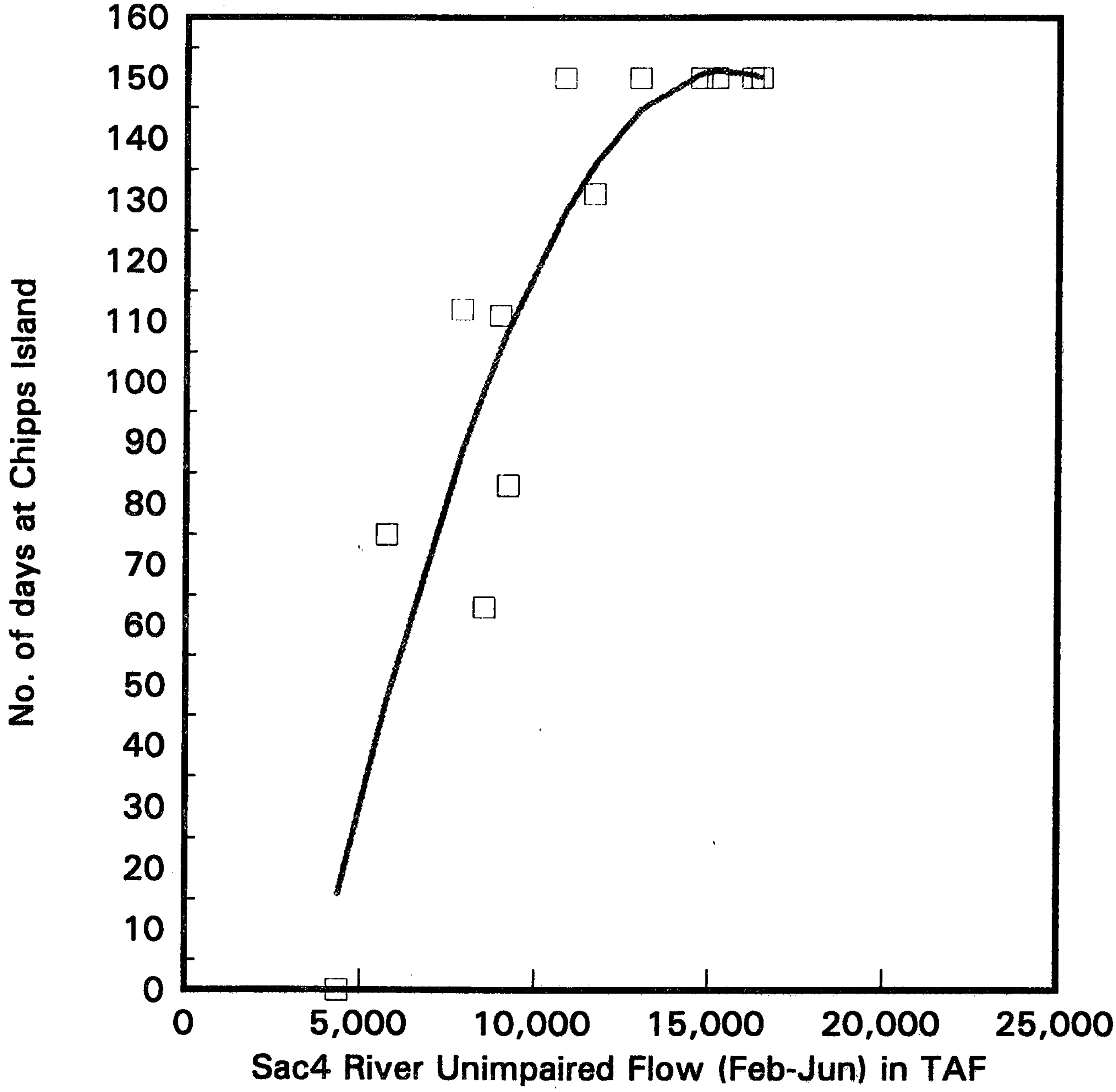
— Quadratic regression line for historic data

□ Actual No. of days per year for historic period

QUPC6476
1/18/94

FIGURE 36

No. of days 2ppt is at or below Chipps Island from Feb through June (1964-76) Versus the Unimpaired Flow



Y=a*FEJU**2+b*FEJU+c
a=-1.11E-07, b=0.0342, c=-112.377
R Square = 0.8446

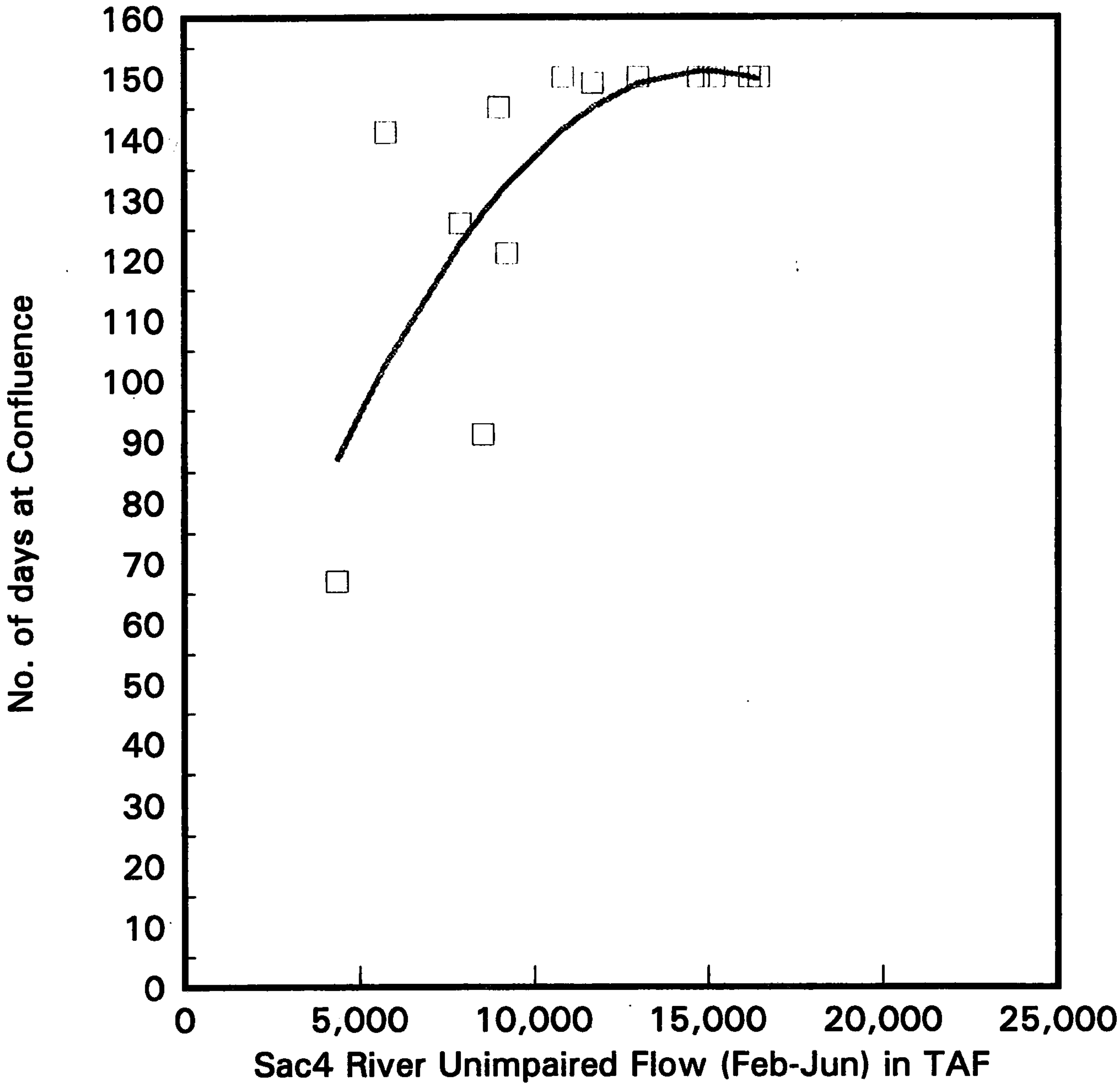
— Quadratic regression line for historic data

□ Actual No. of days per year for historic period

QUCP6476
1/18/94

FIGURE 37

No. of days 2ppt is at or below Confluence from Feb through June (1964-76) Versus the Unimpaired Flow



Y=a*FEJU**2+b*FEJU+c
a=-5.78E-07, b=0.0172, c=22.883
R Square = 0.5720

— Quadratic regression line for historic data

☐ Actual No. of days per year for historic period

QUCF6476
1/18/94

FIGURE 38

No. of days 2ppt is at or below Port Chicago from Feb through June Versus the Sacramento River Index (SRI)

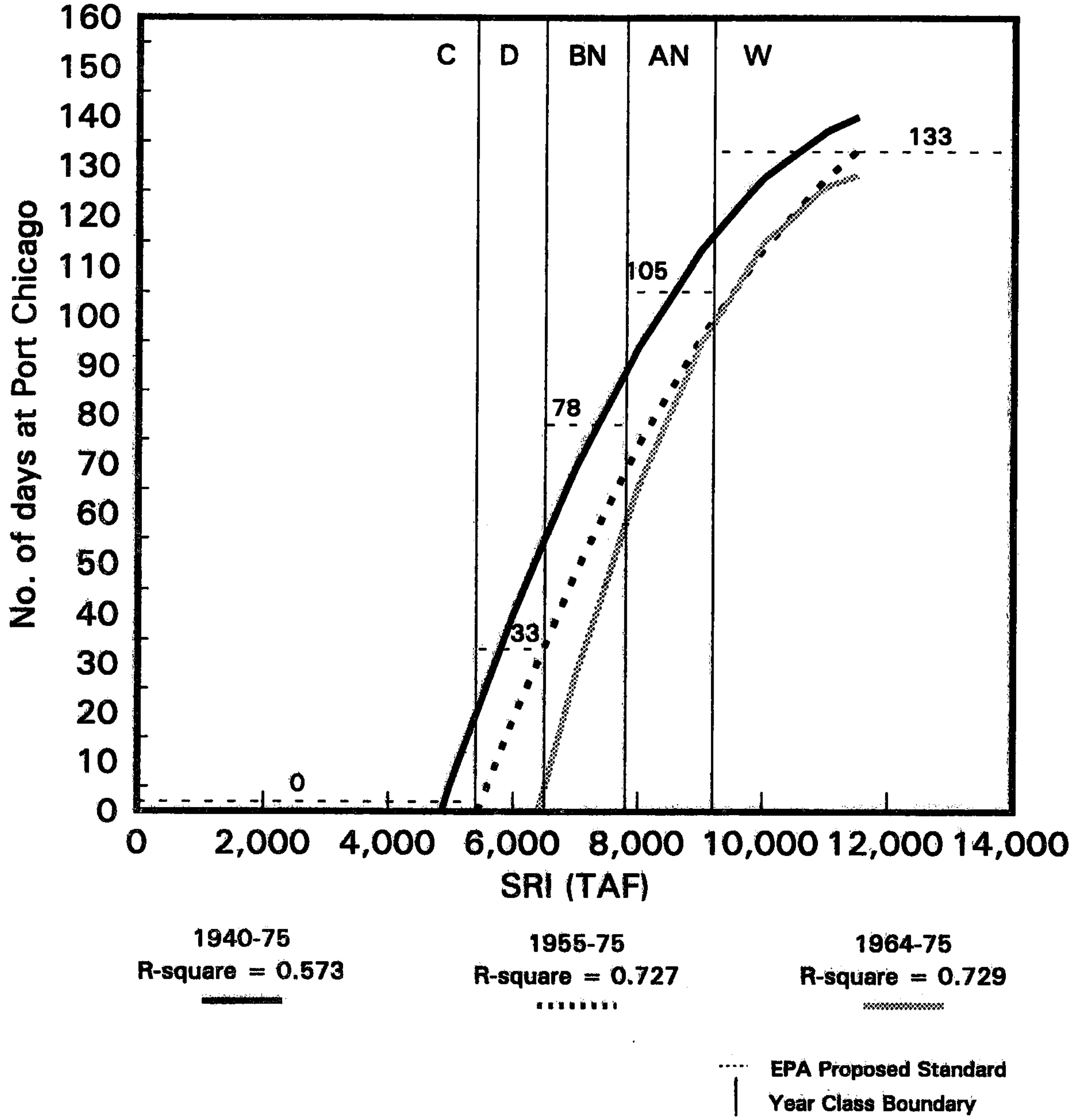


FIGURE 39

No. of days 2ppt is at or below Chipps Island from Feb through June Versus the Sacramento River Index (SRI)

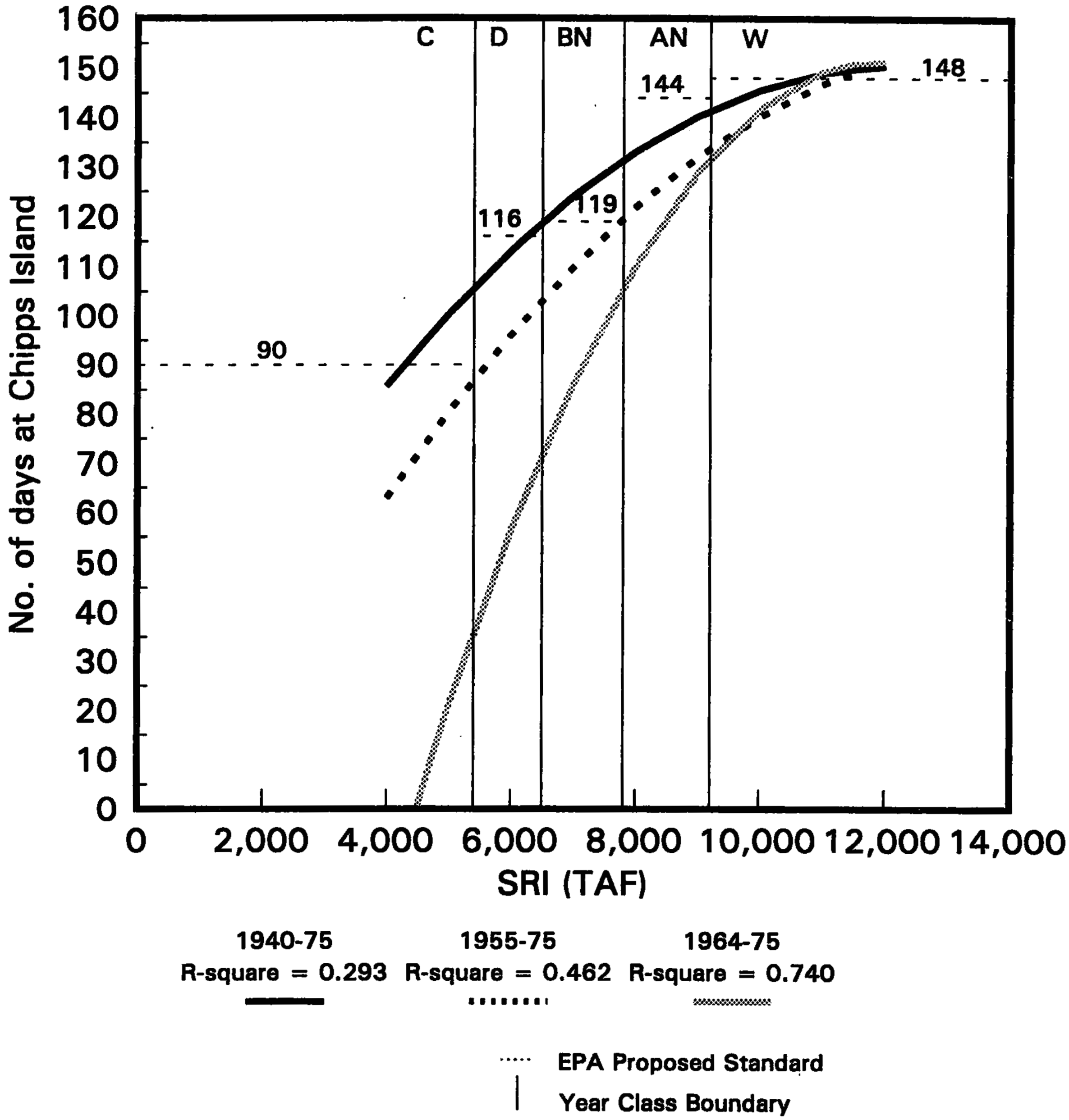
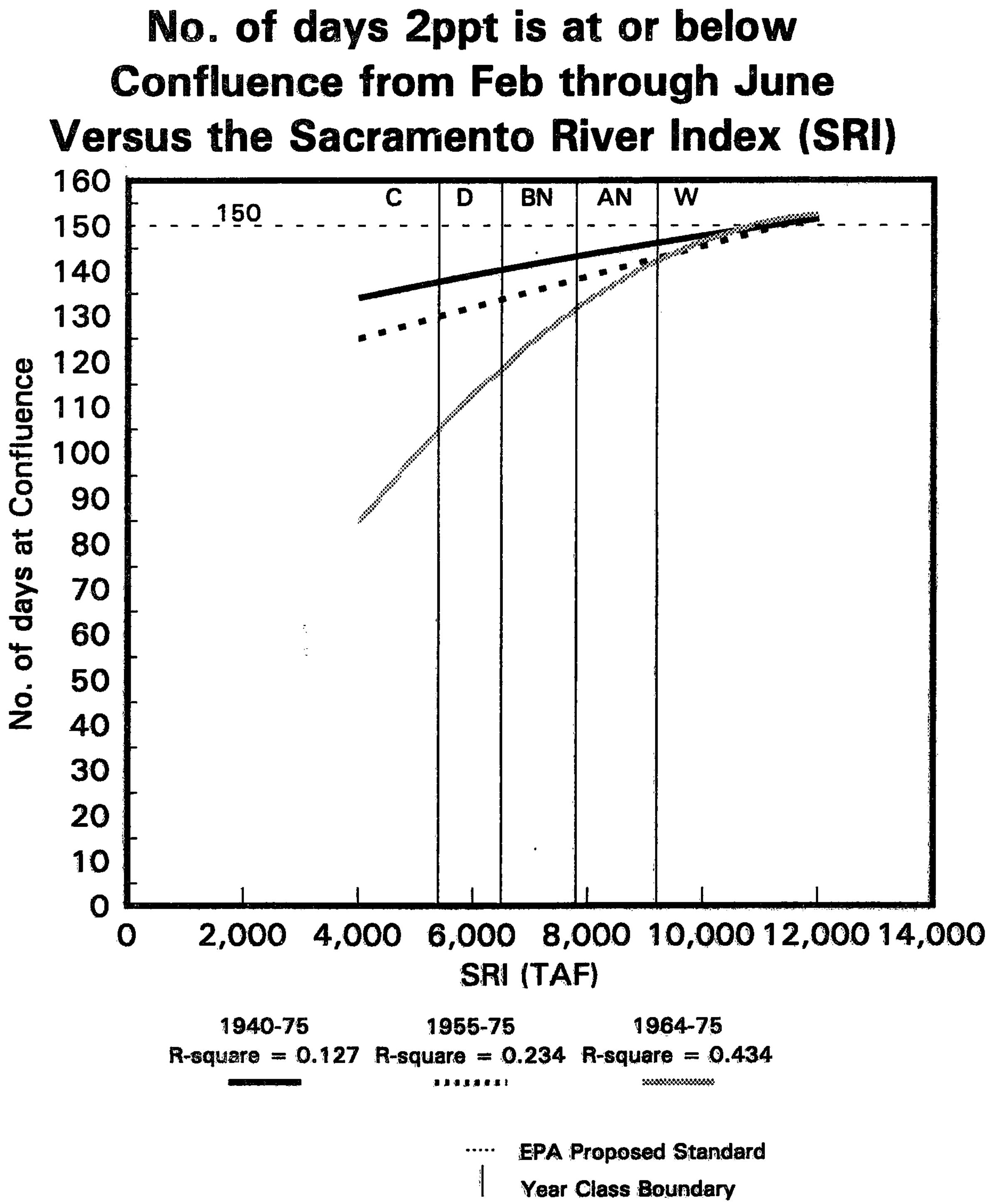


FIGURE 40



No. of days 2ppt is at or below
Confluence from Feb through June
Versus the Sacramento River Index (SRI)
No. of days at Confluence
SRI (TAF)
150
C
D
BN
AN
W
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
2,000
4,000
6,000
8,000
10,000
12,000
14,000
1940-75
R-square = 0.127
1955-75
R-square = 0.234
1964-75
R-square = 0.434
EPA Proposed Standard
Year Class Boundary

FIGURE 41

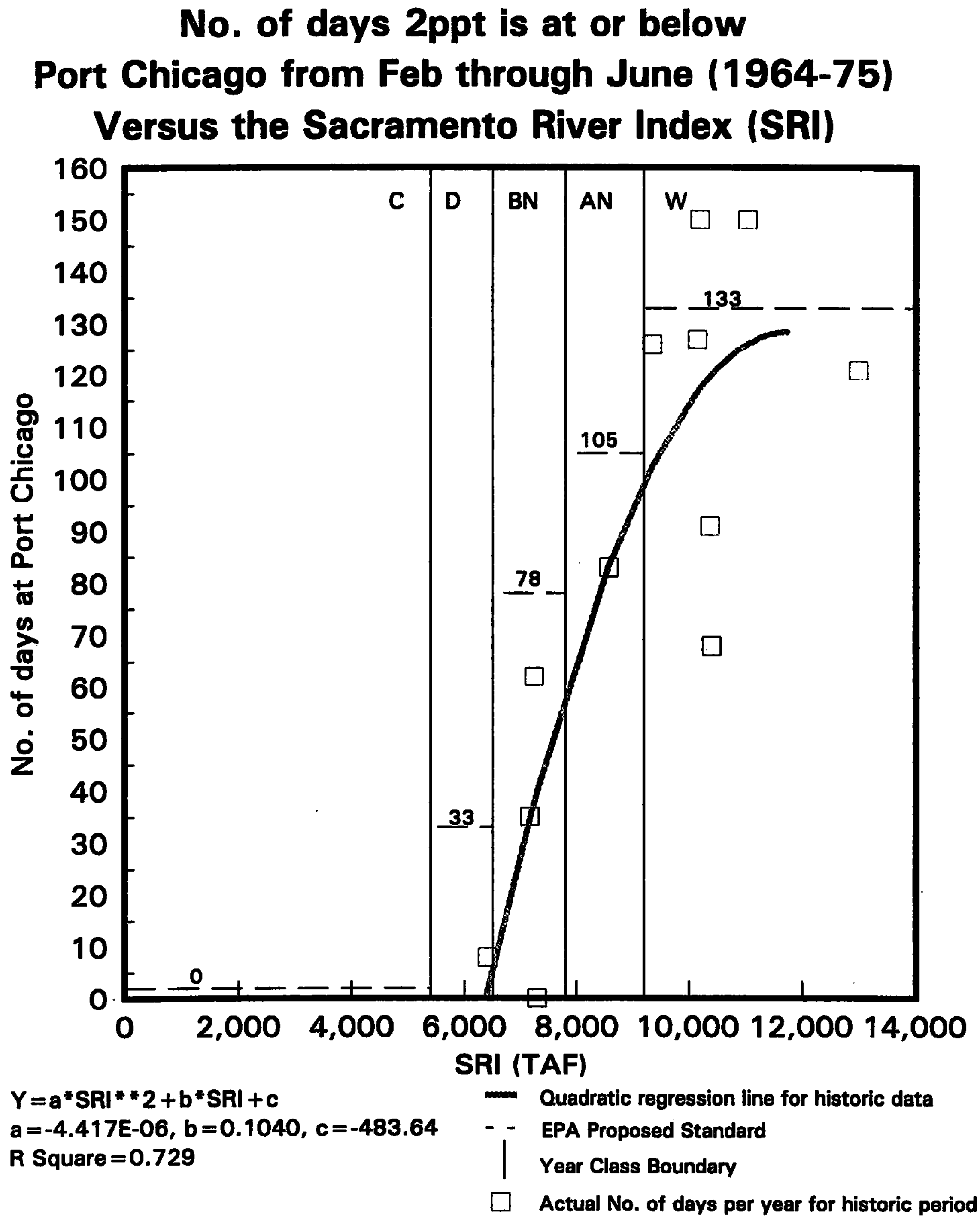
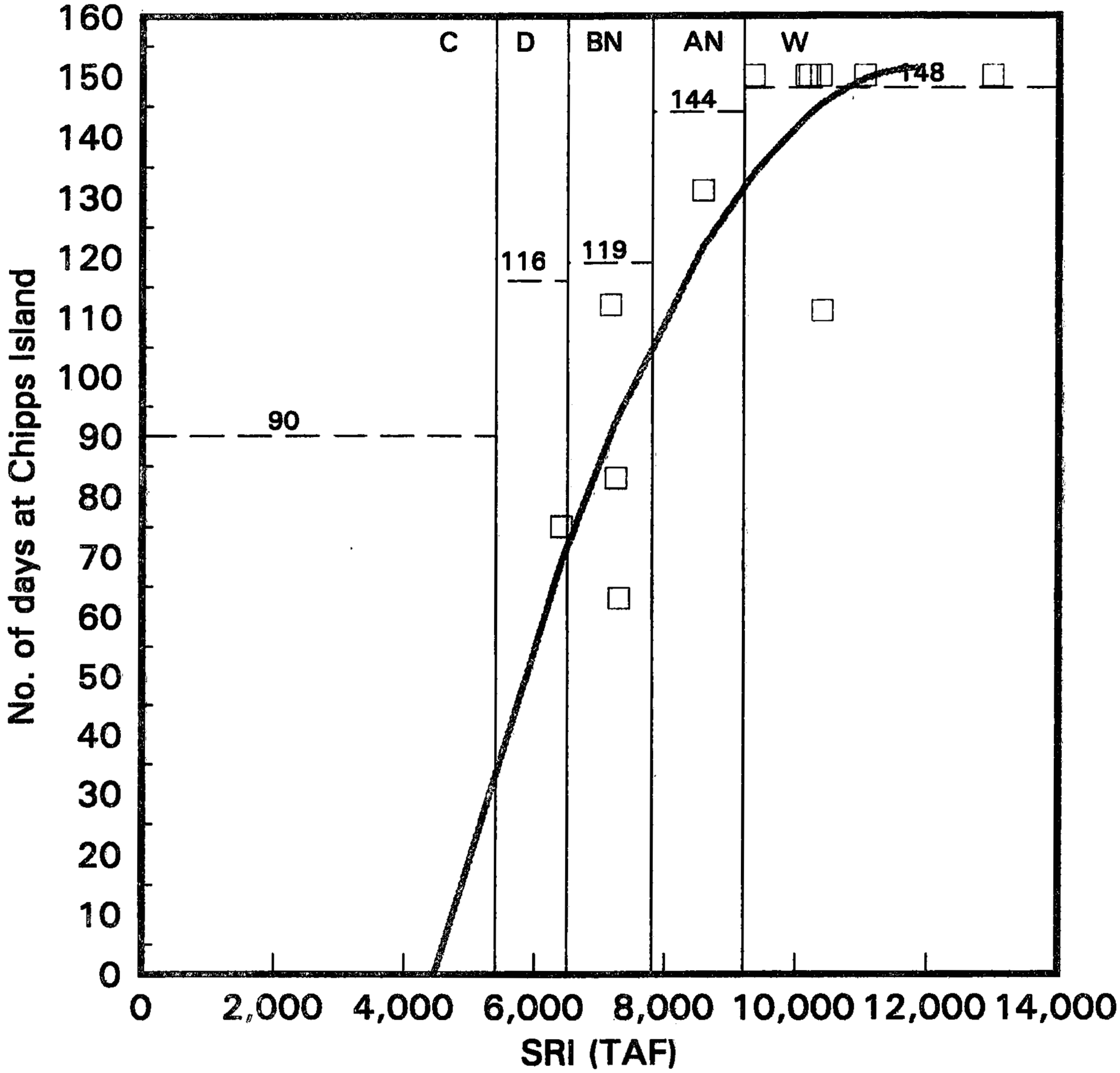

No. of days 2ppt is at or below
Port Chicago from Feb through June (1964-75)
Versus the Sacramento River Index (SRI)
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
C
D
BN
AN
W
133
105
78
33
0
2,000
4,000
6,000
8,000
10,000
12,000
14,000
SRI (TAF)
No. of days at Port Chicago
Y=a*SRI**2+b*SRI+c
a=-4.417E-06, b=0.1040, c=-483.64
R Square=0.729
Quadratic regression line for historic data
EPA Proposed Standard
Year Class Boundary
Actual No. of days per year for historic period

FIGURE 42

No. of days 2ppt is at or below Chipps Island from Feb through June (1964-75) Versus the Sacramento River Index (SRI)

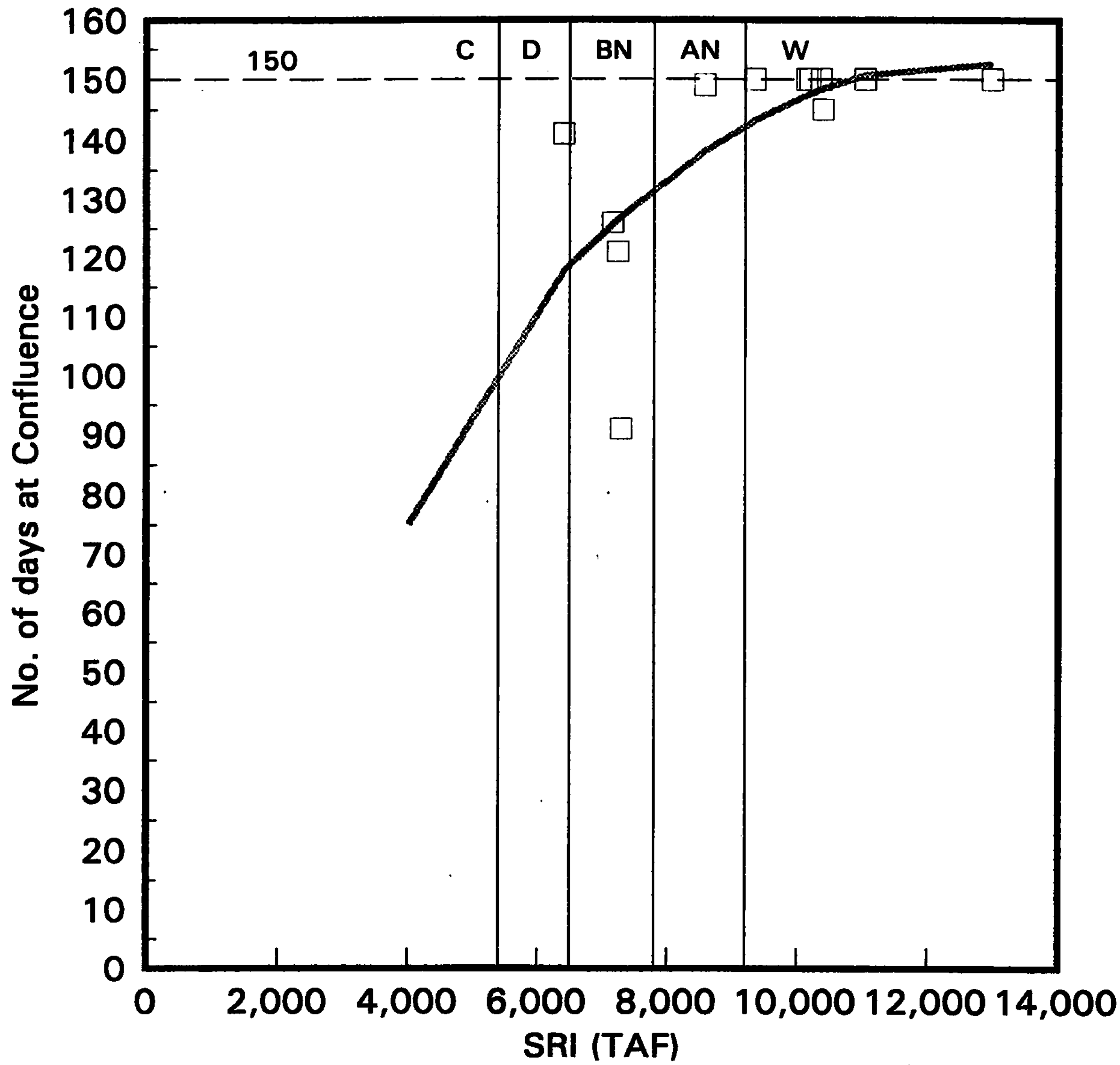


Y=a*SRI**2+b*SRI+c
a=-2.774E-06,b=0.06574,c=-238.28
R Square = 0.7397

— Quadratic regression line for historic data
- - EPA Proposed Standard
| Year Class Boundary
□ Actual No. of days per year for historic period

FIGURE 43

No. of days 2ppt is at or below Confluence from Feb through June (1964-75) Versus the Sacramento River Index (SRI)



Y=a*SRI**2+b*SRI+c
a=-9.370E-07, b=0.023475, c=5.6351
R Square=0.4340

— Quadratic regression line for historic data
- - EPA Proposed Standard
| Year Class Boundary
□ Actual No. of days per year for historic period

FIGURE 44