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A REVIEW OF THE SALMON SMOLT SURVIVAL INDEX AS PROPOSED BY THE U.S. ENVIRONMENTAL PROTECTION AGENCY AS WATER QUALITY STANDARDS FOR THE SAN FRANCISCO BAY ESTUARY

prepared for

The California Urban Water Agencies
Sacramento, California

by
The Metropolitan Water District of Southern California
contracted to
Randy Bailey
Bailey Environmental
3050 Meadow Creek Road
Lincoln, CA 95648
916-645-1235

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NOTICE

PREFACE

This report was prepared for the California Urban Water Agencies (CUWA) by The Metropolitan Water District of Southern California as a part of a CUWA review of the U.S. Environmental Protection Agency's proposed "Water Quality Standards for Surface Waters of the Sacramento River, San Joaquin River, and San Francisco Bay and Delta of the State of California (40 CFR Part 131)". The Metropolitan Water District of Southern California commissioned this report as a part of CUWA's overall review and evaluation of this standard. This report addresses the following scientific question:

1) What is the scientific and technical basis for the proposed salmon smolt survival criteria for the Sacramento and San Joaquin Rivers?

TABLE OF CONTENTS

SALMON SMOLT SURVIVAL CRITERIA

THE PROPOSED STANDARD

The U.S. Environmental Protection Agency is proposing salmon smolt survival criteria to protect fall-run chinook salmon smolts entering the Delta using the following set of values:

Sacramento River		San Joaquin River	
Water Year Type	Index Value	Water Year Type	Index Value
Wet	.45	Wet	.46
Above Normal	.38	Above Normal	.30
Below Normal	.36	Below Normal	.26
Dry	.32	Dry	.23
Critical	.29	Critical	.20

The Salmon Smolt Survival Index is based on two formulas, one for the Sacramento River and one for the San Joaquin River. The Sacramento River Salmon Index (SRSI) is computed according to the following formula: (**Author's Note: the formula below is that computed and published by the U.S. Fish and Wildlife Service in the source documents cited by EPA and differs from the formula published by EPA in the Federal Register. The corrections and correct values are presented in bold type.**)

$$SRSI = 1 - [(-2.45925 + 0.0420748\ T) + (-0.5916024 + 0.017968\ T + 0.0000434\ E)(P1) + (-1.613493 + \mathbf{0.0319584}\ T)(P2) - (-2.45925 + 0.0420748\ T)(-0.5916024 + 0.017968\ T + 0.0000434\ E)(P1) - (-2.45925 + 0.0420748\ T)(-1.613493 + \mathbf{0.0319584}\ T)(P2)]$$

where:

T = Average Water Temperature in Fahrenheit at Freeport
E = Average State Water Project plus Central Valley Project exports in cubic feet per second (cfs) (from DAYFLOW)
$P1$ = Proportion of water diverted into the Delta Cross-Channel and Georgiana Slough at Walnut Grove
$P2$ = Proportion of water remaining in the Sacramento River at Walnut Grove

The San Joaquin River Salmon Index (SJSI) is calculated according to the following formula:

$$SJSI = (0.341271 - 0.000025\ E + 0.000067\ F)/1.8$$

Where:
E = Average Central Valley Project plus State Water Project Exports in cfs
F = Mean daily flow in cfs in the San Joaquin River at Stockton, calculated as Old River flow subtracted from San Joaquin River flow at Mossdale. Old River flow is calculated from the ratio of Brandt Bridge flow to exports.

SUMMARY OF PRIMARY CONCLUSIONS

1. The index as proposed is not a water quality standard. The proposed standard does include water temperature as one component for one part of the standard. However, the water temperature at the defining location is relatively independent of flow and is nearly completely dependent on ambient air temperature. This conclusion was part of the testimony presented by the U.S. Bureau of Reclamation to the State Water Resources Control Board in previous hearings (Appendix A). The remainder of the terms in the equations used to derive the smolt survival index are all water flow related terms and not tradition water quality constituent parameters.

2. The fundamental basis for the equations developed by the U.S.Fish and Wildlife Service and the Environmental Protection Agency to derive the smolt survival index is flawed. The mortality equations used to develop the Sacramento River index are based on probabilities of mortality occurring in a particular reach. However, since the estimation of survival from the experimental data often exceeds 100%, the U.S. Fish and Wildlife Service has scaled the data by dividing all estimates by 1.8 in order to bring the survival estimates into the biologically meaningful range of 100% or less. According to Dr. John Rice, Statistics Department, University of California, Berkeley, scaling the data by the largest experimental multiplier necessary to bring the survival estimates to unity or less invalidates their use as probabilities. This data transformation invalidates all of the estimates of survival used to develop the regression equations which in turn invalidates the equations used to develop the proposed standards since the equations used to estimate mortality in a particular reach are based on probability estimates.

3. Even if the probability questions raised in 2. above could be solved, the propagation of error throughout the entire mathematical sequence of estimations used by EPA to develop the salmon survival indices render the proposed standard values meaningless. For example, just adjusting the effective sampling width of the trawl to a realistic value (justified by U.S. Fish . and Wildlife Service in Exhibit 31, Appendix 12) and placing 95% confidence intervals on the predicted smolt survival index changes the prediction by approximately 100%. Numerous other uncertainty errors associated with the various estimates used to develop the proposed standards only increase the unreliability of the proposed standard.

4. There are numerous mathematical results that can be calculated from the proposed standard, based on reasonable operational assumptions, that do not make any sense biologically. For example, if you assume exports are zero and attempt to reduce mortality to zero on the Sacramento River using the equations in the proposed standard, you get very different results. In Reach 1, above Walnut Grove, mortality is zero when the water temperature is approximately 58 degrees. In Reach 3, below Walnut Grove and after water is diverted through the Delta Cross-Channel and/or Georgiana Slough, the water temperature necessary to reach zero is approximately 50 degrees. If you solve the equations for mortality equal to zero in Reach 2, which is the amount of flow diverted by the Cross-Channel and Georgiana Slough that travels down the lower Mokelumne and San Joaquin rivers, the water temperature must be approximately 30 degrees. The difference in these answers clearly

indicate that factors other than water temperature and proportion of flow diverted are affecting survival based on the experimental data. Until all of the factors affecting survival are incorporated into the estimates of survival, the use of the equations to develop salmon survival indices is patently invalid.

5. The U.S. Fish and Wildlife Service has cautioned repeatedly that the results of their analyses should not be used outside the range of parameters from which they were developed. The Environmental Protection Agency ignored this warning and failed to incorporate it into the equations they are proposing as standards. For example, at very high flows it is possible to violate the proposed standards under a normal operational procedures just because of the mathematical calculation of the salmon survival index. None of the experimental data used to develop the various regression equations was based on very high flow data. Most fishery biologists would agree that exports would have a minimal effect on salmon smolt migration at very high flow conditions.

6. Given reasonable operational and flow conditions in the spring, the standard on the Sacramento River will be violated in most years because of the lack of influence of outflow on water temperature at Freeport. An analysis of the 1962-92 mean monthly (April, May, June) water temperature record for Freeport indicates that the proposed standards for the Sacramento River will be violated based on the naturally occurring water temperatures. The ability of flow releases to significantly reduce the temperatures is highly speculative. The data indicate that the proposed standard would have been violated 5 years out of 29 even if exports were zero in April, May and June and both the Delta Cross-Channel and Georgiana Slough were completely closed and no water were permitted to flow into the northern delta (Appendix B). As proposed, the Sacramento River Salmon Index cannot be met even with a physical barrier preventing flow down Georgiana Slough. It is important to note that of the 5 years of violations in the 1962-92 data set, 3 occurred in wet years and an additional violation occurred in an above normal year.

TECHNICAL ANALYSIS

1. The estimates of survival used by the U.S. Fish and Wildlife Service (USFWS) are highly variable and have not been sufficiently validated to be used in developing smolt survival criteria. For example:

The smolt survival index based on recaptures from midwater trawl catches at Chipps Island of coded wire tagged (CWT) smolts released at various locations in the upper estuary is based on the formula $S = R/MT$ (0.0078), where R is the number of trawl recaptures from CWT salmon released upstream of the trawling site; M is the number of marked salmon released for a particular tag group, and T is a factor accounting for the portion of time sampled when the marked fish were passing the trawl site (time between capture of first and last marked fish). The value (0.0078) equals the trawl width (9.1 meters) divided by the width of the channel at Chipps Island (1200 m). This information is presented in Appendix 16 of USFWS Exhibit 31 of the 1987 State Water Resources Control Board water quality/water rights hearings on the Bay/Delta. However, in Appendix 12 of the same document, while discussing how the total smolt abundance estimate is made, USFWS uses a smaller effective trawl width to verify earlier estimates. The effective width is 6.5 m not 9.1 m used to estimate smolt survival.

The effect of using just a change in trawl width greatly changes the smolt survival estimate by changing the value (0.0078) to (0.0054) with a resultant change in the smolt survival index of 29%. For example, data from the 1979 Sacramento release of tag group 6-62-05, produces an estimate of $S = 0.4198$ using the 9.1 m trawl width factor of (0.0078), while the same data produces an estimate of $S = 0.6047$ using the 6.5 m trawl width factor. The critical point in this analysis is that the estimate of S (smolt survival) is used to develop the regression equations used to develop the smolt survival criteria proposed by EPA.

2. Estimates of survival for an individual tag group exceeds 100% for some tag groups using the existing methods of analysis.

An examination of Table 4-1. of Exhibit 31 of the USFWS submittals for the 1987 hearings and Appendix 9 of the USFWS's Sacramento-San Joaquin Estuary Fishery Resource Office 1991 Annual Progress Report reveals smolt survival values exceeding 100% for various smolt survival estimates. We know that this is biologically impossible and therefore, the methods used to derive the estimates must be examined carefully. The current practice used by USFWS to address this problem is to divide all raw survival estimates (those derived directly from the tag recoveries) by a factor of 1.8 which is the highest ratio of upstream released recoveries to downstream released recoveries found to date. This correction factor is important since it reduces all estimates of smolt survival in the Delta by approximately 55% before the data are used to develop the survival/water temperature regression relationships which are the basis for the EPA's proposed standards. Only some tag groups have raw survival estimates exceeding 100%, but the USFWS has decided that best way to account for these "anomalies" is to divided the raw estimates by the 1.8 factor. This analysis should be looked at carefully since the survival/water temperature regressions are the cornerstone of the smolt survival index. Discussions with Dr. John Rice, Statistics Department, University of California, Berkeley on

7

February 10, 1994 about the use of the 1.8 scaler reached the conclusion that use of the scaler invalidates the use of estimates of smolt survival (the smolt survival index) as probabilities. If the estimates of smolt survival cannot be used as probabilities, then the equations (which are based on probabilities) used to develop the regression relationships and are the foundation of the proposed standard are invalid.

3. The USFWS has used the mean smolt survival index estimate to develop the relationship between smolt survival and water temperature using regression analysis. However, the 95% confidence intervals around those estimates are in many cases quite large and result in survival estimates of less than zero and greater than 1 which are both biologically impossible.

Table 4-1. of Exhibit 31 of the USFWS's 1987 hearings submission shows the mean survival estimates ± 1 standard deviation for the trawling effort at Chipps Island. These confidence intervals are large in some cases exceeding 43% of the point estimate. When the confidence intervals are expanded to the scientific standard of 95% (1.96 standard deviations), the interval estimates are as much as 86% of the point estimate. This analysis needs to be carefully examined since the variance around the point estimate is so large (but not unusual in biological data analysis). While this level of precision may be appropriate for management actions, the question of whether or not this level is acceptable for regulatory purposes needs to be examined. A sensitivity analysis of the proposed standards should be conducted incorporating all of the estimates used to derive the proposed standards and rerun using the estimates at 1 and 1.96 standard deviations. This analysis will help determine if the standards are inordinately biased in a certain manner by the errors associated with the data. Propagation of error throughout the development of the equations is a major concern since compounding the errors of numerous estimates seriously weakens or invalidates the predictive capability of the final relationship.

4. There are a number of assumptions that serve as the foundation for the the smolt survival index that are based on USFWS's smolt survival model. Each of these assumptions may have an influence (although possibly unquantifiable in some cases) on the smolt survival estimates generated by the USFWS's model. It appears that EPA has adopted the model as a finite mechanism for determining estimated smolt survival without examining the underlying assumptions adequately. The following assumptions should be examined in light of the model as developed by USFWS:

1. The relationship between the water temperature of the hatchery stocking truck and the receiving waters at the time of stocking of the test fish.
The difference in water temperature between the hatchery truck and the receiving waters have been documented as high as 20 F. with the receiving water at 75 F. only 3 F. below the lethal maximum for chinook salmon smolts. Inspection of the limited data indicates that generally lower survival estimates occur at higher water temperatures in the receiving waters and when the water temperature differential between the hatchery truck and receiving waters are greatest. An analysis of this factor is needed.

2. An evaluation of the effects of stocking smolts from different hatchery stocks.
The survival estimates are based on the coded wire tag returns from smolts stocked at various

8

locations in the rivers and a number of downstream locations. An evaluation of the source stocks used in the estimate experiments is needed. Also, only fall-run chinook smolts have been used in the experiments even though all four runs are migrating at sometime during the proposed regulatory period.

3. Data outliers are eliminated from the data analysis without adequate explanation.
In several instances data have been excluded from various regression analyses without an adequate explanation by USFWS. The effects of analyzing all the data should be evaluated since including all data could change, in some cases substantially, the linear relationships used to develop portions of the smolt survival indices proposed by EPA.

4. The derivation and use of the survival estimates need to be evaluated further.
The entire derivation and use of the survival estimates should be re-examined. A number of the raw estimates of survival exceed 100% using the USFWS's methodology. A survival of greater than 100% is impossible. Also, in some analyses where the estimated values exceed 1.0 or are less than 0, the data are truncated to facilitate the analysis. This data truncation procedure should be examined to determine the effects on the relationships derived.

5. The USFWS assumes that the effects of predators is constant at all water temperatures.
The model developed by the USFWS assumes the effects of predators is constant at all water temperatures. Determining the effects of predation at various water temperatures is an extremely difficult, but not impossible task. However, given the abundance of warmwater predators in the Delta, ignoring how the rate of predation changes with increasing water temperature the effects on smolt migration is not justified. Several predators present in the Delta have major increases in activity between the water temperatures of 60-75 F. which coincides with range of temperatures into which the experimental stockings occurred.

6. The USFWS assumes that 90% of the smolts are vulnerable to the trawling gear used to capture fish at Chipps Island.
The USFWS has assumed that approximately 90% of the smolts migrating past Chipps Island are subject to capture by their trawling operations. This assumption is not supported in any of the source documents cited by EPA. In addition, USFWS assumes that the probability of capture during daylight hours is equal to the capture probability at night. This assumption is based on the high turbidity levels at Chipps Island. This assumption is not supported by any comparative capture data for day versus night trawling. Data from other river systems indicate that the rate of migration and location in the water column of the smolts changes from day to night. The lack of night sampling may tend to bias the survival estimates lower since the capture probabilities and assumption of random distribution in the water column are probably closer to being met.

5. The proposed standard assumes that since EPA has decided that the standard will improve smolt survival for fall-run chinook salmon smolts, then that same standard will improve conditions for striped bass, delta smelt, longfin smelt, white and green sturgeon, American shad and Sacramento splittail. No data are presented or referenced to support this claim. At a minimum, EPA should document the literature used to reach this conclusion.

6. The proposed standard fails to address the effects of agricultural return flow water quality on salmon smolt survival. The basis for the striped bass spawning survival standard proposal is to protect spawning striped bass from the adverse effects of poor water quality in the San Joaquin River. It would seem prudent to address the effects of the water quality of agricultural return flows on salmon smolt survival in a water quality standard designed to protect salmon smolt survival.

7. The parameters used to derive the San Joaquin smolt survival index are all various measurements of flow in the San Joaquin River and southern Delta. Unless these flow relationships are related to water quality and not some aspect of smolt survival based on migration rates or which Delta channel a particular smolt migrates down, the use of flow parameters seems inappropriate as a water quality parameter. If the flows are directly related to a water quality parameter, such as water temperature, then a possible connection between flows and a water quality parameter is justified. However, no connection between San Joaquin River flow and lower water temperatures out to the recovery location at Chipps Island is presented or referenced.

8. The proposed smolt survival criteria under part 131 of the proposed regulations are based on testimony by the USFWS and several of their publications. However, the equations used to calculate the Sacramento River Salmon Index in part 131 do not match those presented as the USFWS equations in Appendix III of the draft regulations or in the USFWS's June 1992 Sacramento-San Joaquin Estuary Fishery Resource Office 1991 Annual Progress Report. Some of the coefficients for the water temperature terms are incorrect and the coefficients of variation for some of the equations are different from the USFWS's documents. No explanation for the changes are given by EPA. Also, the definition of P1 in this part is different than the definition in Appendix III.

9. Calculation of the Sacramento River Salmon Index (SRSI) under a variety of operational and water temperature scenarios and an inspection of the monthly mean water temperature records from Freeport indicate two problems: 1) the use of a water year type to change the SRSI values in the standards is not justified. The critical factor used to derive the index is water temperature at Freeport. The water temperature at Freeport is relatively independent of water year type, with ambient air temperature the predominant factor determining water temperature, not total outflow and 2) Using the mean monthly water temperature records for Freeport for the period 1962-1992 to calculate the SRSI as EPA proposes, indicates that the range of values proposed as standards by water year type by EPA could not have been met under any reasonable circumstances. Influencing the water temperature at Freeport with water releases in considered highly impractical by the U.S. Bureau of Reclamation (Appendix A). Approximately 400 operational scenarios that vary exports by month and change the proportion of flow down the Delta Cross-Channel and Georgiana Slough were applied to the 29 year historical water temperature record at Freeport. Representative scenarios, at both high and low levels of exports and proportion of flow (P1) are presented in Appendix B. All 400 scenarios are available for inspection. The bottom line is that the standards as proposed for the SRSI are not attainable, in some years, even under the most restrictive operational scenarios.

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Comments
of the
United States Bureau of Reclamation
on the
Revised Draft Water Quality Control Plan for Salinity
San Francisco Bay/Sacramento-San Joaquin Delta Estuary
before the
State Water Resources Control Board
August 22, 1990

Introduction

In that the majority of the standards contained in Table 6-4 of the draft Water Quality Control Plan (draft Plan) are not changed from D-1485, our comments are directed at what the Bureau believes the record supports. We have also prepared comments and/or corrections to the discussion on agricultural water quality objectives within the draft Plan. These are attached and identified as WQCP USBR Exhibit 128.

Municipal and Industrial Standards

As we and others mentioned before, the 150 mg/l chloride standard was and continues to be unsupported by the hearing record. The industrial users in Contra Costa County now have available to them a source of adequate quality to meet their needs. We refer to the evidence and testimony presented in the Phase I hearings. We believe the evidence clearly supports the 250 mg/l chloride standard.

As we commented previously, the issue of disinfectant by-products such as trihalomethanes is an important issue. The Board and municipal and industrial suppliers have a responsibility to assure that users of Delta water ultimately have a safe and reliable supply of water. In the protection of this beneficial use, all alternative methods of achieving that protection or attaining a particular standard should be evaluated including the construction of Delta facilities. That evaluation must, of course, include an analysis of the impact of that protection or the attainment of alternative standards to other beneficial uses. We note, that as presented in the various results of the operation studies work group, the maintenance of high source water quality in the Delta with outflow has significant impacts to water supplies.

Western and Interior Delta Agricultural Standards

The Bureau believes that the results of the Corn Study, presented in Phase I of these hearings, supports a standard of 1.5 mmho/cm EC. The study noted that leaching may periodically be required to reduce soil salinity to below the threshold value of an adverse affect on corn yield. A study is underway to examine leaching practices and to quantify their costs and effectiveness. This study is being jointly supported by the Bureau along with the Department of Water Resources, the State Water Resources Control Board and the Central Delta Water Agency.

With respect to these and other individual standards, we suggest that the Board establish procedures by which an individual standard can be modified independently of the entire Plan as additional data becomes available, for instance when the leaching study or other similar studies relating to other standards are completed.

South Delta Agricultural Standards

Again we would reference the recommendation we made at the close of Phase I of these hearings. We still recommend that the agreement being negotiated among DWR, USBR and SDWA be completed before the Board sets standards for the South Delta and therefore would suggest that the Board not set standards at this time. The parties are very close to completion of this agreement.

By this agreement the parties will agree on the mitigation measures necessary to resolve the impact of the CVP and the SWP upon the SDWA. The initial physical facilities which will be constructed pursuant to the agreement are designed to provide adequate water levels and circulation in the South Delta. These facilities are an important first step in resolving the South Delta problem. Other measures that may be necessary will include drainage management both upstream of the South Delta and within the South Delta to meet the Stage 2 standards. An important point will be that the agreement will recognize that all water users on the San Joaquin River upstream of the South Delta have an impact and a corresponding responsibility in meeting the water requirements of South Delta agricultural users. The agreement addresses water quality and flow on the San Joaquin River by providing interim protection for the water users in the South Delta Water Agency until a permanent solution is developed according to the framework provided in the agreement.

As the agreement recognizes, the responsibility of upstream users for meeting standards developed for the South Delta will have to be determined and wrapped into the process now underway. This may prove to be a formidable task and we do not presently envision how this will be accomplished.

Striped Bass

The Bureau believes that at this point in time it would be of little use to expand striped bass spawning habitat in the San Joaquin River. Evidence indicates that under present conditions striped bass are not spawning habitat limited. The principal problems that have been identified relate to rearing habitat further downstream and to losses and dislocation caused by export pumping and in-Delta pumping. Until facilities to isolate export pumping from southern Delta channels are constructed, increasing spawning habitat is unlikely to benefit striped bass numbers. As we have mentioned before, a work group to identify and develop guidelines for the operation of cross-Delta transfer facilities is needed.

Chinook Salmon

The proposed temperature objectives for salmon protection in the Delta will require significantly large releases from storage reservoirs and may, in some circumstances, be impossible to meet. The Bureau has recently completed development of a temperature model of the Sacramento River and

2

the CVP-SWP system above the Delta. The results and verification report of this model are being submitted as WQCP USBR Exhibit 127.

These studies indicate that significant quantities of water would be required to be released from system reservoirs to meet the proposed standard of 68° in the Sacramento River at Freeport. For example, to achieve a 1°F reduction at that location during May and June could require additional releases from Shasta Dam of more than 400,000 acre-feet. A 3°F reduction could require in excess of 1,000,000 acre-feet under certain hydrologic and climatic conditions. Table 14 of USBR Exhibit 127 lists the releases, computed by the temperature model, required to meet the Freeport temperature objective in May and June. This table is based on a 56-year DWR operation study. The meeting of the objective during the July-September period would require even greater releases. In light of the quantities required, we consider it infeasible to meet these objectives with reservoir releases.

The impact of such releases to conditions upstream of the Delta later in the year would be significant. Massive springtime releases to manage Delta temperatures could result in low reservoir levels in the summer and fall. This in turn, would result in temperature problems, for example, in the American River below Folsom Dam and in the upper Sacramento River below Keswick Dam. This could adversely impact the winter, spring, and fall salmon runs on the Sacramento River and the fall run on the American River. We consider attempting to meet Delta temperature objectives with reservoir releases to be not only an impractical action but an unreasonable action.

Figures 15 and 16 of WQCP USBR Exhibit 127 compare temperature model results of two DWR operation studies: A base study and a study augmenting spring flow to reduce Freeport temperatures. The efforts to reduce Freeport temperatures in May and June (Figure 15) cause temperature increases at Red Bluff in July and August (Figure 16). The results averaged over 56 years are shown in Table 16.

These studies also evaluated the ability of upstream management actions other than increased flows to reduce Freeport temperatures. These actions included a Shasta Dam temperature control device, the bypassing of Oroville releases around Thermalito forebay and afterbay, increasing riparian shade along the entire length of the Sacramento River from Keswick Dam to Freeport by 10 percent, and eliminating the major agricultural drainage discharges to the Sacramento River in the reach from Butte Creek to Sacramento. The May and June temperature reductions were computed to be 0.7^{o}F or less for each action, and 1.5^{o}F or less for all four actions combined, based on a 56-year average (1922 - 1977) of predicted temperatures using a DWR CVP-SWP operation study. The results are summarized on Table 15. These reductions would not be sufficient to meet the proposed Freeport temperature objectives most of the time considering that maximum daily river temperatures at Freeport frequently exceed 68°F by 4°F or more during May and June.

Our modeling effort does not cover the San Joaquin River. Our knowledge of the two systems (Sacramento and San Joaquin) indicates that the capability to manage temperatures on the San Joaquin River is no greater and perhaps less than that on the Sacramento River. Our initial assessment is that these objectives are probably impossible to meet and would therefore consider it unreasonable to adopt them.

3

We believe that facilities to improve salmon passage through the Delta would be a more efficient and cost-effective alternative than massive flows and that they be studied by the Board and the Five Agency Salmon Committee.

Suisun Marsh

We are pleased to note that the Suisun Marsh Preservation Agreement and the standards within it are proposed for ultimate adoption. As stated by our attorney, the antidegradation concept as it applies to the Suisun Marsh standards is being reviewed. However, we would note that the outflow required to meet the 1978 standard is significant and was deemed unreasonable by the Board at that time. Notwithstanding that legal issue, the Bureau will be participating, to the degree appropriate with our technical staff, in the biological assessments needed for the implementation of the Suisun Marsh Preservation Agreement.

Program of Implementation. Compliance Monitoring and Special Studies

The Bureau is pleased to note the Board's clear statement on page 7-2 - Sharing the Obligation to Meet Water Quality Objectives in the Estuary. However, determining exactly how that obligation or responsibility is to be shared will be a significant task.

We note that the compliance monitoring program described in Table 7-1 is essentially the same program as contained in D-1485. We believe that a complete review of the existing program is necessary before a new or revised program is included in a water quality control plan. In fact, a review of certain elements of the current water quality and zooplankton monitoring program is presently underway as part of the Interagency Ecological Studies Program. We believe this review should be expanded into an overall assessment of the effectiveness of the monitoring program over the last two decades in meeting program objectives.

Although this monitoring program is important and necessary, from the Bureau's perspective, resolution of environmental issues associated with water project operations is the ultimate end product, not the monitoring program itself. In this present review it has been suggested that rather than modify the present program, it may be a easier task to design a new program from scratch. In doing so principal assumptions would be:

1) The monitoring program will include the entire Estuary, from upstream reservoirs in the Sacramento and San Joaquin Valleys to the Golden Gate;

2) the program will include monitoring for long-term trends of certain parameters, but should emphasize focused cause and effect studies:

3) the program would be designed to separate water project and non-water project impacts to the Estuary; and

4) the program realistically identify what can be accomplished considering available resources.

With respect to special studies, we and the other water right holders on the system do not have unlimited resources to undertake an unlimited range

4

of studies. We recommend that a process be developed for the identification and selection of studies to be undertaken and that this process be implemented within the Interagency Ecological Studies Program. This is particularly important if the responsibility, both in terms of who will actually do the study and/or who will pay for it, is to be borne by all water users.

Because of the importance of economic studies to the development of a plan that balances all beneficial uses, how those studies are done is of great concern to us. Again, as we stated in February, we do not believe that Chapter 4 of the draft plan presents an equitable and complete picture of the concerns facing the users of Bay-Delta waters. In undertaking economic evaluations or studies, careful consideration must be given to make sure that economic, financial and/or expenditure data are not misinterpreted or extended to areas where their use is improper. For instance, Section 6.3 - Economic Considerations provides a general discussion of the costs of achieving higher water quality within San Joaquin River and Delta. This discussion focuses primarily on the revenues forgone as the result of releasing water for instream uses instead of supply for the traditional water user. The problem with that type of analysis is this: The current contract rate is not the value of water, rather it is the cost necessary to repay the capital investment and interest for the construction of facilities and associated operation and maintenance costs. Because of the absence of a discussion of the value of the water to the farmers, this leaves the reader of the draft Plan with impression that this is a relative insignificant figure. It is not.

In addition, no mention has been made about the economic impact of denying or changing water service to a relatively small geographic area. Such an action to local communities, in terms of loss in agricultural production and support industries could very well be devastating, both economically and socially.

Summary

We urge the Board to establish, support, participate and ultimately rely upon the results and findings of technical work groups on specific topics. A work group concerning the identification of and development of guidelines for the operation of cross-Delta transfer facilities is clearly necessary.

Thank you for the opportunity to comment.

Jack Rowell
July 29, 1992

Bay-Delta Testimony - Phase III

We are resubmitting WQCP-USBR - Exhibit 127 as WRINT-USBR - Exhibit 30
for the record of this hearing. This exhibit documents the USBR temperature
model of the Sacramento River Basin which has been used to evaluate the
effects of CVP-SWP operations on Sacramento River temperatures at Freeport.

These studies indicate that significant quantities of water would be
required to be released from system reservoirs to meet the proposed
temperature objectives in the Sacramento River at Freeport. For example, to
achieve a 1°F reduction at that location during May and June could require
additional releases from Shasta Dam of more than 400,000 acre-feet. A 3°F
reduction could require in excess of 1,000,000 acre-feet under certain
hydrologic and climatic conditions. Table 14 of USBR exhibit 30 lists the
releases, computed by the temperature model, required to meet the Freeport
temperature objectives in May and June. This table is based on a 56-year DWR
operation study. In light of the quantities required, we consider it
infeasible to meet Delta temperature objectives with reservoir releases.

The impact of such releases on conditions upstream of the Delta later in
the year would be significant. Massive springtime releases to manage Delta
temperatures could result in low reservoir levels in the summer and fall.
This in turn, would result in temperature problems, for example, in the
American River below Folsom Dam and in the upper Sacramento River below
Keswick Dam. This could adversely impact the winter, spring and fall salmon
runs on the Sacramento River and the fall run on the American River.

Uncontrollable factors, such as climatic influences, and adverse impacts
on the other project uses including upstream fisheries would make the strategy
of attempting to meet Delta temperature objectives with reservoir releases
impractical and unreasonable.

G:\data\users\mp720c\bdelta.ph3

APPENDIX B

SELECTED OPERATIONAL SCENARIOS AND RESULTING SACRAMENTO RIVER SALMON INDEX (SRSI) VALUES

No. Years Violated With Exports = 0 in April, May and June

Proportion of Flow in Delta Cross-Channel and Georgiana Slough
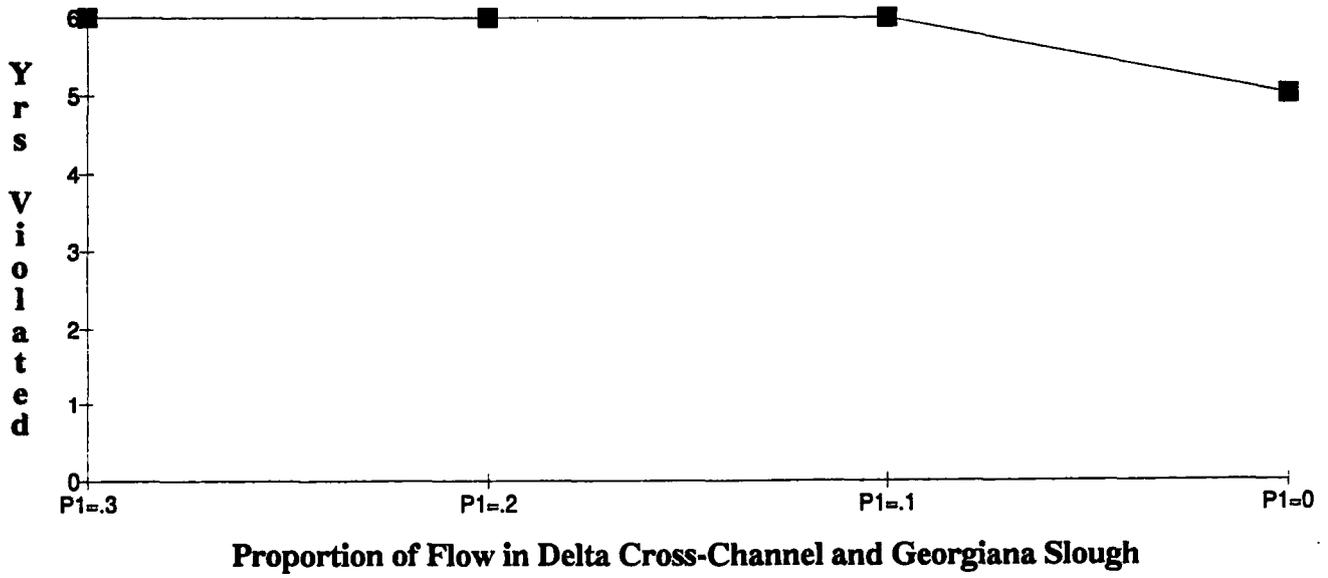
No. years standards violated with May & June exports=1000 at four P1 values
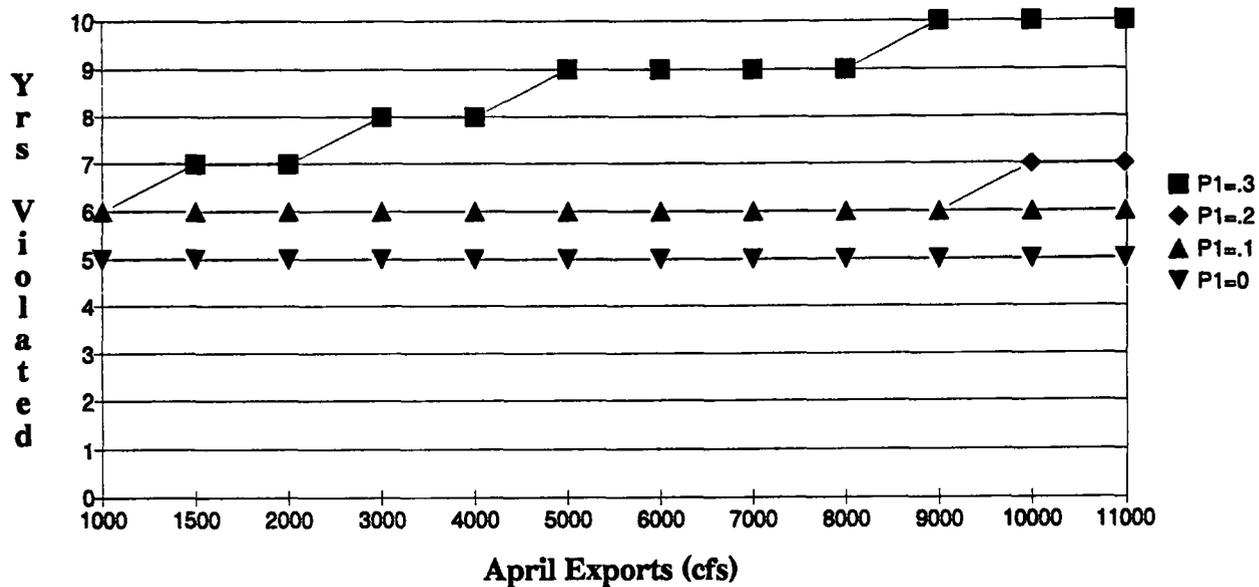
April Exports (cfs)

Yrs Violated

- ■ P1=.3
- ◆ P1=.2
- ▲ P1=.1
- ▼ P1=0

Sacramento River Salmon Smolt Survival Index

Year*	Type	Temperature (F)			Index				Standard
		April	May	June	April	May	June	Total	Met?
1962	BN	56.6	61.0	68.5	0.122	0.356	0.042	0.520	YES
1963	W	54.1	59.3	68.9	0.131	0.414	0.040	0.585	YES
1964	D	58.2	63.7	70.6	0.117	0.273	0.031	0.420	YES
1965	W	58.8	59.5	66.1	0.113	0.407	0.058	0.578	YES
1966	BN	57.6	65.9	68.0	0.119	0.213	0.045	0.377	YES
1967	W	49.8	58.1	60.9	0.152	0.448	0.099	0.700	YES
1968	BN	58.5	65.6	70.0	0.116	0.221	0.034	0.370	YES
1969	W	55.7	60.7	65.3	0.125	0.366	0.063	0.554	YES
1970	W	57.4	64.4	71.6	0.119	0.253	0.026	0.398	NO
1971	W	55.0	59.4	64.4	0.127	0.411	0.070	0.608	YES
1972	BN	58.1	65.6	69.6	0.117	0.221	0.036	0.374	YES
1973	AN	59.7	67.0	70.1	0.105	0.186	0.033	0.324	NO
1974	W	54.2	62.0	66.5	0.130	0.324	0.055	0.509	YES
1975	W	54.1	60.7	66.3	0.131	0.366	0.056	0.553	YES
1976	C	57.9	66.8	68.5	0.116	0.191	0.042	0.351	YES
1977	C	62.5	63.9	73.4	0.081	0.267	0.018	0.366	YES
1978	AN	57.1	63.0	70.0	0.120	0.293	0.034	0.447	YES
1979	BN	59.8	63.8	69.2	0.104	0.270	0.038	0.412	YES
1980	AN	57.1	63.6	66.9	0.120	0.276	0.052	0.448	YES
1981	D	61.5	66.7	71.9	0.089	0.193	0.024	0.306	NO
1982	W	54.0	61.1	66.0	0.131	0.353	0.058	0.542	YES
1983	W	55.0	60.1	69.2	0.127	0.386	0.038	0.551	YES
1984	W	59.7	66.5	68.4	0.105	0.198	0.043	0.345	NO
1985	D	62.5	65.1	70.9	0.081	0.234	0.029	0.344	YES
1986	W	59.8	65.6	71.6	0.104	0.216	0.026	0.345	NO
1987	D		70.7			0.108		0.108	N/A
1988	C	59.5	66.0	68.6	0.106	0.211	0.042	0.358	YES
1990	C	61.4	65.7	70.1	0.090	0.218	0.033	0.341	YES
1991	C	59.5	65.5	68.2	0.106	0.223	0.044	0.374	YES
1992	C	64.0	70.7	70.6	0.069	0.108	0.030	0.207	NO

Constants	
P1= 0.3	
P2= 0.7	

Exports	
April	0
May	0
June	0

Weighting	
April	0.17
May	0.65
June	0.18

Index Value	
AN	0.38
BN	0.36
C	0.29
D	0.32
W	0.45

*1989 missing due to insufficient data

Sacramento River Salmon Smolt Survival Index

Year*	Type	Temperature (F)			Index				Standard Met?
		April	May	June	April	May	June	Total	
1962	BN	56.6	61.0	68.5	0.126	0.366	0.043	0.534	YES
1963	W	54.1	59.3	68.9	0.136	0.426	0.040	0.603	YES
1964	D	58.2	63.7	70.6	0.121	0.279	0.031	0.431	YES
1965	W	58.8	59.5	66.1	0.116	0.419	0.059	0.594	YES
1966	BN	57.6	65.9	68.0	0.122	0.218	0.046	0.386	YES
1967	W	49.8	58.1	60.9	0.160	0.462	0.102	0.724	YES
1968	BN	58.5	65.6	70.0	0.119	0.225	0.034	0.379	YES
1969	W	55.7	60.7	65.3	0.129	0.376	0.065	0.570	YES
1970	W	57.4	64.4	71.6	0.123	0.259	0.026	0.408	NO
1971	W	55.0	59.4	64.4	0.132	0.422	0.072	0.626	YES
1972	BN	58.1	65.6	69.6	0.121	0.225	0.036	0.363	YES
1973	AN	59.7	67.0	70.1	0.108	0.190	0.033	0.331	NO
1974	W	54.2	62.0	66.5	0.136	0.332	0.056	0.524	YES
1975	W	54.1	60.7	66.3	0.136	0.376	0.057	0.570	YES
1976	C	57.9	66.8	68.5	0.121	0.194	0.043	0.359	YES
1977	C	62.5	63.9	73.4	0.083	0.273	0.018	0.374	YES
1978	AN	57.1	63.0	70.0	0.124	0.301	0.034	0.459	YES
1979	BN	59.8	63.8	69.2	0.107	0.276	0.039	0.422	YES
1980	AN	57.1	63.6	66.9	0.124	0.282	0.053	0.460	YES
1981	D	61.5	66.7	71.9	0.091	0.197	0.024	0.313	NO
1982	W	54.0	61.1	66.0	0.137	0.362	0.060	0.558	YES
1983	W	55.0	60.1	69.2	0.132	0.397	0.039	0.568	YES
1984	W	59.7	66.5	68.4	0.108	0.202	0.043	0.353	NO
1985	D	62.5	65.1	70.9	0.083	0.239	0.029	0.351	YES
1986	W	59.8	65.8	71.6	0.107	0.220	0.026	0.353	NO
1987	D		70.7			0.109		0.109	N/A
1988	C	59.5	66.0	68.6	0.110	0.215	0.042	0.367	YES
1990	C	61.4	65.7	70.1	0.092	0.223	0.033	0.348	YES
1991	C	59.5	65.5	68.2	0.110	0.228	0.045	0.382	YES
1992	C	64.0	70.7	70.6	0.071	0.109	0.030	0.210	NO

Constants	
P1= 0.2	
P2= 0.8	

Exports	
April	0
May	0
June	0

Weighting	
April	0.17
May	0.65
June	0.18

Index Value	
AN	0.38
BN	0.36
C	0.29
D	0.32
W	0.45

*1989 missing due to insufficient data

Sacramento River Salmon Smolt Survival Index

Year*	Type	Temperature (F)			Index				Standard Met?
		April	May	June	April	May	June	Total	
1962	BN	56.6	61.0	68.5	0.130	0.376	0.043	0.549	YES
1963	W	54.1	59.3	68.9	0.141	0.438	0.041	0.621	YES
1964	D	58.2	63.7	70.6	0.124	0.286	0.031	0.441	YES
1965	W	58.8	59.5	66.1	0.120	0.431	0.060	0.610	YES
1966	BN	57.6	65.9	68.0	0.126	0.222	0.047	0.395	YES
1967	W	49.8	58.1	60.9	0.168	0.476	0.105	0.748	YES
1968	BN	58.5	65.6	70.0	0.123	0.230	0.034	0.387	YES
1969	W	55.7	60.7	65.3	0.134	0.386	0.066	0.586	YES
1970	W	57.4	64.4	71.6	0.127	0.265	0.026	0.418	NO
1971	W	55.0	59.4	64.4	0.137	0.434	0.073	0.645	YES
1972	BN	58.1	65.6	69.6	0.124	0.230	0.037	0.391	YES
1973	AN	59.7	67.0	70.1	0.111	0.193	0.034	0.338	NO
1974	W	54.2	62.0	66.5	0.141	0.341	0.057	0.539	YES
1975	W	54.1	60.7	66.3	0.141	0.386	0.058	0.586	YES
1976	C	57.9	66.8	68.5	0.125	0.198	0.043	0.367	YES
1977	C	62.5	63.9	73.4	0.085	0.280	0.018	0.383	YES
1978	AN	57.1	63.0	70.0	0.128	0.308	0.034	0.470	YES
1979	BN	59.8	63.8	69.2	0.110	0.283	0.039	0.432	YES
1980	AN	57.1	63.6	66.9	0.128	0.289	0.054	0.471	YES
1981	D	61.5	66.7	71.9	0.094	0.201	0.025	0.319	NO
1982	W	54.0	61.1	66.0	0.142	0.372	0.061	0.575	YES
1983	W	55.0	60.1	69.2	0.137	0.408	0.039	0.584	YES
1984	W	59.7	66.5	68.4	0.111	0.206	0.044	0.361	NO
1985	D	62.5	65.1	70.9	0.085	0.244	0.030	0.359	YES
1986	W	59.8	65.8	71.6	0.110	0.225	0.026	0.360	NO
1987	D		70.7			0.110		0.110	N/A
1988	C	59.5	66.0	68.6	0.113	0.219	0.043	0.375	YES
1990	C	61.4	65.7	70.1	0.095	0.227	0.034	0.356	YES
1991	C	59.5	65.5	68.2	0.113	0.233	0.045	0.391	YES
1992	C	64.0	70.7	70.8	0.072	0.110	0.030	0.213	NO

Constants	
P1= 0.1	
P2= 0.9	

Exports	
April	0
May	0
June	0

Weighting	
April	0.17
May	0.65
June	0.18

Index Value	
AN	0.38
BN	0.36
C	0.29
D	0.32
W	0.45

*1989 missing due to insufficient data

Sacramento River Salmon Smolt Survival Index

Year*	Type	Temperature (F)			Index				Standard Met?
		April	May	June	April	May	June	Total	
1962	BN	56.6	61.0	68.5	0.134	0.385	0.044	0.564	YES
1963	W	54.1	59.3	68.9	0.147	0.450	0.042	0.639	YES
1964	D	58.2	63.7	70.6	0.128	0.293	0.031	0.452	YES
1965	W	58.8	59.5	66.1	0.123	0.442	0.061	0.626	YES
1966	BN	57.6	65.9	68.0	0.130	0.226	0.047	0.404	YES
1967	W	49.8	58.1	60.9	0.175	0.490	0.108	0.772	YES
1968	BN	58.5	65.6	70.0	0.126	0.235	0.035	0.396	YES
1969	W	55.7	60.7	65.3	0.138	0.396	0.067	0.602	YES
1970	W	57.4	64.4	71.6	0.131	0.271	0.026	0.428	NO
1971	W	55.0	59.4	64.4	0.142	0.446	0.075	0.663	YES
1972	BN	58.1	65.6	69.6	0.128	0.235	0.037	0.400	YES
1973	AN	59.7	67.0	70.1	0.114	0.197	0.034	0.344	NO
1974	W	54.2	62.0	66.5	0.146	0.349	0.058	0.554	YES
1975	W	54.1	60.7	66.3	0.147	0.396	0.060	0.603	YES
1976	C	57.9	66.8	68.5	0.129	0.202	0.044	0.375	YES
1977	C	62.5	63.9	73.4	0.087	0.286	0.018	0.391	YES
1978	AN	57.1	63.0	70.0	0.132	0.315	0.035	0.482	YES
1979	BN	59.8	63.8	69.2	0.113	0.289	0.040	0.442	YES
1980	AN	57.1	63.6	66.9	0.132	0.296	0.055	0.483	YES
1981	D	61.5	66.7	71.8	0.096	0.204	0.025	0.325	YES
1982	W	54.0	61.1	66.0	0.147	0.382	0.062	0.591	YES
1983	W	55.0	60.1	69.2	0.142	0.419	0.040	0.601	YES
1984	W	59.7	66.5	68.4	0.114	0.210	0.045	0.368	NO
1985	D	62.5	65.1	70.9	0.087	0.250	0.030	0.366	YES
1986	W	59.8	65.8	71.6	0.113	0.229	0.026	0.368	NO
1987	D		70.7			0.112		0.112	N/A
1988	C	59.5	66.0	68.6	0.116	0.224	0.043	0.383	YES
1990	C	61.4	65.7	70.1	0.097	0.232	0.034	0.363	YES
1991	C	59.5	65.5	68.2	0.116	0.238	0.046	0.400	YES
1992	C	64.0	70.7	70.8	0.074	0.112	0.030	0.216	NO

Constants	
P1= 0.0	
P2= 1.0	

Exports	
April	0
May	0
June	0

Weighting	
April	0.17
May	0.65
June	0.18

Index Value	
AN	0.38
BN	0.38
C	0.29
D	0.32
W	0.45

*1989 missing due to insufficient data

Sacramento River Salmon Smolt Survival Index

Year*	Type	Temperature (F)			Index				Standard
		April	May	June	April	May	June	Total	Met?
1962	BN	56.6	61.0	68.5	0.119	0.348	0.041	0.508	YES
1963	W	54.1	59.3	68.9	0.128	0.406	0.038	0.573	YES
1964	D	58.2	63.7	70.6	0.115	0.266	0.029	0.410	YES
1965	W	58.8	59.5	66.1	0.111	0.399	0.056	0.566	YES
1966	BN	57.6	65.9	68.0	0.116	0.207	0.044	0.367	YES
1967	W	49.8	58.1	60.9	0.149	0.440	0.097	0.686	YES
1968	BN	58.5	65.6	70.0	0.114	0.215	0.032	0.361	YES
1969	W	55.7	60.7	65.3	0.122	0.358	0.062	0.542	YES
1970	W	57.4	64.4	71.6	0.117	0.247	0.025	0.388	NO
1971	W	55.0	59.4	64.4	0.125	0.402	0.068	0.595	YES
1972	BN	58.1	65.6	69.6	0.115	0.215	0.035	0.364	YES
1973	AN	59.7	67.0	70.1	0.103	0.181	0.032	0.315	NO
1974	W	54.2	62.0	66.5	0.128	0.317	0.053	0.498	YES
1975	W	54.1	60.7	66.3	0.128	0.358	0.055	0.541	YES
1976	C	57.9	66.8	68.5	0.115	0.185	0.041	0.342	YES
1977	C	62.5	63.9	73.4	0.079	0.260	0.017	0.356	YES
1978	AN	57.1	63.0	70.0	0.118	0.286	0.032	0.437	YES
1979	BN	59.8	63.8	69.2	0.102	0.263	0.037	0.402	YES
1980	AN	57.1	63.6	66.9	0.118	0.269	0.051	0.437	YES
1981	D	61.5	66.7	71.9	0.087	0.188	0.023	0.298	NO
1982	W	54.0	61.1	66.0	0.129	0.345	0.057	0.530	YES
1983	W	55.0	60.1	69.2	0.125	0.378	0.037	0.540	YES
1984	W	59.7	66.5	68.4	0.103	0.192	0.041	0.336	NO
1985	D	62.5	65.1	70.9	0.079	0.228	0.028	0.335	YES
1986	W	59.8	65.8	71.6	0.102	0.210	0.025	0.336	NO
1987	D		70.7			0.104		0.104	N/A
1988	C	59.5	66.0	68.6	0.104	0.205	0.040	0.349	YES
1990	C	61.4	65.7	70.1	0.088	0.212	0.032	0.332	YES
1991	C	59.5	65.5	68.2	0.104	0.217	0.043	0.364	YES
1992	C	64.0	70.7	70.8	0.067	0.104	0.028	0.200	NO

Constants	
P1=	0.3
P2=	0.7

Exports	
April	1000
May	1000
June	1000

Weighting	
April	0.17
May	0.65
June	0.18

Index Value	
AN	0.38
BN	0.36
C	0.29
D	0.32
W	0.45

*1989 missing due to insufficient data

Sacramento River Salmon Smolt Survival Index

Year*	Type	Temperature (F)			Index				Standard Met?
		April	May	June	April	May	June	Total	
1962	BN	56.6	61.0	68.5	0.124	0.361	0.042	0.527	YES
1963	W	54.1	59.3	68.9	0.134	0.421	0.039	0.595	YES
1964	D	58.2	63.7	70.6	0.119	0.275	0.030	0.424	YES
1965	W	58.8	59.5	66.1	0.115	0.413	0.058	0.586	YES
1966	BN	57.6	65.9	68.0	0.121	0.214	0.045	0.379	YES
1967	W	49.8	58.1	60.9	0.158	0.456	0.101	0.715	YES
1968	BN	58.5	65.6	70.0	0.118	0.222	0.033	0.373	YES
1969	W	55.7	60.7	65.3	0.128	0.371	0.064	0.562	YES
1970	W	57.4	64.4	71.6	0.121	0.255	0.025	0.401	NO
1971	W	55.0	59.4	64.4	0.130	0.417	0.071	0.618	YES
1972	BN	58.1	65.6	69.6	0.119	0.222	0.035	0.376	YES
1973	AN	59.7	67.0	70.1	0.106	0.186	0.033	0.325	NO
1974	W	54.2	62.0	66.5	0.134	0.328	0.055	0.516	YES
1975	W	54.1	60.7	66.3	0.134	0.371	0.056	0.562	YES
1976	C	57.9	66.8	68.5	0.120	0.191	0.042	0.353	YES
1977	C	62.5	63.9	73.4	0.082	0.269	0.017	0.368	YES
1978	AN	57.1	63.0	70.0	0.122	0.296	0.033	0.452	YES
1979	BN	59.8	63.8	69.2	0.105	0.272	0.038	0.415	YES
1980	AN	57.1	63.6	66.9	0.122	0.278	0.052	0.453	YES
1981	D	61.5	66.7	71.9	0.090	0.193	0.024	0.307	NO
1982	W	54.0	61.1	66.0	0.135	0.357	0.058	0.551	YES
1983	W	55.0	60.1	69.2	0.130	0.392	0.038	0.560	YES
1984	W	59.7	66.5	68.4	0.106	0.198	0.042	0.347	NO
1985	D	62.5	65.1	70.9	0.082	0.235	0.029	0.345	YES
1986	W	59.8	65.8	71.6	0.105	0.216	0.025	0.347	NO
1987	D		70.7			0.107		0.107	N/A
1988	C	59.5	66.0	68.6	0.108	0.211	0.041	0.360	YES
1990	C	61.4	65.7	70.1	0.091	0.219	0.033	0.342	YES
1991	C	59.5	65.5	68.2	0.108	0.224	0.044	0.376	YES
1992	C	64.0	70.7	70.8	0.070	0.107	0.029	0.205	NO

Constants	
P1=	0.2
P2=	0.8

Exports	
April	1000
May	1000
June	1000

Weighting	
April	0.17
May	0.65
June	0.18

Index Value	
AN	0.38
BN	0.36
C	0.29
D	0.32
W	0.45

*1989 missing due to insufficient data

Sacramento River Salmon Smolt Survival Index

Year*	Type	Temperature (F)			Index				Standard
		April	May	June	April	May	June	Total	Met?
1962	BN	56.6	61.0	68.5	0.129	0.373	0.043	0.545	YES
1963	W	54.1	59.3	68.9	0.141	0.435	0.040	0.617	YES
1964	D	58.2	63.7	70.6	0.123	0.284	0.031	0.438	YES
1965	W	58.8	59.5	66.1	0.119	0.428	0.059	0.606	YES
1966	BN	57.6	65.9	68.0	0.125	0.220	0.046	0.392	YES
1967	W	49.8	58.1	60.9	0.167	0.473	0.104	0.744	YES
1968	BN	58.5	65.6	70.0	0.122	0.228	0.034	0.384	YES
1969	W	55.7	60.7	65.3	0.133	0.384	0.066	0.582	YES
1970	W	57.4	64.4	71.6	0.126	0.263	0.026	0.414	NO
1971	W	55.0	59.4	64.4	0.136	0.432	0.073	0.641	YES
1972	BN	58.1	65.6	69.6	0.124	0.228	0.036	0.388	YES
1973	AN	59.7	67.0	70.1	0.110	0.191	0.033	0.335	NO
1974	W	54.2	62.0	66.5	0.140	0.339	0.057	0.535	YES
1975	W	54.1	60.7	66.3	0.141	0.384	0.058	0.582	YES
1976	C	57.9	66.8	68.5	0.124	0.196	0.043	0.364	YES
1977	C	62.5	63.9	73.4	0.084	0.278	0.018	0.379	YES
1978	AN	57.1	63.0	70.0	0.127	0.306	0.034	0.467	YES
1979	BN	59.8	63.8	69.2	0.109	0.281	0.039	0.428	YES
1980	AN	57.1	63.6	66.9	0.127	0.287	0.054	0.468	YES
1981	D	61.5	66.7	71.9	0.093	0.199	0.024	0.316	NO
1982	W	54.0	61.1	66.0	0.141	0.369	0.060	0.571	YES
1983	W	55.0	60.1	69.2	0.136	0.405	0.039	0.580	YES
1984	W	59.7	66.5	68.4	0.110	0.204	0.044	0.358	NO
1985	D	62.5	65.1	70.9	0.084	0.242	0.029	0.356	YES
1986	W	59.8	65.8	71.6	0.109	0.223	0.026	0.357	NO
1987	D		70.7			0.109		0.109	N/A
1988	C	59.5	66.0	68.6	0.112	0.217	0.042	0.372	YES
1990	C	61.4	65.7	70.1	0.094	0.225	0.033	0.353	YES
1991	C	59.5	65.5	68.2	0.112	0.231	0.045	0.388	YES
1992	C	64.0	70.7	70.8	0.072	0.109	0.030	0.211	NO

Constants	
P1=	0.1
P2=	0.9

Exports	
April	1000
May	1000
June	1000

Weighting	
April	0.17
May	0.65
June	0.18

Index Value	
AN	0.38
BN	0.36
C	0.29
D	0.32
W	0.45

*1989 missing due to insufficient data

Sacramento River Salmon Smolt Survival Index

Year*	Type	Temperature (F)			Index				Standard Met?
		April	May	June	April	May	June	Total	
1962	BN	56.6	61.0	68.5	0.134	0.385	0.044	0.564	YES
1963	W	54.1	59.3	68.9	0.147	0.450	0.042	0.639	YES
1964	D	58.2	63.7	70.6	0.128	0.293	0.031	0.452	YES
1965	W	58.8	59.5	66.1	0.123	0.442	0.061	0.626	YES
1966	BN	57.6	65.9	68.0	0.130	0.226	0.047	0.404	YES
1967	W	49.8	58.1	60.9	0.175	0.490	0.108	0.772	YES
1968	BN	58.5	65.6	70.0	0.126	0.235	0.035	0.396	YES
1969	W	55.7	60.7	65.3	0.138	0.396	0.067	0.602	YES
1970	W	57.4	64.4	71.6	0.131	0.271	0.026	0.428	NO
1971	W	55.0	59.4	64.4	0.142	0.446	0.075	0.663	YES
1972	BN	58.1	65.6	69.6	0.128	0.235	0.037	0.400	YES
1973	AN	59.7	67.0	70.1	0.114	0.197	0.034	0.344	NO
1974	W	54.2	62.0	66.5	0.146	0.349	0.058	0.554	YES
1975	W	54.1	60.7	66.3	0.147	0.396	0.060	0.603	YES
1976	C	57.9	66.8	68.5	0.129	0.202	0.044	0.375	YES
1977	C	62.5	63.9	73.4	0.087	0.286	0.018	0.391	YES
1978	AN	57.1	63.0	70.0	0.132	0.315	0.035	0.482	YES
1979	BN	59.8	63.8	69.2	0.113	0.289	0.040	0.442	YES
1980	AN	57.1	63.6	66.9	0.132	0.296	0.055	0.483	YES
1981	D	61.5	66.7	71.9	0.096	0.204	0.025	0.325	YES
1982	W	54.0	61.1	66.0	0.147	0.382	0.062	0.591	YES
1983	W	55.0	60.1	69.2	0.142	0.419	0.040	0.601	YES
1984	W	59.7	66.5	68.4	0.114	0.210	0.045	0.368	NO
1985	D	62.5	65.1	70.9	0.087	0.250	0.030	0.366	YES
1986	W	59.8	65.8	71.6	0.113	0.229	0.026	0.368	NO
1987	D		70.7			0.112		0.112	N/A
1988	C	59.5	66.0	68.6	0.116	0.224	0.043	0.383	YES
1990	C	61.4	65.7	70.1	0.097	0.232	0.034	0.363	YES
1991	C	59.5	65.5	68.2	0.116	0.238	0.046	0.400	YES
1992	C	64.0	70.7	70.8	0.074	0.112	0.030	0.216	NO

Constants	
P1=	0.0
P2=	1.0

Exports	
April	1000
May	1000
June	1000

Weighting	
April	0.17
May	0.65
June	0.18

Index Value	
AN	0.38
BN	0.36
C	0.29
D	0.32
W	0.45

*1989 missing due to insufficient data

Sacramento River Salmon Smolt Survival Index

Year*	Type	Temperature (F)			Index				Standard Met?
		April	May	June	April	May	June	Total	
1962	BN	56.6	61.0	68.5	0.110	0.333	0.038	0.481	YES
1963	W	54.1	59.3	68.9	0.118	0.390	0.036	0.543	YES
1964	D	58.2	63.7	70.6	0.106	0.253	0.027	0.386	YES
1965	W	58.8	59.5	66.1	0.102	0.383	0.053	0.538	YES
1966	BN	57.6	65.9	68.0	0.107	0.196	0.041	0.344	NO
1967	W	49.8	58.1	60.9	0.137	0.422	0.093	0.653	YES
1968	BN	58.5	65.6	70.0	0.105	0.203	0.030	0.338	NO
1969	W	55.7	60.7	65.3	0.112	0.343	0.058	0.513	YES
1970	W	57.4	64.4	71.6	0.108	0.234	0.023	0.364	NO
1971	W	55.0	59.4	64.4	0.115	0.386	0.065	0.565	YES
1972	BN	58.1	65.6	69.6	0.106	0.203	0.032	0.341	NO
1973	AN	59.7	67.0	70.1	0.094	0.170	0.030	0.293	NO
1974	W	54.2	62.0	66.5	0.117	0.302	0.050	0.470	YES
1975	W	54.1	60.7	66.3	0.118	0.343	0.052	0.512	YES
1976	C	57.9	66.8	68.5	0.106	0.174	0.038	0.319	YES
1977	C	62.5	63.9	73.4	0.071	0.247	0.015	0.334	YES
1978	AN	57.1	63.0	70.0	0.108	0.273	0.030	0.411	YES
1979	BN	59.8	63.8	69.2	0.093	0.250	0.034	0.378	YES
1980	AN	57.1	63.6	66.9	0.108	0.256	0.048	0.412	YES
1981	D	61.5	66.7	71.9	0.079	0.177	0.021	0.277	NO
1982	W	54.0	61.1	66.0	0.118	0.330	0.054	0.502	YES
1983	W	55.0	60.1	69.2	0.115	0.363	0.034	0.511	YES
1984	W	59.7	66.5	68.4	0.094	0.181	0.039	0.314	NO
1985	D	62.5	65.1	70.9	0.071	0.216	0.026	0.313	NO
1986	W	59.8	65.8	71.6	0.093	0.198	0.023	0.314	NO
1987	D		70.7			0.096		0.096	N/A
1988	C	59.5	66.0	68.6	0.096	0.193	0.037	0.327	YES
1990	C	61.4	65.7	70.1	0.080	0.201	0.030	0.310	YES
1991	C	59.5	65.5	68.2	0.096	0.206	0.040	0.341	YES
1992	C	64.0	70.7	70.8	0.061	0.096	0.026	0.183	NO

Constants	
P1=	0.3
P2=	0.7

Exports	
April	5000
May	3000
June	3000

Weighting	
April	0.17
May	0.65
June	0.18

Index Value	
AN	0.38
BN	0.36
C	0.29
D	0.32
W	0.45

*1989 missing due to insufficient data

Sacramento River Salmon Smolt Survival Index

Year*	Type	Temperature (F)			Index				Standard Met?
		April	May	June	April	May	June	Total	
1962	BN	56.6	61.0	68.5	0.118	0.351	0.040	0.509	YES
1963	W	54.1	59.3	68.9	0.127	0.410	0.038	0.575	YES
1964	D	58.2	63.7	70.6	0.113	0.266	0.029	0.408	YES
1965	W	58.8	59.5	66.1	0.109	0.403	0.056	0.567	YES
1966	BN	57.6	65.9	68.0	0.115	0.206	0.043	0.364	YES
1967	W	49.8	58.1	60.9	0.150	0.445	0.098	0.693	YES
1968	BN	58.5	65.6	70.0	0.112	0.214	0.032	0.357	NO
1969	W	55.7	60.7	65.3	0.121	0.361	0.061	0.543	YES
1970	W	57.4	64.4	71.6	0.115	0.246	0.024	0.385	NO
1971	W	55.0	59.4	64.4	0.124	0.406	0.068	0.598	YES
1972	BN	58.1	65.6	69.6	0.113	0.214	0.034	0.361	YES
1973	AN	59.7	67.0	70.1	0.101	0.179	0.031	0.310	NO
1974	W	54.2	62.0	66.5	0.127	0.318	0.053	0.498	YES
1975	W	54.1	60.7	66.3	0.127	0.361	0.054	0.542	YES
1976	C	57.9	66.8	68.5	0.114	0.183	0.040	0.337	YES
1977	C	62.5	63.9	73.4	0.077	0.260	0.016	0.353	YES
1978	AN	57.1	63.0	70.0	0.116	0.287	0.032	0.435	YES
1979	BN	59.8	63.8	69.2	0.100	0.263	0.036	0.399	YES
1980	AN	57.1	63.6	66.9	0.116	0.269	0.050	0.435	YES
1981	D	61.5	66.7	71.9	0.085	0.186	0.022	0.293	NO
1982	W	54.0	61.1	66.0	0.128	0.347	0.056	0.531	YES
1983	W	55.0	60.1	69.2	0.124	0.381	0.036	0.541	YES
1984	W	59.7	66.5	68.4	0.101	0.191	0.041	0.332	NO
1985	D	62.5	65.1	70.9	0.077	0.227	0.027	0.331	YES
1986	W	59.8	65.8	71.6	0.100	0.208	0.024	0.332	NO
1987	D		70.7			0.101		0.101	N/A
1988	C	59.5	66.0	68.6	0.102	0.203	0.039	0.345	YES
1990	C	61.4	65.7	70.1	0.086	0.211	0.031	0.328	YES
1991	C	59.5	65.5	68.2	0.102	0.216	0.042	0.361	YES
1992	C	64.0	70.7	70.8	0.065	0.101	0.028	0.194	NO

Constants	
P1= 0.2	
P2= 0.8	

Weighting	
April	0.17
May	0.65
June	0.18

Index Value	
AN	0.38
BN	0.36
C	0.29
D	0.32
W	0.45

Exports	
April	5000
May	3000
June	3000

*1989 missing due to insufficient data

Sacramento River Salmon Smolt Survival Index

Year*	Type	Temperature (F)			Index				Standard
		April	May	June	April	May	June	Total	Met?
1962	BN	56.6	61.0	68.5	0.126	0.368	0.042	0.536	YES
1963	W	54.1	59.3	68.9	0.137	0.430	0.040	0.607	YES
1964	D	58.2	63.7	70.6	0.120	0.279	0.030	0.430	YES
1965	W	58.8	59.5	66.1	0.116	0.422	0.058	0.597	YES
1966	BN	57.6	65.9	68.0	0.122	0.216	0.045	0.384	YES
1967	W	49.8	58.1	60.9	0.163	0.467	0.103	0.733	YES
1968	BN	58.5	65.6	70.0	0.119	0.224	0.033	0.377	YES
1969	W	55.7	60.7	65.3	0.130	0.379	0.064	0.573	YES
1970	W	57.4	64.4	71.6	0.123	0.258	0.025	0.406	NO
1971	W	55.0	59.4	64.4	0.133	0.426	0.072	0.631	YES
1972	BN	58.1	65.6	69.6	0.121	0.224	0.035	0.380	YES
1973	AN	59.7	67.0	70.1	0.107	0.188	0.033	0.327	NO
1974	W	54.2	62.0	66.5	0.137	0.334	0.055	0.526	YES
1975	W	54.1	60.7	66.3	0.137	0.379	0.057	0.573	YES
1976	C	57.9	66.8	68.5	0.121	0.193	0.042	0.356	YES
1977	C	62.5	63.9	73.4	0.082	0.273	0.017	0.372	YES
1978	AN	57.1	63.0	70.0	0.124	0.301	0.033	0.459	YES
1979	BN	59.8	63.8	69.2	0.106	0.276	0.038	0.420	YES
1980	AN	57.1	63.6	66.9	0.124	0.282	0.053	0.459	YES
1981	D	61.5	66.7	71.9	0.090	0.195	0.024	0.309	NO
1982	W	54.0	61.1	66.0	0.138	0.364	0.059	0.561	YES
1983	W	55.0	60.1	69.2	0.133	0.400	0.038	0.571	YES
1984	W	59.7	66.5	68.4	0.107	0.200	0.043	0.350	NO
1985	D	62.5	65.1	70.9	0.082	0.238	0.028	0.348	YES
1986	W	59.8	65.8	71.6	0.106	0.219	0.025	0.350	NO
1987	D		70.7			0.106		0.106	N/A
1988	C	59.5	66.0	68.6	0.109	0.213	0.041	0.364	YES
1990	C	61.4	65.7	70.1	0.091	0.222	0.033	0.346	YES
1991	C	59.5	65.5	68.2	0.109	0.227	0.044	0.380	YES
1992	C	64.0	70.7	70.8	0.070	0.106	0.029	0.205	NO

Constants	
P1= 0.1	
P2= 0.9	

Weighting	
April	0.17
May	0.65
June	0.18

Index Value	
AN	0.38
BN	0.36
C	0.29
D	0.32
W	0.45

Exports	
April	5000
May	3000
June	3000

*1989 missing due to insufficient data

Sacramento River Salmon Smolt Survival Index

Year*	Type	Temperature (F)			Index				Standard Met?
		April	May	June	April	May	June	Total	
1962	BN	56.6	61.0	68.5	0.134	0.385	0.044	0.564	YES
1963	W	54.1	59.3	68.9	0.147	0.450	0.042	0.639	YES
1964	D	58.2	63.7	70.6	0.128	0.293	0.031	0.452	YES
1965	W	58.8	59.5	66.1	0.123	0.442	0.061	0.626	YES
1966	BN	57.6	65.9	68.0	0.130	0.226	0.047	0.404	YES
1967	W	49.8	58.1	60.9	0.175	0.490	0.108	0.772	YES
1968	BN	58.5	65.6	70.0	0.126	0.235	0.035	0.396	YES
1969	W	55.7	60.7	65.3	0.138	0.396	0.067	0.602	YES
1970	W	57.4	64.4	71.6	0.131	0.271	0.026	0.428	NO
1971	W	55.0	59.4	64.4	0.142	0.446	0.075	0.663	YES
1972	BN	58.1	65.6	69.6	0.128	0.235	0.037	0.400	YES
1973	AN	59.7	67.0	70.1	0.114	0.197	0.034	0.344	NO
1974	W	54.2	62.0	66.5	0.146	0.349	0.058	0.554	YES
1975	W	54.1	60.7	66.3	0.147	0.396	0.060	0.603	YES
1976	C	57.9	66.8	68.5	0.129	0.202	0.044	0.375	YES
1977	C	62.5	63.9	73.4	0.087	0.286	0.018	0.391	YES
1978	AN	57.1	63.0	70.0	0.132	0.315	0.035	0.482	YES
1979	BN	59.8	63.8	69.2	0.113	0.289	0.040	0.442	YES
1980	AN	57.1	63.6	66.9	0.132	0.296	0.055	0.483	YES
1981	D	61.5	66.7	71.9	0.096	0.204	0.025	0.325	YES
1982	W	54.0	61.1	66.0	0.147	0.382	0.062	0.591	YES
1983	W	55.0	60.1	69.2	0.142	0.419	0.040	0.601	YES
1984	W	59.7	66.5	68.4	0.114	0.210	0.045	0.368	NO
1985	D	62.5	65.1	70.9	0.087	0.250	0.030	0.366	YES
1986	W	59.8	65.8	71.6	0.113	0.229	0.026	0.368	NO
1987	D		70.7			0.112		0.112	N/A
1988	C	59.5	66.0	68.6	0.116	0.224	0.043	0.383	YES
1990	C	61.4	65.7	70.1	0.097	0.232	0.034	0.363	YES
1991	C	59.5	65.5	68.2	0.116	0.238	0.046	0.400	YES
1992	C	64.0	70.7	70.8	0.074	0.112	0.030	0.216	NO

Constants	
P1= 0.0	
P2= 1.0	

Exports	
April	5000
May	3000
June	3000

Weighting	
April	0.17
May	0.65
June	0.18

Index Value	
AN	0.38
BN	0.36
C	0.29
D	0.32
W	0.45

*1989 missing due to insufficient data

Sacramento River Salmon Smolt Survival Index

Year*	Type	Temperature (F)			Index				Standard Met?
		April	May	June	April	May	June	Total	
1962	BN	56.6	61.0	68.5	0.108	0.345	0.038	0.491	YES
1963	W	54.1	59.3	68.9	0.116	0.402	0.036	0.554	YES
1964	D	58.2	63.7	70.6	0.105	0.263	0.027	0.395	YES
1965	W	58.8	59.5	66.1	0.101	0.395	0.053	0.549	YES
1966	BN	57.6	65.9	68.0	0.106	0.204	0.041	0.351	NO
1967	W	49.8	58.1	60.9	0.136	0.435	0.093	0.664	YES
1968	BN	58.5	65.6	70.0	0.104	0.212	0.030	0.346	NO
1969	W	55.7	60.7	65.3	0.111	0.354	0.058	0.524	YES
1970	W	57.4	64.4	71.6	0.106	0.243	0.023	0.372	NO
1971	W	55.0	59.4	64.4	0.113	0.398	0.065	0.576	YES
1972	BN	58.1	65.6	69.6	0.105	0.212	0.032	0.349	NO
1973	AN	59.7	67.0	70.1	0.093	0.178	0.030	0.300	NO
1974	W	54.2	62.0	66.5	0.116	0.313	0.050	0.479	YES
1975	W	54.1	60.7	66.3	0.116	0.354	0.052	0.522	YES
1976	C	57.9	66.8	68.5	0.105	0.183	0.038	0.326	YES
1977	C	62.5	63.9	73.4	0.071	0.257	0.015	0.343	YES
1978	AN	57.1	63.0	70.0	0.107	0.283	0.030	0.420	YES
1979	BN	59.8	63.8	69.2	0.092	0.260	0.034	0.386	YES
1980	AN	57.1	63.6	66.9	0.107	0.266	0.048	0.420	YES
1981	D	61.5	66.7	71.9	0.078	0.185	0.021	0.284	NO
1982	W	54.0	61.1	66.0	0.117	0.341	0.054	0.512	YES
1983	W	55.0	60.1	69.2	0.113	0.374	0.034	0.522	YES
1984	W	59.7	66.5	68.4	0.093	0.190	0.039	0.321	NO
1985	D	62.5	65.1	70.9	0.071	0.225	0.026	0.321	YES
1986	W	59.8	65.8	71.6	0.092	0.207	0.023	0.322	NO
1987	D		70.7			0.102		0.102	N/A
1988	C	59.5	66.0	68.6	0.095	0.202	0.037	0.334	YES
1990	C	61.4	65.7	70.1	0.079	0.209	0.030	0.318	YES
1991	C	59.5	65.5	68.2	0.095	0.214	0.040	0.349	YES
1992	C	64.0	70.7	70.8	0.060	0.102	0.026	0.188	NO

Constants	
P1= 0.3	
P2= 0.7	

Weighting	
April	0.17
May	0.65
June	0.18

Index Value	
AN	0.38
BN	0.36
C	0.29
D	0.32
W	0.45

Exports	
April	5500
May	1500
June	3000

*1989 missing due to insufficient data

Sacramento River Salmon Smolt Survival Index

Year*	Type	Temperature (F)			Index				Standard Met?
		April	May	June	April	May	June	Total	
1962	BN	56.6	61.0	68.5	0.117	0.358	0.040	0.515	YES
1963	W	54.1	59.3	68.9	0.127	0.418	0.036	0.582	YES
1964	D	58.2	63.7	70.6	0.112	0.273	0.029	0.414	YES
1965	W	56.8	59.5	66.1	0.108	0.411	0.056	0.575	YES
1966	BN	57.6	65.9	68.0	0.114	0.212	0.043	0.369	YES
1967	W	49.8	58.1	60.9	0.149	0.453	0.098	0.700	YES
1968	BN	58.5	65.6	70.0	0.111	0.220	0.032	0.362	YES
1969	W	55.7	60.7	65.3	0.120	0.368	0.061	0.550	YES
1970	W	57.4	64.4	71.6	0.115	0.252	0.024	0.391	NO
1971	W	55.0	59.4	64.4	0.123	0.414	0.068	0.605	YES
1972	BN	56.1	65.6	69.6	0.113	0.220	0.034	0.366	YES
1973	AN	59.7	67.0	70.1	0.100	0.184	0.031	0.315	NO
1974	W	54.2	62.0	66.5	0.126	0.325	0.053	0.504	YES
1975	W	54.1	60.7	66.3	0.127	0.368	0.054	0.549	YES
1976	C	57.9	66.8	68.5	0.113	0.189	0.040	0.342	YES
1977	C	62.5	68.9	73.4	0.076	0.267	0.016	0.359	YES
1978	AN	57.1	63.0	70.0	0.115	0.294	0.032	0.441	YES
1979	BN	59.8	63.8	69.2	0.099	0.270	0.036	0.405	YES
1980	AN	57.1	63.6	66.9	0.115	0.276	0.050	0.441	YES
1981	D	61.5	66.7	71.9	0.094	0.191	0.022	0.296	NO
1982	W	54.0	61.1	66.0	0.127	0.355	0.056	0.538	YES
1983	W	55.0	60.1	69.2	0.123	0.389	0.036	0.548	YES
1984	W	59.7	66.5	68.4	0.100	0.196	0.041	0.337	NO
1985	D	62.5	65.1	70.9	0.076	0.233	0.027	0.336	YES
1986	W	59.8	65.8	71.6	0.099	0.214	0.024	0.337	NO
1987	D		70.7			0.105		0.105	N/A
1988	C	59.5	66.0	68.6	0.102	0.209	0.039	0.350	YES
1990	C	61.4	65.7	70.1	0.085	0.217	0.031	0.333	YES
1991	C	59.5	65.5	68.2	0.102	0.222	0.042	0.366	YES
1992	C	64.0	70.7	70.8	0.065	0.105	0.028	0.197	NO

Constants	
P1= 0.2	
P2= 0.8	

Exports	
April	5500
May	1500
June	3000

Weighting	
April	0.17
May	0.65
June	0.18

Index Value	
AN	0.38
BN	0.38
C	0.29
D	0.32
W	0.45

*1989 missing due to insufficient data

Sacramento River Salmon Smolt Survival Index

Year*	Type	Temperature (F)			Index				Standard Met?
		April	May	June	April	May	June	Total	
1962	BN	56.6	61.0	68.5	0.126	0.372	0.042	0.539	YES
1963	W	54.1	59.3	68.9	0.137	0.434	0.040	0.610	YES
1964	D	58.2	63.7	70.6	0.120	0.283	0.030	0.433	YES
1965	W	58.8	59.5	66.1	0.116	0.427	0.058	0.601	YES
1966	BN	57.6	65.9	68.0	0.122	0.219	0.045	0.386	YES
1967	W	49.8	58.1	60.9	0.162	0.471	0.103	0.736	YES
1968	BN	58.5	65.6	70.0	0.119	0.227	0.033	0.379	YES
1969	W	55.7	60.7	65.3	0.129	0.382	0.064	0.576	YES
1970	W	57.4	64.4	71.6	0.123	0.262	0.025	0.409	NO
1971	W	55.0	59.4	64.4	0.132	0.430	0.072	0.634	YES
1972	BN	58.1	65.6	69.6	0.120	0.227	0.035	0.383	YES
1973	AN	59.7	67.0	70.1	0.107	0.190	0.033	0.330	NO
1974	W	54.2	62.0	66.5	0.136	0.337	0.055	0.529	YES
1975	W	54.1	60.7	66.3	0.137	0.382	0.057	0.576	YES
1976	C	57.9	66.8	68.5	0.121	0.195	0.042	0.358	YES
1977	C	62.5	63.9	73.4	0.081	0.277	0.017	0.375	YES
1978	AN	57.1	63.0	70.0	0.124	0.305	0.033	0.462	YES
1979	BN	59.8	63.8	69.2	0.106	0.280	0.038	0.423	YES
1980	AN	57.1	63.6	66.9	0.124	0.286	0.053	0.462	YES
1981	D	61.5	66.7	71.9	0.090	0.198	0.024	0.312	NO
1982	W	54.0	61.1	66.0	0.137	0.368	0.059	0.564	YES
1983	W	55.0	60.1	69.2	0.132	0.404	0.038	0.574	YES
1984	W	59.7	66.5	68.4	0.107	0.203	0.043	0.353	NO
1985	D	62.5	65.1	70.9	0.081	0.241	0.028	0.351	YES
1986	W	59.8	65.8	71.6	0.106	0.222	0.025	0.353	NO
1987	D		70.7			0.108		0.108	N/A
1988	C	59.5	66.0	68.6	0.109	0.216	0.041	0.367	YES
1990	C	61.4	65.7	70.1	0.091	0.225	0.033	0.348	YES
1991	C	59.5	65.5	68.2	0.109	0.230	0.044	0.383	YES
1992	C	64.0	70.7	70.8	0.069	0.108	0.029	0.207	NO

Constants	
P1= 0.1	
P2= 0.9	

Exports	
April	5500
May	1500
June	3000

Weighting	
April	0.17
May	0.65
June	0.18

Index Value	
AN	0.39
BN	0.36
C	0.29
D	0.32
W	0.45

*1989 missing due to insufficient data

Sacramento River Salmon Smolt Survival Index

Year*	Type	Temperature (F)			Index				Standard
		April	May	June	April	May	June	Total	Met?
1962	BN	56.6	61.0	68.5	0.134	0.385	0.044	0.564	YES
1963	W	54.1	59.3	68.9	0.147	0.450	0.042	0.639	YES
1964	D	58.2	63.7	70.6	0.126	0.293	0.031	0.452	YES
1965	W	58.8	59.5	66.1	0.123	0.442	0.061	0.626	YES
1966	BN	57.6	65.9	68.0	0.130	0.226	0.047	0.404	YES
1967	W	49.8	58.1	60.9	0.175	0.490	0.108	0.772	YES
1968	BN	58.5	65.6	70.0	0.126	0.235	0.035	0.396	YES
1969	W	55.7	60.7	65.3	0.138	0.396	0.067	0.602	YES
1970	W	57.4	64.4	71.6	0.131	0.271	0.026	0.428	NO
1971	W	55.0	59.4	64.4	0.142	0.446	0.075	0.663	YES
1972	BN	58.1	65.6	69.6	0.128	0.235	0.037	0.400	YES
1973	AN	59.7	67.0	70.1	0.114	0.197	0.034	0.344	NO
1974	W	54.2	62.0	66.5	0.146	0.349	0.058	0.554	YES
1975	W	54.1	60.7	66.3	0.147	0.396	0.060	0.603	YES
1976	C	57.9	66.8	68.5	0.129	0.202	0.044	0.375	YES
1977	C	62.5	63.9	73.4	0.097	0.286	0.018	0.391	YES
1978	AN	57.1	63.0	70.0	0.132	0.315	0.035	0.482	YES
1979	BN	59.8	63.8	69.2	0.113	0.289	0.040	0.442	YES
1980	AN	57.1	63.6	66.9	0.132	0.296	0.055	0.483	YES
1981	D	61.5	66.7	71.9	0.096	0.204	0.025	0.325	YES
1982	W	54.0	61.1	66.0	0.147	0.382	0.062	0.591	YES
1983	W	55.0	60.1	69.2	0.142	0.419	0.040	0.601	YES
1984	W	59.7	66.5	68.4	0.114	0.210	0.045	0.368	NO
1985	D	62.5	65.1	70.9	0.087	0.250	0.030	0.366	YES
1986	W	59.8	65.8	71.6	0.113	0.229	0.026	0.368	NO
1987	D		70.7			0.112		0.112	N/A
1988	C	59.5	66.0	68.6	0.116	0.224	0.043	0.383	YES
1990	C	61.4	65.7	70.1	0.097	0.232	0.034	0.363	YES
1991	C	59.5	65.5	68.2	0.116	0.238	0.046	0.400	YES
1992	C	64.0	70.7	70.8	0.074	0.112	0.030	0.216	NO

Constants	
P1=	0.0
P2=	1.0

Weighting	
April	0.17
May	0.65
June	0.18

Index Value	
AN	0.38
BN	0.36
C	0.29
D	0.32
W	0.45

Exports	
April	5500
May	1500
June	3000

*1989 missing due to insufficient data

Sacramento River Salmon Smolt Survival Index

Year*	Type	Temperature (F)			Index				Standard Met?
		April	May	June	April	May	June	Total	
1962	BN	56.6	61.0	68.5	0.117	0.336	0.040	0.493	YES
1963	W	54.1	59.3	68.9	0.127	0.393	0.038	0.558	YES
1964	D	58.2	63.7	70.6	0.112	0.253	0.029	0.394	YES
1965	W	58.8	59.5	66.1	0.109	0.386	0.056	0.550	YES
1966	BN	57.6	65.9	68.0	0.114	0.194	0.043	0.351	NO
1967	W	49.8	58.1	60.9	0.149	0.428	0.098	0.675	YES
1968	BN	58.5	65.6	70.0	0.111	0.202	0.032	0.345	NO
1969	W	55.7	60.7	65.3	0.120	0.345	0.061	0.527	YES
1970	W	57.4	64.4	71.6	0.115	0.233	0.024	0.372	NO
1971	W	55.0	59.4	64.4	0.123	0.390	0.068	0.581	YES
1972	BN	58.1	65.6	69.6	0.113	0.202	0.034	0.348	NO
1973	AN	59.7	67.0	70.1	0.100	0.168	0.031	0.299	NO
1974	W	54.2	62.0	66.5	0.126	0.304	0.053	0.483	YES
1975	W	54.1	60.7	66.3	0.127	0.345	0.054	0.526	YES
1976	C	57.9	66.8	68.5	0.113	0.172	0.040	0.325	YES
1977	C	62.5	63.9	73.4	0.076	0.247	0.016	0.340	YES
1978	AN	57.1	63.0	70.0	0.115	0.273	0.032	0.420	YES
1979	BN	59.8	63.8	69.2	0.099	0.250	0.036	0.385	YES
1980	AN	57.1	63.6	66.9	0.115	0.256	0.050	0.421	YES
1981	D	61.5	66.7	71.9	0.084	0.175	0.022	0.281	NO
1982	W	54.0	61.1	66.0	0.127	0.332	0.056	0.516	YES
1983	W	55.0	60.1	69.2	0.123	0.366	0.036	0.524	YES
1984	W	59.7	66.5	68.4	0.100	0.180	0.041	0.320	NO
1985	D	62.5	65.1	70.9	0.076	0.215	0.027	0.318	NO
1986	W	59.8	65.8	71.6	0.099	0.197	0.024	0.320	NO
1987	D		70.7			0.093		0.093	N/A
1988	C	59.5	66.0	68.6	0.102	0.192	0.039	0.333	YES
1990	C	61.4	65.7	70.1	0.085	0.199	0.031	0.315	YES
1991	C	59.5	65.5	68.2	0.102	0.204	0.042	0.348	YES
1992	C	64.0	70.7	70.8	0.065	0.093	0.028	0.185	NO

Constants	
P1= 0.2	
P2= 0.6	

Exports	
April	5500
May	6000
June	3000

Weighting	
April	0.17
May	0.65
June	0.18

Index Value	
AN	0.36
BN	0.36
C	0.29
D	0.32
W	0.45

*1989 missing due to insufficient data

Sacramento River Salmon Smolt Survival Index

Year*	Type	Temperature (F)			Index				Standard Met?
		April	May	June	April	May	June	Total	
1962	BN	56.6	61.0	68.5	0.126	0.360	0.042	0.528	YES
1963	W	54.1	59.3	68.9	0.137	0.422	0.040	0.598	YES
1964	D	58.2	63.7	70.6	0.120	0.273	0.030	0.423	YES
1965	W	58.8	59.5	66.1	0.116	0.414	0.058	0.588	YES
1966	BN	57.6	65.9	68.0	0.122	0.210	0.045	0.378	YES
1967	W	49.8	58.1	60.9	0.162	0.459	0.103	0.723	YES
1968	BN	58.5	65.6	70.0	0.119	0.218	0.033	0.370	YES
1969	W	55.7	60.7	65.3	0.129	0.371	0.064	0.565	YES
1970	W	57.4	64.4	71.6	0.123	0.252	0.025	0.400	NO
1971	W	55.0	59.4	64.4	0.132	0.418	0.072	0.622	YES
1972	BN	58.1	65.6	69.6	0.120	0.218	0.035	0.374	YES
1973	AN	59.7	67.0	70.1	0.107	0.182	0.033	0.322	NO
1974	W	54.2	62.0	66.5	0.136	0.327	0.055	0.518	YES
1975	W	54.1	60.7	66.3	0.137	0.371	0.057	0.564	YES
1976	C	57.9	66.8	68.5	0.121	0.187	0.042	0.350	YES
1977	C	62.5	63.9	73.4	0.081	0.267	0.017	0.365	YES
1978	AN	57.1	63.0	70.0	0.124	0.294	0.033	0.451	YES
1979	BN	59.8	63.8	69.2	0.106	0.270	0.038	0.413	YES
1980	AN	57.1	63.6	66.9	0.124	0.276	0.053	0.452	YES
1981	D	61.5	66.7	71.9	0.090	0.190	0.024	0.303	NO
1982	W	54.0	61.1	66.0	0.137	0.357	0.059	0.553	YES
1983	W	55.0	60.1	69.2	0.132	0.392	0.038	0.563	YES
1984	W	59.7	66.5	68.4	0.107	0.195	0.043	0.344	NO
1985	D	62.5	65.1	70.9	0.081	0.232	0.028	0.342	YES
1986	W	59.8	65.8	71.6	0.106	0.213	0.025	0.344	NO
1987	D		70.7			0.102		0.102	N/A
1988	C	59.5	66.0	68.6	0.109	0.208	0.041	0.358	YES
1990	C	61.4	65.7	70.1	0.091	0.216	0.033	0.339	YES
1991	C	59.5	65.5	68.2	0.109	0.221	0.044	0.374	YES
1992	C	64.0	70.7	70.8	0.069	0.102	0.029	0.200	NO

Constants	
P1= 0.1	
P2= 0.9	

Exports	
April	5500
May	6000
June	3000

Weighting	
April	0.17
May	0.65
June	0.18

Index Value	
AN	0.38
BN	0.36
C	0.29
D	0.32
W	0.45

*1989 missing due to insufficient data

Sacramento River Salmon Smolt Survival Index

Year*	Type	Temperature (F)			Index				Standard
		April	May	June	April	May	June	Total	Met?
1962	BN	56.6	61.0	68.5	0.134	0.385	0.044	0.564	YES
1963	W	54.1	59.3	68.9	0.147	0.450	0.042	0.639	YES
1964	D	58.2	63.7	70.6	0.128	0.293	0.031	0.452	YES
1965	W	58.8	59.5	66.1	0.128	0.442	0.061	0.626	YES
1966	BN	57.6	65.9	68.0	0.130	0.226	0.047	0.404	YES
1967	W	49.8	58.1	60.9	0.175	0.490	0.108	0.772	YES
1968	BN	58.5	65.6	70.0	0.126	0.235	0.035	0.396	YES
1969	W	55.7	60.7	65.3	0.138	0.396	0.067	0.602	YES
1970	W	57.4	64.4	71.6	0.131	0.271	0.026	0.428	NO
1971	W	55.0	59.4	64.4	0.142	0.446	0.075	0.663	YES
1972	BN	58.1	65.6	69.6	0.128	0.235	0.037	0.400	YES
1973	AN	59.7	67.0	70.1	0.114	0.197	0.034	0.344	NO
1974	W	54.2	62.0	66.5	0.146	0.349	0.058	0.554	YES
1975	W	54.1	60.7	66.3	0.147	0.396	0.060	0.603	YES
1976	C	57.9	66.8	68.5	0.129	0.202	0.044	0.375	YES
1977	C	62.5	63.9	73.4	0.087	0.286	0.018	0.391	YES
1978	AN	57.1	63.0	70.0	0.132	0.315	0.035	0.482	YES
1979	BN	59.8	63.8	69.2	0.113	0.289	0.040	0.442	YES
1980	AN	57.1	63.6	66.9	0.132	0.296	0.055	0.483	YES
1981	D	61.5	66.7	71.9	0.096	0.204	0.025	0.325	YES
1982	W	54.0	61.1	66.0	0.147	0.382	0.062	0.591	YES
1983	W	55.0	60.1	69.2	0.142	0.419	0.040	0.601	YES
1984	W	59.7	66.5	68.4	0.114	0.210	0.045	0.368	NO
1985	D	62.5	65.1	70.9	0.087	0.250	0.030	0.366	YES
1986	W	59.8	65.8	71.6	0.113	0.229	0.026	0.368	NO
1987	D		70.7			0.112		0.112	N/A
1988	C	59.5	66.0	68.6	0.116	0.224	0.043	0.383	YES
1990	C	61.4	65.7	70.1	0.097	0.232	0.034	0.363	YES
1991	C	59.5	65.5	69.2	0.116	0.238	0.046	0.400	YES
1992	C	64.0	70.7	70.8	0.074	0.112	0.030	0.216	NO

Constants	
P1=	0.0
P2=	1.0

Weighting	
April	0.17
May	0.65
June	0.18

Index Value	
AN	0.38
BN	0.36
C	0.29
D	0.32
W	0.45

Exports	
April	5500
May	6000
June	3000

*1989 missing due to insufficient data

Sacramento River Salmon Smolt Survival Index

Year*	Type	Temperature (F)			Index				Standard
		April	May	June	April	May	June	Total	Met?
1962	BN	56.6	61.0	68.5	0.102	0.348	0.041	0.492	YES
1963	W	54.1	59.3	68.9	0.110	0.406	0.038	0.554	YES
1964	D	58.2	63.7	70.6	0.099	0.266	0.029	0.395	YES
1965	W	58.8	59.5	66.1	0.096	0.399	0.056	0.550	YES
1966	BN	57.6	65.9	68.0	0.100	0.207	0.044	0.351	NO
1967	W	49.8	58.1	60.9	0.128	0.440	0.097	0.665	YES
1968	BN	58.5	65.6	70.0	0.098	0.215	0.032	0.345	NO
1969	W	55.7	60.7	65.3	0.105	0.358	0.062	0.525	YES
1970	W	57.4	64.4	71.6	0.101	0.247	0.025	0.372	NO
1971	W	55.0	59.4	64.4	0.107	0.402	0.068	0.578	YES
1972	BN	58.1	65.6	69.6	0.099	0.215	0.035	0.349	NO
1973	AN	59.7	67.0	70.1	0.088	0.181	0.032	0.300	NO
1974	W	54.2	62.0	66.5	0.110	0.317	0.053	0.479	YES
1975	W	54.1	60.7	66.3	0.110	0.358	0.055	0.523	YES
1976	C	57.9	66.8	68.5	0.100	0.185	0.041	0.326	YES
1977	C	62.5	63.9	73.4	0.066	0.260	0.017	0.344	YES
1978	AN	57.1	63.0	70.0	0.101	0.286	0.032	0.420	YES
1979	BN	59.8	63.8	69.2	0.087	0.263	0.037	0.387	YES
1980	AN	57.1	63.6	66.9	0.101	0.269	0.051	0.421	YES
1981	D	61.5	66.7	71.9	0.073	0.188	0.023	0.284	NO
1982	W	54.0	61.1	66.0	0.110	0.345	0.057	0.512	YES
1983	W	55.0	60.1	69.2	0.107	0.378	0.037	0.522	YES
1984	W	59.7	66.5	68.4	0.088	0.192	0.041	0.322	NO
1985	D	62.5	65.1	70.9	0.066	0.228	0.028	0.322	YES
1986	W	59.8	65.8	71.6	0.087	0.210	0.025	0.321	NO
1987	D		70.7			0.104		0.104	N/A
1988	C	59.5	66.0	68.6	0.090	0.205	0.040	0.334	YES
1990	C	61.4	65.7	70.1	0.074	0.212	0.032	0.318	YES
1991	C	59.5	65.5	68.2	0.090	0.217	0.043	0.349	YES
1992	C	64.0	70.7	70.8	0.056	0.104	0.028	0.188	NO

Constants	
P1=	0.3
P2=	0.7

Exports	
April	8000
May	1000
June	1000

Weighting	
April	0.17
May	0.65
June	0.18

Index Value	
AN	0.38
BN	0.36
C	0.29
D	0.32
W	0.45

*1989 missing due to insufficient data

Sacramento River Salmon Smolt Survival Index

Year*	Type	Temperature (F)			Index				Standard
		April	May	June	April	May	June	Total	Met?
1962	BN	56.6	61.0	68.5	0.113	0.361	0.042	0.516	YES
1963	W	54.1	59.3	68.9	0.122	0.421	0.039	0.582	YES
1964	D	58.2	63.7	70.6	0.109	0.275	0.030	0.414	YES
1965	W	58.8	59.5	66.1	0.105	0.413	0.058	0.576	YES
1966	BN	57.6	65.9	68.0	0.110	0.214	0.045	0.369	YES
1967	W	49.8	58.1	60.9	0.144	0.456	0.101	0.701	YES
1968	BN	58.5	65.6	70.0	0.108	0.222	0.033	0.362	YES
1969	W	55.7	60.7	65.3	0.116	0.371	0.064	0.551	YES
1970	W	57.4	64.4	71.6	0.111	0.255	0.025	0.390	NO
1971	W	55.0	59.4	64.4	0.119	0.417	0.071	0.606	YES
1972	BN	58.1	65.6	69.6	0.109	0.222	0.035	0.366	YES
1973	AN	59.7	67.0	70.1	0.096	0.186	0.033	0.315	NO
1974	W	54.2	62.0	66.5	0.122	0.328	0.055	0.504	YES
1975	W	54.1	60.7	66.3	0.122	0.371	0.056	0.549	YES
1976	C	57.9	66.8	68.5	0.109	0.191	0.042	0.342	YES
1977	C	62.5	63.9	73.4	0.073	0.269	0.017	0.359	YES
1978	AN	57.1	63.0	70.0	0.112	0.296	0.033	0.441	YES
1979	BN	59.8	63.8	69.2	0.096	0.272	0.038	0.405	YES
1980	AN	57.1	63.6	66.9	0.112	0.278	0.052	0.442	YES
1981	D	61.5	66.7	71.9	0.081	0.193	0.024	0.298	NO
1982	W	54.0	61.1	66.0	0.123	0.357	0.058	0.538	YES
1983	W	55.0	60.1	69.2	0.119	0.392	0.038	0.548	YES
1984	W	59.7	66.5	68.4	0.096	0.198	0.042	0.337	NO
1985	D	62.5	65.1	70.9	0.073	0.235	0.029	0.337	YES
1986	W	59.8	65.8	71.6	0.096	0.216	0.025	0.337	NO
1987	D		70.7			0.107		0.107	N/A
1988	C	59.5	66.0	68.6	0.098	0.211	0.041	0.351	YES
1990	C	61.4	65.7	70.1	0.082	0.219	0.033	0.333	YES
1991	C	59.5	65.5	68.2	0.098	0.224	0.044	0.366	YES
1992	C	64.0	70.7	70.8	0.062	0.107	0.029	0.197	NO

Constants	
P1=	0.2
P2=	0.8

Weighting	
April	0.17
May	0.65
June	0.18

Index Value	
AN	0.38
BN	0.36
C	0.29
D	0.32
W	0.45

Exports	
April	8000
May	1000
June	1000

*1989 missing due to insufficient data

Sacramento River Salmon Smolt Survival Index

Year*	Type	Temperature (F)			Index				Standard
		April	May	June	April	May	June	Total	Met?
1962	BN	56.6	61.0	68.5	0.124	0.373	0.043	0.540	YES
1963	W	54.1	59.3	68.9	0.134	0.435	0.040	0.610	YES
1964	D	58.2	63.7	70.6	0.118	0.284	0.031	0.433	YES
1965	W	58.8	59.5	66.1	0.114	0.428	0.059	0.601	YES
1966	BN	57.6	65.9	68.0	0.120	0.220	0.046	0.386	YES
1967	W	49.8	58.1	60.9	0.160	0.473	0.104	0.737	YES
1968	BN	58.5	65.6	70.0	0.117	0.228	0.034	0.379	YES
1969	W	55.7	60.7	65.3	0.127	0.384	0.066	0.576	YES
1970	W	57.4	64.4	71.6	0.121	0.263	0.026	0.409	NO
1971	W	55.0	59.4	64.4	0.130	0.432	0.073	0.635	YES
1972	BN	58.1	65.6	69.6	0.118	0.228	0.036	0.383	YES
1973	AN	59.7	67.0	70.1	0.105	0.191	0.033	0.330	NO
1974	W	54.2	62.0	66.5	0.134	0.339	0.057	0.529	YES
1975	W	54.1	60.7	66.3	0.134	0.384	0.058	0.576	YES
1976	C	57.9	66.8	68.5	0.119	0.196	0.043	0.358	YES
1977	C	62.5	63.9	73.4	0.080	0.278	0.018	0.375	YES
1978	AN	57.1	63.0	70.0	0.122	0.306	0.034	0.462	YES
1979	BN	59.8	63.8	69.2	0.104	0.281	0.039	0.423	YES
1980	AN	57.1	63.6	66.9	0.122	0.287	0.054	0.462	YES
1981	D	61.5	66.7	71.9	0.088	0.199	0.024	0.312	NO
1982	W	54.0	61.1	66.0	0.135	0.369	0.060	0.565	YES
1983	W	55.0	60.1	69.2	0.130	0.405	0.039	0.574	YES
1984	W	59.7	66.5	68.4	0.105	0.204	0.044	0.353	NO
1985	D	62.5	65.1	70.9	0.080	0.242	0.029	0.351	YES
1986	W	59.8	65.8	71.6	0.104	0.223	0.026	0.352	NO
1987	D		70.7			0.109		0.109	N/A
1988	C	59.5	66.0	68.6	0.107	0.217	0.042	0.367	YES
1990	C	61.4	65.7	70.1	0.089	0.225	0.033	0.348	YES
1991	C	59.5	65.5	68.2	0.107	0.231	0.045	0.383	YES
1992	C	64.0	70.7	70.8	0.068	0.109	0.030	0.207	NO

Constants	
P1= 0.1	
P2= 0.9	

Exports	
April	8000
May	1000
June	1000

Weighting	
April	0.17
May	0.65
June	0.18

Index Value	
AN	0.38
BN	0.36
C	0.29
D	0.32
W	0.45

*1989 missing due to insufficient data

Sacramento River Salmon Smolt Survival Index

Year*	Type	Temperature (F)			Index				Standard Met?
		April	May	June	April	May	June	Total	
1962	BN	56.6	61.0	68.5	0.134	0.385	0.044	0.564	YES
1963	W	54.1	59.3	68.9	0.147	0.450	0.042	0.639	YES
1964	D	58.2	63.7	70.6	0.128	0.293	0.031	0.452	YES
1965	W	58.8	59.5	66.1	0.123	0.442	0.061	0.626	YES
1966	BN	57.6	65.9	68.0	0.130	0.226	0.047	0.404	YES
1967	W	49.8	58.1	60.9	0.175	0.490	0.108	0.772	YES
1968	BN	58.5	65.6	70.0	0.126	0.235	0.035	0.396	YES
1969	W	55.7	60.7	65.3	0.138	0.396	0.067	0.602	YES
1970	W	57.4	64.4	71.6	0.131	0.271	0.026	0.428	NO
1971	W	55.0	59.4	64.4	0.142	0.446	0.075	0.663	YES
1972	BN	58.1	65.6	69.6	0.128	0.235	0.037	0.400	YES
1973	AN	59.7	67.0	70.1	0.114	0.197	0.034	0.344	NO
1974	W	54.2	62.0	66.5	0.146	0.349	0.058	0.554	YES
1975	W	54.1	60.7	66.3	0.147	0.396	0.060	0.603	YES
1976	C	57.9	66.8	68.5	0.129	0.202	0.044	0.375	YES
1977	C	62.5	63.9	73.4	0.087	0.286	0.018	0.391	YES
1978	AN	57.1	63.0	70.0	0.132	0.315	0.035	0.482	YES
1979	BN	59.8	63.8	69.2	0.113	0.289	0.040	0.442	YES
1980	AN	57.1	63.6	66.9	0.132	0.296	0.055	0.483	YES
1981	D	61.5	66.7	71.9	0.096	0.204	0.025	0.325	YES
1982	W	54.0	61.1	66.0	0.147	0.382	0.062	0.591	YES
1983	W	55.0	60.1	69.2	0.142	0.419	0.040	0.601	YES
1984	W	59.7	66.5	68.4	0.114	0.210	0.045	0.368	NO
1985	D	62.5	65.1	70.9	0.087	0.250	0.030	0.366	YES
1986	W	59.8	65.8	71.6	0.113	0.229	0.026	0.368	NO
1987	D		70.7			0.112		0.112	N/A
1988	C	59.5	66.0	68.6	0.116	0.224	0.043	0.383	YES
1990	C	61.4	65.7	70.1	0.097	0.232	0.034	0.363	YES
1991	C	59.5	65.5	68.2	0.116	0.238	0.046	0.400	YES
1992	C	64.0	70.7	70.8	0.074	0.112	0.030	0.216	NO

Constants	
P1=	0.0
P2=	1.0

Exports	
April	8000
May	1000
June	1000

Weighting	
April	0.17
May	0.65
June	0.18

Index Value	
AN	0.38
BN	0.36
C	0.29
D	0.32
W	0.45

*1989 missing due to insufficient data

Sacramento River Salmon Smolt Survival Index

Year*	Type	Temperature (F)			Index				Standard Met?
		April	May	June	April	May	June	Total	
1962	BN	56.6	61.0	68.5	0.095	0.348	0.041	0.484	YES
1963	W	54.1	59.3	68.9	0.102	0.406	0.038	0.546	YES
1964	D	58.2	63.7	70.6	0.092	0.266	0.029	0.388	YES
1965	W	58.8	59.5	66.1	0.089	0.399	0.056	0.544	YES
1966	BN	57.6	65.9	68.0	0.093	0.207	0.044	0.344	NO
1967	W	49.8	58.1	60.9	0.119	0.440	0.097	0.656	YES
1968	BN	58.5	65.6	70.0	0.092	0.215	0.032	0.339	NO
1969	W	55.7	60.7	65.3	0.097	0.358	0.062	0.517	YES
1970	W	57.4	64.4	71.6	0.094	0.247	0.025	0.365	NO
1971	W	55.0	59.4	64.4	0.099	0.402	0.068	0.570	YES
1972	BN	58.1	65.6	69.6	0.093	0.215	0.035	0.342	NO
1973	AN	59.7	67.0	70.1	0.082	0.181	0.032	0.294	NO
1974	W	54.2	62.0	66.5	0.102	0.317	0.053	0.472	YES
1975	W	54.1	60.7	66.3	0.102	0.358	0.055	0.515	YES
1976	C	57.9	66.8	68.5	0.093	0.185	0.041	0.319	YES
1977	C	62.5	63.9	73.4	0.060	0.260	0.017	0.338	YES
1978	AN	57.1	63.0	70.0	0.094	0.286	0.032	0.413	YES
1979	BN	59.8	63.8	69.2	0.081	0.263	0.037	0.381	YES
1980	AN	57.1	63.6	66.9	0.094	0.269	0.051	0.414	YES
1981	D	61.5	66.7	71.9	0.068	0.188	0.023	0.279	NO
1982	W	54.0	61.1	66.0	0.102	0.345	0.057	0.504	YES
1983	W	55.0	60.1	69.2	0.099	0.378	0.037	0.514	YES
1984	W	59.7	66.5	68.4	0.082	0.192	0.041	0.315	NO
1985	D	62.5	65.1	70.9	0.060	0.228	0.028	0.316	NO
1986	W	59.8	65.8	71.6	0.081	0.210	0.025	0.315	NO
1987	D		70.7			0.104		0.104	N/A
1988	C	59.5	66.0	68.6	0.083	0.205	0.040	0.328	YES
1990	C	61.4	65.7	70.1	0.068	0.212	0.032	0.313	YES
1991	C	59.5	65.5	68.2	0.083	0.217	0.043	0.343	YES
1992	C	64.0	70.7	70.8	0.050	0.104	0.028	0.183	NO

Constants	
P1= 0.3	
P2= 0.7	

Exports	
April	11000
May	1000
June	1000

Weighting	
April	0.17
May	0.65
June	0.18

Index Value	
AN	0.38
BN	0.36
C	0.29
D	0.32
W	0.45

*1989 missing due to insufficient data

Sacramento River Salmon Smolt Survival Index

Year*	Type	Temperature (F)			Index				Standard Met?
		April	May	June	April	May	June	Total	
1962	BN	56.6	61.0	68.5	0.108	0.361	0.042	0.511	YES
1963	W	54.1	59.3	68.9	0.117	0.421	0.039	0.577	YES
1964	D	58.2	63.7	70.6	0.104	0.275	0.030	0.409	YES
1965	W	58.8	59.5	66.1	0.100	0.413	0.058	0.571	YES
1966	BN	57.6	65.9	68.0	0.106	0.214	0.045	0.364	YES
1967	W	49.8	58.1	60.9	0.138	0.456	0.101	0.695	YES
1968	BN	58.5	65.6	70.0	0.103	0.222	0.033	0.358	NO
1969	W	55.7	60.7	65.3	0.111	0.371	0.064	0.546	YES
1970	W	57.4	64.4	71.6	0.106	0.255	0.025	0.386	NO
1971	W	55.0	59.4	64.4	0.114	0.417	0.071	0.601	YES
1972	BN	58.1	65.6	69.6	0.104	0.222	0.035	0.361	YES
1973	AN	59.7	67.0	70.1	0.092	0.186	0.033	0.311	NO
1974	W	54.2	62.0	66.5	0.117	0.328	0.055	0.499	YES
1975	W	54.1	60.7	66.3	0.117	0.371	0.056	0.544	YES
1976	C	57.9	66.8	68.5	0.105	0.191	0.042	0.337	YES
1977	C	62.5	63.9	73.4	0.069	0.269	0.017	0.356	YES
1978	AN	57.1	63.0	70.0	0.107	0.296	0.033	0.436	YES
1979	BN	59.8	63.8	69.2	0.091	0.272	0.038	0.401	YES
1980	AN	57.1	63.6	66.9	0.107	0.278	0.052	0.437	YES
1981	D	61.5	66.7	71.9	0.077	0.193	0.024	0.294	NO
1982	W	54.0	61.1	66.0	0.117	0.357	0.058	0.533	YES
1983	W	55.0	60.1	69.2	0.114	0.392	0.038	0.543	YES
1984	W	59.7	66.5	68.4	0.092	0.198	0.042	0.333	NO
1985	D	62.5	65.1	70.9	0.069	0.235	0.029	0.333	YES
1986	W	59.8	65.8	71.6	0.091	0.216	0.025	0.333	NO
1987	D		70.7			0.107		0.107	N/A
1988	C	59.5	66.0	68.6	0.094	0.211	0.041	0.346	YES
1990	C	61.4	65.7	70.1	0.078	0.219	0.033	0.329	YES
1991	C	59.5	65.5	68.2	0.094	0.224	0.044	0.362	YES
1992	C	64.0	70.7	70.8	0.058	0.107	0.029	0.194	NO

Constants	
P1=	0.2
P2=	0.8

Exports	
April	11000
May	1000
June	1000

Weighting	
April	0.17
May	0.65
June	0.18

Index Value	
AN	0.38
BN	0.36
C	0.29
D	0.32
W	0.45

*1989 missing due to insufficient data

Sacramento River Salmon Smolt Survival Index

Year*	Type	Temperature (F)			Index				Standard
		April	May	June	April	May	June	Total	Met?
1962	BN	56.6	61.0	68.5	0.121	0.373	0.043	0.537	YES
1963	W	54.1	59.3	68.9	0.132	0.435	0.040	0.608	YES
1964	D	58.2	63.7	70.6	0.116	0.284	0.031	0.430	YES
1965	W	58.8	59.5	66.1	0.112	0.428	0.059	0.599	YES
1966	BN	57.6	65.9	68.0	0.118	0.220	0.046	0.384	YES
1967	W	49.8	58.1	60.9	0.156	0.473	0.104	0.734	YES
1968	BN	58.5	65.6	70.0	0.115	0.228	0.034	0.377	YES
1969	W	55.7	60.7	65.3	0.125	0.384	0.066	0.574	YES
1970	W	57.4	64.4	71.6	0.118	0.263	0.026	0.407	NO
1971	W	55.0	59.4	64.4	0.128	0.432	0.073	0.632	YES
1972	BN	58.1	65.6	69.6	0.116	0.228	0.036	0.381	YES
1973	AN	59.7	67.0	70.1	0.103	0.191	0.033	0.328	NO
1974	W	54.2	62.0	66.5	0.131	0.339	0.057	0.526	YES
1975	W	54.1	60.7	66.3	0.132	0.384	0.058	0.573	YES
1976	C	57.9	66.8	68.5	0.117	0.196	0.043	0.356	YES
1977	C	62.5	63.9	73.4	0.078	0.278	0.018	0.373	YES
1978	AN	57.1	63.0	70.0	0.119	0.306	0.034	0.459	YES
1979	BN	59.8	63.8	69.2	0.102	0.281	0.039	0.421	YES
1980	AN	57.1	63.6	66.9	0.119	0.287	0.054	0.460	YES
1981	D	61.5	66.7	71.9	0.087	0.199	0.024	0.310	NO
1982	W	54.0	61.1	66.0	0.132	0.369	0.060	0.562	YES
1983	W	55.0	60.1	69.2	0.128	0.405	0.039	0.572	YES
1984	W	59.7	66.5	68.4	0.103	0.204	0.044	0.351	NO
1985	D	62.5	65.1	70.9	0.078	0.242	0.029	0.350	YES
1986	W	59.8	65.8	71.6	0.102	0.223	0.026	0.350	NO
1987	D		70.7			0.109		0.109	N/A
1988	C	59.5	66.0	68.6	0.105	0.217	0.042	0.365	YES
1990	C	61.4	65.7	70.1	0.087	0.225	0.033	0.346	YES
1991	C	59.5	65.5	68.2	0.105	0.231	0.045	0.381	YES
1992	C	64.0	70.7	70.8	0.066	0.109	0.030	0.205	NO

Constants	
P1= 0.1	
P2= 0.9	

Weighting	
April	0.17
May	0.65
June	0.18

Index Value	
AN	0.38
BN	0.36
C	0.29
D	0.32
W	0.45

Exports	
April	11000
May	1000
June	1000

*1989 missing due to insufficient data

Sacramento River Salmon Smolt Survival Index

Year*	Type	Temperature (F)			Index				Standard Met?
		April	May	June	April	May	June	Total	
1962	BN	56.6	61.0	68.5	0.134	0.385	0.044	0.564	YES
1963	W	54.1	59.3	68.9	0.147	0.450	0.042	0.639	YES
1964	D	58.2	63.7	70.6	0.128	0.293	0.031	0.452	YES
1965	W	58.8	59.5	66.1	0.123	0.442	0.061	0.626	YES
1966	BN	57.6	65.9	68.0	0.130	0.226	0.047	0.404	YES
1967	W	49.8	58.1	60.9	0.175	0.490	0.108	0.772	YES
1968	BN	58.5	65.6	70.0	0.126	0.235	0.035	0.396	YES
1969	W	55.7	60.7	65.3	0.138	0.396	0.067	0.602	YES
1970	W	57.4	64.4	71.6	0.131	0.271	0.026	0.428	NO
1971	W	55.0	59.4	64.4	0.142	0.446	0.075	0.663	YES
1972	BN	58.1	65.6	69.6	0.128	0.235	0.037	0.400	YES
1973	AN	59.7	67.0	70.1	0.114	0.197	0.034	0.344	NO
1974	W	54.2	62.0	66.5	0.146	0.349	0.058	0.554	YES
1975	W	54.1	60.7	66.3	0.147	0.396	0.060	0.603	YES
1976	C	57.9	66.8	68.5	0.129	0.202	0.044	0.375	YES
1977	C	62.5	63.9	73.4	0.087	0.286	0.018	0.391	YES
1978	AN	57.1	63.0	70.0	0.132	0.315	0.035	0.482	YES
1979	BN	59.8	63.8	69.2	0.113	0.289	0.040	0.442	YES
1980	AN	57.1	63.6	66.9	0.132	0.296	0.055	0.483	YES
1981	D	61.5	66.7	71.9	0.096	0.204	0.025	0.325	YES
1982	W	54.0	61.1	66.0	0.147	0.382	0.062	0.591	YES
1983	W	55.0	60.1	69.2	0.142	0.419	0.040	0.601	YES
1984	W	59.7	66.5	68.4	0.114	0.210	0.045	0.368	NO
1985	D	62.5	65.1	70.9	0.087	0.250	0.030	0.366	YES
1986	W	59.8	65.8	71.6	0.113	0.229	0.026	0.368	NO
1987	D		70.7			0.112		0.112	N/A
1988	C	59.5	66.0	68.6	0.116	0.224	0.043	0.383	YES
1990	C	61.4	65.7	70.1	0.097	0.232	0.034	0.363	YES
1991	C	59.5	65.5	68.2	0.116	0.238	0.046	0.400	YES
1992	C	64.0	70.7	70.8	0.074	0.112	0.030	0.216	NO

Constants	
P1= 0.0	
P2= 1.0	

Weighting	
April	0.17
May	0.65
June	0.18

Index Value	
AN	0.38
BN	0.36
C	0.29
D	0.32
W	0.45

Exports	
April	11000
May	1000
June	1000

*1989 missing due to insufficient data

Sacramento River Salmon Smolt Survival Index

Year*	Type	Temperature (F)			Index				Standard
		April	May	June	April	May	June	Total	Met?
1962	BN	56.6	61.0	68.5	0.095	0.311	0.034	0.440	YES
1963	W	54.1	59.3	68.9	0.102	0.365	0.032	0.499	YES
1964	D	58.2	63.7	70.6	0.092	0.233	0.024	0.349	YES
1965	W	58.8	59.5	66.1	0.089	0.358	0.048	0.496	YES
1966	BN	57.6	65.9	68.0	0.093	0.178	0.037	0.308	NO
1967	W	49.8	58.1	60.9	0.119	0.397	0.087	0.603	YES
1968	BN	58.5	65.6	70.0	0.092	0.185	0.026	0.303	NO
1969	W	55.7	60.7	65.3	0.097	0.320	0.053	0.471	YES
1970	W	57.4	64.4	71.6	0.094	0.215	0.019	0.328	NO
1971	W	55.0	59.4	64.4	0.099	0.362	0.060	0.521	YES
1972	BN	58.1	65.6	69.6	0.093	0.185	0.028	0.306	NO
1973	AN	59.7	67.0	70.1	0.082	0.153	0.026	0.261	NO
1974	W	54.2	62.0	66.5	0.102	0.281	0.046	0.428	NO
1975	W	54.1	60.7	66.3	0.102	0.320	0.047	0.469	YES
1976	C	57.9	66.8	68.5	0.093	0.158	0.034	0.285	NO
1977	C	62.5	63.9	73.4	0.060	0.228	0.013	0.301	YES
1978	AN	57.1	63.0	70.0	0.094	0.252	0.026	0.373	NO
1979	BN	59.8	63.8	69.2	0.081	0.230	0.030	0.342	NO
1980	AN	57.1	63.6	66.9	0.094	0.236	0.043	0.373	NO
1981	D	61.5	66.7	71.9	0.068	0.160	0.018	0.246	NO
1982	W	54.0	61.1	66.0	0.102	0.308	0.049	0.459	YES
1983	W	55.0	60.1	69.2	0.099	0.339	0.030	0.469	YES
1984	W	59.7	66.5	68.4	0.082	0.164	0.035	0.281	NO
1985	D	62.5	65.1	70.9	0.060	0.197	0.022	0.280	NO
1986	W	59.8	65.6	71.6	0.081	0.181	0.019	0.281	NO
1987	D		70.7			0.084		0.084	N/A
1988	C	59.5	66.0	68.6	0.083	0.176	0.033	0.293	YES
1990	C	61.4	65.7	70.1	0.068	0.183	0.026	0.277	NO
1991	C	59.5	65.5	68.2	0.083	0.188	0.036	0.306	YES
1992	C	64.0	70.7	70.8	0.050	0.084	0.023	0.157	NO

Constants	
P1= 0.3	
P2= 0.7	

Exports	
April	11000
May	6000
June	6000

Weighting	
April	0.17
May	0.65
June	0.18

Index Value	
AN	0.38
BN	0.36
C	0.29
D	0.32
W	0.45

*1989 missing due to insufficient data

Sacramento River Salmon Smolt Survival Index

Year*	Type	Temperature (F)			Index				Standard
		April	May	June	April	May	June	Total	Met?
1962	BN	56.6	61.0	68.5	0.108	0.336	0.037	0.481	YES
1963	W	54.1	59.3	68.9	0.117	0.393	0.035	0.545	YES
1964	D	58.2	63.7	70.6	0.104	0.253	0.026	0.383	YES
1965	W	58.8	59.5	66.1	0.100	0.386	0.052	0.539	YES
1966	BN	57.6	65.9	68.0	0.106	0.194	0.040	0.340	NO
1967	W	49.8	58.1	60.9	0.139	0.426	0.094	0.659	YES
1968	BN	58.5	65.6	70.0	0.103	0.202	0.029	0.334	NO
1969	W	55.7	60.7	65.3	0.111	0.345	0.059	0.515	YES
1970	W	57.4	64.4	71.6	0.106	0.233	0.022	0.361	NO
1971	W	55.0	59.4	64.4	0.114	0.390	0.065	0.568	YES
1972	BN	58.1	65.6	69.6	0.104	0.202	0.031	0.337	NO
1973	AN	59.7	67.0	70.1	0.092	0.168	0.029	0.289	NO
1974	W	54.2	62.0	66.5	0.117	0.304	0.050	0.470	YES
1975	W	54.1	60.7	66.3	0.117	0.345	0.051	0.513	YES
1976	C	57.9	66.8	68.5	0.105	0.172	0.037	0.315	YES
1977	C	62.5	63.9	73.4	0.069	0.247	0.014	0.331	YES
1978	AN	57.1	63.0	70.0	0.107	0.273	0.029	0.409	YES
1979	BN	59.8	63.8	69.2	0.091	0.250	0.033	0.375	YES
1980	AN	57.1	63.6	66.9	0.107	0.256	0.047	0.410	YES
1981	D	61.5	66.7	71.9	0.077	0.175	0.020	0.272	NO
1982	W	54.0	61.1	66.0	0.117	0.332	0.053	0.503	YES
1983	W	55.0	60.1	69.2	0.114	0.366	0.033	0.513	YES
1984	W	59.7	66.5	68.4	0.092	0.180	0.038	0.310	NO
1985	D	62.5	65.1	70.9	0.069	0.215	0.025	0.309	NO
1986	W	59.8	65.8	71.6	0.091	0.197	0.022	0.310	NO
1987	D		70.7			0.093		0.093	N/A
1988	C	59.5	66.0	68.6	0.094	0.192	0.037	0.323	YES
1990	C	61.4	65.7	70.1	0.078	0.199	0.029	0.306	YES
1991	C	59.5	65.5	68.2	0.094	0.204	0.039	0.337	YES
1992	C	64.0	70.7	70.8	0.056	0.093	0.025	0.177	NO

Constants	
P1=	0.2
P2=	0.8

Exports	
April	11000
May	6000
June	6000

Weighting	
April	0.17
May	0.65
June	0.18

Index Value	
AN	0.38
BN	0.36
C	0.29
D	0.32
W	0.45

*1989 missing due to insufficient data

Sacramento River Salmon Smolt Survival Index

Year*	Type	Temperature (F)			Index				Standard
		April	May	June	April	May	June	Total	Met?
1962	BN	56.6	61.0	68.5	0.121	0.360	0.041	0.522	YES
1963	W	54.1	59.3	68.9	0.132	0.422	0.038	0.592	YES
1964	D	58.2	63.7	70.6	0.116	0.273	0.029	0.417	YES
1965	W	58.8	59.5	66.1	0.112	0.414	0.057	0.583	YES
1966	BN	57.6	65.9	68.0	0.118	0.210	0.044	0.372	YES
1967	W	49.8	58.1	60.9	0.156	0.459	0.101	0.716	YES
1968	BN	58.5	65.6	70.0	0.115	0.218	0.032	0.365	YES
1969	W	55.7	60.7	65.3	0.125	0.371	0.063	0.558	YES
1970	W	57.4	64.4	71.6	0.118	0.252	0.024	0.394	NO
1971	W	55.0	59.4	64.4	0.128	0.418	0.070	0.616	YES
1972	BN	58.1	65.6	69.6	0.116	0.218	0.034	0.369	YES
1973	AN	59.7	67.0	70.1	0.103	0.182	0.031	0.317	NO
1974	W	54.2	62.0	66.5	0.131	0.327	0.054	0.512	YES
1975	W	54.1	60.7	66.3	0.132	0.371	0.055	0.558	YES
1976	C	57.9	66.8	68.5	0.117	0.187	0.041	0.345	YES
1977	C	62.5	63.9	73.4	0.078	0.267	0.016	0.361	YES
1978	AN	57.1	63.0	70.0	0.119	0.294	0.032	0.446	YES
1979	BN	59.8	63.8	69.2	0.102	0.270	0.037	0.408	YES
1980	AN	57.1	63.6	66.9	0.119	0.276	0.051	0.446	YES
1981	D	61.5	66.7	71.9	0.087	0.190	0.023	0.299	NO
1982	W	54.0	61.1	66.0	0.132	0.357	0.058	0.547	YES
1983	W	55.0	60.1	69.2	0.128	0.392	0.037	0.557	YES
1984	W	59.7	66.5	68.4	0.103	0.195	0.041	0.339	NO
1985	D	62.5	65.1	70.9	0.078	0.232	0.027	0.337	YES
1986	W	59.8	65.8	71.6	0.102	0.213	0.024	0.339	NO
1987	D		70.7			0.102		0.102	N/A
1988	C	59.5	66.0	68.6	0.105	0.208	0.040	0.353	YES
1990	C	61.4	65.7	70.1	0.087	0.216	0.031	0.335	YES
1991	C	59.5	65.5	68.2	0.105	0.221	0.043	0.369	YES
1992	C	64.0	70.7	70.8	0.066	0.102	0.028	0.196	NO

Constants	
P1= 0.1	
P2= 0.9	

Exports	
April	11000
May	6000
June	6000

Weighting	
April	0.17
May	0.65
June	0.18

Index Value	
AN	0.38
BN	0.36
C	0.29
D	0.32
W	0.45

*1989 missing due to insufficient data

Sacramento River Salmon Smolt Survival Index

Year*	Type	Temperature (F)			Index				Standard Met?
		April	May	June	April	May	June	Total	
1962	BN	56.6	61.0	68.5	0.134	0.385	0.044	0.564	YES
1963	W	54.1	59.3	68.8	0.147	0.450	0.042	0.639	YES
1964	D	58.2	63.7	70.6	0.128	0.293	0.031	0.452	YES
1965	W	58.8	59.5	66.1	0.123	0.442	0.061	0.626	YES
1966	BN	57.6	65.9	68.0	0.130	0.226	0.047	0.404	YES
1967	W	49.8	58.1	60.9	0.175	0.490	0.108	0.772	YES
1968	BN	58.5	65.6	70.0	0.126	0.235	0.035	0.396	YES
1969	W	55.7	60.7	65.3	0.138	0.396	0.067	0.602	YES
1970	W	57.4	64.4	71.6	0.131	0.271	0.026	0.428	NO
1971	W	55.0	59.4	64.4	0.142	0.446	0.075	0.663	YES
1972	BN	58.1	65.6	69.6	0.128	0.235	0.037	0.400	YES
1973	AN	59.7	67.0	70.1	0.114	0.197	0.034	0.344	NO
1974	W	54.2	62.0	66.5	0.146	0.349	0.059	0.554	YES
1975	W	54.1	60.7	66.3	0.147	0.396	0.060	0.603	YES
1976	C	57.9	66.8	68.5	0.129	0.202	0.044	0.375	YES
1977	C	62.5	63.9	73.4	0.087	0.286	0.018	0.391	YES
1978	AN	57.1	63.0	70.0	0.132	0.315	0.035	0.482	YES
1979	BN	59.8	63.8	69.2	0.113	0.289	0.040	0.442	YES
1980	AN	57.1	63.6	66.9	0.132	0.296	0.055	0.483	YES
1981	D	61.5	66.7	71.9	0.096	0.204	0.025	0.325	YES
1982	W	54.0	61.1	66.0	0.147	0.382	0.062	0.591	YES
1983	W	55.0	60.1	69.2	0.142	0.419	0.040	0.601	YES
1984	W	59.7	66.5	68.4	0.114	0.210	0.045	0.369	NO
1985	D	62.5	65.1	70.9	0.087	0.250	0.030	0.366	YES
1986	W	59.8	65.6	71.6	0.113	0.229	0.026	0.368	NO
1987	D		70.7			0.112		0.112	N/A
1988	C	59.5	66.0	68.6	0.116	0.224	0.043	0.383	YES
1990	C	61.4	65.7	70.1	0.097	0.232	0.034	0.363	YES
1991	C	59.5	65.5	68.2	0.116	0.239	0.046	0.400	YES
1992	C	64.0	70.7	70.8	0.074	0.112	0.030	0.216	NO

Constants	
P1= 0.0	
P2= 1.0	

Exports	
April	11000
May	6000
June	6000

Weighting	
April	0.17
May	0.65
June	0.18

Index Value	
AN	0.38
BN	0.36
C	0.29
D	0.32
W	0.45

*1989 missing due to insufficient data