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State Water Contractors

UNITED STATES DISTRICT COURT

EASTERN DISTRICT OF CALIFORNIA, FRESNO DIVISION

PACIFIC COAST FEDERATION OF FISHERMEN'S ASSOCIATIONS/ INSTITUTE FOR FISHERIES RESOURCES, *et al.*,

Plaintiffs,

vs.

CARLOS M. GUTIERREZ, in his official capacity as Secretary of Commerce, *et al.*,

Defendants,

and

SAN LUIS & DELTA MENDOTA WATER AUTHORITY, *et al.*,

Intervenors/Defendants.

Case No. 1:06-CV-00245 OW W-GSA

DECLARATION OF CHARLES H. HANSON, PH.D. IN SUPPORT OF DEFENDANT-INTERVENOR STATE WATER CONTRACTORS' STATUS REPORT

Date: September 4, 2008
Time: 8:15 a.m.
Judge: The Honorable Oliver W. Wanger
Courtroom: 3

I, Charles H. Hanson, declare as follows:

1. I am a principal in the firm of Hanson Environmental, Inc., located at 132 Cottage Lane, Walnut Creek, California. I have provided declarations and expert testimony regarding the status and protections for Central Valley Chinook salmon and steelhead in these proceedings. A statement of my qualifications is attached to my declaration dated May 27, 2008 (Doc. 276).

Scope of Declaration

2. I have reviewed the Amended Memorandum Decision and Order (Doc. 240), the Supplemental Order concerning the scope of questions requested to be addressed in the evidentiary hearing (Doc. 233), and this Court's July 24, 2008 Scheduling Order re: Report on Status of Species and Interim Remedies." Doc. 370. To that end, this Declaration addresses:

- Present population status of winter-run and spring-run Chinook salmon and Central Valley steelhead;
- Relationships between losses of juvenile salmon and SWP/CVP export operations (direct effects) and the effects of SWP/CVP exports on survival of juvenile salmon during migration through the lower Sacramento River and Delta; and
- Whether changes to SWP/CVP operations are required prior March 2009 to avoid jeopardy to the species.

Present Population Status of Winter-run and Spring-run Chinook salmon and Central Valley steelhead

3. Winter-run Chinook salmon have been identified as an endangered species under the federal Endangered Species Acts (ESA), as well as under the California Endangered Species Act (CESA). Spring-run Chinook salmon have been identified as a threatened species under the ESA and the CESA. Central Valley steelhead have been listed as a threatened species under the federal ESA, but are not listed under CESA. Based on results of fishery surveys conducted through mid-June 2008 I had previously concluded that these species were at risk of extinction

and that protection under the ESA was appropriate given the status of these populations. During the period from mid-June through late-August 2008 no new information has been identified to suggest that these earlier conclusions should be modified: the three species continue to be at risk of extinction and protection under the ESA is warranted.

The effects of SWP/CVP exports on juvenile salmon survival

4. Juvenile winter-run and spring-run Chinook salmon and Central Valley steelhead migrate from their upstream rearing habitat through the Delta and into coastal marine waters. The seasonal period of juvenile migration within the Delta typically occurs during the winter and spring months, as reflected in fish salvage at the SWP and CVP export facilities (see Exhibits 1, 2, and 3). During their migration through the Delta juvenile salmon and steelhead are vulnerable to direct losses (entrainment and salvage) at the export facilities as well mortality from a variety of other sources, such as predation by fish (e.g., striped bass, largemouth bass, Sacramento pikeminnow, etc.) and birds, exposure to potential toxics, entrainment at existing unscreened agricultural, municipal, and industrial water diversions, exposure to seasonally elevated water temperatures, and other factors.

5. The information available from Coded Wire Tag (CWT) -- which is a small metal tag encoded with a numeric bar code -- studies conducted by the US Fish and Wildlife Service (USFWS) based on a mark-recapture experimental design can be used to quantify both the direct losses of juvenile salmon (the percentage of a tag group of fish that are collected in fish salvage at the SWP and CVP export facilities) and the "total" mortality to juvenile salmon from all causes (e.g., predation, losses at unscreened diversions, exposure to elevated temperatures or toxics, etc.) within the lower Sacramento River and Delta between the point of release and the point of recapture downstream at Chipps Island (located in Suisun Bay in the western region of the Delta). No measurement of the incremental contribution of SWP and CVP export rates on the overall mortality (total) for juvenile salmon is available from these or other studies conducted within the Delta. "Total" mortality (defined as 1 minus the total estimated survival rate for each group of tagged salmon estimated from USFWS sampling at Chipps Island) is the sum of: (1) the direct

mortality that occurs at the SWP and CVP export facilities; (2) mortality within the lower Sacramento River and Delta that occurs independently of SWP or CVP export operations; and (3) the incremental increase in mortality within the Delta (indirect effect) that occurs as a result of SWP and CVP exports (e.g., increased vulnerability to predation mortality because of delays in migration in response to changes in current patterns in the Delta channels). I assessed the incremental contribution of SWP and CVP exports (indirect effects) by examining the relationship between total mortality as estimated by USFWS sampling at Chipps Island and exports (i.e., does total mortality increase as the rate of exports increases?). Although the USFWS CWT studies were used to estimate survival for juvenile Chinook salmon, results of these studies are also expected to reflect trends in survival of juvenile steelhead that migrate downstream within the lower Sacramento River and Delta during the same seasonal period reflected in the CWT studies.

6. As discussed in greater detail below, results of the analysis presented by Kimmerer (2008) and particle tracking model studies raise several important management questions about the effects of Project operations on mortality of salmonids in the Delta. These questions include:

(1) What is the relationship, if any, between direct mortality of juvenile salmon and steelhead and diversion rates at the SWP and CVP export facilities?

(2) What is the relationship, if any, between total mortality of juvenile salmon and steelhead from all causes prior to reaching Chipps Island (including indirect mortality in the Delta as a necessary component) and diversion rates at the SWP and CVP export facilities?

(3) Are existing regulatory requirements adequate to protect juvenile salmon and steelhead during the interim period (until March 2009) to avoid jeopardy to the species?

7. To help address these management questions, I (with assistance from employees of Hanson Environmental under my direct supervision and control) conducted a series of analyses using the results of CWT studies designed and implemented by the USFWS to investigate

survival relationships for juvenile salmon migrating downstream through the Sacramento River and Delta.

SUMMARY OF CONCLUSIONS

8. As explained in greater detail below, my analysis reached the following conclusions:

(1) The data show there is no relationship between the direct mortality of juvenile salmon and diversion rates at the SWP and CVP pumps. Based on results of 118 studies involving more than 14,200,000 juvenile salmon, the average direct loss was 0.03% with a range from 0 to 0.53%.

(2) There is little to no relationship between total mortality of juvenile salmon and steelhead from all causes prior to reaching Chipps Island, including indirect mortality in the Delta as a necessary component, and diversion rates at the SWP and CVP export facilities.

(3) Based on these results, I concluded that limiting combined SWP and CVP exports to less than 7,000 cfs during the juvenile salmon emigration period would not significantly improve the survival of juvenile salmon emigrating through the Sacramento River and Delta.

(4) It is my opinion that existing regulatory requirements are adequate to protect juvenile salmon and steelhead, and their critical habitat during the interim period (until March 2009).

BACKGROUND

9. It has been hypothesized that operation of the SWP and CVP export facilities indirectly affects the survival of juvenile salmon and steelhead within the Delta through changes in hydrodynamics within Delta channels that alter the migration pathways for juvenile salmonids, and thereby increase their vulnerability to sources of mortality. For example, it has been hypothesized that changes in the direction and magnitude of tidal and current flows within the central Delta (e.g., Old and Middle rivers) as a result of SWP and CVP exports during the emigration period result in the movement of juveniles into the central Delta, and thereby

contribute to delays in downstream migration that increase their mortality. If this hypothesis is correct, it would be expected that the survival of juvenile salmon and steelhead migrating through the Delta would be lower, and both direct and indirect mortality would be higher, when Project export rates are high. Similarly, if the hypothesis is correct, it would be expected that salmon and steelhead survival would be higher when exports are low.

10. Dr. Wim Kimmerer (2008. "Losses of Sacramento River Chinook Salmon and Delta Smelt to Entrainment in Water Diversions in the Sacramento-San Joaquin Delta," *San Francisco Estuary and Watershed Science*, Vol. 6(2), Article 2) conducted an analysis of results from coded wire tag studies, and the recapture of tagged salmon in SWP and CVP fish salvage operations and in sampling by USFWS at Chipps Island, to assess the potential relationship between export rates and survival of juvenile salmon migrating through the Delta. Based on the analyses presented by Kimmerer, Dr. Swanson has proposed that SWP and CVP combined export rates be limited during the juvenile salmon emigration period to not more than 7,000 cfs. This recommended management action is based on a number of important assumptions, such as the level of pre-screen mortality to juvenile salmon and steelhead during passage through Clifton Court Forebay (thought to be the result of increased predation on juvenile salmonids) as well as pre-screen losses at the CVP diversion facility. However, as discussed by Gingras[1] and Clark et al.,[2] there are a number of factors that may affect results of pre-screen survival studies and, thus, create uncertainties in the results of previous experimental studies conducted within Clifton Court Forebay. (No similar pre-screen loss studies have been conducted at the CVP diversion). Moreover, additional analyses, not considered by Kimmerer (2008), have also been conducted to assess the potential for indirect mortality related to SWP and CVP export rates using hydrodynamic model simulations and results of particle tracking studies (assuming that juvenile salmon and steelhead behave as passive neutrally buoyant particles).

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[1] (1997. "Mark/ Recapture experiments at Clifton Court Forebay to estimate pre-screening loss to juvenile fishes": 1976-1883. Tech. Rept. 55. Interagency Ecological Program).

[2] (2008. "Quantification of pre-screen loss of juvenile steelhead within Clifton Court Forebay". DWR Draft Rept. June 2008).

METHODOLOGY

11. The data I used in conducting my analysis were generated by the USFWS in over 100 survival studies on the Sacramento River conducted over more than 20 years using juvenile winter-run, spring-run, and fall-run Chinook salmon. The juvenile salmon used in these studies primarily originated in the Coleman National Fish Hatchery and the Livingston-Stone Fish Hatchery, both located on the Sacramento River upstream of the Red Bluff Diversion Dam (RBDD). In addition, limited CWT tests have also been performed by the USFWS and the California Department of Fish and Game (CDFG) using wild juvenile salmon collected from the Sacramento River and its tributaries.

12. For purposes of my analysis, the results of survival studies in which marked salmon were released into the upper reaches of the river system were used to represent juvenile Chinook salmon emigrating from the upstream rearing areas (e.g., Sacramento River, Clear Creek, Butte Creek, etc.). The releases typically occurred during the winter and spring months coinciding with the seasonal period and conditions when wild salmon and steelhead are migrating downstream through the river and Delta. The studies included juvenile salmon typically ranging in length from approximately 50 to 200 mm. My use of these survival studies was limited to those tests in which more than 10,000 fish were released, to increase the statistical reliability of the study results and also to increase the probability that a CWT salmon would subsequently be detected in recapture sampling at the Project export facilities and at Chipps Island. I calculated survival estimates for multiple tag codes when more than one tag code was used in a release. The CWT studies used in this analysis included results from 118 studies with a combined total of over 14,200,000 juvenile salmon released.

13. For each of the CWT survival studies, marked fish were collected at the SWP and CVP fish salvage facilities as part of routine monitoring. The numbers of marked fish were expanded to account for the time spent sampling at each facility in accordance with standard procedures for fish salvage monitoring (expanded salvage estimates were compiled by USFWS for each CWT group). Marked salmon were also recaptured by USFWS in trawling conducted at Chipps Island, located within Suisun Bay in the western Delta, and used to calculate survival

estimates based on expansion for sampling effort (all survival estimates were calculated by USFWS). Survival estimates from CWT studies estimated based on USFWS fishery sampling for juvenile salmon at Chipps Island have been found to be highly correlated (r^2= 0.76) with the independent measure of salmon survival based on expanded catch of adults in the ocean (VAMP 2006). As part of routine fishery monitoring during the survival studies, information on the date of release for each tag code, as well as the initial and final dates of recapture, is recorded. Information on the duration between the date of release and the last date of recapture was used in the analyses to estimate the rate of migration of juvenile salmon downstream through the Delta, and to assess the flow and export conditions that occurred within the Delta during the migration period.

14. For purposes of this analysis, two periods were used to assess flow and export conditions for each CWT release group: the average conditions 30 days and 60 days prior to the date of last recapture. The range in dates reflects the variability in the duration of fish passage through the river and Delta observed in these studies and the conditions within the Delta during downstream passage. Information on hydrologic conditions during each CWT survival study, including Sacramento River flow, Delta inflow, SWP and CVP combined exports, and Delta outflow was obtained from the DWR DAYFLOW database. Results of the survival studies were then used in an analysis of the potential relationship between SWP and CVP export rates and both direct losses (percentage of each tagged group of salmon recaptured at the fish salvage facilities) and total juvenile salmon mortality during migration through the river and Delta. Statistically significant relationships were defined as $p<0.05$.

RESULTS

The data show there is no relationship between the direct mortality of juvenile salmon and steelhead and diversion rates at the export pumps.

15. Based on the results of my analyses, there is no evidence that direct losses of salmon migrating downstream in the lower Sacramento River and through the Delta are higher as

a result of increases in SWP or CVP export rates. As part of my analysis, I first calculated an index of direct losses as a result of SWP and CVP export operations for each CWT survival test conducted by the USFWS. This index is based on the percentage of the number of fish released and the expanded estimate of salvage of that tag group in the combined SWP and CVP fish salvage. The percentage of CWT salmon released into the upper Sacramento River that were collected at the fish salvage facilities averaged 0.03% (sample size (n) =118; 95% Confidence Interval (CI) = 0.0145) with a range from 0 to 0.53%. I then plotted the estimated percentage of each CWT group recaptured at the SWP and CVP fish salvage facilities against the average combined export rate over the 30 and 60 day periods prior to the date of the last fish recaptured. It was expected that if SWP and CVP export rates were an important factor affecting the occurrence of salmon from the Sacramento River in the salvage (direct losses) then the percentage of tagged fish recaptured at the salvage facilities would increase when export rates were high. The results of my analysis based on average export rates for the 30 days prior to the last recapture are shown in Exhibit 4 and the results for the average exports of the 60 days prior to the last recapture are shown in Exhibit 5. The results of a linear regression model with 95% confidence intervals are also shown in Exhibits 4 and 5. The relationships between export rate and salmon salvage were characterized by very flat slopes (slopes < 0.0001) and low correlation coefficients (r^2 = 0.02 for the 30-day exports and 0.04 for the 60-day exports).

16. The relationship between combined SWP and CVP export rates and the percentage of each tag group recaptured (direct loss) was not statistically significant for the 30-day (p=0.12) average export rate. The relationship between the percentage salvage and average export rate over a 60 day period was significant (p=0.04); however, the relationship was extremely weak (r^2 = 0.04). Based on results of these analyses I concluded that salmon migrating downstream in the lower Sacramento River and through the Delta would not experience an appreciable increase in direct losses as a result of increases in SWP or CVP export rates.

17. Factors in addition to export rates may influence direct losses at the export facilities. These factors include the rate of flow in the Sacramento and San Joaquin rivers, Delta inflow and outflow rates, other sources of mortality within the river and Delta that result in the

elimination of juvenile salmon from the population before they have an opportunity to encounter the SWP and CVP export facilities, and others. Given the level of uncertainty and variability in these factors and the underlying functional relationships NMFS uses, it is my opinion that it is appropriate to utilize results of CWT salmon releases on the Sacramento River as surrogates for winter-run and spring-run Chinook salmon, and to utilize the estimate (JPE) for juvenile winter-run salmon, as bases for regulating exports to limit direct losses to less than 1-2%. That is, the results of my analyses support the continued use of CWT- and JPE-based analyses for assessing and monitoring the level of direct losses at the SWP and CVP export facilities and for their use as a regulatory mechanism for limiting direct losses.

There is little to no relationship between total mortality of juvenile salmon and steelhead in the Sacramento River and Delta prior to reaching Chipps Island and diversion rates at the SWP and CVP export facilities.

18. As discussed above, a number of factors affect the survival of juvenile salmon during migration through the lower Sacramento River and Delta. A key question in the management of the Delta is the role of SWP and CVP exports as a factor affecting the survival of juvenile salmon. I hypothesized that if SWP and CVP exports are a major factor affecting survival within the Delta (i.e., causing indirect effects/indirect Delta mortality), it would be expected that total salmon survival from all causes prior to reaching Chipps Island would be low in those years when export rates are high and would be high in those years when export rates are low (see "(A)" on Exhibit 6). I also hypothesized that if SWP and CVP export rates are not a major factor affecting Delta survival, it would be expected that there would be no relationship between total juvenile salmonid survival and combined exports during the seasonal period corresponding to the migration of a group of juvenile salmon through the lower river and Delta (see "(B)" on Exhibit 6).

19. To test this hypothesis, I plotted the estimates of total salmon survival from results of the CWT survival studies against average SWP and CVP export rates 30-days and 60-days prior to the date of last recapture for a specific CWT group of juvenile salmon. Results of salmon

survival studies conducted within the Sacramento River and Delta over more than 20 years show that: (1) the total survival (the overall survival estimate for a specific group of tagged salmon from the point of release to Chipps Island in these analyses) has been highly variable within and among years, and (2) total survival rates have been low in some years. Over the 118 survival studies included in this analysis the average survival rate was 0.29 (n=118; 95% CI = 0.04)[3] with a range from 0.016 to 1.0 (studies in which no CWT salmon were collected were not included in the analysis; maximum calculated survival rates were truncated at 1.0).

20. The results of my analysis are shown in Exhibit 7 assuming a 30-day average period for exports and in Exhibit 8 assuming a 60-day average period from exports (results of the linear regression and 95% CI are shown for each analysis). The slopes of the regressions were low (<0.0001) and were characterized by a high variance (r^2= 0.01 for the 30-day average and 0.02 for the 60-day average). The relationship between juvenile salmon survival and combined SWP and CVP export rates was not statistically significant for either the 30-day average export rate (p=0.27) or the 60-day average export rate (p=0.10). Results of these analyses show that SWP and CVP exports, overall, are a small incremental factor in determining survival of juvenile salmon, and that regulating exports (e.g., limiting exports to less than 7,000 cfs) would not have a strong predictive effect on survival of juvenile salmon within the Delta.

21. I also used results of the survival studies to explore the interrelationship between juvenile salmon survival and general environmental factors, such as Sacramento River flow, Delta inflow and outflow, in addition to SWP and CVP export rates as factors affecting juvenile salmon survival. For example, Exhibits 9 and 10 show the relationship between juvenile salmon survival and average Sacramento River flows (cfs) 30 and 60 days prior to the date of last recapture. Although these relationships show a statistically significant increasing trend in survival as river flow increases (p <0.001 for both the 30-day and 60-day average flow rates) during the emigration period, the relationships are characterized by high variability (low r^2 values

[3] Results of this analysis show the survival of juvenile salmon migrating downstream through the lower Sacramento River and Delta averaged 29% based on a sample size (n) of 118 CWT survival studies with a 95% probability that the actual average survival rate, based on the 95% confidence interval (CI) was within the range from 0.25 to 0.33 (0.29 +/- 0.04).

for the regression analyses; r^2=0.18 for the 30-day average flow and r^2=0.17 for the 60-day average flow). Results of statistical analyses of the relationship between Delta survival, Sacramento River flow, Delta inflow, and Delta outflow produced similar results (all were significant at p<0.001) for both the 30-day and 60-day averaging periods (Sacramento River flow, Delta inflow, and Delta outflow were all found to be autocorrelated (i.e., correlated with each other) and therefore only Sacramento River results are presented in the following analyses).

22. I conducted a multiple linear regression analysis to examine the relative contribution of river and Delta flows and SWP and CVP export rates on observed juvenile salmon survival reflected in the USFWS CWT survival studies. Multiple regression analyses allow the statistical determination of the incremental contribution of various factors included in the analysis (some factors such as Delta Cross Channel gate operations, seasonal water temperature, fish health, etc., were not included in the regression analysis; variables included in the analysis included the percentage of each tag code recaptured at the SWP and CVP salvage facilities, average length of salmon in each release group, Sacramento River flow, and combined SWP and CVP export rate) on observed salmon survival (as estimated based on recaptures at Chipps Island). Results of the multiple regression analysis using the 30-day average river flow and export rate showed that the relationship between juvenile salmon survival was significantly related to fish length (p<0.001) and Sacramento River flow (p=0.003), but was not significantly related to either combined SWP and CVP export rate (p=0.39) or the percentage of fish salvaged (p=0.95). The overall relationship had a relatively low correlation coefficient (r^2 = 0.29). Results of the multiple regression analysis using the 60-day average Sacramento River flow and SWP and CVP combined export rate showed a similar result in which fish length (p<0.001) and Sacramento River flow (p=0.001) were statistically significant, while the contribution of both the percentage of the tag group recaptured at the salvage facilities (p=0.67) and SWP and CVP export rate (p=0.27) were not statistically significant. The overall relationship had a relatively low correlation coefficient (r^2 = 0.31).

23. Results of these analyses were consistent in showing that survival of juvenile Chinook salmon during emigration through the lower Sacramento River and Delta was related to

both fish size (larger juvenile salmon typically have higher survival rates) and Sacramento River flows (survival rates were higher at higher flows) during the emigration period, but were not significantly related to either the percentage of a tag group salvaged at the SWP and CVP export facilities (direct loses) or combined SWP and CVP export rates (indirect effect). These results provide no evidence to indicate that limiting SWP and CVP export rates to less than 7,000 cfs during the emigration period would appreciably improve survival of emigrating juvenile Chinook salmon.

24. The USFWS CWT mark-recapture studies have provided useful and important information on the survival of juvenile Chinook salmon migrating through the lower Sacramento River and Delta. The studies have limitations in that capture efficiency is expected to vary within and among years in sampling at Chipps Island based on fish size, Delta outflow, and other factors. In addition, sampling at one location, such as Chipps Island, does not provide fine-grained resolution on the migration pathways, the duration of migration through various reaches of the river and Delta, the mortality rate within various reaches, and has a low probability of detection particularly for larger juveniles that may avoid capture in conventional trawl sampling. To address many of these issues the NMFS, University of California, US Army Corps of Engineers, and others have recently implemented a large-scale acoustic tagging program to investigate the migration patterns, pathways, rates, and mortality within the Sacramento River and Delta. Results of the acoustic tagging program are expected to provide improved understanding of the relationships between river and Delta flows, exports, and other factors on survival of salmon and other fish species. Although small-scale experimental radio and acoustic tagging studies have been conducted within the Sacramento River and Delta in recent years, the above-described large-scale acoustic tagging studies are currently underway and therefore have not been included in this analysis.

25. Results of the CWT survival studies conducted over more than 20 years show that the survival of juvenile salmon migrating downstream through the lower Sacramento River and Delta is highly variable within and among years. Survival rates are weakly correlated with Sacramento River flow and Delta inflow and outflow during the seasonal migration period. SWP

and CVP export rates contribute a small incremental amount to explaining juvenile salmon survival within the lower river and Delta; however, the contribution of SWP and CVP export rates were not found to be statistically significant ($p > 0.05$). Based on these results, it is my opinion that limiting combined SWP and CVP exports to less than 7,000 cfs during the juvenile salmon emigration period would not appreciably affect the survival of juvenile salmon emigrating through the river and Delta.

Existing regulatory requirements are adequate to protect juvenile salmon and steelhead during the interim period (until March 2009)

26. A number of regulatory requirements exist that are designed to enhance and protect Chinook salmon, steelhead, and other aquatic resources inhabiting the Bay-Delta estuary and Central Valley rivers and tributaries, as well as their critical and essential habitat. These regulations include, but are not limited to, actions by and requirements of the State Water Resources Control Board (SWRCB), Central Valley and San Francisco Bay /Regional Water Quality Control Boards, NMFS and USFWS biological opinions, Central Valley Project Improvement Act (CVPIA), agreements with the California Department of Fish and Game (CDFG), Pacific Fisheries Management Council (PFMC), and others. For example, SWRCB D-1641 limits SWP and CVP export rates during the salmon emigration period to not more than 65% of Delta inflow prior to February 1, and to not more than 35% of Delta inflow after February 1. D-1641 also requires that the Delta Cross Channel gates be closed beginning February 1 for the protection of juvenile emigrating salmon and steelhead, and that the gates be closed for up to 45 days during the November through January period based on requests of the state and federal fishery agencies.

27. The existing interim actions ordered by this Court to protect delta smelt also provide incidental protections for juvenile salmon and steelhead during their migration period. In addition, the NMFS BO limits direct losses of winter-run and spring-run Chinook salmon and steelhead as part of authorized levels of incidental take that are expected to continue to be in effect until an new biological opinion is issued by NMFS. The RBDD gates will remain open

starting September 15 and will not be closed prior to the March 2009 date when a new NMFS BO is expected that will address future management of the RBDD gates and fish ladders.

28. The existing protections that are expected to remain in place during the interim period (prior to issuance of a new BO by NMFS expected in March 2009), namely, the Data Assessment Team (DAT) and salmon decision tree management processes, will continue to be in effect to protect and improve conditions for listed salmonids. The upstream habitat and enhancement projects implemented by CALFED, the Anadromous Fish Restoration Program, and other programs will remain in effect throughout the interim period to improve habitat conditions, improve migration access, and reduce and avoid entrainment losses at a number of water diversions located along the Sacramento River through operation of existing positive barrier fish screens. Ocean harvest restrictions intended to reduce adverse effects on adult Chinook salmon are also expected to remain in effect during the interim period.

29. Based on my review of SWP and CVP operations and hydrologic conditions, it is my opinion that operations of the SWP and CVP projects through March 2009 are not expected to reduce appreciably the likelihood of either survival or recovery of winter-run or spring-run Chinook salmon or Central Valley steelhead. Limiting SWP and CVP export rates to less than 7,000 cfs, in addition to other existing regulatory requirements and constraints, would not be expected to result in (1) an appreciable reduction in the direct losses of juvenile salmon or steelhead as a result of SWP and CVP export operations from the already low take level (<1%), or (2) an appreciable improvement in the expected survival of juvenile salmon during emigration through the lower Sacramento River and Delta. Based on results of these analyses I have concluded that additional regulatory constraints (such as the 7,000 cfs export limitation), when added to the existing requirements and constraints on SWP and CVP export operations, would not appreciably improve the likelihood of survival or recovery of protected salmonid species inhabiting the Central Valley, Therefore, I have identified no additional interim changes to SWP or CVP operations that are required to avoid jeopardy to winter-run and spring-run Chinook salmon and steelhead from the Central Valley through March 2009.

I declare under penalty of perjury that the foregoing is true and correct and that this declaration is executed this 29 day of August, 2008, at Walnut Creek, California.

CHARLES H. HANSON, Ph.D.

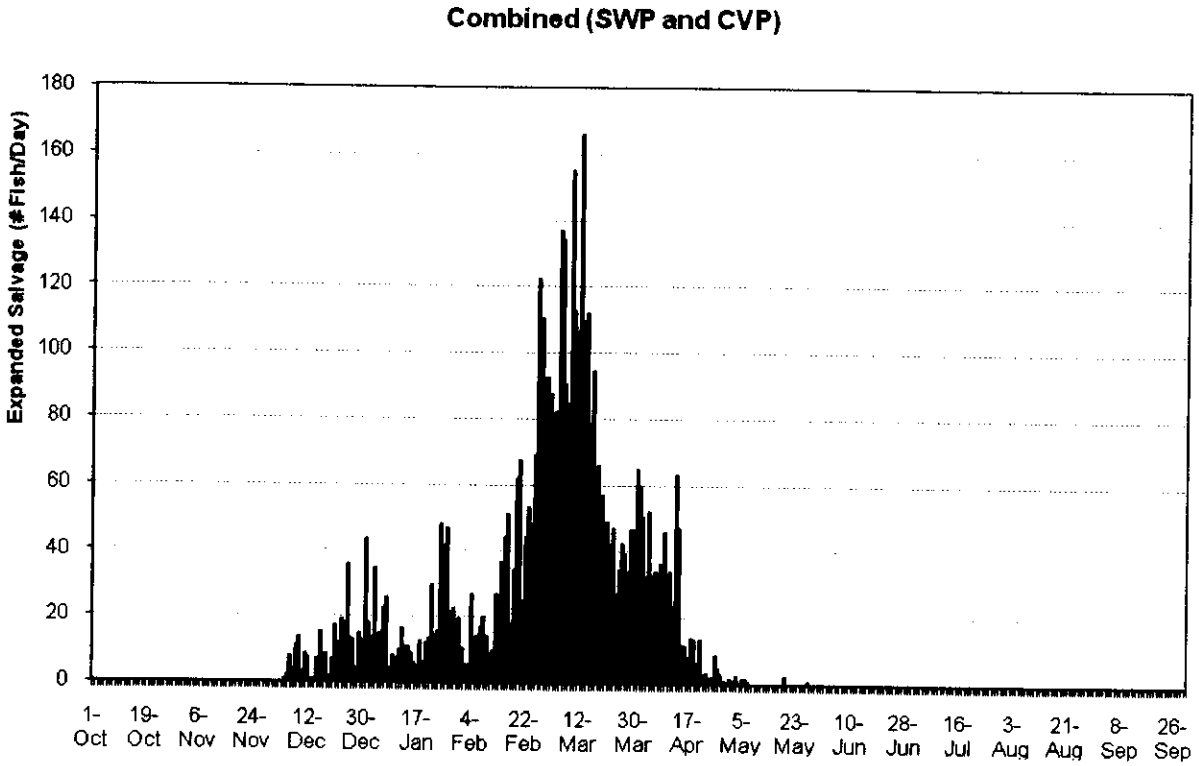

Exhibit 1. **Seasonal distribution of juvenile winter-run Chinook salmon at the SWP and CVP export facilities, 1995-2007. (Source: California Department of Fish and Game (ftp://ftp.delta.dfg.ca.gov/salvage)), non-clipped only.**

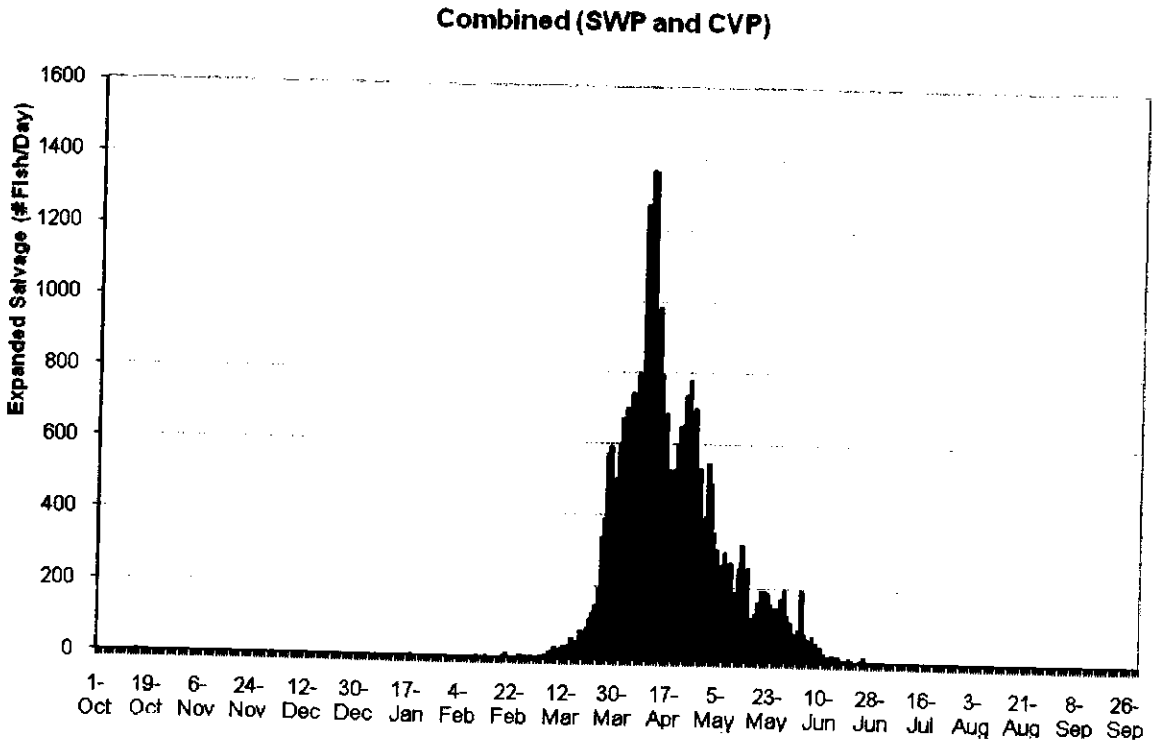

Exhibit 2. **Spring-run Chinook expanded salvage (# fish/day) at the SWP and CVP. (Source: California Department of Fish and Game (ftp://ftp.delta.dfg.ca.gov/salvage)), clipped and non-clipped.**

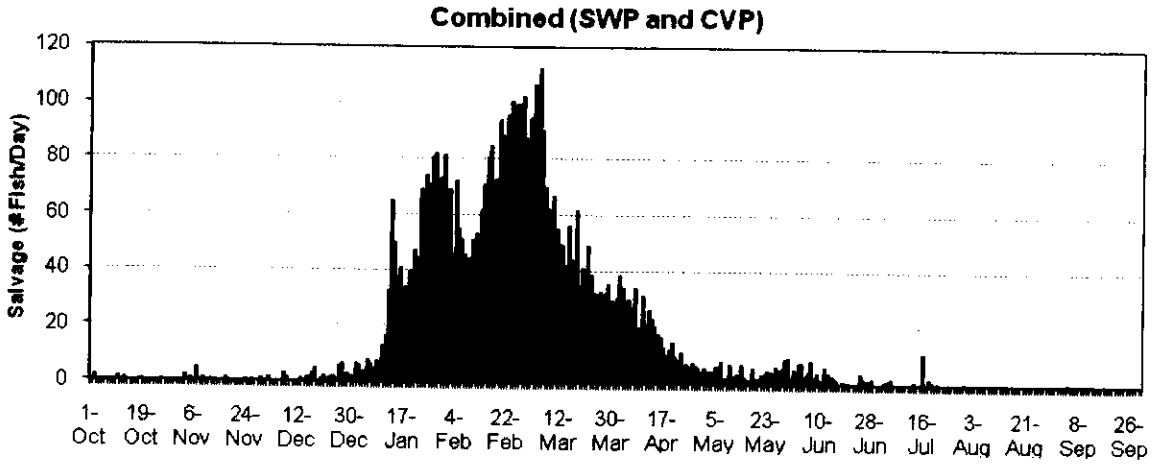

Exhibit 3. **Steelhead expanded salvage (# fish/day) at the SWP and CVP. (Source: California Department of Fish and Game (ftp://ftp.delta.dfg.ca.gov/salvage)), clipped and non-clipped.**

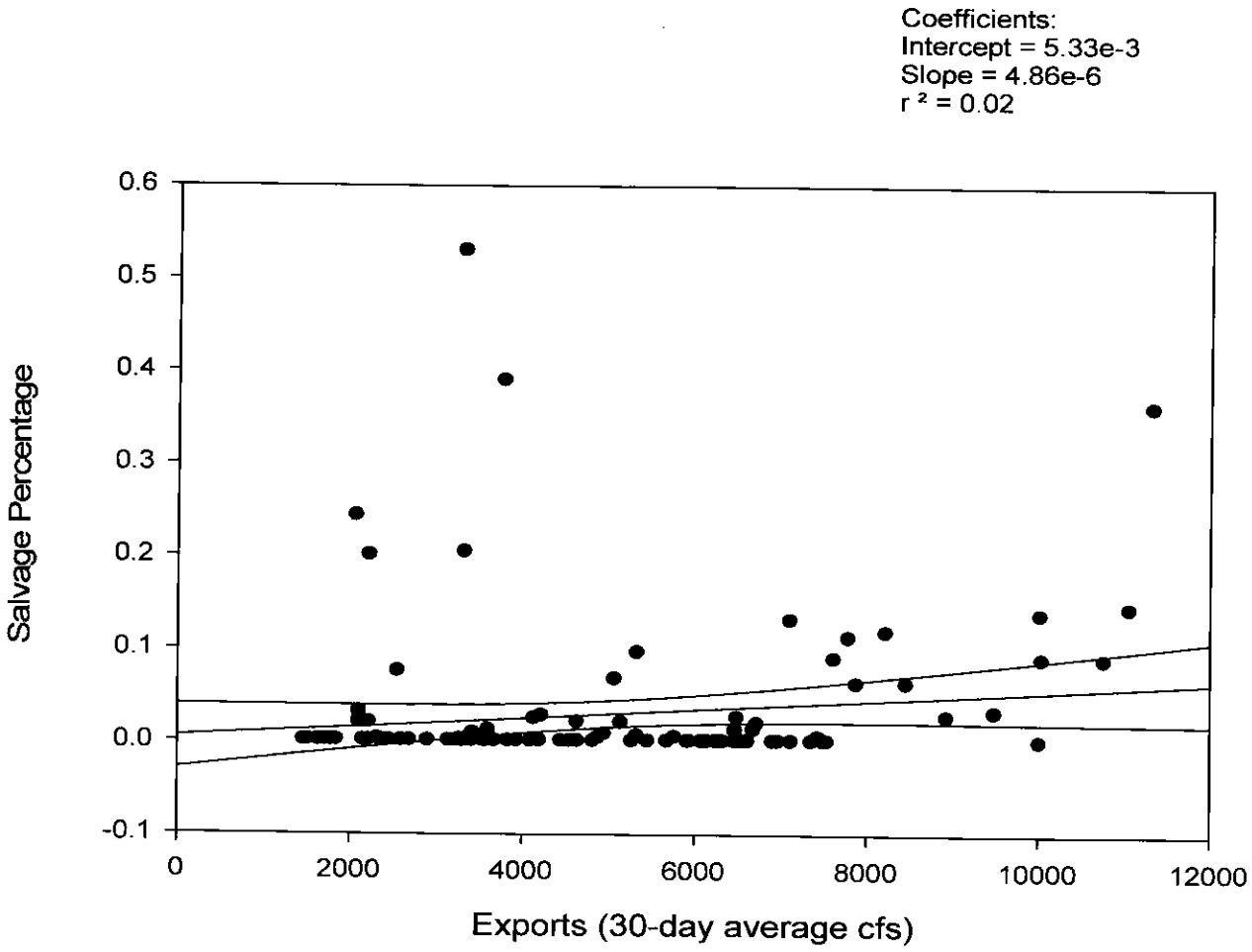

Exhibit 4. Relationship between SWP and CVP exports (30-day average) and percentage salvage.

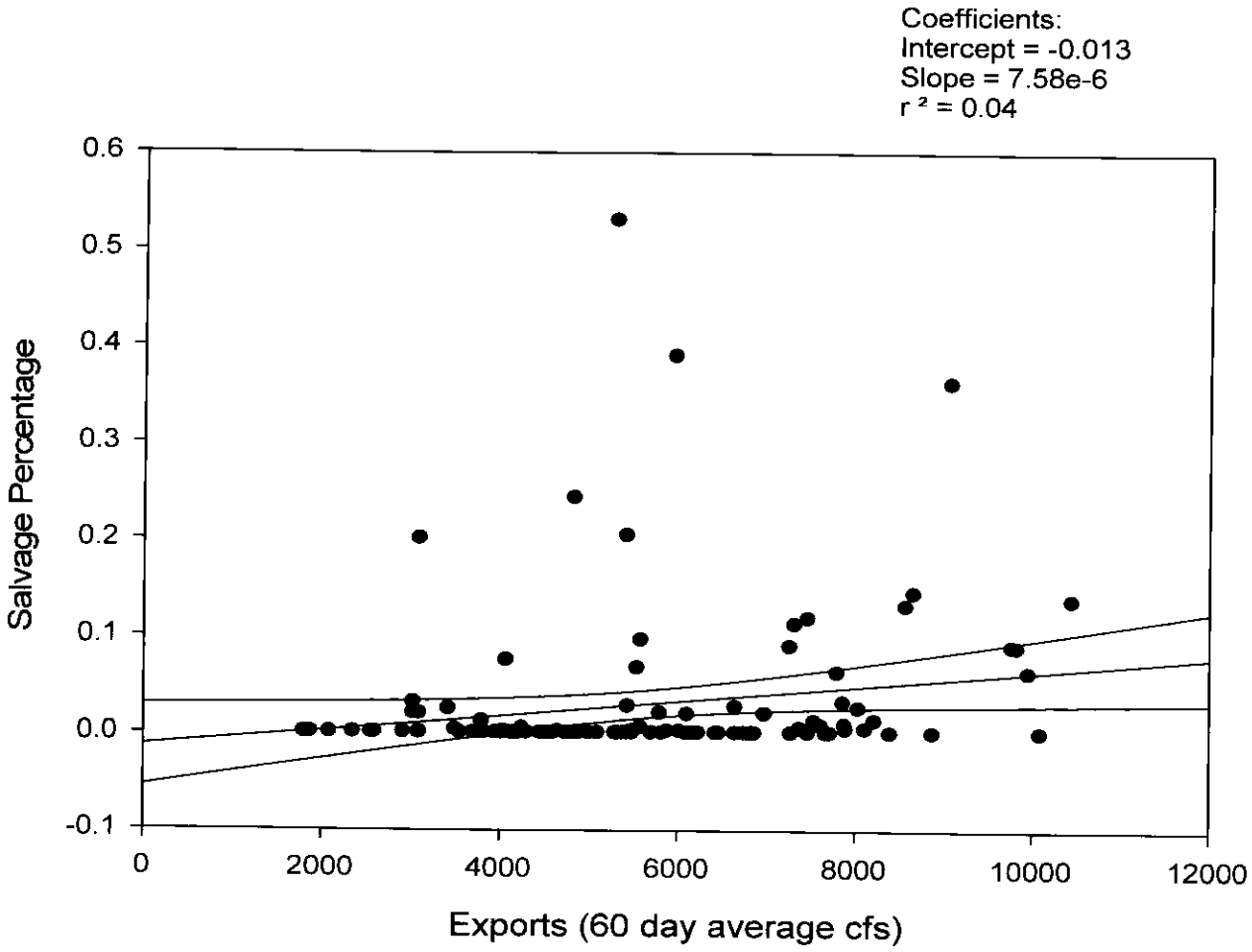

Exhibit 5. Relationship between SWP and CVP exports (60-day average) and percentage salvage.

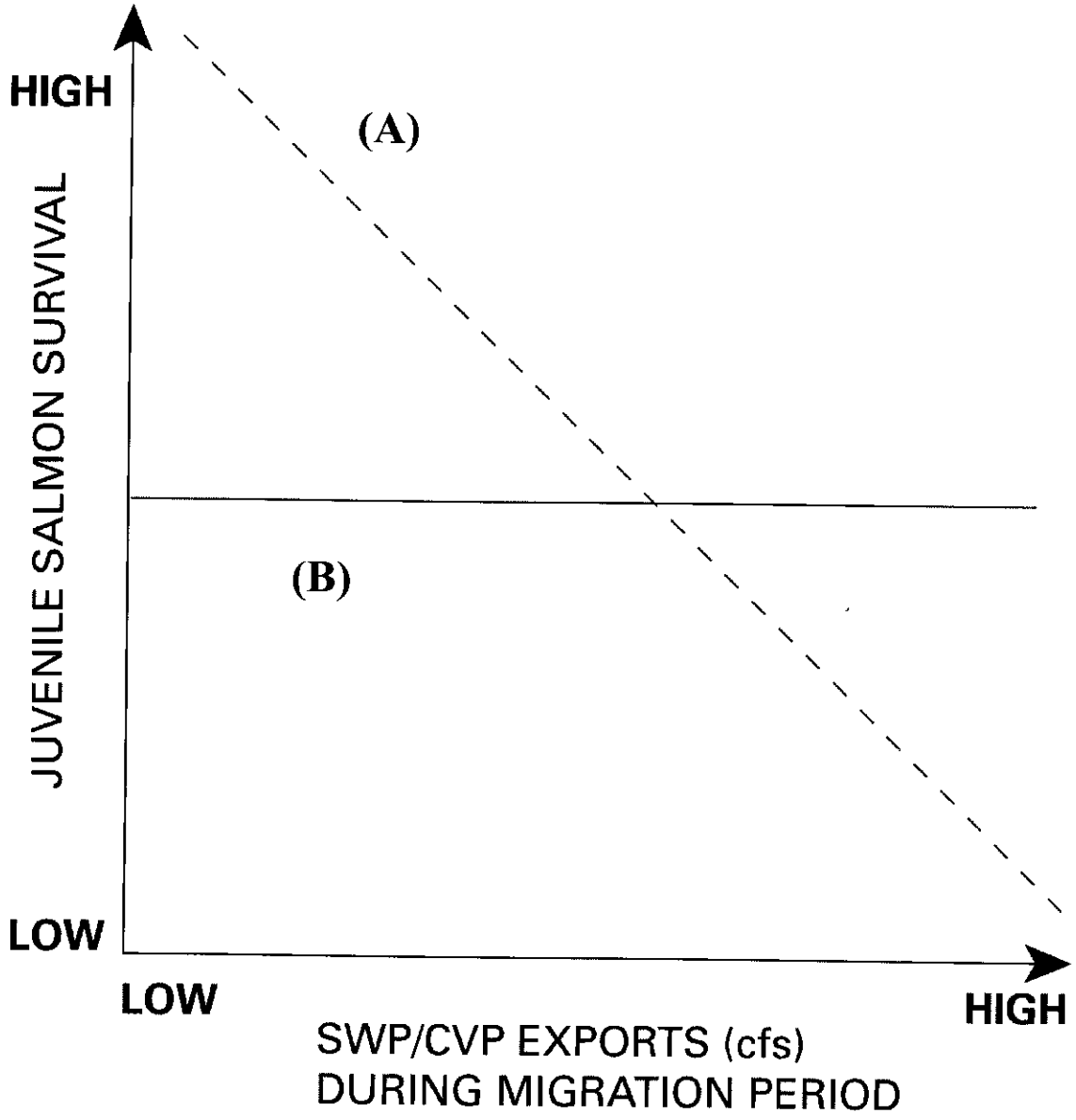

Exhibit 6. Hypothesis regarding the effect of SWP/CVP exports on indirect mortality of juvenile salmon.

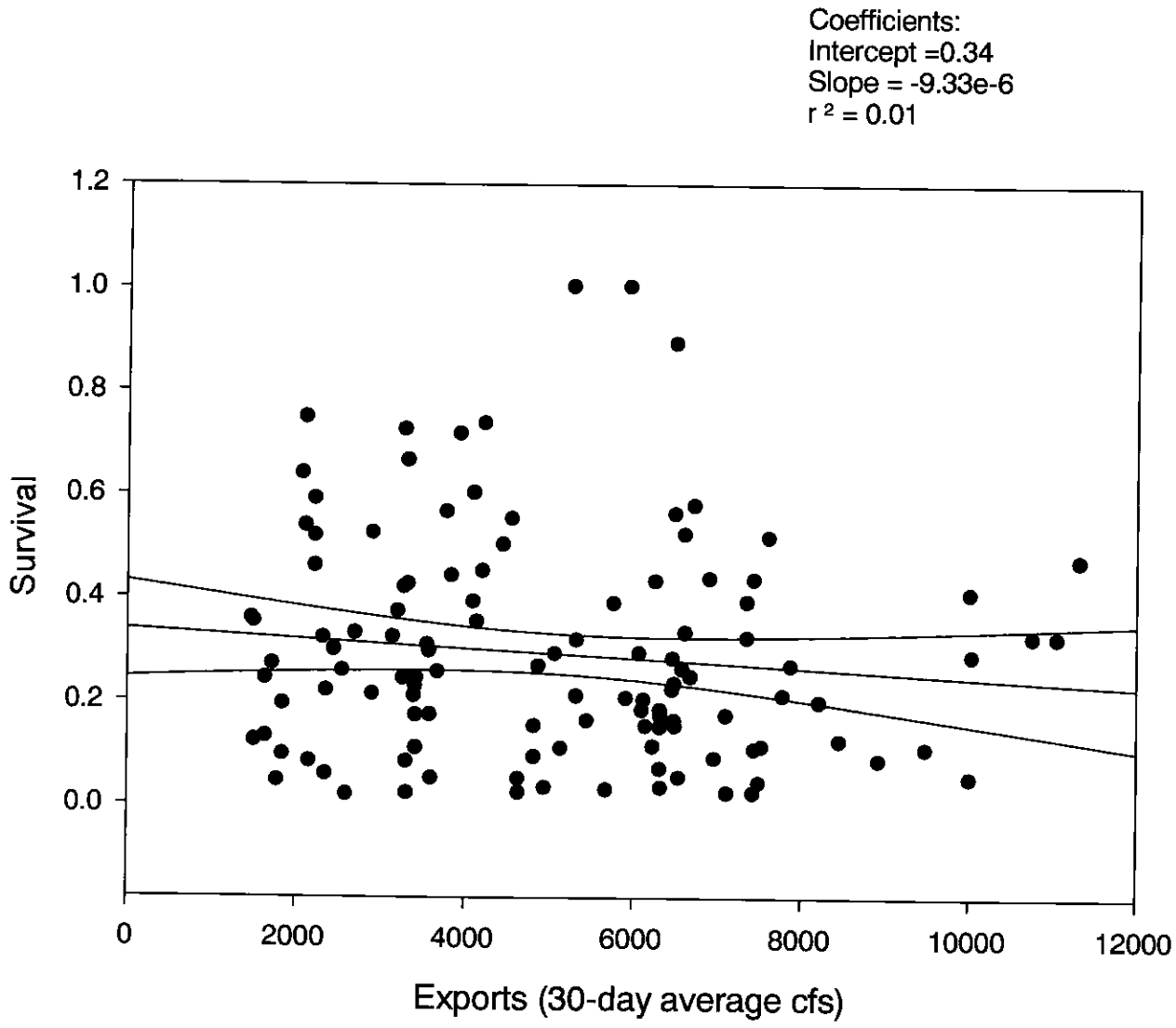

Exhibit 7. Relationship between SWP and CVP exports (30-day average) and Delta salmon survival.

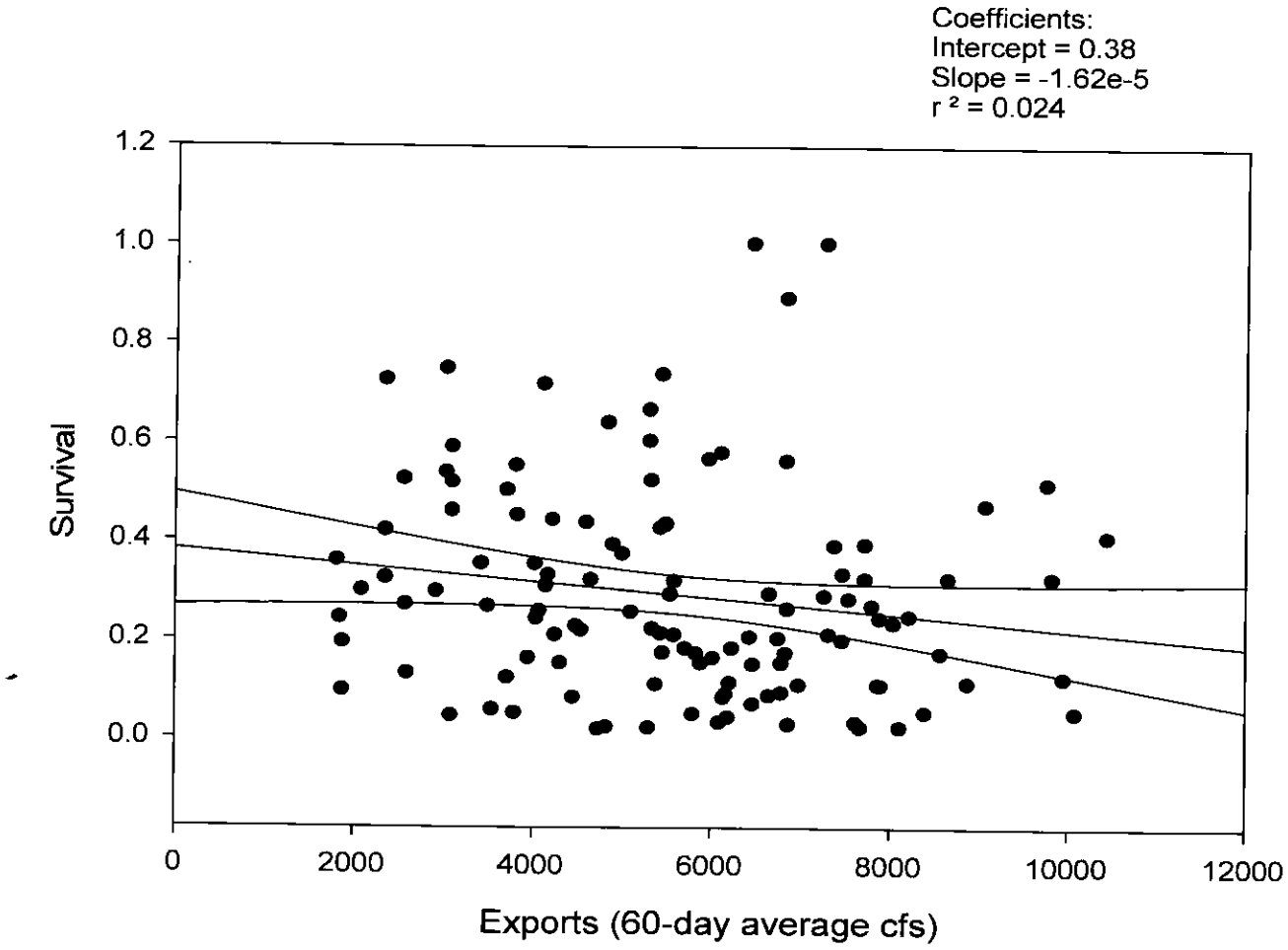

Exhibit 8. Relationship between SWP and CVP exports (60-day average) and Delta salmon survival.

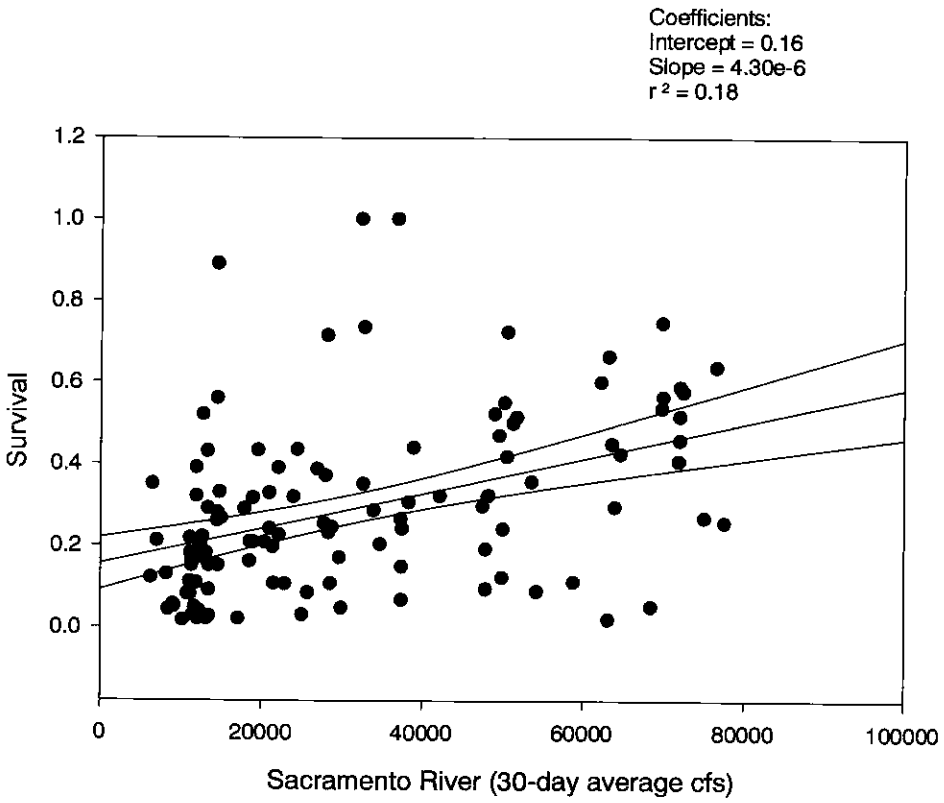

Exhibit 9. Relationship between Sacramento River flow (30-day average) and Delta salmon survival.

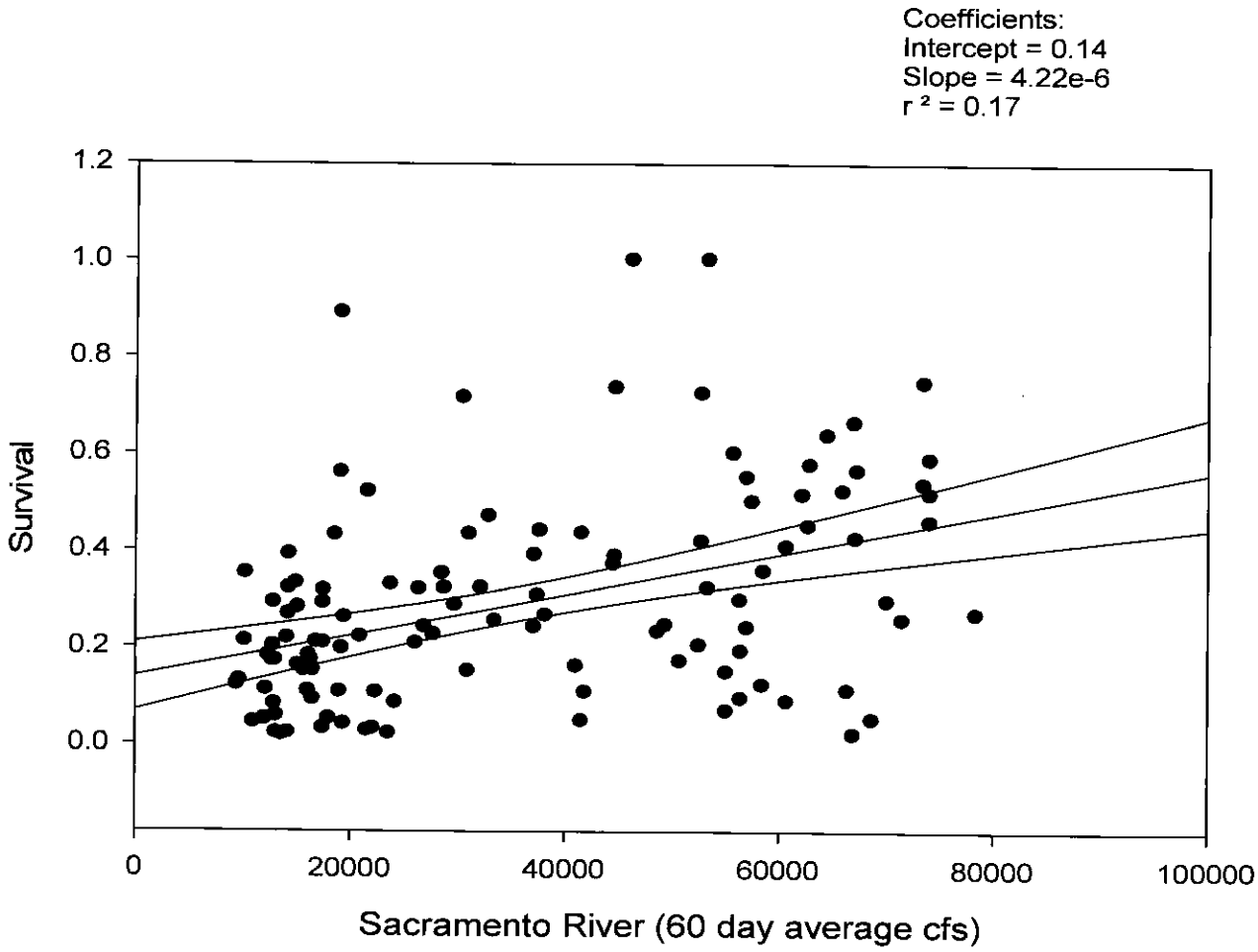

Exhibit 10. Relationship between Sacramento River flow (60-day average) and Delta salmon survival.