IGNACIA S. MORENO, Assistant Attorney General
JEAN E. WILLIAMS, Section Chief
SETH M. BARSKY, Assistant Section Chief
BRIDGET KENNEDY McNEIL, Trial Attorney (CO State Bar 034299)
U.S. Department of Justice
Environment and Natural Resources Division
Wildlife & Marine Resources Section
1961 Stout St., 8th Floor
Denver, CO 80294
Ph: 303-844-1484/Fax: 303-844-1350
bridget.mcneil@usdoj.gov

WILLIAM J. SHAPIRO, Trial Attorney (CO State Bar 030929)
U. S. Department of Justice
Environment and Natural Resources Division
Natural Resources Section
501 I Street, Suite 9-700
Sacramento, CA 95814
Ph: 916-930-2207/ Fax: 916-930-2010
william.shapiro@usdoj.gov

Attorneys for the Federal Defendants

UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF CALIFORNIA
FRESNO DIVISION

CONSOLIDATED SALMON CASES	Case No. 1:09-cv-407 OWW **Declaration of Jeffrey Stuart In Support of Federal Defendants' Opposition to Plaintiffs' Motion for Temporary Restraining Order**

I, JEFFREY STUART, declare as follows:

1. My name is Jeffrey Stuart, and I am employed by NOAA's National Marine Fisheries Service ("NMFS") as a Fisheries Biologist in the Sacramento Office of the NMFS Southwest

Region. I have been employed in that position since 2001, and my duties include conducting section 7 consultations under the Endangered Species Act (ESA), including significant involvement in the development and issuance of NMFS' June 4, 2009, Biological and Conference Opinion on the Long Term Operations of the Central Valley Project and State Water Project ("CVP/SWP Opinion").

2. I have reviewed Plaintiffs San Luis & Delta-Mendota Water Authority and Westlands Water District's Memorandum of Points and Authorities in Support of Motion for Temporary Restraining Order and motion for Preliminary Injunction (Case 1:09-cv-01053-OWW-DLB, Document 164), filed on January 27, 2010, and the supporting declarations by Steven P. Cramer, Thomas A. Boardman, Joe del Bosque, Russ Freeman, Chris Hurd, Daniel G. Nelson, Dana Wilkie, Jonathan R. Marz, and Todd Allen. I have also reviewed Metropolitan Water District's Joinder, State Water Contractors' Joinder, and the declaration of Terry Erlewine. For the purposes of this declaration, I will focus on the scientific arguments presented in San Luis & Delta-Mendota Water Authority and Westlands Water District's Memorandum of Points and Authorities, the declaration by Steven P. Cramer, and Metropolitan Water District's joinder, as they relate to the CVP/SWP Opinion Reasonable and Prudent Alternative Action IV.2.3, Old and Middle River Flow Management ("Action IV.2.3"). In addition, this declaration is limited to the time period ending on March 5, 2010.

<u>Fish Presence in the Delta</u>

3._The estimate for the 2009 returning adult escapement of winter-run Chinook salmon is 4,416 fish (including 416 hatchery fish), up from an adult escapement estimate of 2,850 fish in 2008. The preliminary juvenile production estimate ("JPE") for winter-run is 1,144,860 fish (the preliminary JPE is based on the fecundity and sex ratio from the 2008 cohort, therefore, this estimate may change as these parameters are updated). This preliminary JPE estimate establishes the 2% incidental take limit at 22,897 juvenile winter-run Chinook. There are no population estimates for spring-run juveniles or steelhead smolts that are routinely used that would be comparable to the JPE estimate.

4. The periodicity table provided in Exhibit 1a shows the temporal distribution of anadromous fish species within the Delta. For the time period up to March 5, 2010, I expect to see a high level of Sacramento River winter-run Chinook salmon ("winter-run"), a moderate level of Central Valley ("CV") spring-run Chinook salmon ("spring-run"), and a moderate level of CV steelhead migrating into and through the Delta. Averaged monthly data for the period between January and the end of March (years of records 1999-2009), obtained from the Central Valley Operations ("CVO") website (http://www.usbr.gov/mp/cvo/) indicate that approximately 40% of the annual winter-run salvage will occur between January and the end of February, and 90% by the end of March, as measured by loss estimates at the salvage facilities during the period of record (14% in January, 26% in February, 50% in March). I expect that less than 1 % will of the spring-run Chinook salmon will have moved through the Delta by the end of February as measured by the loss counts at the salvage facilities but that this will rise to approximately 17 percent of the spring-run population by the end of March (0.1% in January, 0.2% in February, and 17% in March). I expect that approximately 58% of the CV steelhead population will have moved through the Delta by the end of February as measured by the loss counts at the facilities, but that this will rise to approximately 90% by the end of March (21% in January, 37% in February, and 31% in March) (Exhibit 1b). Salvage and loss prior to the recent precipitation event has been very low.

5. In addition, the Southern Distinct Population Segment (“DPS”) of North American green sturgeon (“Southern DPS of green sturgeon”) are present within Delta waterways throughout the year. Based on historical salvage data at the Federal and State fish collection facilities, a total of approximately 16 percent of the annual salvage of green sturgeon will occur between January and the end of March (2% in January, 6% in February, and 8% in March). Salvage is typically higher at the SWP during this period (Exhibit 1c).

6. As shown in Exhibits 1 and 2 from the declaration by Jonathan R. Marz, there was very little salvage and loss of winter-run and CV steelhead (identified by the column “Season Combined,” with the season beginning on October 1) at the Federal and State fish facilities until the recent storm events. This indicates that the recent storms triggered the downstream migration of winter-run and CV steelhead into the Central and South Delta waterways.

7. I anticipate that the fish currently in the Delta and those that will be entering the Delta through March 5, 2010, will be vulnerable to increases in salvage and loss as a result of the potential increases in export rates and reduced screening efficiency at the CVP facilities. In particular, winter-run juveniles enter the Delta during the December through March period (approximately 63% through the end of February, > 99% by the end of March; [Exhibit 1d]), but do not migrate past Chipps Island in large numbers until March. Based on the 10 years of data from the CVO web site, approximately 50% of winter run entrainment has typically occurred by the end of February, and almost all winter-run entrainment has typically occurred by the end of March [Exhibit 1b].

<u>Rationale for the Use of the Particle Tracking Model (“PTM”) and Old and Middle River (“OMR”) Flows</u>

8. Plaintiffs' characterization of NMFS' use of the PTM simulations is inaccurate. It is the subjective opinion of the plaintiff's witness that NMFS solely used neutrally buoyant particles as a surrogate to represent salmonids and their behavior. The CVP/SWP Opinion (pages 366-367) clearly states that this was not so. The analysis of flows and entrainment risk used the output of the PTM simulations, combined with evidence from the salvage data and mark and recapture studies, to develop a relationship between these two factors. The CVP/SWP Opinion (pages 380-381) states, "While the correlation of the survival rates of fish released in the Delta Action 8 and the Interior Delta CWT [coded wire tag] studies with the percentages of particles reaching Chipps Island is poor under most of the runs, Kimmerer and Nobriga (2008) offer potential causes for these differences. They opine that the lack of correlation may be merely due to the differences in the behavior between salmon and neutrally buoyant particles, or, on the other hand, that artifacts of the experiments such as the survival potential of fish traveling through the different waterways (*i.e.*, predation on the CWT fish) or the lack of efficiency in the trawl recapture rates for Chipps Island biases the results of the CWT studies and results in lower numbers of fish reaching the terminal endpoints than suggested by the PTM results. They conclude that 'despite all these differences, the PTM results suggests that river flow may be an important variable in determining which way the salmon go and their probability of survival, and should be included in the design and analysis of future studies' (Kimmerer and Nobriga 2008 page 19)."

9. NMFS used several PTM simulations, executed by the California Department of Water Resources (DWR) at NMFS' request, to assess the relationship between OMR flows and particle fate, including entrainment at the export facilities in the south Delta. Simulations were run using two different water years: 2005, a "wet" year with high San Joaquin River flows; and

2008, a “dry” year with low San Joaquin River flows. These represented two bookends for hydrologic conditions. NMFS included the “dry” year of 2008 as it represented conditions used by the U.S. Fish and Wildlife Service (“FWS”) in their analysis for Delta smelt, and thus, FWS could compare runs done for NMFS with their own data set. Injection points within the Delta overlapped with injection sites utilized by FWS studies to make data directly comparable at these points, but also included points in the eastern Delta and south Delta relevant to NMFS’ species.

10. The PTM simulations for NMFS examined particle fates injected at OMR flows of -3,500 cubic feet per second (“cfs”), -2,500 cfs, and -1,250 cfs. The particles were tracked for 90 days through the Delta with the first 30 days sampled at intervals of 5 days, thereafter particle fate was determined at 60 and 90 days. Injections were made starting at the beginning of each month beginning with February and ending with June. Due to time limitations, DWR staff could not run additional simulations at higher flow levels and more months, despite requests from NMFS.

11. PTM simulation output was used to assess the magnitude of particle entrainment from each of the injection points over the 90-day time course under a given OMR flow regime, water year type, and month of injection (February through June). Data from the injection site location and initial sampling rate provided additional information concerning the rate of entrainment and the spatial dispersion of the export effects. The synthesis of this information allowed NMFS to develop a conceptual “footprint” of the entrainment vulnerability of particles injected at each injection site, as related to OMR flow values.

12. The conceptual footprint indicates that as exports increase, as represented by more negative OMR flows, the level of particle entrainment at a given injection site will increase to a certain level, and then plateau. The level of the plateau and the speed at which the plateau is

reached indicates the relative vulnerability to entrainment at that injection site. Assessment of the simulation data also indicated that proximity to the export pumps plays a role in the entrainment vulnerability. Injection sites located in closer proximity to the export pumps or along a direct path were more vulnerable than locations located at a greater distance or along an indirect path. Entrainment rates also were higher for sites located closer to the export facilities than those located at a farther distance (*i.e.*, entrainment effects were seen in a shorter amount of time).

<u>Relationship of Exports to Fish Entrainment</u>

13. Newman (2008) found a significant effect of exports on the survival of CWT Chinook salmon released into Georgiana Slough: there is a 98% probability that as exports increase, survival decreases for Georgiana Slough releases (Delta Action 8 studies) compared to fish released in the Sacramento River (Ryde). The Interior Studies also indicated that fish which had moved into Georgiana Slough were 16 times more likely to be salvaged at the export facilities than fish remaining in the Sacramento River. This indicates that fish moving southwards to the San Joaquin River via Georgiana Slough and the Mokelumne River, were vulnerable to entrainment by the export facilities upon entering the Central Delta. These fish also had a lower rate of survival than fish which remained in the Sacramento River (ratio of 0.44). Thus, moving into the central and southern Delta (Delta interior) results in lower survival overall, a higher susceptibility to entrainment at the export facilities, and a lower rate of survival as exports increased compared to the Sacramento River. The location of the junction between the lower Mokelumne River and the lower section of the San Joaquin River where fish enter the San Joaquin River system is approximately Station 815 of the injection sites (Exhibit 2). In addition, Newman's (2008) analysis of the Vernalis Adaptive Management Plan ("VAMP")

experiments indicated that survival was lower for fish moving through the Old River system to Chipps Island, than for fish which remained in the main stem of the San Joaquin River.

14. Information provided by DWR (Exhibit 3) indicate that as OMR levels increase (*i.e.*, more negative), salvage and loss of older juveniles (winter-run and yearling spring-run) increase, typically in a non-linear fashion. In the material provided by DWR, entrainment is relatively low at an OMR flow of up to approximately -5,000 cfs. As OMR flows increase (*i.e.*, more negative) beyond -5,000 cfs, entrainment rates are considerably higher. Data from other sources had variable results. In some months, strong relationships between OMR and salvage existed (Exhibits 3 and 4), while in other months, weaker relationships existed (Exhibit 5), indicating that fish (steelhead) may be coming from multiple basins. Modeling performed for the consultation indicated that predicted OMR flows would be consistently more negative than -5,000 cfs in the months of December through April for wet, above normal, below normal and dry water year types. Critical years had OMR flows that were modeled to range between approximately -2,500 cfs and -6,300 cfs during the period between December and June (Exhibit 7).

15. Taking all of these pieces of information together, the older juvenile (winter-run and yearling spring-run) loss to OMR flow information indicate that under the current and projected future conditions, as modeled in the CALSIM II simulations, loss at the facilities will be in the region of the greater, more vertical slope, not in the region of the flatter slope (Exhibit 3). Loss is substantially reduced when OMR flows are more positive than -5,000 cfs. The particle tracking models indicate that at OMR flows more negative than -5,000 cfs, the vulnerability of particles to entrainment extends out to the lower San Joaquin River (>50 percent at the locations along the lower San Joaquin River between the confluence of the Mokelumne River and

Stockton). When OMR flows are reduced to -3,500 and -2,500 cfs, particle entrainment at points along the San Joaquin River drop substantially. At these flow levels, the export footprint has been reduced in size and fish moving along the San Joaquin River main channel experience less export influence the farther west they move from Stockton towards Jersey Point. Newman (2008) indicates that fish moving through the Georgiana Slough pathway into the lower San Joaquin River section experience more loss, and presumably more movement deeper into the south Delta, under the influence of increasing exports. The increased potential to be salvaged at the exports for fish moving through the Georgiana Slough pathway compared to the Sacramento River route parallels the lower entrainment risk at Rio Vista in the PTM simulations compared to Station 815 at the confluence of the Mokelumne River and San Joaquin River.

16. The plaintiffs have stated that there is no statistically significant relationship between OMR and salmonid mortality. However, the plaintiffs have unfairly represented the reality of the conditions under which the data are collected which makes achieving statistical significance difficult without numerous replications to reduce the standard error. This is particularly true when examining retrospective observational data in which the variables are not well replicated and environmental noise is prevalent. The Delta system is full of multiple factors that can influence the statistical results of the relationship. High levels of environmental noise will mask all but the most robust effects, *i.e.*, a low signal to noise ratio. Newman's (2008) analysis of the four studies involving the Delta Cross Channel, Delta interior, Delta Action 8 and VAMP described this problem. Dr. Newman indicated that the excessive environmental noise swamps the signal from the exports, making the detection of statistically significant differences very hard to find. His analysis in the paper points out the problem in reducing the standard error sufficiently to see the difference in the sample means (pages 68-73 of Newman 2008 report) for

the different mark/recapture studies in the Delta. It would require substantially greater numbers of replications of the experiments to reduce the magnitude of the standard errors to detect significant differences. Plaintiffs also fail to mention that Dr. Newman did find a statistically significant relationship (98% probability) between lowered survival and increased exports in the Delta Action 8 studies. OMR is a function of export levels and, thus, it is likely that a statistically significant relationship would also be found for OMR and salmon survival provided the correct experimental and statistical designs are employed which minimizes extraneous environmental noise. Furthermore, plaintiffs have failed to explain that salvage, whether raw or "indexed," is but a small fraction of the total number of fish affected by exports and is at best a fairly crude assessment due to its inherent assumptions and expansion factors. Most fish drawn into the southern Delta by export-related hydraulic effects fail to ever make it to the actual fish collecting facilities; therefore the values generated for salvage or loss underestimates the impacts created by the export actions. Previous mark/ recapture methods were too crude and insensitive to adequately capture this and this area of project impacts remains contentious. Future studies utilizing acoustic tags, which have better discrimination and sensitivity of fish movement both temporally and spatially, are anticipated to give the resolution needed to detect these relationships.

Impacts of Plaintiffs' Proposed Injunction

17. During the period between February 1 and March 5, salvage and loss records indicate that winter-run, CV steelhead, and green sturgeon will be increasingly present in the salvage collections at the CVP and SWP (Exhibits 1b,c, 8, 9, and10). The cumulative salvage data for green sturgeon shows that approximately 6 percent of the annual salvage for Southern DPS green sturgeon occurs in February. Salvage of Southern DPS green sturgeon doubles in March

compared to February at the State facility (Exhibit 1c). Therefore, I expect increased salvage of Southern DPS of green sturgeon through March 5, 2010. As a result, the Plaintiffs' proposed preliminary injunction of Action IV.2.3 from the beginning of February through early March will result in increased salvage and loss of winter-run, CV steelhead, and Southern DPS of green sturgeon at the Federal and State facilities (see paragraphs 3 and 4, above). I also expect spring-run (as represented by hatchery releases of tagged surrogate late fall-run and fish within the spring-run size criteria) to start showing up at the Federal and State facilities, as approximately 53 percent of the annual population has migrated into the Delta by March (Exhibit 1d) and approximately 17 percent of the annual loss has occurred by the end of March (Exhibit 1b). I expect considerably more fish will be lost prior to encountering the salvage facilities based on the high rates of loss seen in the waterways of the Delta interior in both the central and southern waterways. Survival of fish in these waterways may be no more than 10 to 30 percent based on survival estimates in recent acoustic tag studies (Perry and Skalski 2008, 2009; Holbrook *et al.* 2009).

18. The CVP and SWP water projects alter flow patterns in the Delta due to export pumping and create entrainment issues in the Delta at the pumping and fish facilities. In addition to reducing the loss and salvage of the anadromous salmonid species, Action IV.2.3 improves the function of primary constituent element of migratory corridor for CV steelhead and the Southern DPS of green sturgeon. Migratory habitat condition is strongly affected by the presence of barriers, including behavioral impediments to migration. For successful survival and recruitment of salmonids, freshwater migration corridors must function sufficiently to provide adequate passage. In the absence of Action IV.2.3, the primary constituent element of migratory corridor

for CV steelhead and the Southern DPS of green sturgeon, and thus, the conservation value of their critical habitat, will be modified and degraded.

19. The reasonable and prudent alternative (RPA) contained in the CVP/SWP Opinion is comprised of over 50 actions, which must be implemented in its entirety for the projects not to violate the statutory and regulatory requirements of section 7(a)(2) of the ESA. If the protective measures afforded by any of the actions, and in this case, specifically Action IV.2.3, are not implemented, then the CVP and SWP will likely deepen the harm to the listed anadromous fish species and their critical habitat, and the RPA as a whole may not avoid jeopardy to Sacramento River winter-run Chinook salmon, Central Valley steelhead, and Southern DPS of North American green sturgeon, and may not avoid adverse modification to the designated critical habitat of Central Valley steelhead and Southern DPS of North American green sturgeon.

20. I declare under penalty of perjury under the laws of the State of California and the United States that the foregoing is true and correct.

Dated this 1 day of February, 2010

Jeffrey S. Stuart
Biologist, Sacramento Office, Southwest Region
National Marine Fisheries Service

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Holbrook, C.M., R.W. Perry, and N.S. Adams. 2009. Distribution and joint fish-tag survival of juvenile Chinook salmon migrating through the Sacramento-San Joaquin Delta, California. 2008. U.S. Geological Survey Open-File Report 2009-1204. 30 pages.

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EXHIBIT 1

Exhibit 1a. Temporal distribution of anadromous fish species within the Delta (KL = Knights Landing, FW = Fremont Weir). Reproduced from the NMFS CVP/SWP Opinion (Table 6-27 on page 335).

Delta Location	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	Month											
a) Adult winter-run Chinook salmon												
Sac. River	M	M	M	M	M	M					M	M
b) Juvenile winter-run Chinook salmon												
Sac. River @ KL	M	M	M	L	L			L	L	L	M	M
L Sac. River (seine)	H	H	M	L	L				L	L	M	H
W Sac. River (trawl)	M	M	H	M	L						L	M
c) Adult spring-run Chinook salmon												
Lower Sac River	L	L	M	M	M	M / L	L					
d) Juvenile spring-run Chinook salmon												
Sac R @ KL	M	M	H	H	M	L					M	H
e) Adult Central Valley steelhead												
Sac R @ FW	L	L						M	H	M	L	L
San Joaquin River	H	M	L				L	L	M	M	M	H
f) Juvenile Central Valley steelhead												
Sac R. @ KL	M	M	H	H	L						L	L
Sac R @ Hood	L	M	H	H	M	L / –					L	L
Chipps Island (wild)	L	L	H	H	M	M	L			L	L	L
Mossdale/SJR			L	H	H	L						
Stan R @ Caswell	L	M	H	M	M	L						
Mokelumne R	M	M	M	M	M	M	M					
g) Adult Southern DPS green sturgeon (≥ 13 years old for females and ≥ 9 for males)												
SF Bay and Delta	L	L	M	M	M	M	M	M	M	L	L	L
h) Juvenile Southern DPS green sturgeon (> 10 months and ≤ 3 years old)												
Delta waterways	M	M	M	M	M	M	M	M	M	M	M	M
Relative Abundance		H = High			M = Medium			L = Low				

Exhibit 1b: Summary table of monthly Winter-run and Spring-run Chinook salmon loss and Combined total salvage and loss of Central Valley steelhead at the CVP and SWP fish collection facilities from water year 1999-2000 to water year 2008-2009. Data from CVO web site: (http://www.usbr.gov/mp/cvo/)

Fish Facility Salvage Records (Loss)

Winter Run (loss)

Year	October	November	Dec	Jan	Feb	March	April	May	June	July	August	September	Sum
2008-2009	0	0	8	55	210	1654	21	0	0	NA	NA	NA	1948
2007-2008	0	0	0	164	484	628	40	0	0	NA	NA	NA	1316
2006-2007	0	0	87	514	1678	2730	330	0	0	NA	NA	NA	5339
2005-2006	0	0	649	362	1016	1558	249	27	208	NA	NA	NA	4069
2004-2005	0	0	228	3097	1188	644	123	0	0	NA	NA	NA	5280
2003-2004	0	0	84	640	2812	4865	39	30	0	NA	NA	NA	8470
2002-2003	0	0	1261	1614	1464	2789	241	24	8	NA	NA	NA	7401
2001-2002	0	0	1326	478	222	1167	301	0	0	NA	NA	NA	3494
2000-2001	0	0	384	1302	6014	15379	259	0	0	NA	NA	NA	23338
1999-2000	0	0				1592	250	0	0	NA	NA	NA	1842
Sum	0	0	4027	8226	15088	33006	1853	81	216	0	0	0	62497
Avg	0	0	447	914	1676	3301	185	8	22	0	0	0	6553
%Wr/yr	0.000	0.000	6.828	13.947	25.581	50.364	2.828	0.124	0.330	0.000	0.000	0.000	

Spring-Run (loss)

Year	October	November	Dec	Jan	Feb	March	April	May	June	July	August	September	Sum
2008-2009	0	0	0	0	0	333	5912	2604	4	NA	NA	NA	8853
2007-2008	0	0	0	0	15	315	6918	4673	87	NA	NA	NA	12008
2006-2007	0	0	0	0	7	190	4700	365	0	NA	NA	NA	5262
2005-2006	0	0	0	0	104	1034	8315	3521	668	NA	NA	NA	13642
2004-2005	0	0	0	0	0	1856	10007	1761	639	NA	NA	NA	14263
2003-2004	0	0	0	25	50	4646	5901	960	0	NA	NA	NA	11582
2002-2003	0	0	0	46	57	11400	27977	2577	0	NA	NA	NA	42057
2001-2002	0	0	0	21	8	1245	10832	2465	19	NA	NA	NA	14590
2000-2001	0	0								NA	NA	NA	0
1999-2000										NA	NA	NA	0
Sum	0	0	0	92	241	21019	80562	18926	1417	0	0	0	122257
Avg	0	0	0	12	30	2627	10070	2366	177	0	0	0	15282
% SR/yr	0.000	0.000	0.000	0.075	0.197	17.192	65.896	15.481	1.159	0.000	0.000	0.000	

Steelhead (combined salvage and loss, clipped and non-clipped)

Year	October	November	Dec	Jan	Feb	March	April	May	June	July	August	September	Sum
2008-2009	0	0	0	40	571	1358	210	68	13	7	NA	NA	2267
2007-2008	0	0	0	624	4639	717	300	106	24	15	NA	NA	6425
2006-2007	0	0	10	81	1643	4784	2689	113	20	NA	NA	NA	9340
2005-2006	0	0	0	129	867	3942	337	324	619	NA	NA	NA	6218
2004-2005	0	20	70	120	1212	777	687	159	116	NA	NA	NA	3161
2003-2004	0	12	40	613	10598	4671	207	110	0	NA	NA	NA	16251
2002-2003	0	0	413	13627	3818	2357	823	203	61	NA	NA	NA	21302
2001-2002	0	0	3	1169	1559	2400	583	37	42	NA	NA	NA	5793
2000-2001	0	0	89	543	5332	5925	720	69	12	NA	NA	NA	12690
1999-2000	3	60				1243	426	87	48	NA	NA	NA	1867
Sum	3	92	625	16946	30239	28174	6982	1276	955	22	0	0	85314
Avg	0	9	69	1883	3360	2817	698	128	96	11	0	0	9071
SH %/yr	0.0	0.1	0.8	20.8	37.0	31.1	7.7	1.4	1.1	0.1	0.0	0.0	

Exhibit 1c: Total sum of monthly salvage rates for North American green sturgeon at the CVP and SWP Fish Collection Facilities 1981 to 2006.

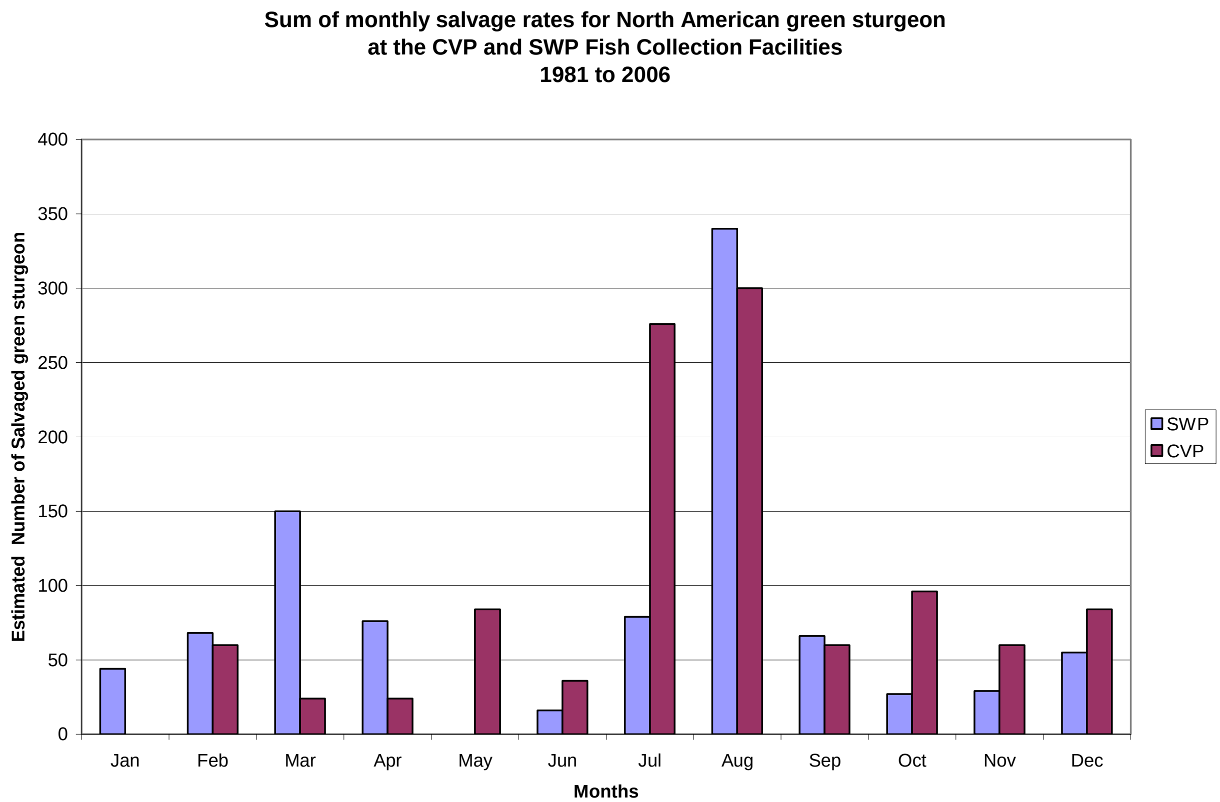


Exhibit 1d: The proportion of juvenile Chinook salmon and steelhead production entering the Delta from the Sacramento River by month.

Month	Sacramento River Total[1,2]	Fall-Run[3]	Spring-Run[3]	Winter-run[3]	Sacramento Steelhead[4]
January	12	14	3	17	5
February	9	13	0	19	32
March	26	23	53	37	60
April	9	6	43	1	0
May	12	26	1	0	0
June	0	0	0	0	0
July	0	0	0	0	0
August	4	1	0	0	0
September	4	0	0	0	1
October	6	9	0	0	0
November	9	8	0	03	1
December	11	0	0	24	1
Total	100	100	100	100	100

Notes:
[1] Mid Water trawl data
[2] All runs combined
[3] Runs from Sacramento River basin only
[4] Rotary screw trap data from Knights Landing
Source: SDIP Draft EIR/EIS 2005 Tables J-23 and J-24, Appendix J.

EXHIBIT 2

Exhibit 2: Location of Injection Sites in the Sacramento –San Joaquin Delta for Particle Tracking Model.

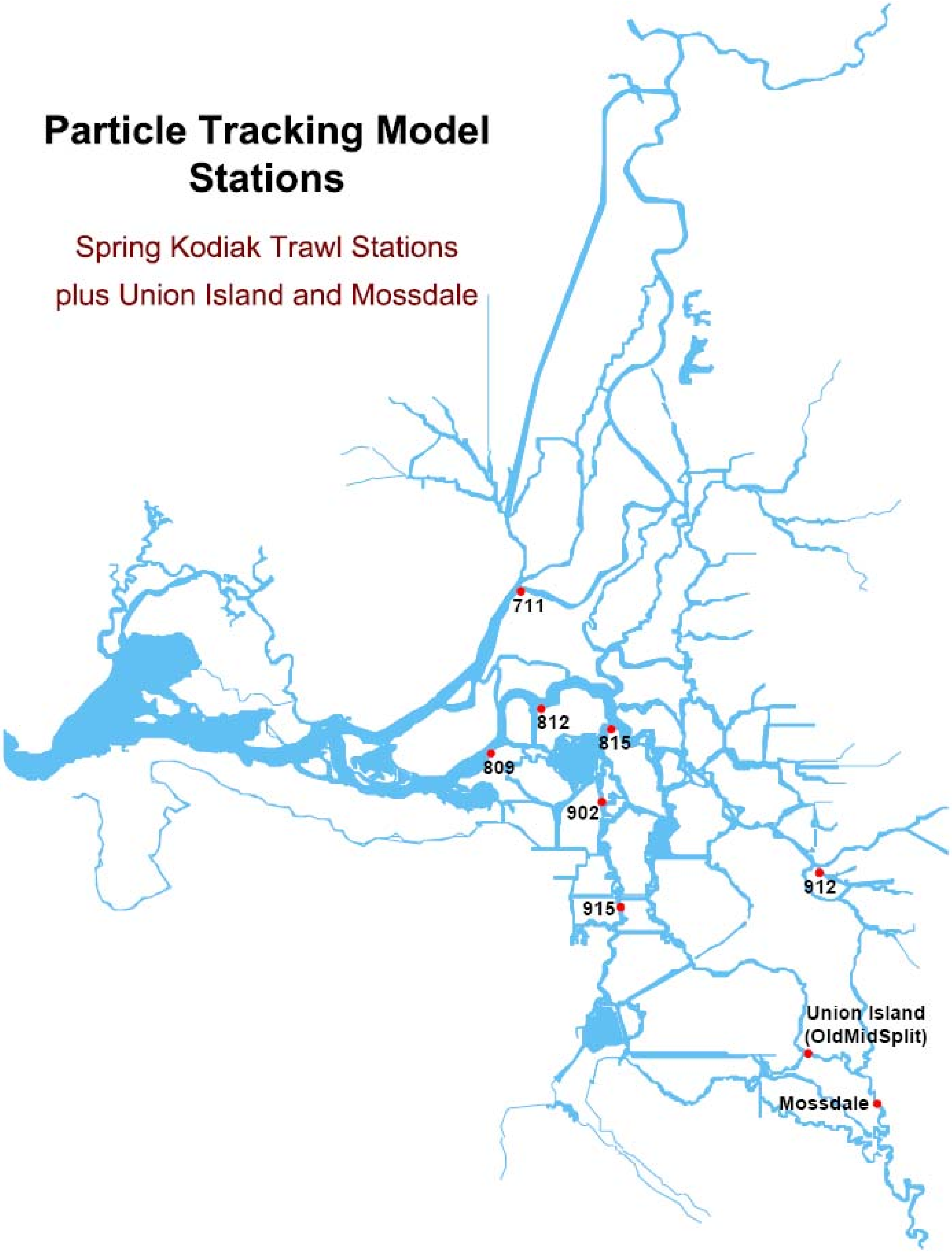


EXHIBIT 3

Exhibit 3: Monthly loss of Older juvenile Chinook salmon versus average monthly Old and Middle River Flows at the CVP and SWP fish collection facilities 1995-2007

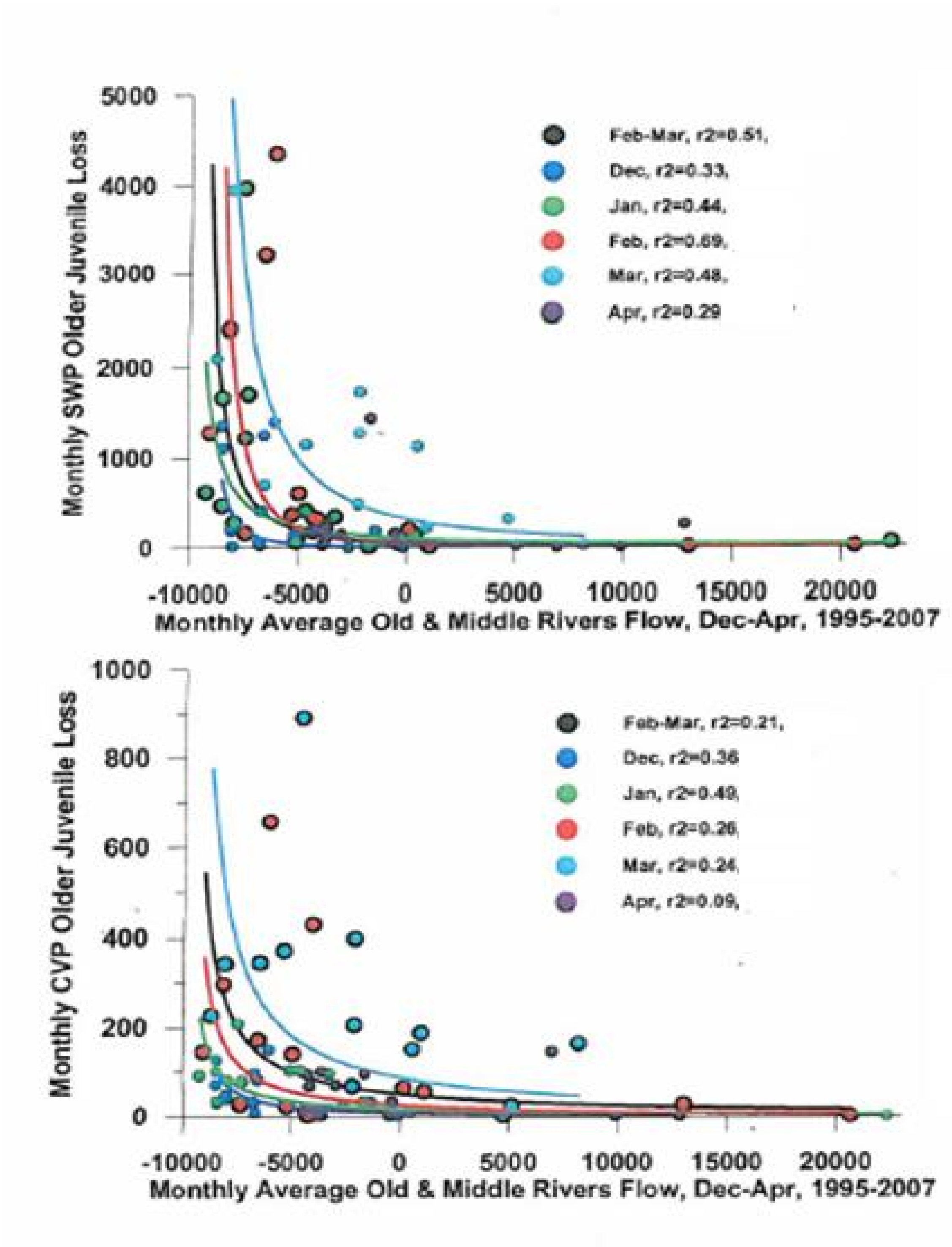


EXHIBIT 4

Exhibit 4: Winter-run Chinook salmon Expanded Salvage, January 1995-2007

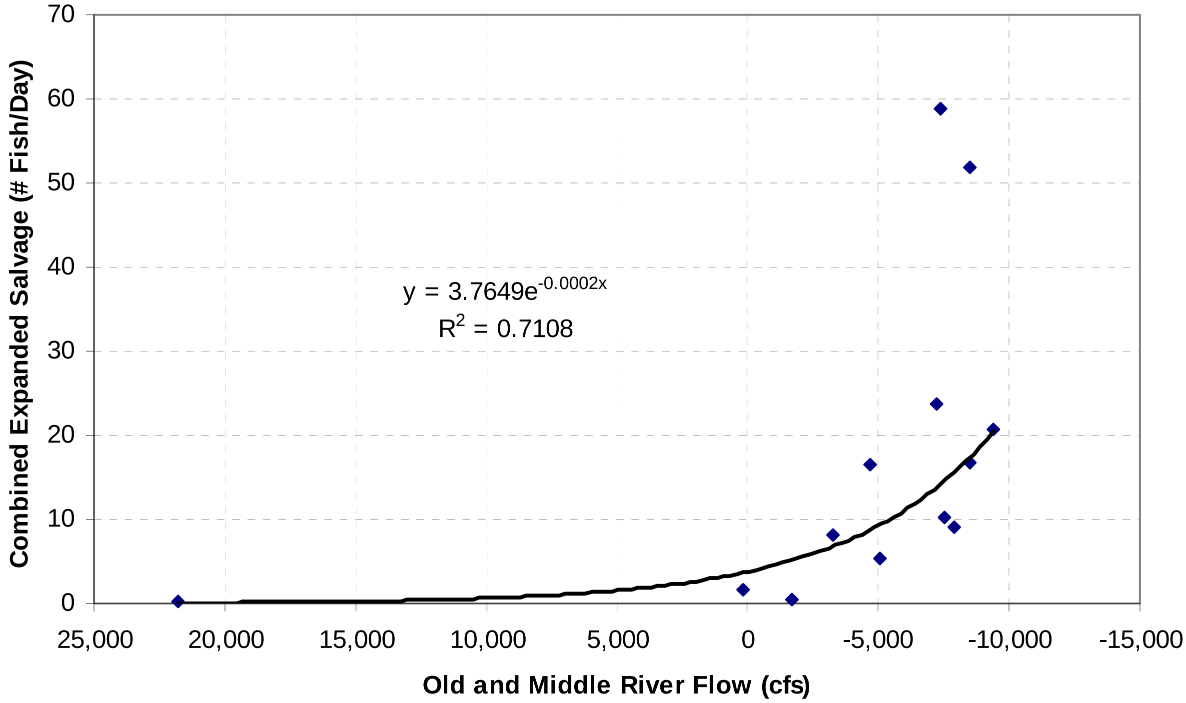


EXHIBIT 5

Exhibit 5: Central Valley steelhead expanded salvage, March 1995-2007

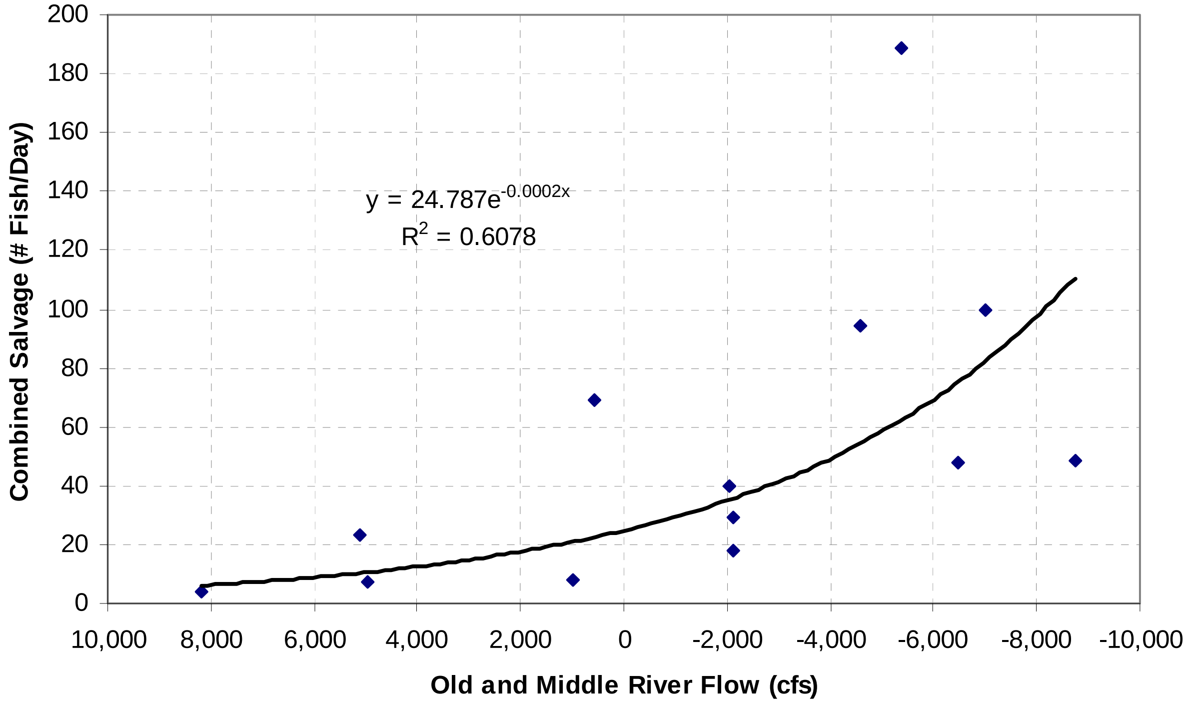


Exhibit 6

Exhibit 6: Central Valley steelhead expanded salvage, April 1995-2007

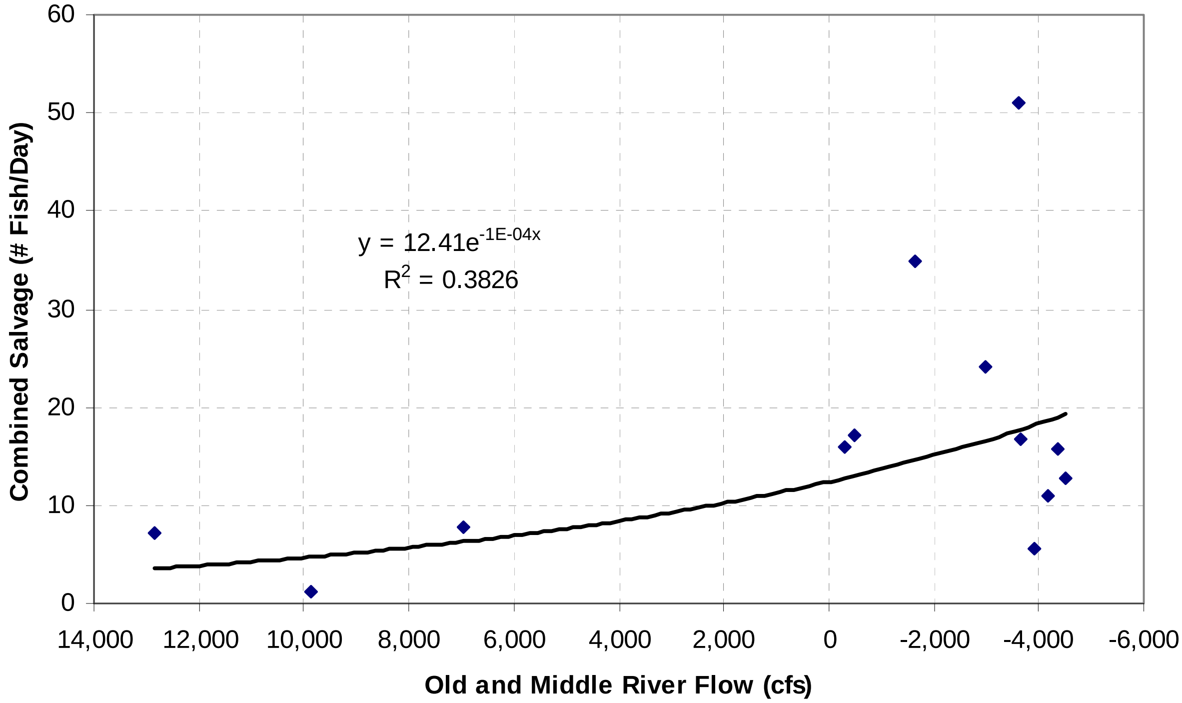


Exhibit 7

Exhibit 7: **Projected Average Old and Middle River Flows in cfs (CVP/SWP operations BA Appendix E CALSIM Output).**

Wet and Above Normal Water Year Types

Study	December	January	February	March	Average
Study 7.0	-8350	-6391	-7322	-6858	-7230
Study 7.1	-8083	-6511	-7377	-7956	-7482
Study 8.0	-8230	-6276	-7203	-7890	-7400

Study	April	May	June	July	Average
Study 7.0	-5847	-4381	-4118	-643	-3747
Study 7.1	-6561	-4652	-3450	-1146	-3952
Study 8.0	-6611	-4941	-3792	-1193	-4134

Below Normal and Dry Water Year Types

Study	December	January	February	March	Average
Study 7.0	-7668	-6125	-6767	-7117	-6919
Study 7.1	-6687	-6098	-6504	-8063	-6838
Study 8.0	-6946	-6030	6435	-8004	-6854

Study	April	May	June	July	Average
Study 7.0	-6889	-6052	-5573	-1064	-4895
Study 7.1	-7889	-5897	-5440	-1442	-5167
Study 8.0	-8038	-5989	-5407	-1428	-5215

Critical Water Year Type

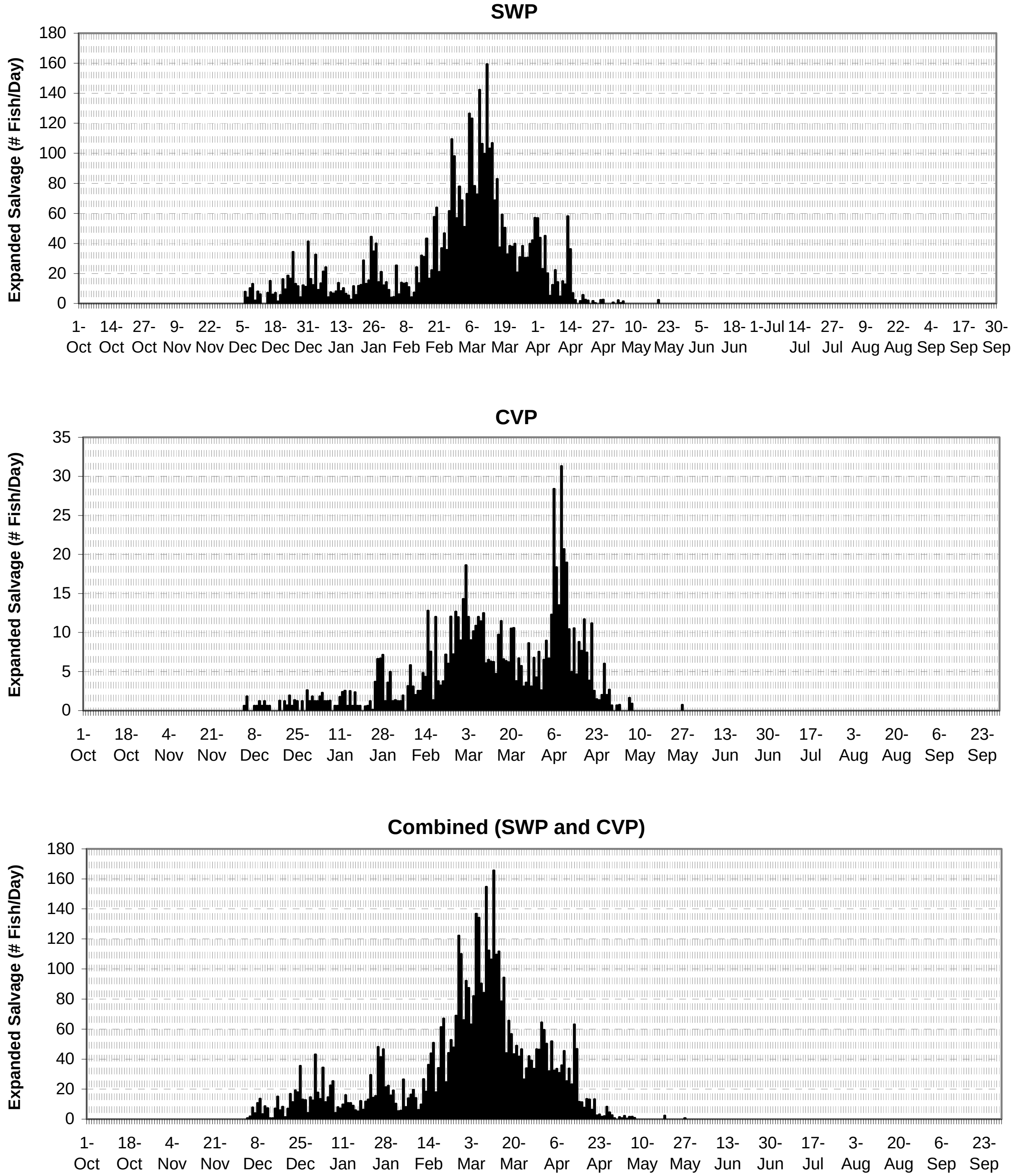
Study	December	January	February	March	Average
Study 7.0	-4576	-5633	-5293	-6158	-5415
Study 7.1	-3375	-5399	-4892	-6389	-5014
Study 8.0	-3312	-5317	-4333	-6315	-4819

Study	April	May	June	July	Average
Study 7.0	-5368	-4250	-2514	-797	-3232
Study 7.1	-5903	-4744	-2824	-842	-3578
Study 8.0	-5618	-4865	-3024	-870	-3594

EXHIBIT 8

Exhibit 8: Temporal distributions of winter-run Chinook salmon salvage

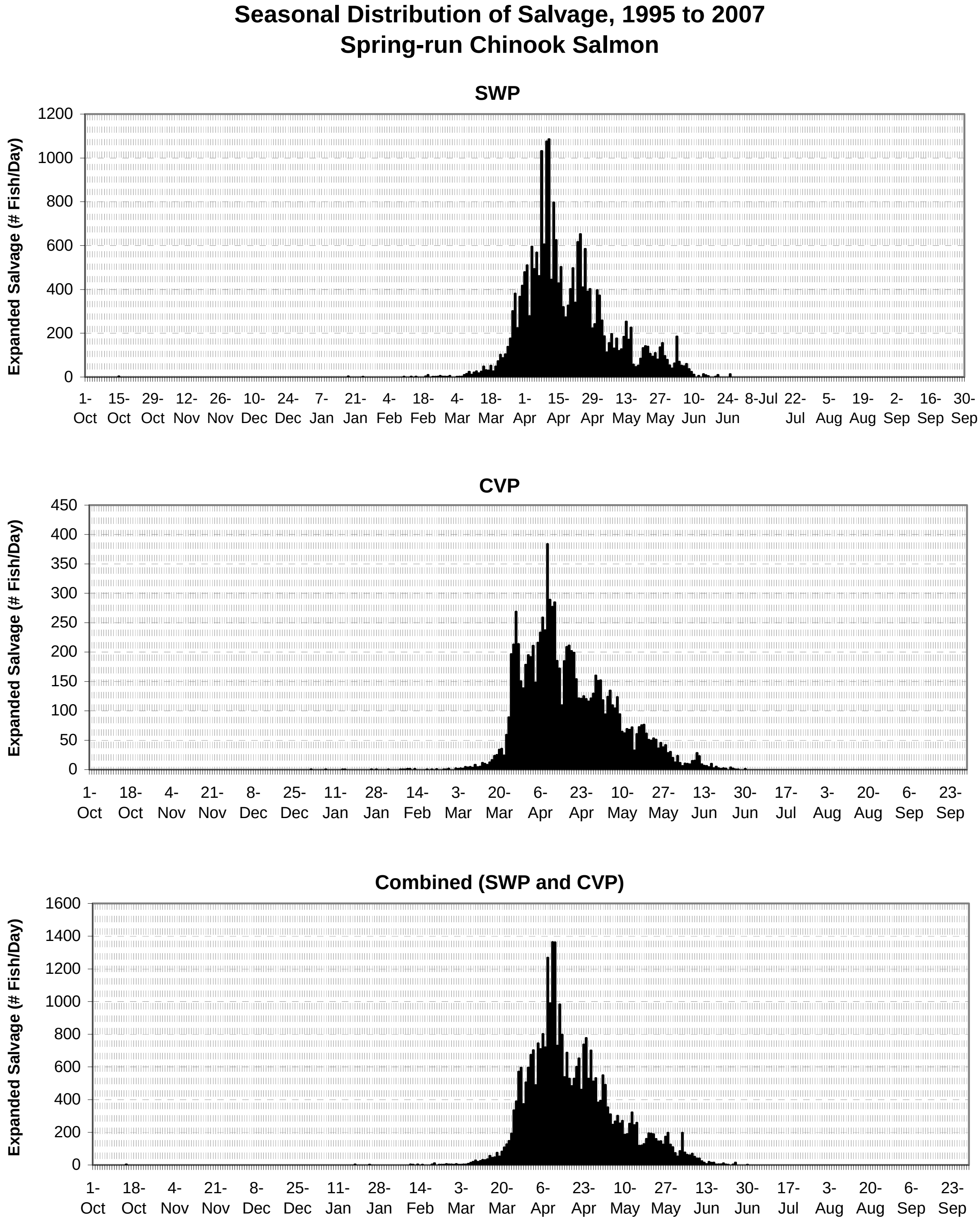
Seasonal Distribution of Salvage, 1995 to 2007
Winter-run Chinook Salmon



Source: California Department of Fish and Game (ftp://ftp.delta.dfg.ca.gov/salvage), non-clipped only.

EXHIBIT 9

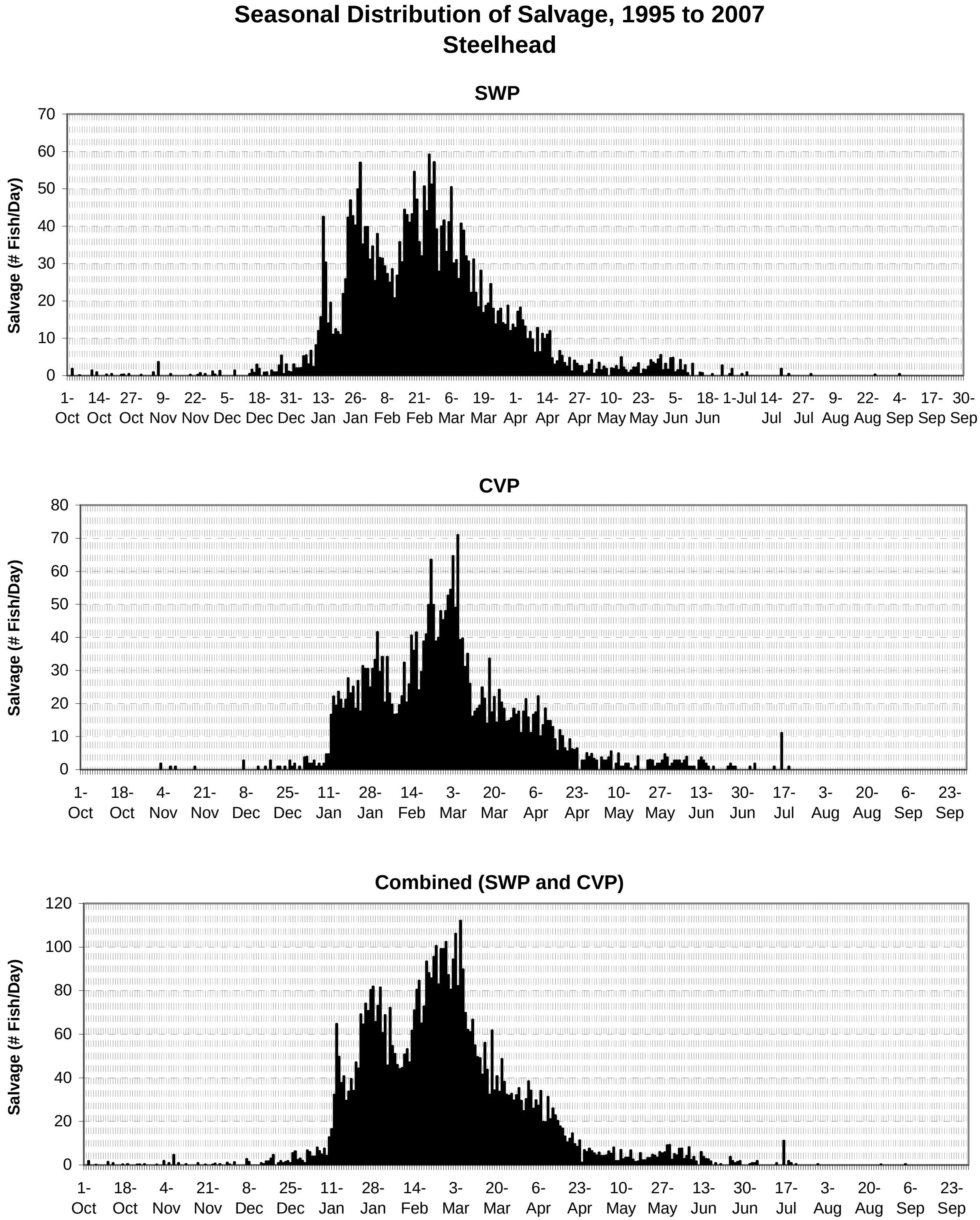
Exhibit 9: Temporal distributions of spring-run Chinook salmon salvage



Source: California Department of Fish and Game (ftp://ftp.delta.dfg.ca.gov/salvage), non-clipped only.

EXHIBIT 10

Exhibit 10: Temporal distributions of steelhead salvage



Source: California Department of Fish and Game (ftp://ftp.delta.dfg.ca.gov/salvage), clipped and non-clipped.