

CHAPTER 7

Conclusions & Recommendations

The VAMP experimental investigation of juvenile Chinook salmon survival was implemented during spring 2003. The Vernalis target flow was 3200 cfs, with a combined SWP and CVP export rate of 1500 cfs. The HORB was successfully installed and maintained throughout the VAMP test period. Estimates of juvenile Chinook salmon smolt survival were calculated based upon recoveries of CWT juvenile salmon produced in the Merced River Fish Facility and released at Durham Ferry, Mossdale, and Jersey Point. Marked salmon were subsequently recaptured in sampling at the HORB, SWP and CVP export facility salvage, and through intensive fisheries sampling at Antioch and Chipps Island. Based upon the data and experience gained during the VAMP 2003 investigations, conclusions and recommendations have been developed, as summarized in

Table 7-1. The conclusions and recommendations include both technical and policy/management issues that will affect the design and implementation of VAMP 2004 operations and investigations.

Based on testing the relationship of salmon survival rates against flow and export conditions in 2000, 2001, 2002, and 2003 it has been shown that survival generally improves as flows increase and flows relative to exports increase. With the addition of the 2003 data, the relationships between salmon survival rates and Vernalis flows to SWP/CVP export ratios are no longer statistically significant. Survival tests at extreme target levels are important to obtain. The VAMP program provides improved protection for juvenile salmon when compared to “pre-VAMP” conditions.

TABLE 7-1
Summary of VAMP 2003 conclusions and recommendations

Conclusions	Recommendations
Hydrologic measurements at Vernalis were improved by weekly verification of rating curves.	Continue weekly flow measurements. Investigate alternative flow measurement methods and/or locations. Obtain additional funding for USGS weekly Vernalis gage verification.
Estimation of ungaged flows (accretions, depletions) at Vernalis was improved.	Continue hydrology investigation to improve predictions of ungaged flows.
Flow in the lower San Joaquin River downstream of Old River is important to evaluating salmon survival.	Calibrate the stage and flow monitoring system prior to the 2004 VAMP test period.
Confusion over forecasting New Melones releases impacted planning for tributary flows and related operations.	Management committee should resolve forecasting issues prior to 2004 VAMP and a set of written procedures for operational planning within each tributary should be established.
Coordination with upstream tributary operations was successful.	Continue coordination among tributary operators.
First release of CWT test fish was delayed five days to allow for completion of construction, clean-up, and flushing of debris from culverts.	Continue to work with DWR and resource agencies on scheduling construction of HORB to facilitate VAMP releases as quickly after barrier closure as possible.

Conclusions Continued	Recommendations Continued
<p>Operation of the HORB was successful in maintaining south delta water levels.</p>	<p>Continue to refine operational criteria for culverts, water level modeling, and groundwater level monitoring.</p>
<p>Closure of HORB is dependent on completion of other barriers. Construction of multiple barriers in south delta channels may delay HORB closure.</p>	<p>Continue to work with DWR and resource agencies on scheduling construction of south Delta barriers to facilitate VAMP releases as quickly after barrier closure as possible.</p>
<p>An estimate of the flow through the culverts was obtained through use of measuring device in culvert #4.</p>	<p>Take flow measurements within each culvert during the 2004 VAMP.</p>
<p>The use of fyke nets was successful in collecting entrained fish at the culverts.</p>	<p>Continue monitoring culverts using fyke nets to document fish entrainment.</p>
<p>The index of salmon entrainment at HORB was substantially higher in 2003 (3.4 salmon per hour) with three culvert operated compared to 2002 (2.5 salmon per hour and 2001 (1.4 salmon per hour) when all six culverts were operated.</p> <p>Most salmon were entrained at night in 2003, similar to prior years. The relationship between tidal condition and salmon entrainment at HORB was variable.</p>	<p>Continue barrier monitoring and analysis of factors affecting entrainment.</p> <p>The split releases at Mossdale should be continued to evaluate tidal-diel interactions affecting salmon entrainment.</p>
<p>2003 studies were successful in determining salmon entrainment at HORB culverts, but did not estimate mortality associated with HORB.</p>	<p>Evaluate methods to estimate mortality associated with HORB.</p>
<p>The release at Durham Ferry was improved by having the diversion pump at the site curtail operation.</p> <p>Water temperatures were suitable during both sets of releases.</p>	<p>Continue to curtail diversion pump operations during releases—coordinate release schedule with landowner.</p> <p>Avoid seasonal delays in barrier installation and survival testing to allow releases when most suitable water temperatures.</p>
<p>Results of net pen studies showed a 1/2 percent mortality rate in 2003 compared to no mortality in 2002.</p>	<p>Continue net pen studies and fish health inspections.</p>
<p>Physiological studies provided useful information on fish health and condition and indicated PKD may have been a factor in survival particularly for the second set of releases.</p> <p>There were few consistent patterns in blood chemistry values among releases groups. Comparisons were complicated by differences in transport time and handling.</p>	<p>Recommend continued health monitoring to compare within and between year trends of health and condition.</p> <p>Baseline data for blood chemistry analyses should be taken from unstressed fish (not subjected to stress for 24 or more hours).</p>
<p>2003 survival rates were the lowest since the initiation of the VAMP and were significantly lower than those in 2002 under similar flow and export conditions.</p>	<p>Continue to evaluate differences in survival rates between release locations, flows, and export conditions.</p>
<p>Survival from Durham Ferry and Mossdale in 2003 was significantly less than prior years. Further evaluation of survival rate versus flow and export rate is needed to detect differences in survival.</p>	<p>Repeat the 2003 target flow and export condition in the future when conditions allow. Testing 7000 cfs flow and 1500 cfs export rate is recommended to determine survival under higher flow/export ratio. Continue VAMP test program.</p>
<p>Complimentary studies to evaluate mechanisms affecting survival of fish from tributaries and through the Delta were conducted.</p> <p>Relatively few CWT salmon from VAMP releases were recovered at the SWP and CVP salvage facilities.</p>	<p>Encourage an expansion of complementary studies to provide additional information on factors and mechanisms affecting salmon survival.</p> <p>Continue salvage monitoring to document direct losses at SWP/CVP export facilities.</p>

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SIGNATORIES TO THE SAN JOAQUIN RIVER AGREEMENT

U.S. Bureau of Reclamation

U.S. Fish and Wildlife Service

California Department of Water Resources

California Department of Fish and Game

Oakdale Irrigation District*

South San Joaquin Irrigation District*

Modesto Irrigation District*

Turlock Irrigation District*

Merced Irrigation District*

San Joaquin River Exchange Contractors
Water Authority*

Central California Irrigation District

Firebaugh Canal Water District

Columbia Canal Company

Sal Luis Canal Company

Friant Water Users Authority*

Public Utilities Commission of the City
and County of San Francisco*

Natural Heritage Institute

Metropolitan Water District of Southern California

San Luis and Delta–Mendota Canal Water Authority

San Joaquin River Group Authority

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San Joaquin River Agreement

www.sjrg.org/agreement.htm

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SWRCB Decision 1641

www.waterrights.ca.gov/hearings/Decisions.htm

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VAMP 2002 Annual Technical Report

www.sjrg.org/technicalreport/2002_tech_report.htm

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VAMP Experimental Design

www.sjrg.org/agreement.htm

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Operation Monitoring, CDEC Hourly

cdec.water.ca.gov/cgi-progs/queryGroup?s=fw1

Operation Monitoring, CDEC Daily

cdec.water.ca.gov/cgi-progs/queryDgroups?s=fw2

Vernalis USGS Real-Time

waterdata.usgs.gov/nwis/uv?format=pre&period=1&site_no=11303500

Vernalis, USGS Daily

waterdata.usgs.gov/ca/nwis/dv?format=pre&period=31&site_no=11303500

Newman, USGS Daily

waterdata.usgs.gov/ca/nwis/dv?format=pre&period=31&site_no=11274000

Cressey, CDEC Daily

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Stevinson, CDEC Daily

cdec.water.ca.gov/cgi-progs/queryF?s=mst

LaGrange, USGS Daily

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Goodwin, USBR Daily

www.usbr.gov/mp/cvo/vungvari/gdwdop.pdf

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Temporary Barrier Program

sdelta.water.ca.gov

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Reclamation District 544 Seepage Monitoring Study

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HORB on Old River Tidal Stage

cdec.water.ca.gov

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CVP and SWP Salvage Data

www.iep.ca.gov/dfishfa/fmt.html

USFWS Stockton

www.delta.dfg.ca.gov/usfws/monitoring_main/monitoring_main.html

Pacifica States Marine Fisheries Commission

Regional Mark Information System

www.rmis.org

HORB on Old River Tidal Stage

cdec.water.ca.gov

COMMON ACRONYMS & ABBREVIATIONS

ACDP	Acoustic Doppler Current Profiler	NOAA	National Marine Fisheries Service
Bay-Delta	Sacramento and San Joaquin Rivers San Francisco Bay Delta	OID	Oakdale Irrigation District
CDEC	California Data Exchange Center	ORT	Old River at Tracy
CDRR	Combined Differential Recovery Rate	PKD	Proliferative Kidney Disease
CFS	Cubic Feet Per Second	SDWA	South Delta Water Agency
CPUE	Catch Per Unit Effort	SJRA	San Joaquin River Agreement
CRR	Combined Recovery Rate	SJREC	San Joaquin River Exchange Contractors Water Authority
CVP	Central Valley Project	SJRGA	San Joaquin River Group Authority
CWT	Code Wire Tagged	SJRTC	San Joaquin River Technical Committee
D-1641	Water Rights Decision 1641 of the SWRCB	SSJID	South San Joaquin Irrigation District
DFG	California Department of Fish and Game	SWP	State Water Project
DWR	California Department of Water Resources	SWRCB	California State Water Resources Control Board
GLC	Grant Line Canal	TBP	Temporary Barriers Project
HOR	Head of Old River	TID	Turlock Irrigation District
HORB	Head of Old River Barrier	USBR	United States Bureau of Reclamation
Merced	Merced Irrigation District	USFWS	United States Fish and Wildlife Service
MID	Modesto Irrigation District	USGS	United States Geologic Survey
MR	Middle River	VAMP	Vernalis Adaptive Management Plan
MSL	Mean Sea Level	WQCP	Water Quality Control Plan for the Bay-Delta Estuary