

EXECUTIVE SUMMARY



The San Joaquin River Agreement (SJRA) and Vernalis Adaptive Management Plan (VAMP) is the cornerstone of a history-making commitment to implement the State Water Resources Control Board (SWRCB) 1995 Water Quality Control Plan (WQCP) for the lower San Joaquin River and the San Francisco Bay-Delta Estuary (Bay-Delta). VAMP, officially initiated in 2000 as part of SWRCB Decision 1641, is a large-scale, long-term (12-year), experimental/management program designed to protect juvenile Chinook salmon migrating from the San Joaquin River through the Sacramento-San Joaquin Delta. VAMP is also a scientific experiment to determine how salmon survival rates change in response to alterations in San Joaquin River flows and State Water Project (SWP)/Central Valley Project (CVP) exports with the installation of the Head of Old River Barrier (HORB).

The lack of returning adults to the Merced River Hatchery and subsequent low salmon smolt production resulted in the California Department of Fish and Game's (CDFG) inability to provide test fish for a coded wire tag study in 2007 VAMP. The SJRA technical committee (SJRATC) concluded that an acoustic telemetry monitoring program, relying on 1,000 acoustic tagged salmon smolts, would be conducted over the same

VAMP period. The VAMP test period was delayed one week from the default period of April 15-May 15 to April 22-May 22 to allow the test fish to increase in size to better accommodate the acoustic tag to body weight ratio standard of less than 5 percent. Water Year 2007 was very dry on the San Joaquin River watershed, with the four-basin April-July forecasted runoff ranging from 41% to 52% of average. The VAMP Vernalis test flow over the April 22-May 22 period was set at 3,200 cfs based on the SJRA criteria.

The 2007 Annual Technical Report consolidates the annual SJRA Operations and the Vernalis Adaptive Management Plan (VAMP) Monitoring Reports. The VAMP 2007 program represents the eighth year of formal compliance with SWRCB Decision 1641 (D-1641). D-1641 requires the preparation of an annual report documenting the implementation and results of the VAMP program. Specifically, this 2007 report includes the following information on the implementation of the SJRA: the hydrologic chronicle; management of any additional SJRA water; flow and fisheries monitoring in the lower San Joaquin River, Old River, and Delta; results of the juvenile salmon acoustic tag study; discussion of complementary investigations; and conclusions and recommendations.

VAMP is intended to employ an adaptive management strategy using current knowledge to protect Chinook salmon as they migrate through the Delta, while gathering information to allow more efficient protection in the future. 2007 represented the first year of a monitoring program relying fully on the use of acoustic telemetry technology. Implementation of this new technology was not without some difficulties. The lack of two key monitoring stations, receiver malfunctions and the unexplained mortality near Stockton of a sizable number of test fish impacted our ability to complete a survival analysis. In addition to providing improved protection for juvenile Chinook salmon emigrating from the San Joaquin River system, specific experimental objectives of VAMP 2007 included:

- Quantification of Chinook salmon smolt survival along individual river segments between Durham Ferry, Mossdale, Head of Old River, Bowman Road (near Dos Reis), and Stockton by detection of acoustic signals from transmitters implanted in the test fish.
- Evaluation of the San Joaquin River – Old River flow split at the Head of Old River under the 2007 flow conditions with the installed HORB.
- Monitoring in Old River to evaluate the movement of salmon smolts in Old River under the 2007 flow conditions with the installed HORB.
- Evaluation of fish mortality across Clifton Court Forebay between the Clifton Court Forebay inlet structure and the Skinner Fish Facility.
- Health and physiology testing of VAMP fish was conducted at the MRH, Durham Ferry and Mossdale to evaluate the incidence of disease.

The VAMP design provides for a 31-day pulse flow (target flow) in the San Joaquin River at the Vernalis gage along with a corresponding reduction in SWP/CVP

exports. The magnitude of the pulse flow is based on an estimated flow that would occur during the pulse period absent the VAMP. As part of the implementation planning, the VAMP hydrology and biology groups meet regularly throughout the year to review current and projected information on hydrologic conditions occurring within the San Joaquin River watershed. This facilitates communication and coordination for both the VAMP Chinook salmon smolt survival experiments and for scheduling streamflow releases on the Tuolumne, Merced, and Stanislaus rivers to facilitate the experimental investigations and protection for juvenile salmon within the tributaries.

Hydrologic conditions in 2007 were similar to those experienced in 2002. In the March 21 operation plan the existing a flow was forecasted to be between 2,182 and 2,582 cfs calling for a VAMP target flow of either 3,200 cfs or 4,450 cfs. The forecasts throughout the weeks leading up to the VAMP period indicated the HORB could safely be installed; however the uncertain condition of the Delta smelt controlled the final decision on its installation. A decision by the Delta smelt working group allowed for the barrier to be constructed and closed on April 22. The HORB culverts remained closed until May 16 when they were opened due to Delta smelt concerns. As the dry conditions continued through the spring it became evident the double step criteria would not be a factor in determining the target flow for VAMP. By April 13 forecasts of existing flow at Vernalis was projected to be about 2,770 cfs between April 22 and May 22. In planning for the VAMP the SJRA Technical Committee recommended delaying the start of the VAMP pulse period until April 22 in an effort to provide larger smolt sized fish for the implantation of acoustic tags. The study was designed to measure survival along three segments of the San Joaquin River; Durham Ferry to Mossdale, Mossdale to Bowman Road and Bowman Road to Jersey Point.

EX - 1 Proposed Fish Release and Detection Locations.					
Planned Detection Locations	Fish Release Locations				
	Durham Ferry to	Mossdale to	Bowman Road to	Stockton to	Downstream of HORB
Upstream of HORB	Upstream of HORB				Tracy Fish Facility
Bowman Road	Bowman Road				Clifton Court Inlet
Stockton	Stockton	Stockton			Old River at Highway 4
Jersey Point*	Jersey Point*	Jersey Point*	Jersey Point*	Jersey Point*	
Chippis Island*	Chippis Island*	Chippis Island*	Chippis Island*	Chippis Island*	Chippis Island*

* Jersey Point and Chippis Island receivers not installed in 2007.



In an effort to document migratory behavior of salmon entering the Old River 100 acoustically tagged fish were released in the Old River immediately downstream of the HORB.

Unfortunately due to physical and technical difficulties beyond the control of the SJRA parties the acoustic receiver stations at Jersey Point and Chipps Island could not be installed in time for the 2007 VAMP. Thus survival to Jersey Point and Chipps Island could not be estimated.

Vamp experimental test conditions that have occurred over the past eight years are summarized below:

Water temperature data were collected with a series of computerized recorders at the Merced River Fish Facility, in the transport trucks, at the release sites and throughout the lower San Joaquin River and Delta. Overall the average temperature at all sites remained below 20 C, which is considered suitable for salmon smolts.

Survival of fish between Mossdale and Stockton was relatively high, but survival estimates in some reaches were suspect due to periods of receiver malfunction. Survival between Durham Ferry and Mossdale appeared lower. As mentioned earlier without the deployment of acoustic receivers at Jersey Point and Chipps Island

EX - 2
VAMP Experimental Test Conditions.

Year	VAMP Period	Average Vernalis Flow (cfs)	Average SWP/CVP Exports (cfs)	Head of Old River Barrier
2000	April 15-May 15	5,869	2,155	Installed
2001	April 20-May 20	4,220	1,420	Installed
2002	April 15-May 15	3,300	1,430	Installed
2003	April 15-May 15	3,235	1,446	Installed
2004	April 15-May 15	3,155	1,331	Installed
2005	May 1-May 31	10,390	2,986	Not Installed
2006	May 1-May 31	26,020	1,559/5,748 (a)	Not Installed
2007	April 22 - May 22	3,263	1,486	Installed

survival through the Delta could not be estimated. Deploying receivers at these two stations are being given high priority for the 2008 study.

The health of the CWT fish in 2007 was relatively good, but all test fish examined were infected with the parasite that causes PKD. It is uncertain how such infection affects long term survival of the smolts released as part of VAMP. Dummy tags were implanted in twenty fish during tagging and held for 7 to 14 days to assess tagging and handling stress. No mortalities were observed and the condition characteristics assessed were normal.

The relationship of survival to exports is difficult to detect based on the data gathered to date. The escapement data for adult salmon indicate that the flow/export ratio explains more of the variability in adult escapement than flow alone without the HORB, but the smolt survival data is too limited to detect these effects, if they are real. These relationships could not be tested in 2007. To further refine the relationship between survival and exports with the HORB, the VAMP experiments were designed to estimate survival at a flow of 7,000 cfs at two export levels, 1,500 and 3,000 cfs. We have not yet been able to estimate survival under these experimental conditions.

In addition to recommending these conditions to test, it is noteworthy that survival from Dos Reis to Jersey Point in 2003, 2004, 2005 and the second release group in 2006, was significantly less than prior years (Figure 5-10, SJRG 2007). Flows and exports during the VAMP tests in 2003-2004 were similar to those in 2002 (Table 2), but survival was significantly less. Although, 2007 had the same VAMP targets as in 2002-2004, we were not able to estimate survival to Jersey Point. The high mortality observed near Stockton may explain some of the poor survival in past years. Future studies to estimate survival through the Delta are important in documenting these types of occurrences. Measuring survival at 3200 flow at an export rate of 1500 will help document whether survival has rebounded to pre-2003 levels.

The decline in fish production at the Merced River Hatchery and the continued concern for the abundance of Delta smelt will greatly influence future VAMP designs. A priority will be to design future acoustic monitoring studies so that results can be compared to those generated from the previous coded wire tag studies.



