

## CONCLUSIONS AND RECOMMENDATIONS



After some uncertainty regarding the HORB relative to Delta smelt it was installed on April 20, two days prior to the start of the VAMP pulse flow period of April 22 to May 22. The average Vernalis pulse flow was 3,260 cfs, varying between 2,830 cfs and 3,790 cfs. Combined exports averaged 1,486 cfs. Flow monitoring was conducted in the San Joaquin River downstream of the HOR and in the Old River. Kodiak trawling was conducted in the San Joaquin River between Mossdale and the Old River. An acoustic telemetry study was implemented in 2007 to estimate movement of tagged Chinook salmon smolts. Survival estimates across the Delta were not possible in 2007, however limited survival estimates to individual receiver sites were possible. Conclusions and recommendations have been developed, and summarized in Table 7-1. The conclusions and recommendations include both technical and policy/management issues that will affect the implementation of future VAMP operations and investigations.

From past VAMP releases, the relationship of salmon survival to San Joaquin River flow has shown that survival increases as flows increase, with the HORB in place (SJRG 2007). The survival to flow relationship is statistically significant when recovery from all available sources both in the trawls and ocean (Antioch, Chipps Island, and ocean fishery) are combined (SJRG 2007). However, in 2007 survival through the Delta could not be measured due to the lack of study fish for a coded wire tag study and the inability to install receivers at Jersey Point and Chipps Island for the acoustic study. Thus the role of survival to flow with the HORB in place could not be confirmed in 2007. However, the acoustic study results appeared to indicate that predation and possibly toxicity, may contribute to the mortality of migrating salmon smolts through the Delta. These factors will require further investigation in future years.

The relationship of survival to flow without the HORB is more variable especially when including data from 2005 and 2006 (SJRJG 2007). Relationships of flow to adult escapement 2 1/2 years later, indicates these relationships are likely real and that survival is improved as flows and flows relative to exports increase.

The role of exports has been difficult to identify from past VAMP CWT studies because survival with the HORB has not been estimated at VAMP targets of 7,000 cfs flow with exports at 1,500 and 3,000 cfs.

The VAMP program provides increased flows at a wide range of flows along with corresponding decreased exports and likely increases the survival of migrating salmon through the Delta.

The VAMP study was forced to change in 2007 due to the study fish limitation. Acoustic telemetry was used in 2007, but for acoustic studies to measure survival through the Delta receivers must be deployed at Jersey Point and Chipps Island. While logistically challenging, it appears it can be done given enough time and resources to overcome the challenges. Acoustic telemetry is also more expensive than the traditional CWT studies,

but if the downstream receivers can be successfully installed, the acoustic telemetry study can estimate survival with greater precision in addition to providing more detailed mortality information through-out the Delta. Further effort will be spent on these deployments in 2008 for the work to be completed prior to releasing the acoustically tagged fish. Without these key detector locations, survival cannot be measured through the Delta using acoustic telemetry. CWT studies no longer appear feasible due to the continued study fish limitation. If the deployment of the downstream acoustic receivers is successful then acoustic telemetry will allow additional measurements of survival to be made at the VAMP targets to continue the assessment of the relative roles of flow and exports on survival through the Delta with and without the HORB.

One additional complication for future VAMP studies is the recent court order to prevent the installation of the HORB in 2008 for the protection of delta smelt. It is uncertain how this court order will affect the installation of the HORB for VAMP studies and the protection of juvenile Chinook salmon migrating from the San Joaquin tributaries after 2008.

**Table 7-1**  
**Summary of VAMP 2007 conclusions and recommendations**

<b>Conclusions</b>	<b>Recommendations for 2008</b>
Due to unforeseen physical and technical problems acoustic receivers could not be installed at Chipps Island and Jersey Point in 2007.	Acoustic receivers at Chipps Island and Jersey Point need to be installed to allow survival estimates through the Delta to be completed.
Observed unged flows (accretions, depletions) between upstream measurement points and Vernalis varied significantly from those forecasted resulting in differences in forecasted and required supplemental flows.	Hydrology committee to continue refining estimates of unged flow and develop a management scheme to accommodate variability.
The flow data collected in 2007 at San Joaquin River near Lathrop and the Old River at Head provided useful information on the flow split at the Head of Old River	The 2005 through 2007 flow data should be compared against DWR-DSM2 modeling results.  Continue to calibrate the stage and flow monitoring at the San Joaquin River near Lathrop station.
Short-term survival (48-hours post-transport) was relatively high indicating that handling, transport, and release likely had no affect on short-term smolt survival.	Continue net pen studies and fish health inspections.
Smolt abundance and production estimates could be improved by ensuring that sampling is conducted daily at Mossdale when salmon smolt are emigrating.	Maintain the Mossdale Kodiak trawl at existing or higher level of effort throughout the year.
Further evaluation of survival rate versus export rate is needed. The VAMP is limited by data at the target conditions of 7000 cfs flow with a HORB with exports at 1500 or 3000 cfs.	Evaluate the possibility of amending the San Joaquin River Agreement to achieve needed test conditions of 7000 cfs flow with a HORB at exports of 1500 or 3000 cfs. Prescribing target conditions will allow the most critical data to be obtained quickly so that the role of exports can be identified in the most efficient manner.
Complimentary studies to evaluate mechanisms affecting survival of fish from tributaries and through the Delta were conducted.	Encourage an expansion of complementary studies to provide additional information on factors and mechanisms affecting salmon survival.