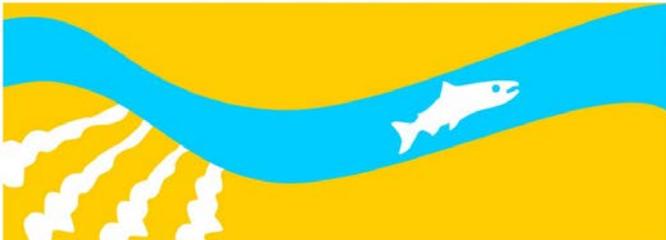


Study 17

Bed Material Data Processing and Evaluation

**Public Draft
2013 Monitoring and Analysis Plan**

**SAN JOAQUIN RIVER
RESTORATION PROGRAM**



San Joaquin River Restoration Program

2013 Monitoring and Analysis Plan

Bed Material Data Processing and Evaluation

1. Statement of Need

Studies addressing potential impacts of flow releases under the SJRRP on sediment transport, channel morphology, vegetation, and habitat often require bed material information. With the continuation of interim flows and recent flood releases, potential changes in the bed material size distributions and the quantities of sand present in the bed material are unknown. During the spring of 2009 and again in the summer of 2012, Reclamation conducted field visits to collect bed material throughout Reach 1 to compare to historical bed material data and to investigate visible changes associated with flow changes between 2009 and 2012. Evaluating changes in the bed material data short time scales (3-5 years) is a necessary step in monitoring how differences in releases from Friant Dam potentially influence bed material gradations. In addition to monitoring for change, acquired sediment data may be used in numerical modeling, gravel mobilization studies, and other investigations of spawning gravel quality. This study proposes to complete processing of photogrammetric sediment samples and bed material samples conducted in June 2012, incorporate results into the sediment atlas, and evaluate potential changes in the bed material from historical conditions and between 2009 and 2012.

2. Background

SJRRP partner agencies have been working to understand how changes in flows may impact sediment transport characteristics under the SJRRP hydrology. Mobilization studies are currently ongoing by California Department of Water Resources (DWR) to evaluate the required flows and amount and locations of mobilization at select riffles within Reach 1. DWR collected an extensive network of bulk samples throughout Reach 1A using McNeil Samplers in 2009. USGS is monitoring suspended and bedload during restoration releases within Reach 1. A sand storage assessment was conducted by TetraTech (2012a, 2012b) to quantify potential sand storage within the reach and the mechanisms for transport. Also, multiple studies are underway to evaluate the quantity and quality of spawning gravels present within Reach 1 (SJRRP, 2012).

One key parameter to all sediment-related investigations is the bed material size distribution. More specifically, most sediment related studies on the San Joaquin River require some information related to the quantity of sand present within the bed downstream from Friant Dam. This information may be used to investigate sand storage, spawning gravel quality, and potential gravel augmentation techniques. Bed material data were collected in March 2009 within Reach 1 of the San Joaquin River between Friant Dam and Gravelly Ford. Bed material data collection

was a joint effort between DWR, USGS, DFG and Reclamation, and were documented in the 2010 ATR. Sediment sampling was conducted using 3 methods: bulk sampling, pebble counts, and photographic documentation.

Since March 2009, interim restoration flows have been released from Friant Dam in addition to flood releases in December 2010, January 2011, April 2011, and June 2011. Water Year 2012 was dry in comparison to previous years. The impacts of these releases on the bed material size distributions and quantities of fine sands within the bed are unknown.

Reclamation is developing a Sediment Atlas that will include a geodatabase of all known bed material distributions collected. Information from this study will be incorporated into the Sediment Atlas to expand current understanding of the spatial and temporal distributions of bed material gradations within Reach 1.

3. Anticipated Outcomes

Results from the bed material data collection effort may be used to inform the program on how the bed material gradations and sand content within the bed have changed over the last 3 years. Comparisons of bed material gradations and texture using photographs will provide evidence to support mobilization, sand storage, and spawning gravel quality studies. The comparisons will also be valuable in detecting evidence of change in the gravel-sized gradation and percent of fine sands visible in the photograph, which may help discern if the flow releases experienced during the interim flow period have acted as “flushing” flows to mobilize and clean gravels. Continued monitoring of bed material data is critical to managing sediment within Reach 1 and evaluating the objectives outlined in the Sediment Management Plan (SJRRP, 2011- DRAFT 2011 ATR). Information from this effort can also be used in future modeling activities for the program to investigate potential restoration opportunities.

Bulk sampling of bed material through McNeil samples is labor and time intensive. Repeating this level of sampling at each riffle on a frequent basis is costly. Results from this effort could be used to further define locations where some change has been detected. These locations could help focus future bulk sampling efforts and provide a basis for conducting additional McNeil sampling to quantify the extent of the change within the surface and subsurface.

4. Methods

Bed material sampling was conducted in March 2009 and June of 2012 and included bulk sampling, pebble counts, and photographic documentation. Processing of the 2012 data has not been completed and incorporated into the Sediment Atlas.

Image processing of the photographs acquired in 2009 and 2012 will be completed using an edge detection technique through the software WipFrag (Maertz et al, 1996). Image-processing procedures will include: correction for radial lens distortion and for the camera axis not being

orthogonal to the surface, identification of the grains within a selected region, calibration of the grain sizes according to the scale within the photograph, and finally measurement of the selected grains, resulting in a grain-size distribution and median sediment size. Attempts will be made to quantify the percentage of fines within each sample.

Once processed, a comparison of bed material sizes over time will be completed to evaluate potential changes from historical conditions and potential changes over the last 3-5 years.

5. Schedule

6. Budget

Task	SL2	SL3	Non-labor	Total
Data Processing	\$7,760	\$952	\$500	\$9,212
Update Geodatabase and Sediment Atlas	\$2,328			\$2,328
Comparisons with historical data	\$2,328			\$2,328
Preparation of tech memo	\$3,880	\$952	\$200	\$5,032
Subtotal	\$16,296	\$1,904	\$700	\$18,900

7. Deliverables

The deliverables for this effort include bed material gradations for documentation in the Sediment Atlas. A technical memorandum will be produced to document the comparison of bed material gradations over time, locate areas of greatest change, and to provide an interpretation of the changes with respect to objectives outlined in the Sediment Management Plan.

8. Point of Contact/Agency

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Elaina Gordon, Bureau of Reclamation

9. References

Maertz, N, Palangio, T., and J. Franklin (1996) Wipfrag Image Based Granulometry System, Proceedings of the FRAGBLAST 5 Workshop on Measurement of Blast Fragmentation, Montreal, Quebec, Canada, 23-24 August, 1996, p. 91-99.

Rubin, D.M. (2004). A simple autocorrelation algorithm for determining grain size from digital images of sediment. Journal of Sedimentary Research, Vol 74, No. 1, p. 160-165.

San Joaquin River Restoration Program, SJRRP, 2011. 2010 Annual Technical Report. April, 2011.

San Joaquin River Restoration Program, SJRRP, 2010. Final 2011 Agency Plan. November, 2010.

San Joaquin River Restoration Program, SJRRP, 2011. 2011 Draft Annual Technical Report, July, 2011.

San Joaquin River Restoration Program, SJRRP, 2012. 2012 Mid-Year Technical Report, July 2012.

TetraTech, 2012a. San Joaquin River: Evaluation of Sand Supply, Storage, and Transport in Reaches 1A and 1B, January, 2012.

TetraTech, 2012b. 2011 Sand Storage Evaluation, January 2012.