

FY2011 TRRP Project Work Plan

Project Title: Gravel Implementation monitoring and analysis

Principal Investigator(s): David Gaeuman, Reclamation

Project Goals and Objectives: This proposal integrates monitoring activities needed to assess the impacts of gravel augmentation activities. The funding requested for these activities combine two line items in the proposed FY2011 budget: 'Implementation Monitoring and Analysis' and 'Coarse Sediment Design/Planning'. There is significant overlap in the activities necessary for monitoring these two types of implementations, and efficiency is gained by considering the data requirements together.

The coarse sediment augmentation component of the program requires two types of feedback to close the adaptive management loop. Firstly, TRRP is responsible for assessing and documenting the outcome of gravel augmentations at and downstream from augmentation locations to prevent unintended adverse consequences. The TRRP gravel augmentation program is potentially beneficial to the Trinity River fishery by stimulating bed mobility, increasing topographic complexity, and improving substrate conditions for spawning, but it is also potentially problematic for private property and infrastructure, and could negatively impact adult holding habitat and recreation. We propose to monitor bed and water surface elevations, channel geometry, and bed grain size distributions at and downstream from locations where coarse sediment has been introduced to address the following questions:

1. Are bed elevations elevations downstream from gravel injection points increasing?
2. Are water surface elevations downstream from gravel injection points increasing?
3. Are private properties threatened by increased flood risk downstream from gravel injection locations?
4. Is bank erosion induced by gravel augmentations threatening private properties or other infrastructure, and is mitigation required?
5. When is it appropriate to replenish individual long-term augmentation locations?
6. Are holding pools at or downstream from gravel injection points being filled?
7. Are gravel augmentations decreasing channel depths and creating navigation difficulties?

Secondly, current scientific understanding of the propagation and dispersal of coarse sediment in rivers is inadequate to confidently predict the outcome of gravel augmentations. Investigations are needed to improve our ability to predict where and how much added gravel is needed to improve habitats at particular locations, how long it will take for new habitats to form, and how long habitat improvements will last. Some specific questions relevant to the management of the gravel augmentation program to be addressed include:

8. How have gravel additions altered downstream channel morphology and geomorphic processes?
9. How far downstream from augmentation sites have gravel additions influenced channel morphology and geomorphic processes?

10. How far downstream from augmentation sites have gravel additions improved substrate conditions?
11. How long will it take to achieve downstream habitat benefits?
12. How long will habitat benefits at a specific location persist?
13. Are the planned quantities of augmented gravel sufficient or excessive?
14. Are refinements to the size distribution of gravel augmentations needed?
15. What is the significance of tributary deltas and other large hydraulic controls for the propagation of augmented gravel?

The data needs to address questions 1-9 are similar to the data needed to address questions 10-15. That is, we must collect topographic and hydraulic information that defines changes in channel geometry and substrate. These same types of data are the cornerstones of assessments of rehabilitation site design effectiveness, that is, assessments to determine if specific rehabilitation designs and/or design elements perform, function, and evolve as expected. Design effectiveness monitoring is an essential component of the complete monitoring strategy necessary to close the adaptive management loop mandated in the ROD. It is distinct from implementation monitoring (verification that the site was built as designed), validation monitoring (assessment of the biological response to site construction), monitoring of management targets expressed in the TRFES (IHAP), or system-wide trend monitoring.

The questions listed above concerning gravel augmentations expand upon a priority question identified in the IAP concerning the quantities, size distribution, and locations of gravel augmentation. The intent of rehabilitation monitoring to determine if constructed design features are “working” is identical to another of the priority questions identified in the IAP. Together, they incorporate many of the assessments described in the IAP, including assessments 1P, 2P, 3P, 4P, 12P, 13P, and 15P.

In addition, we propose to monitor bed elevations in more than 40 pools that are not in the immediate vicinity of gravel augmentations or rehabilitation projects. Local fishing guides have asserted that numerous holding pools up and down the river have filled recently. The purpose of monitoring numerous pools is twofold: First, it is necessary to determine if the public perception that holes are generally filling throughout the river is accurate. Secondly, these data may prove useful in determining whether any actual pool filling is indeed due to TRRP management activities, and if so, which activities are responsible and how the problem might be corrected. For example, it has been hypothesized that some pools may tend to fill during periods of moderate discharge, but tend to scour during periods of very high discharge. It has also been hypothesized that excessive channel widening at channel rehabilitation sites may have caused some pools to fill. The proposed data collection will contribute to the evaluation of both of these hypotheses. It is noted here that the selection of pools to be monitored was not based on any kind of statistical sampling design. Instead, the selected pools were either identified by the local fishing community as areas of special interest or are located in areas where the survey crew will already be working and so can be picked up at negligible addition cost. Conclusions drawn from this work will apply only to the population of pools actually surveyed – no statistical inferences will be made regarding the scour/fill dynamics of unsampled pools.

Methods: Data collection to evaluate rehabilitation and coarse sediment augmentation implementations will consist of bathymetric and water surface elevation surveys and substrate characterization. Surveys will be conducted using wading methods (level, GPS, or total station) or sonar, depending on site conditions. Various types of topographic surveys will be employed, including longitudinal profiles, cross sections, and 2-dimensional point distributions. Survey resolution and spatial extent will depend on numerous factors, including real-time assessment of the degree of recent change since the last survey, available time, available equipment, and available personnel. Water surface elevations obtained repeated over time at baseflow and at 2000 cfs may be used in lieu of more detailed bed topography to efficiently assess stage changes and increased flood risk. Other activities will include bed surface photo documentation and pebble counts. Data will be collected at and downstream from the long-term gravel injection sites at Lewiston Dam, the diversion pool, Sawmill, and Lowden Ranch, near constructed bars at the Sawmill and Lower Reading Creek rehabilitation sites, and at more than 40 holding pools throughout the project area. The time scales of interest include both individual release hydrographs and multi-year trends (3-5 yr).

Data Evaluation and Deliverables: Topographic data will be reduced for presentation in spreadsheet graphs and GIS features and/or surfaces, as appropriate. Features and surfaces representing different time periods will be compared to assess cut and fill, which will be interpreted to document the propagation of gravel additions and assess impacts such as pool filling and bank erosion. Repeat photo documentation and pebble counts on a selected set of pool tail-outs and riffle crests in the vicinity of gravel additions will be used to qualitatively assess surface substrate changes and validate bed surface facies maps. Changes in the substrate detected via these methods will directly track success toward improving surface substrate conditions, as well as detect downstream effects of gravel additions in locations where changes in channel geometry are negligible. All data and interpretations will be documented in an annual gravel implementation monitoring report.

Tasks and Schedule:

Task 1: Inventory existing pre-release topographic data to assist in selecting areas for post-release survey. To be completed by Feb. 2011.

Task 2: Obtain updated topography, pebble counts, etc. at all required locations after the spring flow release and prior to the next winter storm season. To be completed by Dec. 2011.

Task 3: Reduce and analyze data, and release summary reports on coarse sediment monitoring and rehabilitation design monitoring. To be completed by Feb. 2012.

TRRP Requested Budget: \$85,000.

Estimated cost breakdown. Estimates based on 1 day per model reach plus 1 day for targeted surveys at selected rehabilitation sites.

	Unit	Quantity	Unit cost	Total cost
Shallow water topography	per day	4	\$4400	\$17600
Deep water bathymetry	per day	4	\$4400	\$17600
Water stage surveys	per day	4	\$4600	\$18400
Flow velocity surveys	per day	4	\$5200	\$20800
Bedload samples	sample	4	\$1500	\$60000
Data management			\$1200	\$8000
Total				\$88400

Out-year funding: Implementation monitoring will be required at a similar level of efforts at least through the construction phase mandated in the ROD. Annual funding of \$85,000 adjusted for inflation will be requested.