

Development of a Continuous Bed Load Transport Measurement Technique (Project #6499)

ACCOMPLISHMENTS IN 2008 AND 2009

The U.S. Department of the Interior plans to remove Elwha and Glines Canyon Dams on the Elwha River, near Port Angeles, Washington, U.S.A. to restore the ecosystem and native anadromous fisheries. By 2011, when dam removal may begin, the two reservoirs are predicted to contain 19 million m³ of sediment from the 324 mi² watershed. This will be the largest volume of reservoir sediment erosion associated with dam removal in North America and, therefore, offers a unique learning opportunity.

In the summers of 2008 and 2009, a series of 72 bed load impact sensors were installed across the Elwha River. These sensors were mounted on the downstream side of a concrete weir that is used for diverting river water for municipal and hatchery uses. The plates and housing were fabricated by Reclamation at the Denver Federal Center. Fabrication and installation of the bed load impact sensors was funded by Reclamation's Science and Technology program. Over 15,000 ft. of wiring was routed to a computer cabinet on the bank, where computer hardware will be installed to operate the system. The series of instrumented plates were checked for operation and continuity prior to completing construction.

This system will measure bed load across the Elwha River to monitor the fate of coarse reservoir sediment released during and after the deconstruction of the Elwha and Glines Canyon Dams. The instrumented plates 'feel' the bed load moving across them by measuring the vibration created by the impact of gravel on the plate. The instruments installed behind the plates are geophones and accelerometers. The use of geophones to measure bed load has been in development by Rickenmann and McArdell at the Swiss Federal Institute. The National Center for Earth-Surface Dynamics (NCED) has researched the application of a multi-frequency accelerometer to improve the measurement. The NCED determined a correlation between signals generated by the impact plates and measured bed load in a flume. Funding for the research at the NCED was provided by the Federal Interagency Sedimentation Project (FISP).

FUTURE PLANS

We need to determine a sampling scheme for all 72 sensors, building on the research performed by the NCED. Questions to be answered will be: how fast do we sample?; how do we threshold the data so we don't fill a hard drive with no data but don't lose good data?; how do we process the data using algorithms from the NCED research?; will we have to blank the data collection to use the processors for processing the raw data?; what type of specialized hardware is required?; do we need more than one computer? The answer to these questions will provide a framework for a program that will be written to handle the data collection.

Future work on the bed load impact sensors will be moved to another project ID number, 9562. Please refer to that project ID for further details on this ongoing project.