

U. S. Geological Survey
Wyoming-Montana Water Science Center
Real-Time Monitoring of Suspended Sediment in Shoshone River
Project Progress Report
Period from Aug 1 2017 through December 31, 2017

January 24, 2018

Project Name: Real-time monitoring of suspended sediment in the Shoshone River above and below Willwood Diversion Dam

JFA: 17WNWY086100041 **Begin Date:** 8/1/2017 **End Date:** 12/31/2020

Project Chief: Chris Ellison **Cooperators:** Wyoming Department of Environmental Quality

Objectives

1. Provide real-time continuous suspended-sediment concentrations and streamflow for two sites (USGS ID 06283995 and 06284010) above and below Willwood Diversion Dam on the Shoshone River using the online USGS Real-Time Water Quality Data for the Nation portal (<https://nrtwq.usgs.gov/>)
2. Develop statistical model(s) using relations developed among acoustic signals, turbidity, streamflow, and suspended-sediment concentrations for sites on the Shoshone River.

Reporting period: 8/1/2017 – 12/31/2017

Progress during this Reporting Period

During this reporting period, a majority of the required monitoring equipment was purchased and installed at both the upper and lower monitoring sites on the Shoshone River. Equipment installed during this period included a weatherproof enclosure at the upper site, 4 100-W solar panels, 2 Sutron SatLink3 data recorders, 2 Yagi antennas, 2 streamflow bubblers, 1 Hach SOLITAX turbidity sensor, 1 YSI 600 series turbidity sensor, 1 aluminum I-beam, 2 turbidity sensor deployment (PVC) tubes, and 1 SonTek SL 1500 hydroacoustic devices. The initial set of equipment was installed on or about October 7 prior to the beginning of the Diversion Dam drawdown operations (October 15).

Equipment sensors (SL1500 and turbidity) were programmed in concert with the SatLink 3 data recorder and satellite communications platform. Initial data transmissions of turbidity nephelometric units (NTUs) from the upper and lower monitoring sites began on October 11 to capture turbidity response to Willwood Dam river drawdown activities. These data were provided to cooperators on the NWIS web portal at <https://wy-mt.water.usgs.gov/> for public viewing during the time period from Oct 1 through Dec 24. Periodic gaps in the data were observed related to equipment maintenance and adjustments to installation design. Initial data transmissions continued until Dec 24, when cold temps and low light levels resulted in complete power failure at the below dam monitoring site. Since Dec 24, the turbidity sensor output was removed from public viewing at the web portal.

Plans for Next Reporting Period

Prior to spring runoff, the remainder of the equipment will be purchased and installed to complete the installation of the monitoring stations at the above and below dam sites. This will entail installation of an aluminum I-beam at the upper site and the installation of a SonTek SL 1500 acoustic

device. Both sites will be modified during this time period to improve sustainability of the turbidity sensors during the winter months. This will be accomplished by incorporating lower power requirement related equipment and increasing battery charging capabilities at both sites. For the upper site (06283995), there is a need to move the equipment further upstream in the deeper, narrower section of the river to minimize the effects of variable stream levels. Fluctuating water levels have caused problems with maintaining the turbidity sensor in sufficient water depths to produce representative values. This problem is expected to be resolved by moving the sensor from its current position to a point upstream in a deeper, narrower reach of the river. Moving the equipment upstream also entails the installation of 2 Waterlog 427 Data Radios (Master and Slave) to transmit the data from the remote station to the SatLink3 datalogger. During this next reporting period, there are plans to install two Tacoma Bank Operated Cableways (BOCs) to facilitate collection of suspended-sediment samples and for obtaining streamflow measurements. Once the BOCs are installed, water sampling will begin for analysis of suspended-sediment concentrations and streamflow measurements will be collected.

Significant Results since Last Reporting Period

Data transmissions of real-time continuous turbidity were successfully brought online at the upper and lower sites and provided first-ever real-time continuous (15-minute data) measurements of turbidity during the fall 2017 drawdown period at Willwood Diversion Dam (Fig. 1). This data provided the Willwood Irrigation District Manager and the Wyoming Department of Environmental Quality the information needed to respond to upward trends in sediment discharges by making adjustments to the dam sluice gates, thereby minimizing negative effects to the downstream river from elevated sediment transport.

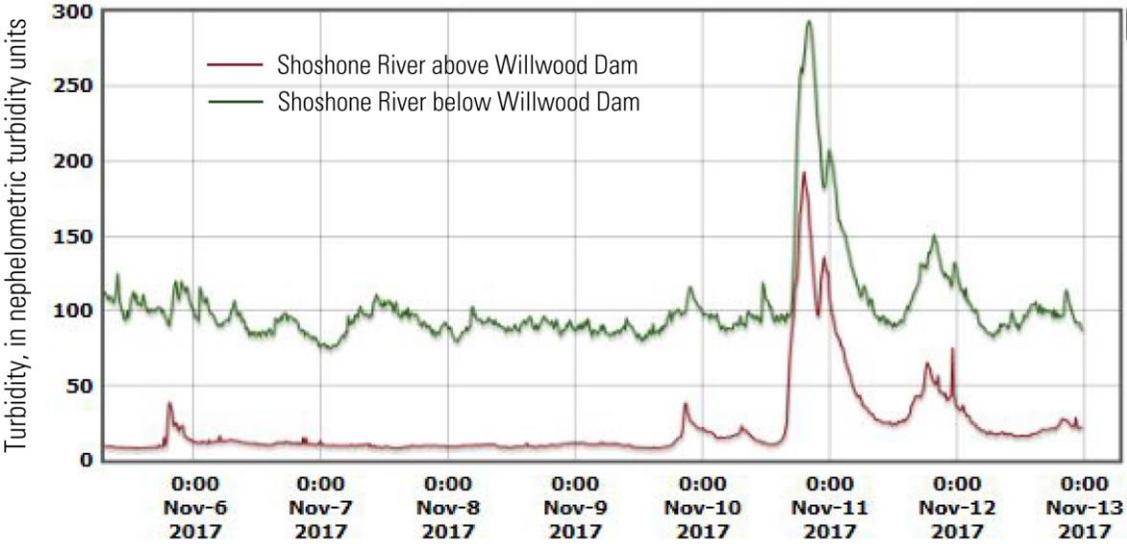


Figure 1. Real-time turbidity for sites on the Shoshone River available online at <https://wy-mt.water.usgs.gov/>.