Report as of FY2006 for 2006NV114B: "Quantify Wash Load and Fractional Suspended Load Transport in Lake Tahoe"

Publications

- Conference Proceedings:
  - Rotter, S. (2006) Predicting fine-sized sediment load in Lake Tahoe tributaries. ASCE EWRI 2006 World Water Congress.
  - Rotter, S. and Duan, J. G. (2006) Statistical properties of fine sediment time-series from Lake Tahoe tributaries, Submitted to Lake Thaoe Basin 3rd Biennial Conference.
- Other Publications:
  - Rotter, S. and Duan, J.G. (2005). Fine-sized sediment load prediction by Artificial Newton Network approach. Lake Tahoe Science Consortium 2005, June.

Report Follows

Synopsis

Final Report

Project Objective

The objective of the project is to quantify fine sediment load from 10 primary streams directly discharging into Lake Tahoe. Integrated sediment samples were collected at the Long Term Interagency Monitoring Program (LTIMP) stations. DRI Soil Lab has analyzed fine particles of silt and clay from the measured suspended load. The project is in collaboration with USGS Carson City office. USGS scientists are Nancy Alevax, Bob Burrow, and Tim Rowe.

This funded research project is important to the LTIMP program. It provides additional data of fine-grained sediment by size fractions at ten primary LTIMP sites, develops statistical and analytical methods to predict fine-grained sediment load, and establishes foundations for DRI and USGS continue their collaboration in strengthening LTIMP program in Lake Tahoe.

Study Site

Due to the focus on Lake Tahoe as the terminal point for suspended sediment transport in all of the tributaries to the lake, the sampling sites of greatest concern are those in the closest proximity to the lake on any individual tributary. The study chose ten primary LTIMP sites, which located at Third Creek near Crystal Bay, Incline Creek near Crystal Bay, Glenbrook Creek at Glenbrook, Edgewood Creek at Stateline, Trout Creek at South Lake Tahoe, Upper Truckee River at South Lake Tahoe, General Creek near Meeks Bay, Blackwood Creek near Tahoe City, Ward Creek at Hwy 89 near Tahoe Pines. The ten tributaries that are monitored each have a gauging site located near their entrance to the lake with several of the streams having additional sites further upstream. The eight additional sites located higher within the watersheds are of less importance to this study because we are most concerned with the final output to the lake from any one tributary. Thus, the ten gauging stations located closest to the lake provide the most relevant data and are the only LTIMP sites used for this study.

Results

Measurements were taken weekly or bi-weekly depending on high or low flows since May 2005. At each site, we measured air and water temperature, and collected water samples. These samples were analyzed using DRI Saturn Laser Digitizer for turbidity, suspended sediment concentration, and conductivity. Preliminary conclusions from samples collected from May 2005 to Jan. 2006 are summarized as follows.

1) Over 96% of suspended sediments is finer than $62.5\,\mu m$, and over 82% of suspended sediment is less than $31\mu m$ at the ten streams. The averaged D_{50} for the ten streams is $25.85\mu m$. This result clearly indicated that fine particles less than $62.5\,\mu m$ are the majority of sediment load to the lake.
2) The highest sediment concentration (503 mg/L) was measured at the Glenbrook Creek. Sediment concentrations at Logan House and Edgewood Creek are around 100mg/L. Other Creeks including Blackwood, General, Upper Truckee, Incline, Ward, Third, Trout Creek has SSC varying from 30 to 90 mg/L.
3) Suspended sediment concentration (SSC) does not directly relate to flow discharge. Streams (e.g. Third Creek, Upper Truckee) having high values of SSC associate with low discharges. However, the total fine sediment volume closely correlates with flow discharge. High flows carry more fine sediment load to the lake because flow discharge is

high.

In summary, fine sediment load is the primary suspended sediment load discharging directly into the lake. The contributions from different streams vary depending on climate and watershed characteristics. High suspended sediment concentration does not always associate with high sediment load volume.

Current Research Activity

Since we have not completed data collection for an entire season, field data collection is currently on-going. More sediment samples are analyzed at DRI soil laboratory. SSC showed no direct correlation with flow discharge, so that we are employing statistical method to analyze these field data. Currently, we are generating time-series of discharge, SSC, sediment percentages by size fraction for data collected from May 2005 to June 2006. Statistical characteristics (e.g. mean, variance, skewness) are calculated for these time-series. Correlations between time-series for the same variable (e.g. discharge) at different watersheds or time-series of different variables for the same watershed will be analyzed.

Training Accomplishment

Funding one MS student, Shane Rotter, from the Hydrologic Sciences Program at the University of Nevada, who has successfully defended his proposal, and expected to graduate in Dec 2006.

Publications

Rotter, S. and Duan, J.G. (2005). "Fine-sized sediment load prediction by Artificial Newton Network approach." *Lake Tahoe Science Consortium 2005*, June.

Rotter, S. (2006) "Predicting fine-sized sediment load in Lake Tahoe tributaries." *ASCE EWRI 2006 World Water Congress.*

Rotter, S. and Duan, J. G. (2006) "Statistical properties of fine sediment time-series from Lake Tahoe tributaries", Submitted to Lake Thaoe Basin 3rd Biennial Conference.