



Missouri River Suspended Sediment Sampling Analysis

The U.S. Army Corps of Engineers, Omaha District, in cooperation with the U.S. Geological Survey, collects suspended sediment samples twice weekly at three sites along the Missouri River: Sioux City, Iowa; Omaha, Nebraska; and Nebraska City, Nebraska. As a result of budget cuts, an assessment of the suspended sediment data collection program was undertaken to determine if it was possible to reduce the sampling frequency, thus reducing costs, without compromising the precision and accuracy of annual sediment yield calculations. The study evaluated the adequacy of the existing data and the effectiveness of alternative sampling strategies.

Suspended sediment rating curves for each of the sampling sites were developed from observed data using a log-linear regression model and applying the method of least squares. Under the assumption of normally distributed regression residuals, this rating curve estimator had a bias and, in general, systematically underestimated the suspended sediment discharges. The Minimum Variance Unbiased Estimator was used to correct for the bias.

The suspended sediment data from each of the sampling sites were analyzed independently. The existing suspended sediment data

sets were systematically thinned to simulate. The thinning scenario that had the smallest number of samples and that resulted in similar regression parameters, suspended sediment discharge estimates and acceptable mean square errors compared to the original data was recommended.

The approach used to formulate the sampling strategies resulted in seasonal, flow-stratified sampling designs having the following properties: (1) suspended sediment samples that span the entire streamflow range for low, moderate and high water discharges; (2) more suspended sediment samples concentrated at streamflows intervals having the largest fraction of the total suspended sediment discharge; (3) number of annual suspended sediment samples necessary to observe shifts in the suspended sediment rating curves that can occur in response to changes in the watershed; and (4) an adequate number of samples that will maintain or improve the precision and accuracy of the suspended sediment rating curves.

To demonstrate the sample reduction associated with the proposed sampling designs, the current twice weekly and the proposed sampling schemes were implemented for future water years and the numbers of samples collected under the two sampling schemes were compared. The proposed sampling designs required significantly fewer samples than the current twice-weekly sampling scheme. The implementation of this sampling strategy at the Sioux City site resulted in a **\$10,000 savings** during the 2001 fiscal year.

Project Owner:

U.S. Army Corps of Engineers, Omaha District
106 South 15th Street
Omaha, NE 68102-1618
Contact: Mr. John I. Remus II, P.E.
(402) 221-4620

Completion Date: January 2001

