



Urban Flood Demo Program & Southwest Demo Program

Sediment Facilitated Transport of Nutrients and Metals in Arid and Semi-Arid Regions

Products

To develop a conceptual model for the interaction of nutrients and metalloids with sediments and to test the transferability of the model from one area of the U.S. Southwest to another.

Benefits

One of the main questions in any study is the extent of applicability of the results. Clearly, a methodology that can only be applied to a small geographic area would be of relatively little use. This project will test the transferability of our methodology related to the association of metals and nutrients with sediments in the Las Vegas Wash area and the extraction procedures of these potential contaminants from sediments. This methodology will enable managers to better anticipate, identify, and mitigate potential areas of concern with respect to water and sediment quality.

**Issue**

Nutrients (e.g., phosphorus, nitrate, organic carbon) and metals and metalloids (e.g., selenium and arsenic) are common contaminants of concern for urban watersheds of the arid and semi-arid southwestern U.S. These same watersheds are often heavily managed to mitigate flood events and sediment-related impacts including incision and aggradation. The overall objective of this research program is to expand and to test the transferability of results obtained from studies in a Las Vegas watershed (Las Vegas Wash area) to other urban watersheds of the southwestern U.S. (e.g., Phoenix or Albuquerque). It should be kept in mind that sediment transport can have a profound effect on the water quality of affected bodies of water, not only by affecting water clarity, but also by facilitating the transport of chemical constituents, as well as microbiological components (e.g., bacteria and viruses). This project component will contribute to our continued understanding of sediment-facilitated nutrient and metal transport in urban watersheds by expanding the work already completed in the Las Vegas Wash area to additional southwestern U.S. watersheds. In the current fiscal year, a site in Maricopa County near Phoenix on Rio Salado will be selected. At a later phase, a site near Albuquerque on Rio Grande may be selected.

Description

The general objectives will be accomplished by completing the specific research tasks outlined below. Task 1 – Site selection. An appropriate site on Rio Salado near Phoenix, AZ will be selected in consultation with the local office of the U.S. Corps of Engineers and the Maricopa County Flood Control District. Selection criteria include availability of sediments that can be collected easily, location in an urban watershed, accessibility, and

potential loading of the sediments with nutrients and metals from nearby urban areas. Task 2 – Sediment sampling. Sediment sampling according to the procedures developed in the Las Vegas Wash area will be used. Composite samples will be selected to assure that samples are representative. Task 3 – Sediment characterization. The sediments will undergo a complete characterization, including particle size distribution performed by light scattering, specific surface area by nitrogen adsorption and the BET method, particle mineralogy, as determined by x-ray diffraction (XRD), and particle morphology, based on scanning electron microscopy (SEM). The sediment characterization will allow a comparison of the sediments from the two locations and will be a critical component of the interpretation of the results. Task 4 – Sediment analysis. The sediments will be analyzed for phosphorus, arsenic, selenium, and boron. Additional information will be obtained by sequential extractions of the metalloids to determine the distribution of the metalloids across individual sediment components. Task 5 – Data analysis. Following sediment analysis, the differences and similarities observed in the two sites, Las Vegas Wash and Rio Salado, will be analyzed and interpreted based on sediment properties obtained from the detailed characterization conducted. Specifically, we will compare distribution of nutrients and metalloids across the same sediment fractions of the two locations and determine if specific patterns emerge. In addition, the results will be interpreted based on the properties of the sediments sampled, with the objective to correlate the results to the properties of the sediments. These results will contribute to a database that will be used for the formulation of a conceptual metalloid—sediment interaction model in the U.S. Southwest.

Sponsor Urban Flood Damage Reduction and Channel Restoration Development and Demonstration Program for Arid and Semi-Arid Regions (UFDP).

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