Water Quality History Derived From Diatom Communities in a Water Treatment Sediment-Settling Reservoir, Aztec, NM

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Abstract

The Animas River and San Juan River watersheds in southern Colorado and northern New Mexico have a long history of anthropogenic land use activities. Some of these activities, including gold, silver, and uranium mining; lead, uranium, and vanadium milling; and oil and gas development, have resulted in adverse environmental impacts. Exposed geology of these watersheds can also contribute to naturally elevated constituents of concern (for example, lead and aluminum) in these rivers. Understanding historic effects of anthropogenic land use can inform future management decisions.

Diatoms are important single-celled photosynthetic protists in aquatic ecosystems that are useful for biomonitoring because they often live in a specific range of environmental conditions. Analysis of depositional layers of sediments in lakes and reservoirs for biological indicators such as diatoms can be used to reconstruct historic water-quality conditions of a watershed.

The U.S. Geological Survey collected bed sediments from four trenches within a drained settling reservoir maintained by the City of Aztec drinking water treatment plant. Analyses of bed sediments include sediment descriptions, chemistry, age dating, and diatom species identification, and provide a history of water quality (1947-2018) in the Animas River watershed upstream of Aztec, NM. This work explores the response of diatom taxa through the reservoir's history to changes in water-quality conditions (e.g. pH, nutrient concentrations, salinity, metals, etc.) that may have occurred in the watershed over the past 71 years.

Diatoms were identified and species composition delineated every 10 centimeters along the length of one sediment core. Diatom communities are characterized on the basis of the life history (e.g., cosmopolitan versus endemic, planktonic versus benthic, etc.) of community species. Chemical, physical, and particle size analysis of sediments are used to interpret drivers of the diatom community structure. These data inform the assessment of conditions of the settling reservoir in Aztec and may predict how upstream changes in water chemistry affect the local reservoir.