USGS

WATER RESOURCES RESEARCH GRANT PROPOSAL

Title: Metal(loid) Cycling in Lake Couer d'Alene, ID as Controlled by Reduced Sulfur Species

Focus Categories: TS, SED, WQL

Keywords: Heavy metals, Lakes, Mathematical models, Water chemistry

Duration: 9/99-8/01

Federal Funds Request: $183,650

Non-Federal Matching Funds Pledged: $183,785

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Abstract

Lake Coeur d'Alene (CDA) is the second largest natural lake in the Inland Northwest. Over the last century Lake CDA became the major collecting bed for sediments impacted by human activities in its two major drainages. These activities include recreation, logging, and agriculture in addition to mining and ore processing in the Coeur d'Alene River basin. Mining activities within the region have resulted in extensive metal(loid) contamination of the lake. The USGS has estimated that as much as 85% of the lake bottom is contaminated with metal(loids). Lake CDA is used as a source for drinking water for at least six communities and serves as a primary recreational area for inhabitants of the Pacific Northwest. Because of its scenic beauty the region around Lake CDA is currently undergoing rapid development. As a result, we may expect additional human impact on this system in the forms of increased nutrient loading and mechanical disturbance. Models that predict the fate and stability of metal(loid) contaminants under various perturbing influences are urgently needed by state, regional, and federal water quality regulators. Such models will facilitate management decisions ensuring continued protection of human health and environmental quality. Our previous work indicates that reduced sulfur species play an important role in controlling the cycling of metal(loid) contaminants in Lake CDA. We therefore propose to characterize this key variable controlling metal(loid) transport and bioavailability. More specifically, we will 1) identify and quantify sulfur species present in sediment pore waters, 2) develop an equilibrium model describing metal-sulfur speciation, 3) correlate model predictions with total soluble Pb, Cd, and Zn concentrations, and 4) predict metal flux from the sediment to the overlying water column. Our overall objective is thus to develop a clear

understanding of sulfur biogeochemistry within the lake sediments, providing appropriate data that will contribute to the development of models focused on the fate of metal(loid)s within the sediments. Ultimately such models will be used to predict how anthropogenic alteration of the lake will modify metal(loid) cycling and potentially increase environmental deterioration. This research will ensure protection of regional water resources impacting northern Idaho and eastern Washington.