ABSTRACT

MOBILIZATION AND UPTAKE INTO THE AQUATIC ECOSYSTEM OF WASTE, METALLIC MERCURY FROM HISTORICAL GOLD-MINING OPERATIONS IN THE SIERRA NEVADA OF CALIFORNIA

by

Steven Mark Killingsworth

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California State University, Chico
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Liquid, metallic mercury is widespread in streams draining the gold-mining region of the Sierra Nevada in California. This mercury is waste discharge left over from gold-mining operations on these streams since 1849.

The purpose of this study was to determine if any of this vast reservoir of potentially toxic, yet relatively insoluble, mercury was finding its way into the edible fish in the Sierran streams. Available data on water samples, fish samples, and sediment samples were evaluated; other potential mercury sources were investigated; the chemical behavior of mercury in aquatic systems was reviewed and utilized.
Investigation of the water-quality sampling record showed that hydrologic conditions favorable to the oxidation and ensuing mobilization of otherwise insoluble mercury were encountered in Sierran streams nearly 100\% of the time. Analysis of a 20-year record of statewide fish-sampling data showed a positive "fingerprint" of elevated mercury residues in fish from the Sierra Nevada study area, a region that has no significant, natural mercury sources. Sediment-sampling data for Sierra Nevada reservoirs substantiated the above findings.

It was concluded that waste, metallic mercury from gold mining bioaccumulates in fish from Sierra Nevada streams. The relatively insoluble, elemental mercury is oxidized in stream water containing oxygen and organic matter, and is mobilized as the soluble mercuric ion. The mercuric ion is then transformed, through methylation by sediment bacteria, to highly toxic methylmercury, which is readily incorporated into the aquatic food chain.