# Greene Environmental Services

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The Honorable Governor Arnold Schwarzenegger
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Dear Governor Schwarzenegger

## PLEASE VOTE NO ON BILL 670 (anti-suction dredging legislation)

I am a research biologist. I live in Philomath, Oregon. I worked for about 32 years as a research biologist for the United States Environmental Protection Agency, starting when that agency was known as the Federal Water Quality Agency, and I retired from the E.P.A. in 2002. Among other assignments, I measured and evaluated water soluble toxicants from Superfund sites. I spent about four years during my career with the E.P.A. serving as a faculty member at Oregon State University in Corvallis, Oregon on an intergovernmental exchange program and developed a program and a laboratory for the practice of ecotoxicology, the science of determining the toxicity of samples of effluents and other environmental contaminants by measuring the reaction of living organism assemblages to such samples. I have served as a chairman of testing committees for the American Society for Testing and Materials. I have chaired a number of international symposia, workshops, and congresses in my field as well as been an invited speaker to numerous national and international professional scientific meetings in my field.

Looking for gold in California streams and rivers is a recreational activity for thousands of state residents, and a part-time or full-time job for hundreds more. As these miners remove sediments, sands, and gravel from streams and former mine sites to separate out the gold, they are also removing mercury. This mercury is the remnant of millions of pounds of pure mercury that was added to California rivers by historic mining operations between 1850 and 1890. Modern day small-scale gold suction dredgers do not use mercury to recover gold during the operation of the dredge. Therefore, any mercury that would be found in their possession would be that which was extracted from the stream or river they are working.

Taking mercury out of streams benefits the environment. Efforts to collect mercury from recreational gold miners in the past, however, have been stymied due to perceived regulatory barriers. Disposal of mercury is normally subject to all regulations applicable to hazardous waste.

In 2000, EPA and California's Division of Toxic Substance Control worked in concert with other State and local agencies to find the regulatory flexibility needed to collect mercury in a simple and effective manner. In August and September 2000, the first mercury "milk runs" collected 230 pounds of mercury, most of which came from suction dredge miners. A Nevada County household waste collection event held in September 2000 collected about 10 pounds of mercury. The total amount of mercury collected was equivalent to the mercury load in 47 years worth of wastewater discharge from the city of Sacramento's sewage treatment plant or the mercury in a million mercury thermometers. This successful pilot program demonstrates how recreational gold miners and government agencies can work together to protect the environment (US EPA, 2001).

In Washington State, over the past four years, the Resources Coalition and other small- scale miners associations have turned in 127 pounds of mercury and eight pounds of lead for safe disposal. This year, Ecology staff attended miners' rallies in Oroville and Monroe, explaining the state's program for proper disposal of lead and mercury.

In a September 18, 2007 news release from the Washington State Department of Ecology Brian Dick, a manager with Ecology's hazardous waste and toxics reduction program stated, “That is 127 pounds of mercury no longer

contaminating Washington's waterways or being accidentally spilled". He continued, "The miners have responded with great enthusiasm and have worked with Ecology to get the word out to their members about our collection program." The results of this program further support the results of the 2000 EPA and California's Division of Toxic Substance Control program.

Mercury occurs in several different geochemical forms, including elemental mercury, ionic (or oxidized) mercury, and a suite of organic forms, the most important of which is methylmercury. Methylmercury is the form most readily incorporated into biological tissues and is most toxic to humans. The process of mercury removal by suction dredging does not contaminate the environment because small-scale suction dredging removes elemental mercury. Removal of elemental mercury before it can be converted, by bacteria, to methylmercury is an important component of environmental and human health protection provided as a secondary benefit of suction dredging.

A 2005 staff report published by the State Water Resources Control Board, Division of Water Quality has raised quite a stir in the environmental community. This report concluded that a 4-inch gold suction dredge captures 98% of the mercury it sucks from the environment. It further states that portions of the 2% of mercury that escapes from the suction dredge is floured (*i.e.*, in small particles), and that such mercury may travel many miles downriver where it may settle and become available for biological action by bacteria where it will be converted into methylmercury. I have reviewed this report in detail, and the parent material that was test-dredged in this study was already mercury contaminated; the researchers did not fully quantify the particle sizes of mercury in the sample. It seems obvious that the materials tested already contained floured mercury. Furthermore the site dredged was an area where mercury was accumulating or puddling. This site is not typical of areas in which gold dredges operate and does not represent what a miner would usually encounter..

This is consistent with other literature in the field. For example, a report titled “Preliminary Report on Mercury Geochemistry of Placer Gold Dredge Tailings, Sediments, Bedrock, and Waters in the Clear Creek Restoration Area, Shasta County, California” (Ashley et. el., 2002), states: “Mercury in sediment and tailings is associated with fine size fractions”.

Furthermore, the suggestion that the floured mercury, regardless of the source, would remain suspended for miles below the dredging site is not supported by any evidence of which I am aware, and is refuted by indirect evidence.

A study by the U.S. Geological survey reported that “mercury concentrations in Sulphur Creek, CA water and sediments decreased rapidly downstream from hot springs and mine areas indicating that mercury is not effectively transported during low stream flow” (Rytuba, Janik and Goff, 1966).

In 1997 a study of gold dredging impacts was undertaken in the Fortymile River, Alaska. In all of the suction-mined sites studied, dredges were operated by experienced miners. This study evaluated the impact of operations from 8- and 10-inch gold suction dredges. (Each 1-inch increase in the diameter of a dredge hose results in the doubling of the volume of material moved). In relation to the 4-inch dredge used in the California State Water Resources Control Board study, the Alaska 8-inch dredge moved 4-times more volume of material.

Sampling was performed at fixed transects above and below the dredge locations. At the site using the 8-inch dredge, “the primary effects of water chemistry were increased turbidity, total filterable solids, and copper and zinc concentrations downstream of the dredge. These variables returned to upstream levels within 80-160 m downstream of the dredge. The results from this sampling revealed a relatively intense, but localized, decline in water clarity during the time the dredge was operating. The impact of suction dredging on water clarity and heavy metal concentrations may be greater or lesser than we measured, depending on the type of material the dredge is excavating”. Although mercury was not measured in this study the physical/chemical facts would indicate that suspended mercury would not travel farther than the measured plumes of this study (*e.g.*, 8-inch dredge produced a plume from 80-160 m downstream of the dredge).

If we use copper and zinc as indicators of metals suspension within the water column we find that elevated concentrations fell to background concentrations 80-160 m downstream of the dredge. The density of copper and zinc are 8.94 and 7.14 $g/cm^3$ respectively. The density of mercury is 13.534 $g/cm^3$. Therefore, all other things being equal, the greater density (weight) of mercury would insure that it would fall out of suspension sooner that copper or zinc. Also, all of these water quality samples were associated with a turbidity plume.

Even if the metals were somehow associated with particulate matter or sediment within the plume the metals still returned to background concentrations within 80-160 m downstream of the dredge.

The CA State Water Resources Control Board staff report presented results from a study conducted in a well established mercury "hotspot" in the American River—that is, a place where relatively large quantities of mercury from historic gold mining operations has come to rest, at least temporarily. Such spots can persist for many years before river flows release the materials further downstream to form new hotspots. The effects of dredging into a mercury hotspot has little relevance to ordinary gold suction dredging along the many miles of rivers and streams throughout the Western States. Generally, miners occasionally find very small quantities of mercury in their collected materials. What mercury is collected is usually bound to (amalgamated with) other metals, including gold.

On balance, suction dredges provide a net environmental benefit by removing nearly all of any mercury they encounter. If not removed, such mercury will slowly but eventually migrate downstream, dredging or no dredging, to areas where it is more likely to be converted into methylmercury. To the extent that regulatory authorities would prefer to leave the mercury in place for removal by public agencies at public expense when and if such activity is a budget priority, they might require reporting of hotspots (many are already well-known) and forbid suction dredgers from operating in them. Inasmuch as public authorities have no better method to remove the mercury than suction dredges, this seems pointless.

**Literature Cited**


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Sincerely, Joseph C. Greene

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