Mercury Contamination:
Toxic Legacy of the Gold Rush

Assembly Natural Resources Committee
March 24, 2014 Hearing Background Paper

Purpose of the Hearing

The California gold rush contributed so largely to the wealth of the world during its heyday (1860s to the early 1900s) and was the means of settlement and development of California during its time. But the gold rush used immense qualities of mercury, which was mined in the California Coastal Range and used in the Sierra Nevada to obtain gold. Today, the mercury that was left behind creates problems for human health and the environment in much of the state. The purpose of this informational hearing is to better understand the toxic legacy of the gold rush, to learn what public and private stakeholders are doing to address the problem, and to explore next steps.


THE SLUICE.

Figure 2. In one form of gold mining, hydraulic mining, high powered monitors (i.e., water cannons) would strip the ground of soil, sand, and gravel (fig. 3). Mercury was added to the slurry (i.e., the mixture of water and sediment created by the hydraulic mining), which was directed through sluices (shown in this sketch) where workers recovered the gold-mercury amalgams.

Gold Mining in the Sierra Nevada

During the gold rush, California gold miners used massive amounts of mercury—an estimated 26 million pounds. Mercury was used to draw in fine gold particles from sand and gravel to form an alloy called amalgam (fig. 2). Mine workers would gather the gold-mercury amalgams and put them through a heating process that vaporized the mercury and left the gold behind.

Based on estimates by researchers, it is possible that 10 to 13 million pounds of mercury were discharged into the environment during the gold rush. A significant portion of this mercury has migrated downstream to the Sacramento Delta and San Francisco Bay. Recent studies indicate that runoff and erosion from gold mines in the Sierra Nevada are the most significant source of mercury to the Sacramento Delta. In addition, some mercury was lost to the atmosphere when the miners vaporized the amalgams; much remains entrapped behind dams and rivers in the Sierra Nevada; and hundreds to thousands of pounds of mercury remain at a number of historic gold mine sites. Researchers, drawing on historical flood data to predict sediment flow, have reported that California's mining sediments will continue to release mercury into waterways over at least the next 10,000 years. As climate change intensifies the area's rainstorms, the flood-driven discharges should become more frequent.

Figure 3. As part of hydraulic mining, monitors (i.e., water cannons) were used to break down the gold-bearing gravel deposits. The monitors were so powerful, one observer explained, that they would "toss about rocks, tons in weight, as if they were mere pebbles."

Mercury Mining in the Coast Range

Most of the mercury used for the gold rush was mined from the Coast Range between Los Angeles and Eureka. There are a significant number of mercury mines, particularly from the mountains around San Jose and Clear Lake, that were abandoned long ago but continue to discharge mercury into soil and streams (fig. 4).

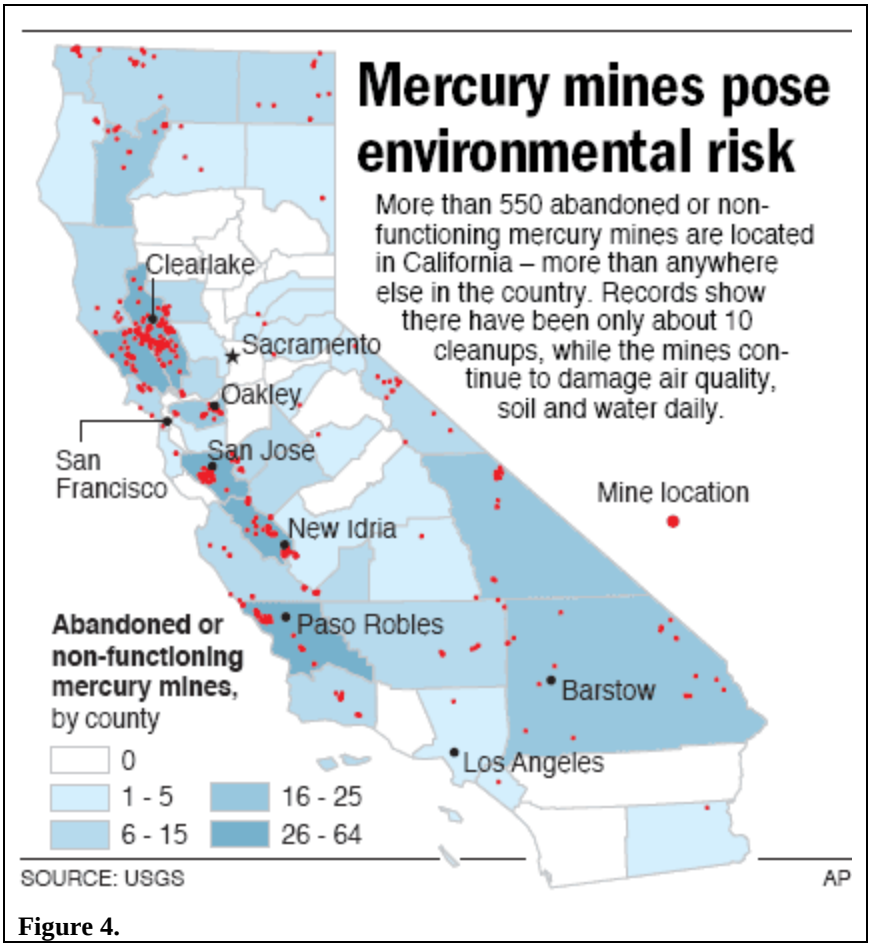

Figure 4.

Health Impacts of Mercury

Once mercury enters a waterway, naturally occurring bacteria absorb it and convert it to a form called methyl mercury. This transition is particularly significant for humans, who absorb methyl mercury easily and are especially vulnerable to its effects.

Mercury then works its way up the food chain as large fish consume contaminated smaller fish. Instead of dissolving or breaking down, mercury accumulates at ever-increasing levels. Newest state health warnings regarding mercury are in effect for nearly every reservoir in the state advising children and women to severely restrict or in some cases completely avoid consumption of certain kinds of fish. The Office of Environmental Health Hazard Assessment (OEHHA) has also issued site-specific fish consumption advisories (fig. 5).

Humans risk ingesting dangerous levels of mercury when they eat contaminated fish. Since mercury is odorless, invisible and accumulates in the meat of the fish, it is not easy to detect and cannot be avoided by trimming off the skin or other parts.

Once in the human body, mercury acts as a neurotoxin, interfering with the brain and nervous system.

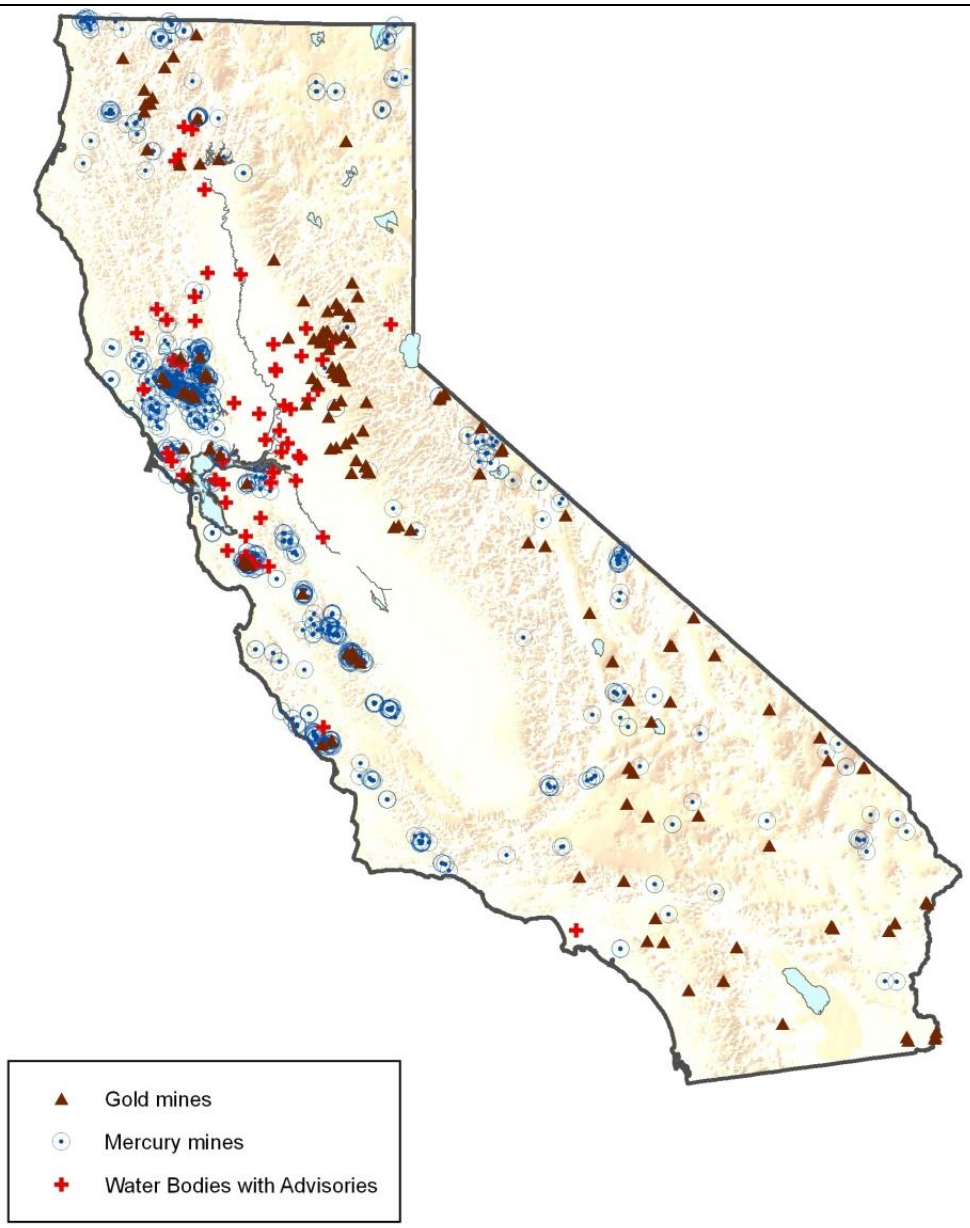

Figure 5. This map includes the location of mines and water bodies with site-specific fish consumption advisories. Water bodies with advisories developed by OEHHA are localized mainly in areas of historical mercury or gold mining operations in Northern California where contaminant levels are expected to be higher and contaminant data are more readily available. These advisories provide fish consumers with information to make choices about how frequently to eat the fish in their catch, and to select fish low in contaminants and high in beneficial omega-3 fatty acids. However, there are many water bodies that have not been evaluated because developing an advisory for an individual water body requires adequate chemical contaminant data for multiple species and is resource intensive.

Exposure to mercury can be particularly hazardous for pregnant women and small children. During the first several years of life, a child's brain is still developing and rapidly absorbing nutrients. Even in low doses, mercury may affect a child's development, delaying walking and talking, shortening attention span and causing learning disabilities. Less frequent, high dose prenatal and infant exposures to mercury can cause mental retardation, cerebral palsy, deafness and blindness.

In adults, mercury poisoning can adversely affect fertility and blood pressure regulation and can cause memory loss, tremors, vision loss and numbness of the fingers and toes. A growing body of evidence suggests that exposure to mercury may also lead to heart disease.

References

Charles N. Alpers & Michael P. Hunerlach, *Mercury Contamination from Historic Gold Mining in California*, U.S. Geological Survey (May 2000), *available at* http://pubs.usgs.gov/fs/2000/fs06100/pdf/fs06100.pdf.

Jason Dearen, *Mercury still leaking at closed Calif. mine sites*, NBCNEWS.COM, *available at* http://www.nbcnews.com/id/32900375/ns/us_news-environment/t/mercury-still-leaking-closed-calif-mine-sites/ (last updated 9/18/2009).

Jessica Shugart, *Mercury contamination in California to last 10,000 year*, Science News (October 28, 2013), *available at* https://www.sciencenews.org/article/mercury-contamination-california-last-10000-years.

Lori Lim, Robert K. Brodberg, Margy Gassel, & Susan Klasing, *Statewide health advisory and guidelines for eating fish from California's lakes and reservoirs without site-specific advice*, California Environmental Protection Agency, Office of Environmental Health Hazard Assessment (July 2013), *available at* http://oehha.ca.gov/fish/pdf/CALakeResAdvisory080113.pdf

Natural Resources Defense Council, *Learn About Mercury and Its Effects, at* http://www.nrdc.org/health/effects/mercury/effects.asp (last visited March 20, 2014).

Sierra Fund, Mining's Toxic Legacy, (2008), *available at* http://www.sierrafund.org/images/content/campaigns/pdf/Miningstoxiclegacy.pdf.

Taliesin Evans, *Hydraulic Mining in California*, The Century, Volume 25 Issue 3, pp. 323-338 (Jan 1883), *available at* http://digital.library.cornell.edu/cgi/t/text/pageviewer-idx?c=cent;cc=cent;idno=cent0025-3;node=cent0025-3%3A1;view=pdf;seq=333;size=100;page=root.