Don't be so *Quick* to Call it a *Silver* Lining: The Legacy of Mercury Mining in the Bay Area

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Writer's Comment: I only took Water in the West by chance, hoping that a historical approach to natural resources would be more interesting than the policy and toxicology courses my department suggested I take. Ten minutes into the first lecture, I realized that I was not just more interested in this material than that of any previous science-oriented natural resource courses, but that it was directly applicable to my interest in the social impacts of environmental issues. My final assignment for this course was to choose a Southwestern water project and discuss how it ties into the broader history of water in the United States. While everything I learned in this course gave me a deeper understanding of the region I call my home, I wanted to use this assignment as an opportunity to research a water issue near where I grew up. I settled on a site only twenty minutes from where I grew up, New Almaden Creek and the adjacent mercury mines.

Instructor's Comment: The environmental impact of the California gold rush is a much-studied subject, but relatively few people are aware that one of the lesser-known auxiliary industries, the mining of mercury, has left California with a particularly toxic legacy. Mercury was a key element in the gold mining process. The discovery of mercury deposits in San Jose and in the Pacific Coast range near Clear Lake meant that mercury mines began to open around the same time as California's gold mines. Miranda Kushner explores the origins of California's mercury mining industry and the highly toxic and intractable legacies it has left us, especially in the rivers and streams of the San Francisco Bay

area, and in the bay itself. For many, the gold rush yet symbolizes new beginnings. In "Don't Be So Quick to Call It a Silver Lining: The Legacy of Mercury Mining in the Bay Area," Miranda Kushner points to the ways that enduring mercury toxicity creates barriers to environmental renewal and resilience, and the expensive precautions required to overcome those barriers.

—Louis Warren, Department of History

Figure 1. The Town of New Almaden [1]

The Gold Rush of the 1850s had an immediate and obvious effect on the development of early California. Underlying the economic and population booms, though just as

[1] Carleton E. Watkins, "New Almaden mine," San José State University Archives Photograph Collection (1863).

pervasive, is the direct environmental impact gold mining had on California's water and natural resources. While so-called gold fever raged through the Sierras, gold's partner in hydraulic mining, mercury, was being extracted from the foothills of the Santa Cruz Mountains. Mercury poisoning was a common cause of illness and death among gold, and, perhaps obviously, mercury miners during this time period, and its lingering presence in the South Bay's watershed is still felt today. One of the more prominent mercury mines was the New Almaden Quicksilver Mine in Santa Clara County, California, just south of San Jose. In recent years, the regional water district has undertaken the Almaden Lake Improvement Project in an effort to improve the conditions of the adjacent Almaden Lake. The discovery of gold in California set off a chain of events, of which this water project is only one of the latest. Modern policy-makers and resource managers are left to grapple with the complicated legacy of America's rapid expansion into the western territories, as the rash and opportunistic forms of resource exploitation still make their effects seen in the water residents consume.

When walking the trails of San Jose's Almaden Quicksilver County Park, it is hard to ignore the signs of what was once a small, but lively mining town. In 1824, acting on a lead from one of the region's native people, Mexican settler Antonio Sunol found numerous deposits of cinnabar in the area that would then become the New Almaden Mines.[2] Cinnabar, known as *mohetka* by the original Ohlone residents of this land who used it as face and body paint, is a bright red mercury compound. This *mohetka,* or red earth, became a valuable commodity among native groups, making the area's Ohlone the first to grow rich off the mercury deposits in the Santa Cruz Mountains. By the time Sunol caught wind of the resource, the Ohlone had abandoned the use of cinnabar on their

[2] Charles W. Snell, "Almaden 1936" (Historic American Building Survey, California, 1936), 1-3.

skin, even going as far as to label the red earth as "evil" due to its poisonous effects[3]. Sunol attempted to extract the silvery veins of ore from the rock, mistakenly believing they were silver, before abandoning the venture, which had proven to be too costly. Not long after, in 1845, the Spanish Andres Castillero became aware of the ore, and undertook the process of extracting the mercury. Castillero, already experienced in quicksilver mining from his time in La Mancha in Spain, named the venture *Nueva Almaden* after the impressive mercury mine in Spain's old Almaden[4]. Predating the discovery of gold in California, New Almaden, and the adjacent so-called Spanishtown[5], was the first mine and mining community in the state, making Castillero and his eventual British partners a substantial profit[6].

This mercury mine was already making its owners a significant profit, but their industry really took off with the discovery of gold in California. In 1848, John Marshall spotted something glimmering in Sutter Creek, only a short distance out from New Almaden and it's mine, and in doing so, altered the trajectory of the California territory forever. The impact the ensuing Gold Rush had on the growth and economy of California cannot be overstated, and that impact did not neglect the New Almaden mine. The most efficient form of gold mining, hydraulic mining, uses mercury as an essential part of the gold recovery process. Hydraulic miners use mercury as it amalgamates with gold, making it heavier and easier to separate from the rush of sediment created by hydraulic mining[7]. As practical as this was for both the mercury and gold

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[3] Henry Winfred Splitter. "Quicksilver at New Almaden." Pacific Historical Review 26, no. 1 (1957): 33–49. https://doi.org/10.2307/3637241.

[4] Charles W. Snell, "Almaden 1936" (Historic American Building Survey, California, 1936), 1-3.

[5] National Park Service, "Spanishtown Site," ParkNet, last modified November 17, 2004. https://www.nps.gov/parkhistory/online_books/5views/5views5h87.htm.

[6] American Latino Heritage, "New Almaden Mining Historic District California," American Latino Heritage Itinerary, National Parks Service, accessed April 19, 2022, https://www.nps.gov/nr/travel/american_latino_heritage/new_almaden_mining_historic_district.html.

[7] Alexandria Herr, "Mercury in Our Waters: The 10,000-Year Legacy of California's

mining companies, at least from a money-making standpoint, the dangerous effects of mercury were clear from the beginning, and were documented as far back as the Ohlone natives, who had stopped using cinnabar facepaint after connecting it to salivation and other symptoms of mercury poisoning[8]. For smelting employees in New Almaden exposed to significant amounts of mercury fumes every day, the symptoms were pervasive and pronounced, to the eventual point of ten percent of mine workers experiencing salivation[9]. The metaphorical "gold fever" that drew so many miners to California in the first place became a real illness, as miners risked exposure every time they went to work. People directly involved in the industry were not the only ones affected, as the nature of hydraulic mining infamously led to erosion and deadly flooding, and, significantly, washed sediments and other waste materials into surrounding environments. Now, amounts of mercury linger in Northern California's watersheds, originating from gold mining residue in the Sierras, and mercury processing in San Jose. The mercury refinement process created a waste product known as calcines, which miners would casually discard along nearby waterbanks. It took next to nothing for this waste to wash into the water, flowing through the San Jose watershed and all the way out to the San Francisco Bay[10].

The south Bay Area and its tributaries contribute a large proportion of the mercury that ends up in the greater Bay Area watershed. A particular site of mercury contamination is Almaden Lake, which, as the name suggests, lies just five miles downstream of the now-defunct mine. Almaden Lake is a man-made body of

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Gold Rush," KCET, September 20, 2020, https://www.kcet.org/shows/earth-focus/mercury-in-our-waters-the-10-000-year-legacy-of-californias-gold-rush

[8] Henry Winfred Splitter. "Quicksilver at New Almaden." Pacific Historical Review 26, no. 1 (1957): 33–49. https://doi.org/10.2307/3637241.

[9] Henry Winfred Splitter. "Quicksilver at New Almaden." Pacific Historical Review 26, no. 1 (1957): 33–49. https://doi.org/10.2307/3637241.

[10] Oakland Museum of California, "The Legacy of the Mercury Mines." Guide to San Francisco Bay Area Creeks, Oakland Museum of California, accessed on April 19, 2022.

water, created by the destruction of a levee that once separated the area from Los Alamitos Creek. This lake is a popular recreational site for residents of Santa Clara County, as well as a habitat for endangered native fish and other animals[11]. Unfortunately for the fish that use it as a habitat corridor and for the humans and animals that eat them, Almaden Lake is essentially a dumping ground for the Bay Area's single largest source of mercury. In fact, mercury levels in the greater Bay Area are one-hundred times higher than those of comparably sized estuaries elsewhere, and the Guadalupe River, which flows from Almaden Lake, has levels five times higher than the bay proper[12]. Clearly, the Guadalupe watershed has a quicksilver problem, and one that is only enhanced by the chemical reaction mercury undergoes when it encounters organic waste and becomes the more dangerous methylmercury. In 2012, Santa Clara County's water authority, Valley Water, began the planning and research for what they named the Almaden Lake Improvement Project. While the project, slated to start in 2020, has since been delayed due to COVID-related complications, it promises to deliver, if not a fully clean Guadalupe watershed, at least some relief from the contamination that continues to accumulate[13]. The plan proposes building a new levee between Los Alamitos Creek and Almaden Lake, preventing future mercury-laden sediment from washing down from the mines[14]. The risk of disturbing the sediment at the lakebed and creating a greater mercury flow problem is not insignificant, so this plan focuses instead on preventing future accumulation and improving water flow, both of which will lessen

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[11] Santa Clara Valley Water District, "Almaden Lake Improvement Project" (report, Santa Clara County, California, 2019), 1-4.

[12] Jane Kay, "Tracking a toxic trail / Long-closed mine identified as largest source of mercury in San Francisco Bay," SFGate, SFGate, updated January 25, 2012, https://www.sfgate.com/bayarea/amp/Tracking-a-toxic-trail-Long-closed-mine-2709557.php.

[13] Santa Clara Valley Water District, "Almaden Lake Improvement Project" (report, Santa Clara County, California, 2019), 1-4.

[14] Linda J. Lezotte, "Almaden Lake project will help the environment," The Mercury News, Bay Area News Group, February 14, 2020, https://www.mercurynews.com/2020/02/14/almaden-lake-project-will-help-the-environment/.

the climb of mercury through the environment's trophic levels[15]. Valley Water presents a clear plan to lessen the impact of mercury on its environment, and while COVID delays mean its success remains to be seen, this project works to minimize the negative legacy of gold mining.

Outside of the New Almaden area, there has been less direction in mercury contamination projects. After all, mercury is not just a problem in the Guadalupe watershed, but rather an environmental concern that haunts large regions throughout northern California. While in the San Jose area, the history of quicksilver mining is so ubiquitous that the local paper named itself *The Mercury News*, there were actually dozens more mercury mines throughout Northern California. One area with such mines is Cache Creek, a site to the northeast of San Jose, that is responsible for fifty percent of the mercury, and only two percent of the water, that flows into the Sacramento River[16]. Just as the Guadalupe River washes into the San Francisco Bay, so does the Sacramento River, adding to the significant presence of mercury in the ocean. Cache Creek is located in Yolo County, California, near the city of Woodland. The creek runs from Clear Lake near Mendocino, where it collects sediment from the Sulfur Bank Mine Superfund site, to the Sacramento River[17]. In wet years it flows through the Yolo Bypass, a wildlife area that provides a home to many species of migratory waterbirds throughout the year[18]. Much like the Guadalupe River, Cache Creek owes its mercury contamination to upstream quicksilver mining, which likewise served to provide the essential

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[15] Santa Clara Valley Water District, "Almaden Lake Improvement Project" (report, Santa Clara County, California, 2019), 1-4.

[16] Elizabeth Case, "Scientists target mercury in Cache Creek," Davis Enterprise, Davis Enterprise, February 13, 2015, https://www.davisenterprise.com/news/local/sunday-best/scientists-target-mercury-contamination-in-cache-creek/.

[17] California Water Boards, "Cache Creek Sub-Watershed" (State of the Watershed Report, California, 2002), 1.

[18] Bill Marble, "Cache Creek Flooding," Woodland Record, The Daily Democrat, June 14, 2009, http://www.ycfcwcd.org/documents/CacheCreekFloodingB.MarbleOp-Ed.pdf.

gold-mining resource in the 1850s. While not near to an individual prolific mining site, the area near Cache Creek contains at least forty mines, all of which contribute sediment and pollution to the creek[19]. All this mercury runoff has led Cache Creek to be one of the largest sources of mercury contamination in the San Francisco Bay watershed, washing through the Sacramento River, into Suisun Bay, and depositing in pockets throughout the East Bay region[20]. The mercury becomes trapped in silt, which allows it to drift further down into the watershed. Larger pieces of mining debris sink to the bottom of the creek upstream, while lighter particles flow through, lingering in the Sacramento Delta or even joining other sources of mercury in entering the Bay itself[21]. The risk of this, and in all parts of the Bay Area that feature high amounts of contamination, is that mercury bioaccumulates, meaning it remains in the food chain indefinitely.[22]

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[19] California Water Science Center, "Mercury's Lasting Legacy: Measuring Contamination in Cache Creek," USGS, United States Department of the Interior, June 12, 2017, https://www.usgs.gov/news/mercurys-lasting-legacy-measuring-contamination-cache-creek.

[20] D.S. McCulloch, T.J. Conomos, D.H. Peterson, K. Leong, "Distribution of mercury in surface sediments in San Francisco Bay estuary, California" (open-file report, California, 1971), 1.

[21] Elizabeth Case, "Scientists target mercury in Cache Creek," Davis Enterprise, Davis Enterprise, February 13, 2015, https://www.davisenterprise.com/news/local/sunday-best/scientists-target-mercury-contamination-in-cache-creek/.

[22] California Water Science Center, "Mercury's Lasting Legacy: Measuring Contamination in Cache Creek," USGS, United States Department of the Interior, June 12, 2017, https://www.usgs.gov/news/mercurys-lasting-legacy-measuring-contamination-cache-creek.

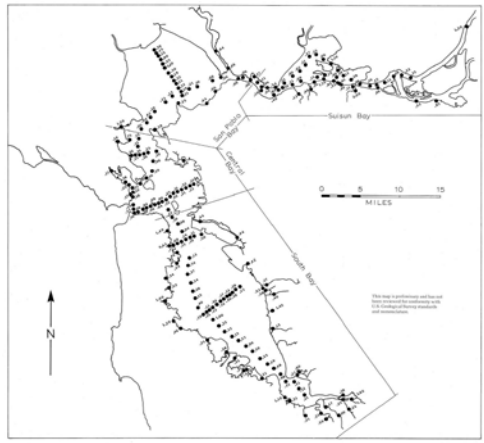

Figure 2: Map of mercury distribution in San Francisco Bay[23]

This bioaccumulation of mercury, which is present in much of the greater Bay Area's watershed, poses a hazard not just to humans, but to the ecosystem at large. When mercury enters the watershed, it combines with organic matter and becomes methylmercury, which is the specific neurotoxin that fish, birds, and even humans inadvertently consume. Additionally, due to the ecological process of biomagnification, animals at the top of the food chain consume far more methylmercury than those at the bottom[24]. For this reason, as harmful as consuming a fish caught in mercury-filled waters may be, hunting and eating the waterfowl that eat these fish, a practice permitted in parts of the Cache Creek Settling Basin,

[23] D.S. McCulloch, T.J. Conomos, D.H. Peterson, K. Leong, "Distribution of mercury in surface sediments in San Francisco Bay estuary, California" (open-file report, California, 1971), 1.

[24] California Water Science Center, "Mercury's Lasting Legacy: Measuring Contamination in Cache Creek," USGS, United States Department of the Interior, June 12, 2017, https://www.usgs.gov/news/mercurys-lasting-legacy-measuring-contamination-cache-creek.

is even more harmful. There is already existing legislation that intends to improve the quality of water, such as the Clean Water Act of 1969, which, among other things, requires governments to do their part in cleaning mercury out of contaminated waters. However, as has been seen by the New Almaden Project creating infrastructure as opposed to cleaning, this practice can be very difficult and expensive. In lieu of removing the contaminant from the greater Bay Area's water, local governments have settled for a combination of monitoring programs and warnings. This system of prevention instead of action only staves off responsibility, and also puts the health of native tribes that traditionally consume river fish at risk[25]. This approach, which is more reactive than proactive, is prominent in the mercury-contaminated parts of the Sacramento Delta, which is the area Cache Creek feeds into. The New Almaden Improvement Project in the south Bay Area is, while also not capable of removing mercury from the environment, at least a stronger attempt at keeping it from further entering the food chain. Beyond Cache Creek, there are dozens more sites of mercury-contaminated water in Northern California, all caused by the long-ago action of mercury mining[26]. All these sites pose risks to their animal and human inhabitants, while the mines and their purpose themselves have faded into memory.

While not providing a surefire way to erase the impact of over a century's worth of mercury mining,[27] Valley Water's Almaden Lake Improvement Project at the very least makes an effort to stop the problem from becoming any worse. Ultimately,

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[25] Elizabeth Case, "Scientists target mercury in Cache Creek," Davis Enterprise, Davis Enterprise, February 13, 2015, https://www.davisenterprise.com/news/local/sunday-best/scientists-target-mercury-contamination-in-cache-creek/.

[26] D.S. McCulloch, T.J. Conomos, D.H. Peterson, K. Leong, "Distribution of mercury in surface sediments in San Francisco Bay estuary, California" (open-file report, California, 1971), 1.

[27] Jane Kay, "Tracking a toxic trail / Long-closed mine identified as largest source of mercury in San Francisco Bay," SFGate, SFGate, updated January 25, 2012, https://www.sfgate.com/bayarea/amp/Tracking-a-toxic-trail-Long-closed-mine-2709557.php.

the rush to exploit California's natural treasures made a lot of men very rich, while causing an entire host of consequences that are not at all limited to the long term. Even while the mines were active, New Almaden workers were being poisoned as one of the first byproducts of the Gold Rush. This pattern only continues today, as residents of the same area are warned not to eat anything caught in the lakes or creeks of their own backyards.

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