Mining's Toxic Legacy

An Initiative to Address Mining Toxins in the Sierra Nevada

Executive Summary

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by
The Sierra Fund

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Is human health, water quality or the environment at risk from historic mining toxins?

The Gold Rush changed California demographics as indigenous people were dislocated and mining towns appeared and disappeared across the Sierra Nevada Mountains. A less recognized consequence of the California Gold Rush was the massive environmental destruction that took place, which still plagues the Sierra today.

Working with partners from state, federal, and tribal governments as well as from the academic, health, and environmental communities, The Sierra Fund's report "Mining's Toxic Legacy" is the first comprehensive evaluation of what happened during the Gold Rush, including: the cultural, health, and environmental impacts of this era; the obstacles that lie in the way of addressing these impacts; and a strategic plan for taking action on the longest neglected environmental problem in the Golden State of California.

> The California Gold Rush clawed out of the foothills of the Sierra Nevada considerable gold—93 tons or 2.7 million troy ounces in the peak year of 1853 alone... In the course of doing so, everything in the region and much downstream was ravaged. Wildlife was decimated. Trees were cut down to burn for domestic and industrial purposes and to build the huge mining infrastructure that was firmly in place by the 1870s. ...The earth was dug into desolation and later hosed out so that some landscapes—notably the Malakoff Diggins and San Juan Ridge near Nevada City—are still erosive badlands of mostly bare earth.
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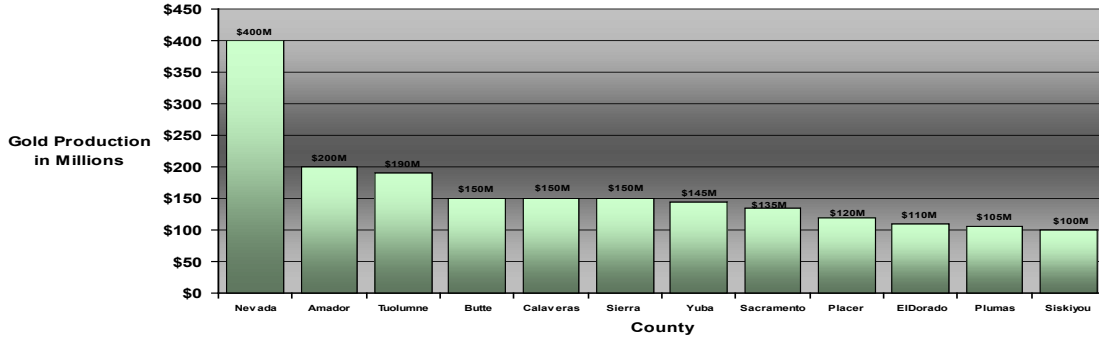
> But most of all, the streams and rivers were devastated. The myriad waterways of the Sierra Nevada were turned into so much plumbing, to be detoured, dammed, redirected into sluices high above the landscape, filled with debris and toxins. Water as an industrial agent was paramount, and water as a source of life for fish, riparian creatures, downstream drinkers, farmers, and future generations was ignored.
>
> *-- Solnit, Rebecca.*
> *"Winged Mercury and the Golden Calf." Orion, September/October 2006.*

Mining the Mountains

Through placer, hard rock, and hydraulic mining techniques, millions of tons of gold were extracted from the Sierra Nevada "Mother Lode" during the 19th century. Mining practices used substantial amounts of mercury, millions of gallons of which still pollute the Sierra landscape. Abandoned mines have left behind toxic pits and acid mine drainage. Naturally occurring minerals including arsenic and asbestos were disturbed, crushed, and distributed throughout the region as gravel for road construction. Much of the land impacted by these activities is now publicly owned by state, federal, and local governments.



Impacts of the Gold Rush

Cultural:

The Gold Rush devastated the Native Peoples in the region. Forced relocation, disease, and outright murder shattered their villages and tribes. Toxic materials that remain from this era sever Native Californians from their traditional ceremonial activities such as fishing and collection of ceremonial plants, perpetuating the devastation begun over a century ago.

Environmental:

The Sierra Nevada provides more than 60% of the drinking water for the state of California. Mercury, acid mine drainage, and other contaminated sediments left behind from mining threaten the water, plants, and people of the entire state. Elemental mercury remaining from historic gold mining is the primary source of mercury contamination in the Sacramento River, which flows downstream to pollute the San Francisco Bay and Delta. Although the presence of mercury in the Bay and Delta is a significant issue, the impact of exposure on Sierra watersheds is currently unknown, for lack of studies.

Health:

Mercury, arsenic, and asbestos are known to cause severe human health problems with continued exposure. Mercury contamination of fish has caused the State to issue warnings about fish consumption in Sierra water bodies that have been tested. Arsenic and asbestos, naturally occurring in toxic materials crushed during the Gold Rush and left in massive tailings piles, have been found in dangerously high levels throughout the region and can be inhaled as dust particles when working or recreating in these areas.

Despite the extensive evidence of potential exposure to these many toxins, human health studies have never been conducted in the Sierra Nevada to learn if there are health impacts resulting from this exposure. A survey of thirteen health clinics throughout the Gold Country documented that none of these clinics currently collect environmental health histories from their patients or provide information about mercury contamination of fish as part of their maternal health program, even though many serve areas where there are recently adopted advisories to limit fish consumption.

Obstacles to Solving the Problem

1. Lack of appropriate health hazard screening

The presence of mercury, arsenic, and other mining toxins in the region has been established. The potential health risks from exposure to each agent are understood to some degree. There is no existing evidence, however, showing what impact if any this exposure is having on humans in the region. This is due to the fact that there has been no research, no screening, and no studies to look into the extent of human impact from exposure to these materials.

2. Poor methods of community and tribal engagement

Sierra residents do not know the environmental dangers to which they may be exposed on a daily basis. As a result, the community remains uninvolved in cleaning up mining toxins. The public has not been widely involved in development of the regulations affecting mining toxins and cleanup plans. Additionally, local tribes have not been consulted on site prioritization and cleanup methods for state and federal mine remediation projects that occur on ancestral lands. Tribal input into the assessment and remediation process is essential, and in particular direct and regular consultation with tribes that may have sacred or historic lands affected by toxic materials.

3. Underfunded and inadequate government programs

A patchwork of government agencies and regulations on the local, state, and federal levels relate to mining toxin problems on both public and private property.

The government is the largest landowner in the Sierra Nevada, and many of the lands affected are owned by public agencies, however, the state and federal governments have not established a clear plan for assessing and addressing the many problems associated with the impact of gold mining on public land. Ineffective communication among state, federal, and local agencies regarding remediation efforts and techniques makes proper remediation difficult. Public land managers such as regional Forest Service offices and BLM field offices are faced with costly environmental cleanup actions on severely limited budgets.

There are no incentives for private lands cleanup, and regulations regarding cleanup are not consistent or understandable. General Mining Law enables current mining operations to continue without reclamation plans that are specific to mitigating legacy mine waste. Some policies need closer examination:

- Regulations of suction dredging are outdated. New studies indicate that suction dredging has the potential to spread mercury in the environment in highly mobile and reactive forms.
- Reservoir management may increase mercury mobility and reactivity. Accumulation of sediment contaminated with mercury behind reservoirs requires dredging out this excess material to maintain water storage capacity. Dangers associated with this procedure include re-suspending and re-mobilizing toxins, and increasing mercury methylation.
- Mine tailings and materials left over from dredging are not tested for arsenic or other heavy metals before being sold for aggregate. Though many of the materials dredged from reservoirs or left over from mining are known to be contaminated, the use of local aggregate fill is not effectively regulated for arsenic, mercury and other contaminants.

Summary of Policy Obstacles

Public land cleanup is not strategic
No incentive for private lands cleanup
Regulations not consistent or understandable
Agencies not coordinated around site remediation
Abandoned mine cleanup hard to fund
Suction dredging regulations outdated
No proper disposal of recovered mercury
Reservoir management aggravates toxin issues
Construction materials not tested
Government mining and reclamation policies outdated

Key Recommendations

1. Increase Collaboration and Research
2. Improve Outreach and Education on Human Health
3. Improve Environmental Education in the Health Community
4. Reform and Fund Government Programs

The Initiative's Gold Ribbon Panel of tribal leaders, watershed scientists, medical professionals, and community members has identified four activities to begin to address mining toxin issues. Effective implementation of these recommendations requires new institutional relationships and funding.

A strategic alignment among indigenous tribes, scientists, local landowners, government representatives, philanthropic and conservation organizations, and the health community in the Sierra Nevada, based on mutual need and desire to find solutions, is the key to solving this vast problem.

A key recommendation is that the newly established Sierra Nevada Conservancy serve as primary coordinator for the actions proposed by this Panel. Another top priority of the Panel is the call for a new, strategic investment in research, education, and cleanup. State, federal, and private philanthropic funding must be directed to the Sierra Nevada mining problem over the next several decades.

The Gold Ribbon Panel recommends the following four activities:

1. Increase Collaboration and Research

Improving collaboration among key governmental, academic, and medical institutions to stimulate the implementation of this Initiative is crucial. State and federal governments should form a Mining Toxins Working Group including researchers at the University of California and California State University, government researchers, tribal and community leaders and others to ensure effective information exchange on these issues.

More information is needed on a number of issues in order to inform policy and develop best practices, with priorities:

- Human health impacts resulting from exposure to mining toxins and naturally occurring toxic minerals disturbed during the Gold Rush
- The geographic distribution and biogeochemical behavior of mining toxins, especially as they relate to exposure routes
- How to assess priorities and clean up the pollution distributed throughout the region most effectively

2. Improve Outreach and Education on Human Health

Awareness of the potential human health hazards associated with mining toxins needs to be increased dramatically. Education and outreach campaigns should be aimed at people working with families and children, in health care, and those who may be exposed to these materials at work, at home, or through recreational activities. Best outreach practices need to be established to ensure materials are culturally appropriate and understandable, and to improve training for medical professionals.

3. Improve Environmental Education in Health Community

There needs to be a much better understanding of what, if any, epidemiological impacts this exposure is having on the residents of the Gold Country. The medical and conservation communities must be engaged in development and distribution of an environmental health assessment tool. This needs to be implemented in health education programs at schools and clinics. Community monitoring of mining toxins using high-quality scientific tools needs to be supported. The public needs access to all testing data in order to effectively participate in decisions about mine remediation.

4. Reform and Fund Government Programs

The complexity of the mining toxin problem requires evaluation of scientific information and policy solutions among a number of local, state, and federal agencies. The Sierra Nevada Conservancy can play this important role. Improved methods for engaging the public and local tribes in assessment and remediation are critical.

State and federal agencies need to coordinate the development of plans for public land cleanup carefully, as they own a majority of the lands in the region with abandoned mines. The state and federal government should each carefully assess their publicly owned land for mining toxins and develop plans to clean up or contain these wastes from contaminating the land and water of the state. Additional state and federal funding is critically needed to clean up legacy mining contamination.

Local governments need to develop general plan policies and strategies for managing land use impacts of mining toxins. Solutions to the obstacles to cleanup of private lands must be developed and funding mechanisms for these identified. Legal mechanisms need to be explored to look for ways for downstream urban users to help pay for cleanup upstream in the Gold Country.

Wetlands restoration and reservoir management need to reflect mercury methylation concerns. Materials dredged from reservoirs that may contain toxins need to be carefully monitored. Hazardous materials recovered from cleanups need to be carefully disposed.

Regulatory actions should be adopted to implement provisions of the Clean Water Act applicable to instream suction dredging and its impacts on mercury methlyation. The Clean Water Act needs to be reformed to make it easier to conduct cleanup activities.

The Federal 1872 Mining Act needs to be reformed to require meaningful mitigation of cultural and environmental impacts from both modern-day and historic mining. Good Samaritan laws must be reformed to provide incentives for cleanup. The California Surface Mining and Reclamation Act needs to be strengthened to require minimum verifiable standards for reclamation.

A Call to Action

After nearly two years of effort to build relationships among new constituencies, this Initiative has laid the foundation to bring to light this long-neglected issue. The time has come for the State of California and the nation to recognize and remediate the lasting impact of California's Gold Rush.

Agency Science and Policy Advisors:
The Government Science and Policy Advisors who assisted in this effort provided the authors with a more thorough understanding of the complex issues and problems associated with historic mining in the Sierra, but are not responsible for the report's conclusions.

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Rick Humphreys	State Water Resources Control Board
David Lawler	US Bureau of Land Management
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Gold Ribbon Panel:
Leaders on this panel include doctors, tribal representatives, environmental scientists, and local leaders who have studied these problems and stand behind this report's findings and recommendations.

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Scope and Methods

The area considered by this Initiative is consistent with the California Sierra Nevada Conservancy service boundary. This enabled the Initiative to address both the east and west sides of the Sierra, as well as some parts of the Cascade region, all of which were heavily impacted by historic mining.

California State University (CSU), Chico's Department of Geological and Environmental Studies and School of Nursing were contracted to conduct literature reviews on mining's toxic legacy and its effects on human health in the Sierra and confirm the validity of their analysis.

This document was adapted from the fully referenced *Mining's Toxic Legacy: An Initiative to Address Mining Toxins in the Sierra Nevada.*

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