

The New Gold Rush: Multiple Benefits of Restoration Activities in the Gold Country

The Sierra Fund – Reclaiming the Sierra 2015 Issue Paper

Version 4 – March 30, 2015

This issue paper has been developed by The Sierra Fund to frame the Multiple Benefits track of the Reclaiming the Sierra 2015 conference. This and the three other issue papers associated with the three other event tracks are working documents intended to frame the conference track. As a result, they will be revised and updated leading up to the conference. The Sierra Fund will produce an outcomes paper on this topic based on the conference proceedings, which will be published after the conference.

I. Overview

One hundred sixty years ago, every tree on the east and west slopes of the Sierra Nevada was cut to timber the mines and build the towns of the gold and silver strikes. Every stream of any size was dammed, and thousands of miles of ditches were dug to convey the water to hydraulic mining sites that washed away mountains in search of gold. California's rivers ran thick with rock and mud, flooding downstream cities and filling up 1/3 of the San Francisco Bay with hydraulic mining sediment. River boat pilots dredged channels through the muck, creating the original levee and channel system in the Delta.

In order to restore the resiliency of the mine-impacted waters and lands of California, a whole new look at the towns, forests, meadows and wetlands of the region is needed, including an understanding that these are all artifacts of decades of large scale, industrial mining in the region that have never been remediated or ameliorated. Living, working or recreating on these lands can be literally hazardous to one's health. Catching and eating certain kinds of fish in the region is not advised. The even-aged forests, the ditches and reservoirs, the empty lots in the middle of small towns or the oddly flat places along the creeks that were once mines or gold-crushing mills—are all part of the ecological footprint of the Gold Rush.

Another critical part of the footprint is the changed role of the original People of the area who have still survived, despite the Gold Rush-instigated genocide which killed tens of thousands of the original inhabitants. Restoring the region must therefore involve working with original people of the land to restore ecosystems and bring back the critical keystone species, such as salmon, which were so abundant prior to the Gold Rush, and which remain ecologically and culturally essential.

Recovering from the Gold Rush requires a new approach to forest and reservoir management, meadow and wetland restoration, and economic development in the Sierra Nevada region. There are numerous benefits to be derived by improving the watershed health of the region's forests that serve as the "lungs" of the State and rivers that serve as its source of water. Recovering from the Gold Rush requires a new holistic approach that will support a broad new interface between the human and natural community, from the forest and reservoir management, meadow and wetland restoration, to economic and cultural development that will support the entire region.

II. Reservoir Siltation: Filling up with Rocks, Silt, Mercury and Gold¹

A great deal of gold remains in California's Gold Country, some of it mobilized during the heyday of gold mining and now trapped behind the dams below these old mines along with the legacy elemental mercury used as part of the gold mining process. These metals are mixed in with huge amounts of gravel, sand, silt, and anything else that flows down the river during a rain storm. The gold and mercury comes to rest when the water stops moving – when it gets to the reservoir. Almost every major river and creek in the Sierra Nevada was dammed as part of the mining era.

This region serves as the headwaters of both the federal and state water projects that provide 60% of the developed water for California. With the region in the grip of one of the most severe droughts in history, and global climate change threatening to dramatically alter precipitation regimes, reservoir storage is vital to capture every inch of rain that falls.

Over the last many decades, legacy mine tailings and materials have begun to fill up the region's reservoirs, impacting the reservoirs' operational capacity and reducing water storage and water management options for many water suppliers. Research looking at 200 reservoirs in California that was conducted just a few years ago revealed that as much as 2 million acre feet of water storage has been lost to sedimentation in the State.

The Sierra Fund is exploring methods to identify the best available technologies and practices needed to remove this sediment from the reservoirs and treat it to remove mercury, returning only clean water back to the river. This activity has the potential to restore capacity that both improves reservoir management and water storage, while also improving water quality and potentially yielding marketable mined products such as gold, rare earth metals, sand and gravel.

III. Recommendations for Action

The Sierra Fund has identified two related recommendations for action and some next steps to address this problem as part of the 2015 Reclaiming the Sierra conference which are summarized here and discussed in greater detail below:

- A. Multiple Benefits: Restore reservoir water storage capacity, improve water quality, enhance wildlife habitat, provide environmental benefits, and get gold, too.** The Sierra Fund is interested in the potential for restoring reservoir capacity and improving water quality by removing sediments trapped behind the dams, processing them to remove contaminants, and selling or using the products from this activity including gravel, sand and gold. This activity has so many benefits – improved water quality, improved storage for rain water, improved wildlife habitat and other major environmental benefits.
- B. E3 Gold: Explore the potential for the development of a marketable gold product from legacy mine reclamation that tells the story of restoration of rivers, forests and meadows and revitalization of tribal cultures.** The Sierra Fund is exploring opportunities to create a specialty market for gold produced as a by-product of this reservoir restoration activity (and other mine reclamation activities) to incentivize this market segment, and use this “E3 Gold” to tell the story of reclamation through sales campaigns. This could be

¹ While this conference track focuses primarily on the multiple benefits of addressing the growing problem of reservoir siltation impacting many of the Sierra Nevada region's vital water infrastructure reservoirs, there are many other opportunities for multiple benefits to be derived from addressing the lasting environmental, cultural and health impacts of the Gold Rush.

marketed to consumers interested in ethically sourced jewelry and/or to electronics companies looking for more environmentally sound sources of gold.

A. Multiple Benefits: Restore reservoir water storage capacity, improve water quality, enhance wildlife habitat, provide environmental benefits, and get gold, too.

The Sierra Fund is exploring the potential technology, science, policy, legal and practical sides to the challenges currently faced by those that need to remove sediment from reservoirs choked with debris. Every dam in the State has a predicted lifetime before it completely silts up. Some have a hundred years before they become a lovely meadow. Some are already becoming dysfunctional due to siltation. A recent study by the USGS and University of California estimated that approximately 1.7 - 2 million acre feet of water has been displaced by silt in California's reservoirs.

Removing sediment from reservoirs has been a routine practice in some areas, while other reservoirs have not been treated this way. In some reservoirs where legacy mercury is present, routine dredging for capacity has been stopped because of water quality concerns when the mercury entrained in the sediments behind the reservoir is disturbed and mobilized by dredging.

The Nevada Irrigation District (NID) is one water agency that had to suspend dredging to maintain their reservoir's operational capacity due to concerns about mercury. NID is consequently implementing a pilot project at their Combie Reservoir to dredge their reservoir to increase water storage capacity and improve water management, using methods that do not create a disturbance of mercury. In addition to restored water storage capacity this project will yield products of gravel, sand, silt, mercury, and gold. The amount of mercury and gold they capture could help quantify how much gold might be recovered by dredging other reservoirs. NID currently estimates that they will recover from \$90,000 - \$1 million in gold as a by-product of regular reservoir maintenance. There will also be sales of gravel and sand.

Based on this estimate and anecdotal information, it is possible that hundreds of thousands of ounces of gold could be recovered from California reservoirs as part of remediation and reclamation efforts. The result of this activity on a large scale could be an increase in water storage capacity, an increase in water quality, and in some cases marketable products including sand, gravel, rare earth materials, and gold.

Significant capital investment would be required to retrofit existing reservoir operations that have this problem to include a treatment center and a portable dredge and barge operation in order to dredge out sediments and restore the reservoir's storage capacity. While the sale of gold from this source will not cover the cost of the reservoir maintenance, it could help offset some of these costs. When marketed, this gold has the potential to help tell the story of the Gold Rush, and to develop a consumer base that would pay a premium for gold from this source.

Next Steps:

- I. The State of California needs to study the current status of the State's water storage reservoirs in terms of siltation and its impact on the reservoirs' operational capacity under various climate scenarios.

2. The State needs to evaluate potential methods for restoring capacity where this is possible in reservoirs that are filling with sediment. These methods must meet rigorous standards of environmental protection and restoration.
3. The State should prioritize funding for pilot projects that have multiple benefits including: increased water storage, improved water quality, flood control, in-stream habitat restoration, and production of useful or marketable materials to help offset some reservoir maintenance costs. A good evaluation of the potential value of gold or other precious metals, minerals, gravels and other mined products from reclamation would inform the economic impact of these activities.

B. E3 Gold: Explore the potential for the development of a marketable gold product that tells the story of watershed reclamation.

The Sierra Fund defines E3 Gold as gold that is both economically viable and environmentally beneficial.

- *Ethically* produced means that the gold was produced with an ethic of restoration: that land, water, and habitats are not harmed in the process; that the workers were protected by the appropriate labor laws; and that the customer knows that their product even in its sourcing represents a regenerative economic model. This could also include articulating how the gold benefited the local community from which it originated by sustaining local jobs and opportunities. A foundational element of this is “mine to market” traceability and transparency.
- *Environmentally* beneficial gold production means that E3 Gold was obtained as a by-product of legacy mining restoration efforts under the appropriate regulatory permits in California. This is not about new mining, but strictly about cleaning up old mines.
- *Economically* viable means that that process covers its own expenses, and is a viable triple bottom line enterprise.

The Sierra Fund is interested in establishment of transparent and science-based ways to certify an E3 Gold product. We want to create benefits for the entire supply chain from community being mined, to the mine and mill, to jeweler, and establish consumer demand for the product. We hope to reinvest some of the proceeds from sale of the product in efforts to restore the watersheds and to support the cultural restoration efforts led by the Original People of the areas that were historically mined.



Multiple Benefits: Production of E3 Gold will result in a reduction of legacy pollution, and new green jobs tailored to the skills and needs of the Sierra Nevada’s rural communities, which continue to suffer high unemployment rates. Restoring water capacity in our existing reservoirs is an even more urgent priority given the drought and the projected impacts of climate change in the region. Restoration of the scars left by historic mines will also help the region address the climate change stresses that are already being experienced, since every rainstorm transports more mercury-laced mine debris downstream into our water storage reservoirs. Elimination of pollution sources will restore water quality in rural

communities, and over time we hope to document reductions of the high levels of mercury we see in locally caught fish enough for women and children to be able to eat them again.

Finally, establishing a market for California's E3 Gold would support national and international demand for ethically sourced, branded gold from traceable transparent sources that are part of a new jewelry narrative. At an international level there are a number of organizations that are working to promote a market for "fair trade, fair mined" gold. Raising consumer awareness on the sourcing of gold in the context of jewelry will raise public awareness of the need to reform the hard rock gold mining sector.

Considerations for Clarifying the Brand

The term E3 Gold should be transparent, unified, and accountable, as consumers have to trust the source in order to have confidence in their purchase. Simply defined, E3 Gold is only produced as a result of a reclamation activity. It does not apply to gold from new mining operations – only to gold or other precious metals or materials that are directly produced as a result of watershed restoration and environmentally sensitive reservoir maintenance activities.

Verification of the source of the gold product as being produced through reclamation activities is one method of showing that retail gold jewelry consumers are getting the product that they are purchasing. Written and enforceable voluntary standards about the source of the gold using the term E3, and aggressive marketing to define that term, may be adequate to ensure consumer confidence and establishing standards will not require changes to existing regulations whereas certification could.

Recycled gold does not meet the test for E3 Gold. Although consumers understand recycling is "good" in many instances, nothing is being preserved, protected, or restored with recycled gold, nor has it been shown to reduce the demand for new mining.

What can be done to successfully market this product?

The majority of gold used in the U.S. (80% or more) is for jewelry, about 12% for electronics, and gold stored by financial institutions accounts for the rest. The jewelry industry is masterful at using its products to tell stories. Emerging ethical designer jewelers could tell the story of E3 Gold that actually is restorative to the people and environment around legacy mines.

In addition, in California there are unique opportunities with the computer technology industry that uses gold and rare earth materials. The electronics industry is located on top of mine scarred lands and near water bodies badly contaminated with mercury, and could be a major player in helping to clean up legacy mines.

Next Steps:

1. Monitor the amount of gold, mercury, rare earths and other metals recovered in NID's Combie Reservoir Project, to provide increasingly solid data points to answer the question of how much gold and other valuable metals and minerals might be recovered through a regular management program of dredging reservoirs in California's Gold Country. Identify and monitor other Gold Country Foothill reservoir sites to help flesh out how the gold and other benefits of restoring water storage capacity vary across the region.
2. Conduct additional research on how much gold is available through reservoir maintenance and mine reclamation projects in California's Gold Country and downstream from legacy gold mines.

Develop a projected lifetime of the potential reclamation projects that acknowledges that the supply is finite.

3. Conduct market research to get a better handle on the opportunities and challenges in the various market segments for gold (mining, smelting, refining, and end uses of jewelry and electronics). Reach out to the electronics industry to learn about their current sourcing practices.
4. Define job creation benefits and include these as part of the E3 Gold story.

