

Prioritization of Remediation Efforts

The Sierra Fund – Reclaiming the Sierra 2015 Issue Paper

Version 2 – March 17, 2015

This issue paper has been developed by The Sierra Fund to frame the Abandoned Mine Lands Site Prioritization and Coordination 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.

The Challenge

Hydraulic and hardrock mining activities throughout California in the late 1800s and early 1900s left behind 10-13 million pounds of mercury, numerous mine-scarred landscapes and countless physical hazards. State and federal agencies responsible for addressing environmental risks associated with contaminated lands continue to identify, catalogue, and clean up mercury and other contaminants from such areas in the Sierra Nevada and elsewhere. Mercury and other contaminants from abandoned mine land discharge and in-stream legacy sources present special challenges because there are no clearly responsible parties that can be ordered to perform cleanup actions.

Technical challenges to addressing mercury contamination come from the timing and types of hydrologic and ecologic processes acting on mercury in combination with the wide variety of conditions in California's watersheds. Upstream sources of mercury (be they human or natural sources) can impair many beneficial uses far downstream through several hydrologic and ecologic processes. These processes operate and respond to physical, chemical, and biological drivers at time scales ranging from diurnal (dam releases, photodemethylation, wetting/drying cycles) to seasonal (snowmelt, reservoir stratification) to decadal (sediment transport through reservoirs and floodplains). Simplifying and prioritizing those ranges of conditions for policy decisions and planning commonly leads to arguments in which uncertainty trumps action.

In addition, environmental regulations present an ironic set of challenges when it comes to addressing the results of streams of unregulated waste over a century or more. Under the federal Clean Water Act, "third parties" (parties representing neither the discharger nor the regulatory authority) are able to sue dischargers for violations and recover legal fees, if successful. A so-called Good Samaritan who cleans up such sites for environmental benefit could be forever liable to meet national Clean Water Act standards. The threat of third-party lawsuits thus creates a situation whereby environmental law is discouraging environmental restoration.

Recently, State regulators have begun developing regulatory control programs that address mercury pollution found downstream of the Sierra Nevada's rivers and streams—in California's water management hub of the Delta and in northern California's population center of San Francisco Bay. The Delta program allocates methylmercury load reductions to in-Delta sources and allows them to conduct control studies during the first phase of implementation. The program also allocates reductions to the

major Delta tributaries, but not to any sources within those tributary watersheds. Currently, state regulators are attempting to develop statewide objectives for mercury in fish tissue, and concurrently to develop control programs for impaired reservoirs and other water bodies (separately) to attain those objectives.

The legal and financial mechanisms that either promote or discourage abandoned mine cleanup are directly related to current land ownership and liability. Local land use authorities, such as counties and irrigation districts, are left with the burden of abandoned mine-impacted lands because they prevent growth and development and/or they occupy otherwise valuable space. The capacity for local land use authorities to assess mine sites and evaluate their impacts is insufficient and progress is slow. Strategic and comprehensive efforts to develop a prioritization of abandoned mines that need cleanup have not occurred locally or statewide. The Abandoned Mine Lands Unit at the CA Department of Conservation is developing the capacity to embark on such an effort.

Watershed Connections: Prioritization

Addressing abandoned mine sites on a site-by-site basis is akin to treating an epidemic by providing care to only those patients that find their way to a doctor. A proactive strategic approach that is comprehensive across California is a smarter and more effective method of abating the contamination and physical hazards posed by abandoned mine lands.

Upstream sources of mercury contamination continue to contribute contaminated sediments to downstream reaches, from the headwaters of the Sierra to the Delta. Mercury contaminated sediments accumulate behind impoundments and water carrying sediment-bound mercury is transported over impoundments during storm conditions. These watershed processes need to be considered when prioritizing sites for cleanup. Prioritization of remediation efforts on upstream sources of mercury contamination must consider numerous factors; including percent contribution of mercury contaminated discharge, but also factors such as land ownership and access. Prioritization of remediation efforts on reservoirs where contaminated sediments accumulate must consider the rate at which new sediments that contain mercury will re-enter the reservoir.

The CAMLAG group led by the Department of Conservation is responsible for coordinating agency groups that own abandoned mine lands and in some cases can contribute funds towards remediation, specifically towards the remediation of physical hazards. However, the remediation effort on public lands is largely driven by the landowning agencies, and is not coordinated or integrated on a watershed or statewide scale, missing the potential for a net benefit of cumulative and coordinated efforts of upstream source remediation.

Watershed and water management decision makers need quantitative tools to compare alternative management scenarios. Should a reservoir manager install and operate in perpetuity a capital- and energy-intensive reservoir oxygenation system, or stabilize erodible mercury-contaminated streambanks upstream? When and by how much will a mine site cleanup provide benefits to the Yolo Bypass downstream? How does a watershed-wide approach to abandoned mine cleanup get implemented in an era of patchwork land ownership and management?

Watershed Connections: Modeling

Strategic prioritization of remediation efforts can be informed by models developed for a particular constituent, such as mercury. Watershed-scale mercury models are needed to track inorganic mercury from watershed sources to methylating environments, and then methylmercury from those environments through food webs. Modeling strategies for addressing public health and environmental concerns will need to consider these broad ranges of factors, time scales, and space scales.

In other areas of environmental management, payments for watershed services have been a valuable tool to incentivize downstream communities to contribute to the cleanup of upstream contamination. However, such programs may rely upon models that predict the net benefit of removing mercury at an upstream location to a net reduction at a downstream location, which in the case of mercury and its many forms is a difficult translation.

The modeling argument can often be distilled to “essentially all models are wrong, but some are still useful.” A simple ratio of mercury in sediments to fish tissue drives the San Francisco Bay control program. Complex hydrodynamic, water quality, and ecosystem mercury models are currently being developed for the Delta and Yolo Bypass to predict effects of future water and land management scenarios there. Reservoir releases, downstream water management, water quality, and tide-influenced hydrodynamic models have been linked and applied to simulate the movement of other pollutants from the Sierra Nevada through the Central Valley and Delta.

Goals for the Session

This session will describe the current knowledge gained from monitoring and field studies, summarize current and proposed regulations driving actions to address mercury contamination, and describe simulation models under development.

Session panelists and participants will be asked to discuss prioritization efforts, including:

- Work with local land use authorities to improve and implement mine assessment and prioritization protocols, and draft ordinance language that can be adopted by counties to inform smart growth.
- Work with downstream water managers seeking lower-cost solutions to mercury impairments upstream. Objectives to consider and prioritize may include: conduct spatial analyses to prioritize watersheds and projects, build statistical models correlating causal factors with impairments, monitor at the watershed scale, implement pilot control projects, and develop cost-benefit curves.