A Comprehensive Assessment of Mercury Loading, Fate and Transport within a Mining Impacted Watershed

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Introduction: Mercury is a global pollutant that affects human and ecosystem health on a local and global scale. The Klau and Buena Vista Mines Superfund Site (KBV Site) is located in the Santa Lucia Mountain Range of the California Coast Mountain Range, USA. Mercury releases at the KBV Site have entered the Las Tablas Creek Watershed and migrated downstream to Las Tablas Creek Ranch Reservoir and Lake Nacimiento. Lake Nacimiento is used by the local Hmong community for subsitence fishing and also serves as a local source of drinking water. Mercury deposited in anaerobic zones of the bottom sediments of these two water bodies and the creek can potentially be converted to methylmercury whereby it enters the aquatic food web, ultimately resulting in fish tissue at concentrations that pose a risk to human health. The Las Tablas Creek watershed exhibits periods of low to non-existent flow during the summer dry season and periods of intense flow between October and April in response to episodic precipitation events. A multiple lines of evidence study is being conducted to evaluate the transport and fate of mercury within the Las Tablas Creek watershed to support the development of remedial measures to address contaminated sediments within Las Tablas Creek Ranch Reservoir and Lake Nacimiento.

Methods: The watershed level assessment includes water quality monitoring in conjunction with stream flow measurements to estimate contaminant loading within the Las Tablas Creek Watershed. In addition, sampling has been conducted to evaluate sediment transport. These sampling efforts include chemical analysis of mercury on multiple sediment size fractions, a sediment erodibility study, deployment of sediment traps to characterize recently deposited sediments, and a series of bathymetric surveys to estimate sediment depostion rate. Finally, a series of investigations have been conducted to evaluate mercury methylation potential in surface sediments, methylmercury concentrations in water overlying sediments, and mercury body burden in lower trophic organisms in both dry and wet seasons. In addition, a sediment transport model will be developed using site data to model sediment and contaminant transport over a range of flow and climatic conditions.

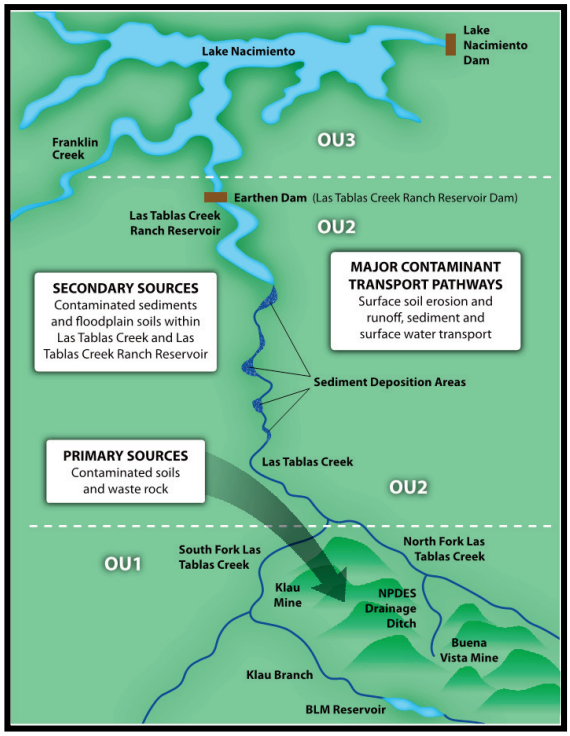

Fig. 1: Conceptual Site Model for Contaminant Transport within the Las Tablas Creek Watershed.

Results: The results of the evaluation will be presented. In addition, the effect of drought conditions on sediment and contaminant transport and methylmercury production and uptake will be discussed.

Discussion: The results of two years of water quality and stream flow monitoring will be presented which will include preliminary loading estimates, an evaluation of sediment erosion and deposition processes, and the results of the comprehensive mercury assessment. Zones of mercury methylation and aquatic organism uptake will be identified and implications of sediment mercury production, bottom water enrichment, and food web uptake will be discussed in context of potential remedies. Because California suffered from extreme drought during 2013/2014 as part of a long term drought cycle, these data will be useful in understanding how the Las Tablas Creek watershed behaves in a drought year and how infrequent precipitation events control sediment transport and contaminant loading.