The Hydrographic Setting for Mercury Sampling

Fish Mercury Concentrations in California

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The National Hydrography Dataset (NHD) is the surface water component of the *The National Map;* a cornerstone of the U.S Geological Survey's (USGS) National Geospatial Program. The NHD can be used by Geographic Information Systems (GIS) for general mapping. and because the NHD network contains flow direction it can also be used in scientific analysis and modeling (6). NHD*Plus* is the result of a collaboration between the U.S. Environmental Protection Agency(EPA) and the USGS and includes important features from the NHD, the National Elevation Dataset (NED), the National Land Cover Dataset (NLCD), and the Watershed Boundary Dataset (WBD)(1).

This map illustrates how the NHD*Plus* can be used with mercury data to evaluate the hydrologic setting for a selected set of mercury sampling sites in California. The state's hydrography is displayed using modeled streamflow estimates from the NHD*Plus* dataset to visualize relative streamflows. A specific set of fish samples are displayed in an inset to see more detail in the stream networks. Also shown on the state and detail maps are the mercury sampling locations and upstream gold and mercury mines. This provides the viewer with a clear understanding of the basic hydrography surrounding the sampling sites(fig. 1).

The hydrography of this map is based upon the results of the NHD*Plus* Unit Runoff Method (UROM) calculations for modeling natural streamflow (1). Actual streamflow is not shown, rather modeled streamflow is represented by graduated line weights. The intent of this map is to show the characteristics of California's drainage network and how the tributary system converges into increasingly larger arteries to form the major rivers that drain the state. By reviewing this drainage pattern, it is possible to better understand how drainage patterns might impact mercury concentration levels in fish samples; however, no association between streamflow or mining and mercury in fish is implied by these maps, nor has it been tested statistically.

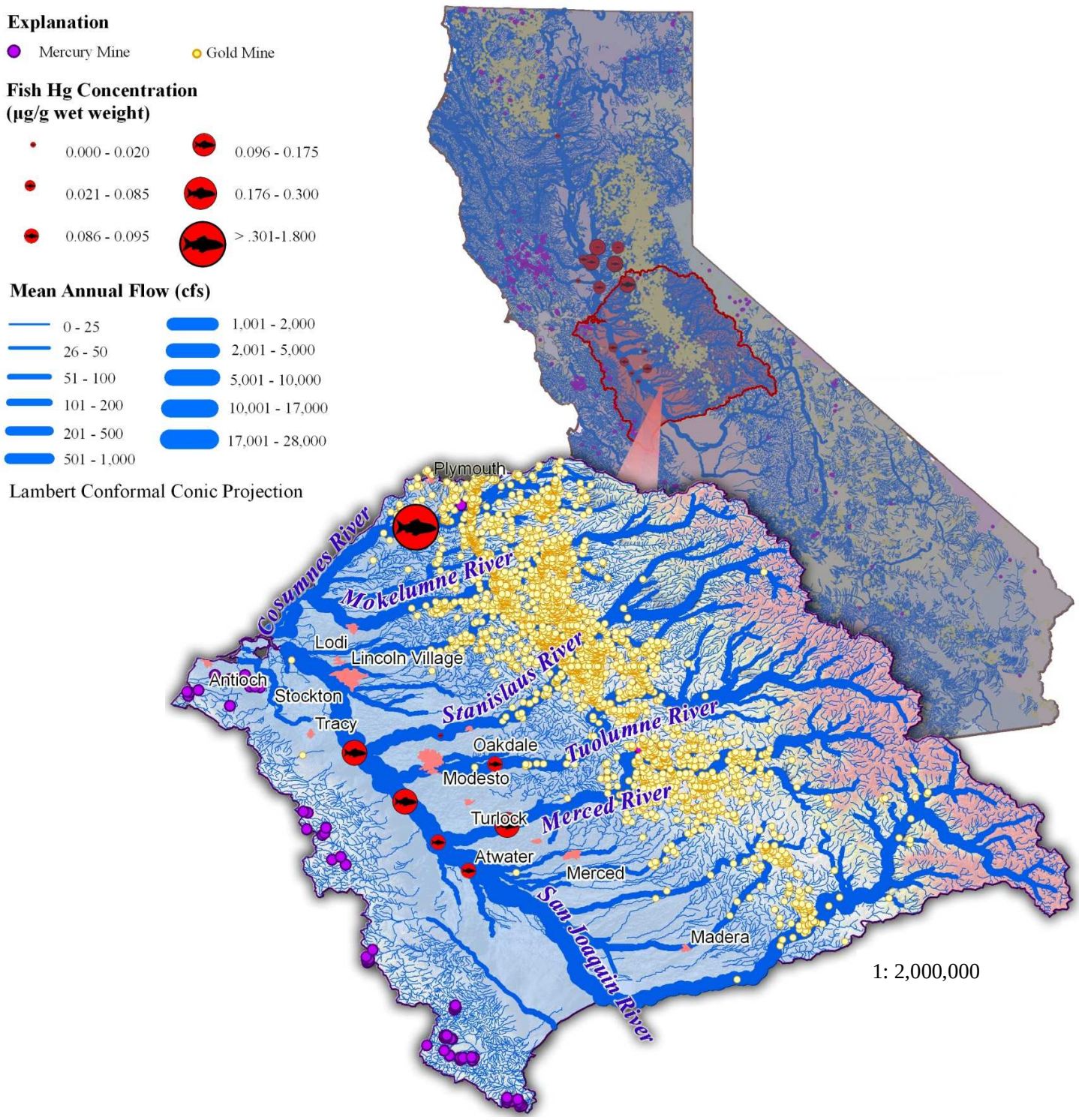

Figure 1- Graduated symbols represent different levels of mercury concentration in fish samples (wet weight). EPA guidelines set the human health criterion for mercury at 0.3 micrograms per gram wet weight for fish muscle or fillet (2). California's high fish mercury concentrations are the result of the state's historic gold mining operations. The inset highlights the San Joaquin Subregion where fish samples were collected downstream from numerous gold mines. A significant amount of mercury that was mined in California was used in gold recovery processes that took place in the Sierra Nevada and Klamath-Trinity Mountains (4). A variety of different fish species were sampled in this state, with the highest concentration measured at 1.80 µg/g wet weight in a largemouth bass *(Micropterus salmoides)* (3).

The mercury data used in this map was derived from USGS studies on mercury contamination across the United States as part of the National Water-Quality Assessment Program and the Toxic Substances Hydrology Program (2,3).

The stream lines come from NHD*Plus*, a joint U.S. Environmental Protection Agency (USEPA)-USGS program to develop enhancements to the 1:100,000-scale National Hydrography Dataset. The line weights represent ranges in mean annual streamflow measured in cubic feet per second (cfs). Streams with a UROM streamflow greater than 0 cfs (perennial streams) are shown.

Gold and mercury mine locations were extracted from the USGS Mineral Resources Data System(MRDS) which includes Minerals Availability and Mineral Industry Location Database (MAS/MILS)(5).

Displaying these datasets together creates a powerful visualization and analysis tool. Combining the modeling capabilities of NHD*Plus* with fish mercury concentrations and gold and mercury mine locations allows for a greater understanding of how a drainage basin's upstream events may impact mercury sampling sites downstream.

References Cited:

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4.) Alpers, C.N., Hunerlach, M.P., May, J.T., Hothem, R.L., 2005, Mercury Contamination from Historical Gold Mining in California: U.S. Geological Survey Fact Sheet 2005-3014 Version 1.1, 6 p., accessed Janurary, 2010, at *http://pubs.usgs.gov/fs/2005/3014/fs2005_3014_v1.1.pdf*

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6. U.S. Geological Survey. *National Hydrography Dataset*. accessed January 2010 at *http://nhd.usgs.gov/.*