HISTORY REPEATS ITSELF: MERCURY POLLUTION FROM HISTORIC AND MODERN GOLD RUSHES

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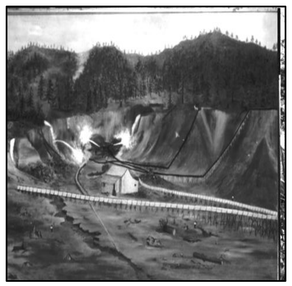
California Gold Rush (1840-1910)

"People described the… landscape as looking like it had been dug up by giant moles." [1]

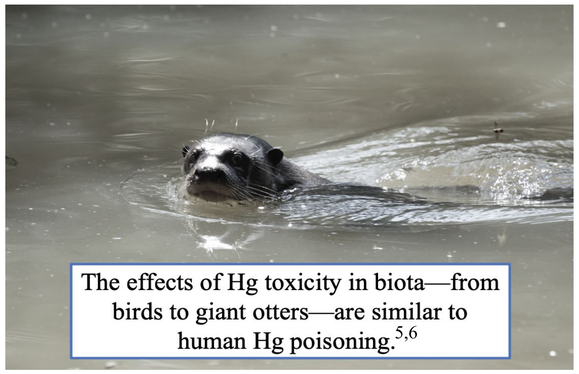


Landscape Change

- Deforestation to clear land and acquire fuel-wood[2]
- Creation of dams and reservoirs[2]
- Excavation of hillsides leads to erosion[1]

How Has Mercury Impacted California's Environment?

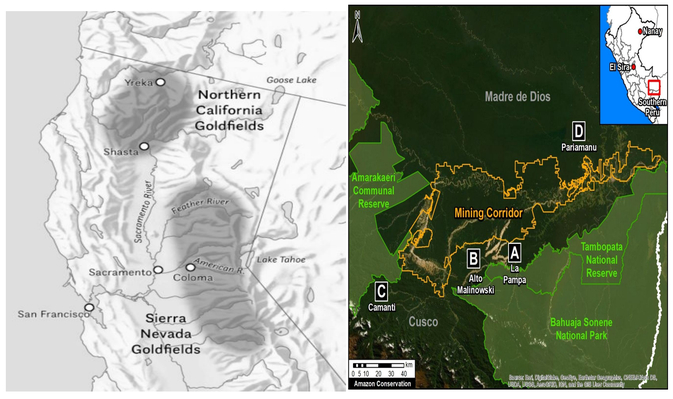
- Mercury can travel long distances and can impact people far from its source[3]
- Mercury contamination is still present over 100 years later[4]



The effects of Hg toxicity in biota—from birds to giant otters—are similar to human Hg poisoning.[5,6]

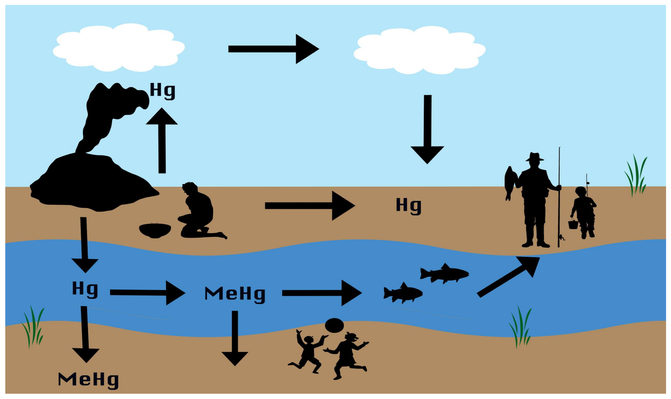
Animals inhabiting historically mined sites in California have high mercury concentrations compared to those in nearby unmined landscapes. [7,8]

Artisanal Small-Scale Gold Mining



(Left) Map of California with historic mining areas highlighted in pink.[9] (Right) Map of Madre De Dios, Peru with mining corridor outlined in orange.[10]

Gold extraction has harmed people, animals, and the environment for centuries and will for generations to come. We, as consumers, must share responsibility for that.



Mercury is used to bind to gold particles in the sediment for extraction. It then enters into the environment, where it can be taken up by people and wildlife.

Peruvian Gold Rush (2000 to present)

"But any sense of being in a pristine wilderness was lost at the river's edge... Huge sandy craters, mounds of pebbles and poisoned waterways were everywhere."[11]

Changing Landscape

- Extensive deforestation and creation of mining ponds[12]
- High rates of land erosion lead to sedimentation in waterways[13]

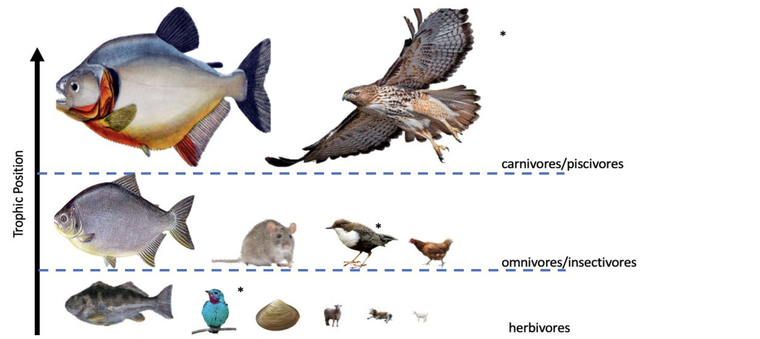
How Will Mercury Impact Peru's Environment?

High contamination of mercury found in water and soil now can persist for centuries

Scan this code for a recording with more information

This is a global issue:

- Occurs in over 70 countries and involves 10-19 million workers[14]
- Produces ~12% of the world's gold[15]



Mercury contamination extends to many organisms living near ASGM sites. The size of each organism represents the relative mercury content.[16]

Citations:
1 Thornton, S. 21 Jan. 2011. <https://www.nationalgeographic.org/article/after-gold-rush/> 2 University of California. 2005. <https://calisphere.org/exhibitions/14/environmental-impact-in-the-gold-rush-era/> 3 Schmidt, C.W. 2012. *Environ. Health Perspect.* 120(11): a424-a429. 4 Donovan P.M., et al. 2016. *ES&T.* 50(4): 1691-1702. 5 Whitney M.C. and Cristol D.A. 2017. *Rev. Environ. Contam. Toxicol.* 244:113-163. 6 Gutleb, A.C., et al. 1997. *Ambio* 26(8): 511-514. 7 Saiki, M.K., et al. 2010. *Environ. Monit. Assess.* 163: 313–326. – bird picture 8 Eisler, R. 2004. *Rev: Environ. Contam. Toxicol.* 181: 139–198. – otter pic 9 van der Maarel, H. 14 July 2015. <https://en.wikipedia.org/wiki/File:CaliforniaGoldRush.png> 10 Finer M. and Mamani N. 17 Jan. 2020. MAAP: 115. <https://maaproject.org/2020/mining_frontiers_peru/> 11 Daley, S. 26 July 2016. *The New York Times.* <www.nytimes.com/2016/07/26/world/americas/peru-illegal-gold-mining-latin-america.html?auth=login-email&login=email> 12 Caballero Espejo, J. et al. 2018. *Remote Sensing* 10(12): 1903. 13 Dethier E.N., et al. 2019. *PNAS.* 116(48):23936-23941. 14 Esdaile, L.J. and Chalker, J.M. 2018. *Chemistry.* 24(27): 6905-6916. 15 Telmer, K.H. and Veiga M.M. 2009. *Mercury fate and transport in the global atmosphere.* Pp. 131-172. 16 This figure is a compilation from multiple sources. Citations can be found here.