

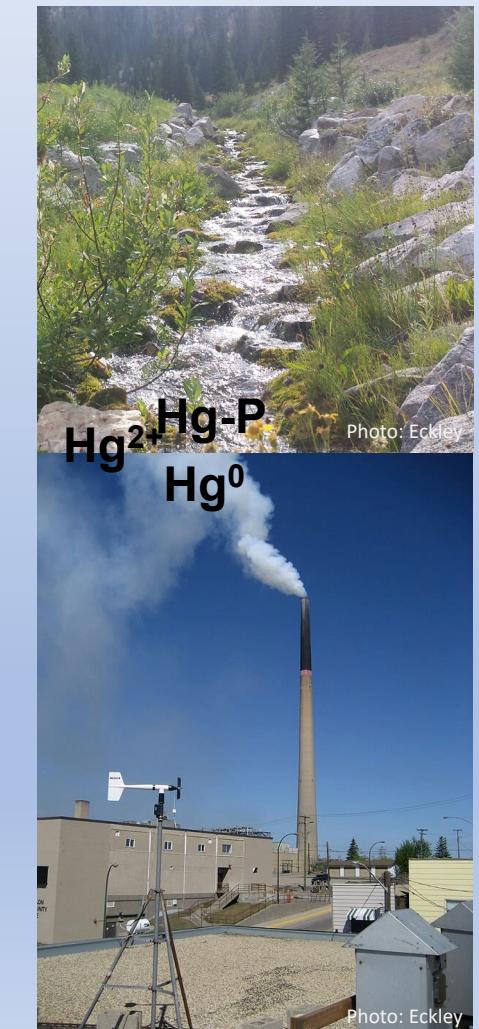
Summary of mercury sources and dynamics in the environment



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2020/03/03

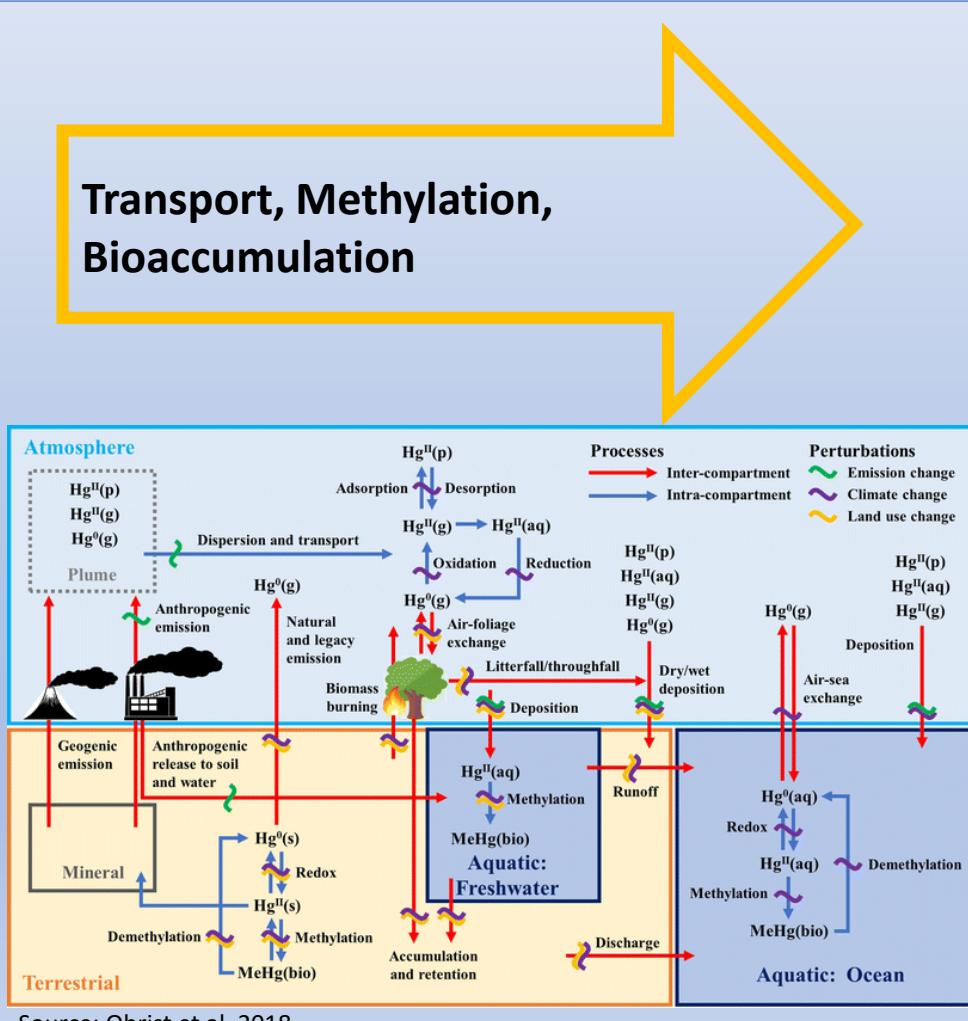
The Mercury Cycle



Mercury Releases

Mercury in the Environment

Mercury Exposure



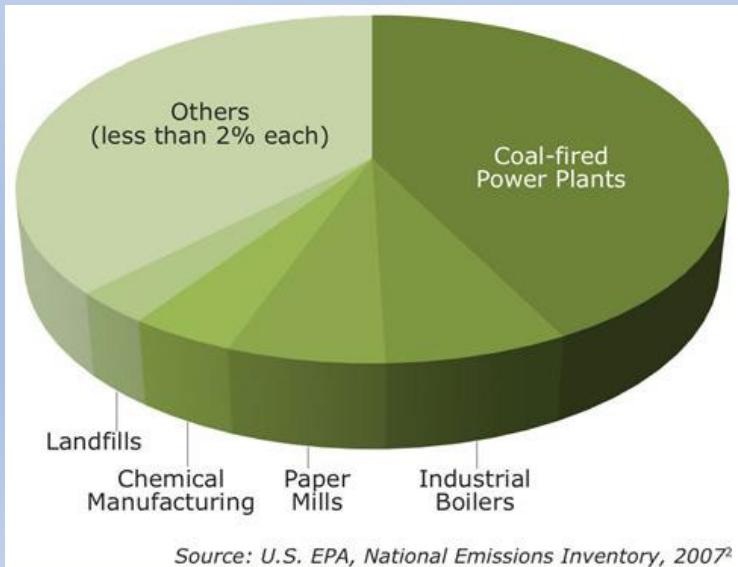
Global Mercury Pollution

- Mercury is a global pollutant (& a local pollutant)
- Long atmospheric lifetime (0.5-2 yr) of Hg^0 before deposition

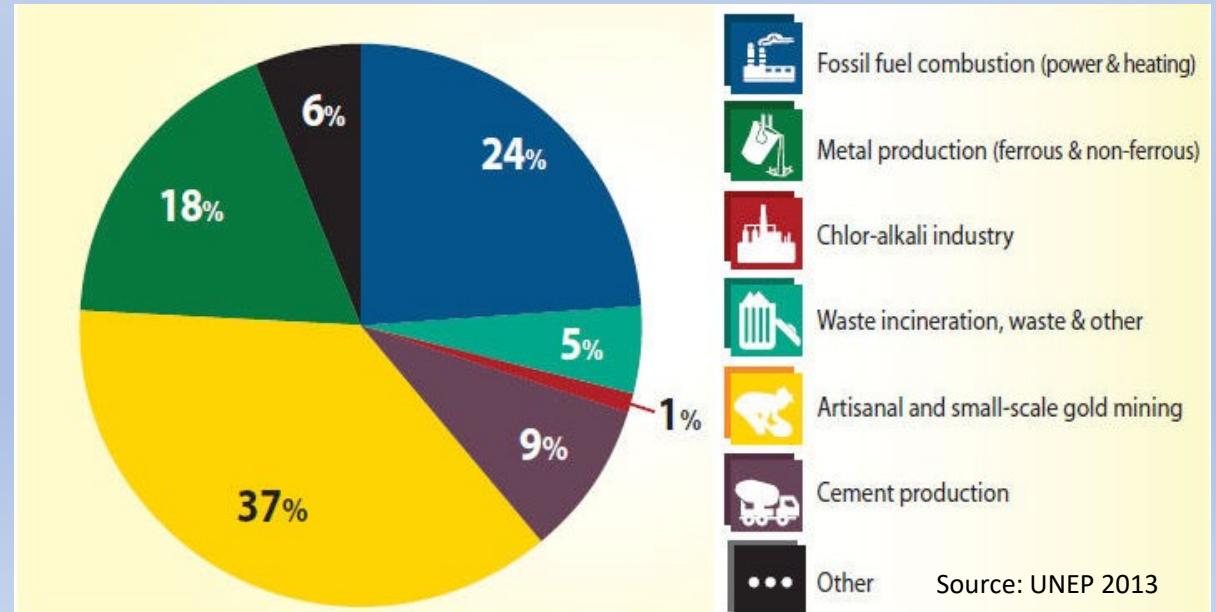


- Sources of Hg emissions:

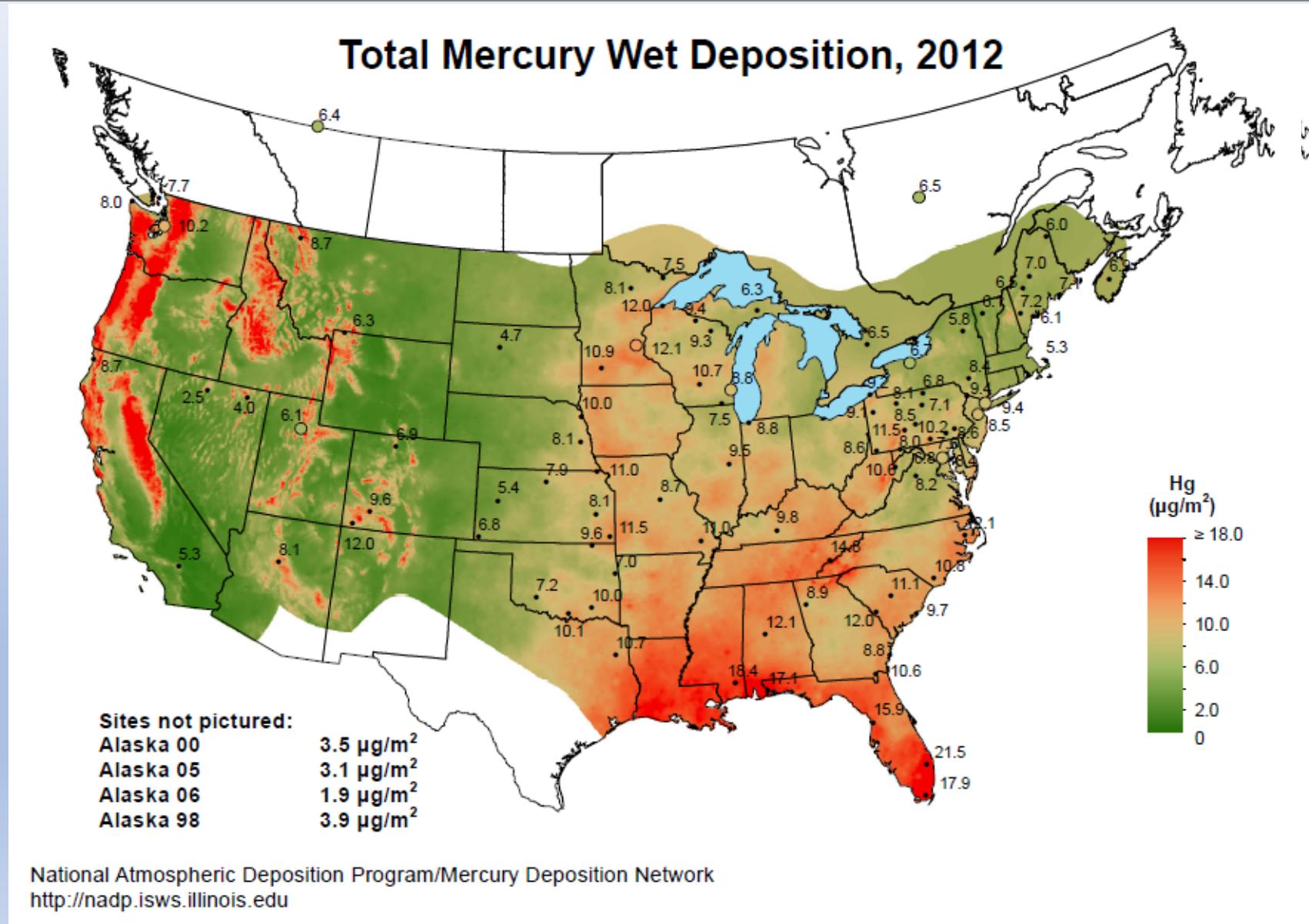
US Sources



Global Sources

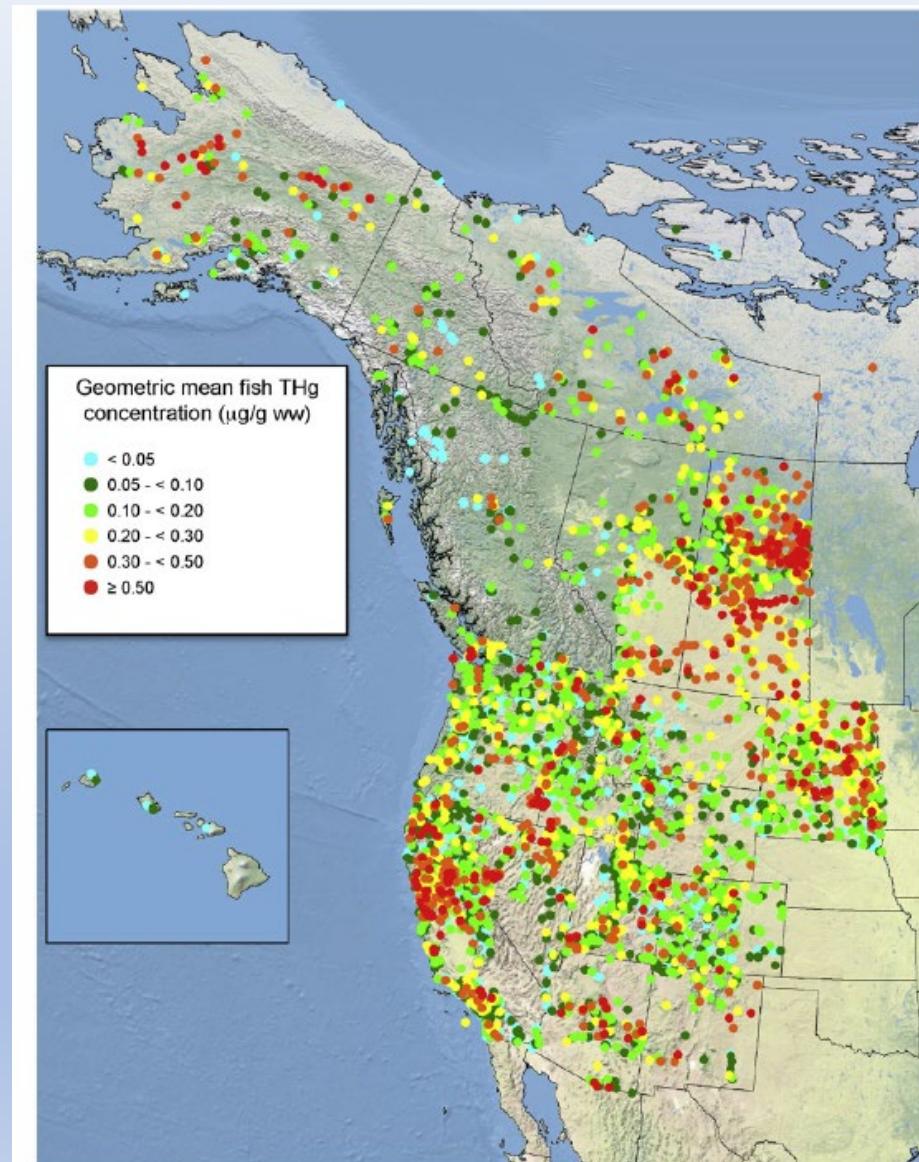
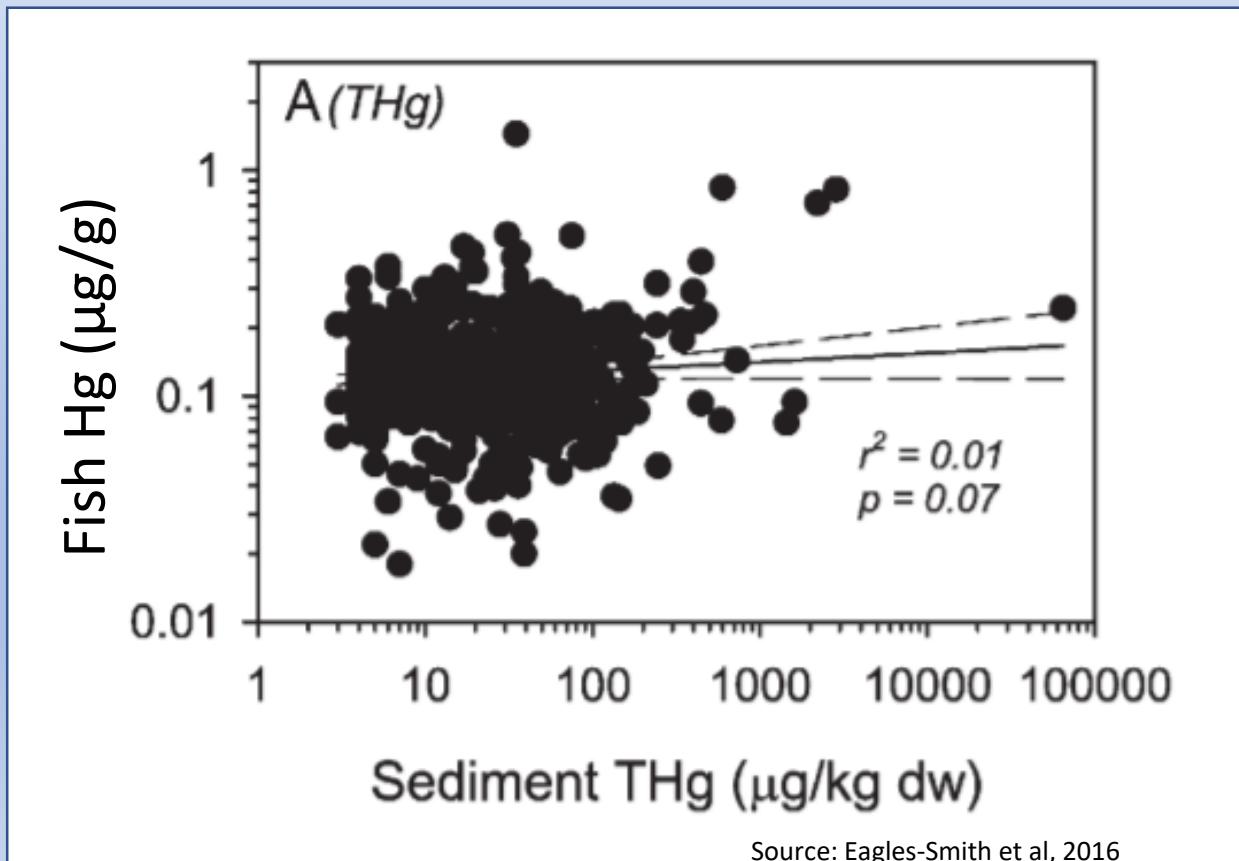


Mercury Deposition



Spatial variability in fish Hg concentrations

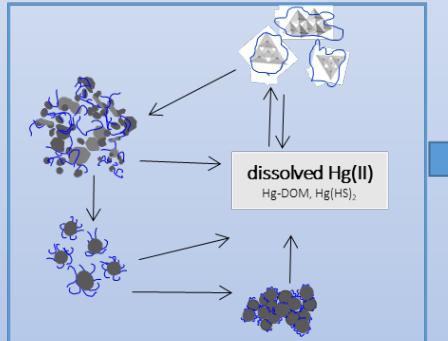
- Fish Hg concentrations are spatially variable
- Fish Hg concentrations are not well correlated with the total-Hg in sediment



Factors that affect spatial variability of fish Hg

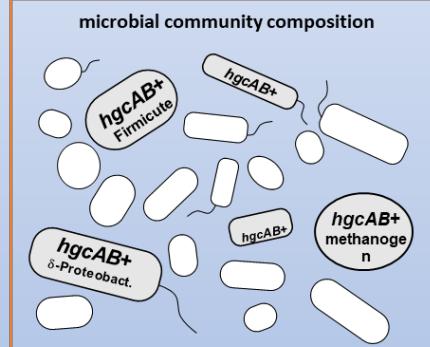
Methylmercury (MeHg) production

Bioavailable Inorganic Hg



Adapted from: Hsu-Kim et al, 2018

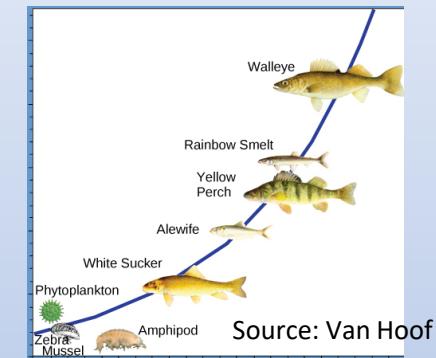
Aerobic Microbiome



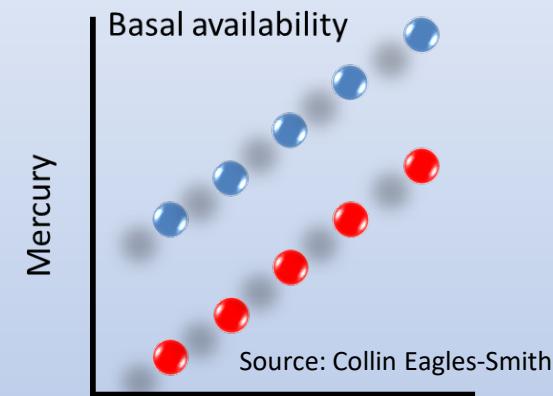
Wetlands: important zones of methylation



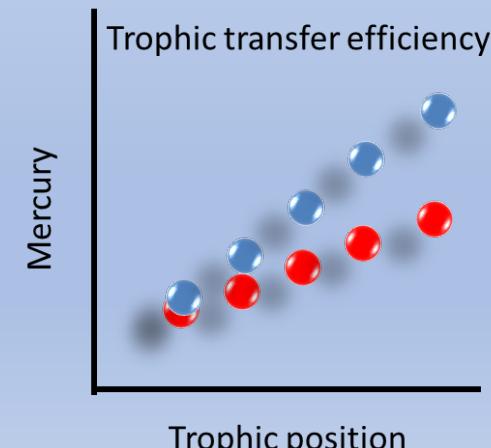
Foodweb variables



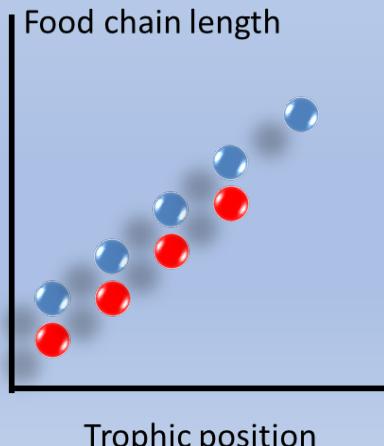
Trophic position



Trophic position

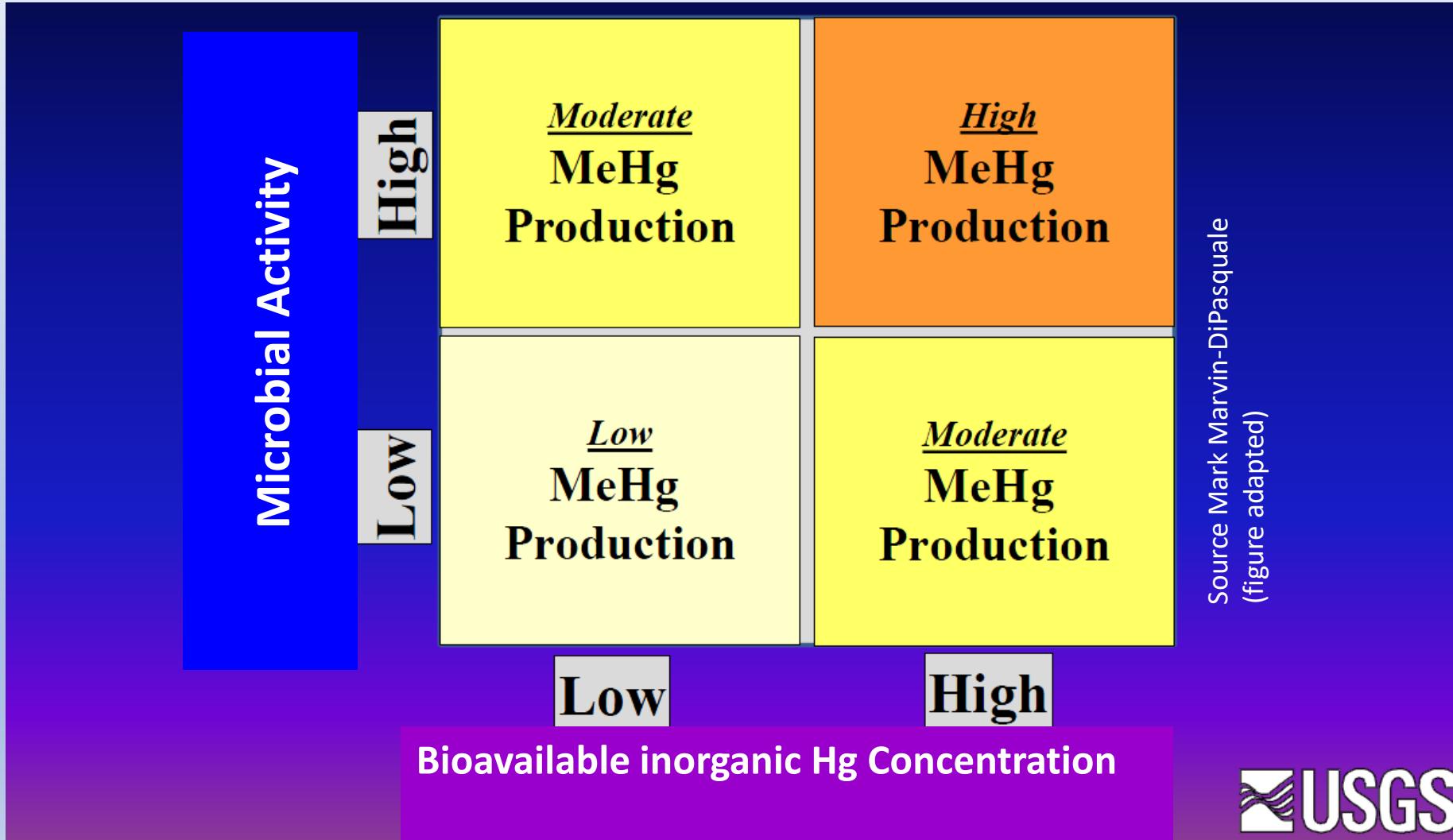


Food chain length



Trophic position

Factors affecting Hg methylation

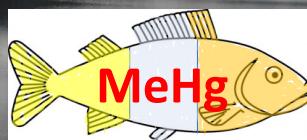
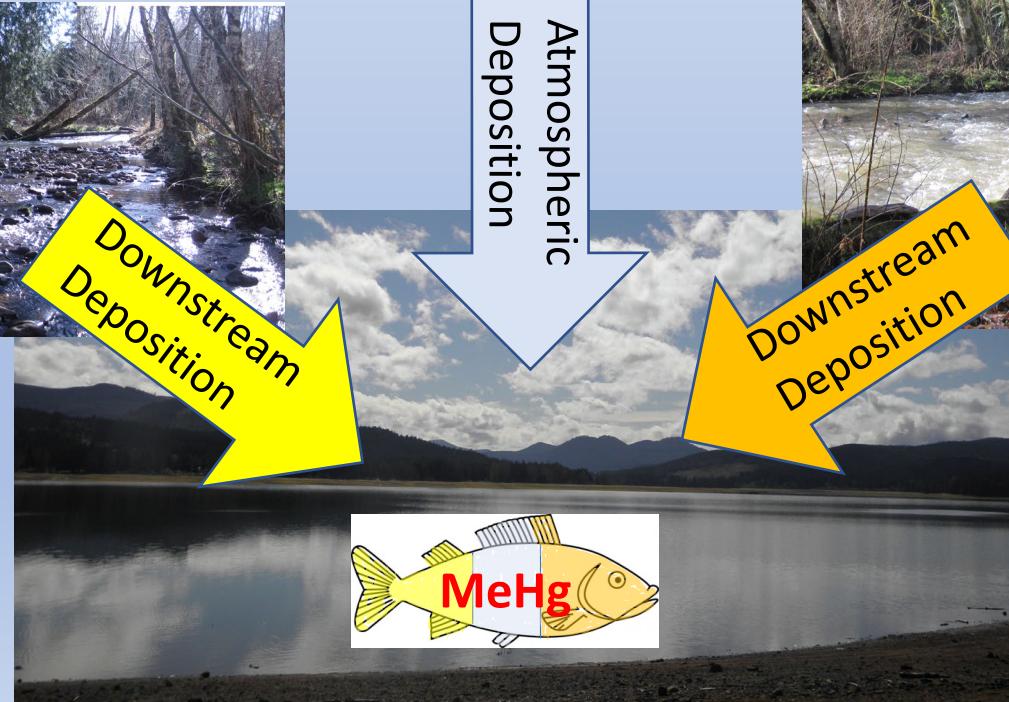


Fish contain Hg from multiple sources

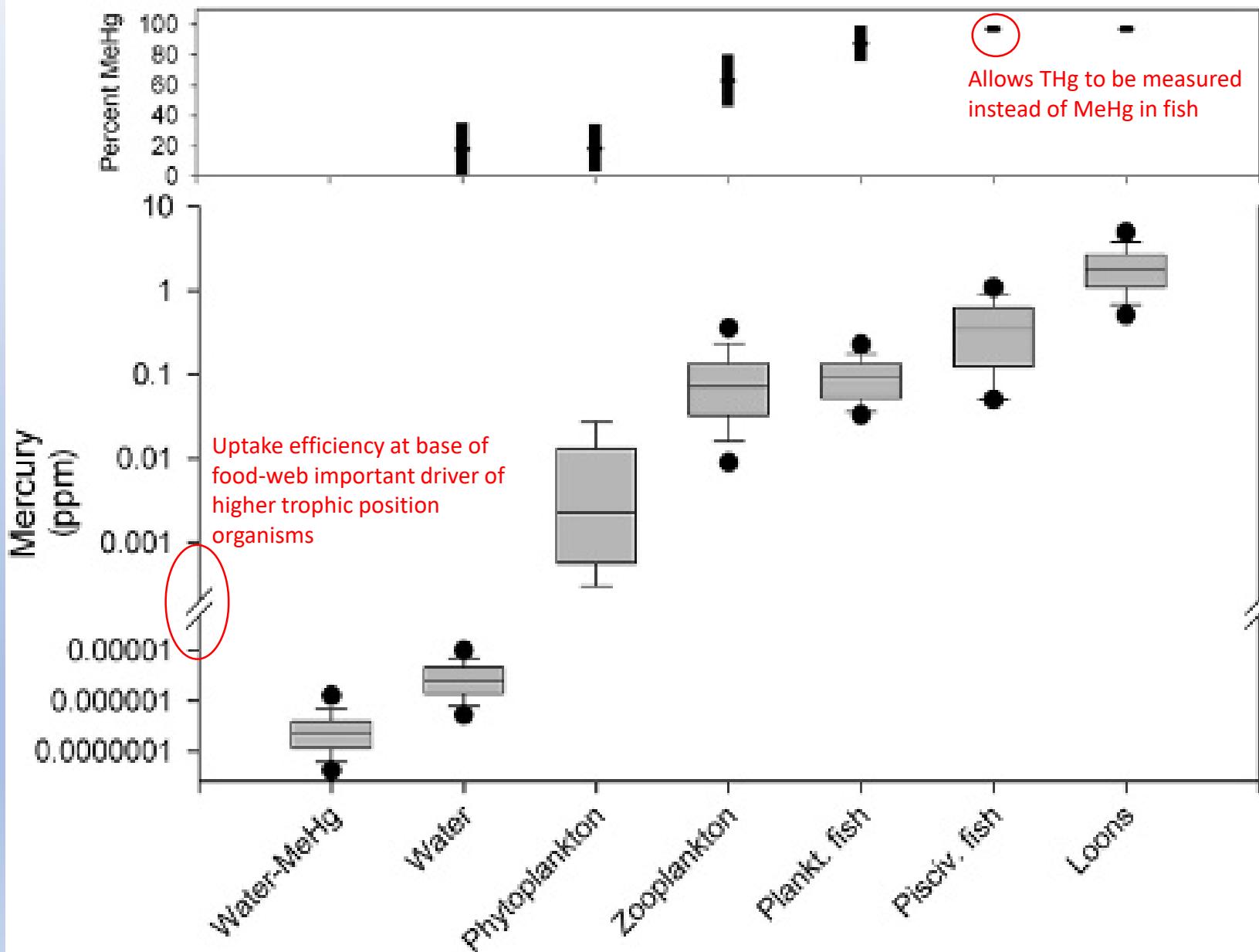
- Downstream/wind of contaminated sites the source of Hg pollution can be more difficult to discern, especially when there are multiple potential sources with different bioavailability



Atmospheric
Deposition

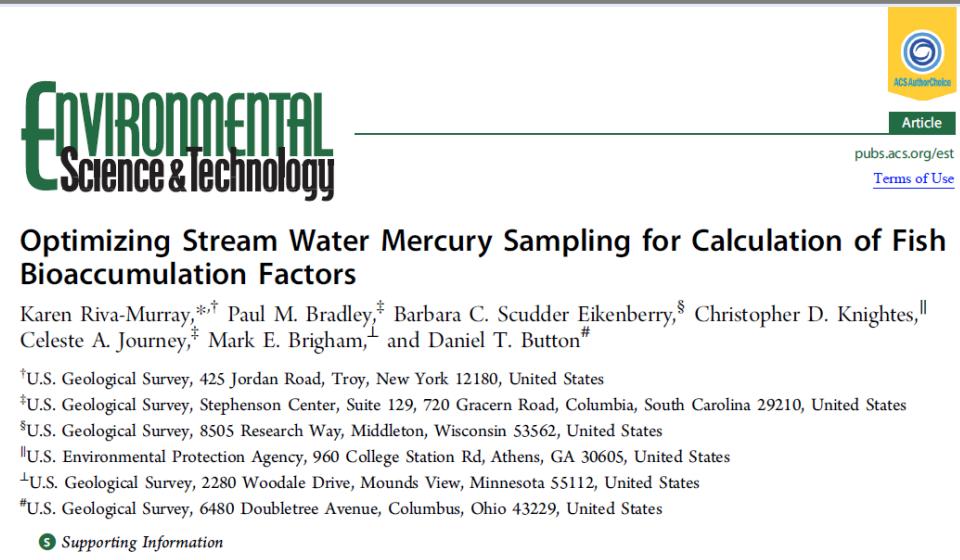


Methylmercury bioaccumulates/biomagnifies in biota



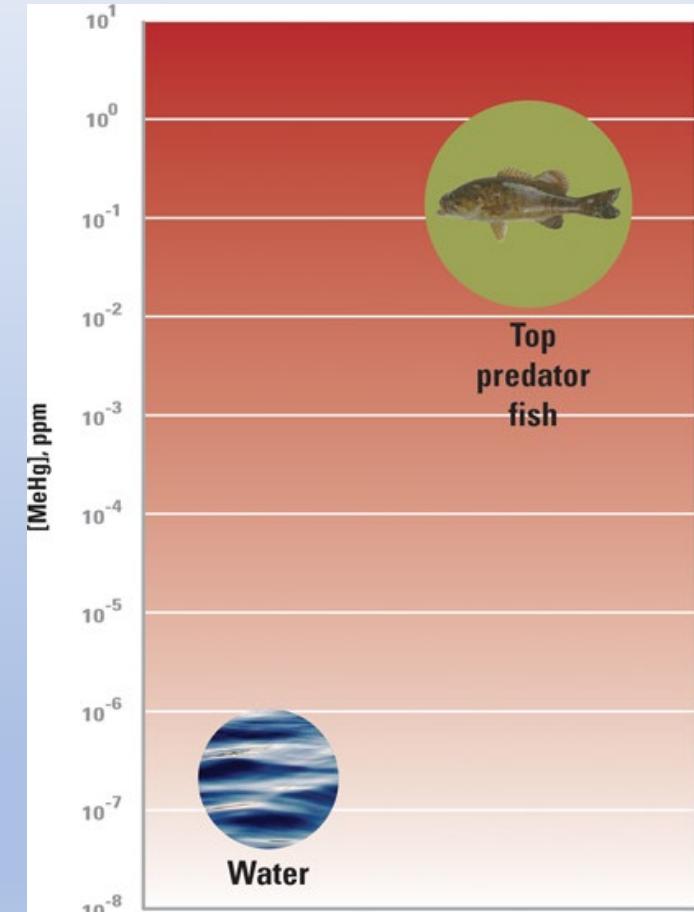
Source—Driscoll et al, 2007 Box and whisker plots of mercury (Hg) concentrations in water and aquatic biota in eastern North America. Also shown are the ranges for the percentage of total Hg occurring as methylmercury (MeHg). All values were obtained from NERC (Northeastern Ecosystem Research Cooperative) data and represent wet weight, except those for phytoplankton, which were obtained from Watras and colleagues .

Monitoring: water & fish tissue



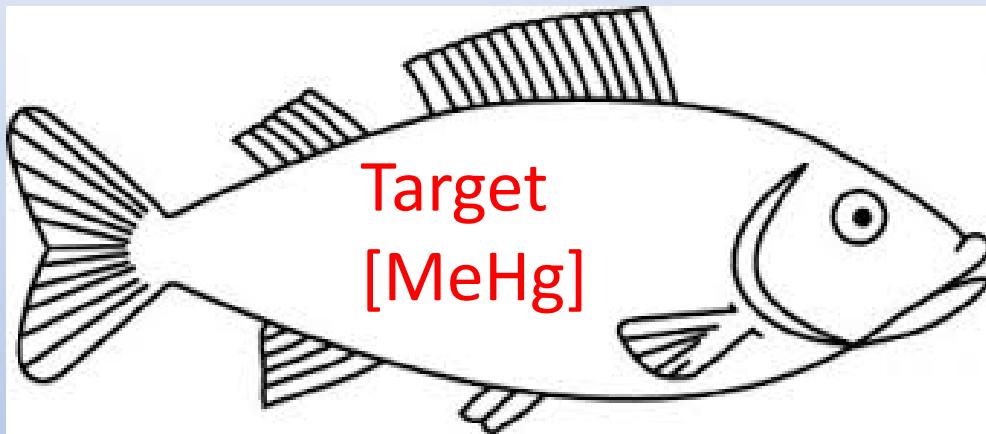
The image shows a screenshot of a journal article from the Environmental Science & Technology (EST) journal. The article is titled "Optimizing Stream Water Mercury Sampling for Calculation of Fish Bioaccumulation Factors". The authors listed are Karen Riva-Murray, Paul M. Bradley, Barbara C. Scudder Eikenberry, Christopher D. Knights, Celeste A. Journey, Mark E. Brigham, and Daniel T. Button. The article is published by ACS AuthorChoice and is an Article. The URL is pubs.acs.org/est and the Terms of Use are available at [pubs.acs.org/est](#). The journal logo is in the top right corner. Below the title, there is a section for "Supporting Information".

- BAFs for fish are widely employed for regulatory purposes.
- Mercury BAFs are calculated as: $(\text{Hg fish}) / (\text{Hg water})$
- Paper evaluates the influence of water sample timing, filtration, and mercury species on the relation between fish and water Hg concentrations to identify optimum Hg water sampling approaches.
- Recommendation: best fit with fish data for mean annual filtered MeHg concentrations



Monitoring: water & fish tissue

Water MeHg/THg Translator



Food web
dynamics



Water [Dissolved MeHg]

MeHg/THg
translator

[Whole water THg]

Questions

