

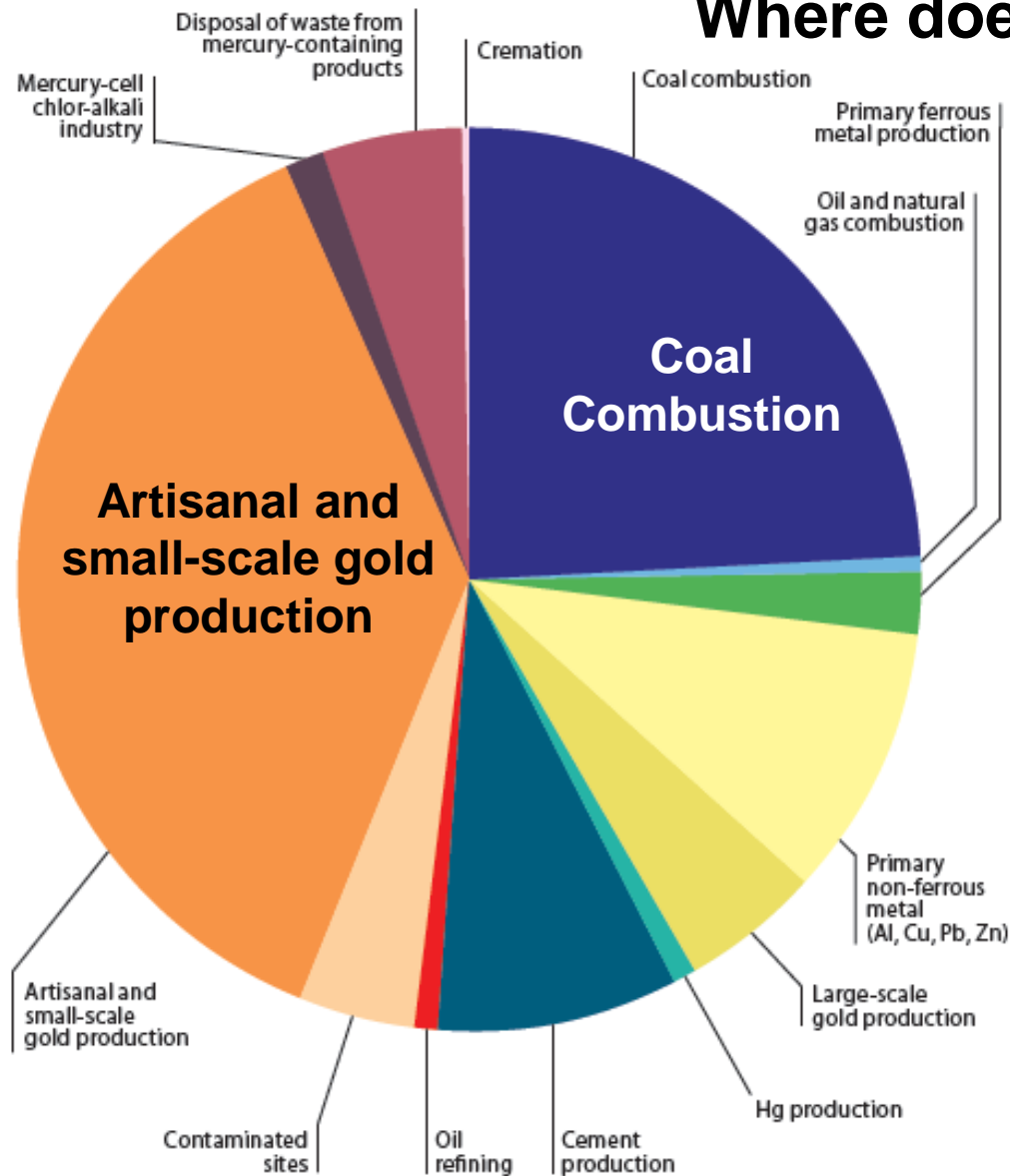
Factors Controlling Mercury Fate in Aquatic Food Webs

Celia Chen

Department of Biological Sciences

Dartmouth College

Where does mercury come from?

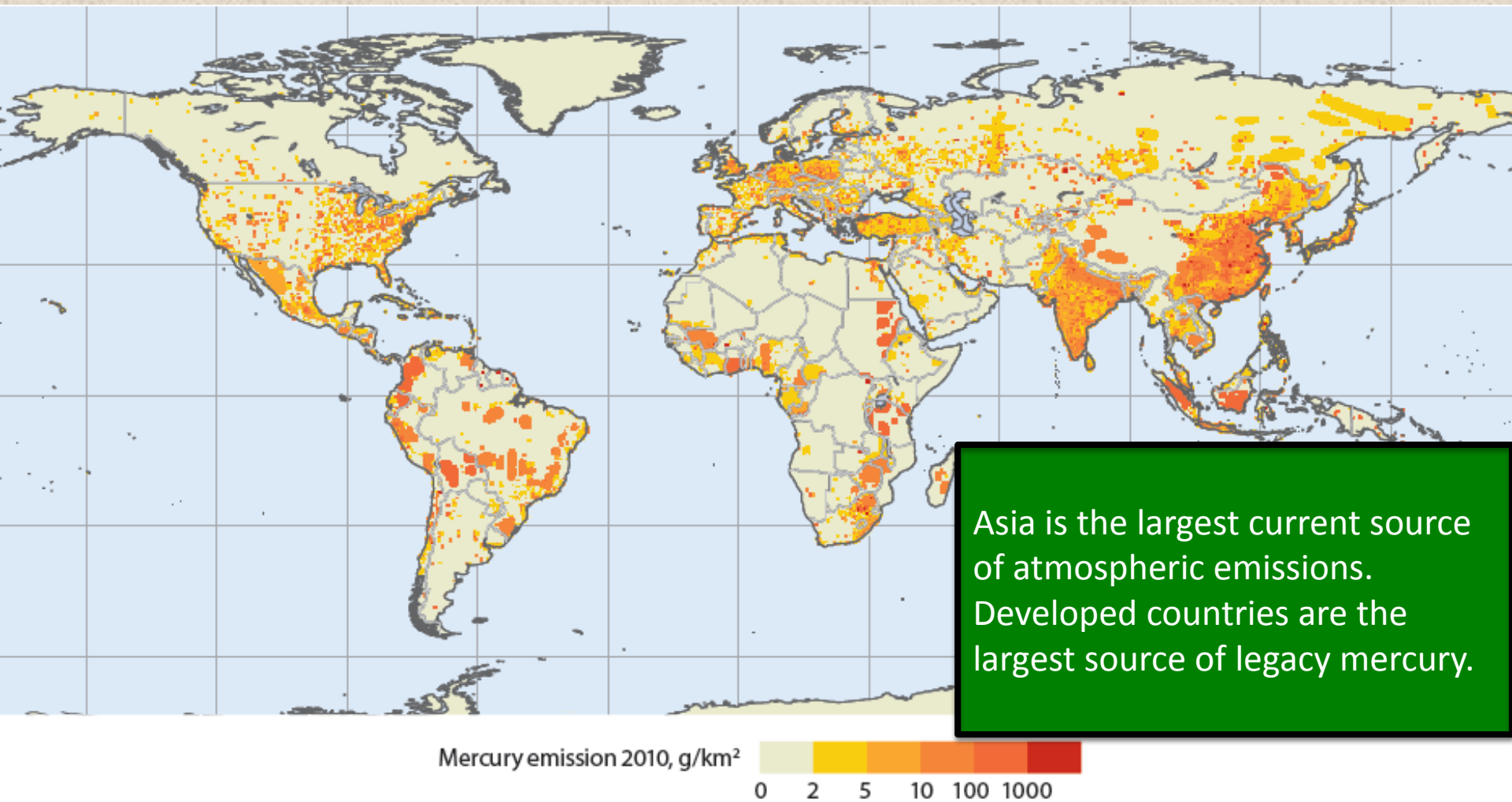


Contributions to Atmosphere, 2010

Fossil fuel combustion is the largest source of anthropogenic mercury emissions in developed countries.

Emissions from gold mining are the largest current source globally.

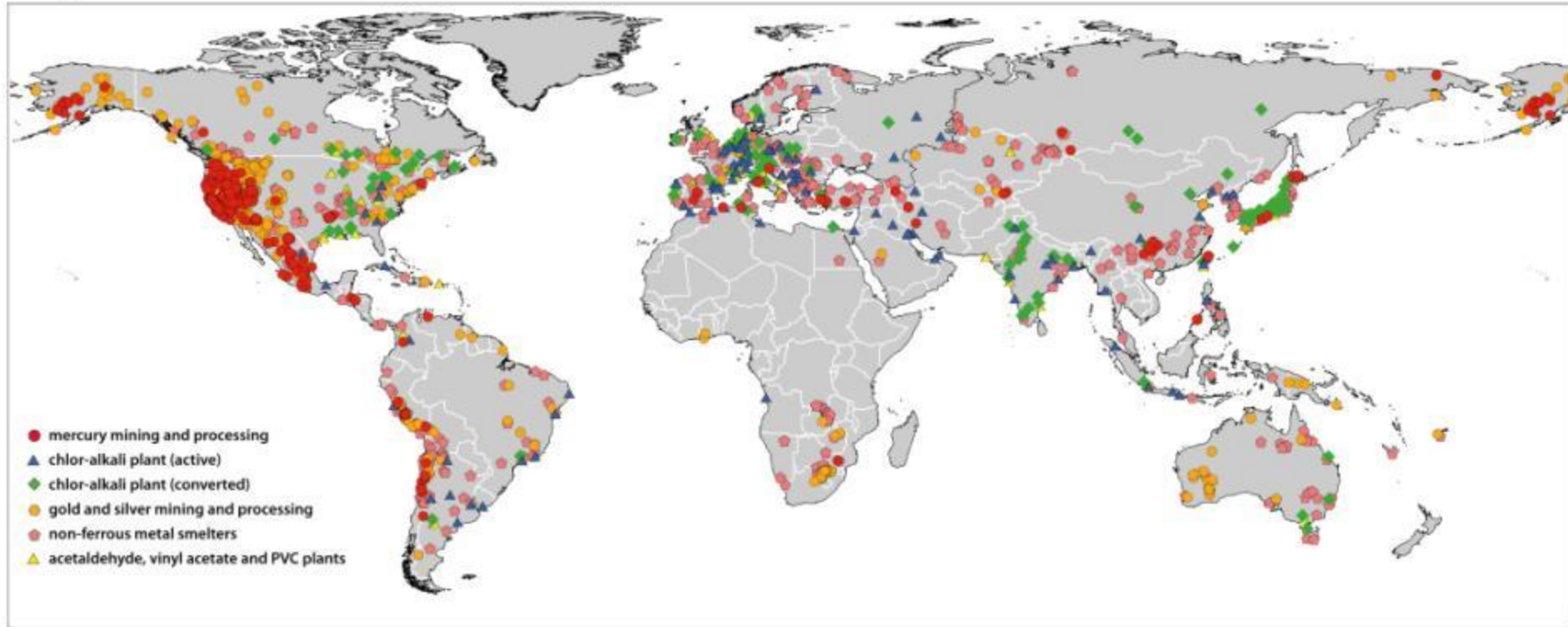
Atmospheric Emissions, 2010



Asia is the largest current source of atmospheric emissions. Developed countries are the largest source of legacy mercury.

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Mercury-Contaminated Sites



Mercury is released directly to rivers and coastal waters from thousands of sites.

Quicksilver Clouds: How Mercury Enters, Cycles, and Impacts Ecosystems

Where does mercury go?

Emissions & Deposition

Hg^0 (Elemental)

Mercury is emitted to the atmosphere

Watershed Cycling

Bioconcentration in forests

Mercury is deposited in rain and snow and as gases and particles

Lake Cycling

Bioconcentration in lakes and reservoirs

Hg^{2+} (Oxidized)

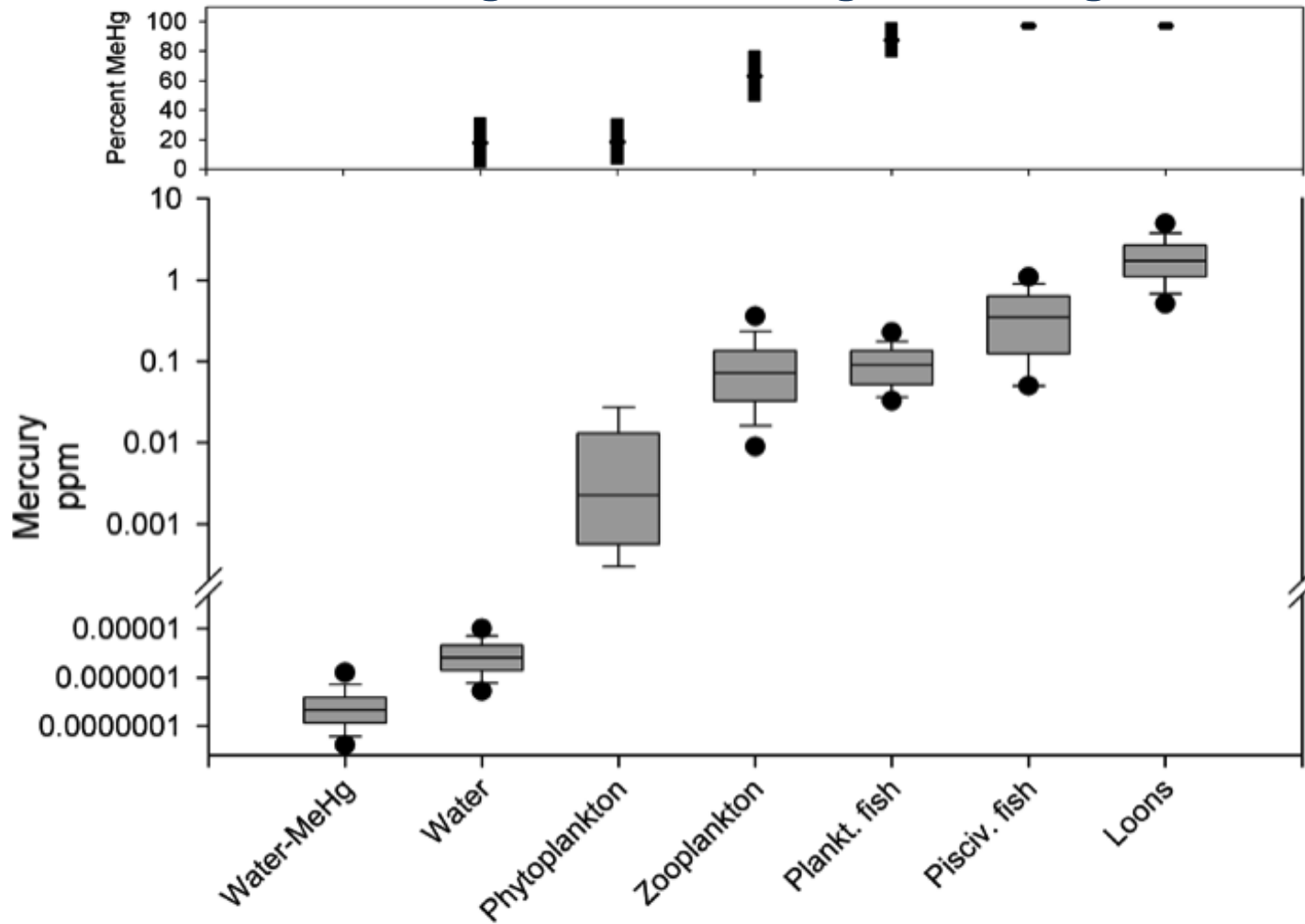
Total mercury =
inorganic + organic Hg
or
 $Hg^{2+} + CH_3Hg^+$

Mercury is transported through watersheds and converted to methyl mercury

CH_3Hg^+
(Monomethylmercury)

Methyl mercury bioaccumulates in food webs

Biomagnification of Hg and MeHg

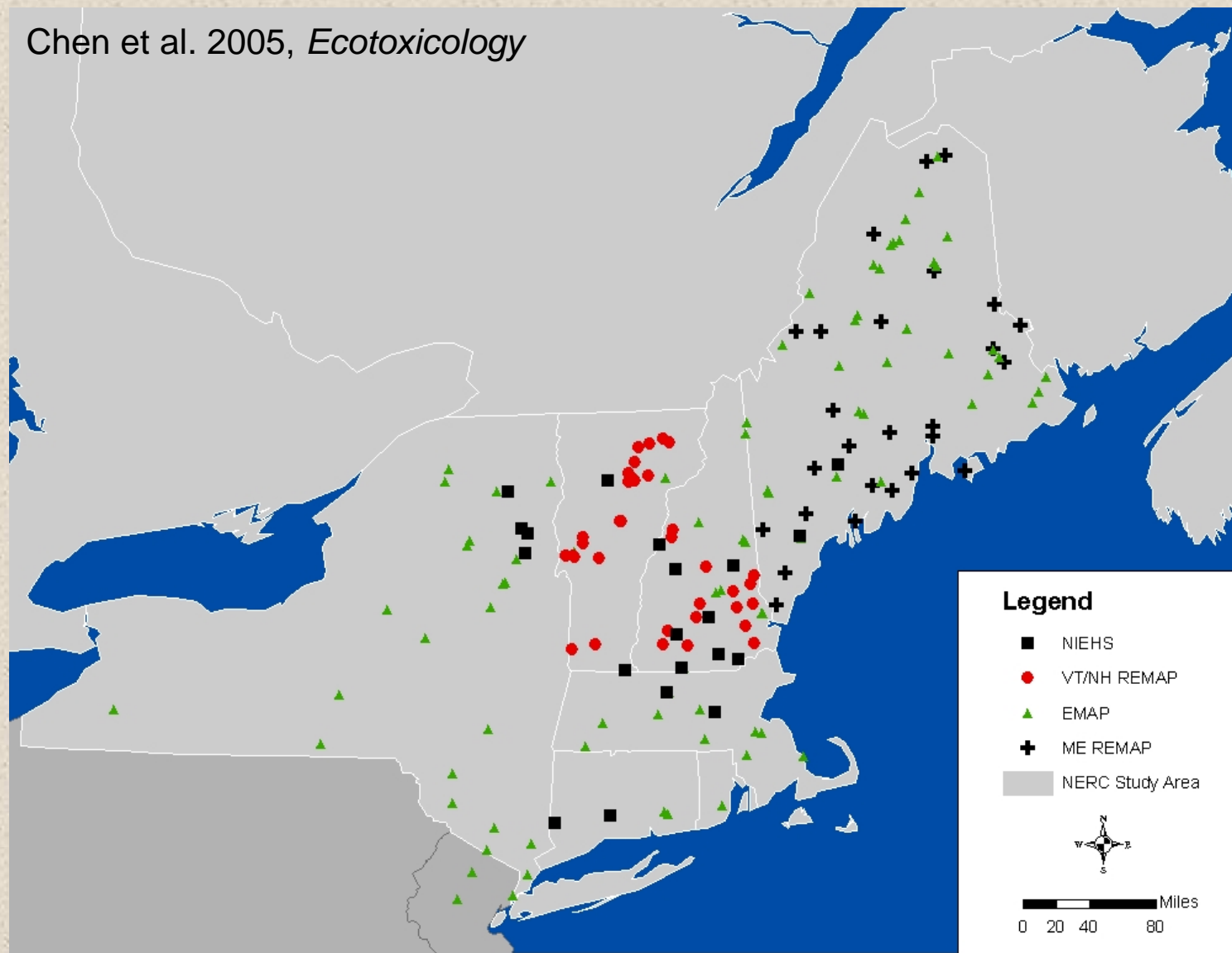


Matrix

Driscoll et al. 2007 *Bioscience*

Comparison of Multi-Lake Datasets from the Northeast US

Chen et al. 2005, *Ecotoxicology*

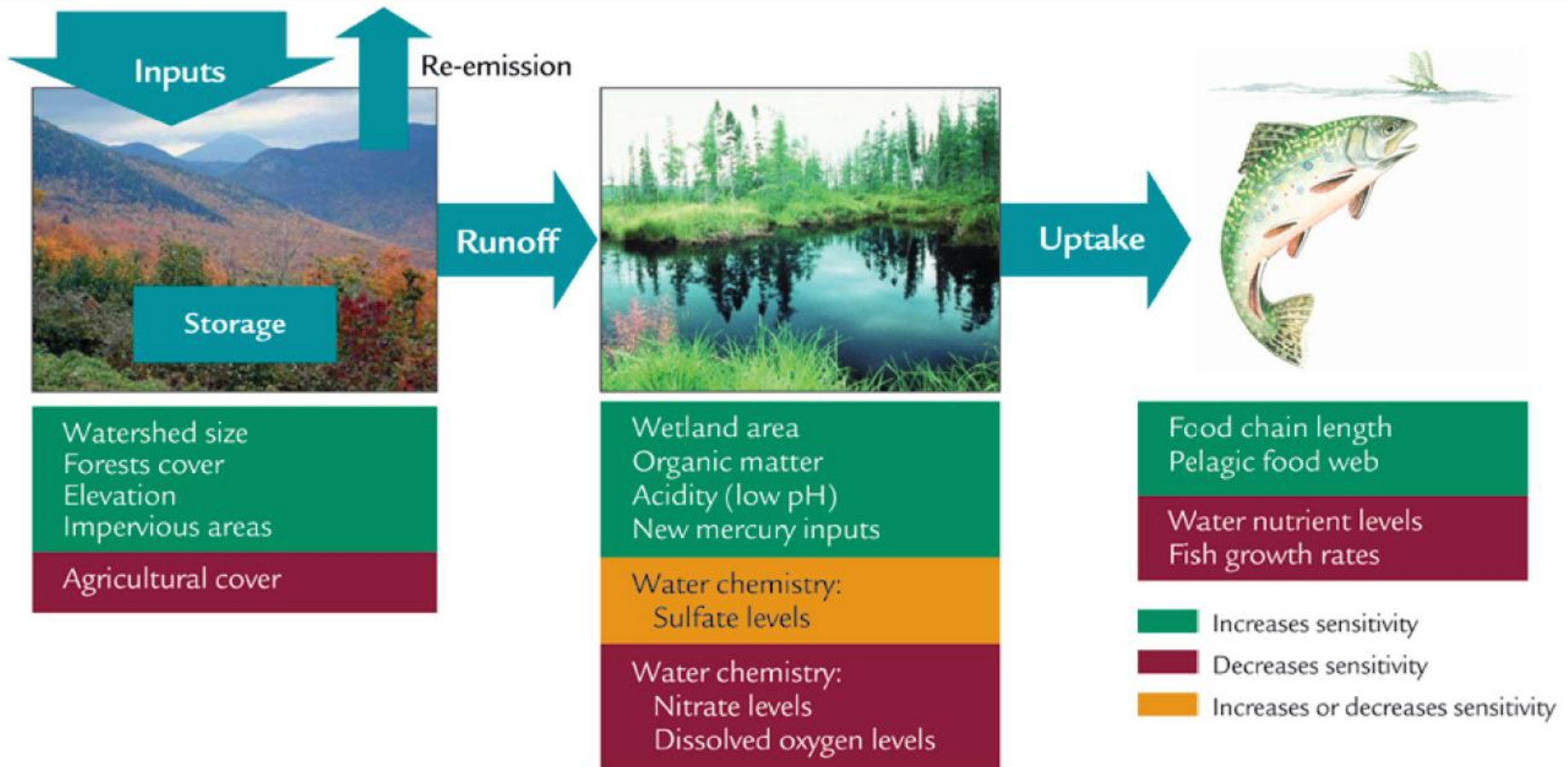


SO..... for aquatic systems

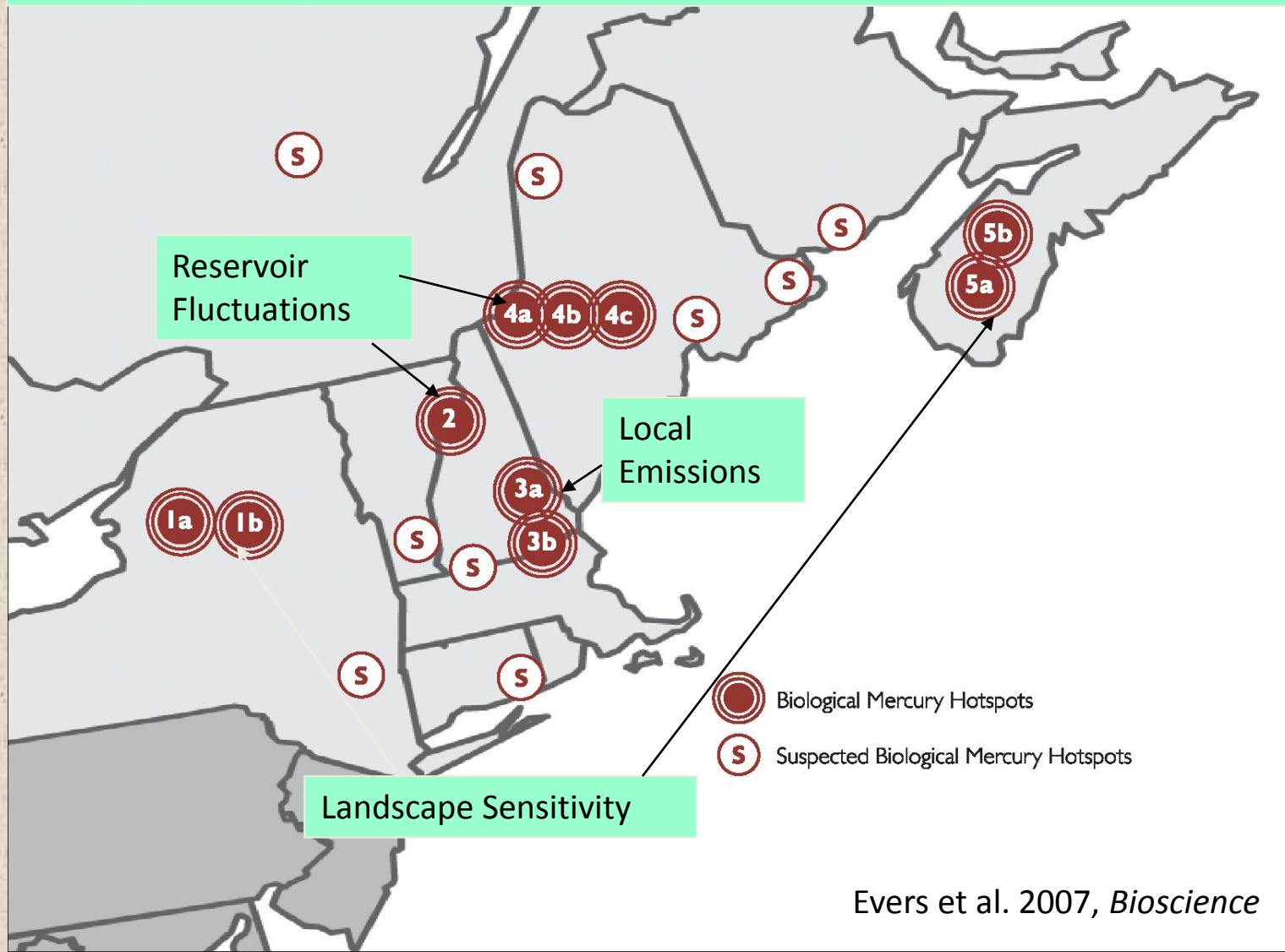
Mercury inputs & transport

Mercury methylation

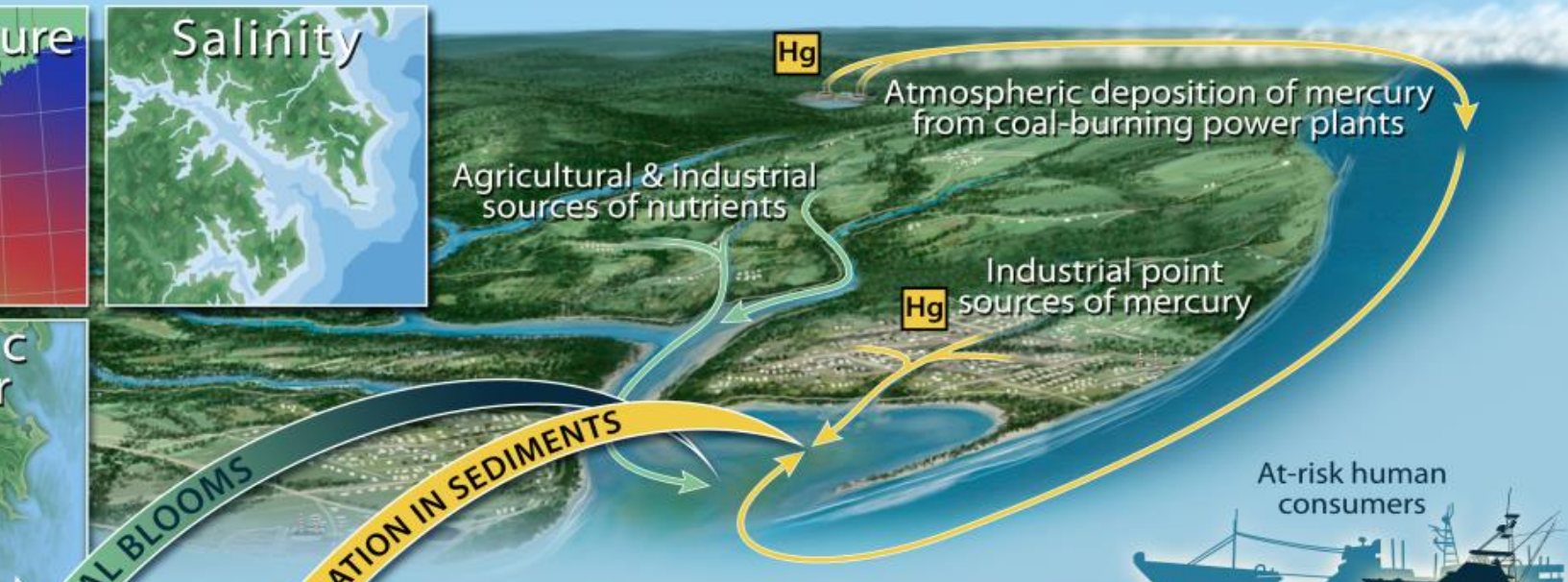
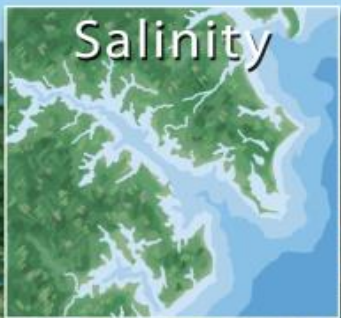
Food web transfer



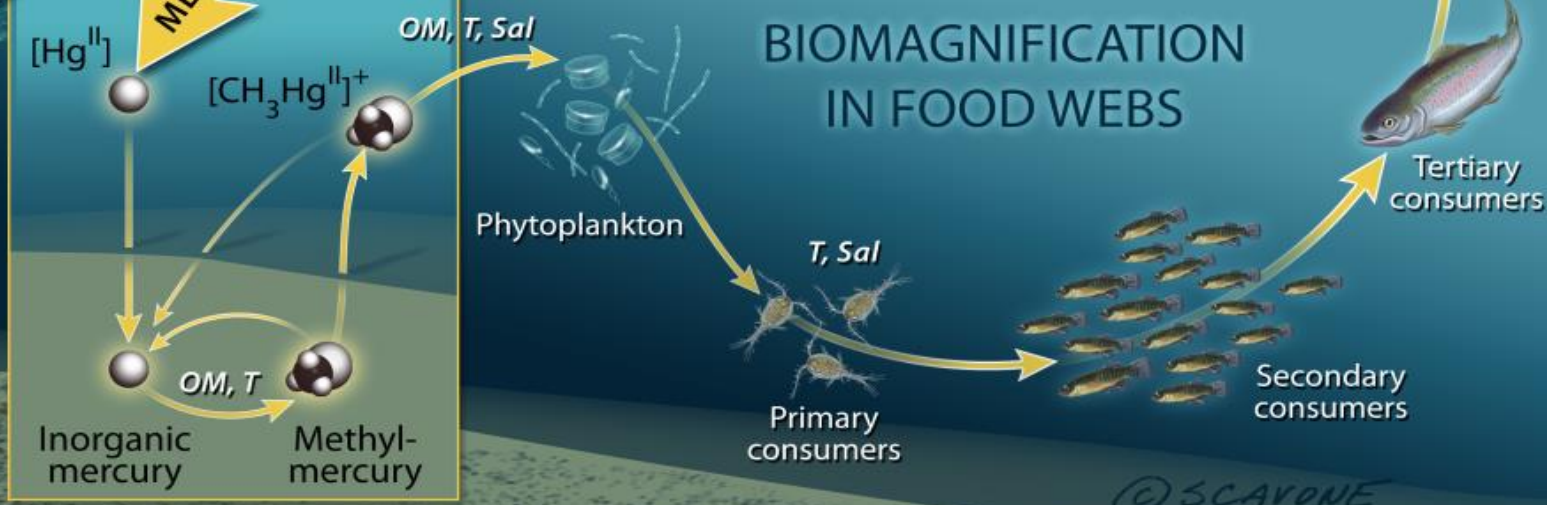
Hotspots of Mercury Bioaccumulation



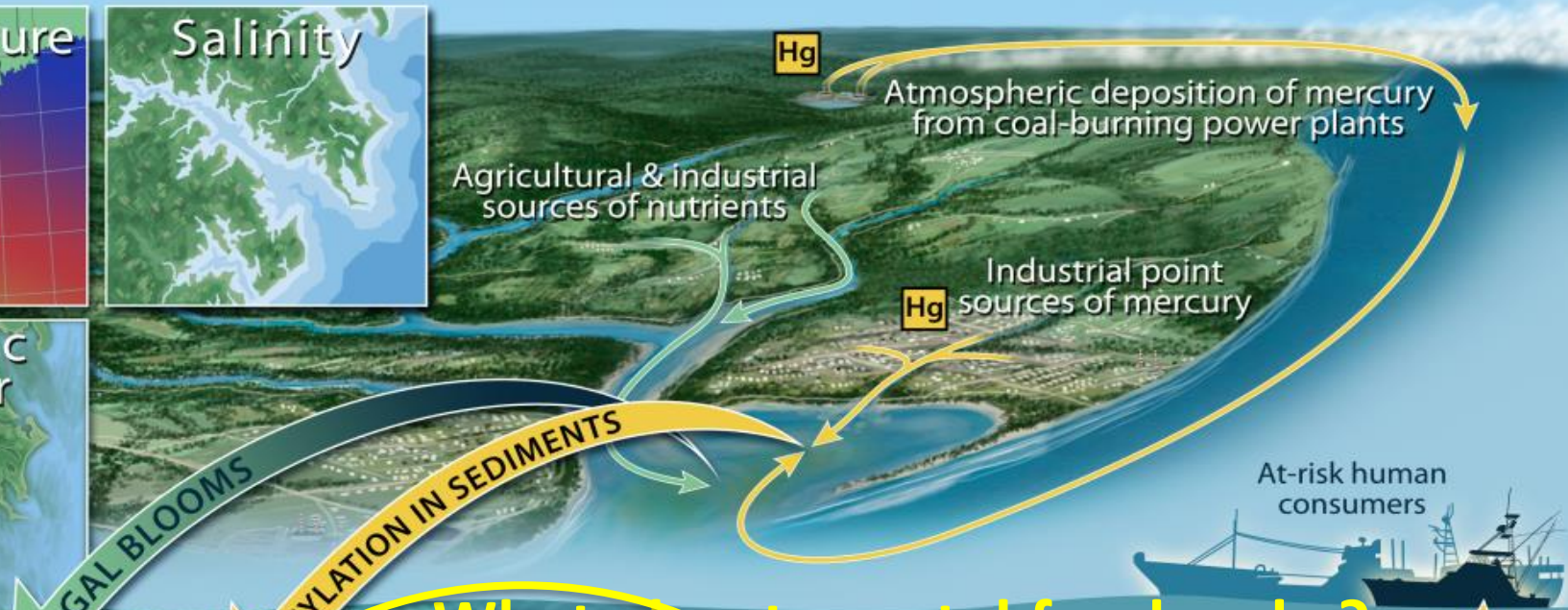
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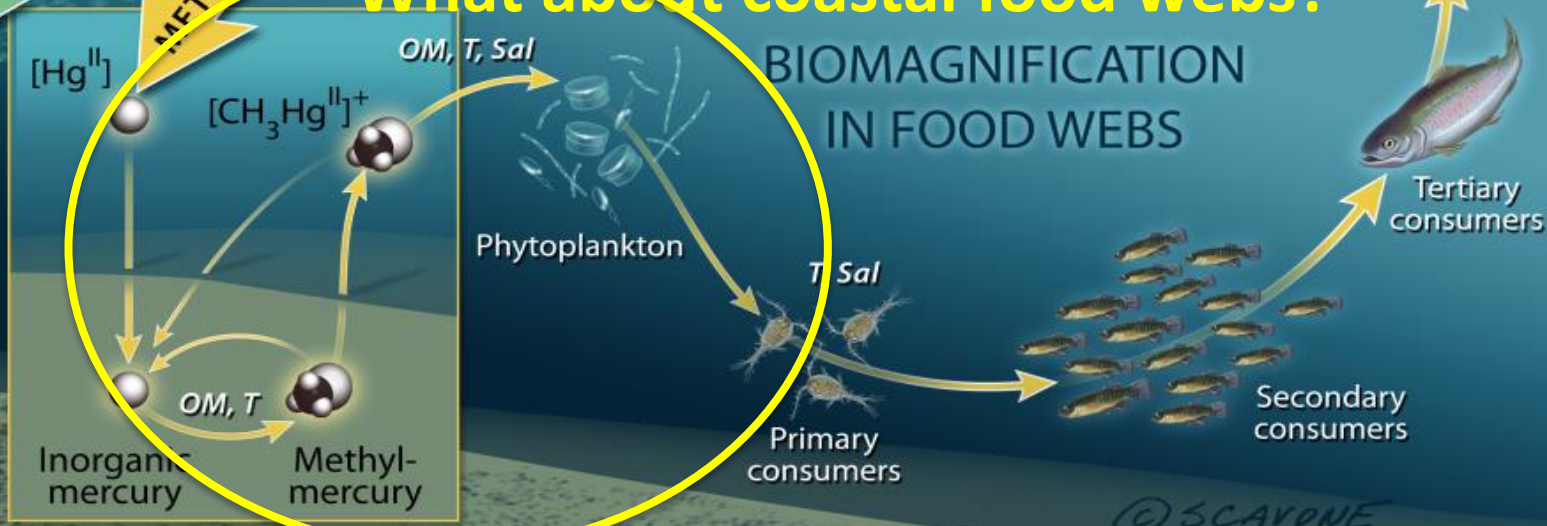
What about coastal food webs?



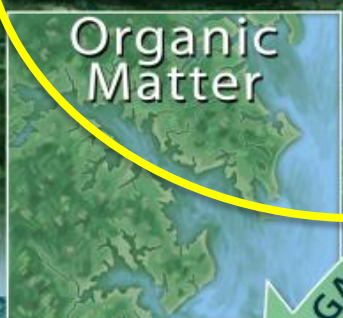
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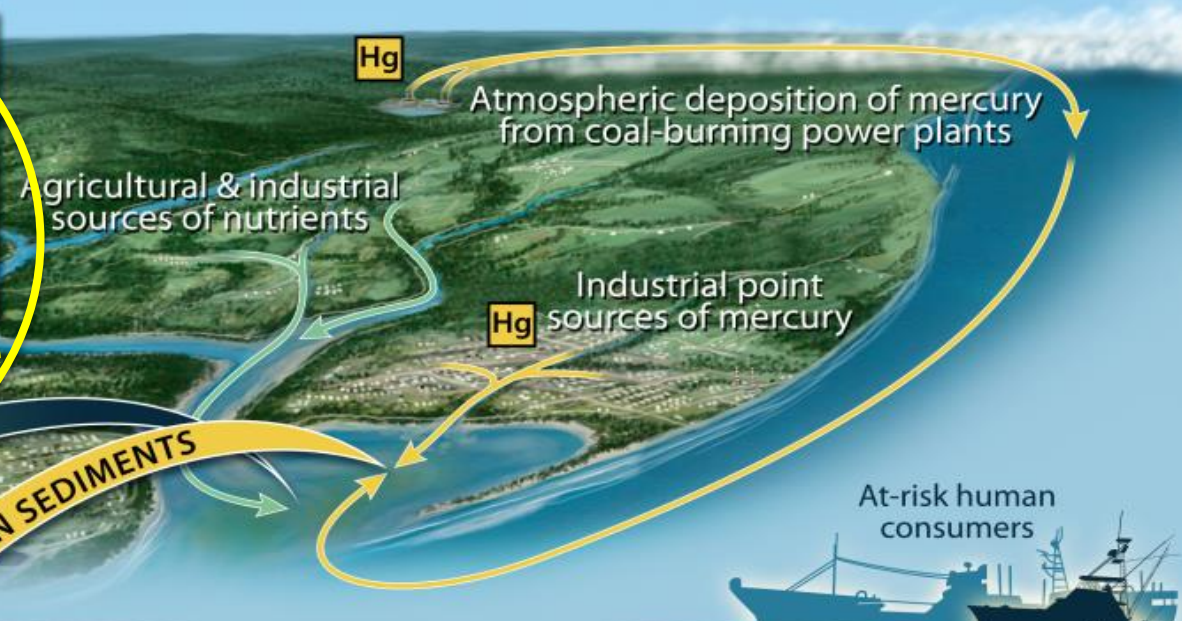
What about coastal food webs?



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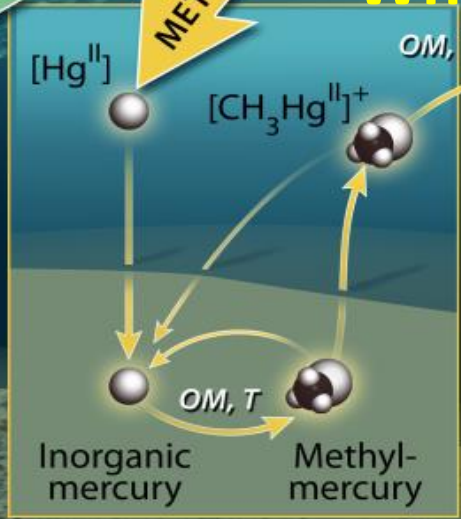
Climate change variables



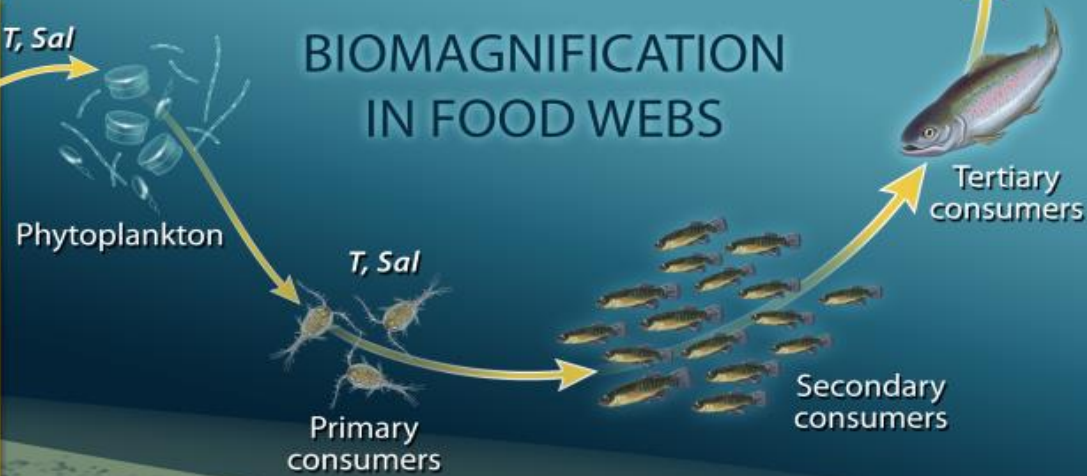
ALGAL BLOOMS

METHYLATION IN SEDIMENTS

What about coastal food webs?

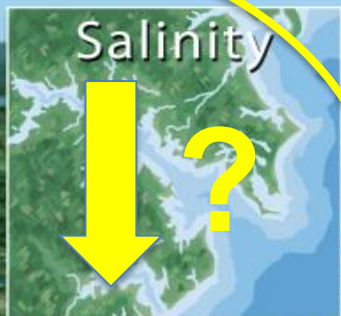
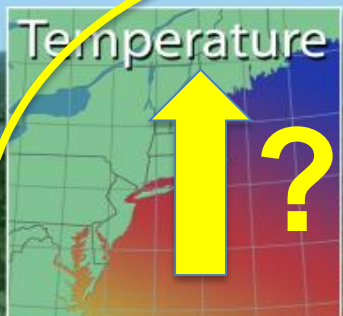


BIOMAGNIFICATION IN FOOD WEBS



Organic matter in sediments

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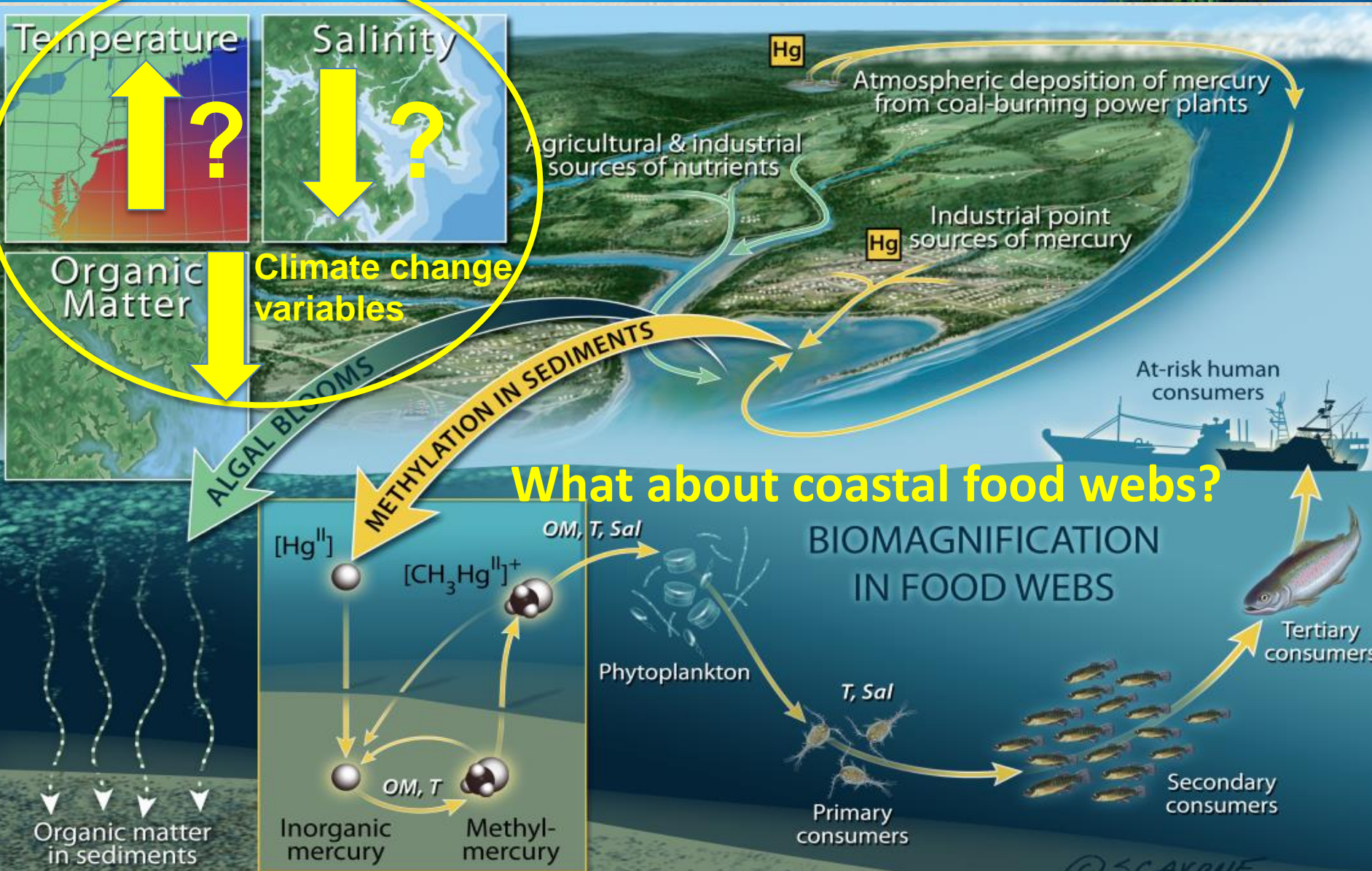
Climate change variables

ALGAL BLOOMS

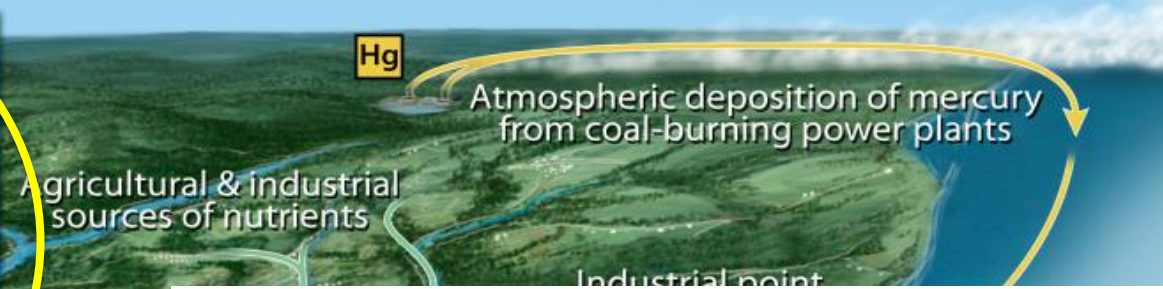
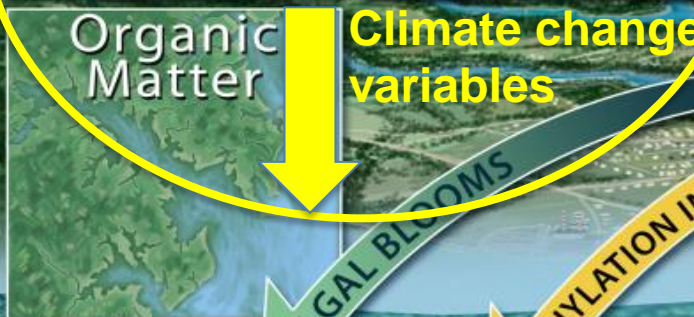
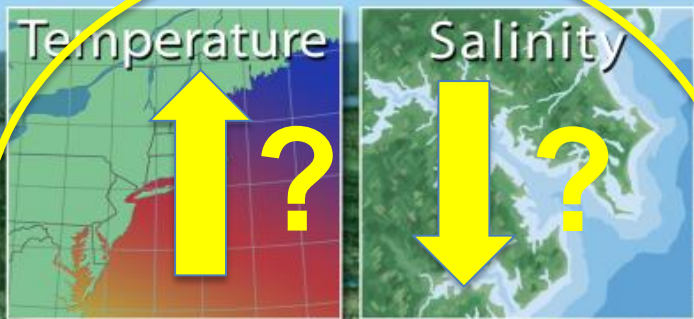
METHYLATION IN SEDIMENTS

What about coastal food webs?

BIOMAGNIFICATION IN FOOD WEBS



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2013 PLOS ONE

Experimental and Natural Warming Elevates Mercury Concentrations in Estuarine Fish

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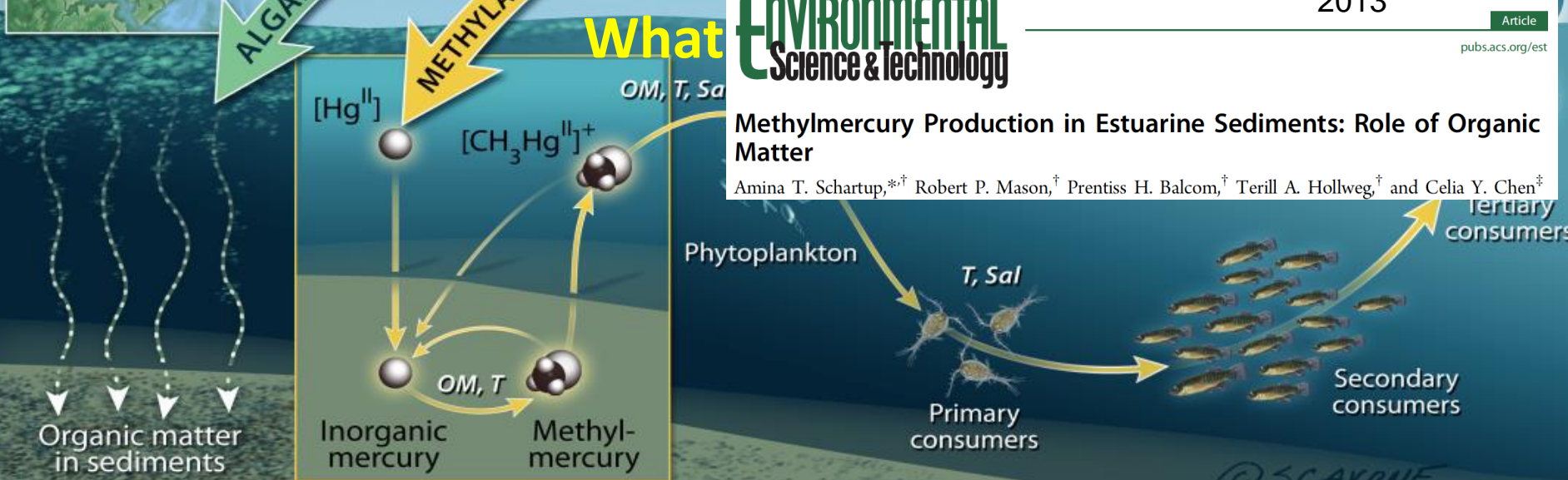
2013

Article

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Methylmercury Production in Estuarine Sediments: Role of Organic Matter

Amina T. Schartup,^{*,†} Robert P. Mason,[†] Prentiss H. Balcom,[†] Terill A. Hollweg,[†] and Celia Y. Chen[‡]



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Translating Science for Decision Makers

MERCURY MATTERS

*Linking Mercury Science
with Public Policy
in the Northeastern United States*

<http://hubbardbrookfoundation.org/mercury-matters-linking-mercury-science-with-public-policy-in-the-northeastern-united-states/>

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SOURCES TO SEAFOOD

<http://www.dartmouth.edu/~toxmetal/C-MERC/index.html>

MERCURY POLLUTION IN
THE MARINE ENVIRONMENT

The Coastal and Marine Mercury
Ecosystem Research Collaborative

DECEMBER 2012

Translating Science for the Public



Dartmouth Toxic Metals

<http://www.dartmouth.edu/~toxmetal/mercury-source-to-seafood/index.html>

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