

Review of Mercury TMDL Approaches

July 18, 2006



EPA's Listing of Approved Hg TMDLs

Pollutant	# of TMDLs
Contaminated sediments (mercury)	2
Mercury	237
Mercury (Fish Tissue)	6
Mercury in Fish Tissue	52
Methylmercury	5
Total	302

- Actual number of TMDL projects is probably closer to 120
- Significant variation in approaches to developing the TMDL

Review of Hg TMDLs

- Reviewed TMDLs that were available online (through EPA or the State websites)
- Tried to review at least 1 TMDL from each state that had approved Hg TMDLs
- Tried to look at most recent examples from a State
- Reviewed 21 different Hg TMDLs from 16 different States

AR	DC	MD	NY
AZ	GA	MS	OR
CA	KS	NC	PA
CO	LA	NJ	WA

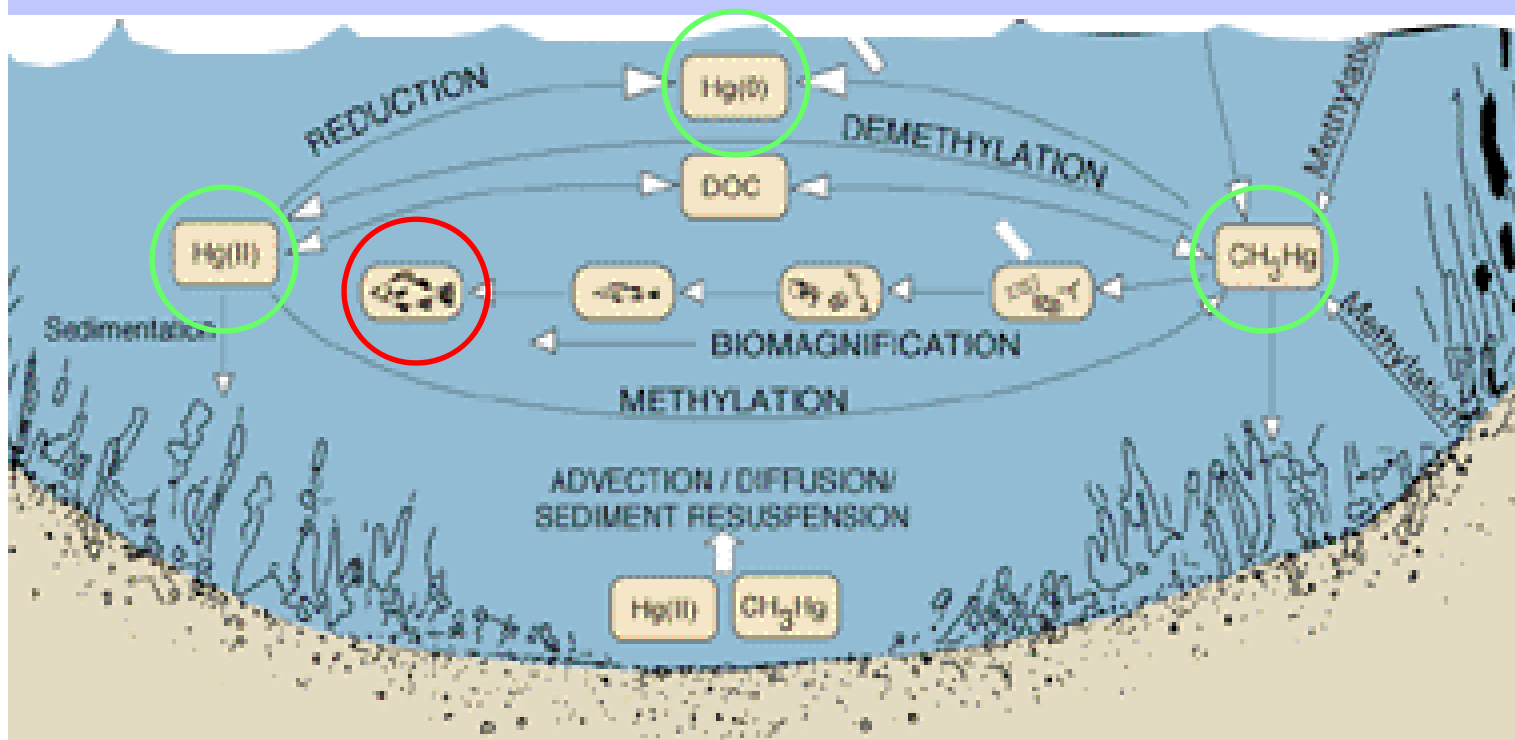


Basic Conceptual Model for Hg Uptake

- 1st Difference: TMDL target

What is it that we are trying to protect?

Hg Load
Inputs



- Atmospheric
- Point sources
- etc

TMDL Targets

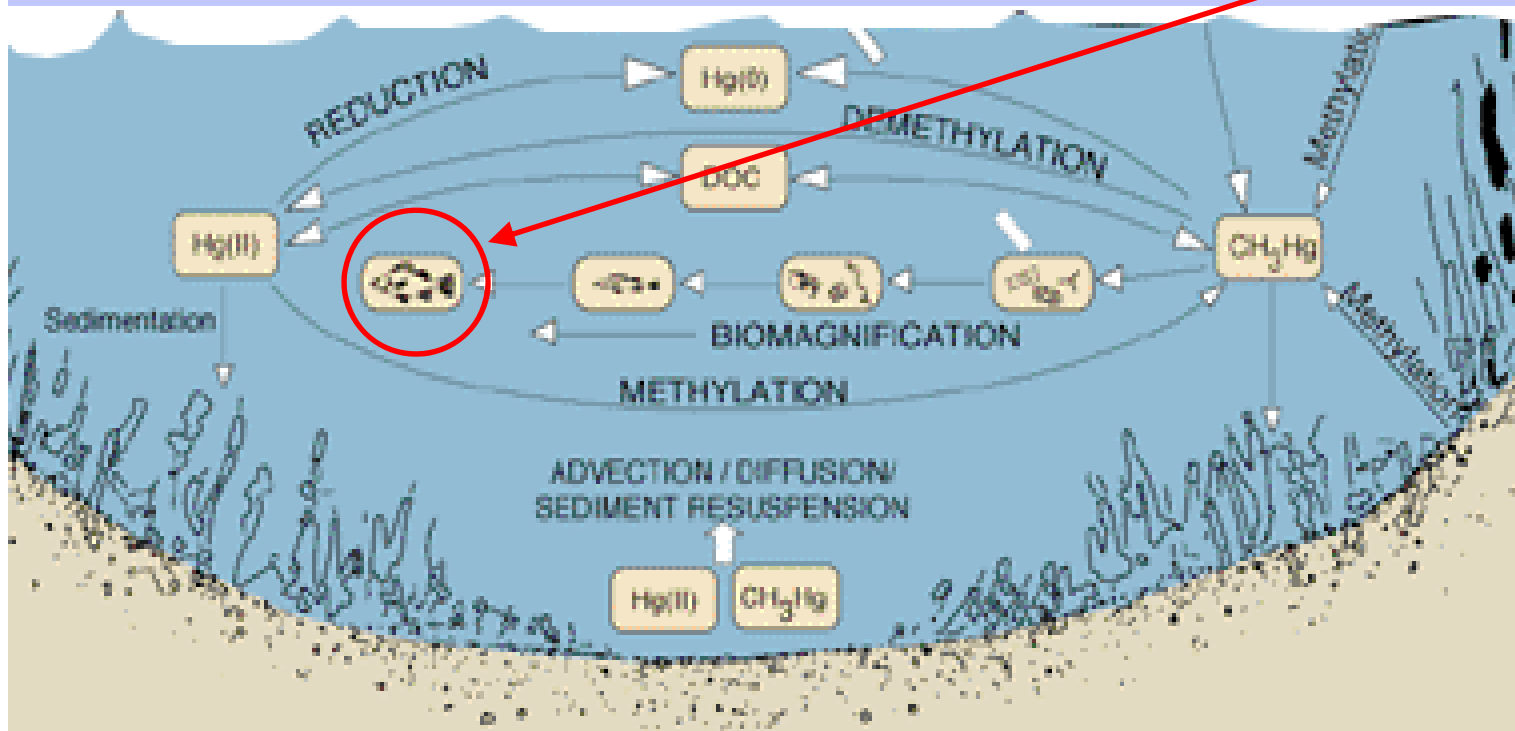
	Fish Tissue Level	Water Quality Standard	Other
No. of TMDLs	14	6	1
Various Target Values	0.2, 0.23, 0.231, 0.235, 0.3, 0.4, 0.5, 0.8, 1ppm	12, 25, 50 ng/L	TSS TMDL
Origin of Target	HH advisory level; +MOS; wildlife protection	State WQS	Hg associated with sediments

Basic Conceptual Model for Hg Uptake

- 2nd Difference: Fish Tissue Linkage

How are fish tissue concentrations linked to Hg loads?

Hg Load
Inputs



- Atmospheric
- Point sources
- etc

3 Main Approaches to Linking Hg Loads to Fish Concs.

1. Direct 1:1 Hg load to fish tissue relationship

- 59% reduction in fish tissue concentrations needed, so 59% reduction in Hg loads needed (Ex. LA gulf waters)

2. Bioaccumulation Factor (BAF)

- Use site-specific (or national) information to translate fish tissue concentrations into a protective water column concentration, then model TMDL to meet water column concentration (Ex. Savannah River, GA)

3. Mechanistic mercury cycling model

- Models Hg speciation, transformations, uptake, and bioaccumulation (Ex. Arivaca Lake)

Linkage Between Fish Tissue and Hg Loads

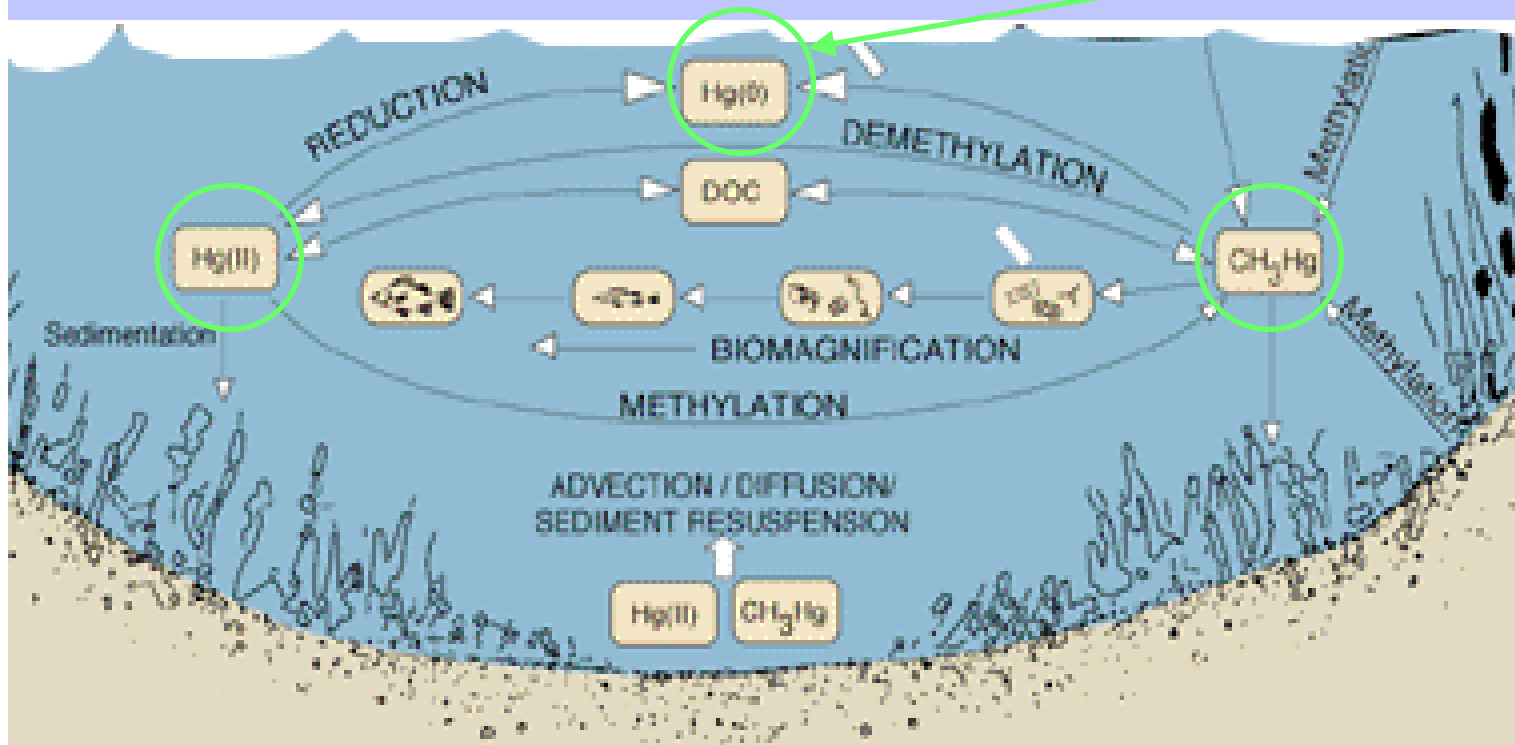
	Direct Load to Fish Relationship	BAF	Mercury cycling model
No. of TMDLs	4	7	3
Resulting Water Column Conc.		THg – 1.53, 2.15, 2.2, 2.42, 2.8, 9.3 ng/L MeHg – 0.06ng/L	

Basic Conceptual Model for Hg Uptake

- 3rd Difference: Water Column Linkage

How are water column concentrations linked to Hg loads?

Hg Load Inputs



- Atmospheric
- Point sources
- etc

4 Approaches to Linking Hg Loads to Water Concs.

- 1. Direct 1:1 Hg load to water column relationship**
 - 50% reduction in water column concentrations needed, so 50% reduction in Hg loads needed
- 2. Annual mass balance**
 - Protective water column conc. X annual flow = TMDL
- 3. Modeled inputs and transports**
 - Watershed and water quality models used to connect Hg loads to dynamic water column concentrations
- 4. Administrative decision**
 - Instream MeHg load reductions were assigned based on direct 1:1 relationship, but because of instream MeHg production, there is no connection to source loads; so THg load reductions were set administratively

Linkage Between Water Column and Hg Loads

	Direct Load to Water Column Relationship	Annual Mass Balance	Water Quality Model	Administrative Decision
No. of TMDLs	1	7	7	1
Models Used			HSPF, LSPC, GWLF, WASP, SWMM	

Likely Direction of South River Hg TMDL

- TMDL Target – 0.5 ppm fish tissue concentration, with possible consideration of 0.3 ppm level and potential wildlife effects
- Fish Tissue Linkage – Site-specific BAF to link fish tissue Hg to THg in water column
- Water Column Linkage – Watershed and water quality model (HSPF with possible incorporation of WASP)

