

# Mercury in Fish: To Eat or Not to Eat...

Presentation to the Friends of Bighorn Lake

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# Mercury – Two forms

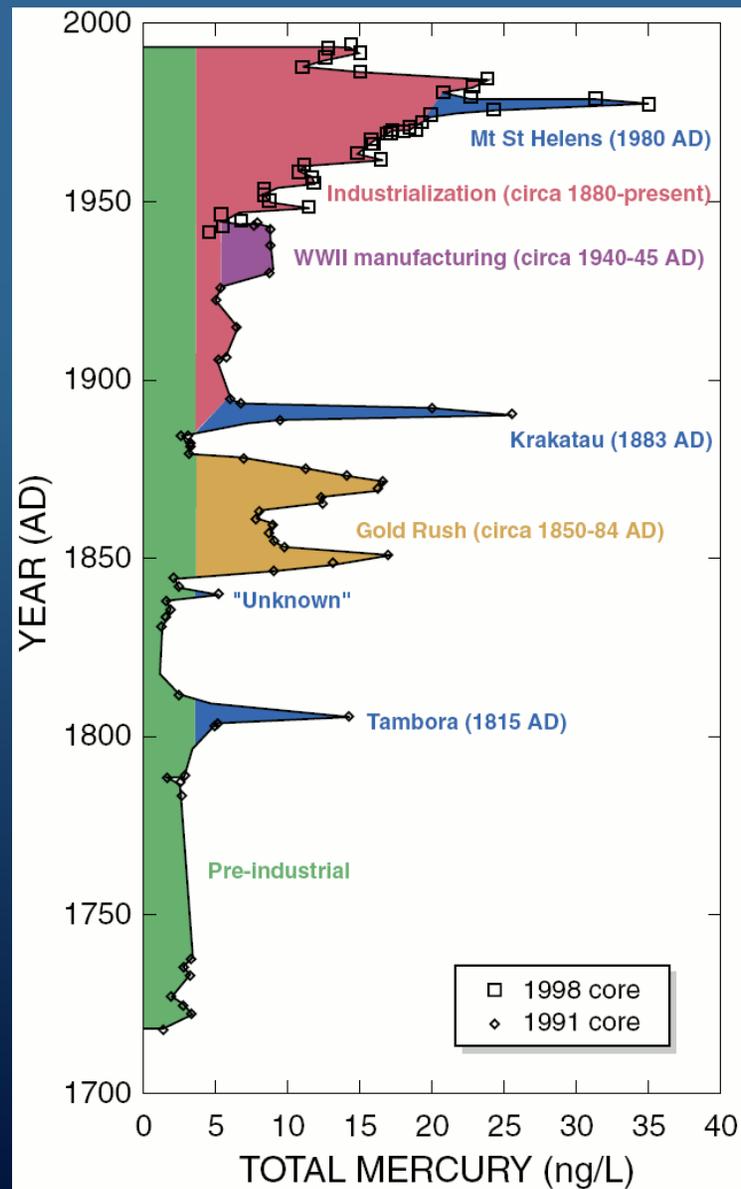
## ▣ Elemental:

- Also known as 'quicksilver'
- Only metal that is a liquid at room temperature
- Primary health concern is through inhalation of vapors

## ▣ Organic/methylmercury:

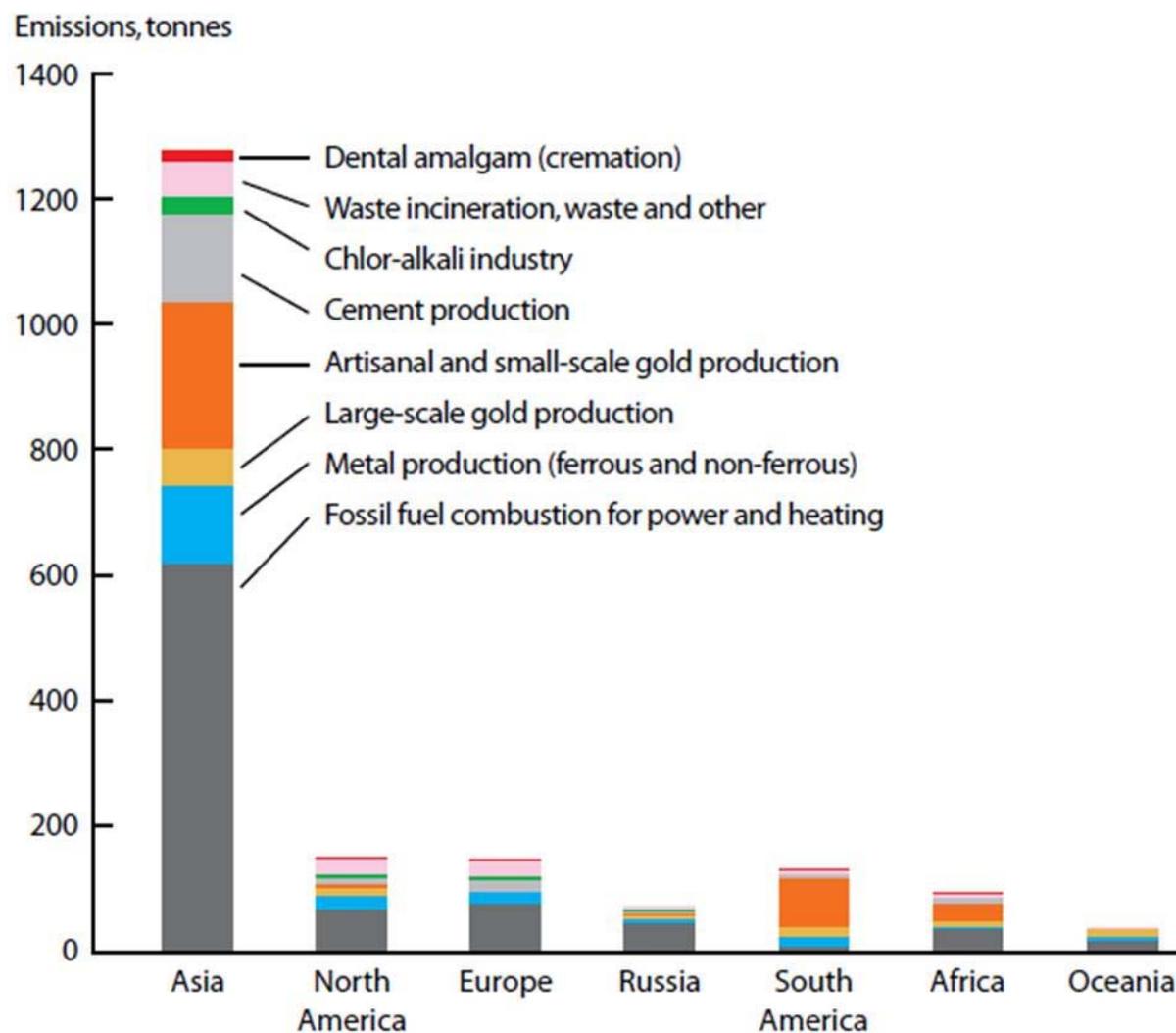
- Few direct anthropogenic sources
- Predominately formed by the action of anaerobic organisms
- Primary health concern is through ingestion

# Sources of mercury



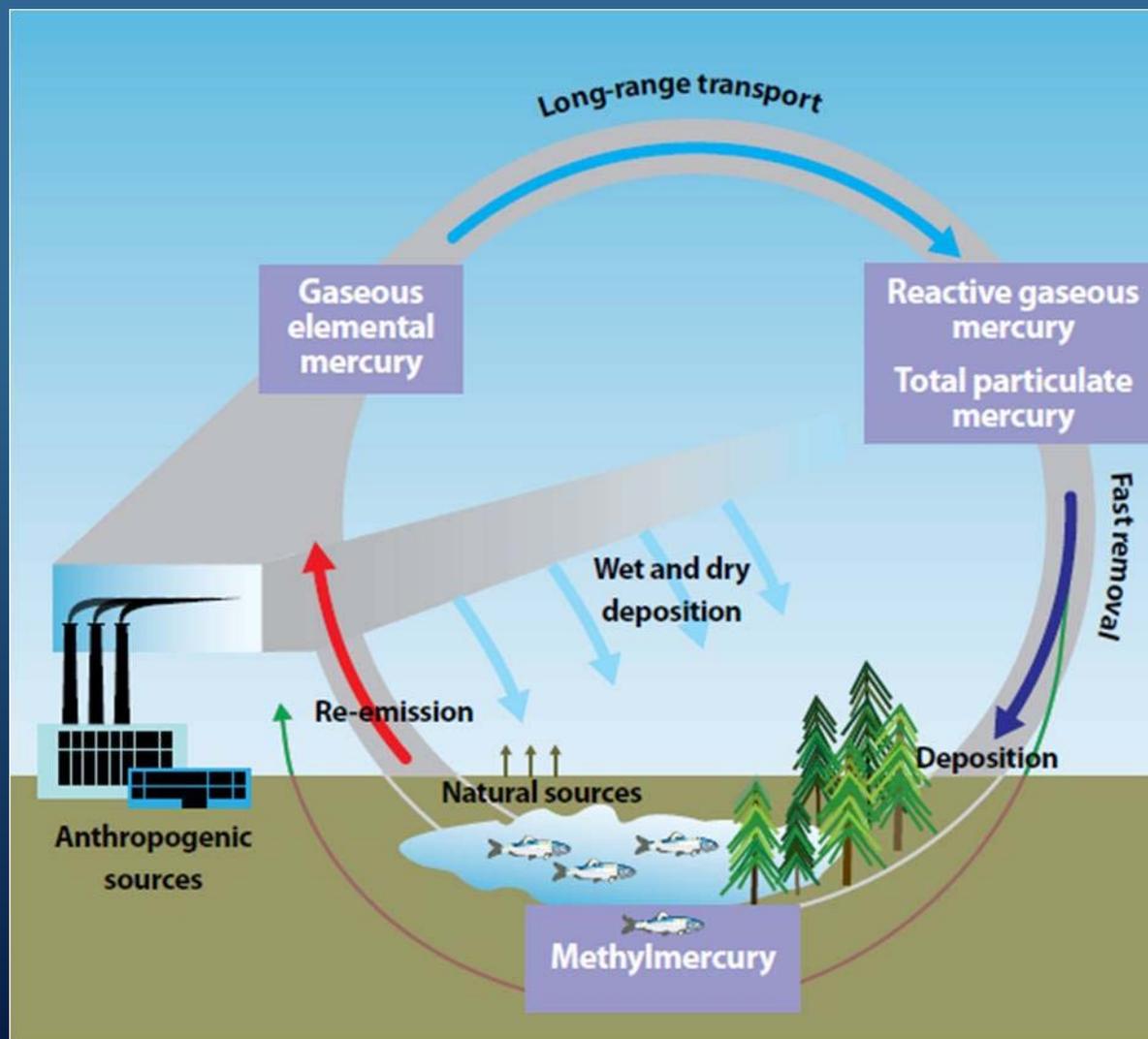
Source: USGS

# Sources of mercury



Source:  
United  
Nations  
Environment  
Programme

# Sources of mercury



Source: United Nations Environment Programme

# Why is mercury a concern?

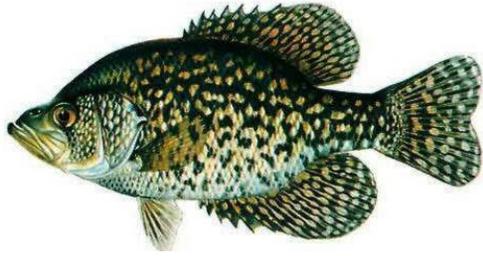
- ▣ **Neurotoxin**
  - Causes paraesthesia, tremors, ataxia, and hearing and vision impairments
  - Cerebral palsy-like symptoms, delayed learning and motor skills, and other neurological effects
  - Irreversibly inhibits selenoenzymes
    - ▣ Prevent oxidative damage to the brain
- ▣ **Bioaccumulates and biomagnifies in the environment**
- ▣ **“Consumption of fish is by far the most significant source of ingestion-related mercury exposure in humans and animals”—US EPA**

# The general process

- ▣ WGFD collects tissue samples from individual fish in the field
  - Focus on the muscle tissue (fillet) that is consumed
  - Non-lethal muscle plug or piece from fillet
- ▣ Individual or composite samples processed
  - Tissue samples from up to five individuals
- ▣ US EPA analyzes processed samples: Hg and Se
- ▣ WDOH issues consumption advisories
- ▣ WGFD & WDOH inform and educate consumers

# Historic sampling

- ▣ 1972–2007
  - Collected sporadically – one or two individuals
  - Focused primarily on standing waters
  - Sampled 48 waters
    - ▣ 10 contained individuals “high” in mercury
  - Sampled 20 species
    - ▣ 12 of which were “high” in mercury



Black crappie

Longnose sucker



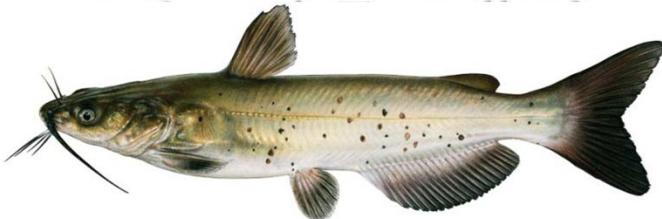
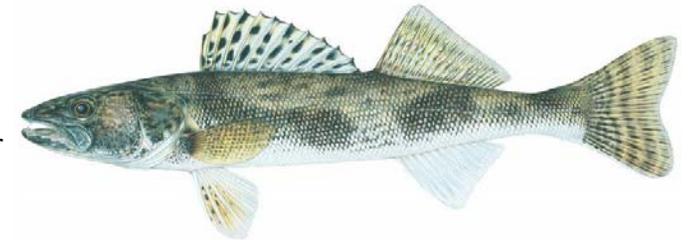
Brown trout

Northern pike



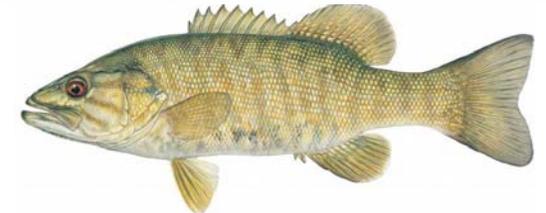
Burbot

Sauger



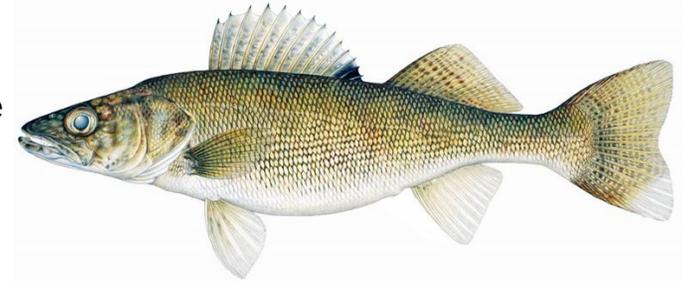
Channel catfish

Smallmouth bass



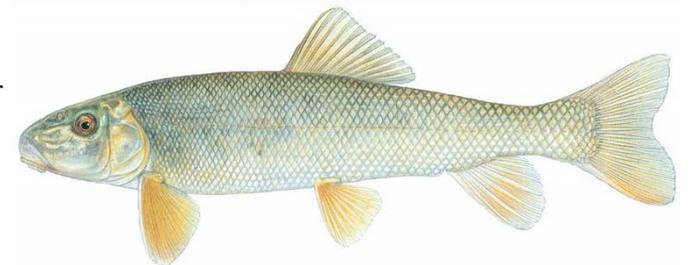
Common carp

Walleye



Lake trout

White sucker



# Historic consumption advice

- ▣ First 'Consumption Advice' published in 2006–2007 Fishing Regulations - No species information
- ▣ 2008–2009, 2010–2011, and 2012–2013 (1<sup>st</sup> printing) Regulations separated species by "high" and "low"
  - "High": Channel catfish, sauger, and walleye from Big Horn, Boysen, Seminoe, and Pathfinder reservoirs
  - "Low": Wyoming-caught trout, farm-raised catfish and tilapia, "other species continue to be monitored"
  - Also listed ocean fish

# Current sampling

## ▣ 2011–present

- Began standardized, intensive sampling
  - ▣ Four or five individuals from each length class
  - ▣ 6–8, 8–10, 10–12, 12–15, 15–20, 20–25, 25–30, 30–35, 35–40, 40+
- Processed as composite samples
- Focuses primarily on species suspected to be “high” in mercury or commonly consumed
- Currently focuses primarily on standing waters

# Current sampling

- ▣ 2011–present
  - Sampled 48 waters
  - Sampled 14 species
    - ▣ All of which were “high” in mercury in at least one water



# Current consumption advice

- Issued by the WY Department of Health

	Mercury level in Wyoming-caught fish in parts per million (ppm)				
	$\leq 0.16$	0.17 – 0.35	0.36 – 0.65	$\geq 0.66$	
<b>Women who might become pregnant; women who are pregnant; nursing mothers; children less than 15 years of age</b>	Up to 2 meals a week	Up to 1 meal a week	Up to 1 meal a month	Do not eat	
	$\leq 0.16$	0.17 – 0.35	0.36 – 0.65	0.66 – 2.88	> 2.8
<b>All other persons</b>	Unrestricted	Up to 2 meals a week	Up to 1 meal a week	Up to 1 meal a month	Do not eat



Rainbow trout



Splake  
(brook trout × lake trout)



Snake River cutthroat trout



Tiger trout  
(brown trout × brook trout)



Yellow perch



Yellowstone cutthroat trout

# Consumption Advisory on Bighorn Lake

## ▣ Channel catfish

- ▣ Less than 20" – Up to 4 meals per month – High risk  
– Up to 8 meals per month – Low risk
- ▣ Greater than 20" – Do not consume – High risk  
– Up to 1 meal per month – Low risk

## ▣ Walleye and sauger

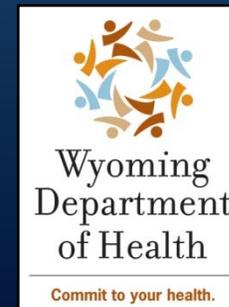
- ▣ Less than 12" – Up to 4 meals per month – High risk  
– Up to 8 meals per month – Low risk
- ▣ 12 – 15" – Up to 1 meal per month – High risk  
– Up to 4 meals per month – Low risk
- ▣ Greater than 15" – Do not consume – High risk  
– Up to 1 meal per month – Low risk

# Take home messages

- ▣ Fish are an important part of a healthy diet
  - Low in saturated fat, high quality protein, essential nutrients, omega-3 fatty acids
- ▣ Some fish are high in mercury
  - Consumption should be limited, especially for 'high-risk' demographic
    - ▣ Women of childbearing age and young children
- ▣ Check the Consumption Advice on the WGFD website regularly
  - Most up-to-date source for meal advice

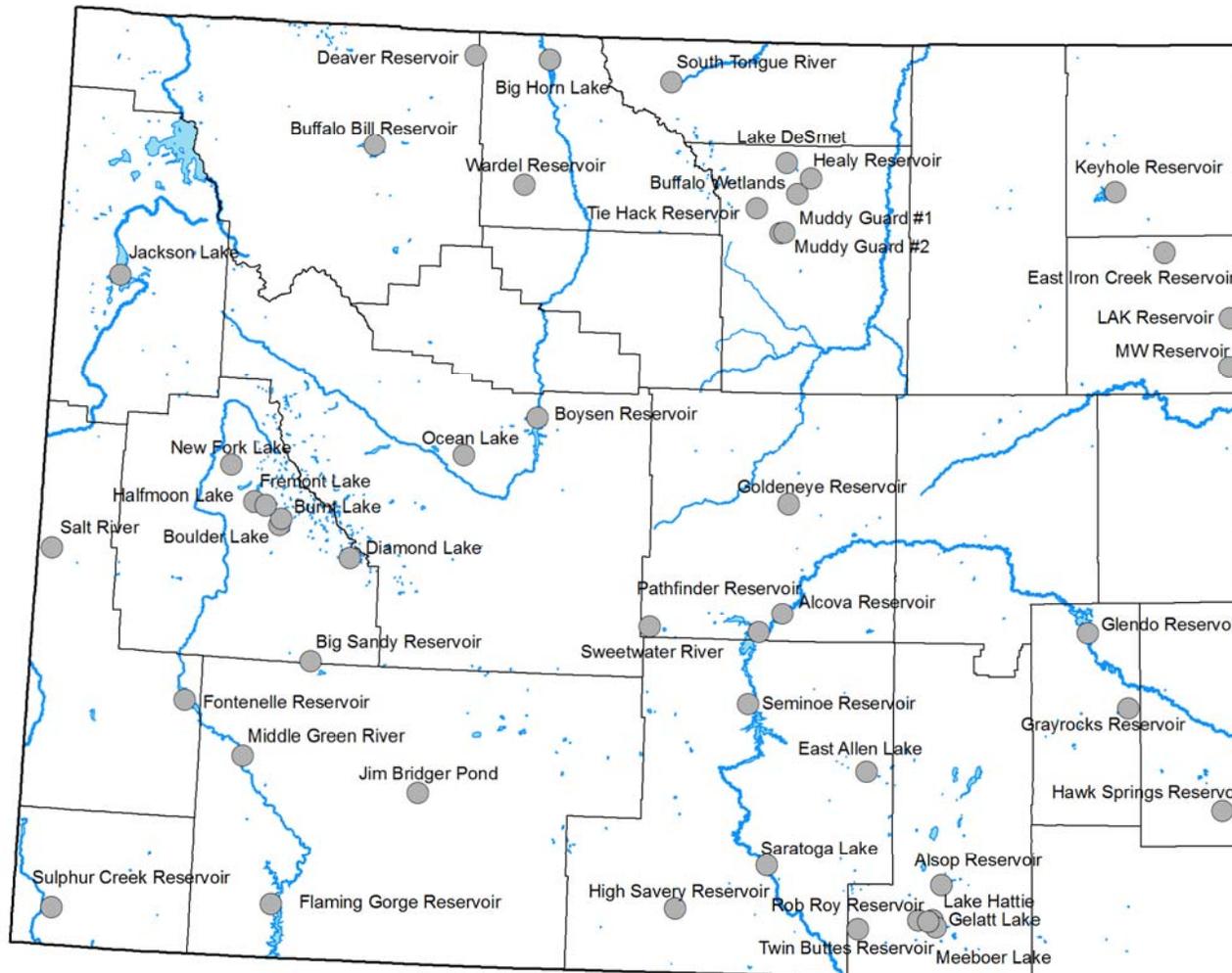
# Acknowledgements

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  - Toney Ott
  - Jack Sheets
- ▣ Wyoming Department of Health
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  - Dr. Tracy Murphy



# Waters sampled

Fish Tissue Monitoring Locations, 2000 - 2013



0 50 100 200 Miles

