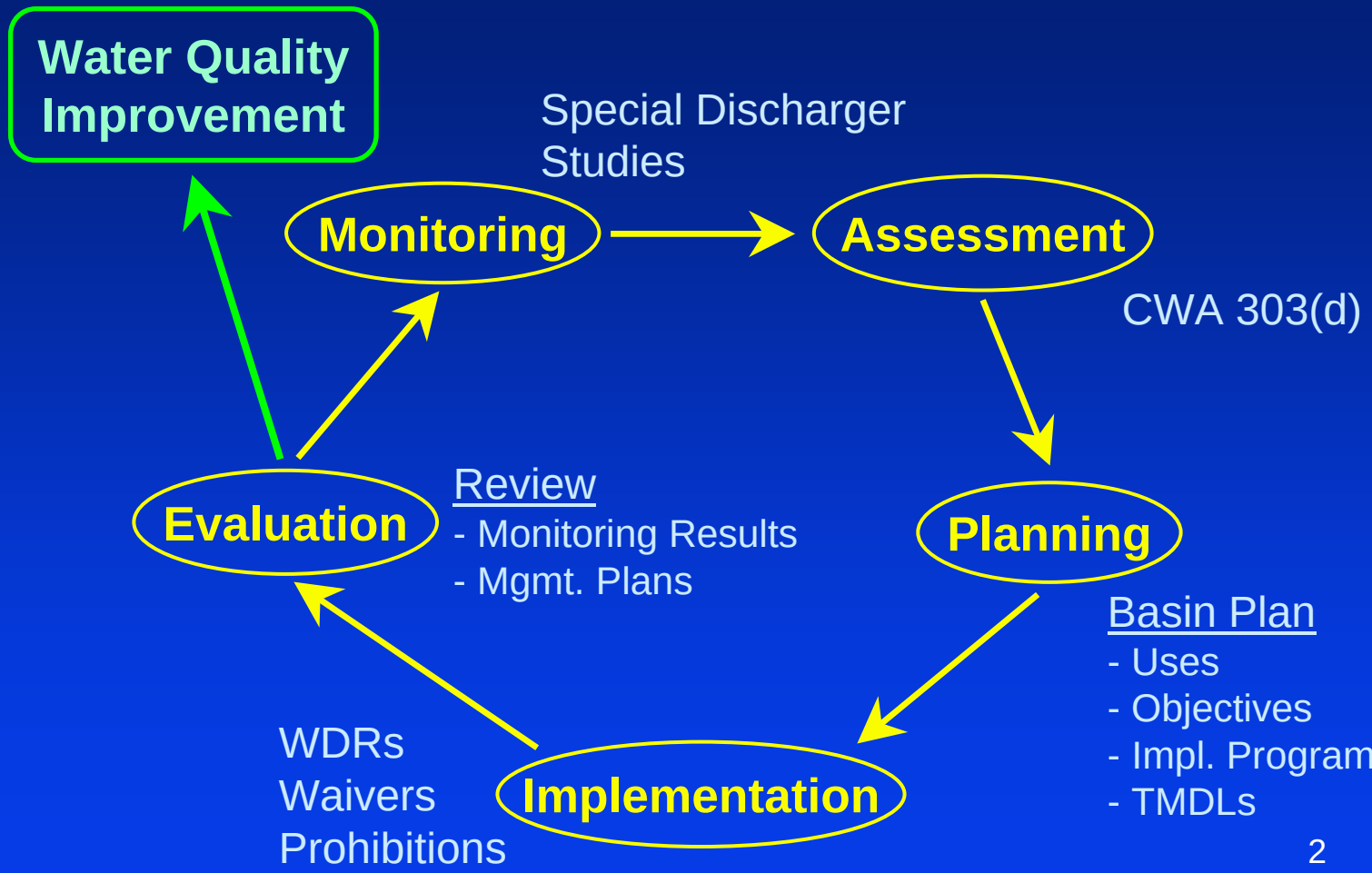
Board Workshop

Methylmercury Basin Plan Amendment for the Sacramento-San Joaquin River Delta Estuary

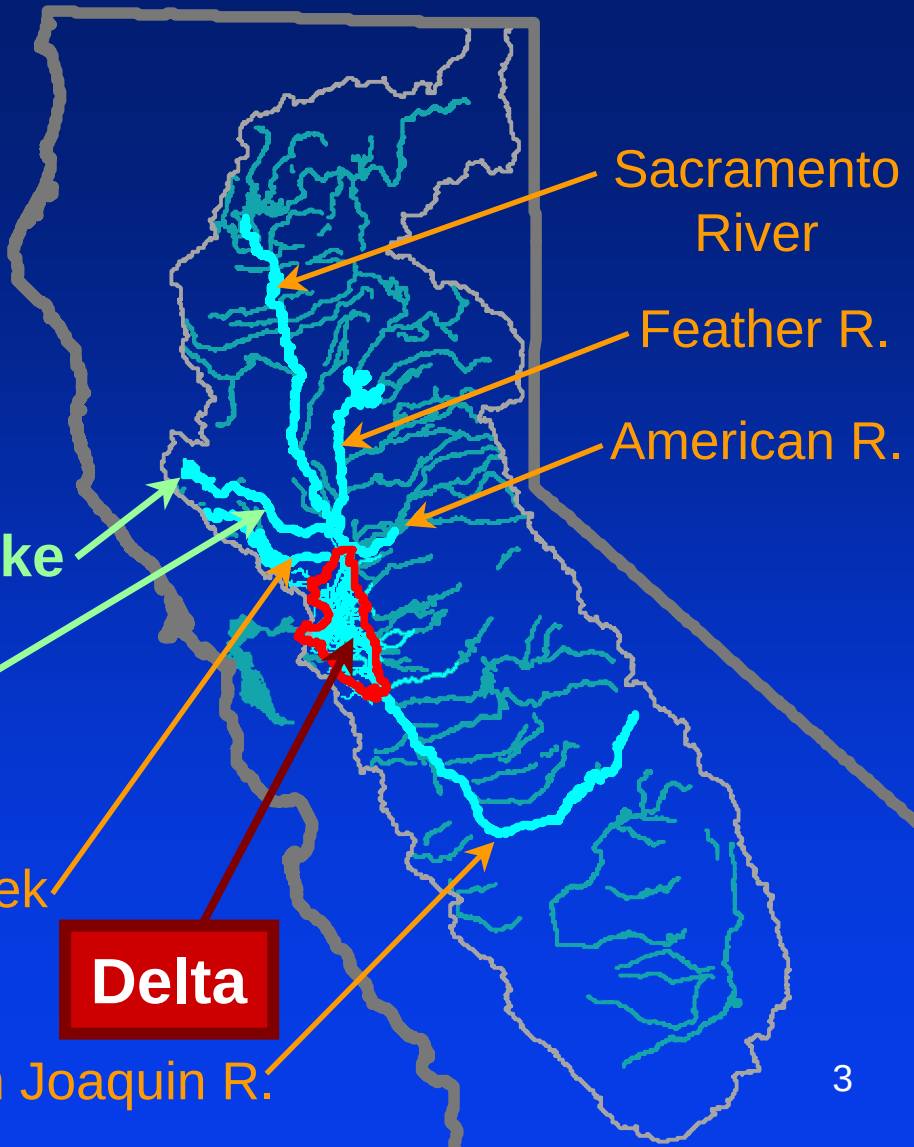
28 November 2005

Michelle Wood & Patrick Morris

Water Quality Management Process



Central Valley Mercury TMDLs



Outline

- Background
- Delta Methyl & Total Mercury Control Program

Delta Mercury Impairment

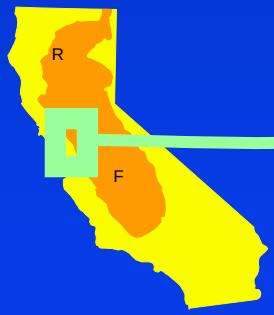
- High mercury levels in fish
- Fish consumption advisories
- Federal CWA 303d list
- TMDL Program to address impairment

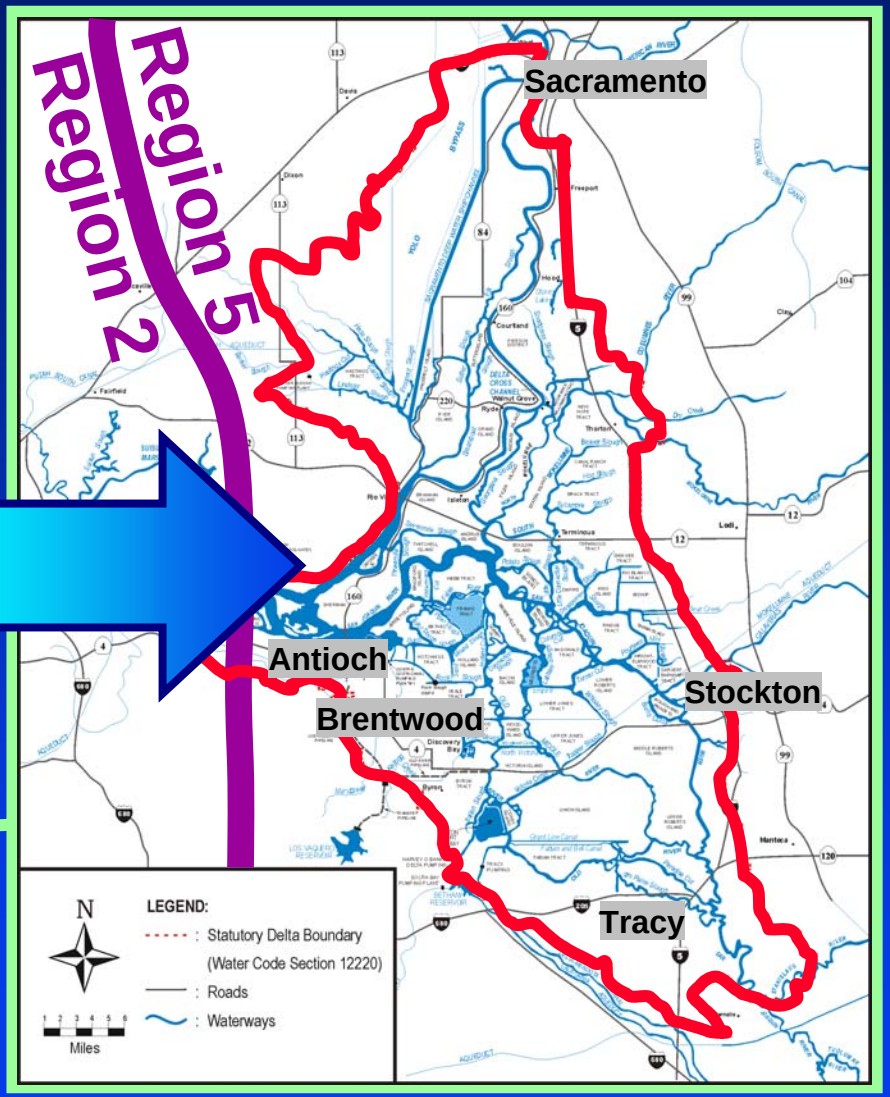
The Delta

>1100 mi waterways
Drains ~1/3 of CA

San Francisco Bay

Reduce
Central Valley
Mercury Outflows by
110 Kg





Delta Methyl & Total Mercury Control Program

Reduce mercury levels in Delta fish

Reduce mercury loading to San Francisco Bay

Why is Mercury a Problem?

Neurotoxicant: Impairs nervous, reproductive, & immune systems in humans & wildlife

- Humans: deficits in memory, attention, motor control
- Wildlife: reductions in learning, social behavior, physical abilities

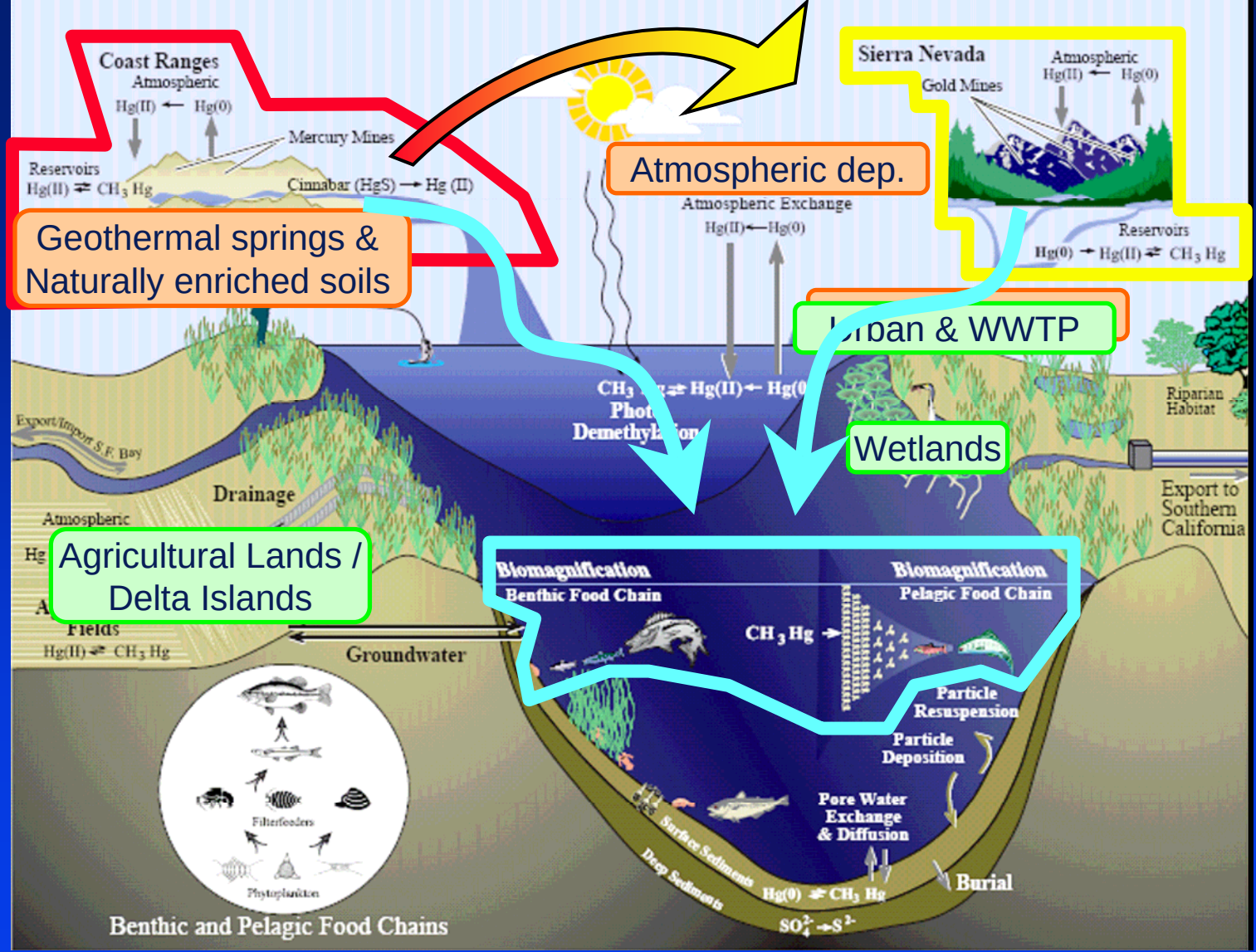
Methylmercury

- Sulfate-reducing bacteria convert mercury to MeHg
- Most toxic form of mercury
- >90% mercury in top trophic level fish is MeHg
- Exposure to MeHg is through consumption of fish & shellfish

Methylmercury Bioaccumulates

Low water MeHg levels result in high MeHg levels in fish

water : largemouth bass
1: 6,500,000


Coast Ranges
Atmospheric
Hg(II) ← Hg(0)
Mercury Mines
Reservoirs
Hg(II) ⇌ CH3 Hg
Cinnabar (HgS) → Hg (II)
Geothermal springs & Naturally enriched soils
Atmospheric dep.
Sierra Nevada
Gold Mines
Atmospheric
Hg(II) ← Hg(0)
Reservoirs
Hg(0) → Hg(II) ⇌ CH3 Hg
Atmospheric Exchange
Hg(II)←Hg(0)
Urban & WWTP
Wetlands
Riparian Habitat
Export/Import S.F. Bay
Drainage
Atmospheric
Export to Southern California
Agricultural Lands / Delta Islands
Fields
Hg(II) ⇌ CH3 Hg
Groundwater
Biomagnification
Benthic Food Chain
Biomagnification
Pelagic Food Chain
CH3 Hg
Particle Resuspension
Particle Deposition
Pore Water Exchange & Diffusion
Surface Sediments
Deep Sediments
Hg(0) ⇌ CH3 Hg
Burial
Filterfeeders
Phytoplankton
Benthic and Pelagic Food Chains

Concerns about Mercury Reduction

- Millions of kilograms released to waterways by historic mining
- Much remains in channels & may be untreatable
- Necessitate reliance on natural erosion as a reduction strategy
- May take centuries to wash the mercury from the waterways

Interrupt the Methylation Cycle

- Identify sources of MeHg
  - Reduce methylation, and/or
  - Reduce mercury sources that supply the methylation sources
- Shorten time to see fish tissue improvements from <u>centuries</u> to <u>decades</u>

Outline

- Background
- **Methyl & Total Mercury Control Program**
  - Fish Tissue Objective
  - Implementation Plan for Source Reduction

Fish Tissue Objective Alternatives

- Protect humans and wildlife
- Main factor is fish consumption rates
- There are many options…

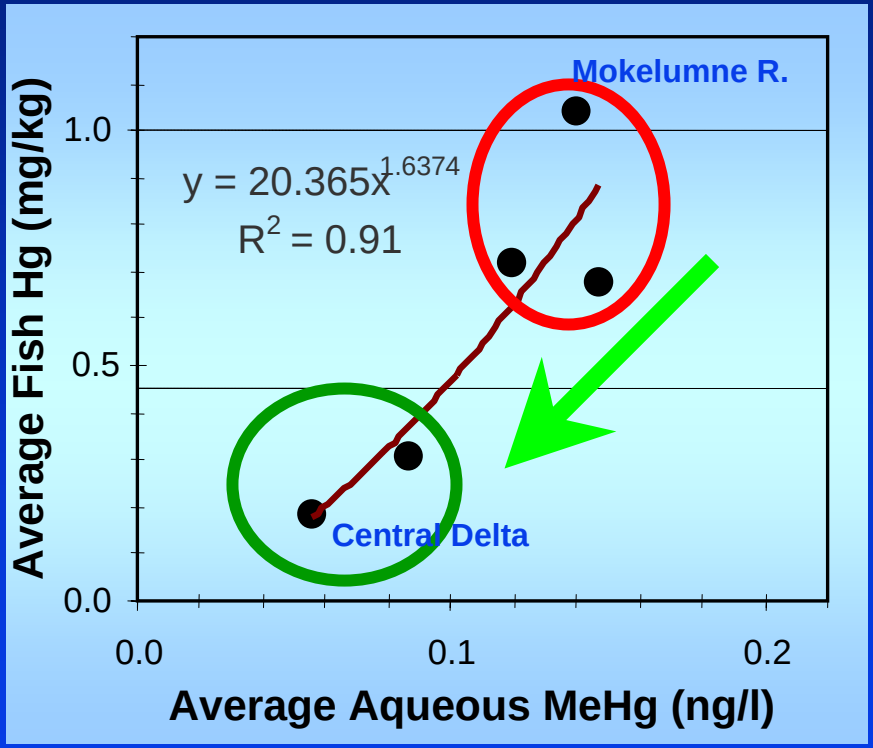
Safe Levels for Wildlife

Available information indicates <u>0.30 mg/kg</u> in bass & catfish is protective of Delta wildlife

A. Alternatives for Fish Tissue Objectives

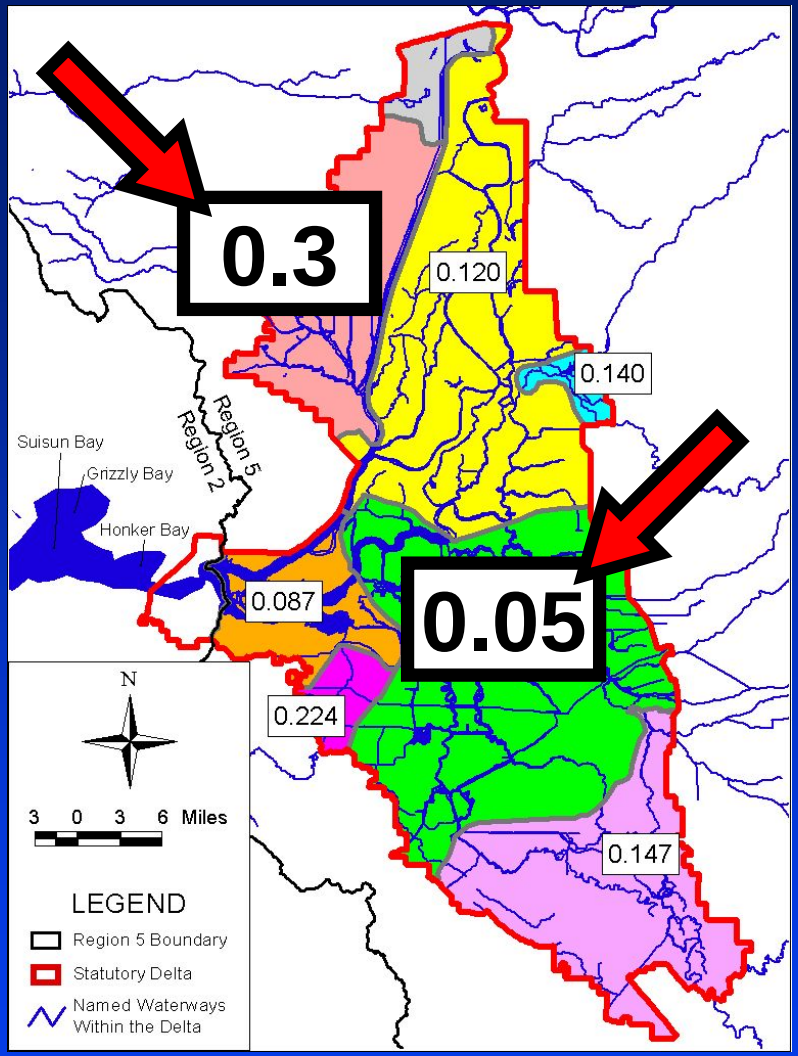
Objective (catfish & bass, mg/kg)	Safe Consumption Amounts for Humans & Implications
0.59	• One 8 oz. meal of a mixture of fish every 2 weeks (USEPA default) • Does not protect fish-eating wildlife • Delta anglers eat mostly catfish & bass
0.30	• One 8 oz. meal of bass/catfish every 2 weeks • Protects fish-eating wildlife & sport anglers
0.16	• One 8 oz. meal of bass/catfish every week • Protects 95th percentile of SF Bay anglers
0.05	• Four 8 oz. meals every week of bass/catfish • Protects subsistence fishers

MeHg Linkage



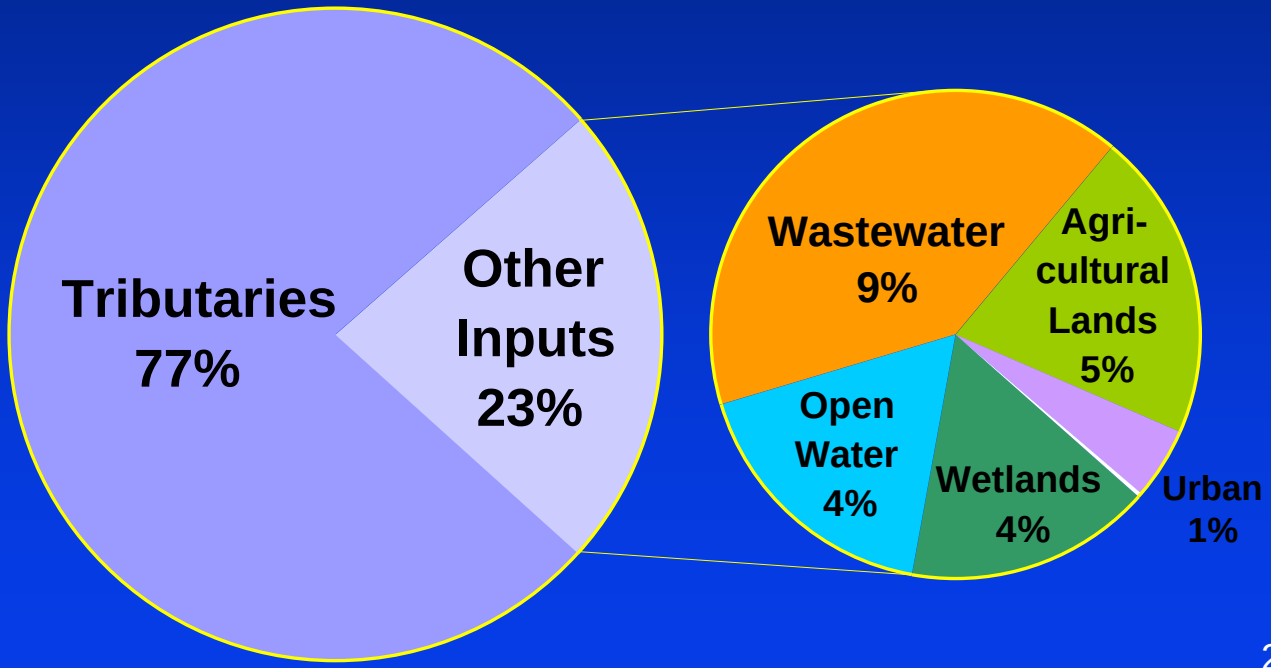
Average Annual Ambient Water MeHg Levels

(ng/l)



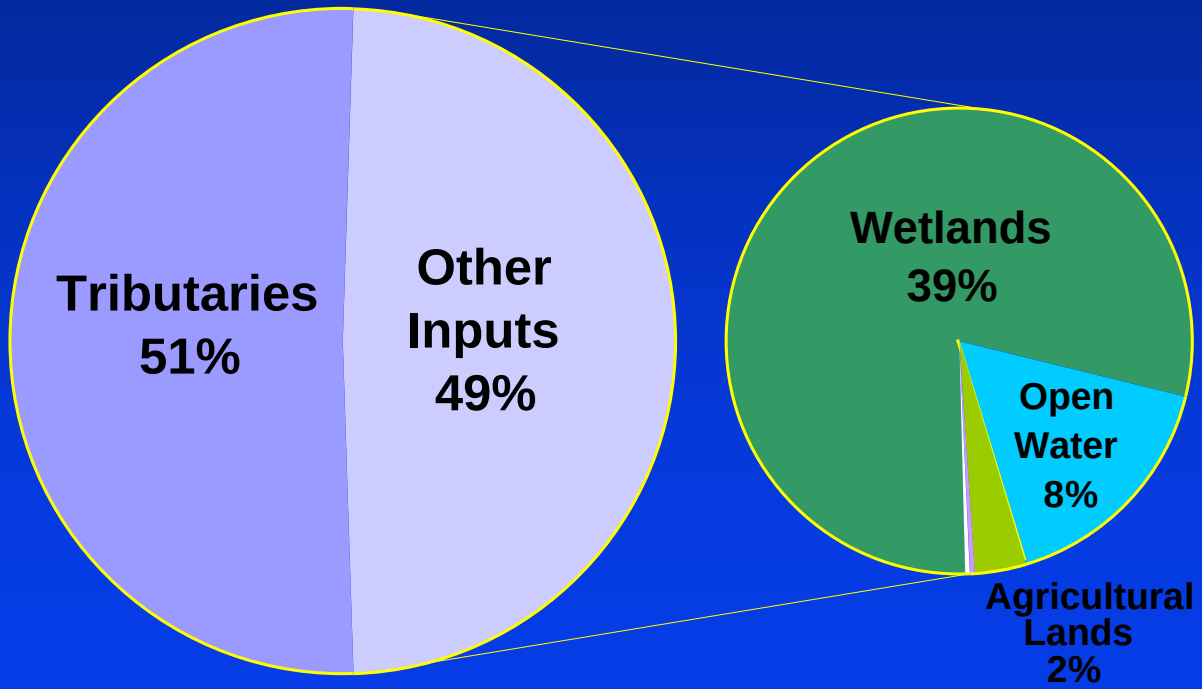
San Joaquin Subregion MethyIlmercury Sources

Total Loading: ~478 g/yr



Yolo Bypass Subregion Methylmercury Sources

Total Loading: ~1,000 g/yr



Outline

- Background
- Methyl & Total Mercury Control Program
  - Fish Tissue Objective
  - **Implementation Plan for Source Reduction**

Control Program

1. Control MeHg sources
2. Control TotHg sources
3. Reduce MeHg exposure to the fish eating public

No Net Increase from New Sources

- **"<u>No net increase</u>"** in MeHg or Hg loads from new or expanded projects
- ***GOAL*:** Prevent future projects from increasing MeHg levels

Methylmercury Sources in the Delta & within 30 Miles*

*1-day travel time by water

- Cap MeHg loads from: Atmospheric, dredging, open channel
- Reduce MeHg loads from: Agricultural, WWTPs, stormwater, wetlands, flood conveyance, Cache Creek Settling Basin
  - Focus on large dischargers within each source type.

Mercury Sources in the Delta & Downstream of Major Dams:

- **Cap** Hg loads from:
  Local atmospheric emissions, dredging, flood conveyance, WWTPs, and stormwater
- **Reduce** Hg loads by 110 kg from:
  Cache Creek Settling Basin, American & Feather Rivers & Putah Creek

5-Year Study Period:

- Conduct **<u>studies to characterize & control</u>** existing MeHg & Hg concentrations and loads
- ***GOALS*:**
  - Address uncertainty in load estimates
  - Develop technically & economically feasible controls

Alternatives

- Cap or reduce only within-Delta sources
- Prioritize source reductions:
  - Cap some sources, allow some to increase, and reduce other sources by a greater amount to compensate
- Require immediate load reductions with no additional studies

Mercury Offset Program

Enable beneficial projects*
to proceed if
on-site mercury controls
are not feasible

*Such as wetland restoration, WWTP expansion, flood conveyance & levee improvements, & changes in water management

Mercury Offset Program

- Total mercury
- Off-site control actions *in lieu* of on-site control actions
- First implement feasible on-site control actions
- Will consider a MeHg offset program after studies completion

Alternatives

- Adopt offset program when 5-year studies are complete
- Adopt offset program soon after June 2006 Hearing
- No offset program

Example: NPDES Facilities

- Cap all Hg discharges downstream of major dams
- Reduce MeHg loads from large facilities with high MeHg
- Cap MeHg concentrations from facilities with small discharges or low MeHg
- Base reductions on 2005 discharge volumes and loads

Example: NPDES Facilities
Alternatives

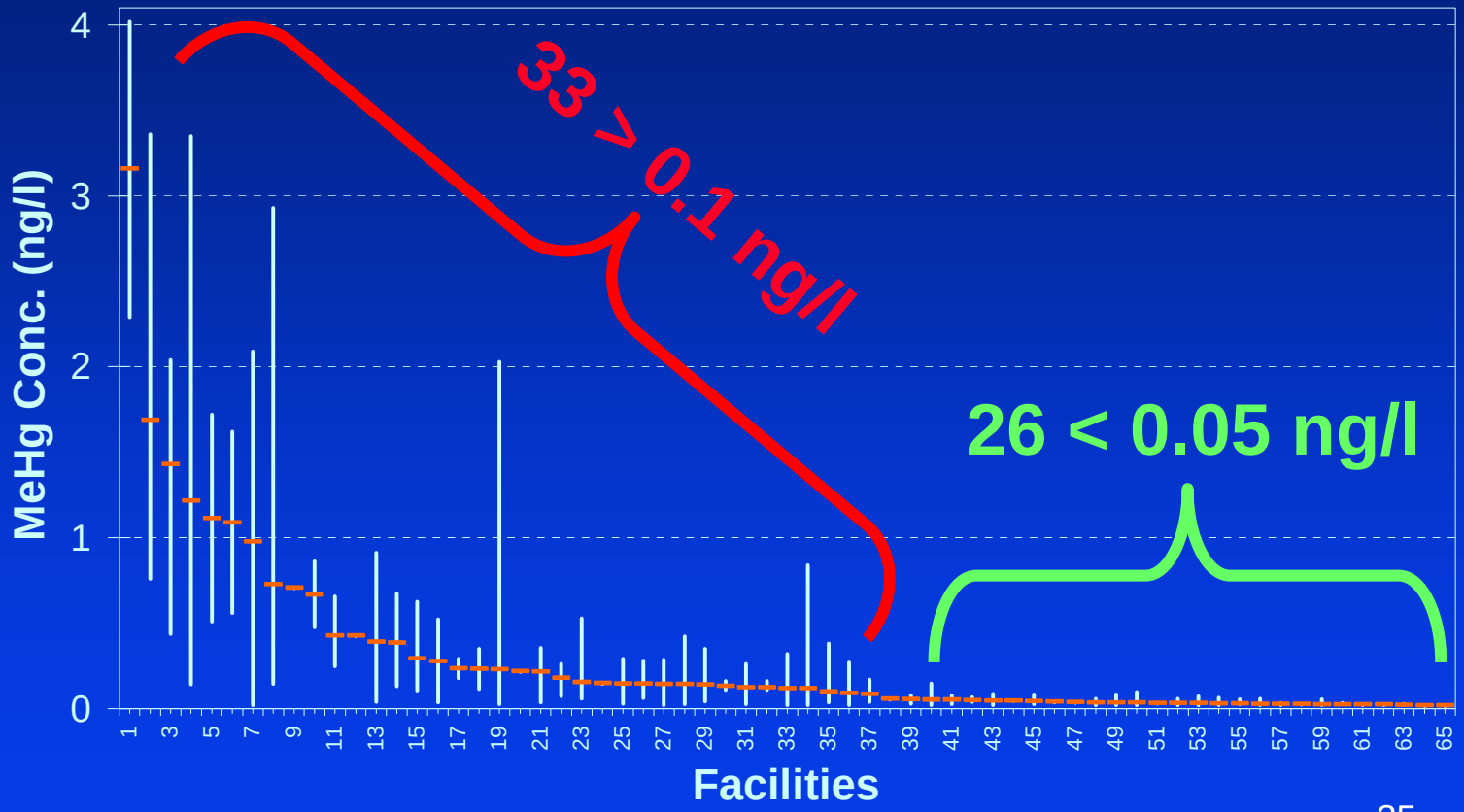
- **<u>Less stringent</u>**: Cap MeHg & Hg loads from all facilities; base allocations on permitted discharge volumes

- **<u>More stringent</u>**: Require all facilities to achieve best available technology

Question for Scientists & Engineers

Can we define
“Best Available Technology” &
management practices
for WWTPs & other sources?

Preliminary Municipal WWTP MeHg Monitoring Results



Potential Timeline

Years 1 to 5: Conduct characterization & control studies

Year 6: Update source analyses & allocations, evaluate control programs, amend Basin Plan

Years 7 to 27: Implement control actions

Years 27 to 100+: Natural erosion reduces contaminated in-channel sediments

Timeline

- **<u>Within 30 years</u>**:
  If implement MeHg controls, achieve measurable reductions in fish tissue mercury

- **<u>100+ years</u>**:
  Fully achieve WQO

Control Program

1. Control MeHg sources
2. Control TotHg sources
3. Reduce MeHg exposure to the fish eating public

Reduce MeHg Exposure to the Fish Eating Public:

- Additional fish monitoring
- Revise fish advisories
- Expand DHS & County education & outreach programs

WQO Alternatives

Key Question #1

How should “fishable” be defined for the Delta?

Implementation Alternatives

Key Question #2

How should methyl & total mercury source reductions be prioritized?

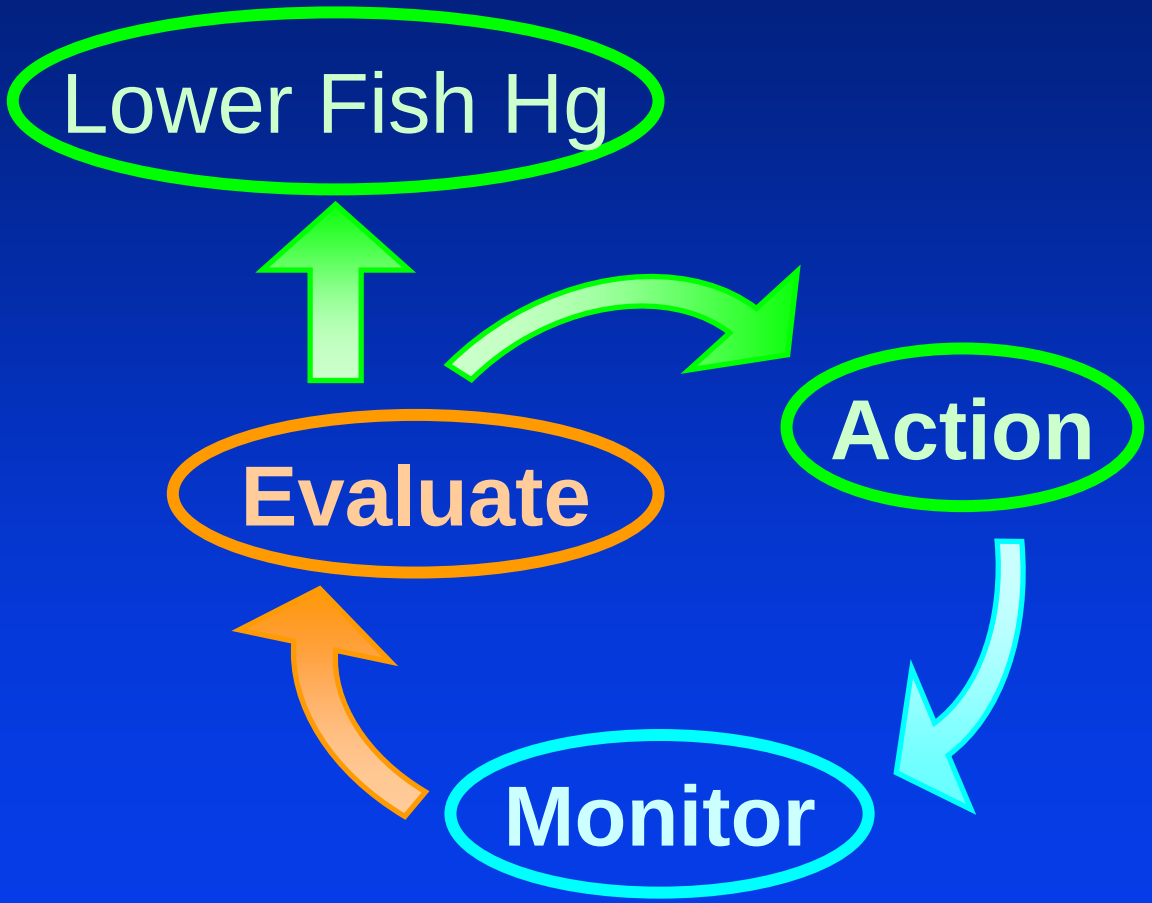
Key Question #3

Some source types are currently unregulated* by the Water Board.

How can the Board assign allocations to these sources?

*Such as local atmospheric emissions, flood conveyance flows, in-channel sources, water management & Delta standards…

Adaptive Implementation



Next Steps

- Report for scientific peer review
- Release draft BPA staff report
- Board Hearing in June 2006

Questions, Comments & Panelists

Panels

- Water storage, wetlands, dredging, water management (DWR)
- CA Bay Delta Authority
- Municipal WWTPs (CVCWA)
- Stormwater
- Environmental Justice, Human and Wildlife Health