San Francisco Bay Mercury TMDL:

Agenda and Project Schedule

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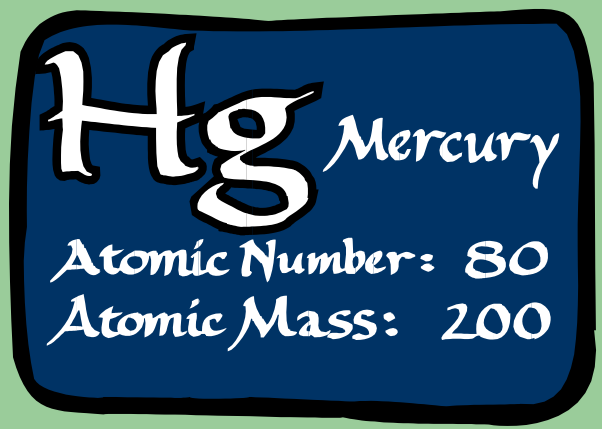
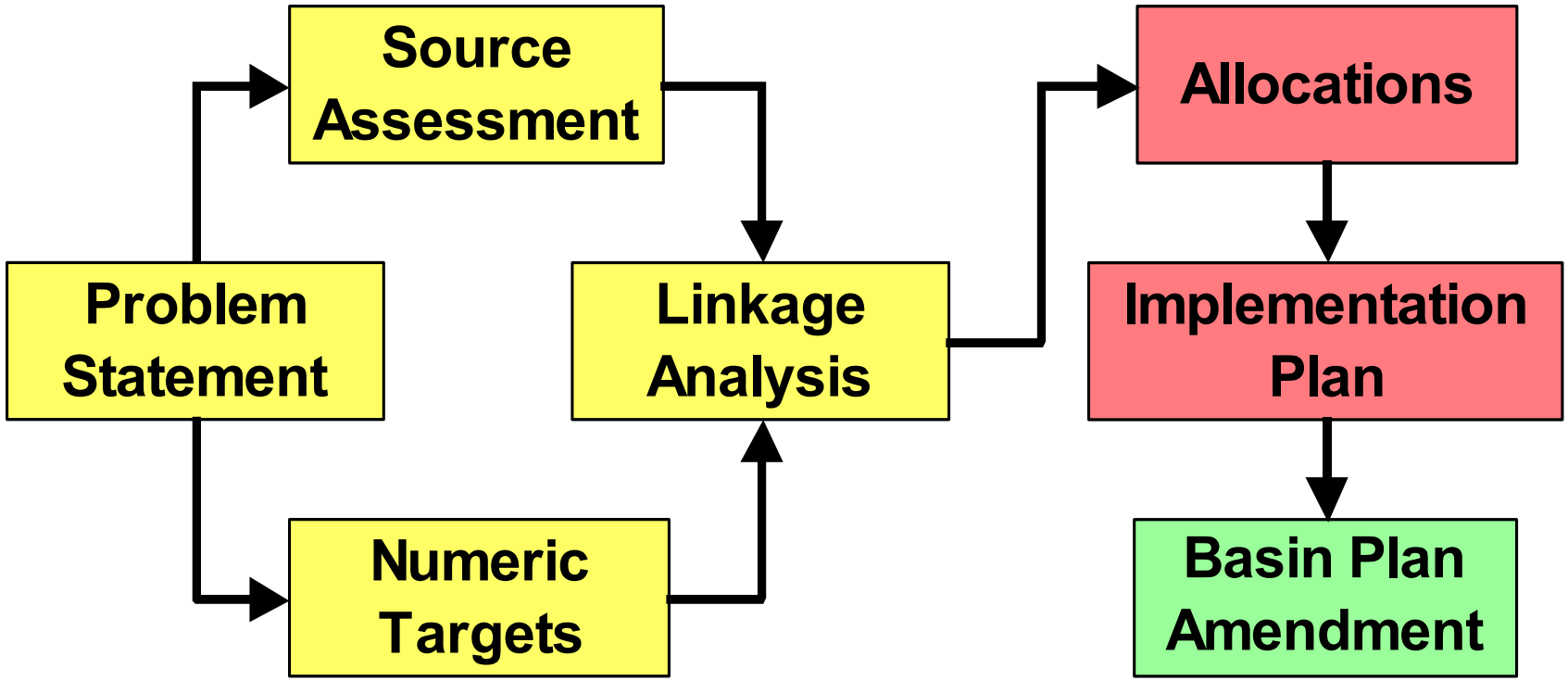


October 31, 2002

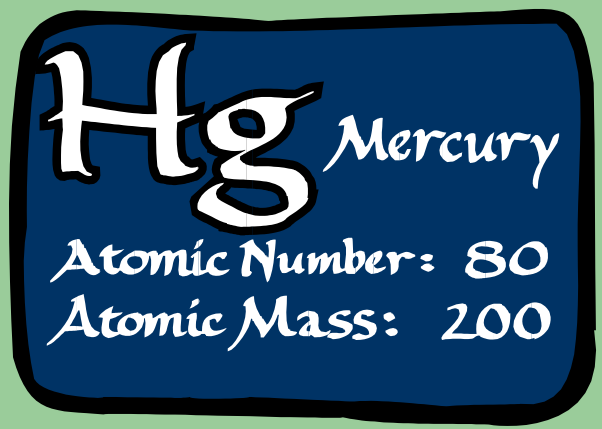
❶ TMDL Analysis ❷ Implementation ❸ Basin Planning



Schedule

- Feedback from today's presentation (due November 14, 2002)
- Project Report (early December 2002)
  - Public release and scientific peer review
- Staff Report and draft Basin Plan Amendment (January 2003)
  - Formal comment period (45 days)
- Preliminary Board hearing (February 19, 2003)
- Board hearing to consider adoption of Basin Plan Amendment (April 16, 2003)

San Francisco Bay Mercury TMDL:
TMDL Analysis



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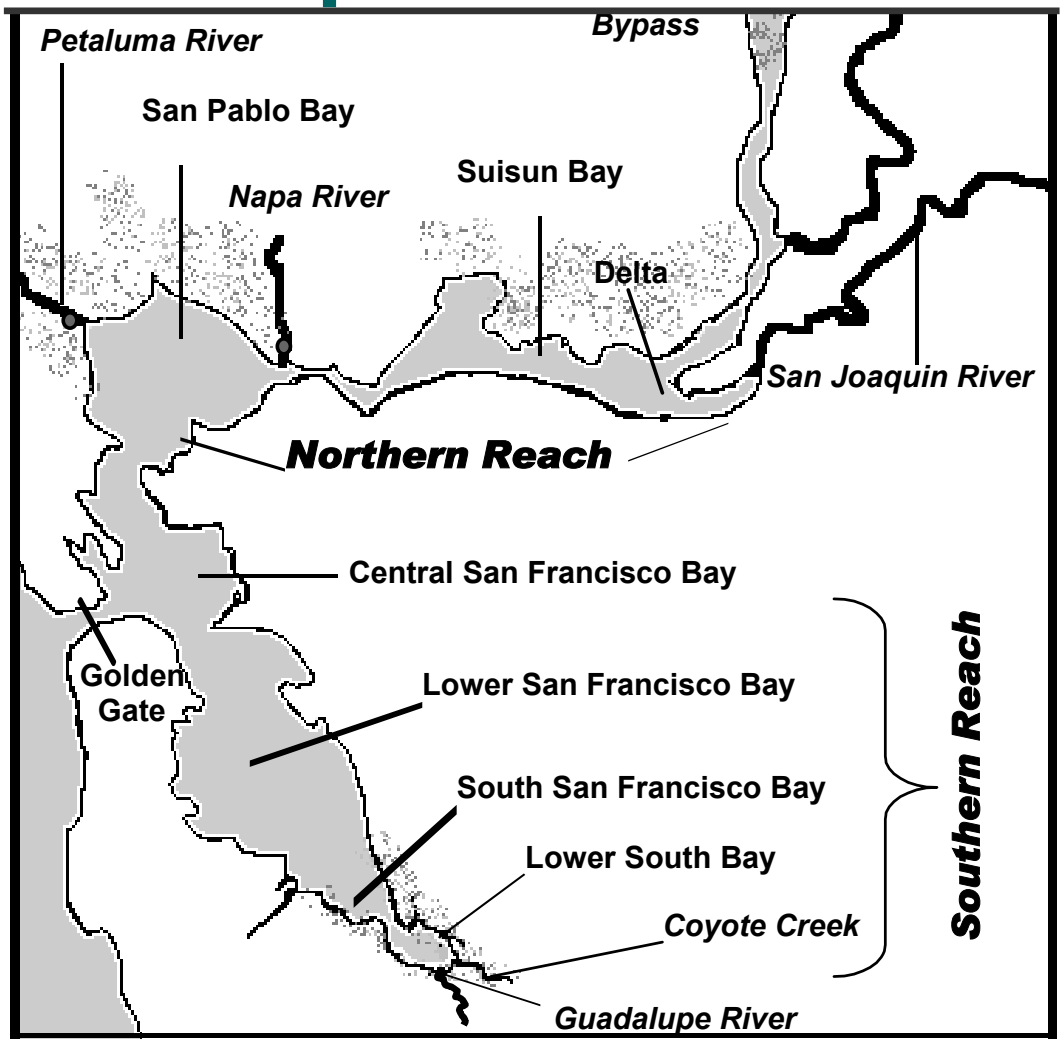
October 31, 2002

Getting to the Point

- Problem Statement
- Numeric Targets
- Source Assessment
- Linkage Analysis

PROBLEM STATEMENT: All Bay Segments Impaired

1. Sacramento / San Joaquin River Delta
2. Suisun Bay
3. Carquinez Strait
4. San Pablo Bay
5. Central SF Bay
6. Lower SF Bay
7. South SF Bay



San Francisco Bay Does Not Fully Support Beneficial Uses

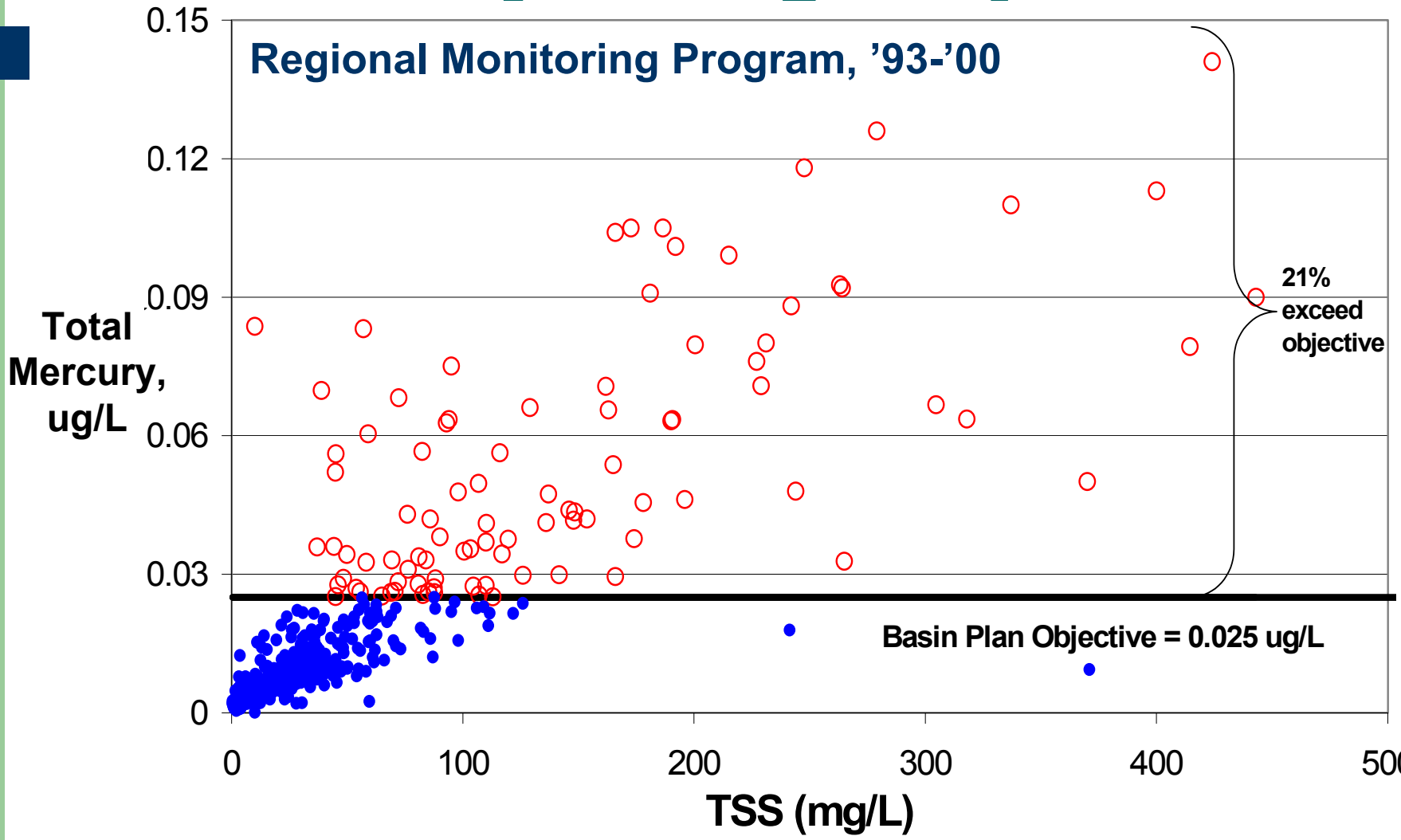
- Sport Fishing
  - Fish consumption advisory
- Wildlife Habitat
  - Mercury in bird eggs accounts for hatch failures
- Preservation of Rare and Endangered Species
  - e.g., California Clapper Rail and California Least Tern

Water Quality Objectives Often Not Met

- Numeric Objectives
  - Basin Plan: 0.025 ug/L total Hg in water
    - Applies only north of Dumbarton Bridge
    - 4-day average
  - California Toxics Rule: 0.051 ug/L total Hg in water
    - Applies everywhere, including south of Dumbarton Bridge
- Narrative Objective
  - Bioaccumative Substances:

    "Controllable water quality factors shall not cause a detrimental increase in concentrations of toxic substances found in bottom sediments or aquatic life."

Many Instantaneous Grab Samples Exceed 4-Day Average Objective



NUMERIC TARGETS: Protect Beneficial Uses and Meet Objectives

- Fish tissue target
  - Protects human health (fishing)
- Bird egg target
  - Protects wildlife and rare and endangered species
- Sediment target
  - Meets water quality objectives

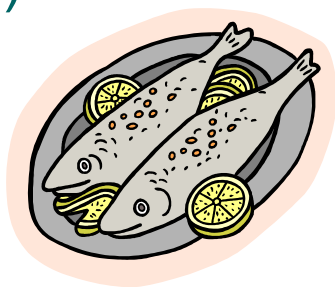
Local Fish Consumption Used to Derive Fish Tissue Target

- U.S. EPA developed fish tissue residue criterion for methylmercury

$$\text{Criterion} = \frac{\text{Body Weight} \times (\text{Reference Dose} - \text{Other Doses})}{\text{Fish Intake}}$$

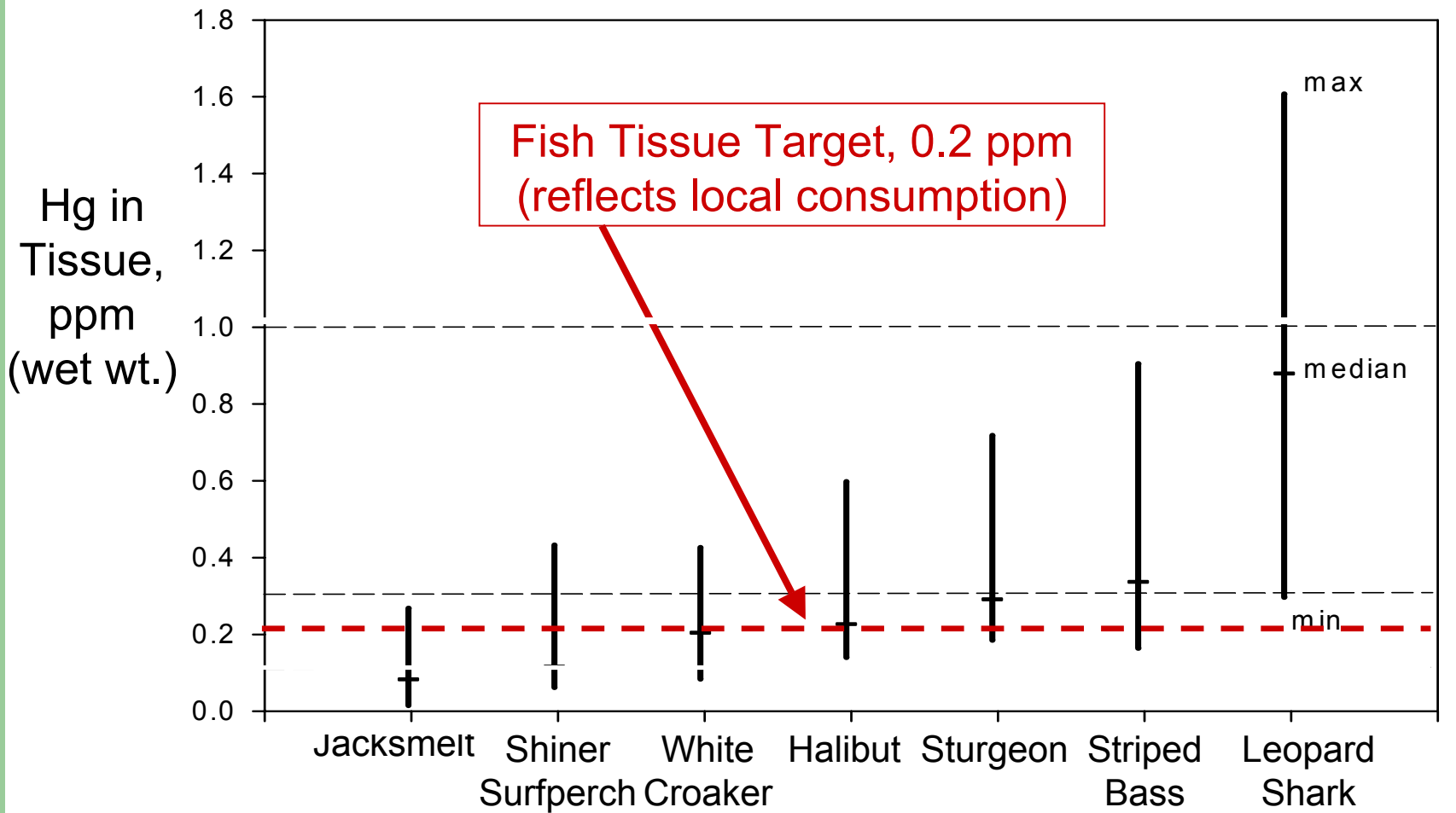
$$\frac{70\ \text{kg} \times (0.0001\ \text{mg/kg-day} - 0.00003\ \text{mg/kg-day})}{17.5\ \text{g/day (i.e., } 90^{\text{th}}\ \text{percentile of U.S. population)}} = 0.3\ \text{ppm}$$

- 95^{th} percentile of local fish consumers eats ~32 g/day

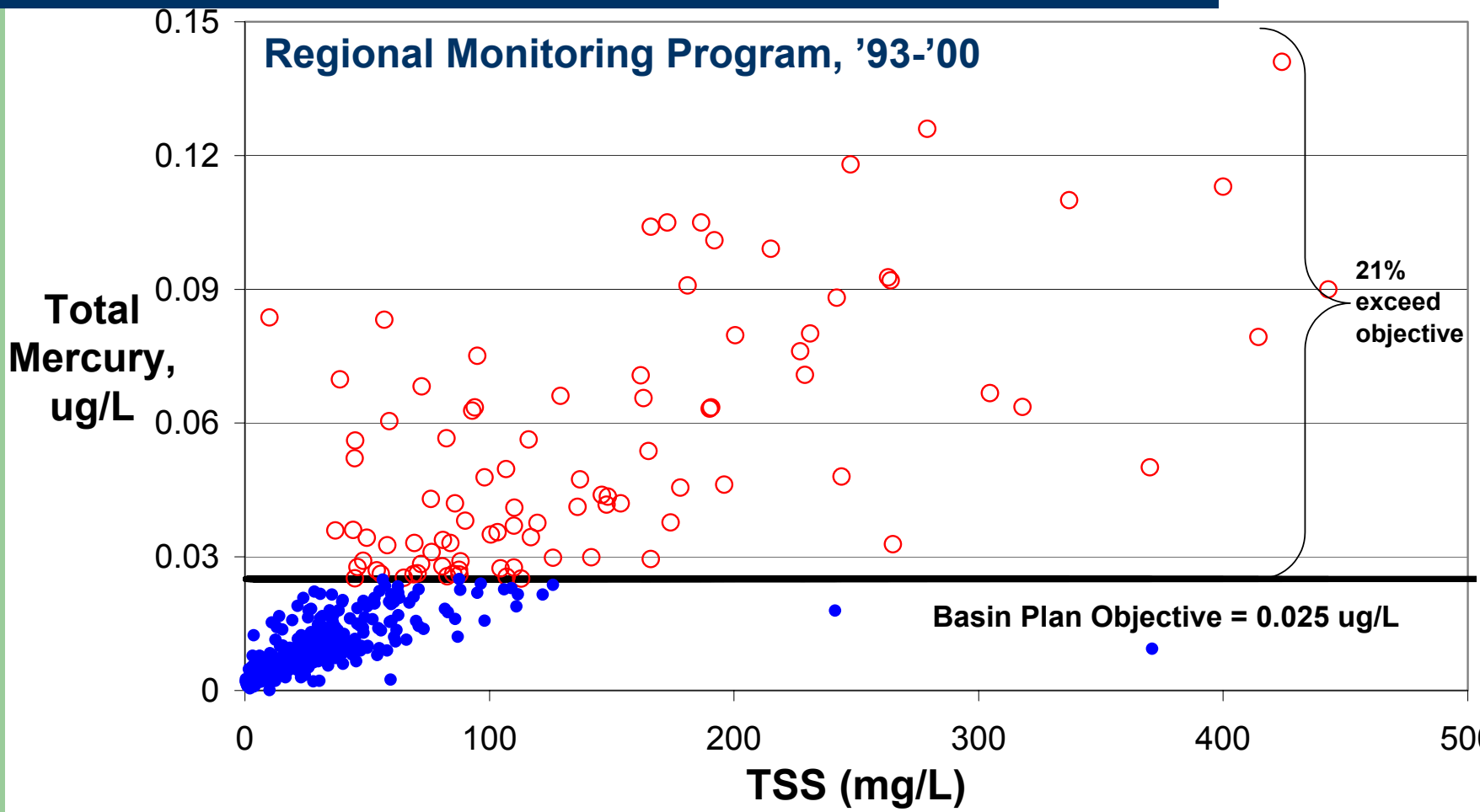


Fish Tissue Target = 0.2 ppm

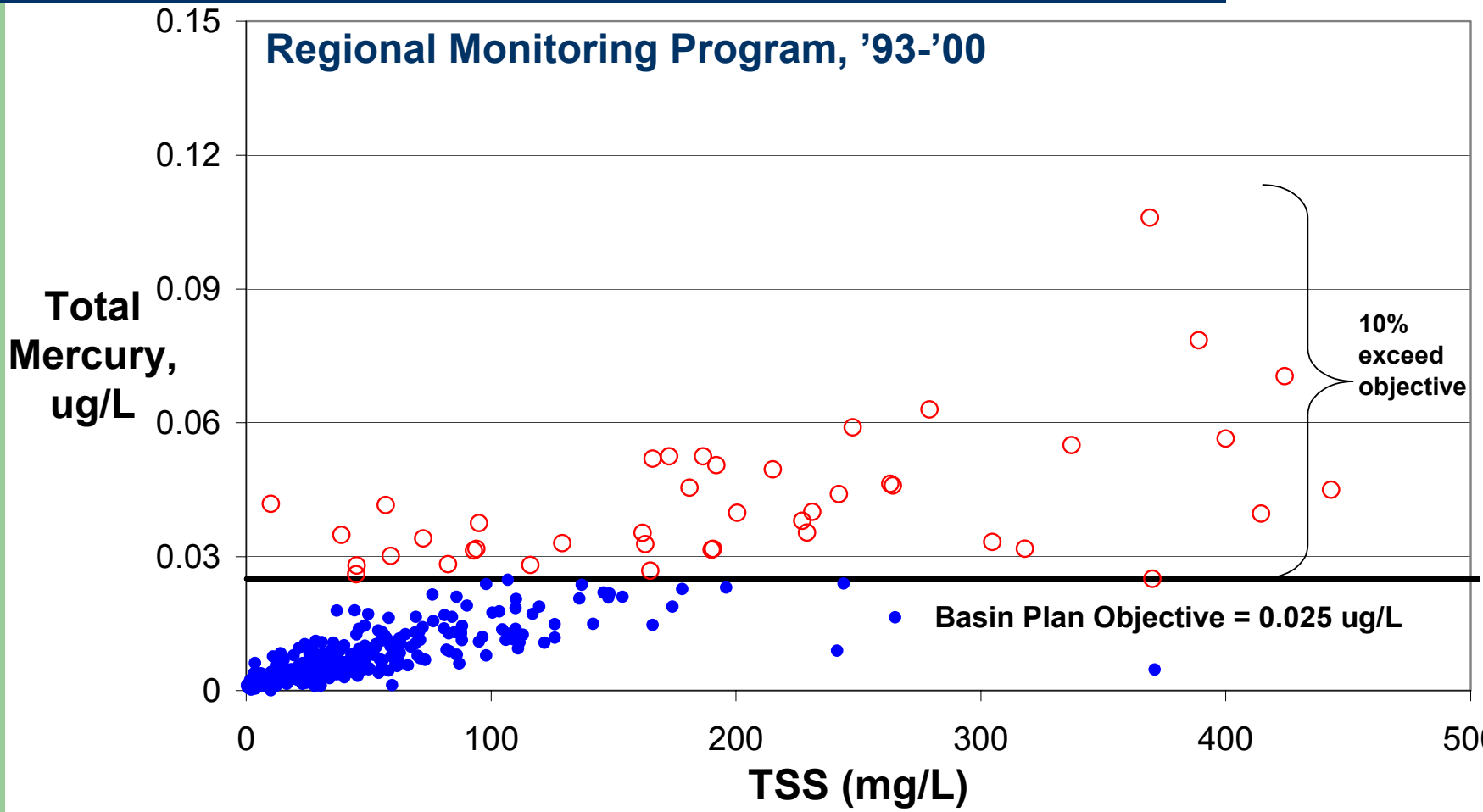
Commonly Consumed Fish Will Meet Target with 40% Reduction



Cutting Sediment Hg Concentration 50% (to 0.2 ppm) Meets Objective

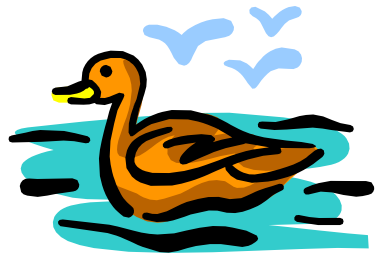


Cutting Sediment Hg Concentration 50% (to 0.2 ppm) Meets Objective



Target Protects Rare & Endangered Birds (and Other Wildlife)

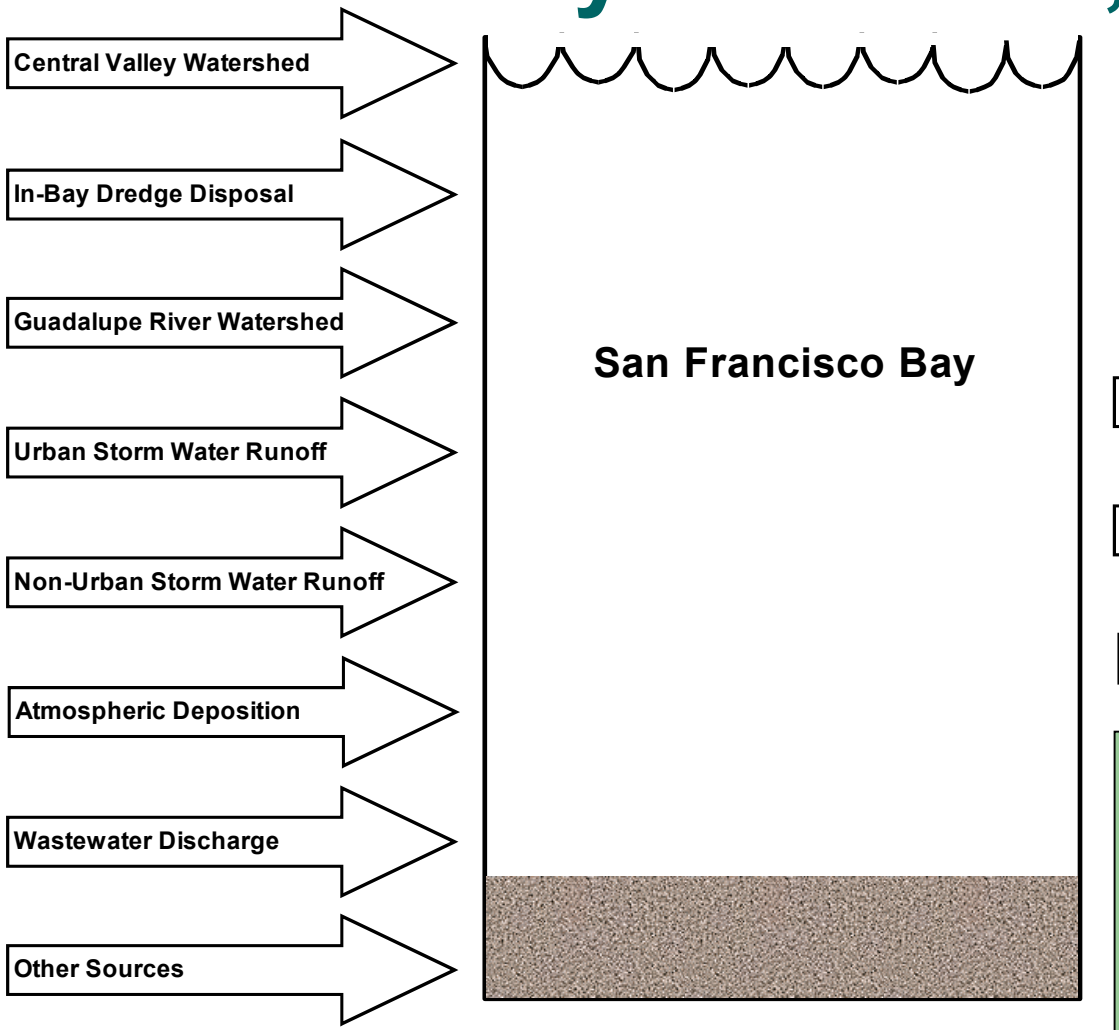
- Studies suggest bird eggs need to contain <0.5 ppm Hg to avoid adverse effects.
- Relationship between prey concentrations and bird exposure is complex:
  - Bird diets vary by species and location.
  - Mercury concentrations in prey vary by size and position within the food web.
  - Our understanding is still evolving.
- Narrative target may be needed in interim.
- Necessary reduction may be greater than 50%.



Targets Agree: ~40-50% Methylmercury Reduction Needed

- To reach fish tissue target (in striped bass): 40% Reduction
- To reach sediment target: 50% Reduction
- To reach bird egg target: >50% Reduction

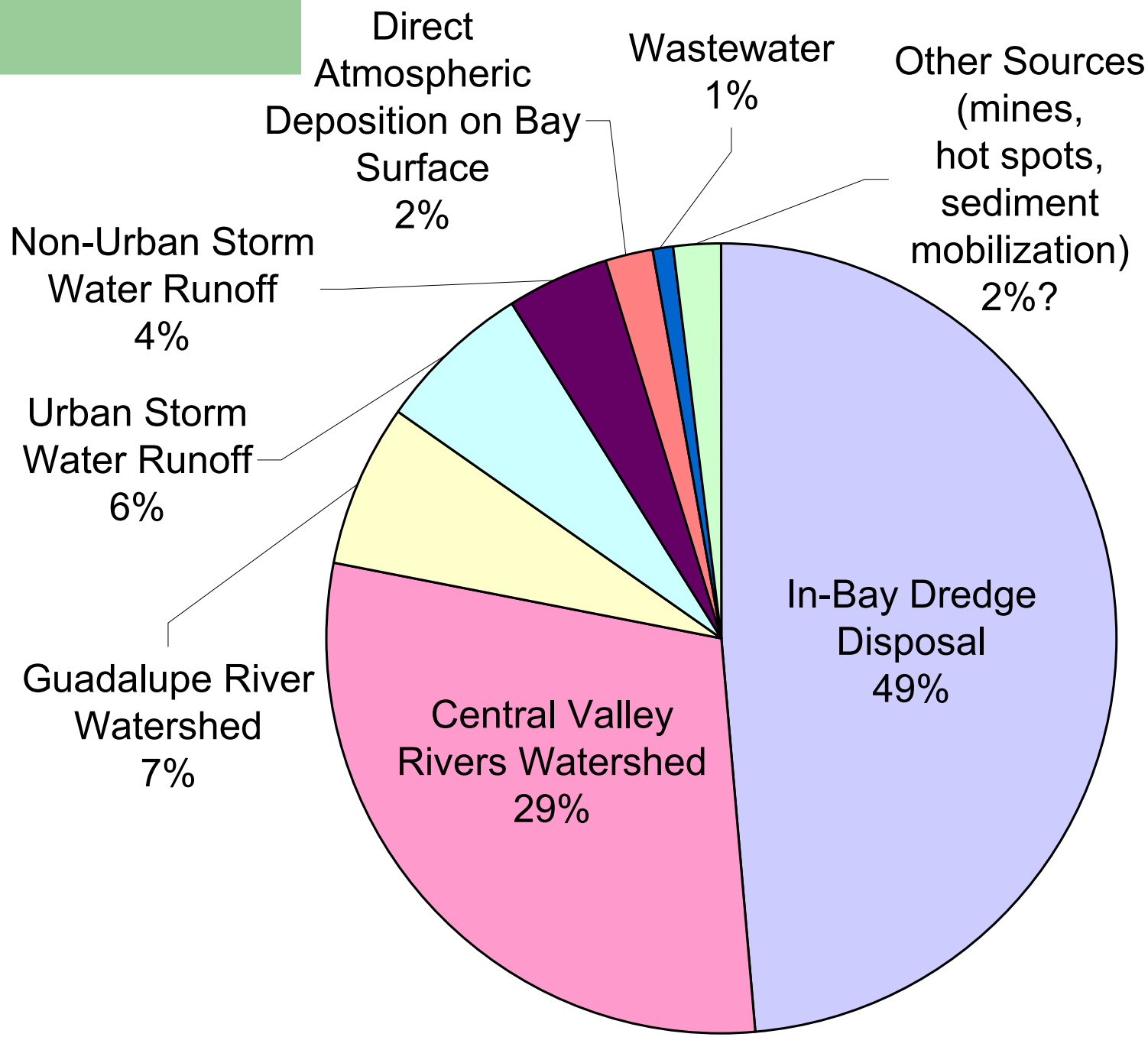
SOURCE ASSESSMENT:
Total Mercury Load = ~1,500 kg/yr



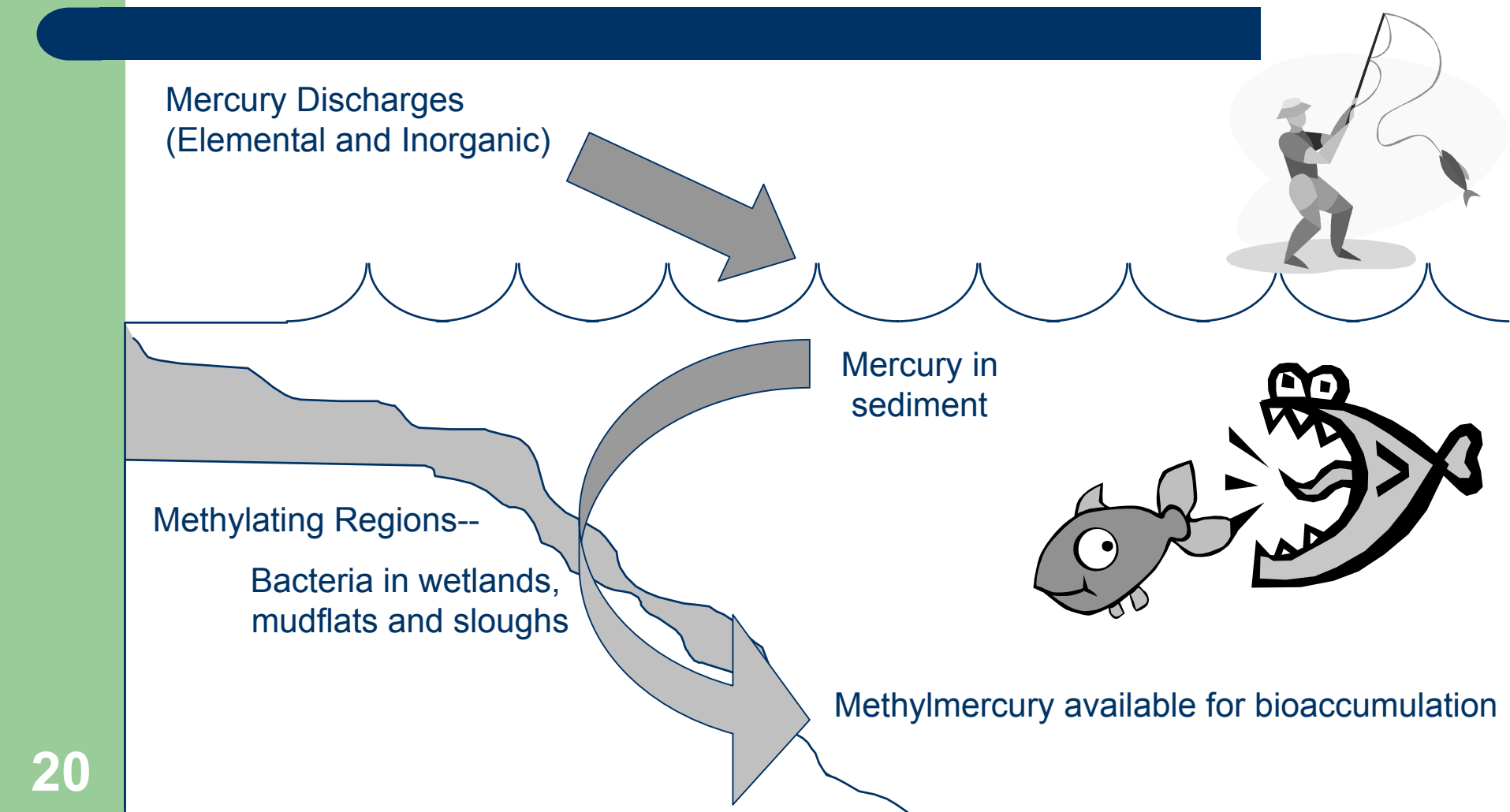
- Uncertainties are great (±100%)
- Refinement is needed

San Francisco Bay Hg Sources & Losses

	Hg Load (kg/yr)	=	Sediment Flux (M kg/yr)	x	Sediment Hg Conc. (ppm)
Sources					
In-Bay Dredge Disposal	730		2,400		0.30
Central Valley Watershed	440		2,100		0.21
Guadalupe River Watershed	100		21		4.8
Urban Storm Water Runoff	95		190		0.50
Non-Urban Storm Water Runoff	62		520		0.12
Direct Atmospheric Deposition	27		0		*NA*
Wastewater	14		0		*NA*
Other Sources	28**?**		*NA*		*NA*
total	***1,500***		***5,200***		
Losses					
Dredge Removal	940		3,100		0.30
Transport through Golden Gate	550**?**		2,100**?**		0.26
Evaporation	10		0		*NA*
total	***1,500***		***5,200***		


Direct Atmospheric Deposition on Bay Surface 2%
Wastewater 1%
Other Sources (mines, hot spots, sediment mobilization) 2%?
Non-Urban Storm Water Runoff 4%
Urban Storm Water Runoff 6%
Guadalupe River Watershed 7%
Central Valley Rivers Watershed 29%
In-Bay Dredge Disposal 49%

LINKAGE ANALYSIS: Data Do Not Support Detailed Quantification



Assume % Reduction in Each Step Results in Same % Reduction in Next

- Hg from sources binds to sediment.
- Hg in sediment is transported to methylating regions.
- Hg in methylating regions is converted to meHg.
- MeHg enters food web.
- MeHg in food web accumulates in biota.
- MeHg in biota enters fish, birds, & bird eggs.

San Francisco Bay Mercury TMDL:
Allocations and Implementation

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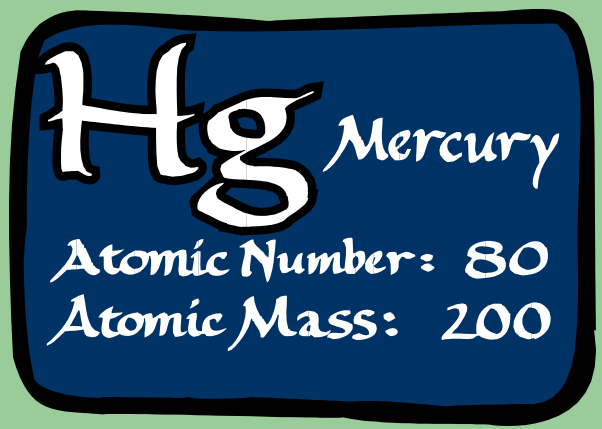


October 31, 2002

Introduction

- TMDLs need to have:
  - load allocations (point and non-point sources)
  - Implementation Plan (IP)
  - Margin of Safety (MOS)
  - Accommodation of seasonal variation
  - Reasonable assurances of meeting allocations.

What are load allocations?

- Waste Load Allocations
  - Portion of loading (assimilative) capacity allocated to existing or future point sources.
- Load Allocations
  - Portion of loading (assimilative) capacity allocated to existing or future non-point sources.
- Guidance from USEPA
  - Expressed usually as a mass per time or as a uniform percentage reduction.
  - Generally need to be given to individual sources unless covered by a general permit.

Challenges for Implementation Plan and Load Allocations

- Uncertainties in:
  - Loading estimates
  - Where and how methylation occurs
  - Controllability of atmospheric deposition and other sources
  - Bioaccumulation details
  - Role of wetlands in biogeochemistry of mercury
- But, we know enough to move forward based on what we now know and learn more as we go along.
- Need to make the best decisions we can now and create a framework for gathering information and making better decisions in the future.

What is an Implementation Plan?

- Identifies enforceable features and triggers for Regional Board action (e.g., performance standards)
- Legal requirement in CA:
  - TMDL must be incorporated into state's water quality management plan (40 CFR 130.7(d)(2).)
  - Porter-Cologne requires program of implementation to achieve WQS within each Basin Plan (Wat. C. 13050(j)(3).)

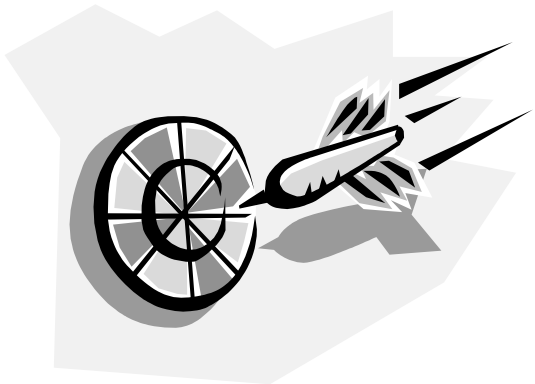
What is an implementation plan?

- Can be creative!
- Must include **at least**:
  - Description of actions necessary to achieve targets and WQOs
  - Time schedule for actions to be taken
  - Description of monitoring to determine attainment

How to calculate mercury loads

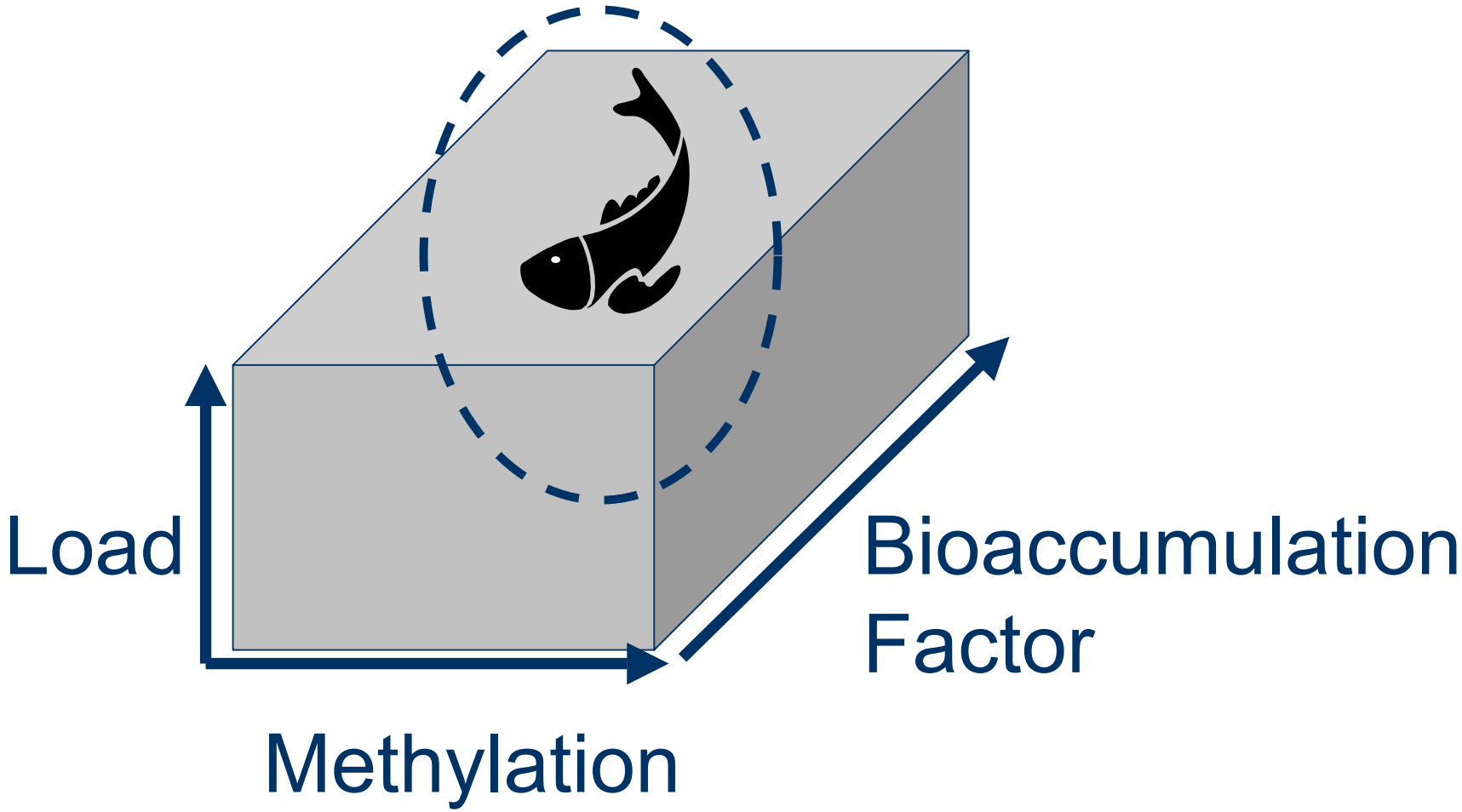
Load Estimate = [Hg] in Sediment x Sediment Load

=



Kg Hg / yr mg Hg/kg sed Million kg sed / yr

Conceptual Model



TMDLs and permits

- TMDL LAs and WLAs ≠ effluent limits
- Effluent limit must be **consistent with assumptions and requirements of the TMDL allocations** and not result in violation of WQS.

I will NOT talk about……..

- Specific permit language – not there yet
- Specific language of TMDL or Basin Plan Amendment – not there yet.

I will talk about……

- The proposed allocations and implementation actions in enough detail to give you an overview of current thinking to foster **constructive** criticism and discussion.
  - I will be as clear as possible about our thinking on permits and how to accomplish the various actions and monitoring.
- General plan for adaptive management

Goals of the Implementation Plan

- Reduce controllable mercury loads to SF Bay to:
  - Achieve allocations (we know it may take a long time)
  - Meet targets (we know it may take a long time)
- Reduce mercury transformed to methyl mercury
- Perform monitoring and focused studies to:
  - Address uncertainties
  - determine if we are reaching targets and allocations
- Encourage actions that address multiple contaminants or otherwise exemplify good stewardship.

Dredge Disposal

Load Allocation

- 303.6 kg/year (58% reduction from current 729 kg/year)

Basis

- Estimated sediment disposal from LTMS (1.0 mcy) * 0.3 ppm mercury (current ambient).

Implementation

- Do LTMS plan and monitor amounts and concentrations.
- We could try to get further reductions by discouraging in-bay disposal of sediments above some Hg threshold.

Non-Urban Storm Water

Load Allocation

- 62 kg/year (no reductions currently required)

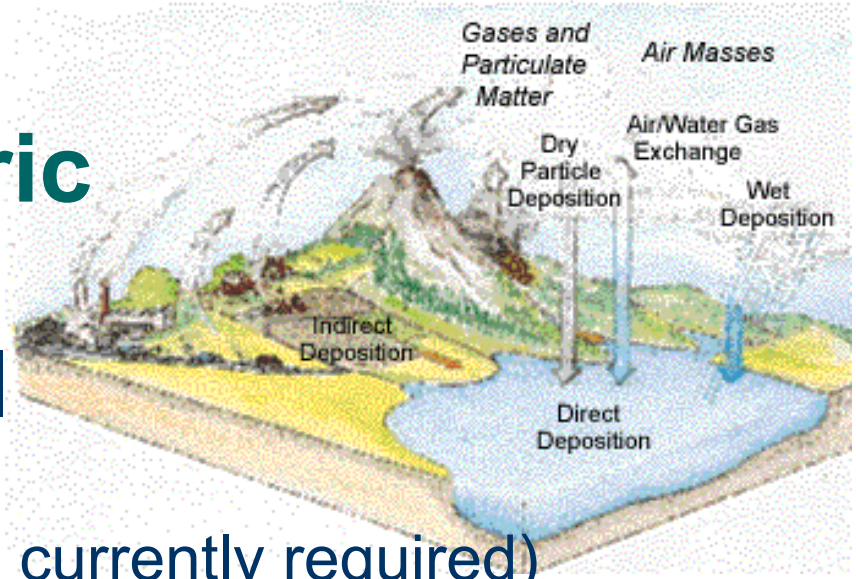
Basis

- Sediments from open space areas typically at 0.12 ppm mercury so no further reductions at this time.
- If atmospheric deposition is deemed controllable, this load allocation may be adjusted.

Implementation

- No actions planned at this time

Direct Atmospheric Deposition



Load Allocation

- 27 kg/year (no reductions currently required)

Basis

- This category currently considered uncontrollable.
- Load allocation = current loading.

Implementation

- We need studies to assess local contribution to this loading and prospects for controllability (who does them?)
- Local sources could be depositing in Central Valley and coming back in runoff as well.

Two Types of Air Sources:

- Controllable air sources
  - Any source subject to regulation
  - Refining, manufacturing and electric power
  - Landfills
    - Landfill gas, working faces of landfills
- Uncontrollable air sources
  - Sources not subject to regulation
  - Global, long-range transport
  - Evasion from surface waters
  - Continental dust

Municipal Wastewater

Waste Load allocation

- Group: 15 kg/year (currently 12.2 ± 2.6 kg/year)
- Individual WLA for facilities: express either as 0% loading increase or a mass per year

Basis

- 15 kg/year = current loading + uncertainty (1 SD).
- WLA will not be exceeded despite population growth if:
  - Achieve modest gains in reclamation
  - Achieve modest gains in pollution prevention
  - Achieve mass offset credit for mercury collection activities

Municipal Wastewater

Implementation in Permits

- Permit violation to discharge > 15 kg/year as a 5 yr running average.
- Performance-based concentration limits computed at permit re-issuance by NPDES staff.
  - Re-do analysis of ultra-clean data to calculate limits.
  - 'Not-to-exceed' limits for secondary and advanced, (currently 87, 23 ng/L).
  - Set 'em and leave 'em, so not penalized for P2 gains.
- If load increases to 18 kg/year during any one year, RB will consider facility-specific mass limits.

Municipal Wastewater

Implementation in Permits

- If a facility or group helps reduce loading from another source category, credit loads avoided.
  - If a POTW treats storm water, POTW and storm water program decide how to divide credit for load avoided.
  - Individual facilities (over 2 MGD) maintain and report on source control programs as before.
- Credit given (eased effluent limits or mass loading offset?) for mercury collected through solid waste collection activities.
  - Help us design a reasonable scheme to do this!

Municipal Wastewater

Implementation in Permits

- Discharges shall not cause detrimental increases in the production and bioaccumulation of methylmercury.
  - Support for mercury fate, transport and bio-uptake special studies.
- Investigate bioavailability of discharges.
  - wastewater loads are small portion of total Hg but discharge is in **highly bioavailable form.**

Industrial Wastewater

Waste Load allocation

- Group: 3 kg/year (currently 2.0 ± 0.7 kg/year)
- Individual WLA for facilities: express either as 0% loading increase or a mass per year

Basis

- 3 kg/year ~ current loading + uncertainty (1 SD).

Industrial Wastewater

Implementation in Permits

- Permit violation to discharge > 3 kg/year as a 5 yr running average.
- Performance-based concentration effluent limits computed at permit re-issuance by NPDES staff.
  - Re-do analysis of ultra-clean data to compute limits.
  - ‘Not-to-exceed’ limits (currently 75 ng/L for this category).
  - Set ‘em and leave ‘em, so not penalized for P2 gains.
- If load increases to 4 kg/year during any one year, RB will consider facility-specific mass limits.

Urban Storm Water

Load Allocation

- Group: 38.5 kg/year (60% less than current 95 kg/year).
- Individual programs: allocate on the basis of population and area of built-up landuse in program area.
  - How to deal with CALTRANS allocation?
- Interim allocation: 66.5 kg/year in 10 years (1/2 way there or 30% reduction).
- Use 5-year running average to account for variation

Basis

- Estimated sediment flux * 0.2 ppm mercury target.

Urban Storm Water

Implementation in Permits

- Implementation of BMPs and current C3 permit provisions a strong starting point.
- **Allocation is a responsibility to demonstrate load reductions** or that sediments are not Hg-enriched.
  - measure loads to bay (need to do sometimes though)
  - quantify loads avoided through actions (preferred)
  - Sediments not above 0.2 ppm mercury (not enriched in Hg)
- Discharges shall not cause detrimental increases in the production and bioaccumulation of methylmercury.
  - Support for mercury fate, transport and bio-uptake special studies.

Urban Storm Water

- Need help from the programs to address:
  - What **REALLY** is the load from urban areas?
    - Report once per permit cycle
  - What is the contribution of atmospheric deposition?
    - Need help addressing this difficult question
  - Methylation potential of storm water loading?
  - Are sediments enriched by your urban areas or not?

Central Valley

Load Allocation

- 420 kg/year (5% reduction from current 441 kg/year) as a running 5-yr average.
- Compliance point is Mallard Island.

Basis

- 0.2 ppm target Hg sediment concentration x estimated sediment flux.
- Central Valley sediments now ~ 0.21 ppm

Central Valley

Implementation

- Address key uncertainties:
  - What really is the load?
  - Is there anything that can be done about it?
  - Suisun/Grizzly Bay Hg could be resuspended and counted as part of C.V. loading to the Bay.
- Region 5 Hg TMDLs should accomplish the modest load reductions we expect.
- CV is a **huge watershed**, so gains will be difficult and progress will be slow – measured in decades.
- Revisit load allocations after load estimates improved.

Guadalupe River (mining legacy)

Load Allocation

- 10 kg/year (90% reduction from current 100 kg/year).
- Interim allocation: 55 kg/year in 10 years (1/2 way there or 45% reduction).
- 5 year running average to account for variation.

Basis

- Virtual (90%) elimination of mining legacy contribution to Guadalupe River loading.
- Storm water contribution already accounted for in urban and non-urban storm water.

Guadalupe River (mining legacy)

Implementation

- Guadalupe River TMDL is principal driver.
- Expect to see quantification of loads avoided consistent with load allocations using:
  - Targeted sediment removal
  - Mine remediation
  - Erosion control

Other Sources (hot spots, local mines, sediment remobilization)

Load Allocation

- 22.4 kg/year (20% reduction from current 28 kg/yr).
  - As a 5 year running average.

Basis

- This is a reasonable load reduction in view of:
  - Gains in long-term from cleaner sediments remobilized
  - Progress on hot spots – tend to get cleaner over time
  - Progress on regulating and remediating local mines

Other Sources (hot spots, local mines, sediment remobilization)

More information

- This category is currently thought to be small.
- It is a catch-all to close the mass balance.
- It could grow or shrink as load estimates improve.
- Toxic Hot Spots generally known and being addressed by our toxics cleanup program and some DOD program activities.
- Sediment remobilization loading could have localized increases in certain sections of the bay.
  - Some parts of bay erosional where there is buried mercury

Other Sources (hot spots, local mines, sediment remobilization)

Implementation

- Assess through the industrial storm water program the 10 or so mine sites that connect to bay to determine:
  - Improved loading estimates
  - Potential for remediation
- Assess Bay Hot Spots managed by RB2 programs for:
  - mercury load estimate
  - threat to wildlife through methylation of available mercury
- Consider additional cleanup requirements more stringent than current if high risk area.

Wetlands

The Problem

- They are not a major source of Hg…….. yet.
- > 16,000 acres of wetlands slated for conversion.
- Wetlands have potential to be areas where Hg is methylated.
- Limited current knowledge about wetlands and methylation.
- Birds and other wildlife live and raise young in wetlands.
- There is a connection to the aquatic food chain
  - even stronger as tidal connections restored

Implementation Actions

- Formulate and address key management questions
- Guidelines for optimum design and management

Wetlands

Implementation

- Formulate key management questions/uncertainties
- Define studies to address these issues.
  - Make sure that monitoring or study is tightly tied to a management question!
- Encourage entities like CALFED to support focused research into key management uncertainties.
- Wetlands RMP already doing some of this work.

The goal

- No net loading increase of MeHg to bay or biota

Wetlands

Management Questions

- What are the conditions in wetlands that promote mercury methylation?
- Can wetlands be managed or designed to suppress such methylating conditions?
- Can wetlands be managed to limit exposure to methyl mercury produced?
- Can we answer the above questions and formulate design or management criteria to incorporate into the CEQA/NEPA or 401 certification process?

Summary of San Francisco Bay Mercury Load Allocations

	Mercury Load (kg/yr) Estimate	Sediment Flux (M kg/yr) Estimate	Sediment Mercury Concentration (ppm) Estimate	Sediment Mercury Concentration (ppm) Target	Mercury Load (kg/yr) Allocation
Sources					
In-Bay Dredge Disposal	729	2,429	0.30	0.30	304
Central Valley Watershed	441	2,100	0.21	0.20	420
Guadalupe River Watershed	100	21	4.6	NA	10
Urban Storm Water Runoff	95	190	0.50	0.20	38
Non-Urban Storm Water Runoff	62	520	0.12	0.12	62
Direct Atmospheric Deposition	27	0	*NA*	*NA*	*27*
Wastewater	14	0	*NA*	*NA*	*18*
Other Sources	28	*NA*	*NA*	*NA*	*22*
Total	***1,497***	***5,236***			***901***

NA = Not available or not applicable
Note: Some mercury loads and sediment fluxes are rounded. All significant figures were used in calculations.

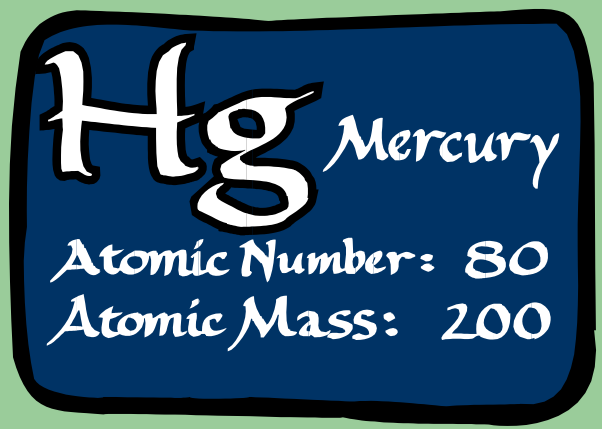
Currently getting about a 40% reduction.
We think we need about 40% - 50% to reach our various targets, though.

Adaptive Management

- Address Uncertainties through monitoring and studies
  - Load estimates, effects, controlling air sources, wetland management, appropriateness of targets, progress on targets.
- Re-visit decisions on targets, allocations, and implementation actions in about 10 years.
  - Improved load estimates may lead to adjustment of allocations.
  - If atmospheric deposition controllable and substantial, we will seek reductions and adjust other load allocations accordingly.
  - If wetlands crucial in methylation, impose monitoring and design requirements for project approval.

San Francisco Bay Mercury TMDL:

California Environmental Quality Act



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October 31, 2002

Basin Plan Amendments Require Environmental Review

- TMDL is intended to benefit environment
- Analysis must consider potential adverse environmental effects
- Staff Report for Basin Plan Amendment will be "Functionally Equivalent Document"
  - Replaces CEQA documentation (e.g., Environmental Impact Report)

Approval of Basin Plan Amendment Will Change Environment

- Amendment will require actions to reduce mercury discharges and mercury methylation
- Effects of some actions will be considered and others will not.

Will consider:

- direct physical changes in the environment
- reasonably foreseeable indirect changes

Will not consider:

- Speculative changes
- Changes where effects have already been considered
- Changes to occur with or without TMDL

Possible Actions to Consider

- Removing mercury-laden sediment from tributaries
- Moving soil
  - “Hot Spot” remediation
  - Settling basin construction
- Disposing of waste
  - Contaminated soil
  - Hazardous waste

Environmental Issues to Consider

- Aesthetics
- Agricultural Resources
- Air Quality
- Biological Resources
- Cultural Resources
- Geology / Soils
- Hazards & Hazardous Materials
- Hydrology / Water Quality
- Land Use / Planning
- Mineral Resources
- Noise
- Population / Housing
- Public Services
- Recreation
- Transportation / Traffic
- Utilities / Service Systems

Feedback Is Invited

- To ensure that scoping comments are considered, submit them by November 14.