



Selenium TMDL for North San Francisco Bay

ADOPTION HEARING

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Photo: USGS

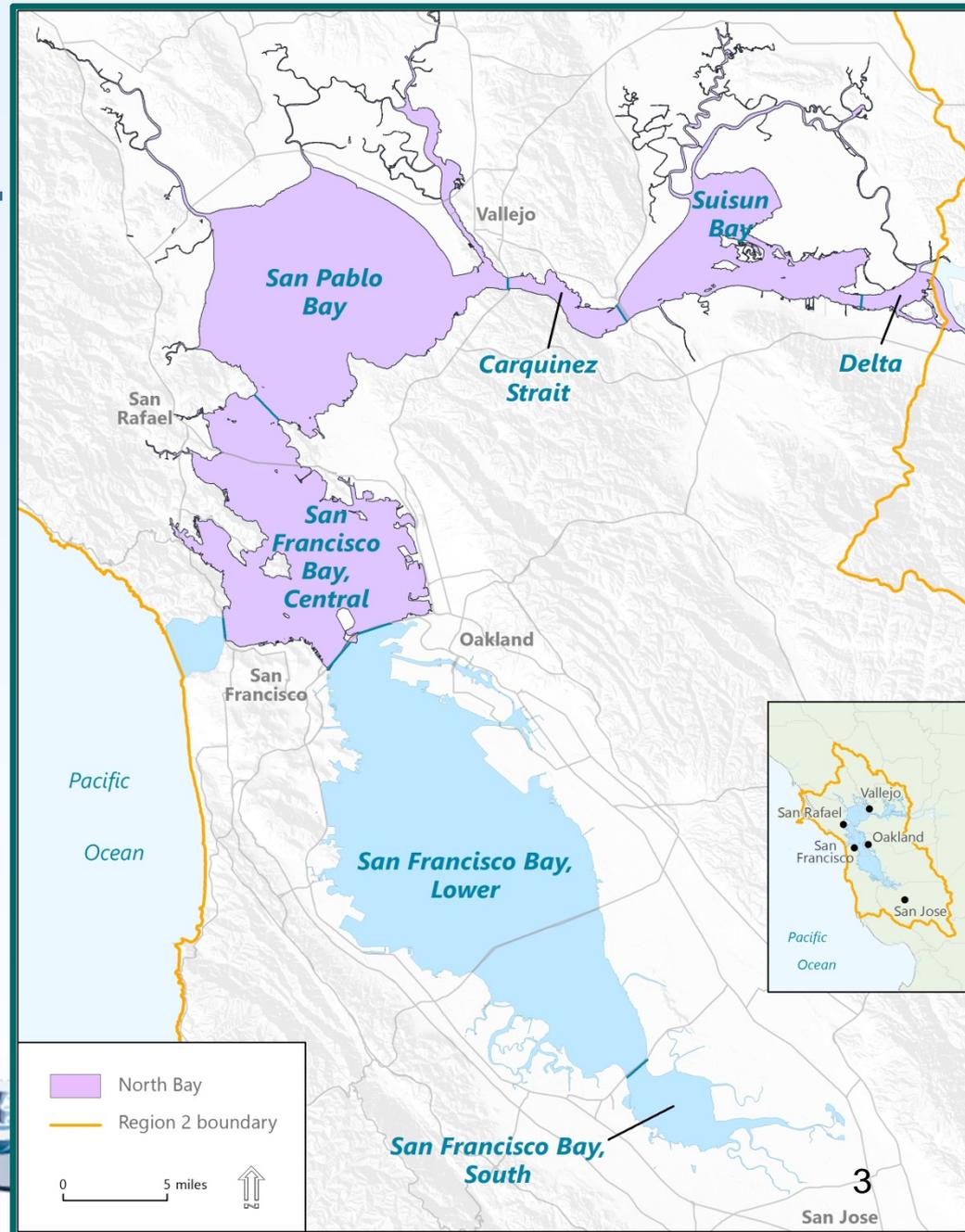
TMDL & Selenium History

- 1986 *Corbula amurensis* invades the Bay
- 1987-90 Selenium Verification Study
- 1990-93 Refinery load reduction strategy
- 1998 Bay listed as impaired for selenium
- 2007 North Bay Selenium TMDL



North Bay TMDL

- North Bay segments only
- Concern for reproductive impairment in fish
- Amplified by invasion of *Corbula*



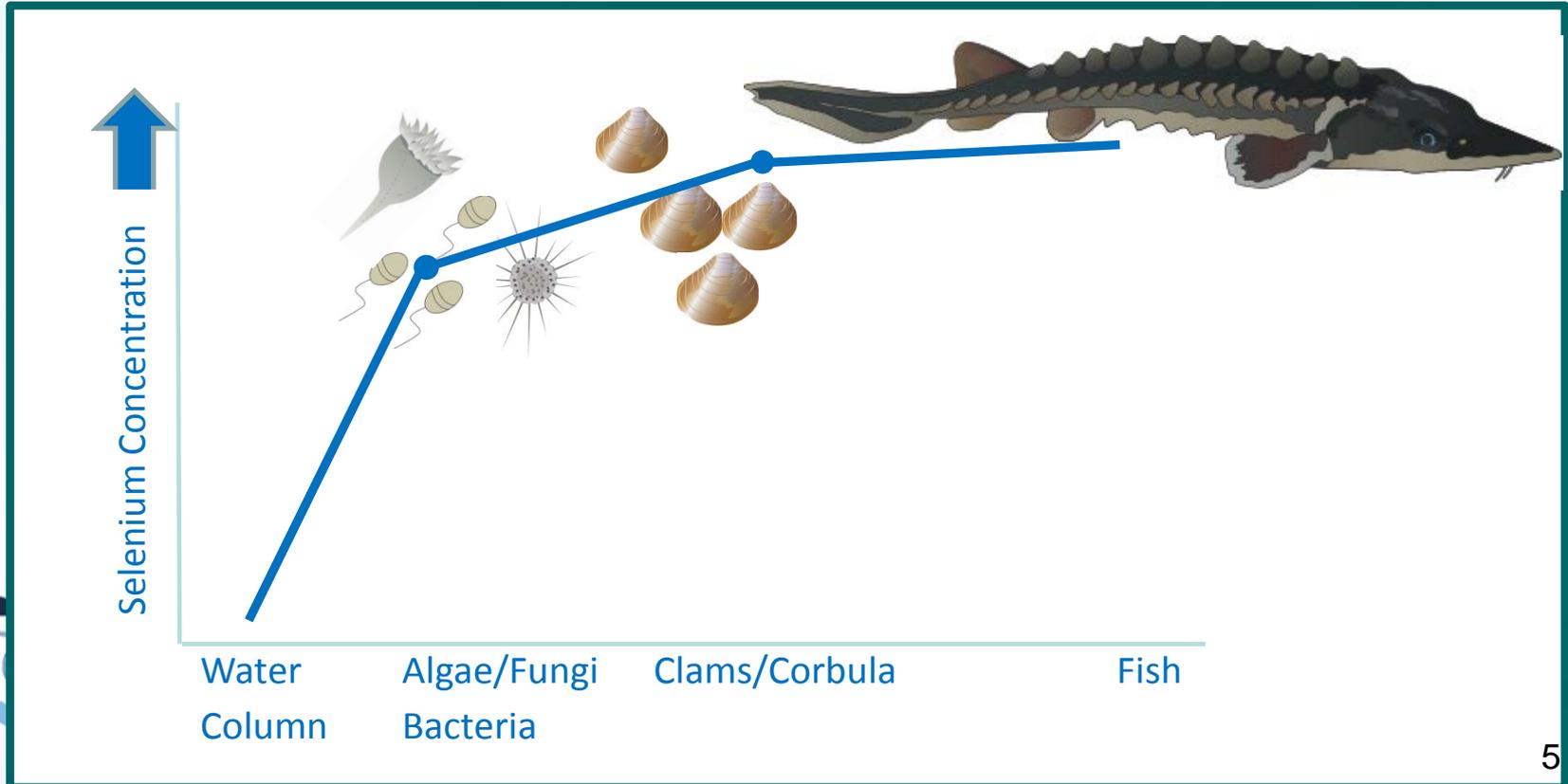
Selenium in Nature

- Naturally occurring
- Geologically ubiquitous
 - associated with natural crude oil
- Essential micronutrient
- Bioaccumulates in food web

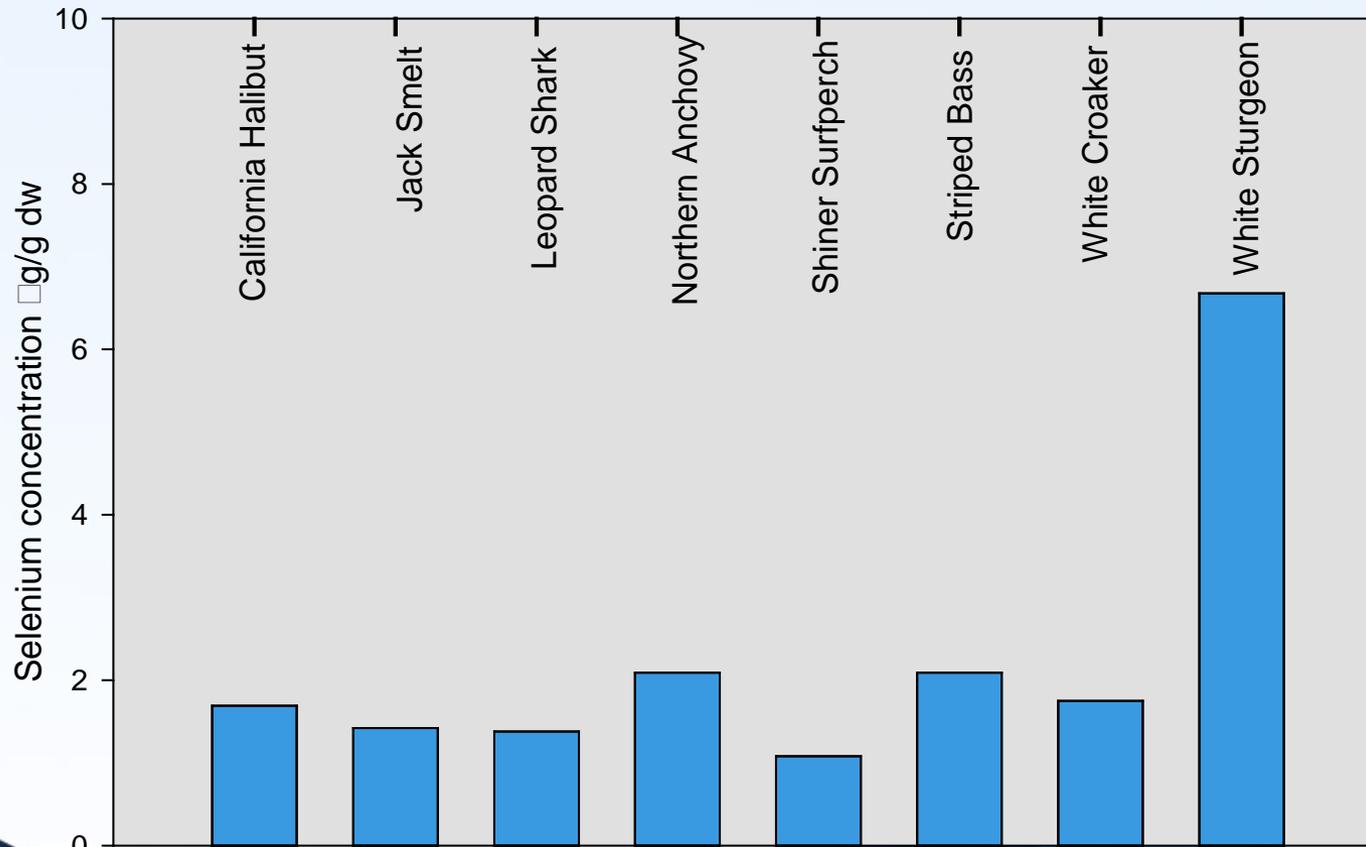


Path to Bioaccumulation

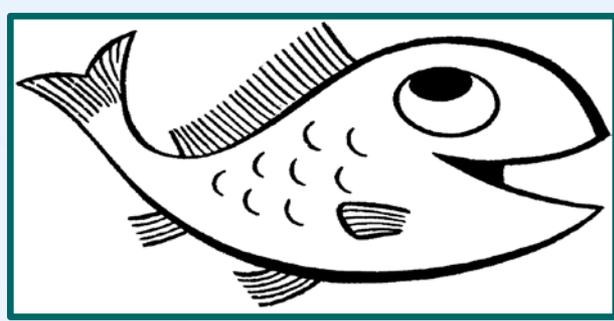
Dietary and maternal transfer through the food web



Average Selenium Concentrations in Bay Fish



Data: Regional Monitoring Program 2009

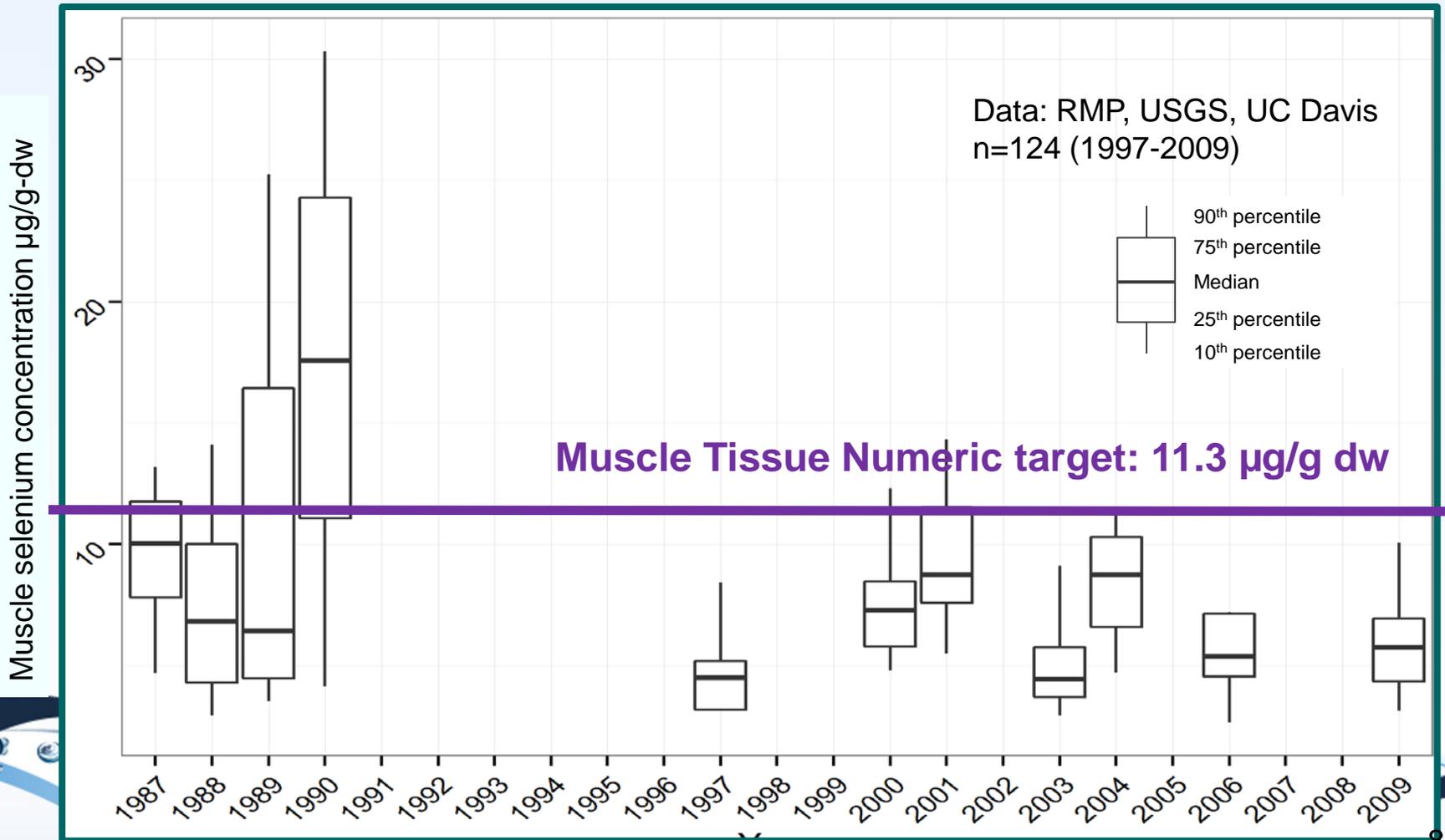


TMDL Targets

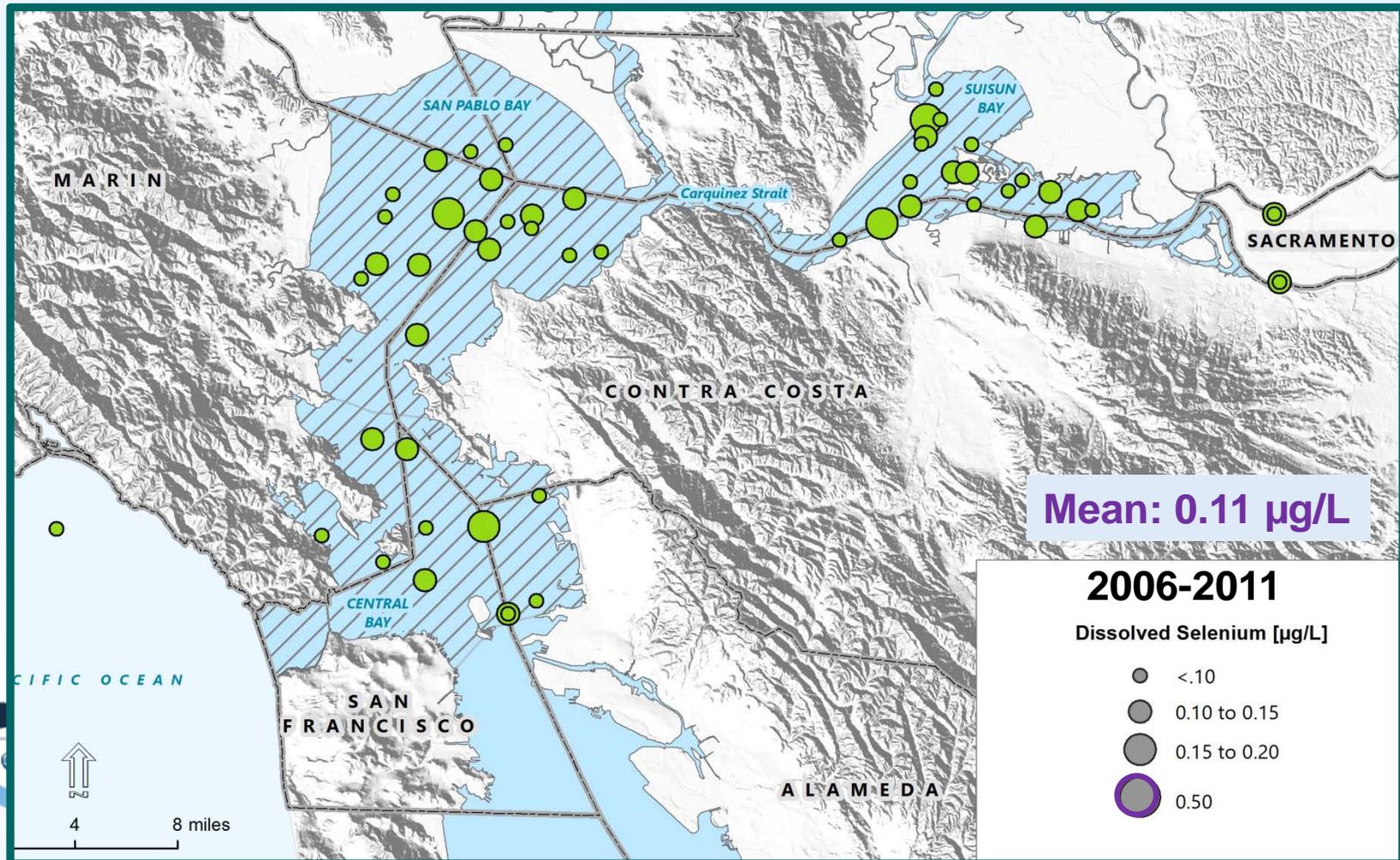
Fish Tissue [$\mu\text{g/g}$ dry weight]	Water Column [$\mu\text{g/L}$]
8.0 in whole-body	0.5 as dissolved Se
11.3 in muscle tissue	

- Based on 2015 USEPA draft freshwater criteria
- Fish tissue targets based on reproductive effects
- Protective of listed species - green sturgeon
- Protective of all fish in North Bay
- Translated to water column target

Selenium: WHITE STURGEON

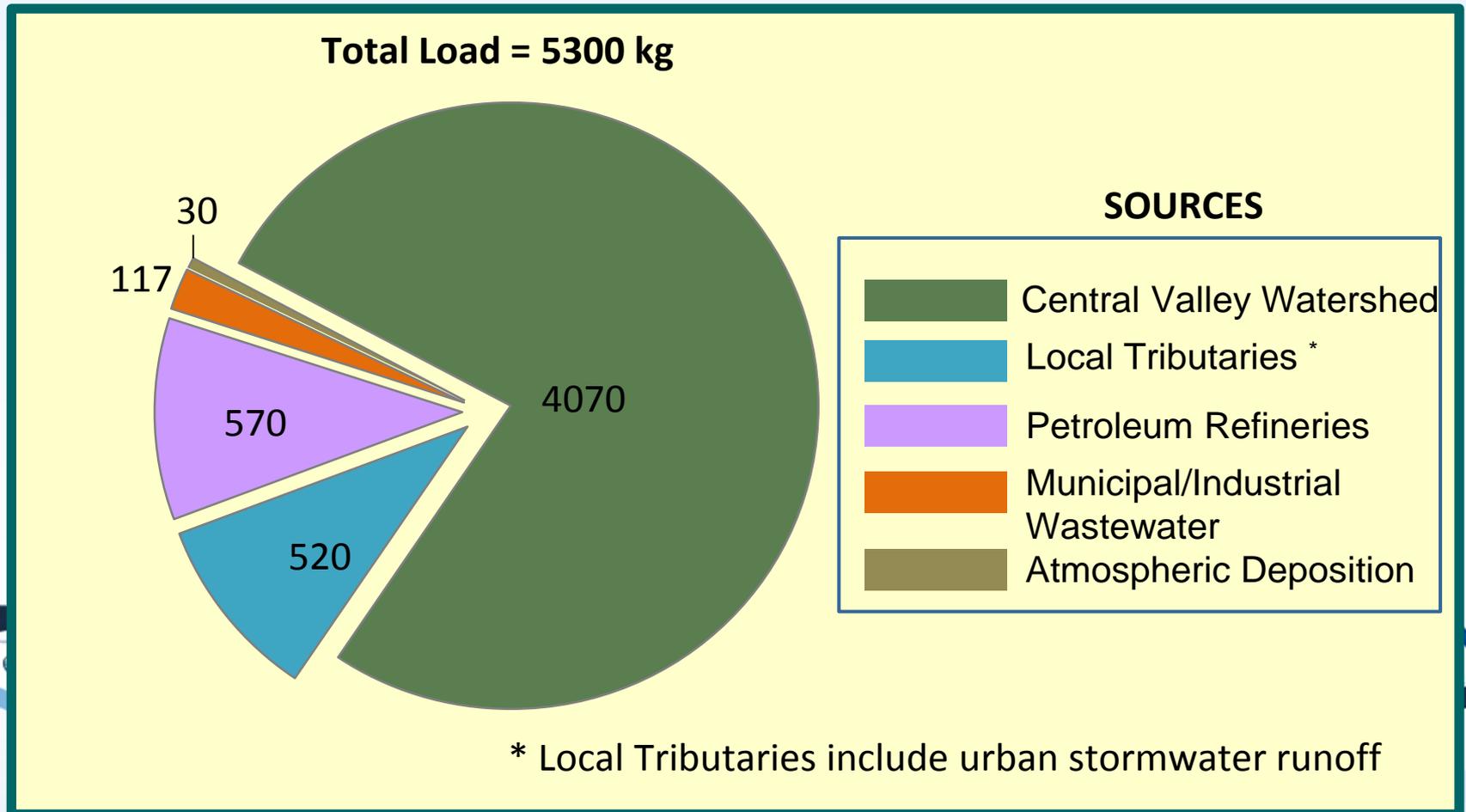


Selenium: WATER COLUMN



TMDL and Loads

$$\text{TMDL} = \sum \text{Existing Loads}$$



Wasteload Allocations

Individual allocations for permitted dischargers

- Petroleum Refineries 570 kg
- Municipal and Industrial 117 kg

Implementation Plan

Ensure safe levels of Se in fish and water

Petroleum refineries	➔	Numeric effluent limits
Municipal & industrial	➔	Load reporting
Central Valley	➔	Control Actions Imposed by CV TMDLs
Air deposition	➔	Background: No action
Local tributaries & urban runoff	➔	Background: No action

Implementation Plan cont.

Ensure safe levels of Se in fish and water



- Ambient selenium monitoring in fish and water
 - Non-lethal techniques to sample sturgeon
- Ambient water monitoring in San Joaquin River

Comments Received

1. US EPA, Region IX
2. San Francisco Baykeeper
3. Western States Petroleum Association
4. Bay Area Clean Water Agencies
5. Central Contra Costa Sanitary District
6. Eco Services Operations LLC
7. Partnership for Sound Science in Environmental Policy

US EPA Region IX

- Supports TMDL adoption
 - Considers TMDL targets appropriate and protective of white and green sturgeon
 - Comments on technical issues
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Response:

- Specific technical questions addressed in the Response to Comments document

San Francisco Baykeeper

Numeric fish tissue targets and TMDL not protective because:

- Green sturgeon risks not adequately assessed
 - White sturgeon not a good surrogate
 - Limited green and white sturgeon data
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Response:

- Green sturgeon life history = less risk
- White sturgeon is sensitive to selenium
- Monitoring of green sturgeon not reasonable
- Adequate white sturgeon data is being collected

Refineries, Municipal & Industrial Wastewater Facilities

- Attainment of Wasteload allocations
 - analytical methods for monitoring
 - Over-protective TMDL targets
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Response:

- Load reporting consistent with allocations
- Numeric targets must be protective of sensitive species and address uncertainty

Partnership for Sound Science in Environmental Policy

- Concerns about impacts of California WaterFix on San Francisco Bay water quality
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Response:

- TMDL considers load increases from San Joaquin River
- Small effect on water column concentrations
- Magnitude of the changes uncertain
- Load allocation applies to the Central Valley watershed

Staff Recommendation

Adopt the Tentative Resolution and Basin Plan Amendment



Biologists from CDFW display a white sturgeon to be tagged and released