

# Sampling Design for a Statewide Survey of Contaminants in Sport Fish in California Rivers and Streams

The Bioaccumulation Oversight Group

# Products and Timeline

- BOG planning discussions - November-January
- Draft Sampling Plan and QAPP - January
- Peer Review Panel meeting - February
- Finalize Sampling Plan and QAPP - End of February
- Begin sampling - End of February
- Year 1 data available - May 2012
- Draft report on year 1 - January 2013
- Final report on year 1 - May 2013

# SWAMP/BOG Monitoring Objectives

1. Status
2. Trends
3. Sources and Pathways
4. Effectiveness of Management Actions

Over the long-term, primary BOG emphasis on  
1 and 2; 3 and 4 are secondary

In the near-term, emphasis on 1 (Status)

# Beneficial Uses

1. Fishing
2. Aquatic Life

Over the long-term, the Program will evaluate the impacts of bioaccumulation on both, with an emphasis on 1

In the near-term, emphasis on 1 - Aquatic Life  
NOT INCLUDED

# Toolbox of Bioaccumulation Indicators

- Sport fish
- ~~Prey fish~~
- ~~Birds~~
- ~~Mammals~~
- ~~Bivalves~~

# Benefits of This Survey

- Consistent statewide assessment of all water body types
  - Building an overall summary report as we go
- Rivers and streams part of long-term survey cycle
- Fuller array of analytes than recent work in rivers and streams

# Significant Prior Work

- TSMP
- Fish Mercury Project
- Region 5 Studies
  - Mercury
  - Organics
- Sacramento River Watershed Program
- UC Davis
- USGS - Alpers et al, Valley work
- USEPA National Rivers and Streams Assessment

# Management Questions For This Screening Study

## Status of the Fishing Beneficial Use

- For popular fish species, what percentage of popular fishing locations have low enough concentrations that fish can be safely consumed?

## Need for Further Sampling

- Should additional sampling of bioaccumulation in sport fish (e.g., more species or larger sample size) at a location be conducted for the purpose of developing comprehensive consumption guidelines?



# Audience and Information Products

- Policy makers - Fact Sheet, Press Release
- Water quality managers - Summary Report
- The fishing public - Press Release, Safe to Eat Portal

# Design Basics

- Target species of toxicological concern: humans that consume fish
- Population of spatial units: fishing locations
- Species of interest
  - Fish species that are:
    - Popular
    - Widely distributed
    - Good indicators

# Coordination and Partnerships

## Coordinated Efforts

- Are there any other studies happening that we should coordinate with?
- Check into:
  - Alpers work in the Sierra
  - The Sierra Fund
  - Region 5

## Partners

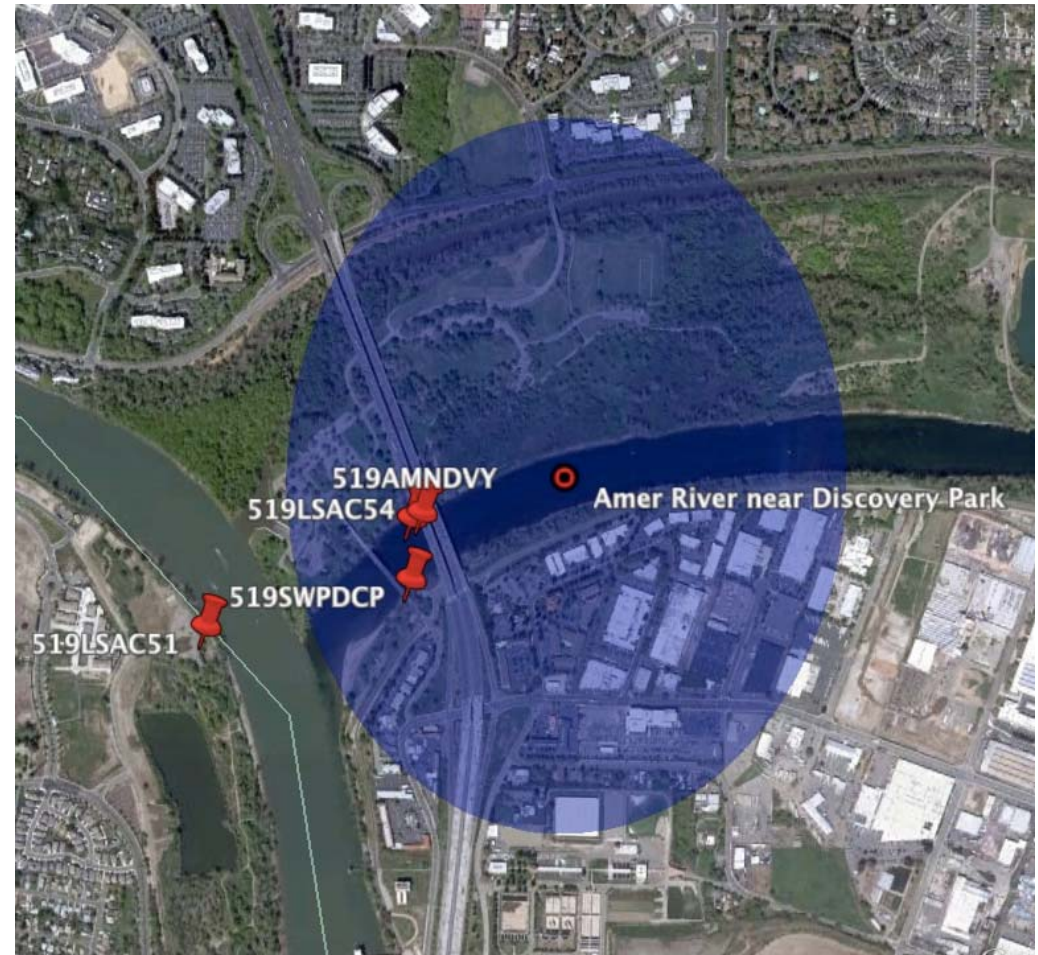
- Some limited Regional Board partnering
- Check with fishing groups

# Strategy for Phasing

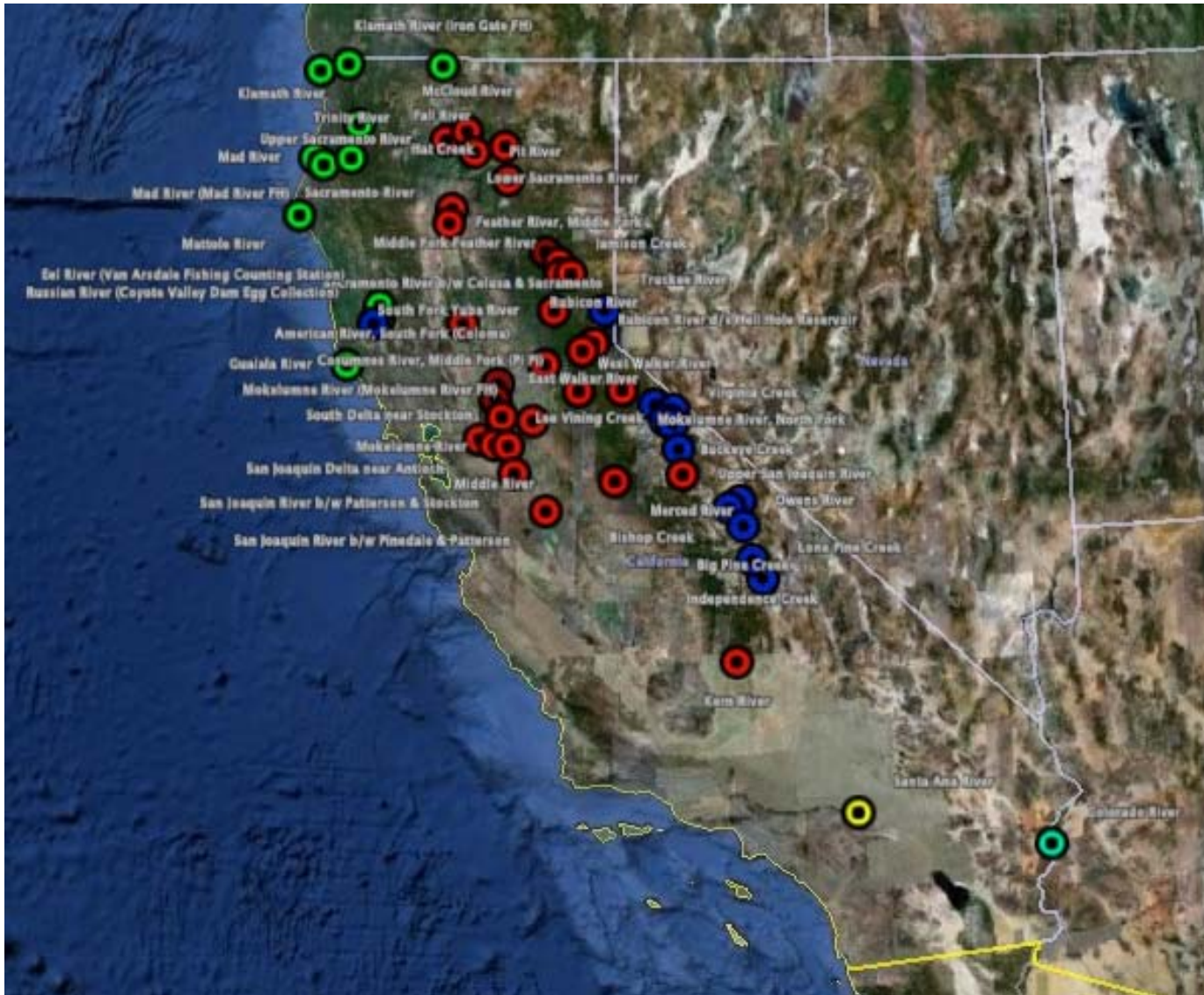
- One year
- No phasing needed

# Spatial Units: Fishing Locations

- Similar to locations used in lakes
- Up to 1 mile length
- Considerations for selection
  - Coverage of popular locations for sport fish consumption
  - Stakeholder (Regional Board) interest



# Sampling Locations: Statewide



# Sampling Locations: North

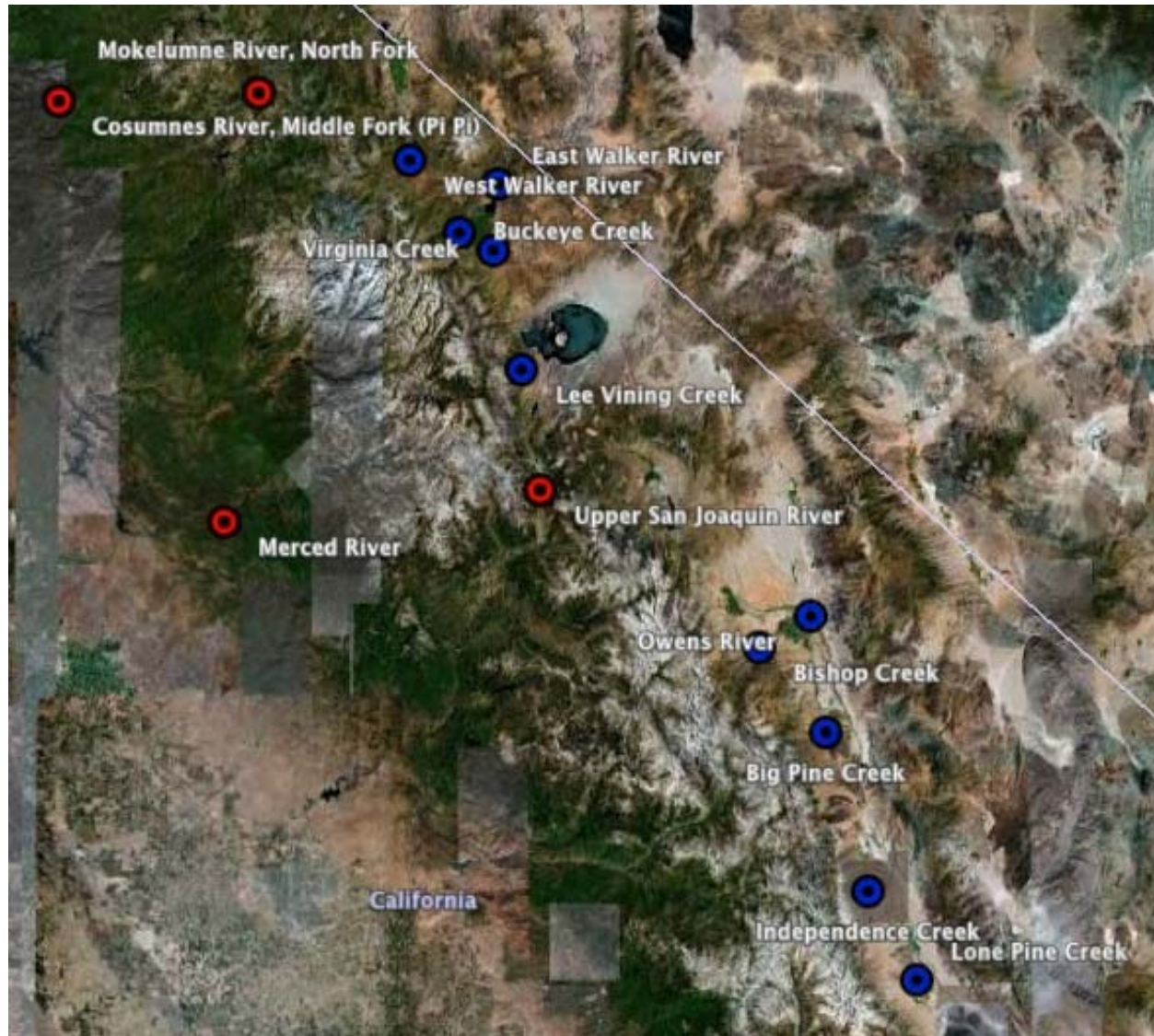


# Sampling Locations: Delta Region

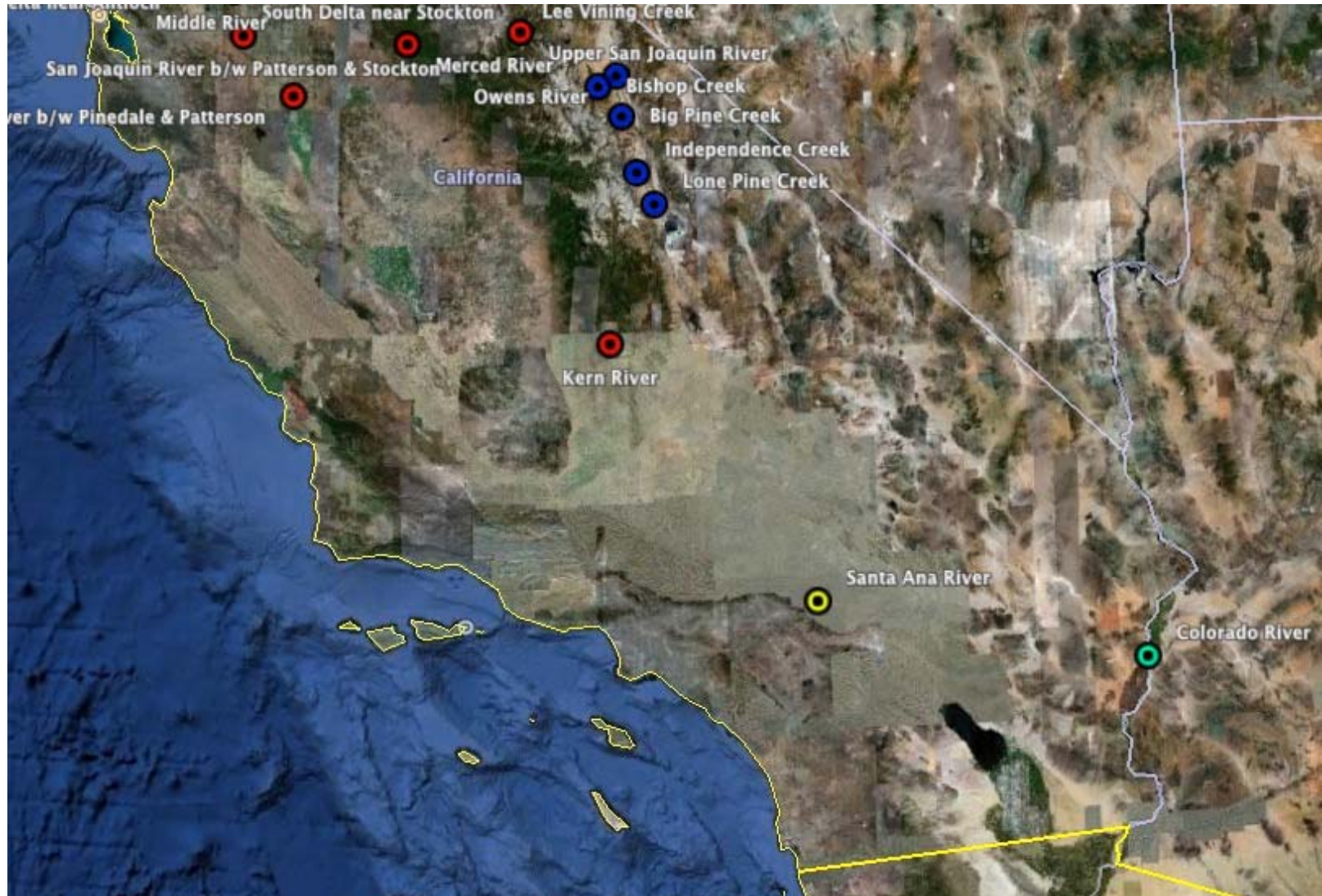




# Sampling Locations: Sierra Nevada



# Sampling Locations: South





# Locations

- See Gary's spreadsheet for latest list

# Questions

- How far to go with coverage of streams?
  - A: hit popular locations as defined by Stienstra and Regional Boards

# Design Within Each Location

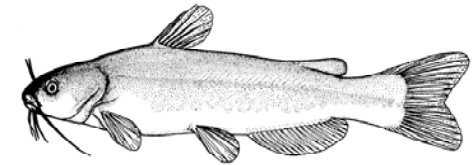
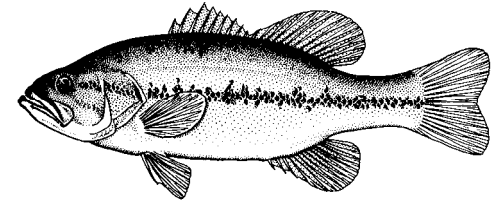
- Replication to support 303(d) listing?
  - No
- Sampling design with a follow-up strategy to conserve budget?
  - No

# Target Species

- Fish species that are (in order of priority):
  1. Popular for consumption
  2. Sensitive indicators of problems - “bad boys” - for the different pollutants of concern - helps with evaluating safe consumption
  3. Widely distributed - spatial coverage and patterns
  4. Represent different exposure pathways (benthic vs pelagic)
  5. Continuity with past sampling

# Target Species

- Primary Targets
  - Where appropriate, two indicator species per location
    - Mercury indicator: e.g., largemouth
    - Organics indicator: high lipid benthic species
    - Most locations will only have trout - sample one species at these locations
- Secondary Targets
  - In case primary targets are not found
- Vary by region
- Bycatch





# Target Species

Species	Foraging Type		Trophic Level	Distribution			Good Candidate
	Water column	Bottom feeder		Low Elevation	Low Sierra	High Sierra	
Largemouth bass	X		4	<b>X</b>	<b>X</b>		<b>A</b>
Smallmouth bass	X		4	<b>X</b>	<b>X</b>		<b>A</b>
Spotted bass	X		4	<b>X</b>	<b>X</b>		<b>A</b>
Sacramento Pikeminnow	X		4	x	x		B
White catfish		X	3	x	x		<b>A</b>
Brown bullhead		X	3	x			B
Channel catfish		X	4	<b>X</b>	<b>X</b>		<b>A</b>
Carp		X	3	<b>X</b>	<b>X</b>		<b>A</b>
Sacramento sucker		X	3	x	x		B
Tilapia		X	3				B
Bluegill	X		3	<b>X</b>	<b>X</b>		B
Green sunfish	X		3	<b>X</b>	<b>X</b>		B
Crappie	X		3/4	x	x		B
Redear sunfish	X		3	<b>X</b>	<b>X</b>		B
Rainbow trout	X		3/4	x	x	<b>X</b>	<b>A</b>
Brown trout	X		3		x	x	<b>A</b>
Brook trout	X		3			x	<b>A</b>
Kokanee	X		3	?	x	x	B

# Target Size Ranges and Compositing for Each Species

- Composite to stretch dollars
- Use 75% rule
- Target middle of distribution that is caught and consumed
- Need to determine ranges
- Numbers in composites
  - Generally 5

# Questions

- How to handle hatchery vs resident fish?
  - A: try to get residents or less recent releases
    - Pick sites away from hatchery release points - note proximity to release point for each site
    - Size?
    - Rounded fins?
    - ? Note this in the field

# Sample Processing and Analysis

- Ancillary data
  - Total length, fork length
  - Hatchery vs resident
  - Location coordinates
  - Field observations: bycatch, others?
- Skin-off fillets

# Analytes in Tissue

- Mercury: generally composites, some individuals
- PCBs: sum of 55 congeners, skip Aroclors, no coplanars
- DDTs: sum of six isomers
- Dieldrin
- Chlordanes: sum of 5 compounds

## Analytes in Tissue (continued)

- PBDEs - no
- Selenium - yes
- PFCs - no
- Dioxins - no
- Omega 3 - no
- Others?
- Ancillary parameters: lipid, moisture

# Ancillary water or sediment quality data?

- Will explore collaboration with Charlie Alpers' study

# Archiving

- Tiered approach
  - Long-term archives
  - Short-term archives



# Sampling Methods

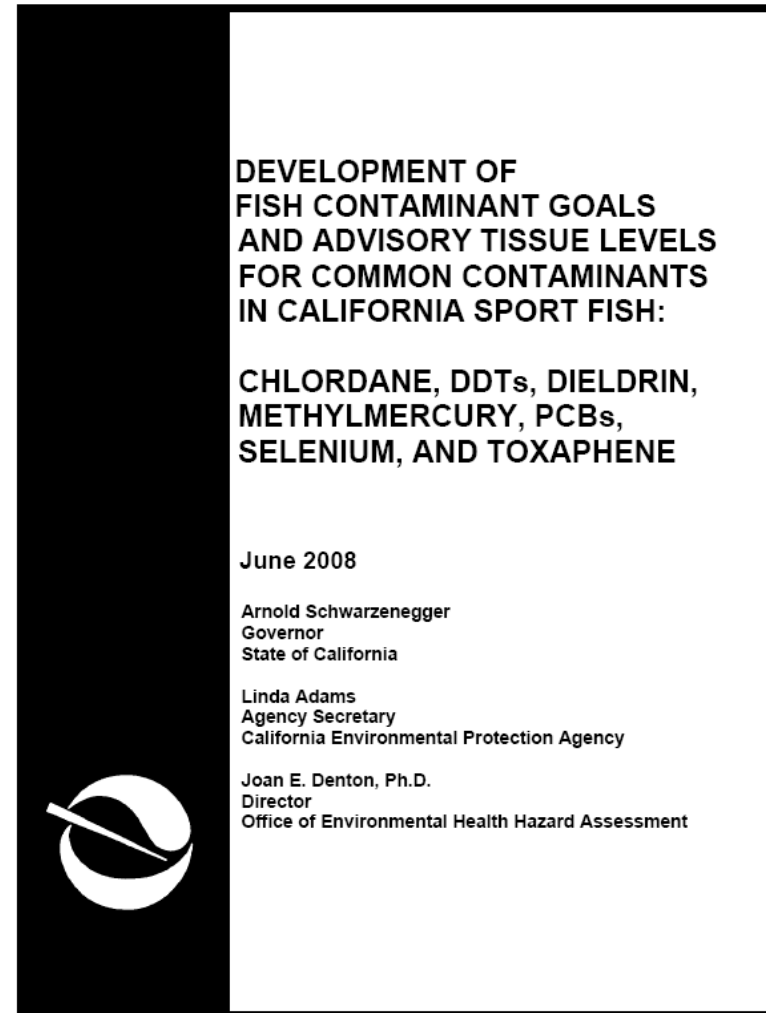
- E-boat
- Backpack shocker
- Gill nets
- Hook and line

QA

- QAPP

# Assessment Thresholds

- Advisory Tissue Levels
- FCGs
- State Board Mercury Objective?



Collect <b>2 species per location</b> as defined by the Statewide Bioaccumulation program. Sample collection costs not only include field time/costs, but also field data entry&QA, pre-trip preparation, post-trip duties, etc.	\$5,500	56	\$308,000
Fish Composite Preparation - includes 1 jar per composite created (DFG-WPCL)	\$100	36	\$3,600
Archive - assume 1 jar per archive (DFG-WPCL)	\$5	180	\$900
Fish Composite Preparation - includes 1 jar per composite created (MPSL-DFG)	\$100	35	\$3,500
Archive - assume 1 jar per archive (MPSL-DFG)	\$5	175	\$875
NIST Archive - assume 1 jar per archive (MPSL-DFG)	\$17	0	\$0
Organochlorine Pesticides (OCH; 8081M) - <b>tissue</b>	\$584	62	\$36,208
Polychlorinated Biphenyls (PCB Congeners; EPA 8082M) - <b>tissue</b>	\$544	62	\$33,728
Polybrominated Diphenyl Ethers (PBDEs) - <b>tissue</b>	\$584	0	\$0
Microcystin	\$436	2	\$872
Other compounds of interest: Pyrethroids, Pharmaceuticals, Nonylphenol, Nonylphenol ethoxylates	\$0	0	\$0
Mercury (Hg) - <b>tissue individuals (dissection and analysis)</b>	\$60	100	\$6,000
Mercury (Hg) - <b>tissue composites</b>	\$66	62	\$4,092
Selenium (Se) - <b>tissue</b>	\$150	71	\$10,650
Scale analysis - on all black bass (based on 5-10 individuals)	\$85	10	\$850
NIST Archive storage fees (based on 110 samples)			\$0
			<b>\$409,275</b>

Hatchery Collections	\$500	6	\$3,000
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