

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 - January/February
- Finalize Sampling Plan and QAPP - March
- Begin sampling - Spring 2011
- 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~~

Significant Prior Work

- TSMP
- Fish Mercury Project
- Region 5 Studies
 - Mercury
 - Organics

Benefits of This Survey

- Consistent statewide assessment of all water body types
 - overall summary report when we're done?
- Rivers and streams part of long-term survey cycle
- Complete array of analytes

Management Questions For This Screening Study

LAKES

1. 305(b): What is the condition of California lakes with respect to contamination?

- Indicator: lakewide average concentration

2. 303(d): Should a given lake be on the 303(d) list?

- Indicator: Two independent samples above the relevant guideline (different days or different locations)

3. *(Consumption Guidelines: Should additional sampling be conducted for the purpose of developing an advisory?)*

COAST

1. Status of the Fishing Beneficial Use

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

2. Regional Distribution

- What is the regional distribution of contaminant concentrations in fish?

3. Need for Further Sampling

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

Design Basics

- Population of interest: humans that consume fish
- Spatial unit: fishing location
- Species of interest:
 - Fish species that are:
 - Popular
 - Widely distributed
 - Good indicators

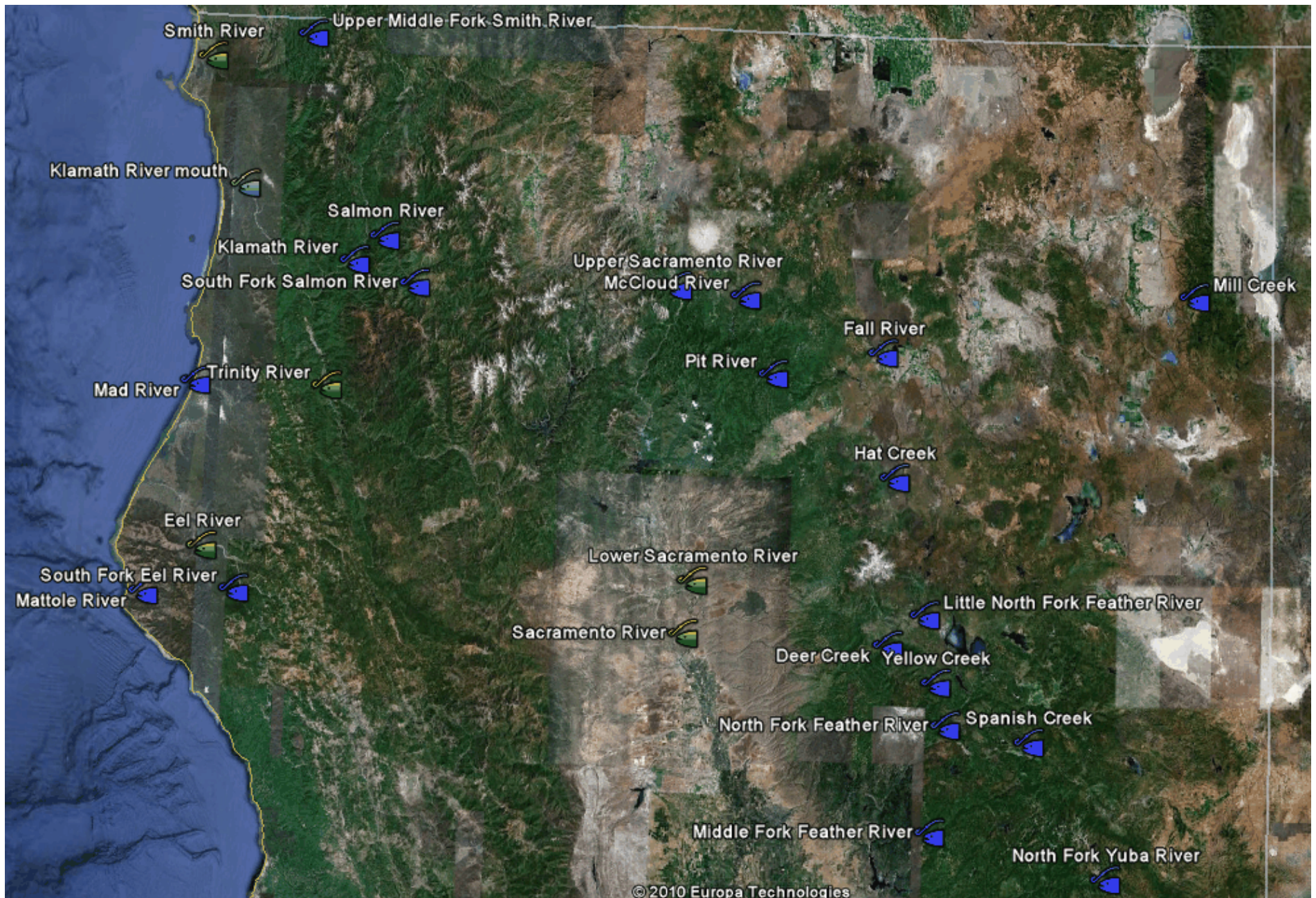
Coordination

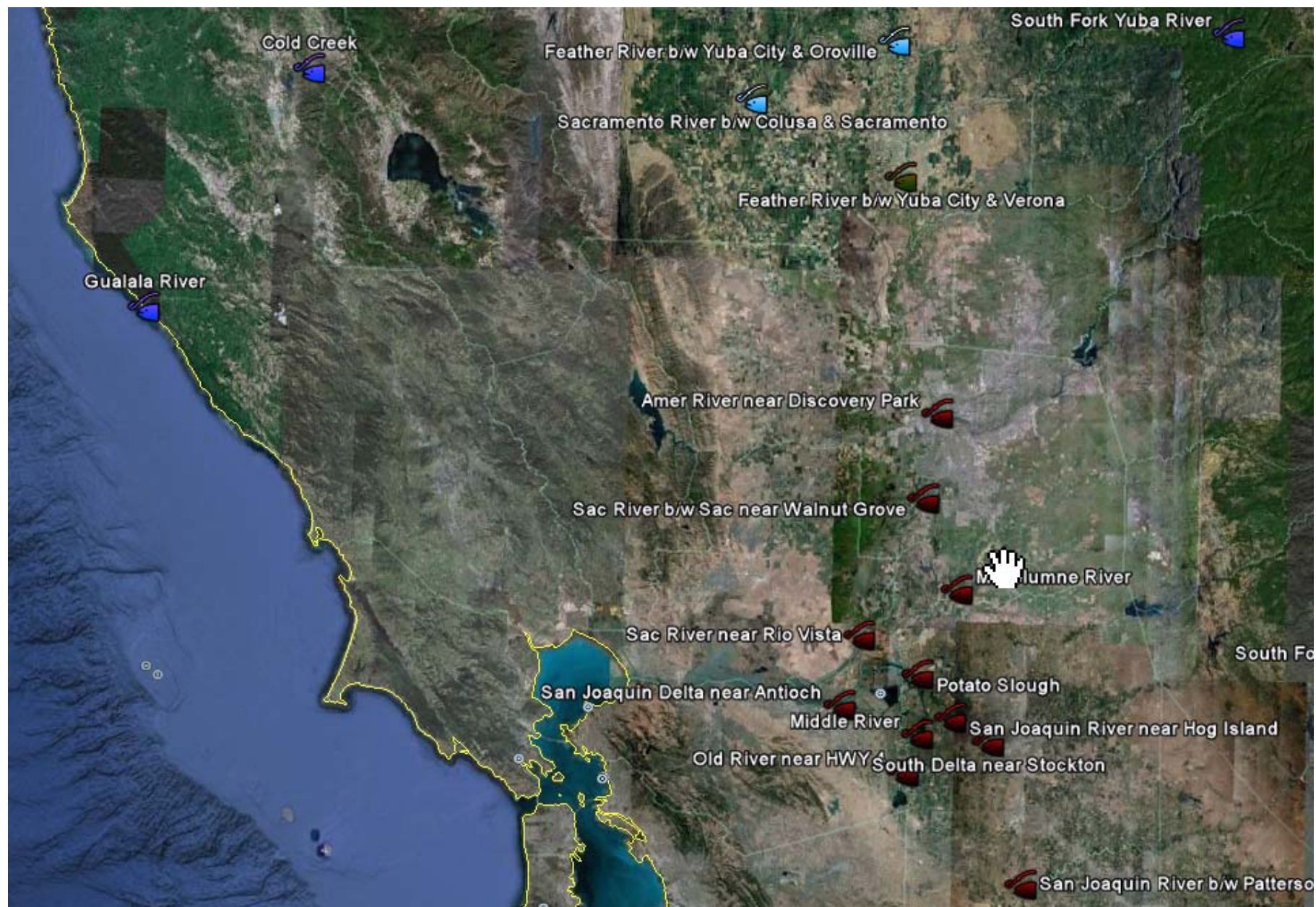
Coordinated Efforts

- Are there any other studies happening that we should coordinate with?

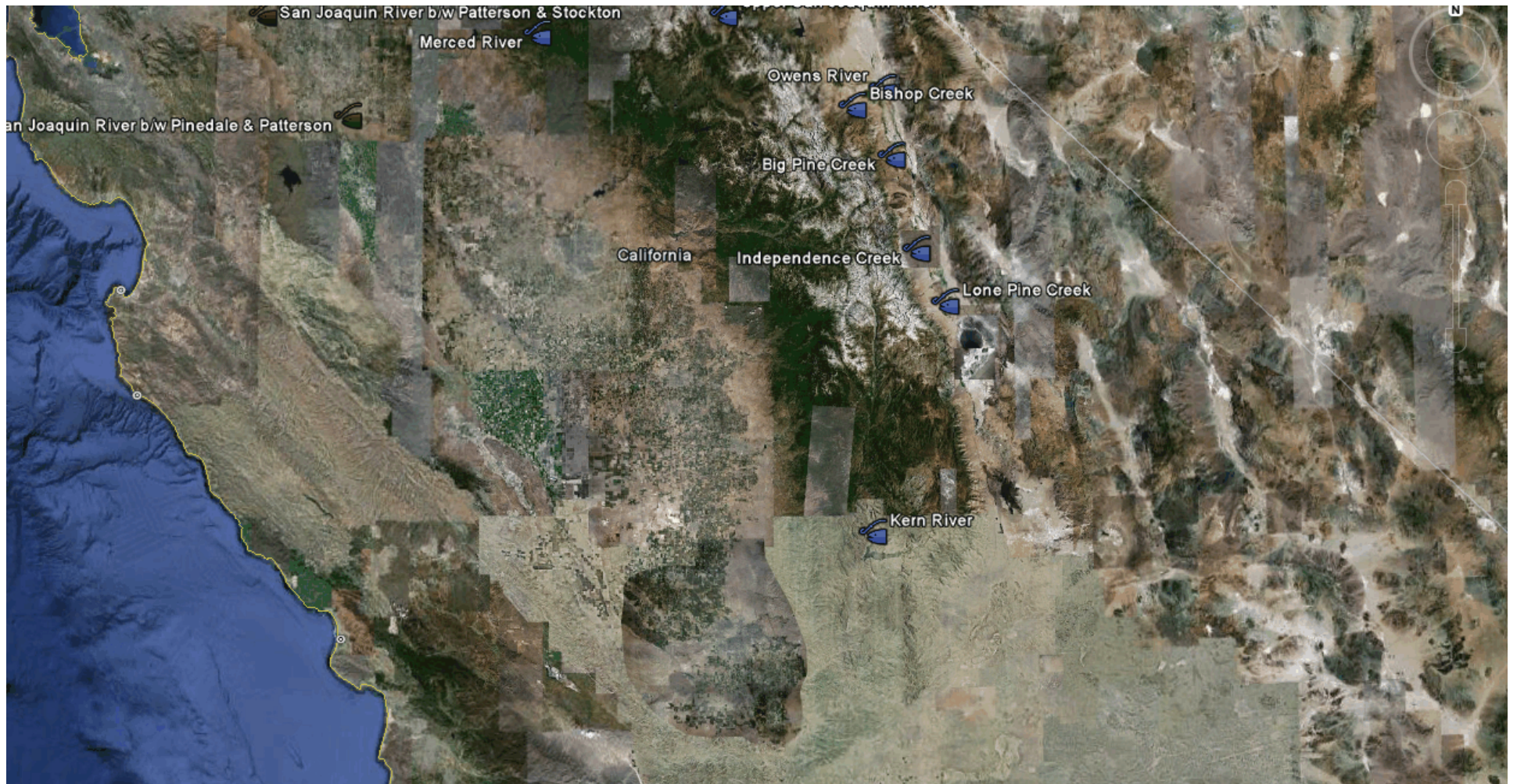
Strategy for Phasing

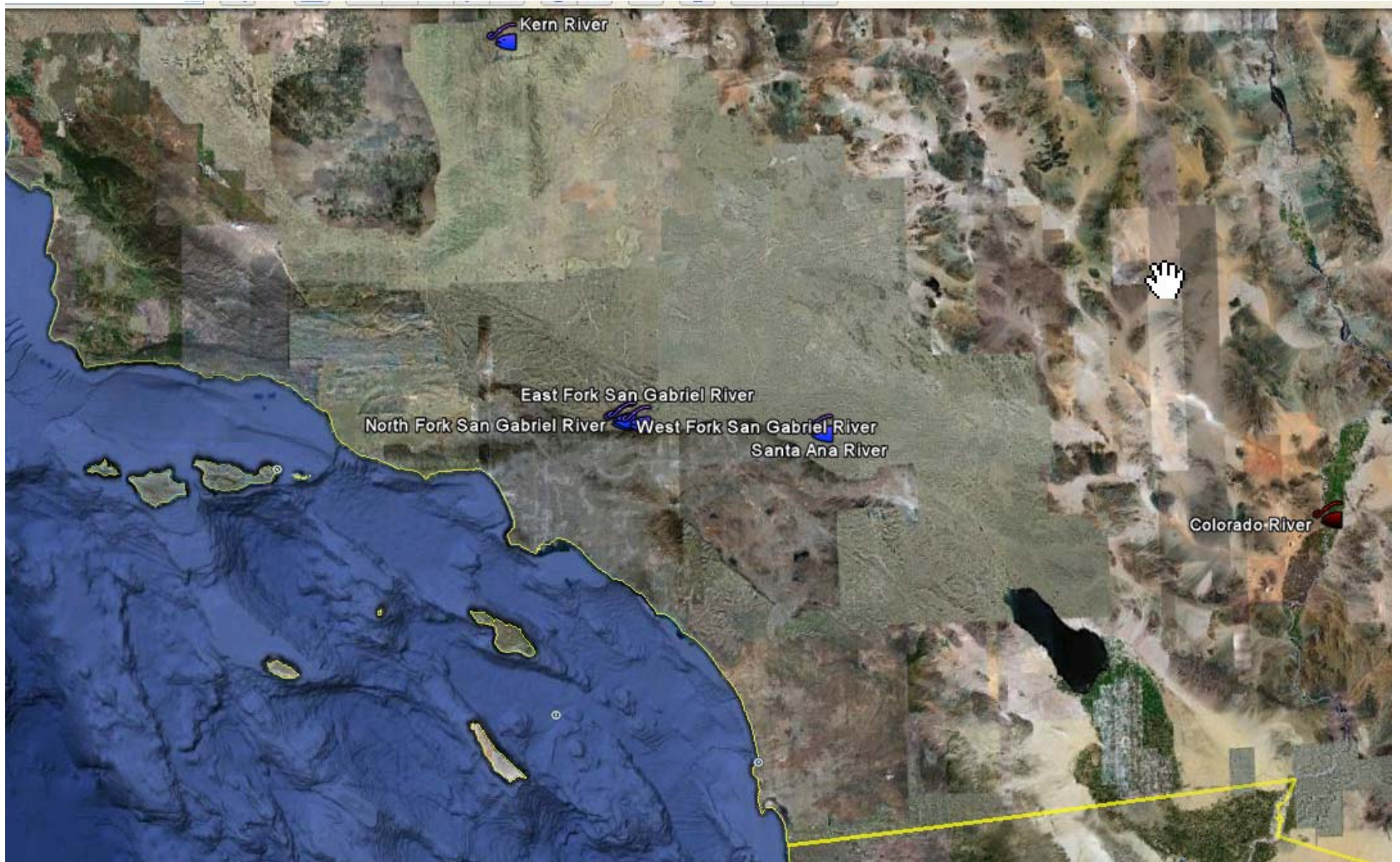
- One or two years?
 - Depends on how many locations we need to cover
- Phasing?
- The following maps show 60 locations based on sites with a 6 or higher rating in *Stienstra, T. 2004. California Fishing: The Complete Guide to Fishing on Lakes, Streams, Rivers, and Coasts. Foghorn Outdoors, Emeryville, CA*, plus 8 locations added by Gary for the Delta based on his past work there. Are there popular sites for catch and consumption missing from these maps?











Outstanding Questions

- How far to go with coverage of streams?
- How to handle hatchery vs resident fish?
 - Sample hatcheries?

Spatial Units: Fishing Locations

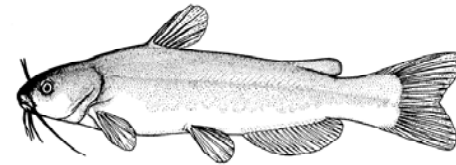
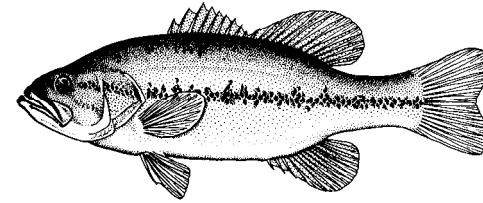
- Similar to locations used in lakes
- Up to 1 mile length
- Considerations for selection
 - Coverage of popular locations for sport fish consumption
 - Stakeholder (Regional Board) interest

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. Cleaner species
 5. Represent different exposure pathways (benthic vs pelagic)
 6. Continuity with past sampling

Target Species

- Primary Targets
 - Where possible, two indicator species per location
 - Top predator as a mercury indicator
 - High lipid benthic species as an organics and mercury indicator
 - Some waters will only have trout
- Secondary Targets
 - In case primary targets are not found
- Vary by region
- Bycatch



Target Species

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

Design Within Each Location

- Replication to support 303(d) listing?
- Sampling design with a follow-up strategy to conserve budget?

Sample Processing and Analysis

- Ancillary data
 - Total length, fork length
 - Location coordinates to store in database: start of a trawl, fishing, gill net or dive
 - Field observations: dominant substrate, Beaufort scale, wind direction, bycatch
- Skin-off fillets

Analytes in Tissue

- Mercury: generally composites, some individuals?
 - For bays and estuaries, consider picking mercury indicator species like lakes
 - Develop budget scenarios
- 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?
- PFCs?
- Dioxins?
- Selenium?
- Omega-3s?
- Others?
- Ancillary parameters: lipid, moisture

QA

- QAPP

Sampling Methods

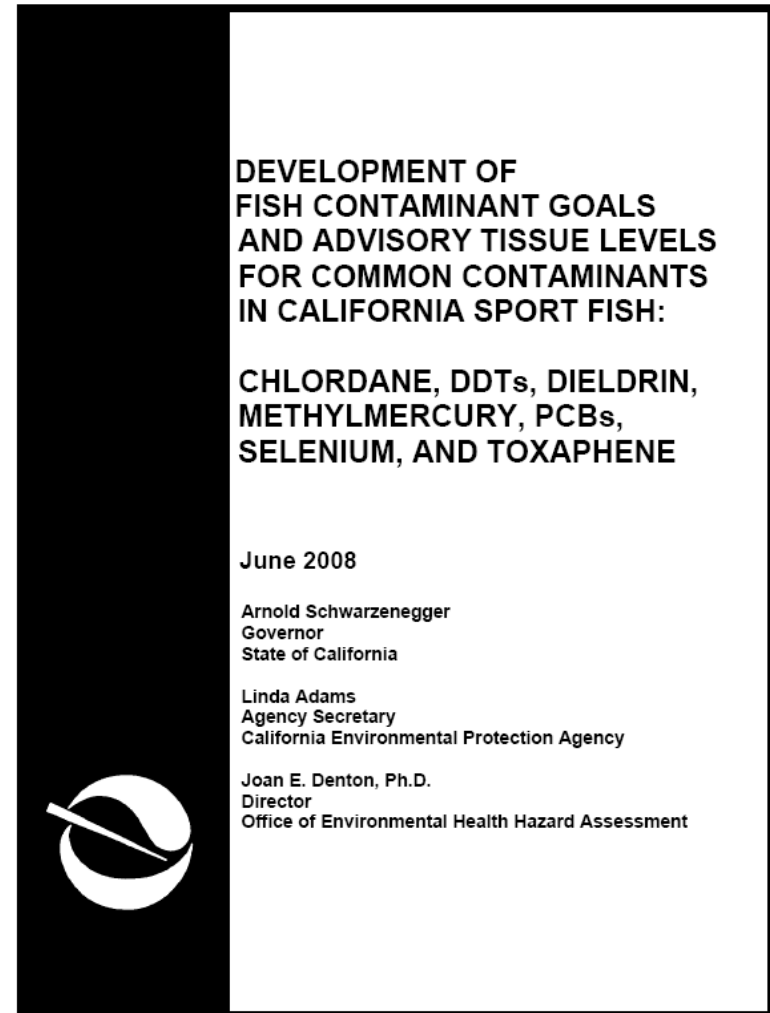
- E-boat
- Nets
- Seining
- Hook and line

Ancillary water or sediment quality data?

- ??

Assessment Thresholds

- Advisory Tissue Levels
- FCGs
- State Board Mercury Objective?
- 303(d) Listing Thresholds?



Archiving

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