

# Mercury monitoring in California sport fish: past, present, and future

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# Mercury (Hg) in California's Aquatic Ecosystems

- Legacy contamination
  - Extensive gold mining in the Sierra Nevada
  - Mercury mining in the Coast Range of northern and central California
- Current contamination
  - Atmospheric deposition from combustion emissions
  - Urban and industrial sources



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# Mercury Monitoring

- Two programs addressing Hg bioaccumulation
  - Fish Mercury Project (FMP), funded by the California Bay-Delta Authority
  - Surface Water Ambient Monitoring Program (SWAMP), funded by the California State Water Resources Control Board



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# Past, Present and Future of Mercury in California

- The programs combined provide a multi-tiered approach to understanding Hg contamination
  - Historic review of sport fish mercury data
  - Extensive fish sampling over the next three years
  - Development of a long-term strategy for monitoring mercury and other pollutants in aquatic biota



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# Historical Data Review

- Compilation of all available data from statewide and regional sport fish monitoring efforts
- QA of incoming data sets
  - e.g., lab QA, fish length, compositing scheme
- Standardized data base



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# Monitoring Programs Included

- Statewide
  - Toxic Substances Monitoring Program
  - State Mussel Watch Program
  - Coastal Fish Contamination Program
- Regional
  - Regional Monitoring Program for Water Quality (SF Bay)
  - Sacramento River Watershed Program
  - Many others

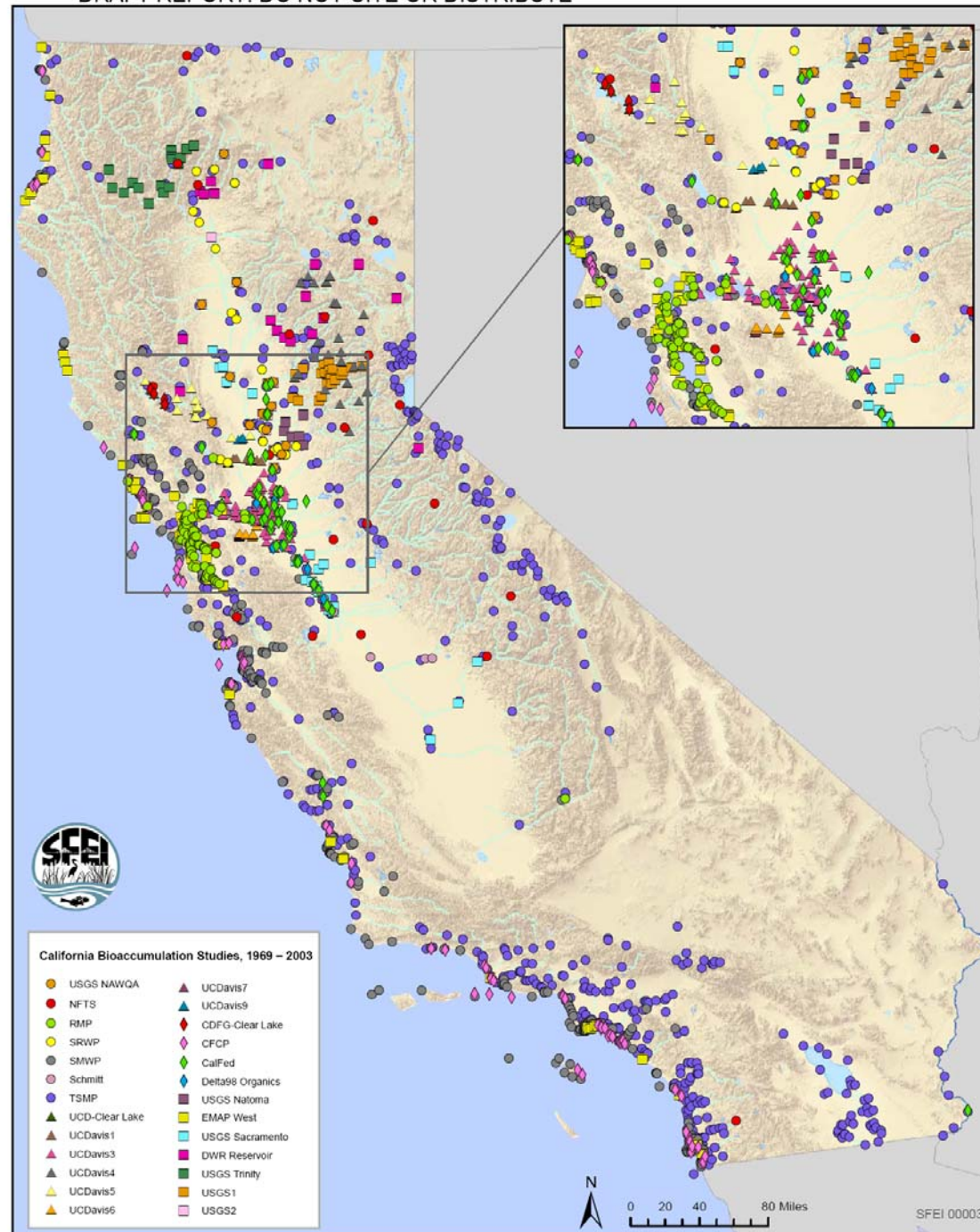




# Historical Data Review:

## Bioaccumulation sampling sites

### 1969-2003



# Assessing Mercury Impact

- Calculate median of Hg concentration in muscle tissue (wet weight)
- Select the species at each site with highest mercury
- Interpret concentrations using human health thresholds from OEHHA



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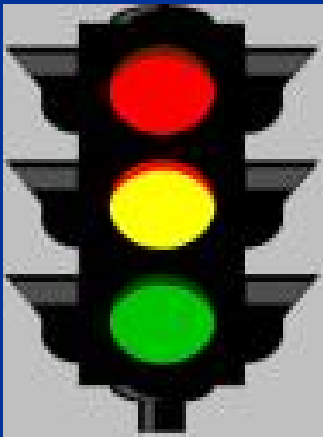
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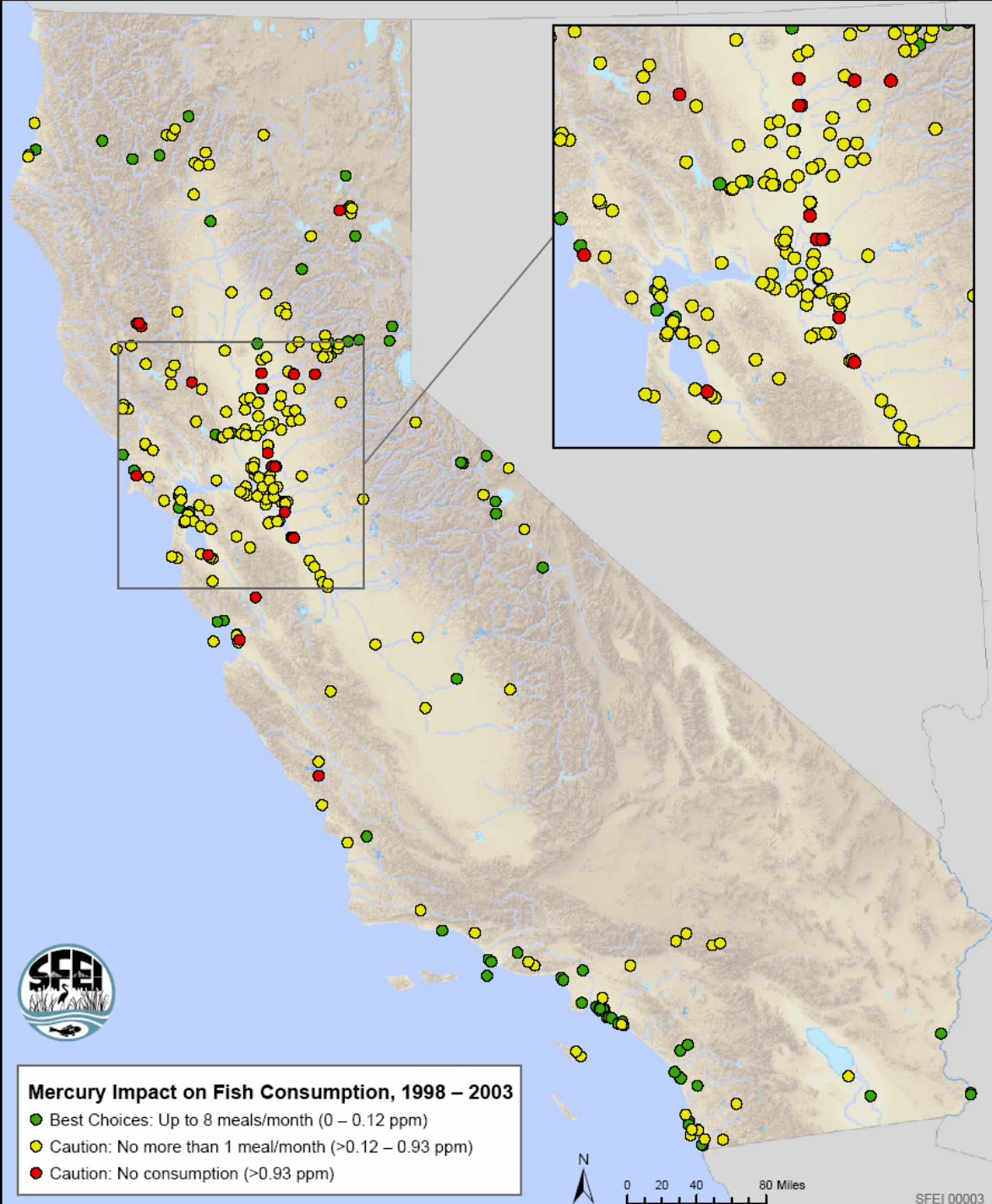
# Mercury Impact on Fish Consumption

1998-2003

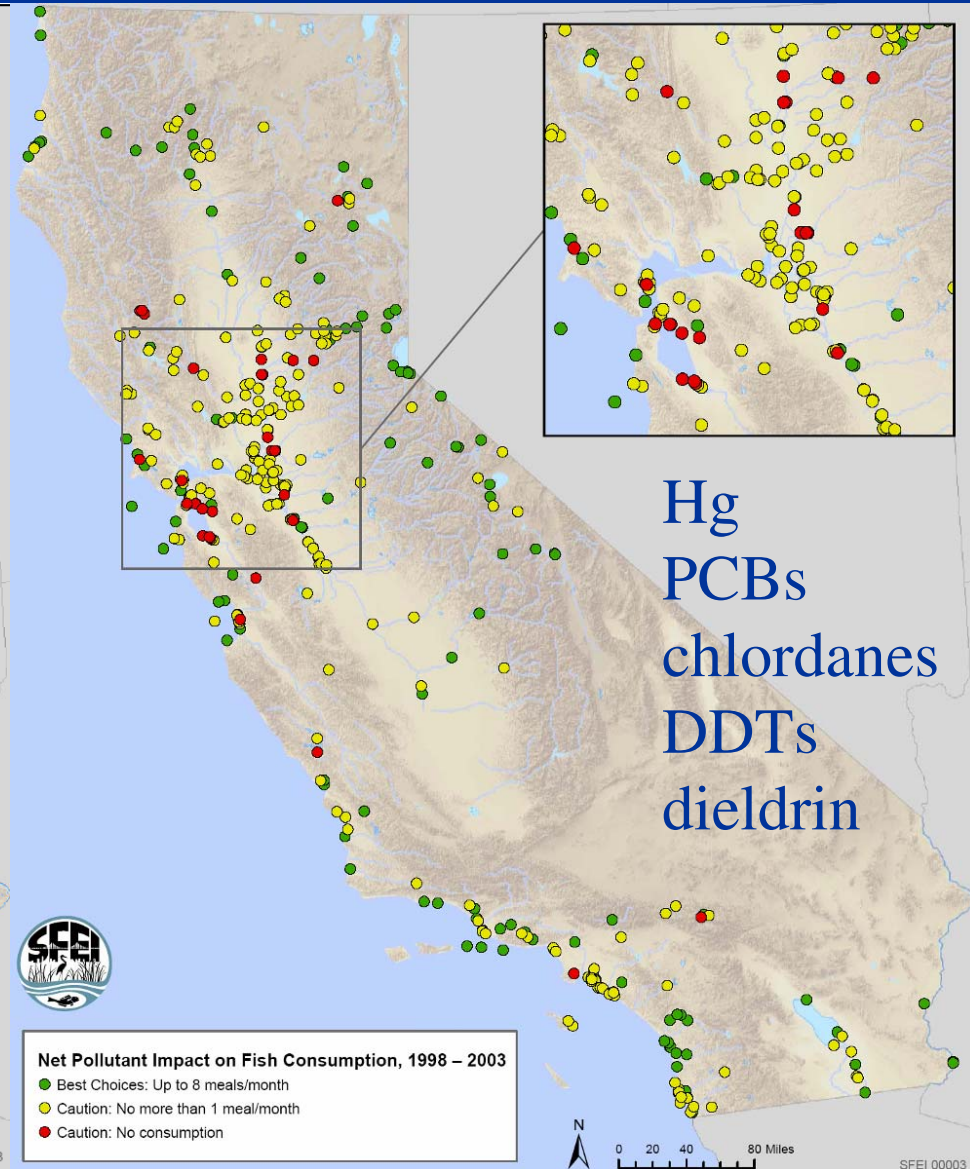
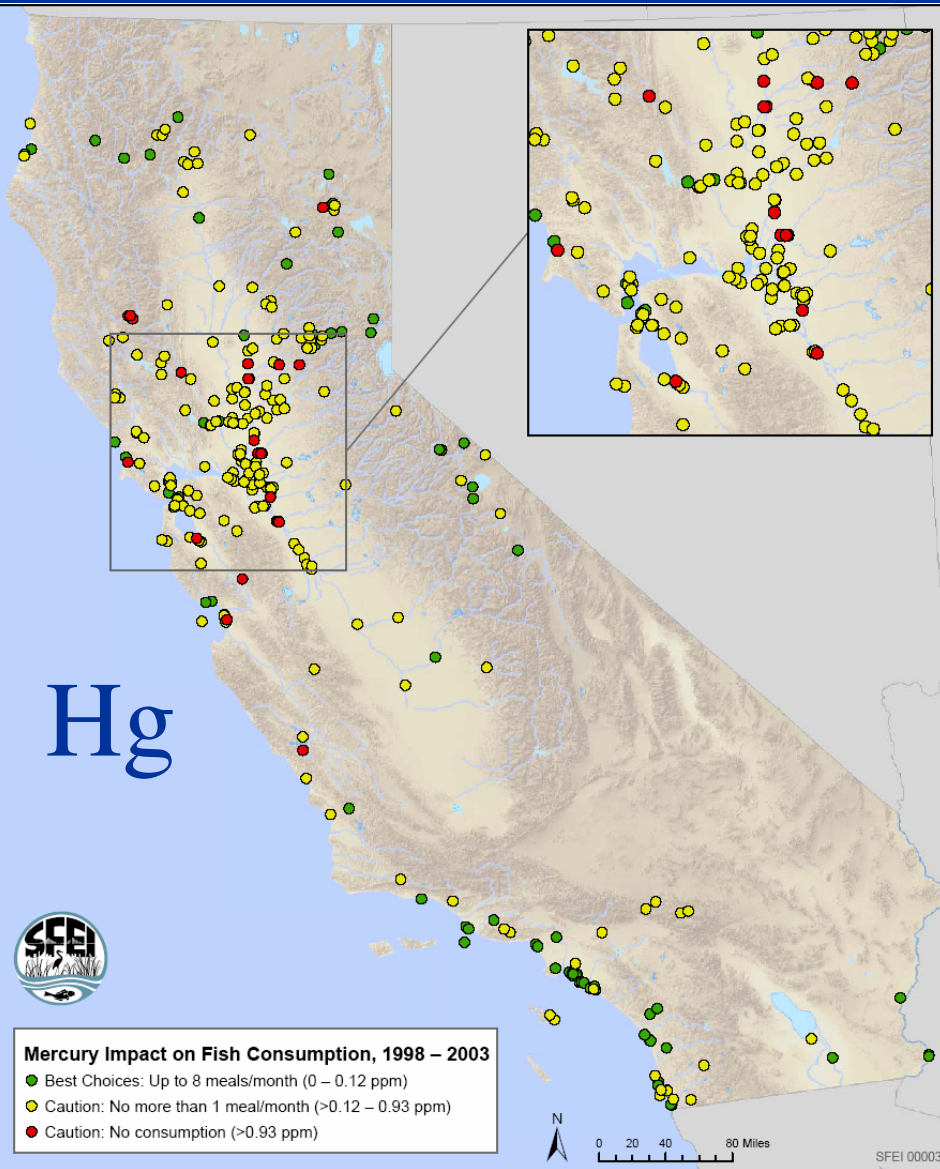


Higher Risk

Lower Risk



# Mercury is driving the overall pattern of net pollutant impact (Hg, PCBs, chlordanes, DDTs, dieldrin)



# Hg Problem is Significant

- Several species and sites exceed a 0.3 ppm threshold for human health concern
- Some exceed the threshold by 3-fold or more
- Consumption advisories driven by mercury are in effect for many water bodies in California



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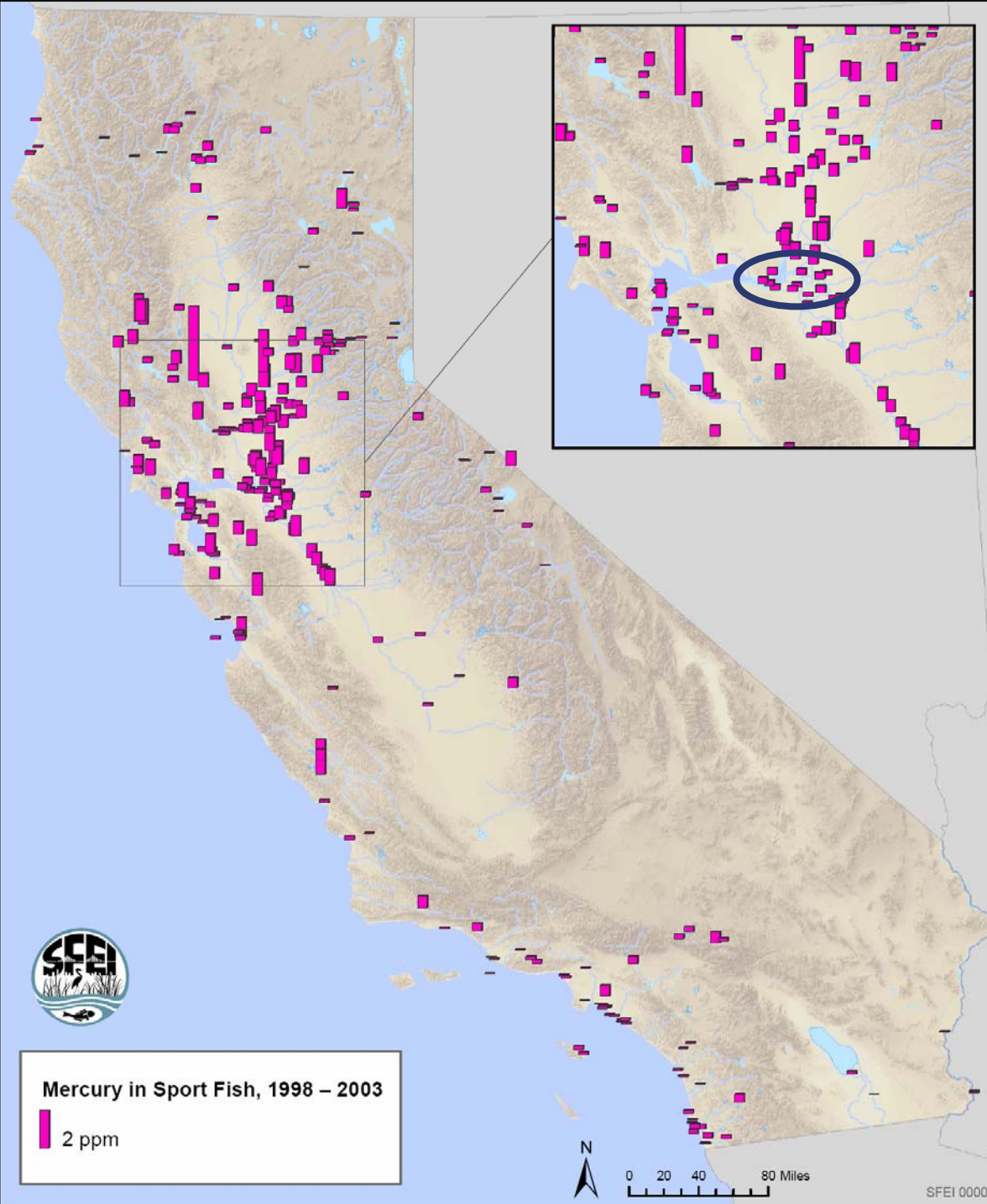
# Water Bodies with Fish Consumption Advisories

## Office of Environmental Health Hazard Assessment



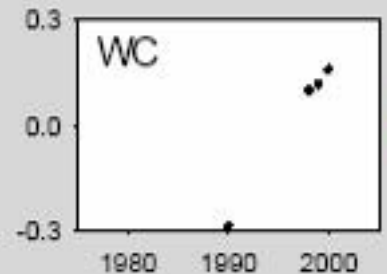
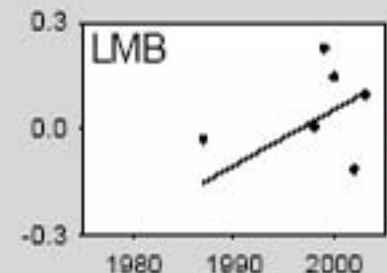
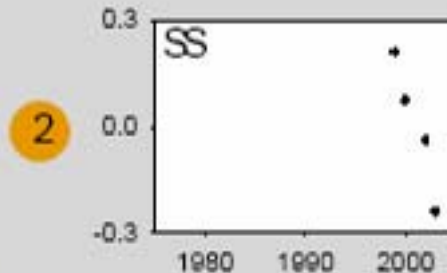
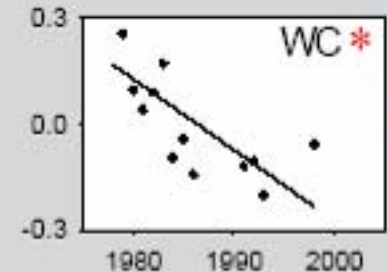
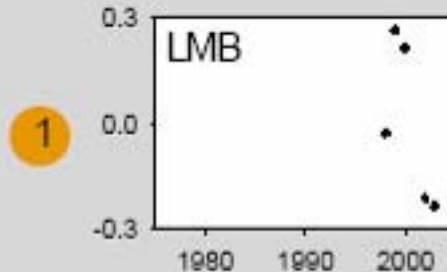
# Mercury Concentrations 1998-2003

- Species with highest median Hg at each site are shown
- Spatial variation in watershed
- Overall spatial correlation with Hg and gold mining
- Worst hot spots are associated with mines



# Little evidence of long-term change

- Sparse data set for time trends
- Largely NS trends
- White croaker decline at Sacramento R poorly understood





# How to address the problem (minimize exposure)?

- Ultimate approach to protect humans and wildlife
  - Adaptive management — cleanup, restoration, and monitoring
  - Impact of cleanup may take 50-100 years or more



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# How to minimize human exposure?

- Interim approach for humans only
  - Monitoring
    - Identify high and low concentration areas
    - Identify high and low concentration species
  - Develop consumption advice
  - Communicate risk information to the public
  - Can have significant impact in 10 years or less



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# Fish Mercury Project 2005-2007

- Extensive sampling of mercury in sport fish in the Central Valley and Delta
- Small fish sampling for spatial trends and effects of restoration
- Advisory development and risk communication
- Stakeholder involvement



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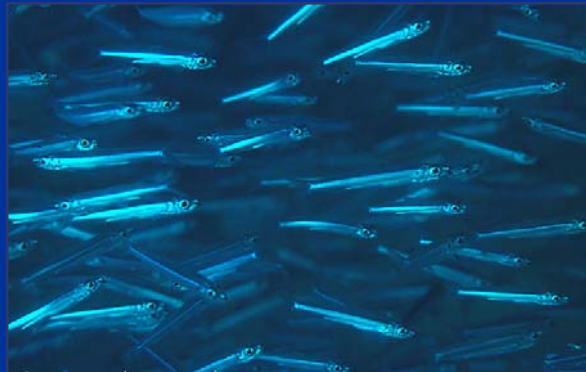
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# SWAMP Monitoring Strategy

## Preliminary Vision

- Integrated monitoring
- Hybrid design for sampling locations
- Suite of different indicator taxa
- Stakeholder involvement
- Peer review



# Hybrid Monitoring Design

- Random sampling (GRTS)
  - Provide inference about areas that have not been sampled
  - Statewide assessment
  - Advisory development
- Targeted sampling (fixed sites)
  - Long-term trend analysis
  - Local assessment of specific management actions
  - Advisory development

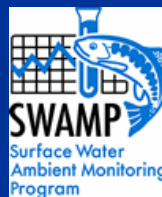


# Process-oriented Elements of the Proposed Program

- Stakeholder involvement
  - Agency staff
    - water quality, health, resource agencies
  - Community-based Organizations
  - Fishing groups
  - Environmental groups
- Peer review



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# Stakeholder Involvement

- Data-user needs
- Goals, objectives, assessment questions
- Coordination with other monitoring
- Environmental justice
- *Risk communication* (integrated monitoring)



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# Peer Review

- Internal
  - SWAMP Roundtable
- External
  - Panel of national experts in bioaccumulation and/or monitoring



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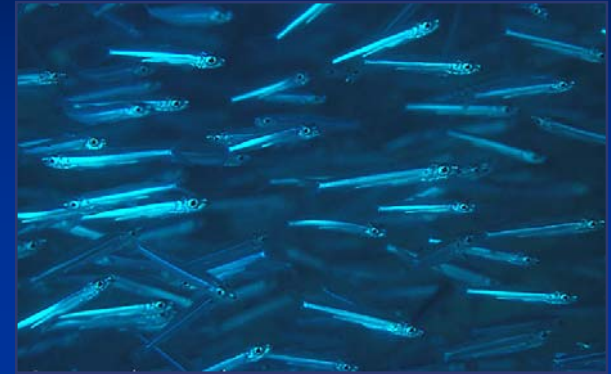
# Preliminary Design - Sport Fish

- Primary emphasis in bioaccumulation monitoring
- Assess the fishing beneficial use
- Use "integrated" monitoring approach
- Hybrid design for sampling locations

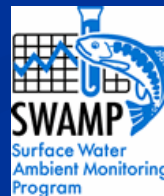


# Preliminary Design - Small Fish

- Indicate
  - Wildlife exposure
  - Spatial and temporal trends
- Targeted sampling location design
  - Critical habitats, particularly wetlands
  - Historic sites
  - Sites potentially influenced by management actions



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# Preliminary Design – Bird Eggs

- Indicate
  - Risks to aquatic birds
  - Regional spatial patterns
  - Long-term trends
- Targeted sampling location design
  - Regional index sites with historic time series
  - Sample in critical wildlife habitats
  - Compare to effects thresholds for development and survival

