



Monitoring Mercury in Sport Fish from the Delta Watershed

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FISH
MERCURY
PROJECT

●●● **The Fish Mercury Project (FMP)** is funded through the Ecological Restoration Program (ERP) of CBDA to monitor the mercury levels in popular sport fish and biosentinel fish from the Delta Watershed, to develop human health consumption advisories where appropriate, to communicate risks of consumption of contaminated fish to affected communities, and to measure short-term temporal and spatial changes in mercury concentrations due to CBDA wetland restoration projects. This poster will focus on the sport fish component of the project. The five principal investigators on the project are the California Department of Health Services (see Poster this session), California Office of Environmental Health Hazard Assessment, Moss Landing Marine Laboratory, San Francisco Estuary Institute, and the University of California at Davis (see Poster this session).

Hg

●●● **The Mercury Problem**

Mercury is a toxic heavy metal that accumulates to concentrations of concern in Bay-Delta sport fish. Mercury contamination of the Delta watershed primarily occurred due to gold and mercury mining activity during the 1800s. Mercury was extensively mined in the Coast Range and transported to the Sierra Nevada for use in extracting gold from ore and placer deposits. Historical releases of mercury from these mercury and gold mining districts was substantial, and in many cases mercury continues to wash downstream from these areas today. Mercury has neurotoxic effects in humans and is particularly hazardous for developing fetuses and children (OEHHA 1994b). The most toxic form of mercury is methylmercury. This is the form most readily accumulated in wildlife and humans via food web transfer. Top aquatic predators, such as seals, humans, and some fish, can accumulate high concentrations of mercury by consuming contaminated fish. Methylmercury formation has been linked to processes that occur in wetlands. Consequently, there is concern that large-scale wetland restoration in the Bay-Delta watershed could increase concentrations of methylmercury in the food web (Davis et al., 2003).

Mercury in Bay-Delta fish has been detected at concentrations exceeding human health guidelines (Greenfield et al., 2003; Davis et al., 1999; Davis et al., 1998) (see Table 1 and Figure 1). Eighty-six percent of striped bass and 73% of channel catfish sampled from the Delta Watershed in 1999 and 2000 exceed the human health screening value of 0.3 ppm. Striped Bass are popular sport fish particularly for Asian American anglers while catfish species are often consumed by Asian and African American anglers (DHS, personal communication). The FMP Principal Investigators have solicited input from anglers and subsistence fishers in order to target the most popular sport fish and fishing locations for mercury analysis.

●●● **Acknowledgements**

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●●● **CBDA Mercury Strategy**

The California Bay Delta Authority has developed a Mercury Strategy to provide a scientific framework for identifying sources of mercury, measuring mercury concentrations in fish and wildlife, assessing and communicating associated health risks, and finding ways to reduce sources of mercury and wetland methylation of mercury (Wiener et al., 2003). The Mercury Strategy guides the ERP in implementing large scale restoration projects in the Delta Watershed. The FMP was designed following the guidance of the Strategy.

●●● **Fish Mercury Project—Governance & Goals**

The Project Team has convened a Steering Committee and a Science Review Panel to oversee and guide the project. The Steering Committee is made up of scientists, human health professionals, environmental group representatives, anglers, and community based organization representatives. The Science Review Panel consists of experts in the field of mercury contamination and public health assessment of fish contamination. The Steering Committee and Panel have been instrumental in the design of the Project and the Project Goals and Objectives. The Project will continue to follow guidance from the Steering Committee and Science Review Panel throughout the project.

The three goals of the Project are:

- 1 Protect human health in the short term by characterizing mercury concentrations in fish, developing safe consumption guidelines, and reducing exposure through risk communication based on environmental justice principles
- 2 Through food web monitoring, determine how habitat restoration and mercury clean-up actions affect methylmercury accumulation in the food web
- 3 Establish an organizational and technical foundation for cost-effective and scientifically defensible fish mercury monitoring that meets the identified needs of end users

●●● **Geographic Focus**

The geographic focus of the project is on the “ecological management units” (EMUs) of the ERP. These EMUs basically cover the Central Valley watershed downstream of the major reservoirs. Based on guidance from CBDA, we are focusing the majority of our sampling sites in these areas to best address CBDA’s needs. While the primary focus of this project is downstream of the reservoirs, in some cases development of effective consumption advice demands that we characterize fish contamination in the reservoirs adjoining the EMUs. Based on guidance from CBDA, some of our sampling will be conducted in these reservoirs but it will be less than 50% of the total sport fish sampling effort.

●●● **Definition of Sampling Sites**

The sampling design for this project includes four different types of sampling sites (index sites, intensive sites, restoration sites, and advisory development sites), in addition to sampling of three salmonid species (Chinook salmon, steelhead, and rainbow trout).

Index Sites

These are intended to form a network for evaluating whether habitat restoration results in increased food web mercury at a regional scale (areas beyond the immediate restoration site), providing a foundation for analyzing long-term changes in Hg accumulation in fish, and evaluating how Hg concentrations vary across the watershed (spatial variation of Hg). Sportfish will be sampled at 6 sites in 2005 and in 2007.

Intensive Sites

These sites will also evaluate whether habitat restoration results in increased food web mercury at a regional scale but will provide more detailed evaluations of seasonal variation in methylmercury uptake, and of methylmercury accumulation in all of the important species in the food web. Sportfish species will be sampled at 3 sites/year.

Restoration or Remediation Project Sites

These sites will evaluate the impacts of habitat restoration or cleanup actions on a local scale (areas in close proximity to restoration/remediation sites). Sportfish will be sampled at 3 sites/year.

Advisory Development Sites

Providing the information needed by OEHHHA to support development of consumption advice throughout the watershed. Also provide information on Hg spatial patterns in the watershed. These sites (~33/year) are going to be spread throughout the watershed, primarily in CBDA’s ecological management units (EMUs) (see Figure 2).

Salmonid and Anadromous Species Sampling

Certain species of salmon and other anadromous fish (fish that live part of their life cycle in marine waters and part in fresh waters) will be sampled in order to develop consumption advice on migratory fish.

●●● **Status of 2005 Sampling**

The Moss Landing Marine Lab sampling team has recently completed the 2005 sampling. Laboratory analysis of sport fish will begin immediately with first year data expected in May 2006.

- For more information on this project please contact:
Jay Davis (jay@sfei.org) or Jennifer Hunt (jennifer@sfei.org).
- You may also visit our web site at www.sfei.org/cmrl/fishmercury for more information.

●●● **References**

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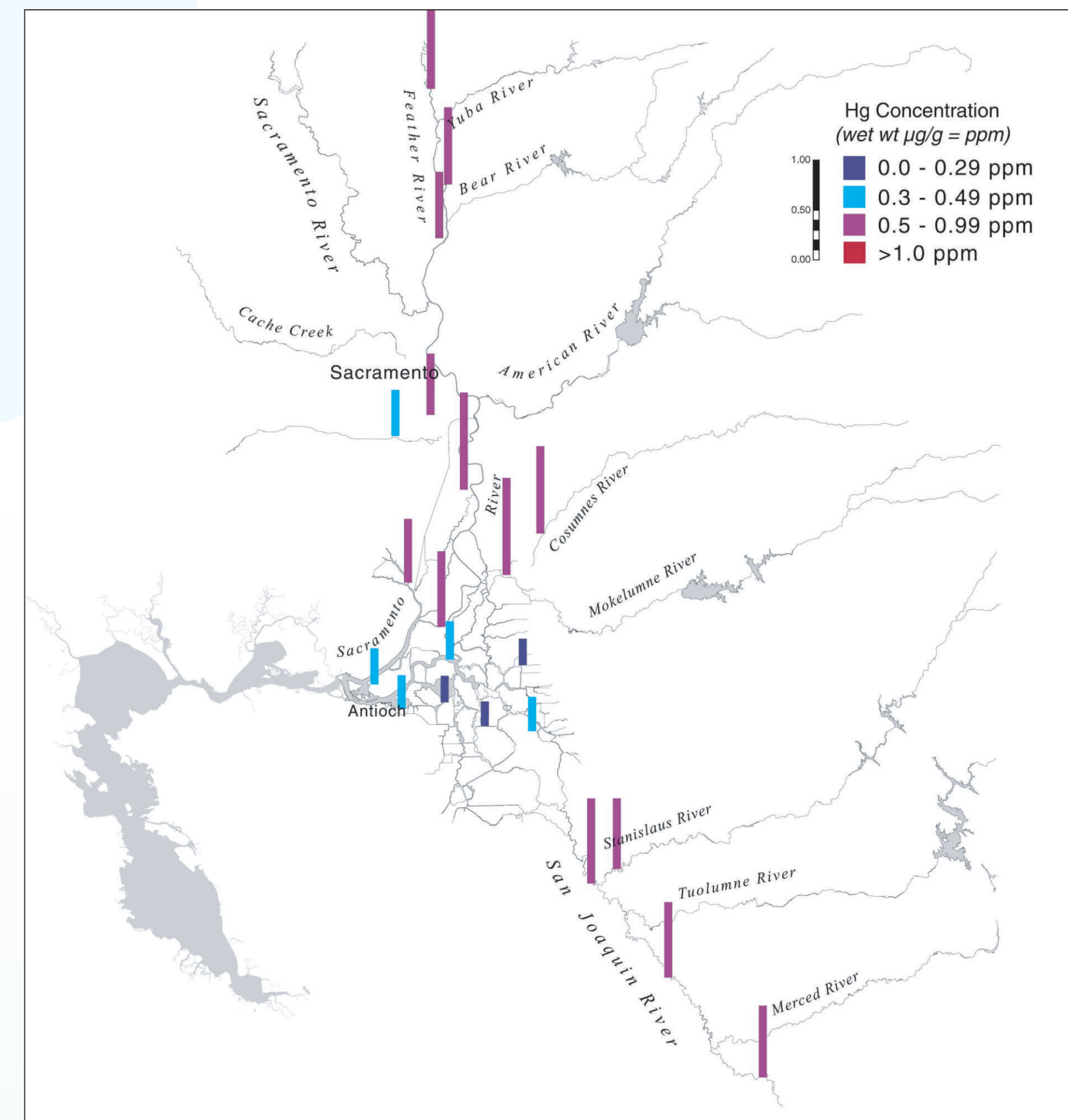
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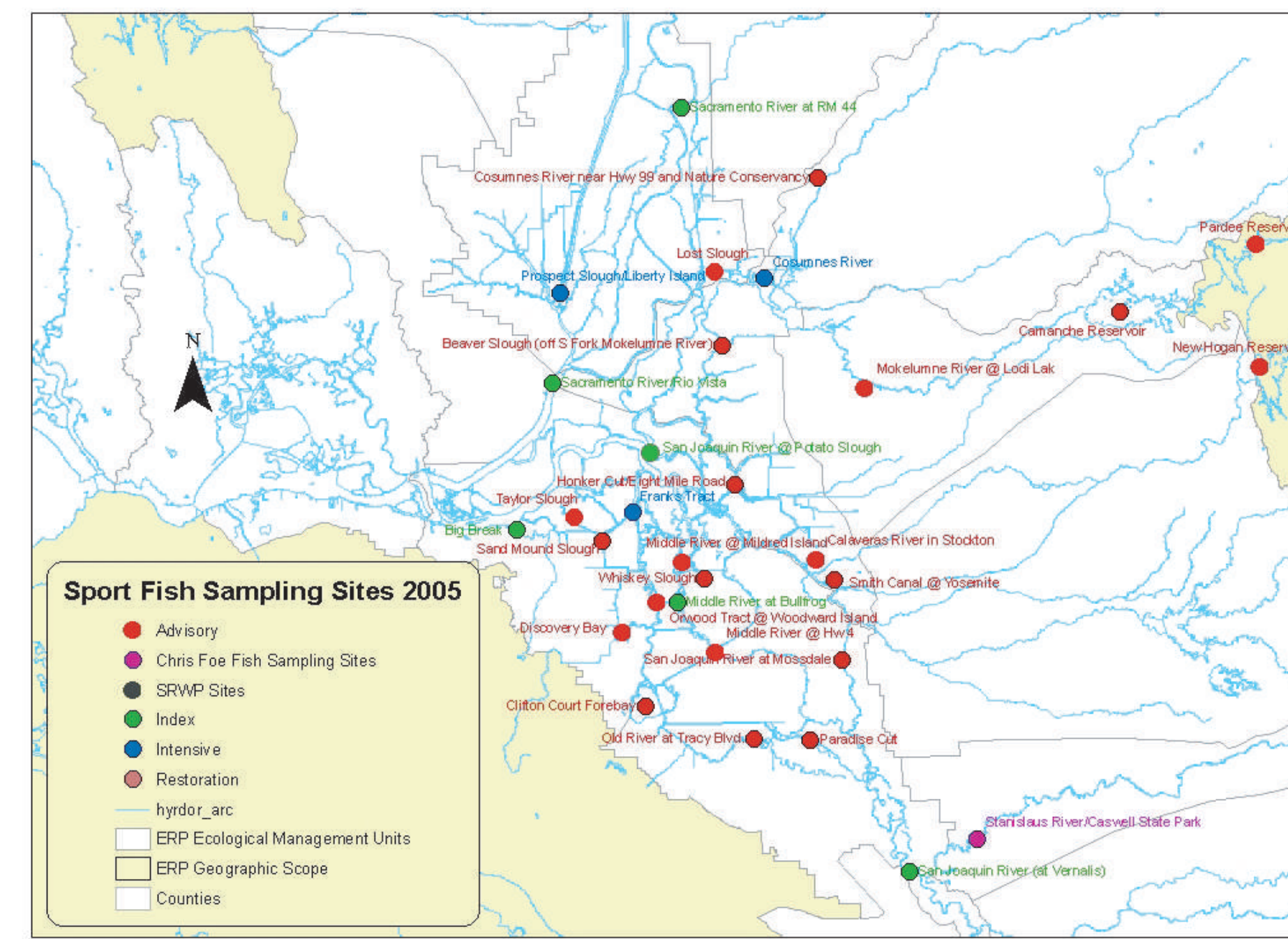
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●●● **Figure 1**



Average mercury concentrations in largemouth bass, 2000. All fish are 305 – 438 mm total length.

●●● **Figure 2**



2005 sport fish sampling locations in the Central Delta. Other sampling will occur along the San Joaquin and Sacramento Rivers and tributaries.

●●● **Table 1**

Species	# Analyzed	# Fish Represented	% over 0.3 ppm	% over 1 ppm
Largemouth bass	326	326	80%	17%
White catfish	142	142	54%	5%
Striped bass	36	36	86%	17%
Sacramento pikeminnow	43	43	58%	30%
Channel catfish	11	38	73%	9%
Black crappie	6	27	67%	0%
Sacramento sucker	17	78	35%	0%
Common carp	9	41	33%	0%
Bluegill	33	159	9%	0%
Redear sunfish	20	96	5%	0%
TOTAL	643	986	65%	13%

Exceedance of mercury screening value (0.3 ppm wet weight) for fish sampled from the Delta, 1999 and 2000.

