

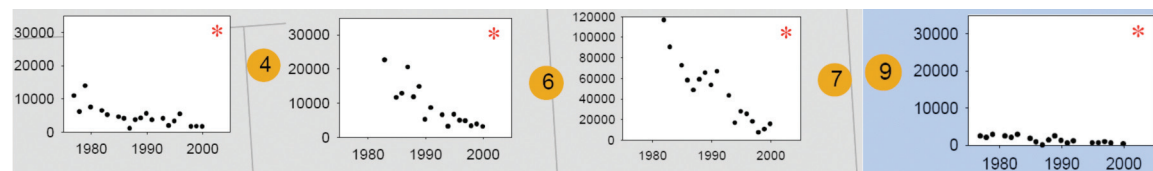
## Moving Forward

SWAMP's review of past monitoring served as a basis for designing an improved statewide program. The new program is beginning with a survey of lakes and reservoirs in 2007 and 2008. This study is measuring pollutants in the 200 most popular fishing lakes in the state. It will also provide an evaluation of the general condition of lakes across the entire state. SWAMP will publish results from the 2007 sampling at the end of 2008.

The bioaccumulation review highlights several limitations of past monitoring that should be improved upon in future efforts. Future monitoring should:

- Include an unbiased, representative sampling of all fishing locations.
- Emphasize sampling of the water bodies that are most popular for fishing.
- Include long-term sampling of selected locations for trend analysis.
- Provide a basis for evaluation of risks to piscivorous wildlife.
- Provide a foundation for development of consumption advice in the near term so the public can reduce its exposure immediately while waiting for cleanup efforts to reduce pollutant concentrations in the longer term.

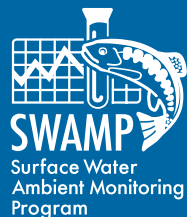
Figure 2



(Source: *Bioaccumulation of Pollutants in California Waters: A Review of Historic Data and Assessment of Impacts on Fishing and Aquatic Life*. Graphs embedded in Fig. 3.4.6, pg. 77, October 24, 2007, State Water Resources Control Board, Surface Water Ambient Monitoring Program)

Figure 2. Mussel monitoring documented clear declines in PCBs and other chemicals from 1980 to 2000. PCB levels have generally fallen across the state since these chemicals were phased out and then banned in the 1970s. These graphs represent the significant long-term trends in PCB concentrations (sum of Aroclors) in California mussels, ppb lipid weight. The locations of these findings are as follows: 4) Royal Palms 6) Huntington Harbor, 7) Newport Bay, 9) Oceanside.

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## Fact Sheet

# Long-Term Monitoring of Pollutants in Fish and Mussels Documents Major Improvements and Persistent Problems

## Overview

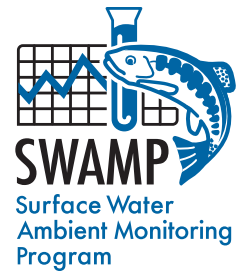
*Bioaccumulation of Pollutants in California Waters: A Review of Historic Data and Assessment of Impacts on Fishing and Aquatic Life*, an important report recently released by the State Water Resources Control Board, offers both reason for celebration and cause for concern. The review assessed the current status of bioaccumulation in waters of the state and set the stage for improved monitoring in the future.

Of the 390 sites sampled between 1998 and 2003, 32 percent fell into the “low” contamination category. These sites were scattered throughout the state, with a particular prevalence in the Sierra Nevada and the area north of San Diego. Unfortunately, the Delta region had relatively few sites with low concentration of pollutants. In general, PCB and DDT levels in fish and mussels across California have declined greatly since the 1970s, and many species have bounced back in response to the decline in DDT levels.

However, the report also found that present concentrations of pollutants in fish collected from many California water bodies are high enough to cause concern for possible effects on human health and to have a significant impact on the fishing beneficial use. The report found that fish in 68 percent of the water bodies sampled have “moderate to very high levels of mercury or persistent organics (such as PCBs and organochlorinated pesticides like DDT).” Consumption advisories exist for only a fraction of the water bodies likely to need them. Many water bodies with elevated contaminant levels in fish are near population centers and are popular for fishing. Furthermore, subsistence fishing is increasing, and consumption of contaminated fish is an environmental justice issue.

## A Brief History of California Monitoring

*Bioaccumulation* refers to the uptake of toxic chemicals by animal species. In California waters, many chemicals of concern bioaccumulate in fish. As these chemicals reach high levels in species at the top of the food chain, they threaten the health of humans and wildlife.



“... Present concentrations of pollutants in fish collected from many California water bodies are high enough to cause concern for possible effects on human health ...”



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In the 1970s, the State Water Resources Control Board (State Board) launched two statewide programs employing the new technique of bioaccumulation monitoring. The Toxic Substances Monitoring Program (TSMMP) was initiated in 1976 and measured chemicals in both fish and clams in lakes, rivers, streams, and estuaries. The State Mussel Watch Program (SMWP), initiated the following year, focused on chemicals in mussels in coastal waters. In 1998, the State Board started a third program, the Coastal Fish Contamination Program (CFCP), which assessed health risks to humans from eating sport fish and shellfish from coastal waters. Sampling under all three programs ended in 2003, as plans for a comprehensive statewide monitoring program took shape in the form of the Surface Water Ambient Monitoring Program (SWAMP).

As a first step in designing a new bioaccumulation monitoring program, SWAMP reviewed in detail the wealth of water quality information gathered during two decades of monitoring. During that period, sampling of hundreds of sites led to identification of many cases of severe contamination, resulting in clean-up actions and fish advisories to protect humans and wildlife, as well as identification of many areas with low levels of contamination. The early programs documented the successful management of many pollutants that had posed serious threats to wildlife and human health in the 1970s and 1980s. Bans on PCBs, DDT, and other pesticides; wastewater treatment improvements; and other clean-up actions were among the rapid improvements in water quality that resulted from the early programs.

**Taking a Comprehensive Approach to Monitoring**

In spite of the general improvements seen for PCBs and pesticides, bioaccumulation remains a problem in many of the state's water bodies (Figure 1). Studies conducted from 1998 through 2003 measured chemicals in fish at a total of 390 sites. The sites were assessed based on levels in the most polluted species at each site and measured several compounds, including mercury, PCBs, DDT, dieldrin, and chlordanes. Using this scheme, 32 percent of the sites had low levels of contamination; 42 percent had moderate levels; 18 percent, high; and 8 percent, very high, totaling 68 percent of sampled sites with some degree of accumulation above levels of concern.

**PCBs**

Polychlorinated biphenyls (PCBs) are persistent pollutants that continue to reach levels of concern in some parts of the state. However, in general, PCB levels have declined greatly across California. The most important actions taken to reduce PCB pollution were the phase out during the 1970s and the 1979 federal ban on production and sale of PCBs. PCB levels in the state's waters have been declining since that time. In many places the rate of decline has been rapid enough that PCBs have fallen below levels of concern (Figure 2). However, PCBs are the cause of the "very high" levels of contamination for 10 of the 390 sites. The sites classified as very high due to PCBs were primarily in San Francisco Bay, but were also found in one Bay Area reservoir (Lake Chabot) and two southern lakes (Big Bear Lake and Harbor Lake). PCB levels, found in fish in these areas, are declining at a slower rate and are still well above levels of concern.

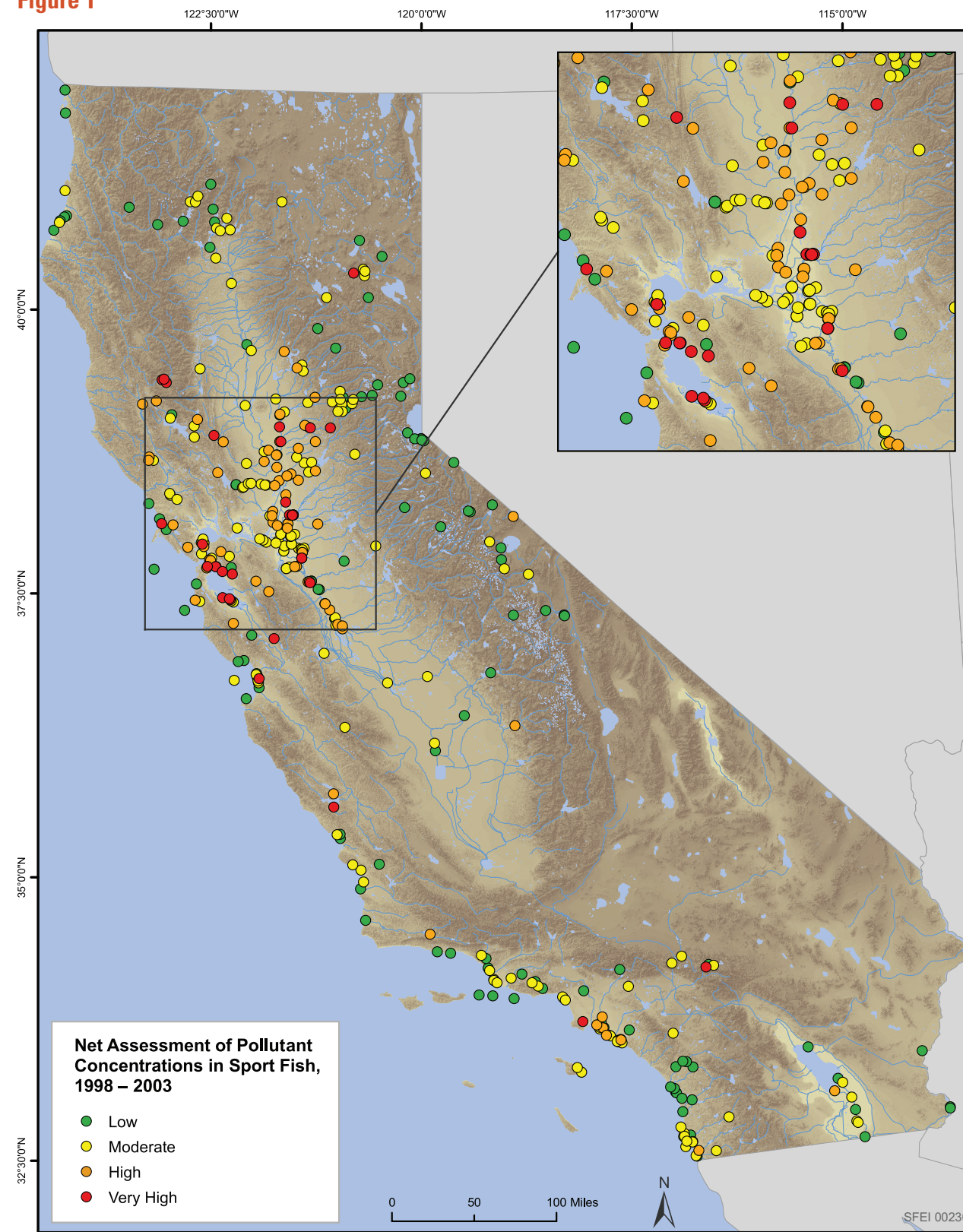
**DDT**

Dichloro-diphenyl-trichloroethane (DDT) levels in fish and mussels have also declined greatly across the state since the 1970s. The declines occurred in response to limits on the use of this pesticide and a federal ban in 1972. Prior to the ban, DDT had severe impacts on aquatic birds on the coast; however, these species have bounced back in response to the decline in DDT levels. The federal government also banned dieldrin and chlordane, two pesticides related to DDT, in the 1980s, and levels of these chemicals have also generally declined sharply. Recent sport fish data show that levels of all of these legacy pesticides in the vast majority of the state are below thresholds for concern.

**Mercury**

In contrast to PCBs and pesticides, mercury levels have not declined over the past 30 years. In fact, mercury poses the greatest concern with regard to bioaccumulation. Of the 33 sites in the "very high" category of contamination, 23 are the result of high mercury levels. The high mercury sites were located primarily in San Francisco Bay, the Delta, historic mercury mining areas in the Coast Range, and historic gold mining areas in the Sierra Nevada. Mercury was the primary pollutant of concern for most of the sites in the "moderate" and "high" categories.

Figure 1



(Source: Bioaccumulation of Pollutants in California Waters: A Review of Historic Data and Assessment of Impacts on Fishing and Aquatic Life, Fig. 3.2.3, pg. 33, October 24, 2007, State Water Resources Control Board, Surface Water Ambient Monitoring Program)

Figure 1. This graph is based on measurements of several chemicals (mercury, PCBs, DDT, dieldrin, and chlordanes) in muscle tissue from a variety of fish species. Dots represent sampling sites. Dot colors correspond to degrees of contamination (low, moderate, high, very high) defined for each pollutant and represent the species with the highest degree of contamination at each site. Note that at many of these locations, other species are present with lower concentrations of pollutants.