A Pilot Program for Monitoring, Stakeholder Involvement, and Risk Communication Relating to Mercury in Fish in the Bay-Delta Watershed (Fish Mercury Project)

Final Project Goals and Objectives

1. Project Goals

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

Explanations:

Environmental justice is: "The fair treatment of people of all races, cultures and income with respect to development, adoption and implementation of environmental laws, regulations and policies"
~Calif. Govt. Code § 65040.12(c)

The goal of assessing and communicating risk based on environmental justice principles means that the project will incorporate these principles into the monitoring design and education and outreach strategies.

Exposure to mercury is the most widespread problem facing populations that consume fish from the watershed. Mercury is a toxic chemical that is most harmful to women and children. It is possible that mercury contamination in fish will get worse due to the large scale habitat restoration projects taking place in the watershed. While the emphasis of this project will be on mercury, other pollutants will be incorporated into monitoring and risk communication as the existing budget allows and additional funding opportunities become available.

This goal describes a short-term approach to reducing mercury exposure by raising awareness about mercury contamination and providing guidance on safe consumption of fish. The long-term solution to the problem is to clean up polluted areas and reduce mercury and methylmercury sources.

2) Through food web monitoring, determine how habitat restoration and mercury clean-up actions affect methylmercury accumulation in the food web

Explanations: The CALFED Ecosystem Restoration Program (ERP) is funding the Fish Mercury Project. A key goal of the ERP is to predict the risks associated with wetland restoration (wetlands in the widest sense of the word – from floodplains, shallow-water habitats, to vernal pools) and to determine which restoration techniques minimize methylmercury production.

Another goal is to document that the clean-up of contaminated sites results in lower fish tissue concentrations. The CBDA Mercury Strategy (Wiener et al. 2003) recommended small fish and other aquatic species (biosentinels) as the best single indicator of spatial patterns and trends from year-to-year. Biosentinels are organisms that accumulate methylmercury, are indicators of short-term variation in methylmercury, and have strong site fidelity to small geographic localities where methylmercury production occurs. Biosentinels can be used to measure small spatial and temporal changes in mercury concentrations in wildlife as a measure of the effectiveness of various restoration methods and their undesirable methylmercury production consequences. Since biosentinels are food items for larger fish and wildlife, monitoring them will also provide information on wildlife health risks. Large fish such as largemouth bass have also proven to be valuable in a dual role of providing information on 1) spatial and temporal trends and 2) human exposure.

"Food web" is a term that includes all of the aquatic organisms living in an ecosystem. Humans that consume fish are part of the aquatic food web. This study will focus on measuring mercury in sport fish and small fish.

"Exposure" refers to the exposure of humans and wildlife to methylmercury.

3) Establish an organizational and technical foundation for cost-effective and scientifically defensible fish mercury monitoring that meets the identified needs of end users

Explanations: Credible and accessible information is the foundation for environmental management and public health protection. Cost efficiencies can be achieved through coordination with other projects and through careful design of sampling and analytical plans. In order to provide the greatest benefit, monitoring should be closely linked to the biggest questions faced by environmental managers and other users of the monitoring data.

The Steering Committee includes representatives of the primary groups that will use the data generated in this project. Committee discussion is the key mechanism that will be used to arrange for information transfer among organizations and to accomplish adaptive management. The end users of the data and their information needs are explicitly described in a separate document.

4) Coordinate with the major ongoing science, management, and risk communication efforts to achieve efficiencies of scale and scope

Explanations: Effective communication among stakeholders (recreational and subsistence anglers, community leaders, educators, natural resource trustee agencies, and local health agencies) can lead to economies of scale and scope,

as well as avoidance of costly mistakes. Major programs include large-scale projects sponsored by the California Bay-Delta Authority, the Army Corps of Engineers, the State Coastal Conservancy, the Fish and Wildlife Service, and the California Department of Fish and Game.

The Steering Committee, with representatives from the major monitoring, management, an risk communication efforts in the region, will provide a primary mechanism for achieving this coordination.

2. Project Objectives

1) Characterize spatial and temporal trends in mercury in fishery resources

Explanations:
"Fishery resources" includes both sport fish and biosentinel fish.

"Sport fish" are defined as fish that are caught and eaten by humans, and includes fish that are consumed for subsistence. This category includes striped bass, largemouth bass, white catfish, channel catfish, bluegill, redear sunfish, Sacramento sucker, Sacramento pikeminnow, black crappie, Chinook salmon, white sturgeon, common carp, and others.

Sport fish will be sampled in this project with these goals: 1) assessing human exposure to methylmercury and other pollutants in fish, 2) characterizing spatial patterns across the watershed, and 3) characterizing temporal trends to the extent possible.

"Biosentinel fish" are defined in this project as small fish that are being used as the primary indicators of spatial patterns and temporal trends. Examples include inland silversides and California roach. These fish are also eaten by wildlife, so they are good indicators of wildlife exposure and health risks.

Biosentinel fish will be sampled in this project with these goals: 1) characterizing spatial patterns across the watershed, and 2) establishing a foundation for monitoring year-to-year and long-term trends.

Almost all of the mercury in fish tissue exists in the highly toxic and bioavailable form of methylmercury, so total mercury (methylmercury plus other forms of mercury) is a cheaper and easier-to-measure surrogate for methylmercury in fish tissue.

2) Demonstrate the use of biosentinel species to link ecosystem restoration, contaminant clean-up, and other landscape changes with spatial and temporal patterns in food web mercury.

Explanations**:** Examining the relation of pollution patterns to restoration, clean-up, and landscape manipulations cannot be achieved in the three-year timeframe of this project. What we can do is develop effective protocols that management agencies can use to monitor the impacts of restoration or clean-up projects, and establish baseline conditions for future reference.

Adaptive management is a process involving cautiously moving forward with management actions of limited scope based on existing knowledge, seizing opportunities to obtain better information through scientific study of the actions taken, and modifying future actions based on the new information.

Management actions include restoration projects (wetland restoration, floodplain restoration, etc.), clean-up projects (for example, clean-up of abandoned mines), or other actions taken by managers to address pollution problems.

3) Assess health risks of consuming contaminated fish and communicate these risks to appropriate target audiences based on environmental justice principles.

Explanations: While the emphasis of this project will be on mercury, other pollutants will be incorporated into monitoring and risk communication as funding allows and data from other studies become available.

4) Establish a Steering Committee and stakeholder advisory groups to facilitate:

a) stakeholder input into the monitoring and risk communication activities based on environmental justice principles, and
b) coordination with other major science, management, and outreach/communication efforts.