

DRAFT

**A STRATEGY FOR COORDINATED
MONITORING, ASSESSMENT, AND
COMMUNICATION OF INFORMATION ON
BIOACCUMULATION IN AQUATIC
ECOSYSTEMS IN CALIFORNIA**

BIOACCUMULATION OVERSIGHT GROUP

**CALIFORNIA WATER QUALITY
MONITORING COUNCIL**

AUGUST 2012

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EXECUTIVE SUMMARY

Pollutants that accumulate in the food web (or “bioaccumulate”) are having detrimental impacts on beneficial uses of water bodies throughout California. Methylmercury bioaccumulation is a particularly widespread and severe problem, and poses a serious threat to human and wildlife health across the state. Monitoring information will provide an essential foundation for control plans and exposure reduction plans to remedy this problem. In addition, effective communication of this information to the public is imperative to enable fish consumers to reduce their exposure to pollutants.

Great strides have been made in the last few years in providing the information needed to manage bioaccumulative pollutants in California water bodies.

- Groundbreaking statewide surveys of contaminants in sport fish, featuring unprecedented coordination of programs, have been conducted across all of the major water body types.
- New or updated safe eating guidelines have been established for many water bodies.
- A “Safe to Eat” Portal has been created to provide public access to information on bioaccumulation.
- A centralized database (CEDEN) has been established as a means for storing and sharing bioaccumulation monitoring data.
- The first statewide study of the impacts of bioaccumulation on wildlife in lakes and reservoirs has been designed and is being implemented.

However, California still lacks the comprehensive monitoring, assessment, and communication needed to adequately support management of bioaccumulative pollutants in California water bodies. There are multiple problems with the status quo:

- insufficient information on spatial extent and long-term trends, high priority topics such as contaminants of emerging concern (CECs) and biotoxins, and the relative importance of different sources and environmental factors that drive bioaccumulation;
- inefficiencies due to a lack of coordination between agencies, and between agencies and regulated entities;
- a need for pilot scale actions to reduce bioaccumulation accompanied by refinement of monitoring tools to track the effectiveness of the actions;
- safe eating guidelines are needed for many additional water bodies, but the current pace of development is slow due to funding limitations,
- a need for optimizing the effectiveness of communication to the public in support of exposure reduction, and
- insufficient access to data and information for regulators, scientists, and the public.

Efficient use of the limited funds available for monitoring, assessment, and communication is of paramount importance. This efficiency can be achieved through close coordination of programs and thoughtful strategic planning. California needs a central entity with the responsibility and authority to attain the degree of coordination and cooperation that is required to address the bioaccumulation problem. The Bioaccumulation Oversight Group

1 has been established as a work group of the California Water Quality Monitoring Council to
2 fulfill this role. This Strategy has been prepared by the BOG to outline steps that should be
3 taken to improve bioaccumulation monitoring, assessment, and communication in
4 California.

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6 The goals of the Strategy are:

- 7 1. conduct coordinated, cooperative, long-term, statewide monitoring to generate the
8 data needed to support control plans and exposure reduction;
- 9 2. provide consistent and timely assessment to support exposure reduction, more
10 coherent regulation, and clear communication of bioaccumulation information to
11 the public; and
- 12 3. provide coordinated communication and access to information on fish
13 contamination to allow the public to reduce their exposure to contaminants and to
14 participate in management processes in an informed manner.

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16 The following actions have been identified as priorities for improving bioaccumulation
17 monitoring, assessment, and communication in California. For each of the planning efforts,
18 the general approach will be to begin with an inventory of existing activities, then identify
19 high priority needs, and then develop and implement plans to address the needs.

20
21 General Coordination

- 22 1. Promote enhanced general coordination by strengthening the BOG's role as the
23 central forum for discussion and planning. The Council and its member
24 organizations can provide crucial support by requiring (where possible) and
25 encouraging active participation by their organizations and the groups they
26 regulate.

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28 Monitoring

- 29 2. Promote consistency across monitoring programs to optimize comparability and
30 usability of monitoring data by using the BOG as a central forum for information
31 sharing, planning, and peer review, and by developing protocols for generating
32 useful data.
- 33 3. Develop a comprehensive plan for coordinated monitoring that includes support for
34 advisory development, periodic statewide assessments of status, trend monitoring,
35 statewide studies to support control efforts (e.g., TMDLs), and source identification
36 and mitigation studies. Priority contaminant categories include legacy pollutants,
37 CECs, and biotoxins.

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39 Assessment

- 40 4. Develop an overarching plan for assessment that supports expedited development
41 of safe eating guidelines. Include consideration of improvements in the consistency
42 in application of assessment thresholds.

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44 Communication

- 1 5. Develop a coordinated plan for exposure reduction, including safe eating guidelines
- 2 and other communication products (such as the Safe to Eat Portal). Include
- 3 effectiveness evaluation and consideration of environmental justice concerns.
- 4 6. Develop a plan for improving communication of bioaccumulation data and
- 5 information to regulators, scientists, decision-makers, and the public.
- 6

7 Priority tasks for 2012 and 2013 include:

- 8 1. Establish new structure and processes for an expanded BOG
- 9 2. Establish requirements for BOG participation (where possible)
- 10 3. Inventory existing monitoring
- 11 4. Develop monitoring protocols
- 12 5. Develop monitoring plans for legacy pollutants, CECs, and biotoxins
- 13 6. Prepare multi-year workplan for development of safe eating guidelines – including
- 14 monitoring, assessment, and communication
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16 Upon completion of these tasks, a longer-term workplan for 2014 and beyond can be

17 established that identifies funding needs and outlines a schedule and approach for

18 implementing the workplan.

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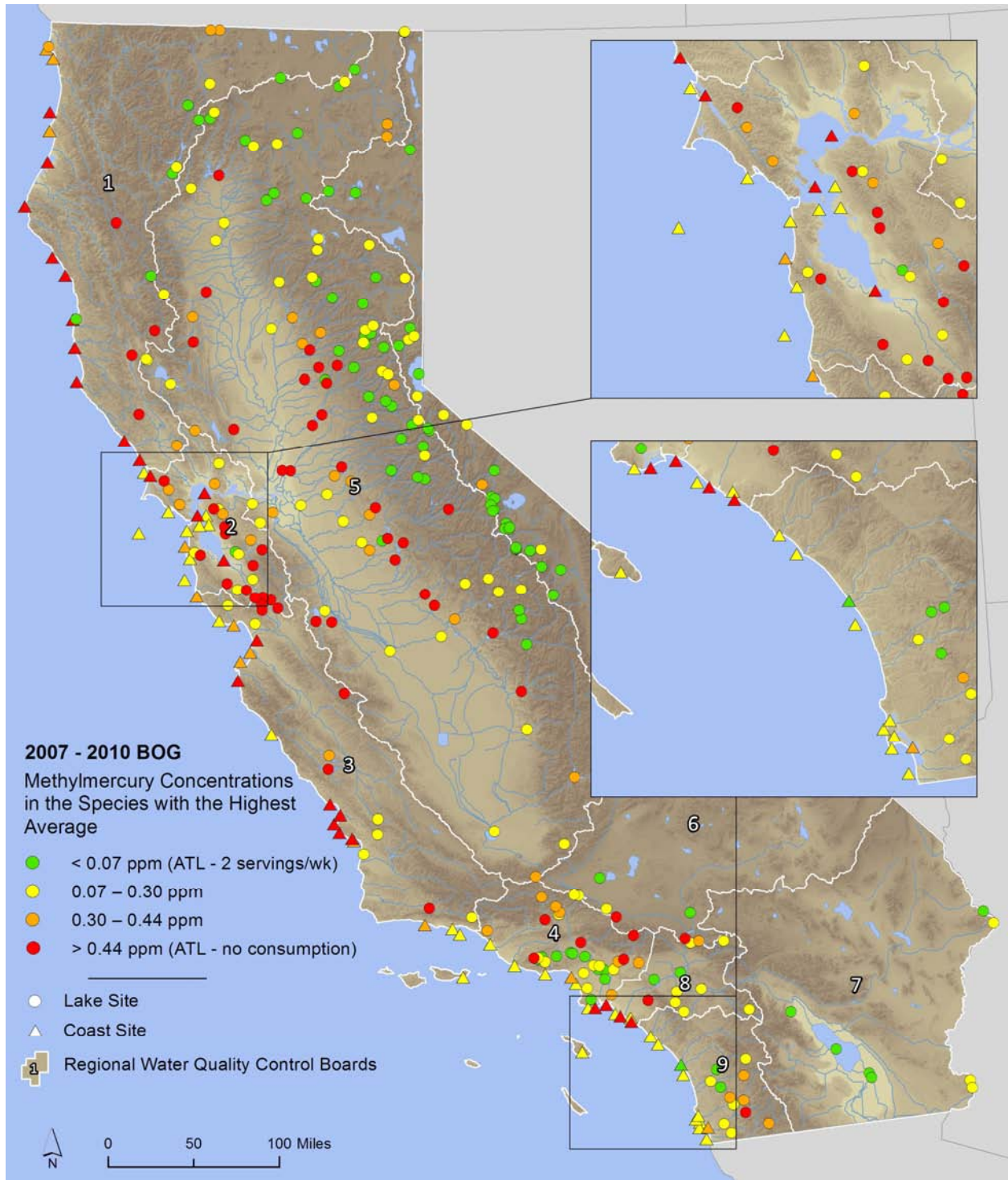
1 **A STRATEGY FOR COORDINATED MONITORING, ASSESSMENT, AND**
2 **COMMUNICATION OF INFORMATION ON BIOACCUMULATION IN**
3 **AQUATIC ECOSYSTEMS IN CALIFORNIA**

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5 **BIOACCUMULATION MONITORING IN CALIFORNIA: PROBLEM STATEMENT**

6
7 Pollutants that accumulate in the food web (or “bioaccumulate”) are having detrimental
8 impacts on beneficial uses of water bodies throughout California. Methylmercury
9 bioaccumulation is a particularly widespread and severe problem (Figure 1), and poses a
10 serious threat to human and wildlife health across the state. Monitoring information will
11 provide an essential foundation for control plans and exposure reduction plans to remedy
12 this problem. In addition, effective communication of this information to the public is
13 imperative to enable fish consumers to reduce their exposure to pollutants.

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15 Great strides have been made in the last few years in providing the information needed to
16 manage bioaccumulative pollutants in California water bodies.

- 17 • Groundbreaking statewide surveys of contaminants in sport fish, featuring
18 unprecedented coordination of programs, have been conducted across all of the
19 major water body types that support fishing (lakes and reservoirs, the coast, bays
20 and estuaries, and rivers and streams). Technical reports, fact sheets, and press
21 releases have been distributed every spring since 2009 providing the latest
22 monitoring information. Extensive media coverage of these reports is an indication
23 of the high degree of public interest in this issue.
- 24 • New or updated safe eating guidelines have been established for many water bodies,
25 including San Francisco Bay and over 40 lake and reservoir or river locations
26 (OEHHA 2009, Gassel et al. 2011).
- 27 • A “Safe to Eat” Portal has been created to provide public access to information on
28 bioaccumulation. The Portal has been populated with data from the SWAMP
29 statewide surveys.
- 30 • A centralized database (CEDEN) has been established as a means for storing and
31 sharing bioaccumulation monitoring data. The Portal draws data from CEDEN. Data
32 from the SWAMP statewide surveys and from some substantial historic datasets
33 (e.g., Fish Mercury Project, TSMP) have been incorporated into CEDEN.
- 34 • The first statewide study of the impacts of bioaccumulation on wildlife in lakes and
35 reservoirs has been designed and is being implemented. The study is examining
36 exposure and risk of methylmercury to a piscivorous species (grebes) on lakes and
37 reservoirs across the state. The study is evaluating whether concentrations in fish
38 can be extrapolated to concentrations in their predators, and whether fish tissue
39 targets are also protective of their predators.



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Figure 1. Methylmercury bioaccumulation is a particularly widespread and severe problem, and poses a serious threat to human and wildlife health across the state. The map is based on sport fish data generated by SWAMP from 2007-2010.

1 However, California still lacks the comprehensive monitoring, assessment, and
2 communication needed to adequately support management of bioaccumulative pollutants
3 in California water bodies. There are multiple problems with the status quo.

- 4 • Insufficient data
 - 5 ○ Incomplete coverage of many water bodies not monitored sufficiently to protect
6 public health (support safe eating guidelines) and aquatic life (including
7 wildlife), or support cleanup efforts; others not monitored at all
 - 8 ○ Lack of information on trends in pollutants of concern at a regional or local scale
 - 9 ○ Lack of information on contaminants of emerging concern
 - 10 ○ Lack of information on biotoxins
 - 11 ○ Lack of information on drivers of patterns in bioaccumulation across the state
12 (e.g., lake characteristics and water quality parameters)
 - 13 ○ Lack of information on the fishing beneficial use (fishing pressure and species
14 preferences across water body types)
 - 15 ○ Lack of information on the aquatic life beneficial use (population status and
16 basic ecology of sensitive species)
- 17 • Inefficiencies due to a lack of coordination between agencies, and between agencies
18 and regulated entities. Activities affected include monitoring, data management,
19 assessment, reporting, peer review, and communication in support of exposure
20 reduction.
- 21 • A need for pilot-scale actions to reduce bioaccumulation accompanied by
22 refinement of monitoring tools to track the effectiveness of the actions. Efforts on
23 both of these fronts are only just beginning.
- 24 • Safe eating guidelines are only in place for some of the water bodies where they are
25 needed. Due to limited funding, the current pace of development of safe eating
26 guidelines is slow.
- 27 • A need for optimizing the effectiveness of communication to the public in support of
28 exposure reduction. Some progress is being made (e.g., in San Francisco Bay
29 through the San Francisco Bay Fish Project - www.sfei.org/sfbfp), but more work is
30 needed in development of communication tools and in evaluating how effective they
31 are.
- 32 • Insufficient access to data and information for regulators, scientists, and the public.
33 Some data are now accessible in raw form from CEDEN. Other datasets should be
34 added to CEDEN, and tools for summarizing and displaying the data are needed.

35
36 Funding to address all of these deficiencies is in very short supply. Efficient use of the
37 limited funds available for monitoring, assessment, and communication is of paramount
38 importance. This efficiency can be achieved through close coordination of programs and
39 thoughtful strategic planning. California needs a central entity with the responsibility and
40 authority to attain the degree of coordination and cooperation that is required to address
41 the bioaccumulation problem. In 2009 the Bioaccumulation Oversight Group was
42 established as a workgroup of the California Water Quality Monitoring Council to fulfill this
43 role. This Strategy has been prepared by the BOG to outline steps that should be taken to
44 improve bioaccumulation monitoring, assessment, and communication in California.

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GOALS OF THE STRATEGY

- Goal 1 Conduct coordinated, cooperative, long-term, statewide monitoring to generate the data needed to support control plans and exposure reduction
- Goal 2 Provide consistent and timely assessment to support exposure reduction, more coherent regulation, and clear communication of bioaccumulation information to the public
- Goal 3 Provide coordinated communication and access to information on fish contamination to allow the public to reduce their exposure to contaminants and to participate in management processes in an informed manner

RECOMMENDED ACTIONS

The following actions have been identified as priorities for improving bioaccumulation monitoring, assessment, and communication in California. For each of the planning efforts mentioned below, the general approach will be to begin with an inventory of existing activities, then identify high priority needs, and then develop and implement plans to address the needs.

General Coordination

1. Promote enhanced general coordination by strengthening the BOG’s role as the central forum for discussion and planning of bioaccumulation monitoring, assessment, and communication in California.

Getting groups involved in bioaccumulation work across California to recognize the BOG’s role and to participate in BOG discussions and activities will be essential.

The Council and its member organizations can provide crucial support by requiring (where possible) and encouraging active participation by their organizations and the groups they regulate. For example, the State Water Board could require BOG participation as a condition in discharge permits and grants.

The BOG will also strive to engage partners by providing valuable information and services. The BOG can serve as a forum for sharing information on new policies and the latest studies and technical advances. The opportunity to participate in strategic planning can also benefit partners.

The structure and processes of BOG meetings should be formalized and improved to support this expanded role. A regular schedule of meetings should be established, and efforts should be made to facilitate broad participation from groups across the state.

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Monitoring

- 2. Promote consistency across monitoring programs to optimize comparability and usability of monitoring data by using the BOG as a central forum for information sharing, planning, and peer review, and by developing protocols for generating useful data.

Promoting consistency in the quality and management of monitoring data generated by different programs is a key to efficient use of available monitoring resources. The BOG (with support from the SWAMP QA team and the BOG Peer Review Panel) can serve as a hub for developing and communicating protocols and standards for sampling design, chemical analysis, data management, assessment, and peer review. The BOG Peer Review Panel can provide guidance to ensure that the monitoring being performed is of sufficient technical quality to provide reliable answers to the questions that are being addressed. The BOG chair and the BOG as a whole can also serve as resources for technical guidance and review.

- 3. Develop a comprehensive plan for coordinated monitoring that includes support for advisory development, periodic statewide assessments of status, trend monitoring, statewide studies to support control efforts (e.g., TMDLs), and source identification and mitigation studies. Priority contaminant categories include legacy pollutants, CECs, and biotoxins.

A first step in developing a coordinated monitoring plan is to establish an inventory of all of the existing programs and entities that are generating data that can contribute to meeting statewide monitoring needs. This inventory will serve as a basis for identifying information needs that are being met, needs that could be met better with improved coordination, and needs that are not being met. The inventory can highlight areas where the need for protocols is greatest.

Another important initial step is to develop a thoughtful, long-term vision of the monitoring information that is needed to support management, including control plans and exposure reduction efforts. The needs vary by pollutant. For legacy pollutants (mercury and PCBs), this vision could be established fairly easily with existing information. For CECs, the results of the collaborative pilot study using mussels will soon be available and will provide a strong basis for a long-term plan. For biotoxins, a workshop is being held in November 2012 that is focused on this very topic.

Development of safe eating guidelines for all water bodies where they are needed should be a top priority. Concentrations of methylmercury and PCBs in sport fish across the state are not likely to decline significantly in the near future. While control plans are being developed and implemented, it is possible to achieve significant and rapid reductions in human exposure through effective communication of safe eating guidelines. This goal should be aggressively pursued to address this significant public health issue. A multi-year

1 workplan should be developed for conducting the monitoring, assessment, and
2 communication needed to establish safe eating guidelines for all water bodies where they
3 would be appropriate.

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5 **Assessment**

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7 4. Develop an overarching plan for assessment that supports expedited development of
8 safe eating guidelines. Include consideration of improvements in the consistency in
9 application of assessment thresholds.

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11 More thorough monitoring will create an even greater need for timely assessment and
12 incorporation of new data into safe eating guidelines. Resources currently available for
13 these assessments are inadequate. Describing what would be needed to support
14 expeditious advisory development will be a step toward attempts to obtain the needed
15 funding.

16
17 The issue of consistency in application of thresholds among agencies could also be
18 addressed by the BOG. The possibility of improving the alignment across water boards,
19 and across Cal EPA could be explored. Even without changes by the agencies, agreement
20 could be reached on how to use existing thresholds in presenting bioaccumulation
21 information to the public. Comprehensive safe eating guidelines for California water
22 bodies would be the ultimate solution.

23
24 **Communication**

25
26 5. Develop a coordinated plan for exposure reduction, including safe eating guidelines and
27 other communication products (such as the Safe to Eat Portal). Include effectiveness
28 evaluation and consideration of environmental justice concerns.

29
30 Effective communication of safe eating guidelines and other information on fish
31 contamination is an essential step in exposure reduction. The effectiveness of sign posting,
32 the fishing license addendum, web sites, community events, media coverage, and other
33 means of communication in raising awareness regarding safe fish consumption should be
34 evaluated, and the most effective techniques should be emphasized.

35
36 Consideration should be given to environmental justice concerns given the
37 disproportionate impacts of fish contamination on communities that are highly dependent
38 on consumption of wild-caught fish or that have the misfortune to fish in contaminated
39 water bodies.

40
41 Development of the Safe to Eat Portal should continue as a means for the public to access
42 data and information about water bodies where they like to fish. User feedback should be
43 gathered and incorporated into the design of the Portal.

44
45 6. Develop a plan for improving communication of bioaccumulation data and information
46 to regulators, scientists, decision-makers, and the public.

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Communication of bioaccumulation information (regulatory developments, monitoring results) to regulators and scientists should be continued and improved, including access to data, technical reports synthesizing monitoring results, workshops, and training. Communication of bioaccumulation information (monitoring results, status of cleanup efforts) to decision-makers and the public should be continued and improved, including fact sheets, media releases, and presentations.

PRIORITY TASKS FOR 2012 AND 2013

What	Who
Strengthen the BOG	
Establish new structure and processes for BOG	SFEI, BOG
Establish requirements to participate (where possible)	State Board, Council
Monitoring	
Inventory existing monitoring	SFEI, State Board, BOG members
Develop monitoring protocols	Moss Landing, WPCL, SFEI
Develop monitoring plans for legacy pollutants, CECs, and biotoxins (including safe eating guideline development [see below], statewide assessment, trend monitoring, TMDL support, source identification, and effectiveness evaluation)	SFEI, BOG
Provide technical support	SFEI, Moss Landing, WPCL
Safe Eating Guidelines	
Prepare multi-year workplan for development of safe eating guidelines – including monitoring, assessment, and communication	OEHHA, BOG

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Upon completion of these tasks, a longer-term workplan for 2014 and beyond can be established that identifies funding needs and outlines a schedule and approach for implementing the workplan.

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APPENDIX 1
BOG CHARTER (2010)

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Bioaccumulation Oversight Group (BOG) - CHARTER

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Mission

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- » To assess the impacts of contaminants in fish and shellfish on beneficial uses in California water bodies through statewide monitoring under SWAMP and syntheses of information from other studies, and to develop an internet portal that presents this information to decision-makers and the public in a form that they can easily use.

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Why Is This Workgroup Needed?

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- » Prior to the formation of the BOG and the inception of statewide surveys of bioaccumulation in 2007 under the Surface Water Ambient Monitoring Program (SWAMP), there was a lack of information on the statewide impact of contaminant bioaccumulation on the fishing and aquatic life beneficial uses of California waters. SWAMP has addressed this need with the state's first systematic statewide surveys of contaminants in sport fish in California lakes, coastal waters, and rivers and streams. The BOG provides the oversight and peer review of the monitoring and synthesis conducted on this topic that is needed to ensure these efforts are technically sound and of optimum value to water quality managers.
- » The BOG provides the oversight needed for development and maintenance of the “**Is It Safe to Eat Fish and Shellfish?**” component of the California Water Quality Monitoring Council’s “**My Water Quality**” website. This website presents information from SWAMP and other programs on contaminants in California fish and shellfish to the public in form that they can readily access and use to reduce their exposure to mercury and other contaminants of concern.
- » The BOG serves as a forum for coordination of bioaccumulation monitoring in California. BOG discussions have created partnerships between state and regional SWAMP monitoring efforts, and between SWAMP and other programs such as the **Regional Monitoring Program for Water Quality in the San Francisco Estuary** and the **Southern California Bight Regional Monitoring Program**. These partnerships promote efficient use of monitoring resources and provide for more coherent assessment of condition across the state.
- » The BOG advises the California Water Quality Monitoring Council and other agencies on information needs relating to management efforts to reduce the impact of contaminants on the beneficial uses of California water bodies.

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Background and Description

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- » California has a long history of employing the technique of “bioaccumulation monitoring” – measuring the concentrations of pollutants in fish, bivalves, and other aquatic biota to assess impacts on beneficial uses. In the 1970s, the California State Water Resources Control Board initiated two major statewide bioaccumulation monitoring programs. The **Toxic Substances Monitoring Program (TSMP)**, initiated in 1976, measured pollutants in fish and invertebrates in freshwater and estuarine habitats. The TSMP primarily targeted water bodies with known or suspected water quality impairments, and successfully identified and documented many hotspots of contamination. The **State Mussel Watch Program (SMWP)** was initiated in 1977 to provide information on long-term trends in water quality in coastal marine waters and to identify specific areas with elevated concentrations. In 1998, a third statewide bioaccumulation monitoring program, the **Coastal Fish Contamination Program (CFCP)**, was established. This program was developed to assess the health risks of consumption of sport fish and shellfish from nearshore waters along the entire California coast. Over

1 the years, these programs yielded a wealth of useful information on water quality in California.
2 However, the datasets generated by these programs had several limitations with regard to answering
3 questions that are high priorities for water quality managers: much of the sampling was biased toward
4 characterization of polluted areas; many areas were not sampled adequately, including areas with
5 significant fishing activity; most of the sampling, though focused on sport fish, was not tailored to the
6 development of consumption advice; the dataset was also not tailored to evaluation of risks to
7 piscivorous wildlife through monitoring of prey species; and long-term time series for detecting trends
8 in sport fish or other wildlife contamination were lacking.

- 9 » In 2000, the State Water Board, responding to a bill passed by the California legislature, developed a
10 plan to restructure their existing water quality monitoring programs (including TSMP, SMWP, and
11 CFCP) and create a **Surface Water Ambient Monitoring Program (SWAMP)** for water quality that
12 addresses all hydrologic units of the state using consistent and objective monitoring, sampling and
13 analytical methods; consistent data quality assurance protocols; and centralized data management.
14 Sampling under the three monitoring programs ended in 2003, as SWAMP began to take shape.
- 15 » In 2005 SWAMP began establishing a foundation for a new monitoring program to provide a
16 systematic statewide assessment of the condition of California water bodies with respect to
17 bioaccumulation. The first step taken was to provide funds for a review of the data generated by the
18 previous statewide programs and other efforts (**Davis et al. 2007**).
- 19 » SWAMP formed the Bioaccumulation Oversight Group (BOG) in 2006 to provide oversight for the
20 statewide assessment of the impact of bioaccumulation of contaminants on beneficial uses. In 2007
21 SWAMP also initiated a new bioaccumulation monitoring program to address the need for systematic
22 statewide information on this topic. This effort marked the beginning of a new long-term, statewide,
23 comprehensive bioaccumulation monitoring program for California surface waters.
- 24 » The BOG has developed and begun implementing a plan to evaluate bioaccumulation impacts on the
25 fishing beneficial use in all California water bodies. Sampling of sport fish in **lakes and reservoirs** has
26 been conducted in the first two years (2007 and 2008). In 2009 and 2010, sport fish from the
27 **California coast**, including bays and estuaries, were sampled. Sport fish from rivers and streams will
28 be sampled in 2011.
- 29 » In 2009 the BOG expanded its role by becoming a workgroup of the California Water Quality
30 Monitoring Council. In this role the BOG has assumed broader responsibilities in guiding development
31 of the Council's "**Safe to Eat Fish and Shellfish**" portal and in coordinating and planning
32 bioaccumulation monitoring across multiple agencies.

33 Membership and Representation

- 34 » Membership on the BOG is open to all organizations that have an interest in regional-scale and
35 statewide monitoring and assessment of contaminants in fish and shellfish from California waters or in
36 communicating information from this monitoring to policy-makers, agency staff, and the public. The
37 **current membership of the BOG** includes State and Regional Board staff and representatives from
38 other agencies and organizations including USEPA, the Department of Fish and Game, the Office of
39 Environmental Health Hazard Assessment, and the San Francisco Estuary Institute. The members of
40 the BOG possess extensive experience with bioaccumulation monitoring. Meetings are open, informal,
41 and consensus driven. To inquire about participation in BOG meetings please contact Jay Davis
42 (jay@sfei.org).
- 43 » The BOG has also convened a **Peer Review Panel** that is providing evaluation and review of the
44 bioaccumulation monitoring program. The members of the Panel are internationally-recognized
45 authorities on bioaccumulation monitoring.

46 Scope

- 1 » The BOG will promote coordination of major bioaccumulation monitoring efforts across the state and
- 2 dissemination of this information in a usable form to water quality managers, policy-makers, and the
- 3 public.

4 **Objectives**

- 5 » Conduct and promote comprehensive statewide bioaccumulation monitoring for the State of California,
- 6 with SWAMP monitoring as a core element
- 7 » Promote coordination of major bioaccumulation monitoring efforts across the state to ensure efficient
- 8 use of monitoring resources and the generation of comparable data to provide for more
- 9 comprehensive statewide assessment
- 10 » Communicate bioaccumulation monitoring information to agency staff and decision makers at the
- 11 federal, state, and local levels
- 12 » To successfully meet these objectives, include appropriate representation by governmental and non-
- 13 governmental organizations with a significant role in communicating information on contaminants in
- 14 seafood to California citizens.

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APPENDIX 2

BOG MEMBERSHIP (2012)

Chair

Jay Davis - San Francisco Estuary Institute

Participating State Agencies

Rich Fadness, North Coast Regional Water Quality Control Board

Karen Taberski, San Francisco Bay Regional Water Quality Control Board

Karen Worcester, Central Coast Regional Water Quality Control Board

Michael Lyons - Los Angeles Regional Water Quality Control Board

Chris Foe - Central Valley Regional Water Quality Control Board

Tom Suk - Lahontan Regional Water Quality Control Board

Lilian Busse, San Diego Regional Water Quality Control Board

Lori Webber, State Water Resources Control Board

Jennifer Salisbury - State Water Resources Control Board

Jon Marshack - State Water Resources Control Board (Monitoring Council Coordinator)

Bob Brodberg - Office of Environmental Health Hazard Assessment

Dave Crane - California Department of Fish and Game

Gail Cho - California Department of Fish and Game

Gary Ichikawa - California Department of Fish and Game

Participating Federal Agencies

Terry Fleming - U.S. Environmental Protection Agency

Tom Maurer, U.S. Fish and Wildlife Service

Josh Ackerman, U.S. Geological Survey

Collin Eagles-Smith, U.S. Geological Survey

Other Participating Organizations

Autumn Bonnema - Moss Landing Marine Laboratories

Cassandra Lamerdin - Moss Landing Marine Laboratories

Marco Sigala - Moss Landing Marine Laboratories

Eric von der Geest - Moss Landing Marine Laboratories

Ken Schiff - Southern California Coastal Water Research Project

SWAMP Bioaccumulation Peer Review Panel

Jim Wiener - Distinguished Professor, University of Wisconsin, La Crosse

Chris Schmitt - U.S. Geological Survey, Columbia, Missouri

Harry Ohlendorf - CH2M Hill, Sacramento, California

APPENDIX 3: KEY PARTNERS

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- 3 • State Agencies
- 4 ○ State Water Board
- 5 ▪ SWAMP
- 6 ▪ TMDL
- 7 ▪ Standards
- 8 ▪ FERC
- 9 ▪ NPDES
- 10 ▪ Ocean
- 11 ○ Regional Water Boards
- 12 ▪ Region 1
- 13 ▪ Region 2
- 14 ▪ Region 3
- 15 ▪ Region 4
- 16 ▪ Region 5
- 17 ▪ Region 6
- 18 ▪ Region 9
- 19 ○ OEHHA
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- 21 ○ DWR
- 22 ○ CDFG
- 23 • Federal Agencies
- 24 ○ USEPA
- 25 ○ USFWS
- 26 ○ USACE
- 27 ○ USBR
- 28 ○ US Forest Service
- 29 ○ National Park Service
- 30 ○ USGS
- 31 ○ NOAA
- 32 • Other Groups
- 33 ○ Tribes
- 34 ○ Utilities and Water Districts
- 35 ▪ SFPUC
- 36 ▪ Santa Clara Valley Water District
- 37 ▪ EBMUD
- 38 ○ PGE
- 39 ○ SFEI
- 40 ○ SCCWRP
- 41 ○ Universities
- 42 ▪ UC Davis
- 43 ▪ CSU Water Resources Policy Initiative
- 44 ○ Permit holders
- 45 ○ Grantees

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- Others