2018 Council
Workgroup Updates

November 29, 2018

Item #6
Molecular methods workgroup update

Susie Theroux, SCCWRP
Refresher: objectives of workgroup

• **Consensus-building**: Identify and provide recommendations on best practices for molecular methods including sample collection, sample processing, and analytical pipelines. Identify key technical challenges in generating DNA-based data to prioritize further research, as well as discuss emerging molecular methods and their potential utility in monitoring applications.

• **Communication**: Provide online resources for communicating molecular results to management communities and water quality managers to enhance the interpretation and efficacy of molecular data.

• **Coordination**: Improve coordination among research groups, sampling programs, and monitoring agencies to enhance collaborations and minimize redundancies in sample collection.
Goals since last Council meeting

• Contact potential members
• Develop list of priority topics for workgroup
• Schedule first meeting
## Membership

<table>
<thead>
<tr>
<th>Type</th>
<th>Contact</th>
<th>Organization</th>
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<tbody>
<tr>
<td>Regulatory</td>
<td>Jeff Rodzen</td>
<td>California Dept Fish and Wildlife</td>
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<tr>
<td>Industry</td>
<td>Gregg Schumer</td>
<td>Cramer Fish Sciences</td>
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<tr>
<td>Industry</td>
<td>Scott Blankenship</td>
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<td>Regulatory</td>
<td>Ed Hancock</td>
<td>Lahontan Water Board</td>
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<tr>
<td>Academic</td>
<td>Kevan Yamahara</td>
<td>MBARI</td>
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<tr>
<td>Industry</td>
<td>Kat Bruce</td>
<td>NatureMetrics</td>
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<tr>
<td>Academic</td>
<td>Adam Wall</td>
<td>NHMLA</td>
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<tr>
<td>Academic</td>
<td>Joshue Steele</td>
<td>SCCWRP</td>
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<td>Academic</td>
<td>Amy Zimmer-Faust</td>
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<td>John Griffith</td>
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<td>Non-profit</td>
<td>Marika Schulhof</td>
<td>SeaGrant</td>
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<td>Academic</td>
<td>Michael O'Mahoney</td>
<td>Smithsonian</td>
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<td>Regulatory</td>
<td>Ali Dunn</td>
<td>SWAMP</td>
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<td>Regulatory</td>
<td>Marissa Van Dyke</td>
<td>SWAMP IQ</td>
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<td>Keith Bouma Gregson</td>
<td>SWAMP/OIMA</td>
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<td>Greg Gearheart</td>
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<tr>
<td>Academic</td>
<td>Sarah Stinson</td>
<td>UC Davis</td>
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<tr>
<td>Academic</td>
<td>Melinda Baerwald</td>
<td>UC Davis</td>
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<tr>
<td>Academic</td>
<td>Holly Bik</td>
<td>UC Riverside</td>
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<tr>
<td>Academic</td>
<td>Zack Gold</td>
<td>UCLA</td>
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<tr>
<td>Academic</td>
<td>Rachel Meyer</td>
<td>UCLA (CALeDNA)</td>
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<tr>
<td>Academic</td>
<td>Bob Wayne</td>
<td>UCLA (CALeDNA)</td>
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<tr>
<td>Federal</td>
<td>Josh Israel</td>
<td>US Bureau of Reclamation</td>
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<tr>
<td>Regulatory</td>
<td>Pete Ode</td>
<td>USFW</td>
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Priority topics

PRIORITY AREAS

I. A catalog of DNA sampling and analyses across California
   A. Who/What/Where/when/how of DNA sampling across the state
   B. Leverage initial survey distributed by Nicole Hack and WB
   C. Produce: Interactive map to help identify areas to target for future sampling efforts and to identify potential collaborations among sampling teams
   D. List/map of labs/universities/organizations/persons that can advise the Water Boards regarding molecular methods with information on who can perform which analyses where.

II. Method Development and best-practices
   A. Sampling methods
      1. Creation of standardized sampling protocols for SWAMP programs (and beyond)
      2. Stream algae and cyanobacteria
      3. Stream benthic macro/invertebrates
      4. Ichthyoplankton
      5. Meiobenthos
      6. eDNA
      7. Soils
      8. SAV
      9. Bacteria (limit to fecal bacteria?)
      10. Others?
   B. Best practice recommendations
      i. Use of negative and positive controls
      ii. Contamination control
      iii. Use of preservation solution and/or preserving samples for analyses at later dates (useful for TMDL investigations)
      iv. Lab and field Replication
   C. DNA extraction
      i. Are all sampling kits created equal?

b. What practices can be instituted for quality control?
C. DNA amplification
   a. Are multiple, pooled reactions required?
   b. Any special reagent considerations that should be recommended/avoided?
C. What practices can be instituted for quality control?
D. Barcode primers
   a. How should barcode selection be recommended with regards to:
      i. Single species targets (e.g. amyo toad)
      ii. Multiple species assemblages (e.g. algae)
   b. Can we provide a recommended primer set(s) for each of the major assemblages?
E. Bioinformatic analyses
   a. Creation of an open source bioinformatics pipeline that is user-friendly for groups unfamiliar with bioinformatic analyses (MOTHUR, QIME, Anisacapa, others?)
   b. Creation of QC measures to ensure good data regardless of pipeline
   c. Training materials to assist new users with adopting protocols and QC pipelines
F. DNA reference libraries
   a. Should California rely on a single, curated DNA library versus published, publicly-available libraries (e.g. GenBank, Silva, BOLD)
G. Data storage
   a. Creation of recommended best practices for storing and publishing molecular data
   b. Reference materials to guide new users on adopting data storage protocol
H. New technologies and opportunities to advance the state of the science - are there new techniques out there which show promise but need deployment opportunities?
I. Products: series of recommended DNA sampling and analytical protocols for different target organisms and environments. QC protocols for each step of data generation to ensure comparable and known data quality.

III. Implementation
   A. How have other states integrated molecular methods into regulatory programs?
      1. e.g. EPA E. coli qPCR protocol
   B. What key agencies will be involved in verifying and approving a recommended protocol?
      1. ELAP, International Organization for Standardization (ISO/IEC)
   C. How will a sequencing facility become approved by the State for permit compliance?
   D. Products:
      a. Submitting recommended protocols (see above) for approval and adoption by monitoring and regulatory agencies
      b. Coordination with ELAP (or others) for approving DNA sequencing facilities for state DNA sequencing projects

Online resources and training workshops
   A. Creating a catalog of reference materials for user community to implement recommended protocols and best-practices
   B. Creating a definitions sheet and FAQ to share with user community (e.g. define barcoding, metabarcoding, eDNA, qPCR, and example applications of each approach)
   C. Products: Molecular Methods Workgroup website with:
      i. Copies of recommended sampling, analytical, and QC protocols
      ii. Training materials (webinars, Powerpoints, FAQs, definition sheets) to help new users adopt molecular methods
      iii. Annual (?) online and in-person trainings for new users and user community
   Other?
First meeting: December 17th, 10am

- Agenda
  - Introductions
  - Review of priority topics
  - Timeline for key products
  - Expected participation
  - Opportunities for funding support
Feedback from Council

1. Please send any additional member recommendations to Susie (susannat@sccwrp.org)
2. Please feel free to contact me regarding priority topics, especially with regards to items to tackle in first year
3. Recording of webinar will be posted to Workgroup website (TBD)
Bonus slides
Molecular Methods Workgroup charter

- In collaboration with Nick Martorano, Kris Jones, Nicole Hack
- “The mission of the Molecular Methods Workgroup is to serve as a clearinghouse for key technical and programmatic guidance on the use of molecular methods for bioassessment and environmental monitoring programs in California..."
Generating DNA data

Sampling → DNA extraction → DNA analysis → Bioinformatics → Taxonomy ID → Biological data
Update

• Workgroup Charter finalized.

• Webpages have been created and are available at https://mywaterquality.ca.gov/monitoring_council/environmental_flows_workgroup/index.html

• Next Steps
Bioaccumulation Oversight Group (BOG) Update

November 29, 2018

Item #6c

Jay Davis
SWAMP Bioaccumulation Monitoring Program

- Began in 2007
- Annual monitoring
- Focus on sport fish
- All water body types
- Lean budget
- Strong peer review
- Annual reports
- Information access through the Portal
- 303(d) listings and fish advisories
SWAMP Bioaccumulation Monitoring 2018

- Coastal Waters, Round 2
- 10-year cycle
- 2018: SoCal Bight
- 2019: SF Bay
- 2020: Central and North Coasts
- Collaboration
SWAMP Bioaccumulation Monitoring 2019

- Long-term Bass Lake Monitoring
- 190 lakes
- 5 panels
- 10-year cycle
- 2015, 2017, 2019….
Bioaccumulation of Pollutants in Fish Tissue

Fish and shellfish are nutritious and good for you to each. But some fish and shellfish may take in toxic chemicals from the water they live in and the food they eat. Some of these chemicals build up in the fish and shellfish - and in the humans that eat fish and shellfish - over time. Although the chemical levels are usually low, it is a good idea to learn about advisories and monitoring in water bodies where you fish, and for fish or shellfish you eat.

Fish Consumption Advisories

Can I eat fish or shellfish caught in my lake, stream or ocean location?

The Office of Environmental Health Hazard Assessment (OEHHA) evaluates contaminant levels in sport fish and issues Fish Consumption Advisories for water bodies in California. Click on the map icon to the left to see an interactive map of current fish consumption advisories issued by OEHHA for specific lakes, rivers or coastal fishing areas. Fish consumption advice is also available for lakes, reservoir, and coastal areas that do not currently have site-specific advice, as well as for fish that migrate.

Contaminant Levels and Long Term Trends in Sport Fish

What are the levels, trends and long-term trends in my lake, stream or ocean location?

Click on the map icon to the left to see an interactive map that allows you to explore fish contaminant data for your favorite fishing locations.

Data are available from extensive monitoring by the Surface Water Ambient Monitoring Program's Bioaccumulation Monitoring Program and from other studies.

Impaired Water Bodies

Which lakes, streams and ocean locations are listed by the state as impaired for fish or shellfish consumption?

Click on the map icon to the left to see an interactive map showing California waters placed on the 2014 and 2016 Impaired Water Bodies list as impaired for uses related fish or shellfish consumption.
A GUIDE TO EATING FISH from CALIFORNIA LAKES AND RESERVOIRS

Women (18-45 Years)
Children (1-17 Years)
Men (18+ Years)

TOTAL SERVINGS A WEEK
2
TOTAL SERVINGS A WEEK
6
TOTAL SERVING A WEEK
1
TOTAL SERVING A WEEK
2
DO NOT EAT
0

EAT THE GOOD FISH
Eating fish that are low in chemicals may provide health benefits to children and adults.

AVOID THE BAD FISH
Eating fish with higher levels of chemicals like mercury or PCBs may cause health problems in children and adults.

CHOOSE THE RIGHT FISH
Chemicals may be more harmful to unborn babies and children.

Rainbow Trout
- High in omega-3s

Catfish

Sunfish Species
- 16 inches or less
- High in omega-3s

Brown Trout
- 16 inches or less

Black Bass Species

Carp

Brown Trout
- Over 16 inches

Serving Size
A serving of fish is about the size and thickness of your hand. Give children smaller servings.

For Adults
For Children

California Office of Environmental Health Hazard Assessment
web: www.oehha.ca.gov/fish
email: fish@oehha.ca.gov
phone: (916) 324-7572

Eat only the skinless fillet
Some chemicals are higher in the skin, fat, and guts.

Eat only the meat
A GUIDE TO EATING FISH from the CALIFORNIA COAST

WOMEN 18 - 45 YEARS AND CHILDREN 1 - 17 YEARS

Eat the Good Fish
Eating fish that are low in chemicals may provide health benefits to children and adults.

Avoid the Bad Fish
Eating fish with higher levels of chemicals like mercury or PCBs may cause health problems in children and adults.

Choose the Right Fish
Chemicals may be more harmful to unborn babies and children.

Women (18-45 Years)

Children (1-17 Years)

TOTAL SERVINGS A WEEK

6 OR

2 OR

1

TOTAL SERVING A WEEK

DO NOT EAT

Serving Size
A serving of fish is about the size and thickness of your hand. Give children smaller servings.

For Adults
For Children

Eat only the skinless fillet
Some chemicals are higher in the skin, fat, and guts.

Small Flatfish: Diamond Turbot, Longfin Sanddab, Speckled Sanddab, and Spotted Turbot

Queenfish

Low-PCB Surfer perch: Shiner, Silver, and Walleye

Very Low-PCB Surfer perch: Barred, Black, Pile, Rainbow, Spotfin, and White

Topsmelt

Croaker: White and Yellowfin

Barred Sand Bass

California Corbina

Cabezon

Kelp Bass

Medium-Mercury Rockfish: Black, Blue, Brown Kelp, Olive, Rosenthorn, and Vermillion

High-Mercury Rockfish: Black and Yellow, China, Copper, and Gopher

Sharks
Bioaccumulation of Pollutants in Fish Tissue

Fish and shellfish are nutritious and good for you to eat. But some fish and shellfish may take in toxic chemicals from the water they live in and the food they eat. Some of these chemicals build up in the fish and shellfish - and in the humans that eat fish and shellfish - over time. Although the chemical levels are usually low, it is a good idea to learn about advisories and monitoring in water bodies where you fish, and for fish or shellfish you eat.

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Under Development

Impaired Water Bodies
Which lakes, streams and ocean locations are listed by the state as impaired for fish or shellfish consumption?

Click on the map icon to the left to see an interactive map showing California waters placed on the 2014 and 2016 Impaired Water Bodies list as impaired for uses related fish or shellfish consumption.
Update

• *Reconvening the larger Safe to Swim Workgroup as a venue for collaborations across the sub-workgroups.*

• The Coastal Beach Water Quality Workgroup webpages have been revived and are available at: https://mywaterquality.ca.gov/monitoring_council/swim_workgroup/coastal_beaches.html

• A new Safe to Swim map has been created with fecal indicator bacteria information for all waterbody types. https://mywaterquality.ca.gov/safe_to_swim/interactive_map/

• *Next Steps*
Healthy Watersheds Partnership

November 29, 2018

Item #6g

Ali Dunn
After a brief hiatus, the **healthy watersheds partnership** is reconvening to update existing framework with new methodologies, tools and data.
Next steps and where we could use some help

- Establish strong connections with watershed management efforts across state (targeted outreach at executive level)
  - E.g., DFW-biogeographic data branch, DWR’s Water Action Plan
- Develop tools that improve access to watershed data for local management actions
- Update existing framework and assessment with new methodologies and data
  - E.g., TNC’s Freshwater Conservation Blueprint products
- Produce demonstration products (support grant funding?)
- Keep momentum going!
Feedback?

It's all connected, man!

Water Board Shed Heads
Swimmable California Webinar Series 2017-2018

- A Swimmable California: The Importance of Safe to Swim Policies and Programs
- Fecal Indicator Bacteria Methods: The Good, Bad and Ugly
- An Introduction to Water Contact Sanitary Surveys
- Testing Sewer and Stormwater Infrastructure
- Water Quality Improvement Projects and BMPs to Achieve a Swimmable California
- Harmful Algal Blooms and Water Recreation
- QMRA Eligibility: Molecular Source Tracking and Disease Detection
- Beach Water Quality Modeling and NowCasting
Technology Advancements for Water Quality Monitoring Webinar Series

- Fishviews: A Tool for Collaboration and Communication
- EnviroDIY Webinar: California Water Quality Monitoring Collaboration Network
- Raman Spectroscopy for Environmental Analysis
- Use of eDNA Methodology as a Survey Tool for Cryptic or Endangered Aquatic Organisms
Safe to Swim Work Group Meeting
July 2018
www.youtube.com/playlist?list=PLvTjRb8VChp5eye3qci_PRKwuyRtnEJG_
Stats from the Last 365 Days
• 4,000 Views
Top Countries Watch Time
• USA
• South Korea
• India

Stats Since June 21, 2013
• 102,800 Views
Top Countries Watch Time
• USA
• Ethiopia
• Canada
• Germany
• India

www.youtube.com/CWQMC
Data Management Workgroup

November 29, 2018

Item #6i

Tony Hale
Updates on recent activities
Data Management Workgroup

Highlighted Activities

● Increased Communication regarding AB 1755: The Open and Transparent Water Data Act
  ○ Participated in AB 1755 technical workshop (Aug ‘18)

● Data Management Plan guidance
  ○ Interagency Ecological Program (DUWG)
  ○ DFW & Delta Stewardship Council

● Advocacy for and Guidance on
  ○ Digital Object Identifiers
  ○ Data Sharing Protocols
Data Management Workgroup

Highlighted Activities (Pt 2)

- Facilitated discussions on data-sharing projects
  - Survey for underserved agencies and other entities
  - CNRA portal
  - USEPA-coordinated Data Federation Pilot
- Produced draft of Open Data Handbook Guidance Outline
Next Steps

● Facilitate outreach for data management plans
● Re-develop the charter for the DMWG
  ○ From Council Workgroup technical coordination to broader intergroup technical coordination and advancement
● Continue support for data sharing among local agencies and organizations
Anticipated Impacts of Changing Strategy
Potential Impacts

- Loss of Co-Chair (Currently provided by DWR)
- Dissolution of Steering Committee
- Reduction in ready interagency communication
Workgroup Needs

- Co-Chair (Currently provided by DWR)
- Funding support for facilitation and outreach
Questions?

Tony Hale, PhD
tonyh@sfei.org
Update

- **Workgroup Focus**—Estuary portal Revamp (launched 3/18)
  - Worked to develop content and tools for data access and visualizations

- Experiencing Leadership Challenges
  - Will need leadership to find new purpose (in line with 5 focus areas)

- **Next Steps**
  - Identify new leadership
  - Develop updated goals for workgroup (5 focus areas)
  - Seek additional partners and re-invigorate workgroup