

*Clean waters are the goal.
Sound science takes us there.*



**Proceedings for
U.S. EPA's 2016
Recreational Waters
Conference**



Contents

Agenda 1

Day One

Session 1: Welcome Speakers 7

Session 2: Trends in Beach Management 13

Session 3: Recreation Water Monitoring and Implementation
Challenges/Successes 33

Session 4: Citizen Science 62

Day 2

Session 5: Epidemiology and Quantitative Microbial Risk Assessment 91

Session 6: Advances in Alternative Indicators and Measurement 101

Session 7: Pollution Source Identification, Tracking, and Sanitary Surveys 120

Session 8: Harmful Algal Blooms Impact 140

Day 3

Session 9: Restoration and Remediation of Beaches 163

Session 10: Predictive Modeling and Forecasting 182

Poster Presentations 202

List of Attendees 257



U.S. EPA's 2016 Recreational Waters Conference Agenda

April 12–15, 2016
New Orleans, Louisiana

Tuesday, April 12, 2016 (Preconference Meetings and Activities)

- 8:00–6:00 Registration
- 8:00–10:00 Introduction to Federal and State Programs that Protect Human Health in Recreational Waters
- 10:30–12:00 Evaluating Water Quality at your Beach through Sanitary Surveys and Monitoring Data
- 1:30–3:00 Data Submission and Verification
- 1:30–3:00 Rapid Method: Quantitative Polymerase Chain Reaction
- 3:30–5:00 Predictive Tools Forum
- 3:30–5:00 qPCR Continued—Implementation Experiences

Wednesday, April 13, 2016

- 7:00–4:00 Registration

Session 1: Welcome Speakers

Session Chair: Tracy Bone, U.S. Environmental Protection Agency

- 8:30–8:45 **EPA Welcome**
Tracy Bone, U.S. Environmental Protection Agency
- 8:45–9:05 **Protection of Recreational Waters**
Ellen Gilinsky, U.S. Environmental Protection Agency
- 9:05–9:45 **The Continuing Recovery and Renaissance of Lake Pontchartrain and Its Rivers**
Andrea Bourgeois-Calvin, Lake Pontchartrain Basin Foundation
- 9:45–10:00 Q & A
- 10:00–10:20 BREAK



Session 2: Trends in Beach Management

Session Chair: Julie Kinzelman, Racine Department of Health

- 10:20–10:35 **The Broader Context of Beach Monitoring**
John Wathen, U.S. Environmental Protection Agency
- 10:35–10:50 **Providing and Promoting Recreational Water Quality Information through Mobile and Social Technology**
Trevor McProud, New York City Department of Health and Mental Hygiene
- 10:50–11:05 **Monitoring, Detection, and Management of Hazardous Algal Blooms in Freshwater Lakes East of San Francisco Bay**
Matthew Graul, East Bay Regional Park District
- 11:05–11:20 **Digging in: Understanding the Causes, Impacts, and How Best to Address Excessive Seaweed Accumulation on Maine's Coastal Beaches**
Keri Kaczor, University of Maine Cooperative Extension, Maine Sea Grant
- 11:20–11:35 **The Changing Geographic Distribution of Climate-Sensitive Pathogens in Recreational Water**
Jonathan Yoder, Centers for Disease Control and Prevention
- 11:35–11:50 **Q & A**
- 11:50–1:20 **LUNCH (on your own)**

Session 3: Recreation Water Monitoring and Implementation Challenges/Successes

Session Chair: John Griffith, Southern California Coastal Water Research Project

- 1:20–1:35 **Monitoring Beaches Statewide in Michigan for *E. coli* with qPCR (USEPA Draft Method C)**
Shannon Briggs, Michigan Department of Environmental Quality
- 1:35–1:50 **Rapid Analyses of Water Quality at Five Chicago Beaches, 2015**
Abhilasha Shrestha, University of Illinois, School of Public Health
- 1:50–2:05 **Application of Rapid qPCR-Based Tests for Enterococci (Method 1611) in Hawaiian Coastal Waters**
Marek Kirs, University of Hawaii
- 2:05–2:20 **Multi-Laboratory Survey of U.S. EPA Enterococci qPCR Methods Acceptability for Analyses of U.S. Coastal and Inland Waters**
Richard Haugland, U.S. Environmental Protection Agency
- 2:20–2:35 **Towards Field-Portable Instrumentation for Real-Time Water Quality Monitoring Using Digital Droplet PCR**
Kevan Yamahara, Monterey Bay Aquarium Research Institute
- 2:35–2:50 **Q & A**
- 2:50–3:10 **BREAK**



Session 4: Citizen Science

Session Chair: Ibrahim Goodwin, U.S. Environmental Protection Agency

3:10–3:25 **Keeping It Real: Creating and Managing Citizen Monitoring Programs for the Collection of Actionable Data Concerning Contact Recreation Water Quality Standards and Watershed Management**

Erick Burren, California State Water Resources Control Board, Clean Water Team

3:25–3:40 **The Surfrider Foundation's Blue Water Task Force: Citizen Science Applied to Enhance the Coverage and Effectiveness of State and Local Beach Programs**

Mara Dias, Surfrider Foundation

3:40–3:55 **How's the Water? Using Community Science to Measure Fecal Indicator Bacteria and Improve Water Quality in the Hudson River Watershed**

Dan Shapley, Riverkeeper

3:55–4:10 **Leveraging Volunteer Hours for Water Quality Restoration**

Michael Meyer, Chattahoochee Riverkeeper

4:10–4:25 **Our MS4 Permit—Reframing the Permit's Ownership through Citizen Science**

Jennifer McDonnell, Arlington County Department of Environmental Services

4:25–4:40 **Q & A**

4:40–7:00 **Poster Session (Foyer of Ile de France Ballroom)**

Thursday, April 14, 2016

8:00–4:00 **Registration**

Session 5: Epidemiology and Quantitative Microbial Risk Assessment

Session Chair: John Ravenscroft, U.S. Environmental Protection Agency

8:30–8:45 **Acute Illness Associated with Ocean Exposure and Fecal Indicator Bacteria during Dry and Wet Weather: A Longitudinal Cohort Study of Surfers in San Diego, California**

Ayse Ercumen, University of California—Berkeley

8:45–9:00 **Development of Site-Specific REC Criteria for a Tidal Creek using Peer-Reviewed, Stakeholder-Led QMRA Process**

Dustin Bambic, Paradigm Environmental

9:00–9:15 **Preliminary Evidence for Asymptomatic Norovirus Infection Transmission Associated with Swimming at a Tropical Beach**

Timothy Wade, U.S. Environmental Protection Agency

9:15–9:30 **Evaluation of the Dry and Wet Weather Recreational Health Risks in a Semi-Enclosed Marine Embayment in Southern California**

Sunny Jiang, University of California—Irvine

9:30–9:45 **Human-Associated Fecal qPCR Measurements and Simulated Risk of GI Illness in Recreational Waters Contaminated with Raw Sewage**

Alexandria Boehm, Stanford University



9:45–10:00 Q & A

10:00–10:30 BREAK

Session 6: *Advances in Alternative Indicators and Measurement*

Session Chair: Stephen Weisberg, Southern California Coastal Water Research Project

10:30–10:45 **Evaluation of Three Culture-Based Methods for Enumeration of Coliphage from Ambient Waters**

Asja Korajkic, U.S. Environmental Protection Agency

10:45–11:00 **Coliphage Levels in the Effluents of Wastewater Treatment Plants Discharging Nearby Great Lakes Beaches**

Marirosa Molina, U.S. Environmental Protection Agency

11:00–11:15 **Advances in Measurements and Indicators for Determining Shellfish Growing Area Classifications Adjacent to Wastewater Treatment Plant Outfalls**

Yaping Ao, U.S. Food and Drug Administration

11:15–11:30 **Coliphages as Indicators of Gastrointestinal Illness in Recreational Waters: A Pooled Analysis of Six Prospective Marine Beach Cohorts**

Jack Colford, Jr., University of California—Berkeley

11:30–11:45 **EPA's Development of Recreational Water Quality Criteria for Coliphage: Updates and Experts Coliphage Workshop Overview**

Sharon Nappier, U.S. Environmental Protection Agency

11:45–12:00 Q & A

12:00–1:30 LUNCH (on your own)

Session 7: *Pollution Source Identification, Tracking, and Sanitary Surveys*

Session Chair: Orin Shanks, U.S. Environmental Protection Agency

1:30–1:45 **Florida Beach Geomorphology and Beach Management Practices Correlate with Enterococci Percent Exceedances**

Helena Solo-Gabriele, University of Miami

1:45–2:00 **Source Tracking of Ankle-Depth Water Quality Impairment at Freshwater Beaches in Ontario, Canada**

Thomas Edge, Environment Canada

2:00–2:15 **Sources of Enterococci and their Relation with Environmental Factors at an Inland Beach**

Asli Aslan, Georgia Southern University

2:15–2:30 **Temporal Stability of Fecal Bacteria and Microbial Source Tracking Markers in Water: Implications for Source Allocation Using MST Markers**

Mia Mattioli, Emory University

2:30–2:45 **Exploring the Microbiome for New Approaches to Microbial Source Tracking**

Sandra McLellan, University of Wisconsin—Milwaukee

2:45–3:00 Q & A



3:00–3:30 **BREAK**

Session 8: Harmful Algal Blooms Impact

Session Chair: Virginia Roberts, Centers for Disease Control and Prevention

3:30–3:45 **Cyanobacterial Blooms in Freshwater and Potential Health Impact in the United States**
Jiyoung Lee, Ohio State University

3:45–4:00 **Application of a Linked Hydrodynamic-Harmful Algal Bloom Model for Assessment of Management Scenarios to Impaired Long Island Embayments**
Raghav Narayanan, Anchor QEA

4:00–4:15 **Recreational Risk Management of Surface Waterbodies: Cyanobacteria Surveillance in Massachusetts**
Michael Celona, Massachusetts Department of Public Health

4:15–4:30 **Cyanotoxin Ambient Water Quality Criteria for Recreational Waters**
John Ravenscroft, U.S. Environmental Protection Agency

4:30–4:45 **Anatoxin-a Poisoning in a Dog Associated with Exposure to a Minnesota Lake, June 2015**
Stephanie Gretsche, Minnesota Department of Health

4:45–5:00 **Q & A**

Friday, April 15, 2016

7:30–12:00 **Registration**

Session 9: Restoration and Remediation of Beaches

Session Chair: John Wathen, U.S. Environmental Protection Agency

8:00–8:20 **Developing and Implementing a "Healthy Beaches Action Plan"**
Sarah U'Ren, The Watershed Center Grand Traverse Bay

8:20–8:40 ***E. coli* Decrease in Southern and Western Lake Michigan: Management, Meteorology, or Mussels?**
Richard Whitman, formerly with U.S. Geological Survey

8:40–9:00 **Turbulence and Triumph: Tackling the Complex Challenges Related to Healthy Beaches**
Kathleen Bell, University of Maine School of Economics

9:00–9:20 **The Multidimensional Benefits to Beach Remediation and Restoration**
Greg Kleinheinz, University of Wisconsin—Oshkosh

9:20–9:30 **Q & A**

9:30–10:15 **BREAK**



Session 10: Predictive Modeling and Forecasting

Session Chair: Mike Cytorski, U.S. Environmental Protection Agency

- 10:15–10:30 **Implementing Predictive Models: Practical Advice and New Tools**
Adam Mednick, University of Wisconsin Sea Grant Institute
- 10:30–10:45 **California Beach Water Quality Nowcasting**
Leslie Griffin, Heal the Bay
- 10:45–11:00 **Predictive Modeling and Forecasting of Water Quality at Recreational Beaches along Gulf of Mexico Coast**
Zhiqiang Deng, Louisiana State University
- 11:00–11:15 **Using Probabilities of Enterococci Exceedance and Logistic Regression to Evaluate Long-Term Weekly Beach Monitoring Data**
Jay Fleisher, Nova Southeastern University
- 11:15–11:30 **Development of a Predictive Spatial Model to Understand the Connection between Rainfall Events and Beach Water Quality**
Lance Larson, Natural Resources Defense Council
- 11:30–11:45 **Q & A**
- 11:45–12:00 **Conference Wrap-Up**
Sara Hisel-McCoy, U.S. Environmental Protection Agency