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Wednesday, April 13
3:10 p.m.–4:40 p.m.

Session 4: Citizen Science

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 Burres
California State Water Resources Control Board, Clean Water Team

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Abstract

Citizen science offers communities the chance to "share the economy" when it comes to water quality watershed management. Through citizen science projects, crowdsourcing, and strategic partnerships, useful data sets can be created through the efforts of many. Ensuring that data collected has value toward understanding real environmental conditions and identifying pollution sources, empowers management decisions, and is scientifically objective must be of primary importance for monitoring programs interested in producing actionable data. The Clean Water Team has assisted hundreds of programs to ensure that the data they collect is of known value, relates directly to answering their questions of interest (e.g., whether the water swimmable), and is usable within a regulatory context.

The Clean Water Team's approach to "keeping it real" relies on question formulation, data needed to answer that question (regulatory and/or environmental), data quality requirements and program costs (including volunteer skill levels) required to obtain the data needed, reevaluation and adaptive alignment of program support and data, and the consideration of adding value so data can be used beyond the program's primary question of interest. Our approach supports the formation of monitoring plans, quality assurance project plans, training manuals, health and safety communication, AIS-HACCPs, information management, and project reporting. It leverages the new Federal Crowdsourcing and Citizen Science Toolkit and enables citizen scientists to conduct sanitary surveys, test for fecal indicator bacteria, and conduct source identification studies using approved methods.

This workshop will introduce the basics of citizen science management, sampling techniques, and how to use IDEXX tests and more.

Biosketch

Mr. Erick Burres is a senior environmental scientist-specialist with the California State Water Resources Control Board. He received his bachelor of science degree in zoology from San Diego State University and his master's degree in public policy and administration from California State University, Long Beach. Mr. Burres has worked on numerous environmental issues within California since 1990, including marine fisheries, natural lands/waters management, endangered species protection and recovery, and water quality monitoring. For the past 15 years, he has served as the Clean Water Team's citizen monitoring coordinator. His main objective is protecting and restoring watersheds and their beneficial uses through science-based community research and stewardship.

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

U.S. EPA's 2016 Recreational Waters Conference
April 12–15, 2016
New Orleans, Louisiana

CALIFORNIA CITIZEN MONITORS

Clean Water Team
Erick Burres, Citizen Monitoring Coordinator
eburres@waterboards.ca.gov
www.waterboards.ca.gov/water_issues/programs/swamp/cwt_volunteer.shtml

We want usable, reliable, and scientifically defensible data of known quality.

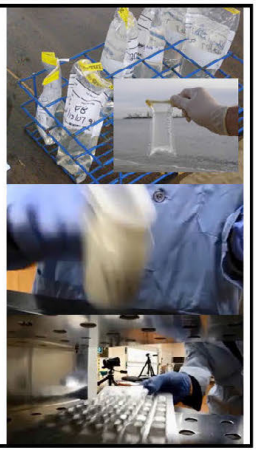
The Clean Water Team has assisted hundreds of programs to ensure that the data they collect is of known value and relates directly to answering their questions of interest. The Clean Water Team's approach to "Keeping it Real" .

Actionable data:

- Values our volunteers time and our funders support.
- Builds community involvement with watershed stewardship.
- Helps improve and protect water quality and beneficial uses.

FIBs

- Sample Collection
- Sample Processing
  - *E. coli*
  - Total Coliforms
  - Fecal Coliforms
  - Enterococcus



Source ID

- Beach Sanitary Survey
  - Homeless Encampments Mapping
  - Trash Assessments
- Molecular ID
- Anthropogenic vs Environmental Contaminants

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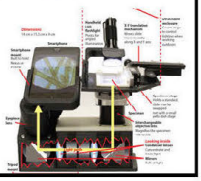
HABs

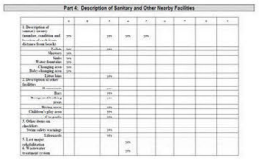
- Sensory Monitoring
  - Visual/Photo/Spectral
    - Shoreline/Dock
    - Areal (Kite/Balloon/Drone/Plane)
- Sample Collection
- Crowdsourcing Species ID

cyanoScope



Recreation Survey

- Water Body Use
  - Recreation Survey
  - Use Determination
- Risk Assessments



Outreach & More

- BMP
  - Assessment
  - Demonstration Projects
- Crowdsoucing
- Beach Health Reporting
- Water Quality Modeling
- Community Ownership

It all starts with a MONITORING QUESTION.

And who's going to use the data produced.

- Data is only meaningful when it becomes information.
- Transformation of data into information is a process.

The transformation process requires:

Knowledge about the question being asked....

....and metadata for the data set being used to answer a particular question.

Monitoring Questions & Monitoring Plans Should Consider Water Quality Objectives

Water Quality Control Plans (Basin Plans)

Water Quality Control Plans (Basin Plans) provide the basis for protecting water quality in California. Basin Plans are mandated by both the Federal Clean Water Act (CWA) and the State Porter Cologne Water Quality Act (Porter-Cologne).

The Basin Plan is each Regional Water Board's master water quality control planning document. It designates beneficial uses and water quality objectives for waters of the State, including surface waters and groundwater. These enforceable water quality standards are designed to ensure that the beneficial uses of California's waters are protected.

Each plan must contain water quality objectives, which in the judgment of the Regional Water Board will ensure the reasonable protection of beneficial uses and the prevention of nuisance, and a program of implementation for achieving those objectives, including a description of the nature of actions that are necessary to achieve the objectives, time schedules for the actions to be taken, and a description of surveillance to be undertaken to determine compliance with objectives.

Monitoring Programs Need to Take into Account the Following:

- Time needed
- Skill sets required (recruiting talent or providing training)
- Equipment, supply and/or lab costs
- **Data quality needed to answer their monitoring questions**

To Ensure Data Legacy Programs Should Follow These 7 Steps

- What ever you are going to do, do it well
- Do it with a goal in mind
- Use acceptable, standardized or validated, instruments and or methods
- Employ sound QA/QC.
- Document everything (metadata)
- Validate all data
- Data communication (storage, sharing…)through an acceptable repository

Metadata Needs Should Never Be Treated Lightly

Record and Share with Data

Instrument – Method – Lab Procedure
- Units
- Resolution
- Detection Range (Min – Max)

Monitoring Design (& Execution)
- Completeness
- Comparability (approved, used by others…)
- Data Quality
- Calibration
- Precision
- Accuracy
- Drift
- Training
- QA Standards (buffers, calibration solutions…)

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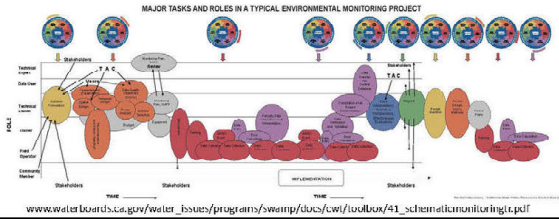
New Technologies Should Undergo Validation & Equivalency Studies

With the rise of interest in citizen monitoring and the ease of forming groups...

...and a disconnect between volunteer monitoring/citizen monitoring and citizen science...

...the hard work needed to make these steps happen may not always be happening.

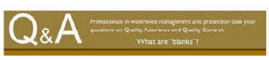


www.waterboards.ca.gov/water_issues/programs/swamp/docs/cwt/toolbox/41_schematicmonitoring1.pdf

To assist monitoring groups

develop their programs the Clean Water Team provides technical consulting on monitoring plans and Quality Assurance Project Plans.

The Team has also created tools available online.



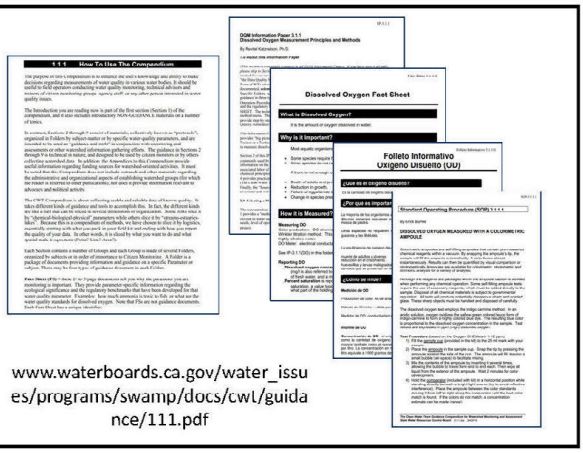
com · pen · di · um
/kəm ˈpendēəm/

Noun a collection of concise but detailed information about a particular subject, especially in book or other publication.

The Clean Water Team's GUIDANCE COMPENDIUM FOR WATERSHED MONITORING AND ASSESSMENT is a collection of **How to Manuals** (starting and running a monitoring program), **Fact Sheets** (presenting ecological significance and regulatory benchmarks), **Information Papers** (method "menus" and principles), **Standard Operating Procedures** (step by step instructions) **and more**. This Compendium was created to help citizen monitoring programs organize and produce actionable data for watershed stewardship.

GUIDANCE COMPENDIUM FOR WATERSHED MONITORING AND ASSESSMENT

Section 1.0	Introduction and Overview
Section 2.0	Field Procedures (e.g., sample collection)
Section 3.0	"Grab Samples" - Measurements Taken at One Point in a Water Body or in a Container (including Water Quality Fact Sheets)
Section 4.0	Stream Measurements (e.g., flow)
Section 5.0	Measurements Taken in a Watershed (e.g., rain)
Section 6.0	Geographic Information for Watershed Use (GIS & GPS)
Section 7.0	Programmatic Quality Assurance and Quality Control (QA, QC & QAPP)
Section 8.0	Data Quality Management (DQM)
Section 9.0	Volunteer & Staff Role Specific DQM Materials
Appendices	Glossary and Web Links (Spanish)
Notes	About the Contents



www.waterboards.ca.gov/water_issues/programs/swamp/docs/cwl/guidance/111.pdf

THE CLEAN WATER TEAM'S TOOL BOX

In addition to the Clean Water Team Compendium for Watershed Monitoring and Assessment, this **Toolbox** has template files and documents that will help you manage and organize your water quality monitoring data. Most of the items are part of the Data Quality Management (**DQM**) system that the Clean Water Team has developed for the collection management and sharing of reliable data of known quality. The utility of the tools contained within this virtual toolbox will be especially useful as you begin to analyze your project's data.

- Part 1: The Basics
- Part 2: Data Validation Kit
- Part 3: Advanced Tools
- Part 4: Monitoring Project Planning Kit

www.waterboards.ca.gov/water_issues/programs/swamp/cwt_toolbox.shtml

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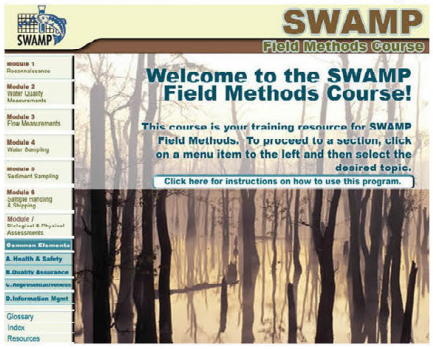
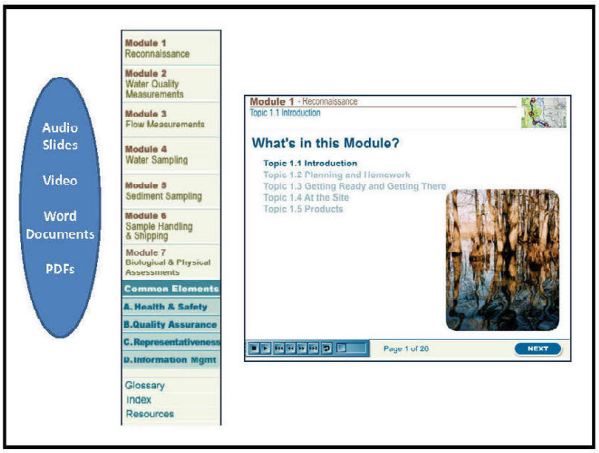
Web Accessible Multi-Media Training



http://swamp.waterboards.ca.gov/swamp/qapp_advisor/FieldMethods/start.html



EMMA Environmental Monitoring & Measurement Advisor

EMMA combines decision criteria based on systematic planning (including all elements of EPA's Data Quality Objective (DQO) process), your specific project needs, and methods information from the new National Environmental Methods Index (NEMI). It also incorporates the latest information from EPA's new Triad Approach and EPA's new Performance and Acceptance Criteria (PAC) Process. www.emma-expertsystem.com

NEMI is an online clearinghouse of environmental monitoring methods. The NEMI database contains chemical, microbiological and radiochemical method summaries of lab and field protocols for regulatory and non regulatory water quality analyses.

MEMO BETA
Methods for Environmental Measurements and Observations

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

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Abstract

The Surfrider Foundation is a grassroots, nonprofit environmental organization dedicated to the protection and enjoyment of the world's oceans, waves, and beaches. The foundation operates through a powerful volunteer network supported by 85 chapters across the United States and internationally.

The Blue Water Task Force (BWTF) is Surfrider's volunteer-run, water quality monitoring, education, and advocacy program. While all of BWTF's more than 30 laboratories are testing beach and other coastal waters for indicator bacteria, each chapter has designed its own individualized citizen science program to best use their available resources and meet local community needs.

Many Surfrider chapters collaborate with other local NGOs, government agencies, and academic institutions to implement and enhance their monitoring programs by sharing resources and capabilities. Surfrider brings to these partnerships a team of highly motivated volunteers who are very familiar with local conditions at the beach and are willing to become advocates for its protection. Surfrider also maintains a national online database that can easily be used to communicate and share data with the public through conventional and social media platforms.

This presentation will provide examples of Surfrider chapters collaborating with state and local governments to stretch limited agency resources to expand the coverage and prioritize the focus of their beach programs and to generate the political will and manpower to look upstream to track and fix local sources of pollution.

Biosketch

Ms. Mara Dias is the water quality manager for the Surfrider Foundation, an international, grass-roots environmental non-governmental organization. She received her bachelor of science degree in marine biology from Southampton College in New York and her master of science degree in environmental policy from the College of Charleston in South Carolina. Ms. Dias currently leads the Surfrider Foundation's Clean Water Initiative, which includes managing their volunteer-run beach water testing program and the Blue Water Task Force, as well as working on advocacy campaigns to improve water quality monitoring and public health protection programs at beaches across the United States. She also assists Surfrider chapters in addressing their local water quality concerns by building community awareness and partnering with local agencies to track and fix sources of beach pollution.

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Who is Surfrider?

The Surfrider Foundation is a non-profit grassroots organization dedicated to the protection and enjoyment of our world's ocean, waves and beaches.

We maintain a large network of coastal defenders supported at the national level with policy, legal & science experts

SURFRIDER FOUNDATION

OUR CHAPTER NETWORK

10 Regions 84 Chapters 50 Academic Clubs

Blue Water Task Force

The Surfrider Foundation's volunteer-run, water quality monitoring, education and advocacy program.

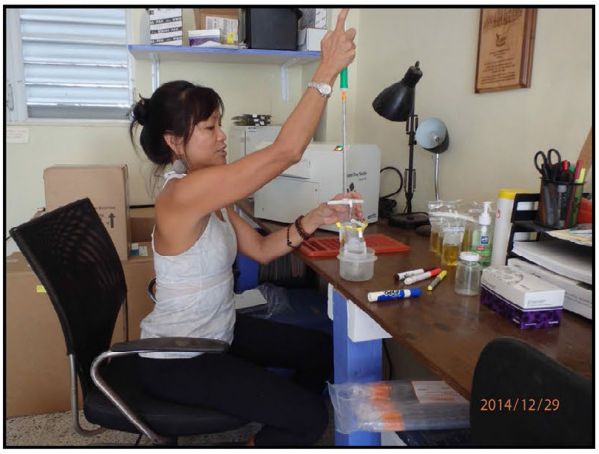
Blue Water Task Force

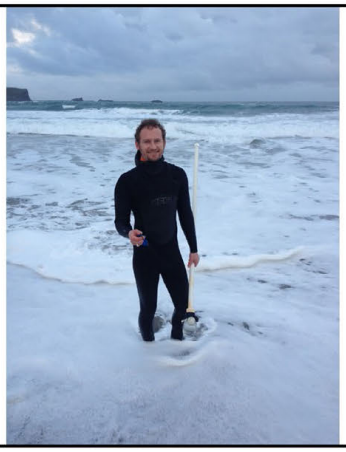
- Test ocean & bay beaches and freshwater sources
  - Creek & river mouths
  - Stormwater discharge
  - Upper watershed sites

- Sites tested fill in data gaps, cover popular surf spots, or sources of pollution
- Enterococcus Bacteria – IDEXX Enterolert Quanti-Tray Methodology
- Site maps & data posted online.

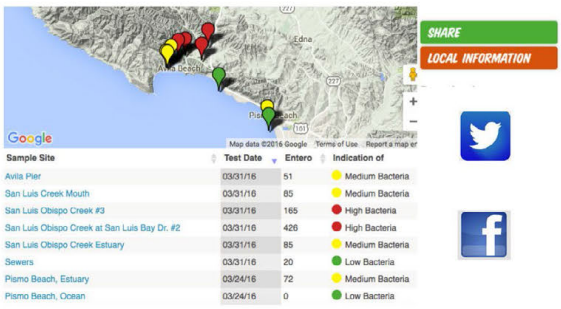
BWTF Labs

- Chapter maintained labs often using borrowed space from local partners
  - Other local env groups, aquariums, universities
- Collect samples for partner organizations & help communicate data
  - State & local beach programs, & other watershed groups
- School & youth programs





Easy to Share Data from BWTF website



http://www.surfrider.org/blue-water-task-force

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Blue Water Task Force

- Activating volunteers
- Educating students
- Grooming future leaders
- Building chapter credibility & legitimacy
- Forming partnerships
- Building community awareness of water quality issues
- Identifying sources of pollution
- Advocating for solutions

Surfrider Foundation's Blue Water Task Force

Citizen science applied to enhance the coverage and effectiveness of state and local beach programs.

Northwest Straits Chapter

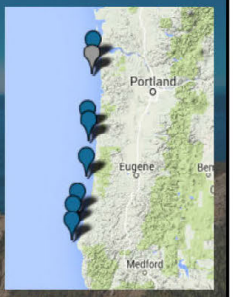
- Lab at Western Washington University
- WA BEACH Program
- High bacteria counts @ Larrabee State Park
- Whatcom County DOH found & fixed septics
- Surfrider education & outreach at camp-ground

Wild Cat Cove, Larrabee State Park

- Stream survey found raccoon latrine site
- Targeted camper education program
- Scoop the poop & stream fencing

Surfrider Oregon

- 7 BWTF labs
- Year-round testing
- OR DEQ Beach Program
- City & community partners
- Advocate for funding
- Midcoast TMDL
- Public outreach
  - BAVs & WQ stds



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Newport, Oregon

- Lab at Oregon Coast Aquarium
- BWTF High Bacteria Counts at Nye Creek & Nye Beach
- City posted signs & State started testing

Newport, Oregon

- Smoke tests revealed sewer misconnects
- Wetland restoration projects
- Stormwater utility established & stormwater BMPs codified by City
- Bacteria levels improved at Nye Beach & Creek

SURFRIDER FOUNDATION

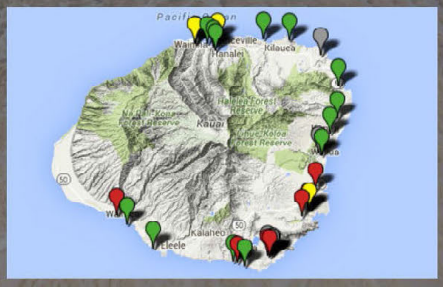
2015 Bacteria Levels Increase

- DEQ & Surfrider data confirm problems
- City prompted study to sample upstream in creek and stormwater system

Blue Water Scholar

- Surfrider, Oregon Coast Aquarium, City of Newport & Oregon Community Foundation

Surfrider BWTF Kaua'i



Warning Signs to Protect Public Health in Recreational Waters

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How's the Water? Using Community Science to Measure Fecal Indicator Bacteria and Improve Water Quality in the Hudson River Watershed

Dan Shapley
Riverkeeper

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Abstract

Riverkeeper coordinates the most extensive community science effort in New York State to measure fecal indicator bacteria in the Hudson River watershed. Because it flows past New York City, the Hudson River is known as the quintessential urban river, but the river's estuary stretches nearly 150 miles north of New York City to the federal dam at Troy, and its watershed is diverse. People swim, boat, and fish throughout its watershed, and its landscape ranges from state-protected forested mountains, to extensive farmland and communities of all sizes, up to and including the largest city in the United States.

Our water quality program was established in 2008 with Columbia University's Lamont-Doherty Earth Observatory and CUNY Queens College to test 74 locations monthly along 150 miles of the Hudson River estuary routinely visited by the Riverkeeper patrol boat. As of 2015, we routinely monitored 300 locations spanning nearly 600 miles of water, including community science projects sampling waterfront access points throughout New York City and in nine tributaries, in partnership with more than 25 organizations and more than 130 individuals. In 2015, we and our partners gathered 6,718 samples, and took over 2,800 measures of Enterococci, the fecal indicator bacteria recommended by U.S. Environmental Protection Agency (EPA) Recreational Water Quality Criteria (RWQC) for assessing both fresh and salt waters, including inland flowing waters. The program measures water quality based on the EPA RWQC, and all data is published at riverkeeper.org.

Data, and the use of community science to gather it, have influenced state and local policies, laws, and actions, leading to infrastructure investments and improved water quality in many locations. Data have both provided information that enables the public to make informed choices about recreation in and on the water, and galvanized popular support for clean water initiatives. Highlights of the program's impact include the passage of the Sewage Pollution Right to Know Law, requiring disclosure of releases to water of raw or partially treated sewage from publicly owned sewage systems; passage of the Water Infrastructure Improvement Act of 2015, creating a new grant program for community investments; strengthening of CSO Long Term Control Plans in several communities; and establishment of new citizen watershed protection efforts in several tributaries.

Biosketch

Mr. Dan Shapley manages the Water Quality Program for Riverkeeper, Inc. A founding member of the Waterkeeper Alliance, Riverkeeper is a 50-year-old watchdog organization devoted to protecting and restoring the Hudson River, its tributaries, and the drinking water supply for New York City. Mr. Shapley has worked for Riverkeeper since 2011 and has managed the Water Quality Program since 2014. Prior to joining Riverkeeper, Mr. Shapley was an award-winning journalist focused on environmental issues both nationally and in New York's Hudson Valley. You can follow his work on the Riverkeeper blog, at riverkeeper.org/author/dshapley/, or on Twitter at @danshapley.

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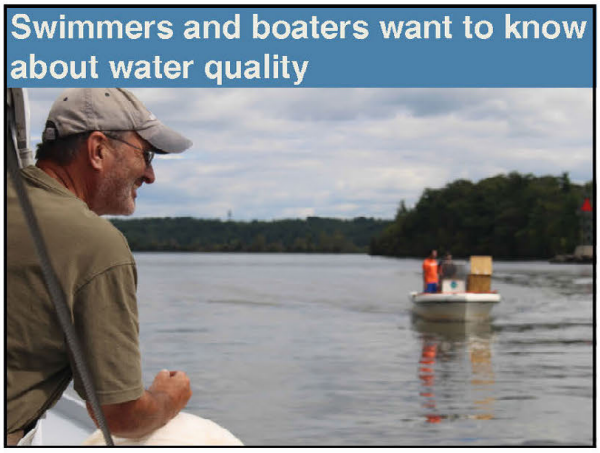

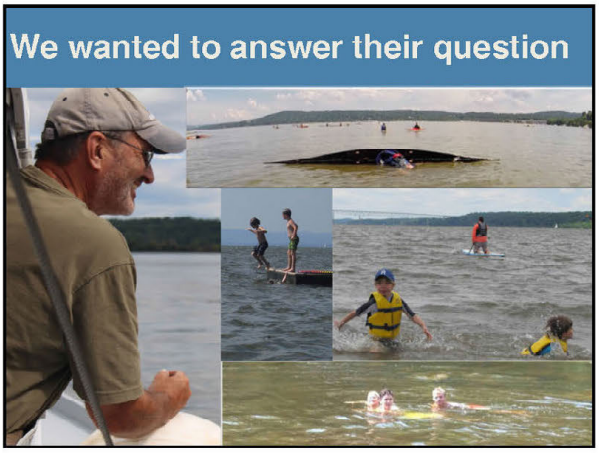

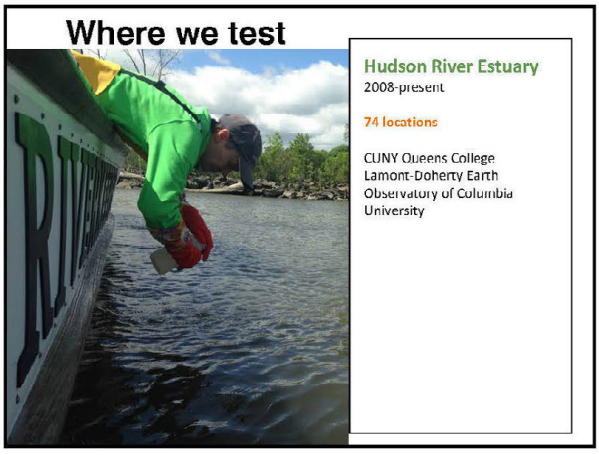

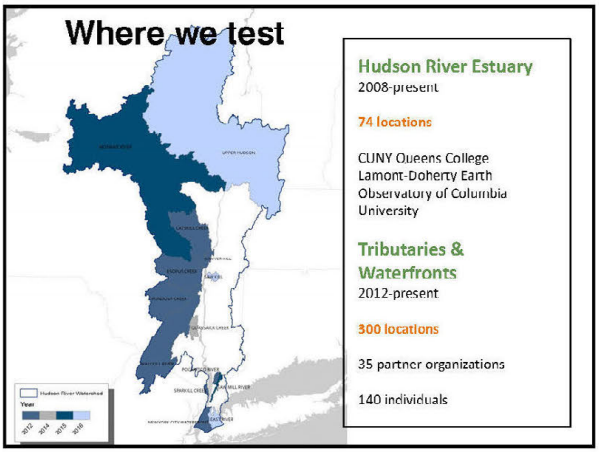

EPA Guidelines for *Enterococcus*

Beach Action Value
= 60 Entero / 100 mL
→ **Single sample**
Beach closure

Geometric Mean
= 30 Entero / 100 mL
→ **Weighted average**
Chronic contamination

Statistical Threshold Value
= 110 Entero / 100 mL
→ **Frequency limit**
Contamination spikes

Entero in the Hudson River watershed: major conclusions

1. Water quality varies over time, in frequency and in degree, at all locations
2. Precipitation increases contamination
3. Contamination is greater in tributaries

23% of samples exceed BAV

59% of sites sampled would exceed GM, STV, or both

Entero in the Hudson River watershed: major conclusions

1. Water quality varies over time, in frequency, and in degree, at all locations
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Entero in the Hudson River watershed: major conclusions

1. Water quality varies over time, in frequency, and in degree, at all locations
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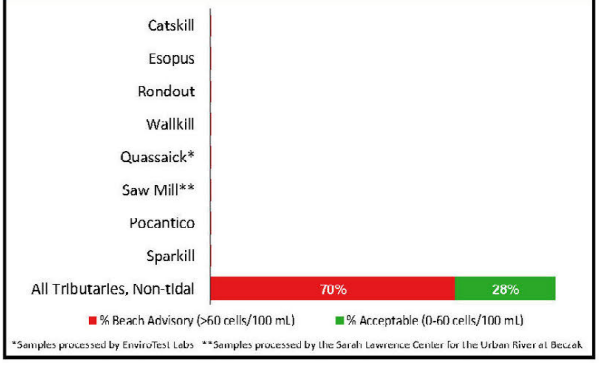
3. Contamination is greater in tributaries

Conclusions from tributary studies are similar

Most tributary samples exceed EPA beach closure guideline (BAV)



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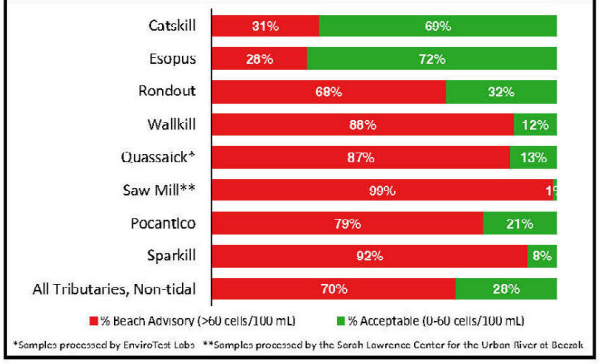
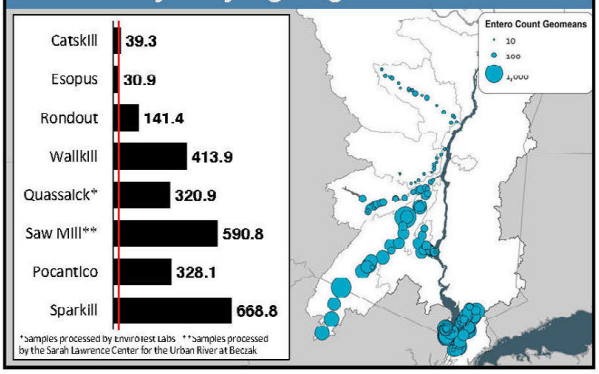
Frequency of contamination varies among tributaries



Tributary geomeans exceed EPA criterion by varying degrees



Hudson Watershed in Context

94% (30 of 32) stream segments fail CM criterion, and

100% fail STV criterion

Vs.

23% that failed the qPCR threshold nationwide, and

29% in Eastern Highlands region

according to National Rivers and Streams Assessment

Putting the data to work

Advocacy

Science

Water quality monitoring team

John Lipscomb , Dan Shapley & Jen Epstein
Riverkeeper

Dr. Greg O'Mullan
CUNY Queens College

Dr. Andrew Juhl, Carol Knudson
Columbia University Lamont-Doherty Earth Observatory

Community sampling partners

- The Ashokan Center
- Catskill Creek Watershed Awareness Project
- Columbia University Lamont Doherty Earth Observatory
- CUNY Queens
- Gardiner Environmental Conservation Commission
- Hudson Valley Arts and Science
- Lower Esopus Watershed Partnership
- Montgomery Conservation Advisory Council
- New York City Water Trail Association
- Ossining High School
- Pocantico River Watershed Alliance
- Pleasantville Conservation Advisory Council
- Quassaick Creek Watershed Alliance
- The River Project
- Rochester Environmental Conservation Commission
- Rosendale Commission for Conservation of the Environment
- The Sarah Lawrence College Center for the Urban River at Beczak
- Saw Mill River Coalition
- Sparkill Creek Watershed Alliance
- SUNY Cobleskill
- Wallkill River Watershed Alliance
- Wawarsing Environmental Conservation Commission
- Yonkers Paddling and Rowing Club
- 20+ NYC boathouses, clubs and parks

Funders

Austen Stokes Ancient Americas Foundation, Chris and Suzanne Augustin, City University of New York, Dale and Laura Kutnick, Dextra Baldwin McGonagle Foundation, Double R Foundation, Eppley Foundation for Research, HSBC Water Programme, Hudson River Estuary Program, Hudson River Foundation for Science and Environmental Research, Lamont-Doherty Earth Observatory of Columbia University, John McLaughlin, Michele Hertz and Larry Friedman, The Nancy and Edwin Marks Family Foundation, New England Interstate Water Pollution Control Commission (NEIWPCC), S. Mackintosh Pulsifer, Mike Richter, Sun Hill Foundation, Wallace Research Foundation, and many Riverkeeper members.

This presentation does not necessarily reflect the views and policies of NEIWPCC or any other funder, nor does the mention of trade names or commercial products constitute endorsement or recommendation for use.

Dan Shapley
dshapley@riverkeeper.org
914-478-4501 x226

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Leveraging Volunteer Hours for Water Quality Restoration

Michael Meyer
Chattahoochee Riverkeeper

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Abstract

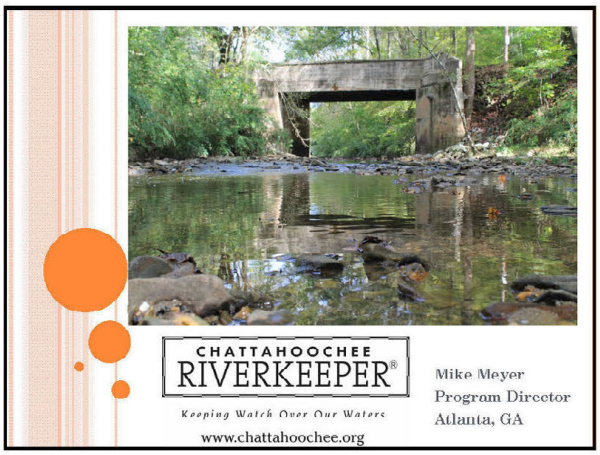
Water quality in the Chattahoochee River has improved significantly in the last 20 years due to improvements in the City of Atlanta's sewer system. Still, many streams flowing through Atlanta's neighborhoods are polluted with high levels of *E. coli* and other pollutants due to cracked and overflowing sewers, failing septic systems, and polluted stormwater runoff. Like many waterways across the nation, a majority of these streams rarely receive routine water quality monitoring from local, state, and federal government agencies. Therefore, many of the pollution sources in the watershed often flow unchecked for long periods of time—resulting in environmental degradation and public health threats.

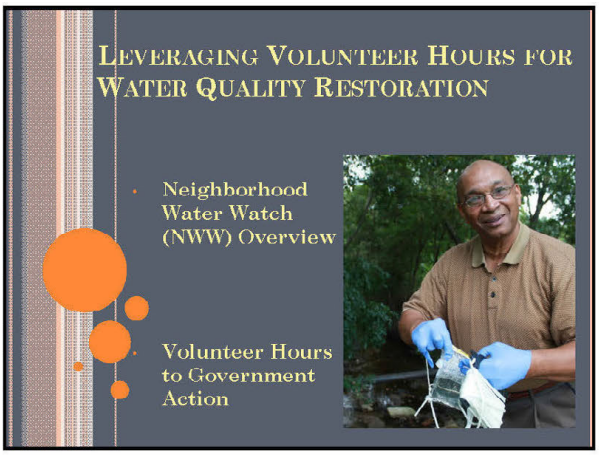
In an effort to fill this void of water quality data and address the many pollution sources plaguing these waterways, Chattahoochee Riverkeeper (CRK) initiated a large-scale volunteer *E. coli* monitoring program called Neighborhood Water Watch (NWW). Since the program's inception, we have been extremely successful in achieving all of our goals, which has resulted in real, measurable water quality improvements in our community's waterways.

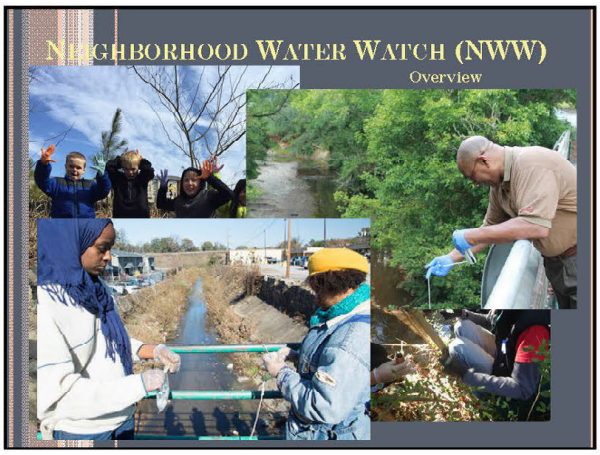
CRK's NWW program started in 2010 with one stream and one concerned community organization. Six years later, the program has grown to monitoring over 120 stations weekly in the Chattahoochee watershed in partnership with community volunteers. Because of this program, we have found and reported numerous sewer leaks and stopped thousands of gallons of raw sewage from reaching local streams and the Chattahoochee River. We have learned how to successfully leverage volunteer hours into significant government action to solve pollution problems in urban areas.

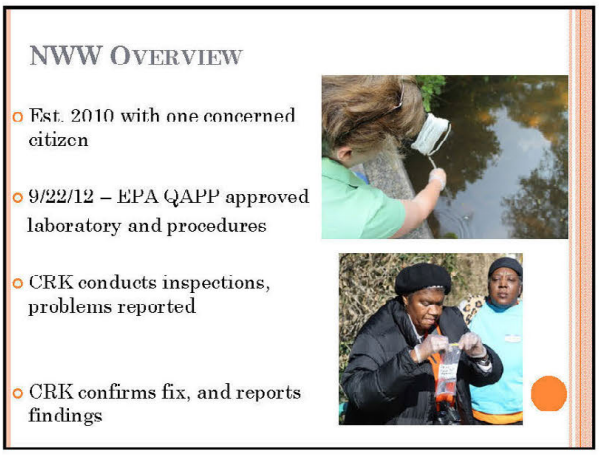
Biosketch

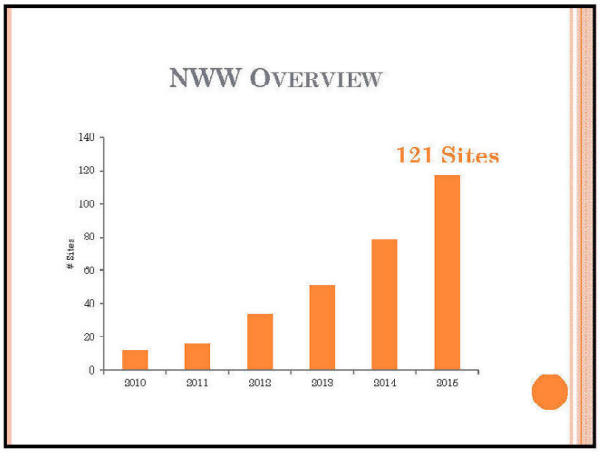
Mr. Mike Meyer is the director of Chattahoochee Riverkeeper's (CRK's) Neighborhood Water Watch Program in Atlanta, Georgia. Working with Riverkeeper Jason Ulseth, Mr. Meyer's work ranges from program management, field studies, and lab analysis with his program, to conservation and education efforts with CRK's outreach programs. Originally from Buffalo, New York, Mr. Meyer was first introduced to Atlanta's water quality issues in 2001 while working with Southeast Waters, an AmeriCorps program. Shortly after graduating from Oglethorpe University with a bachelor of science degree in biology, he began an internship with CRK, which led to his employment in the Technical Programs Department. A passionate advocate for environmental protection and restoration, trained watershed protection specialist, and certified Erosion and Sediment Control Inspector, Mr. Meyer is interested in working to improve urban waterways and greenspaces. He supports ever-expanding Atlanta's enthusiasm for conserving and reclaiming its natural spaces for wildlife and people alike. A long-time resident and supporter of Atlanta's walkable communities, Mr. Meyer prefers a neighborhood in which you can get "a popsicle, a taco, and a video, all on the same block."

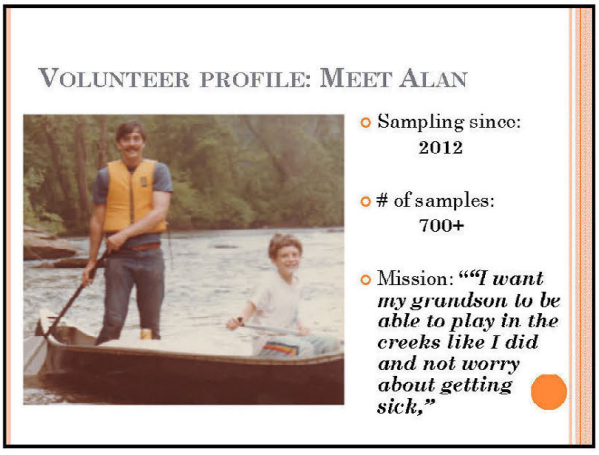












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Volunteer profile: Meet Ruby

- Sampling since: 2014
- # of samples: 100+
- Mission: "This work is about community — that's why I do it"

Volunteer Efforts to Government Action

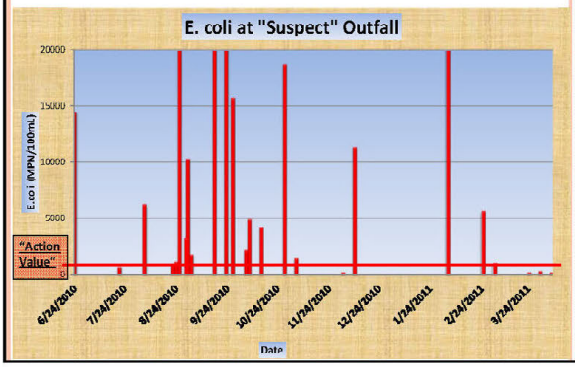
Tanyard "Suspect Outfall 1"

- Amanda's 2010 samples at Tanyard Creek Park indicated a problem, CRK began tracking.

Intermittent Dry Weather Spikes:

>241,000 MPN/100mL

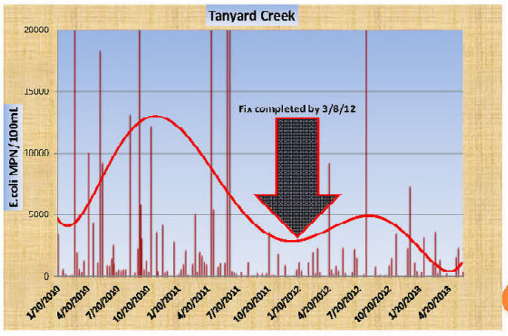
Before the city began their tests



What was the issue?

- City dye tests and CCTV inspections in 2012 identified clogged sewer line
- It only seeped sewage when volumes reached crushed pipe top

After the fix, numbers went down



Tanyard Creek - Atlanta
Reported 7/2/13 - Fixed 7/5/13

- Culprit:
  Private lift station failure

March Creek – Sandy Springs
Reported 7/7/14 - Fixed 7/9/14

- Culprit:
  Broken sewer line

Hollingsworth - Atlanta
Reported 11/10/14 - Fixed 11/10/14

- Culprit:
  Overflowing manhole clogged with FOGB's

Nancy Creek Trib - DeKalb
Reported 10/1/14 - Fixed 10/29/14

- Culprit:
  Erosion caused broken private sewer line

Proctor Creek Trib – Atlanta
Discovered 9/17/15 - Fixed 10/19/15

- Culprit:
  Private broken line coming from homes on Lanier St

Rottenwood – Cobb
Reported 2/10/16 - Fixed 2/11/16

- Culprit:
  Private residential line tie-in

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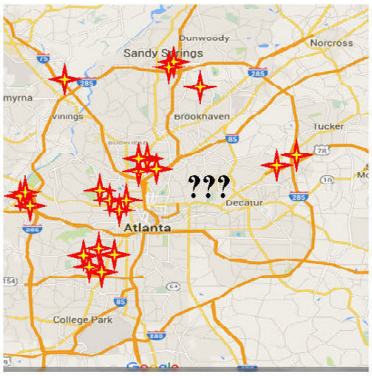
South Utoy Trib –East Point
Reported 3/9/16 - Fixed 3/9/16

- Culprit:
  Overflowing manhole clogged with FOGB's

Metro Sewer Spills Stopped



- Tanyard Poop Pipe
- Tanyard at Reserve
- Tanyard Algae Pipe
- Burnt Fork Creek at Frasier
- Marsh Creek at Winding
- Marsh Creek at Riverside
- Sandy Creek at Bolton
- Utoy North at Benjamin Mays
- Proctor at Hollingsworth
- Proctor at Easton
- Sandy at Hedgewood
- Burnt Fork at Mason Mill
- Proctor at North (E)
- Utoy North at Golf Course
- Proctor at Valley of the Hawks
- Nancy at Byrnwyck
- Sandy at Lake Valley
- Rottenwood at Collingwood
- Utoy South at Alison
- Utoy South at Connally
- Utoy North at Conneco Trail
- Clear at Brookwood
- And others, but where next ????

Thank You To Our NWW Volunteers!

Our MS4 Permit—Reframing the Permit's Ownership through Citizen Science

Jennifer McDonnell
Arlington County Department of Environmental Services

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Abstract

Regulatory requirements are often framed as something that the government imposes on the people, instead of a joint community-government effort to improve the environment. Establishing responsibilities and meaningful ways for the public to contribute through citizen science reframes the conversation with the volunteers from "the county's permit" to "our permit." Arlington County's citizen science macroinvertebrate and *E. coli* monitoring programs have been included in their municipal separate storm sewer system (MS4) permit since 2002 and were included in the most recent 2013 permit renewal. In addition to supporting the county's MS4 permit, the collected data has benefitted the county by identifying a water main leak that otherwise probably would not have been located. The many benefits of a local government-sponsored citizen science program will be discussed during this presentation as well as the unique challenges it presents.

Biosketch

Ms. Jennifer McDonnell is a stormwater outreach specialist for Arlington County, Virginia's Department of Environmental Services, Office of Sustainability and Environmental Management. She has a bachelor of science degree in kinesiology from the College of William and Mary and more than 15 years of environmental education and outreach experience primarily focused on grassroots-level public engagement. Ms. McDonnell's previous work with the Alexandria Seaport Foundation and Earth Force focused on connecting local youths with local streams and the Potomac River. As a consultant to the U.S. Environmental Protection Agency, she was a national trainer for the "Key Internet Tools for Watershed Management" and "Getting in Step" courses as well as project manager for nonpoint source-related contracts. Today, Ms. McDonnell manages Arlington County's citizen science programs and supports outreach efforts related to watershed and stormwater programs, including the Green Streets and StormwaterWise Landscapes programs.

Arlington Snapshot

- 26.5 square miles
- Population. 216,700 (2015 estimate)
- >8,000 persons/sq mile
- Population has increased an average 1% per year since 2000
- 32 miles of perennial, freshwater streams
- 366 miles of storm sewers
- >10,000 storm drains
- Roughly 42% impervious coverage

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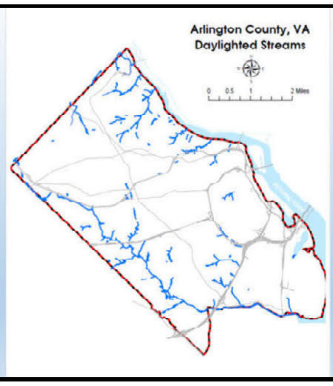

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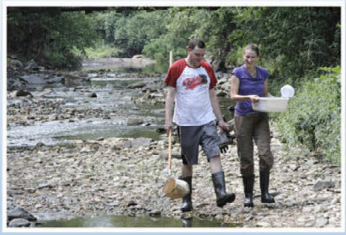
Arlington's volunteer monitoring programs have been a part of our MS4 permit since 2002.

Arlington was the first in Virginia to receive the renewed MS4 permit that included the Chesapeake Bay TMDL requirements in 2013. The 2013 permit included the volunteer programs plus some additional training requirements.



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MS4 Permit Requirements for Bacteria Program

Excerpt:

- The permittee shall use the Colliscan EasyGel method to analyze in-stream E-coli levels.
- The permittee shall collect monthly samples at each of the following locations in Four-Mile Run identified in Table 1.
- **The permittee may rely on community volunteers to conduct bacteriological monitoring.**
- The permittee shall analyze the data for relationships with precipitation events including recent (occurred within 24 hours of sampling) and long term (total monthly precipitation).

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Bacteria Monitoring

- 1x/month
- Colliscan Easygel method
- Began Fall 2005 with 11 sites
- 21 sites today
- 23 volunteers
- 2013 QAPP and updated in 2014
- >$1,300 is supplies per year

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MS4 Permit Requirements for Macroinvertebrate Program

Excerpt:

- The permittee shall use a biological stream monitoring protocol based on EPA's Rapid Bioassessment Protocol 2 and shall include habitat assessment, temperature and pH measurements, and an assessment of the benthic macroinvertebrate community. The developed protocol shall be available on the permittee's website.
- The permittee may rely on community volunteers to conduct biological stream monitoring provided each volunteer has attended two training events. Documentation of volunteer training shall be kept on file for review.

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Macroinvertebrate Monitoring

- Since 2001
- 9 sites
- Roughly 100 volunteers on the roster
- Sampling 3xs per year
- Data reported to VA DGIF, VA DEQ, & public
- Each kit of materials is > $600

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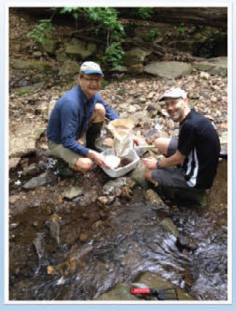
Citizen Science Program Benefits

- Ability to re-sample without significant cost concerns.
- County has background knowledge of the people monitoring.
- More members of the community are aware of the County's efforts and are messengers in their networks
  - Relationships are formed.
- Volunteers are more aware than most in the community and will notice and report pollution events.



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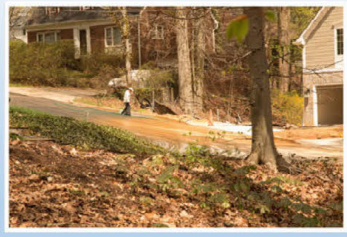

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Benefits of Program Inclusion in the MS4 Permit

- Provides sense of program permanence and requires appropriation of funding.
- Negates the "it's just outreach" mindset.
  - Following the protocol isn't optional.
- Provides meaning to the volunteers' work.
  - They understand they are part of something larger.
- Volunteers understand where the data goes after submittal.

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Benefit of a Government-hosted Citizen Science Program

- Easier for the government and its different departments to use the data because they understand the data's source, the managing staff, and the protocol that was followed.
- Easier to make program and staffing adjustments than if constrained through a contract.

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Discoveries Since 2012

- Water Main Break, Upper Long Branch – Bacteria & Macro Programs
- Drinking Water Broken Valve, Windy Run - Bacteria Program
- Duck Pond, Four Mile Run – Bacteria Program

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Challenges of a Hosting a Citizen Science Program

- If you build it and they come, you have to maintain it.
  - Programs cannot thrive on autopilot
  - Effort is required to retain volunteer interest.
  - Staff presence indicates importance to volunteers.
- Frequent turnover in area/transient nature of area. (Diplomats, military, etc)
- Busy, overbooked lifestyles of volunteers.
- Maintaining enthusiasm in light of poor bug diversity.
  - New trainings
  - Sampling bias – Bigger bugs aren't better bugs.

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2016 Suite of Trainings

Introduction to Monitoring

Macro Level IA: Improve observation and identification skills. Improve familiarity with macroinvertebrate body parts that are important for identification.

Macro Level IB: Improve comfort and familiarity with using keys to identify macroinvertebrates.

Macro Level II A Caddisflies, Mayflies & Crayfish

Macro Level II B – Dragonflies, Damselflies, Aquatic Sowbugs & Scuds

Macro Level II C – Crane Flies, Black Flies, Midges. Snails. Flatworms. Aquatic worms & Leeches

Master Identifiers (MIs) Test

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Challenges of a Government-hosted Citizen Science Program

- Frustrations with governments in general.
  - Because the data indicates there is a problem doesn't mean the problem will be easy to find or resolve.
  - Limitations of what a government can legally do.
- Unrealistic expectations of a government-sponsored program
  - No, we don't have a CSI-style lab with real-time bacteria data.

When tied to the MS4 permit:

- Can limit some program flexibility.
- Can add additional reporting/tracking that you may not otherwise have done.

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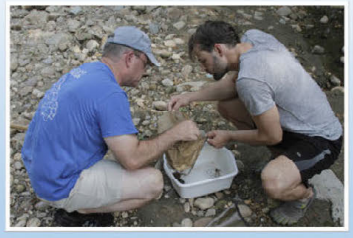
If you plan to start a government-hosted program, I cannot emphasize enough the importance of the program "living" with the appropriate department.



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Citizen Science Alternative: Consultants

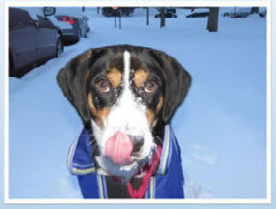
- Hiring consultants requires staff oversight.
- Program costs are higher.

A knowledgeable consultant can provide a citizen science program audit and recommendations for improving your program. This can provide legitimacy to your work, and bring in greater expertise on an as-needed basis.

ARLINGTON VIRGINIA

Jennifer McDonnell
Arlington County, DES
Office of Sustainability and
Environmental Management
2100 Clarendon Blvd,
Suite 705
Arlington, VA 22201

703-228-3042
jmcdonnell@arlingtonva.us



http://environment.arlingtonva.us/streams/stream-monitoring/

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Question & Answer Session

Question 1
(Unknown): Did you find challenges in using data provided by volunteers?

Answer 1
Michael Meyer: They know we are serious; we sued the city of Atlanta, a bit of word-of-mouth, too, that gave us legitimacy. Some were very quick and responsive.

Answer 1 (follow-up)
Erick Burres: We had some riverkeepers in California that had the same successes. We tell the volunteers that they are scientists; it's about the data. That makes a difference. It's all about the community.

Question 2
Keri Kaczor: I'm a big fan of citizen science—that is how a program can run. But when it comes to sleuthing contaminated areas, can you share some best practices? We don't use citizen science for that.

Answer 2
Michael Meyer: We train volunteers very carefully and we check up on them. Our sample sites are usually from pedestrian-friendly bridges, not a highway or something more dangerous, and we don't have them go down steep banks, or sample during a storm. We are careful; safety is important. We have them wear gloves, use hand sanitizer, avoid touching the sample or inside of the bag, and so forth.

Answer 2 (follow-up)
Erick Burres: Safety is always first. How do you control a volunteer, though? We tell them the sample is not as important as you are. We had issues with booby-traps out there. With HAB monitoring, we have some potentially really dangerous waters, so volunteers have to be very careful and avoid harmful situations.

Question 3
Dan Shapley: I'm curious, we tried to talk to people about MS4 [municipal separate stormwater sewer systems] permits and volunteers. Did you run into issues with union contracts?

Answer 3
Jennifer McDonnell: No, union questions never came up. This program was not replacing other monitoring efforts.

Answer 3 (follow-up)
Erick Burres: We have legislation, a conflict in our grants, that it could be taking away potential jobs.

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