



Integration of
Volunteer Water Quality Monitoring
in the Myrtle Beach Urbanized Area's
NPDES Phase II
Stormwater Management Programs



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Coastal Carolina University

Conway SC, USA



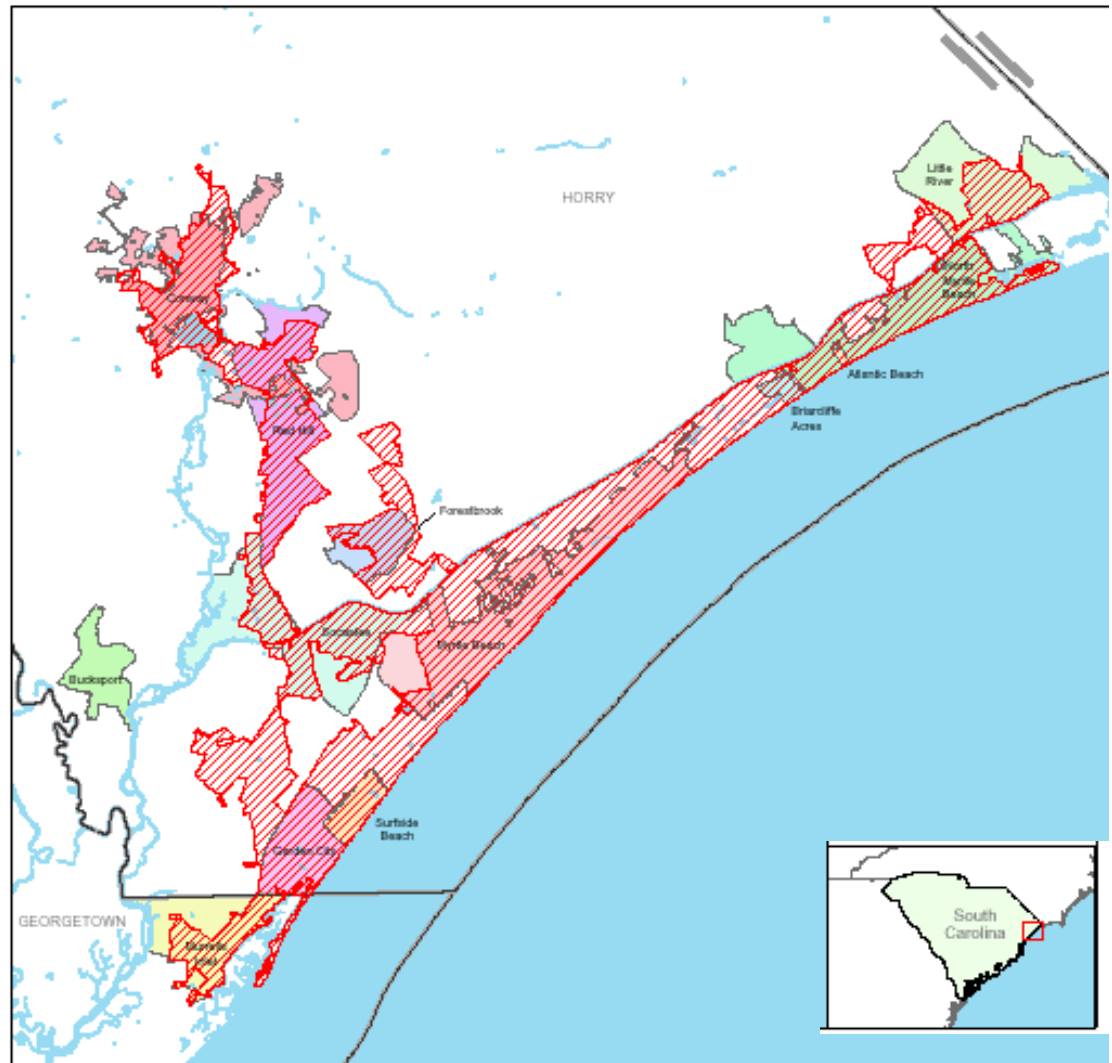
Small MS-4 Communities (Municipal Separate Storm Sewer Systems)

Myrtle Beach Urbanized Area

- **Horry County**
 - Myrtle Beach (22,696)
 - North Myrtle Beach (10,001)
 - **Surfside Beach** (4,425)
 - **Conway** (11,506)
 - Briarcliffe Acres (470)
 - Atlantic Beach (351)
 - Unincorporated (68,302)
- **Georgetown County** (5,233)

US Census of 2000

Funding partners



Program Goals

- Address the NPDES stormwater program requirements
 - Provide public education and involvement.
 - Lots of PR opportunities
 - Help local municipalities detect illicit discharges
 - Document long-term water quality trends
 - Temporal
 - Spatial
 - Assess improvements from implementation of stormwater BMPs.



- Integrate with activities of field leaders/groups
 - Waccamaw Riverkeeper®
 - Murrells Inlet 2020



- Support research activities of Waccamaw Watershed Academy

Equipment

Hach's Sension 156 Multiparameter meter

- Dissolved Oxygen
- % Saturation of DO
- Temperature
- pH



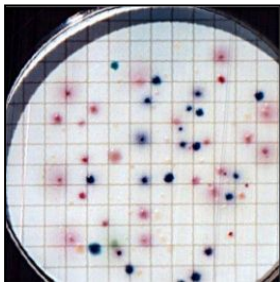
Hach's Sension 5 meter

- Conductivity
- TDS
- Salinity
- Temperature



Hach's 2100 Portable Turbidimeter

- Turbidity



Micrology's Coliscan Easygel Plus™

- *E. coli*
- Total Coliforms



Hach's test strips

- Nitrate
- Nitrite
- Ammonia



Biweekly Sampling

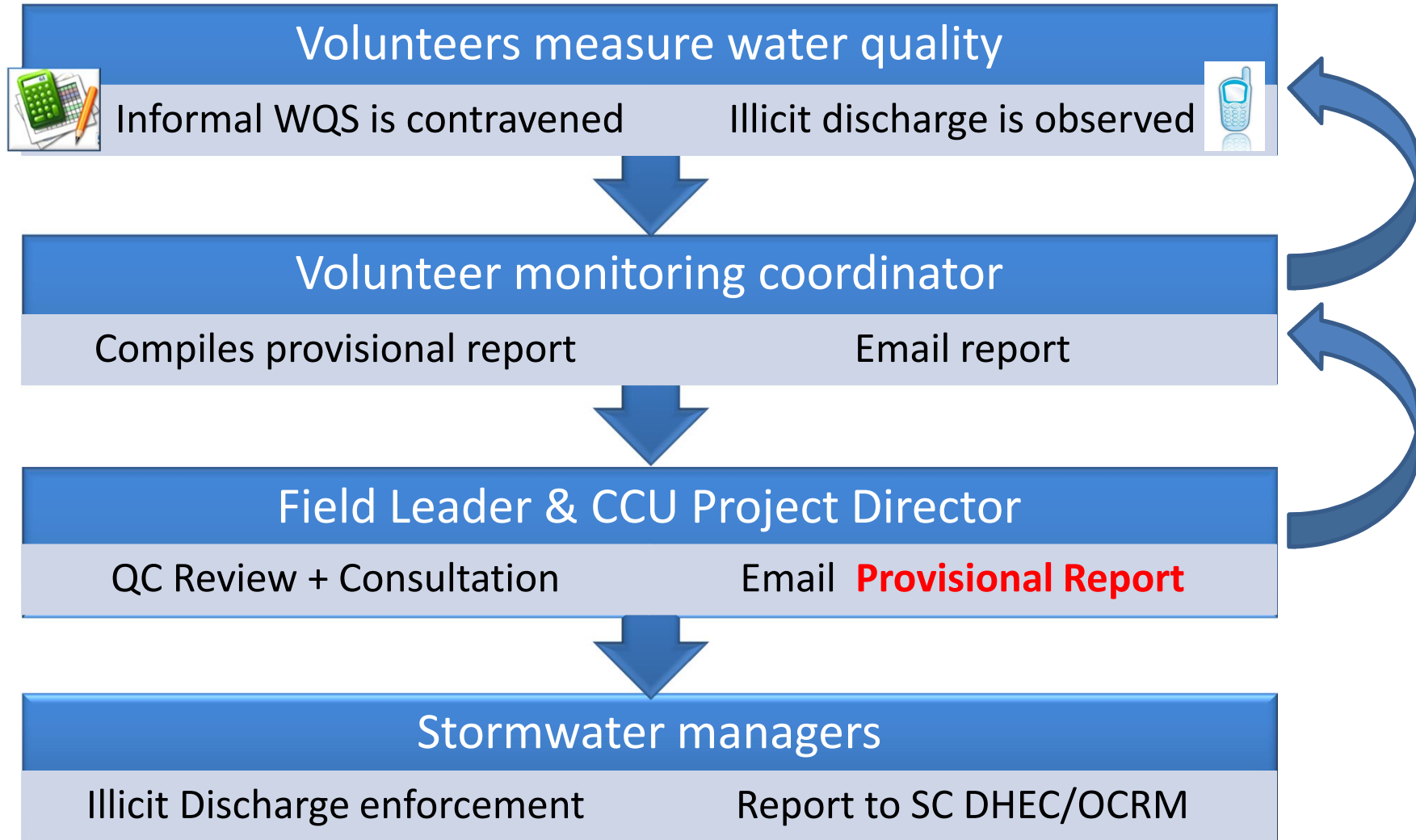
- On site
 - Field calibration checks
 - DO & %DO
 - pH
 - Conductivity/TDS/Salinity
 - Temperature
 - Ammonia, Nitrate, Nitrite
- At home
 - (Meter calibrations)
 - *E. coli*
 - Turbidity
 - Data entry online

Foul Weather Protocol



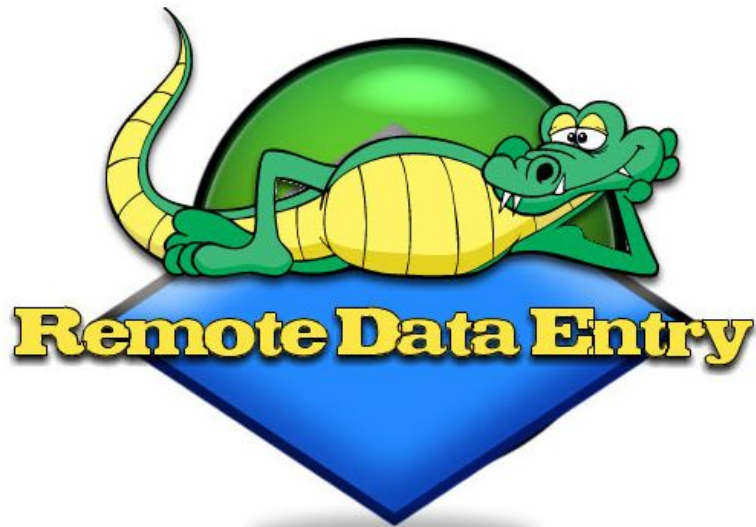
Teams are essential

Reporting Protocol



Web Resources

DATA ENTRY



User Name

Password

Collection Date Sep ▾ 15 ▾ 2010 

ADMINISTRATIVE


- Control charting
- Volunteer accounts
- Content management

DATA RETRIEVAL


- What sites are “hot”?
- When are they “hot”?
- Why?

Other online resources


Quick Links | Search | Home
Waccamaw Watershed Academy



BURROUGHS & CHAPIN CENTER
COASTAL CAROLINA UNIVERSITY
FOR MARINE & WETLAND STUDIES



WACCAMAW
WATERSHED
ACADEMY



Meeting local needs for expertise in the areas of watershed and wetland science and management

RESEARCH

Environmental Quality Laboratory

Volunteer Water Monitoring Program

Ocean Water

Watersheds

Student Presentations

EDUCATION

Educational Services

Coastal Marine & Wetland Studies Graduate Program

OUTREACH

Community Outreach

Watershed & Stormwater Issues

Kingston Lake Environment Awareness Network (KLEAN)

Contact Us

Links

VOLUNTEER MONITORING

[Events](#) | [Contacts](#) | [FAQs](#) | [Links](#) | [QA](#) | [Parameters](#) | [Programs](#)

[Murrells Inlet](#) | [Surfside Beach](#) | [Waccamaw River](#)

[About](#) | [Sampling Dates](#) | [Map](#) | [Data](#) | [Volunteer Teams](#) | [Pubs](#)

The Waccamaw River Volunteer Monitoring Project is a volunteer-based program that uses environmental testing equipment to sample ten sites along the whole length of the Waccamaw River. Volunteers work as a part of one of the five teams that sample all the sites. Monitoring is done by the team itself and team captain helps to keep all the members of the team on top. Volunteer Monitoring Coordinator makes sure that all the quality assurance and quality control procedures are followed according to the guidelines provided by United States Environmental Protection Agency.

Objectives

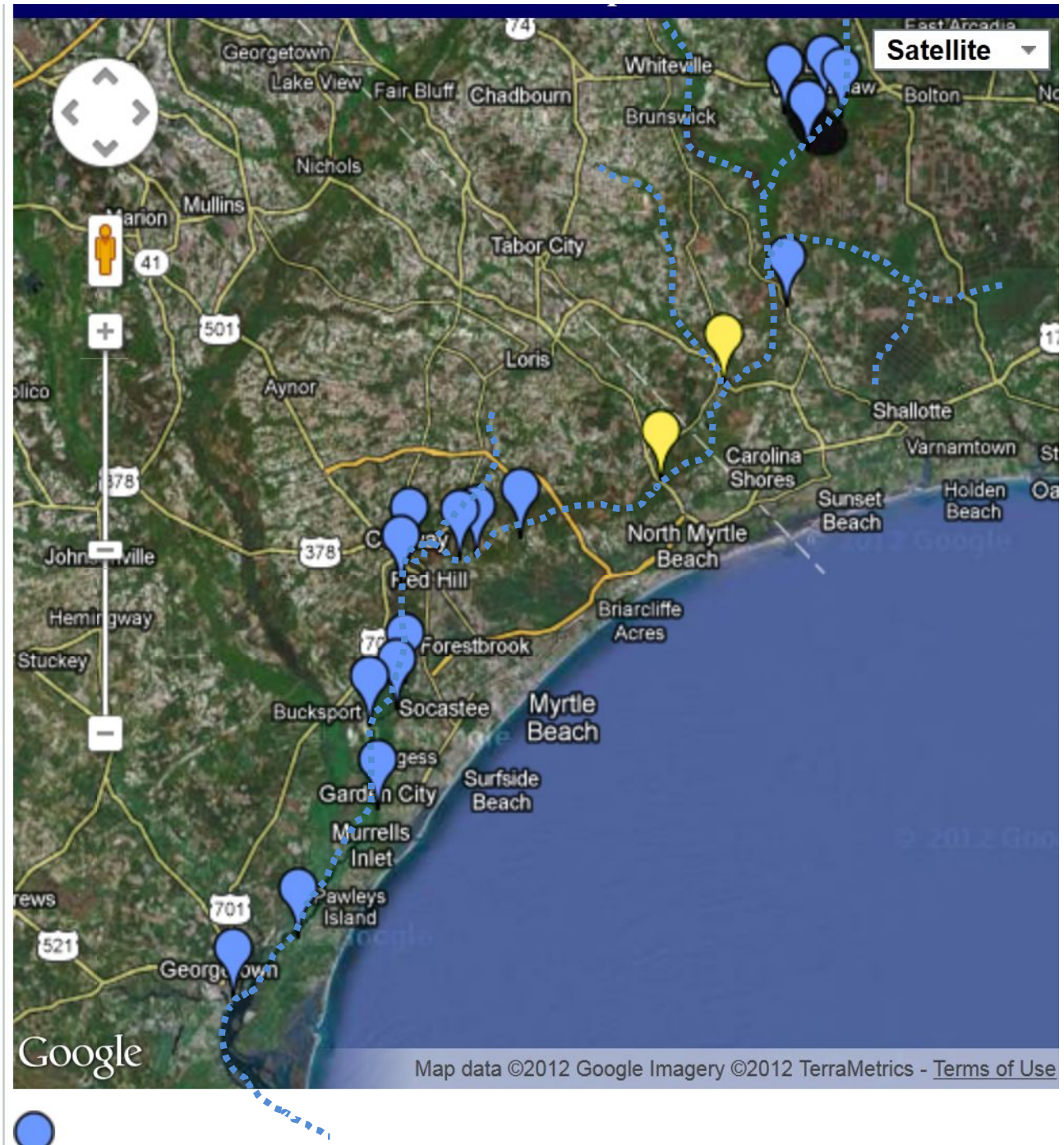
The objective of the project is to initiate and stabilize a volunteer-based, water quality monitoring program in the Waccamaw Watershed. This program will fulfill four needs:

1. Address NPDES (National Pollutant Discharge Elimination System) Phase II program requirements for education and involvement.
2. Assist in illicit discharge detection (an NPDES Phase II program requirement).
3. Increase geographic and temporal coverage of water quality monitoring in the Waccamaw Watershed and development of site specific water quality standards.
4. An effort will be made to meet SC DHEC's (South Carolina Department of Health and Environmental Control) quality requirements for inclusion of the data in their biennial 305(b) reports.

Partners

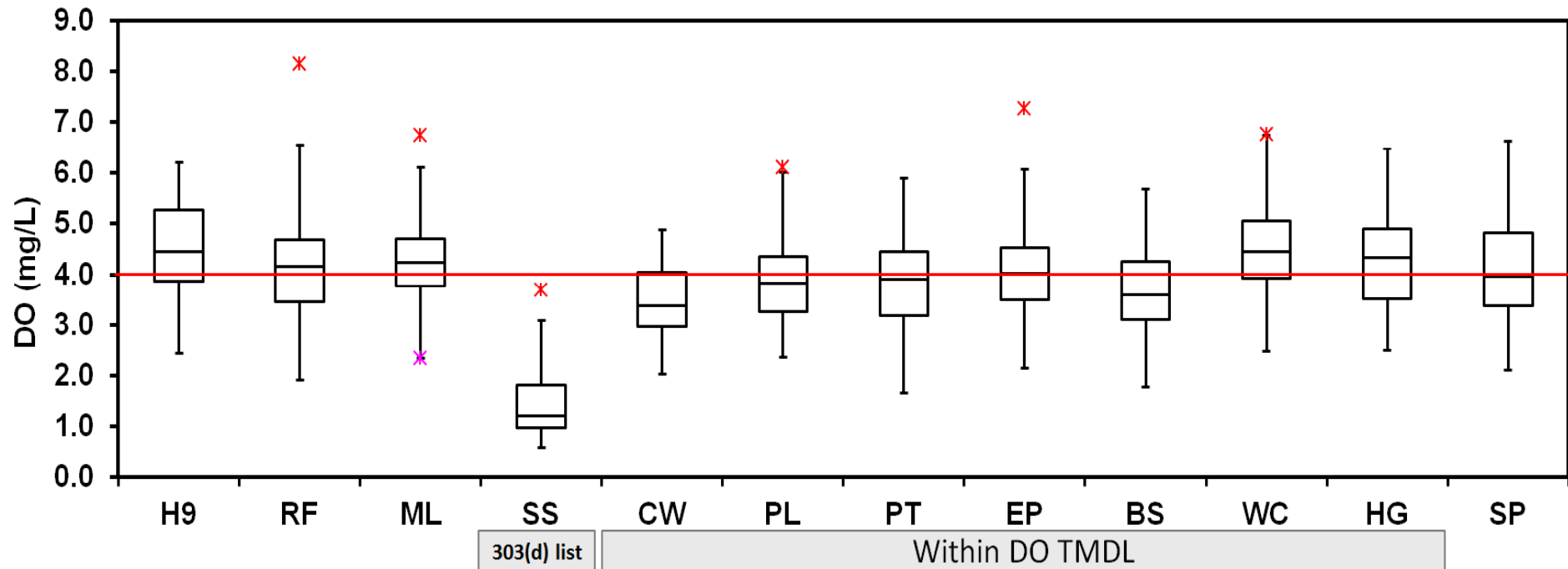
- U.S. Environmental Protection Agency

- Maple Street
- Canal Cove
- Big Creek
- LAWA Dam
- Babson's
- Piroway
- Highway 9
- Reaves Ferry
- Murrells Landing
- Sterritt Swamp
- Conway Waterfront
- Pitch Landing
- Peachtree Landing
- Enterprise Landing
- Bucksport Landing
- Wachesaw Landing
- Hagley Plantation
- Sampit River



Site Specific Percentiles for DO when T > 20 C

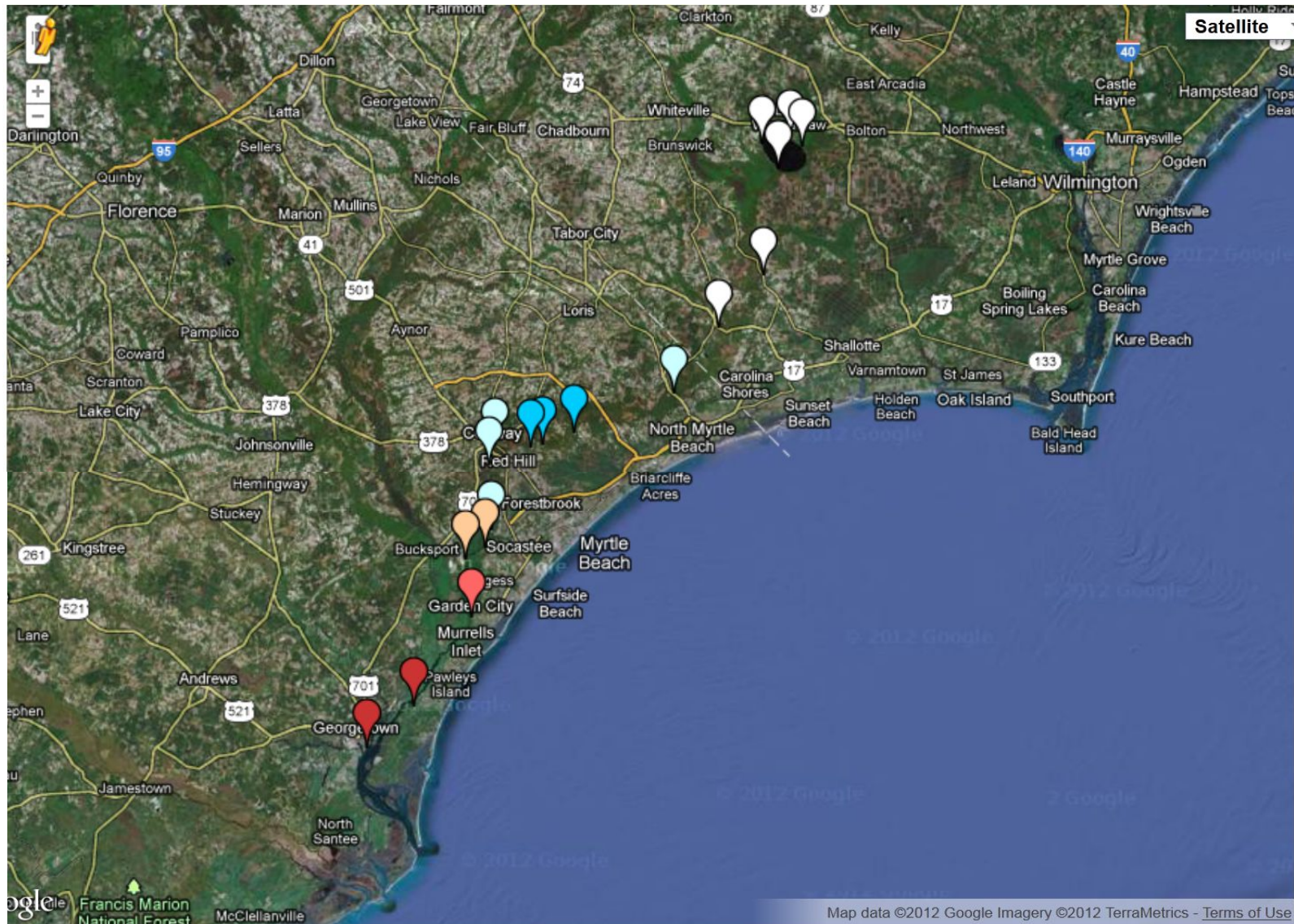
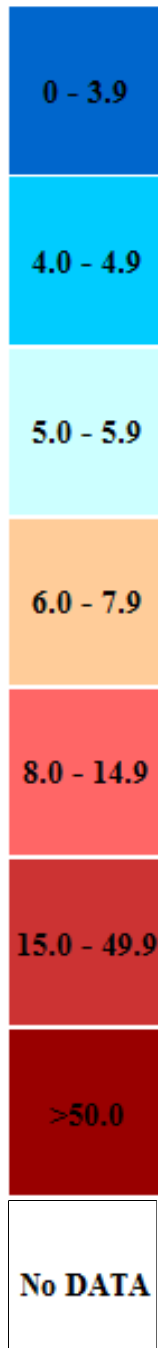
Jun 2006 to Jan 2012. n = 63 for each site



SC DHEC Classified Water WQS for blackwaters = 4 mg/L

Site specific standards for provisional reporting

Average Turbidity (NTU): 2006 to 2012



n = 140 per site. State WQS is 50 NTU. US EPA recommendation is 4 NTU.

Volunteer Monitoring - Water Quality Database Access

[Home](#)

Step One: Pick a program >

Select a Project to View ▾

Select a Project to View

Waccamaw River

Murrells Inlet

Surfside Beach

This database houses information from three volunteer water quality monitoring programs being conducted on the Waccamaw River, Murrells Inlet and Surfside Beach. To view the data, use the drop down menu in the upper right hand corner to select a program.

This program will fulfill four needs:

1. Help local municipalities satisfy NDPEs Phase II stormwater program requirements for public involvement and education.
2. Assist local municipalities with illicit discharge detection.
3. Increase geographic and temporal coverage of water quality monitoring across the Horry Georgetown county regions. This will assist with development of site specific water quality standards.
4. Engage in sufficient QA/QC efforts for data to be considered by SC DHEC for inclusion in their biennial 305(b) reports.



[Graphing Application Tutorial PDF](#)

Disclaimer: Data was collected by the Volunteer Water Quality Monitoring project at Coastal Carolina University's Waccamaw Watershed Academy. Please refer to one of the following links for more information on the data collection procedures and interpolation.

- [Explanation of Parameters and Water Quality Standards](#)
- [Sampling Protocol and Standard Operating Procedures \(SOPs\)](#)
- [Quality Assurance Project Plan \(QAPP\)](#)

Viewing Recommendations

To completely view all of the content & features within our graphing application we strongly recommend that you use one of the browsers displayed below:

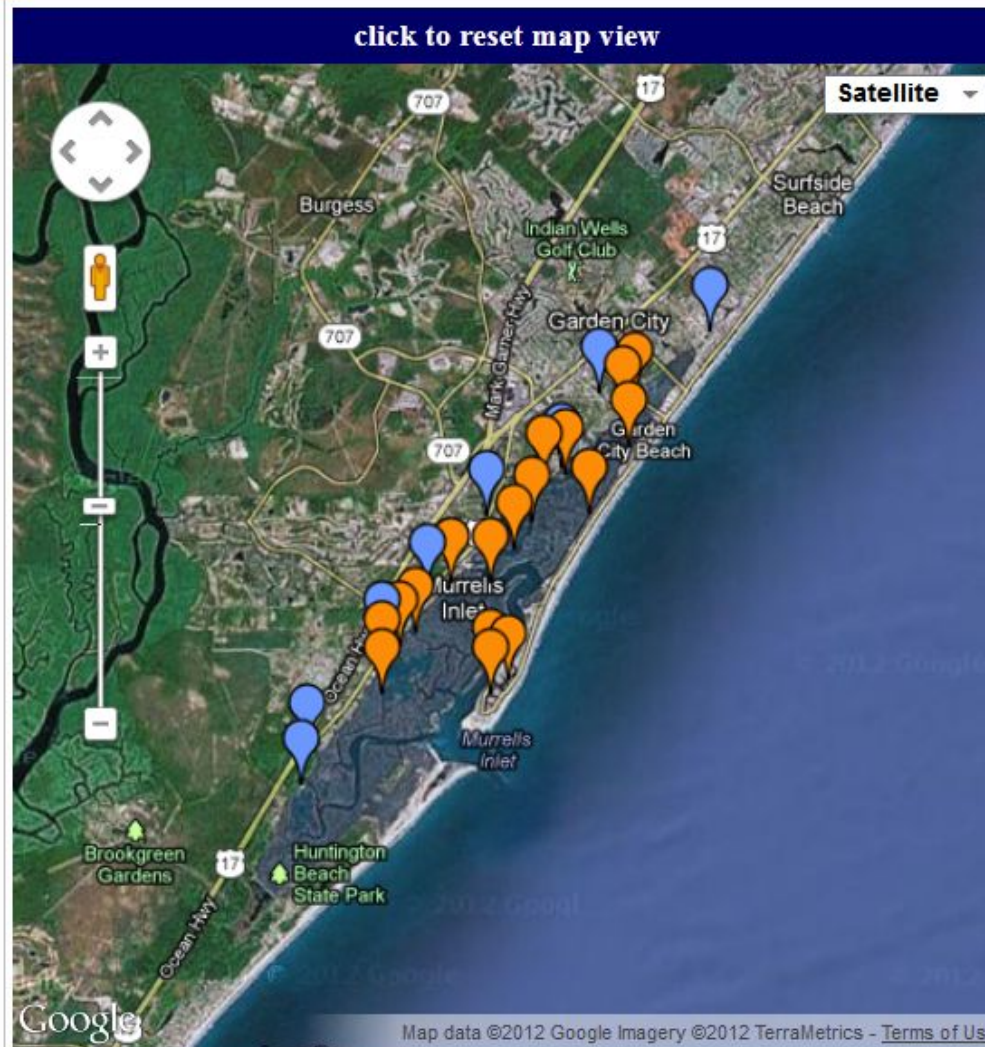


Step Two: Select one or more monitoring locations and then click the submit button.

- Woodland Drive Pond
- Point Drive Canal
- Rum Gully Creek
- Colony Marina Pond
- HS
- BHR
- Bike Bridge
- Oyster Landing Beach

Check All

Submit



Volunteer Monitoring Site

Selected Volunteer Monitoring Site

Fecal Coliform TMDL site. See http://www.scdhec.gov/environment/water/tmdl/docs/tmdl_murrells_fc.pdf and http://www.scdhec.gov/environment/water/tmdl/docs/tmdl_10-303d.pdf for more information.

Volunteer Monitoring - Water Quality Database Access

[Home](#)

You are viewing information about the **Murrells Inlet** project.

Select the data and time period to be graphed for **WDP, PDC, RGC, CMP, HS, BHR, BB, OLB**.

Step 3: Select one or more parameters.

- Conductivity ($\mu\text{S}/\text{cm}$)
- TDS (mg/L)
- Salinity (‰)
- pH
- Dissolved Oxygen (mg/L)
- % Saturation of Dissolved Oxygen
- Temperature ($^{\circ}\text{C}$)
- Turbidity (NTU)
- Nitrate (mg N/L)
- Nitrite (mg N/L)
- Ammonia (mg N/L)
- Nitrate + Nitrite (mg N/L)
- Nitrate + Nitrite + Ammonia (mg N/L)
- E. Coli (CFU/100 mL)
- Total Coliform (CFU/100 mL)

Step 4: Select a date range.

Start Date:

End Date:

Default maximum and minimum date choices are initially set using the maximum and minimum ranges from our database.

Step 5: Choose from one of the options below:

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- [Sampling Protocol and Standard Operating Procedures \(SOPs\)](#)
- [Quality Assurance Project Plan \(QAPP\)](#)

[Volunteer Monitoring Home Page](#)

[Add Data](#)

Murrells Inlet: Mean *E. coli* (CFU/100 mL)

Jul 2009 to Jan 2012. n = 62 for each site.

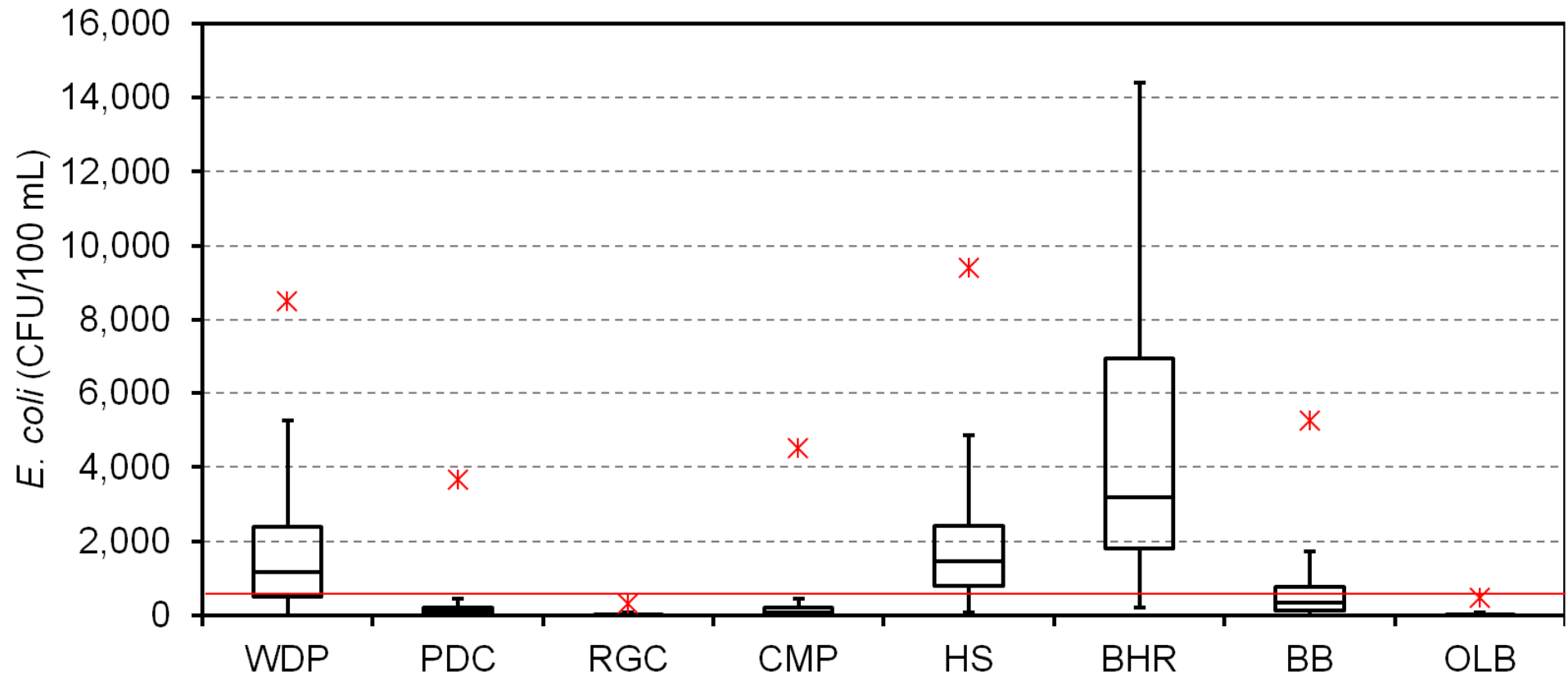


USEPA recreational WQS for infrequently used full body contact is 575 CFU/100 mL.

E. coli (CFU/100 mL)

July 2009 to Jan 2012

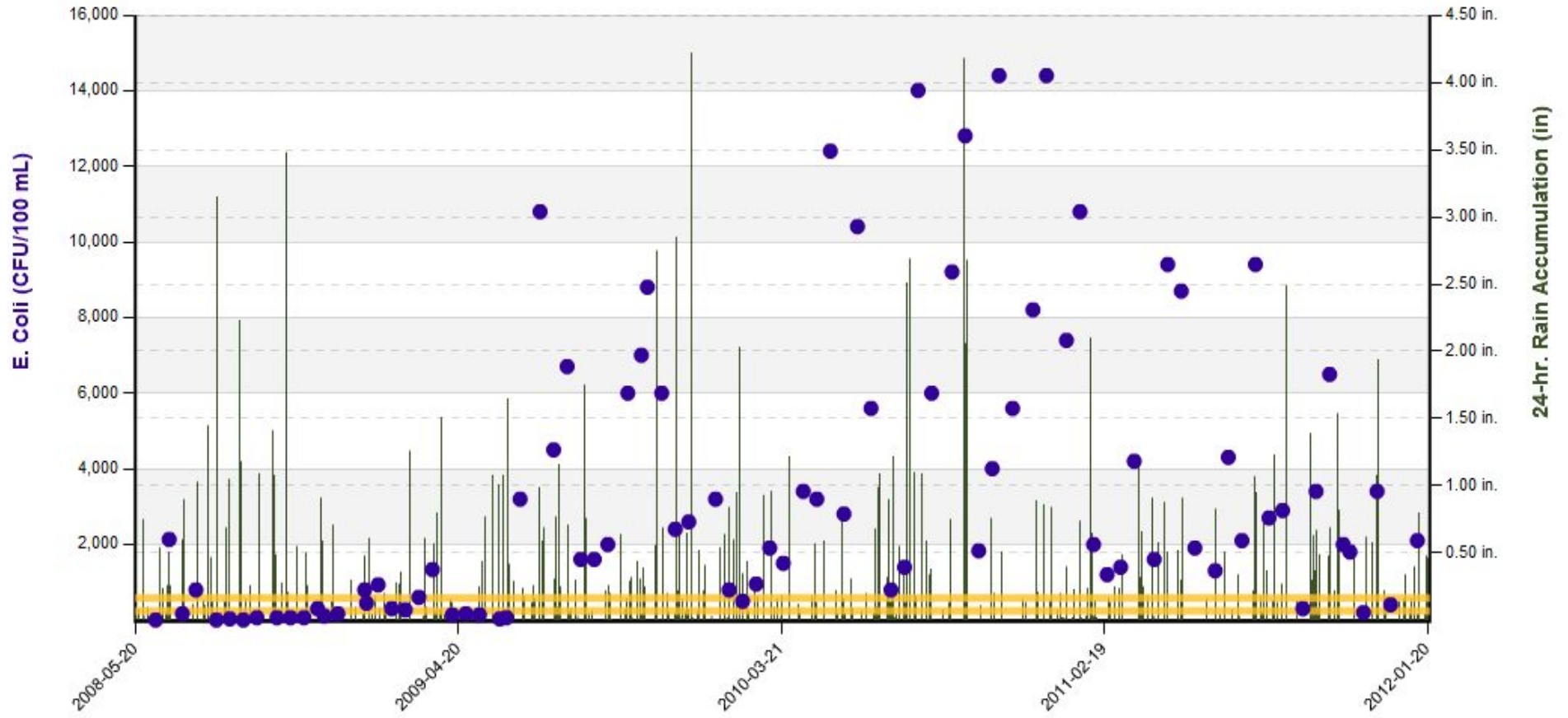
n = 62 for each site



USEPA recreational WQS for infrequently used full body contact is 575 CFU/100 mL.

BHR

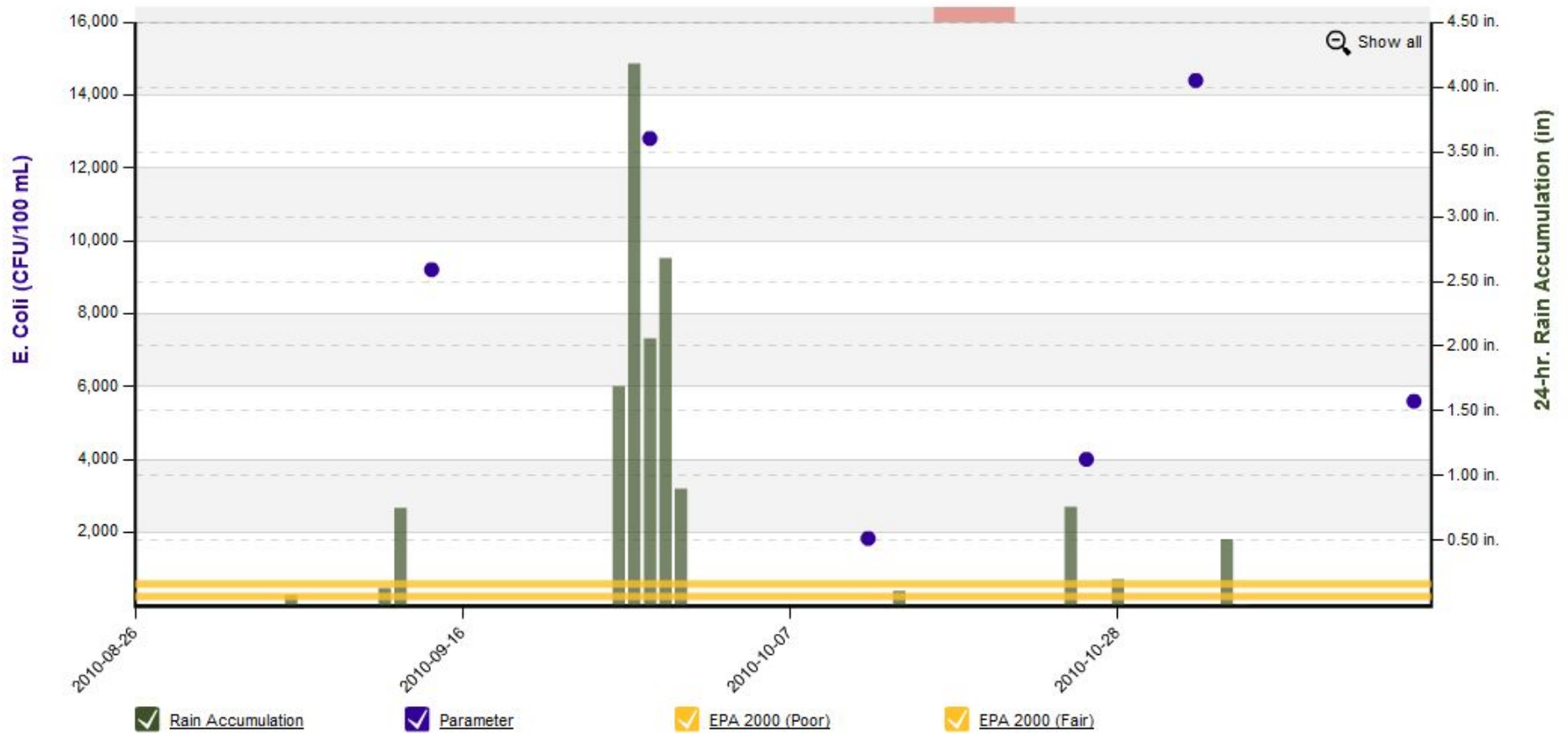
chart by amCharts.com



BHR

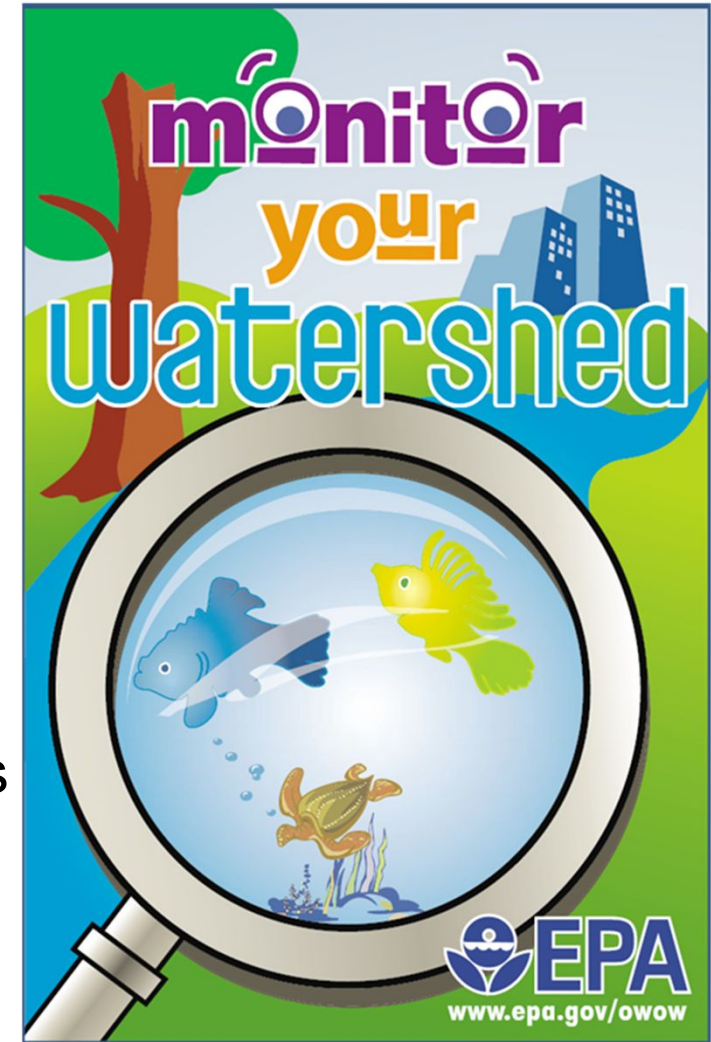
chart by amCharts.com

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Data Quality

- QAPP and SOP's
- Initial Demonstration of Capability (IDC)
- Master samplers perform calibrations.
- Field calibration checks
- Field consultations via cell phone.
- Provisional reports reviewed.
- Control charting of meter replicates.
- Accuracy checks via “some” data overlaps
 - Continuous USGS measurements (n = 4)
 - SC DHEC every other month
 - EQL every other week (n = 4)
- Kits returned to CCU every 12 wk for maintenance.



Expanding Use of Volunteer Monitoring Information

- Program engages diverse group of stakeholders
 - Volunteers
 - Murrells Inlet 2020
 - Waccamaw Riverkeeper®
 - Stormwater Managers and their Stormwater Advisory Boards
 - Elected and appointed officials
 - Scientists
- Integration into NPDES Phase II Stormwater Programs
 - Public database/conferences
 - Site specific standards.
 - Program supports IDDE.
 - Program evaluates long-term trends pre and post management interventions.
- State approval of QAPP ?

