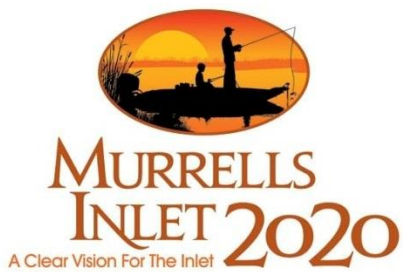




CHOWDER TALK

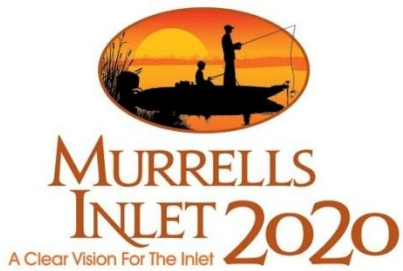
OCTOBER 15, 2013



Murrells Inlet Volunteer Water Monitoring Program

- 2005:
 - 303d List – Impaired Waters
 - Chronic fecal coliform pollution
 - TMDL issued for 8 sites in Murrells Inlet
 - Mandate: 80% load reduction in pathogens
- 2007 - 2008:
 - MI2020, CCU, Horry & Georgetown County & Surfside Beach agree on watershed-based, cost sharing partnership
- May 2008:
 - Murrells Inlet Volunteer Water Monitoring Program begins





Murrells Inlet Volunteer Water Quality Monitoring Program

- Environmental stewardship
- NPDES Phase II Stormwater program requirements
 - Public involvement
 - Public education
 - Illicit discharge detection
- Looking for land-based sources discharging into the Inlet
- Testing parameters that address most common coastal concerns:
 - Soil erosion
 - Overuse of fertilizers
 - ★ – Fecal contamination

Water Monitoring

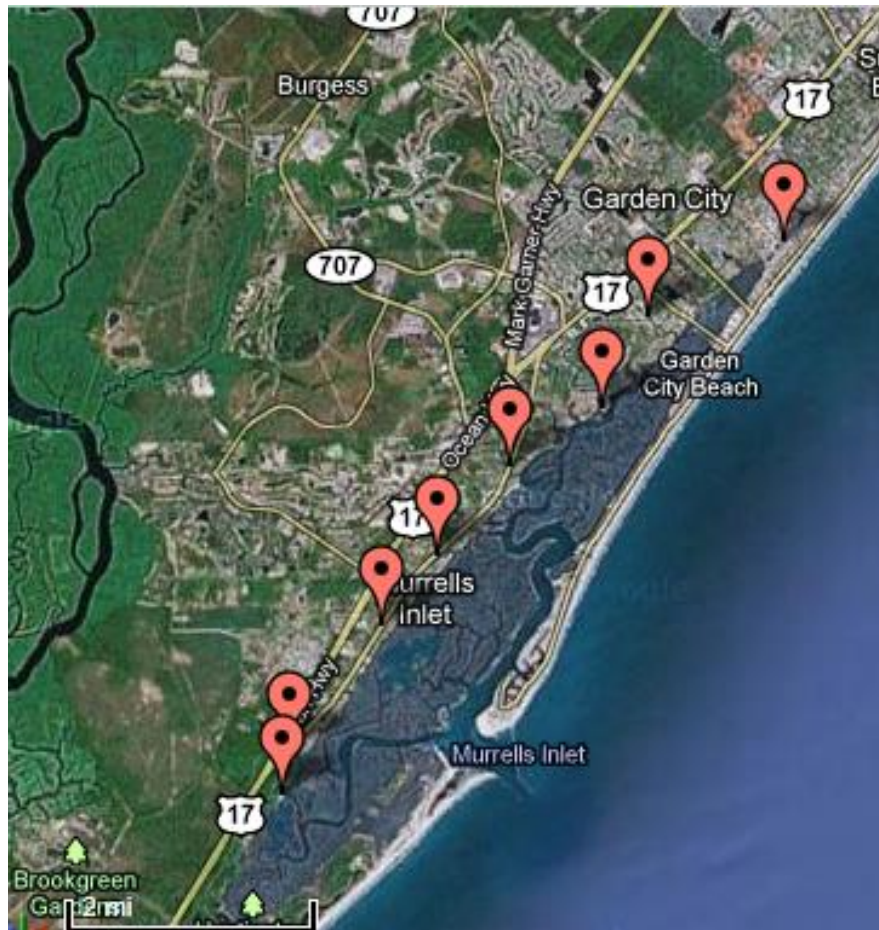


THANK YOU, TEAM!



Monitoring Program

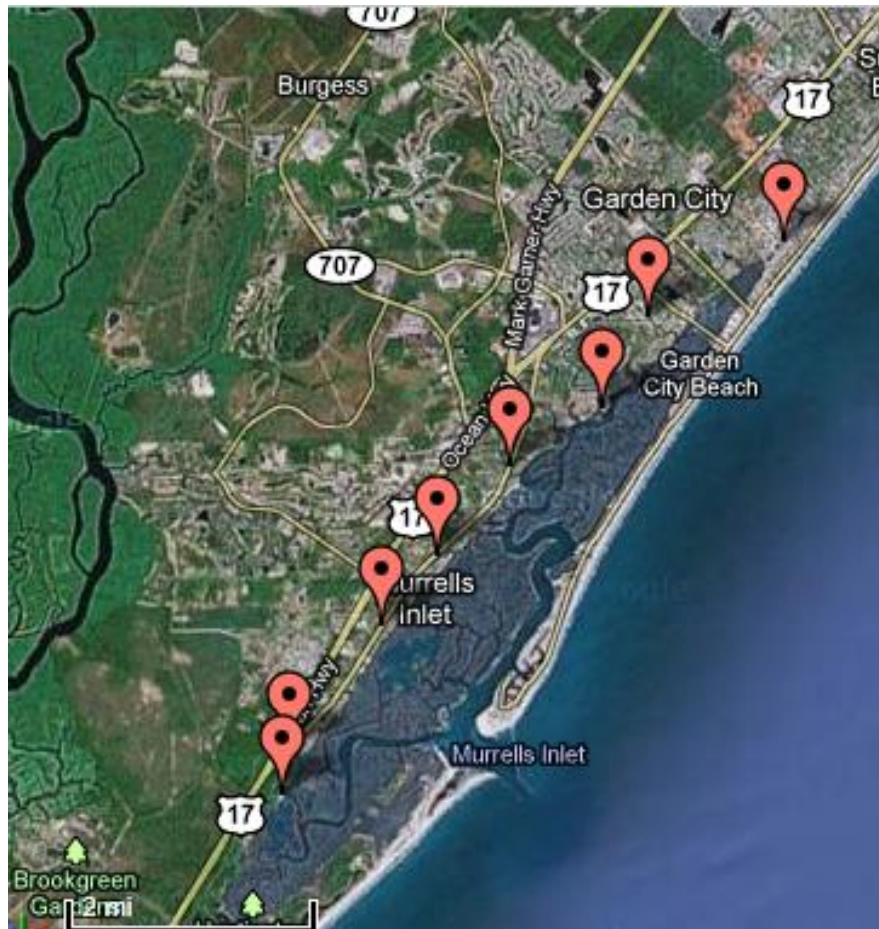
Eight Testing Site Locations



1. Woodland Pond
2. Point Drive Canal
3. Rum Gully Creek
4. Marina Colony Pond
5. Harrelson's creek
6. Boat House Run creek
7. Bike Bridge creek
8. Oyster Landing Beach

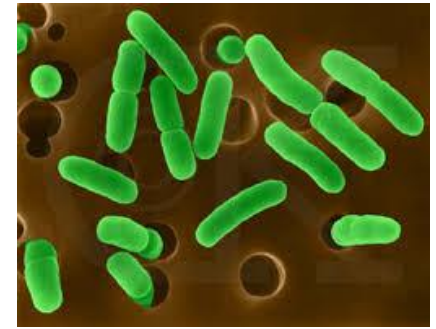
Monitoring Program

Testing Parameters



- **Turbidity:** shows solids in water
- **Nutrients – Ammonia:** over-fertilizing, septic tanks, decayed organic-rich soils
- **Dissolved Oxygen:** the oxygen that animals & Aerobic bacteria need
- **pH:** acid rain or decomposing organic matter
- **Bacteria:** E. coli & Total Coliform (Fecal Indicator Bacteria)

Fecal

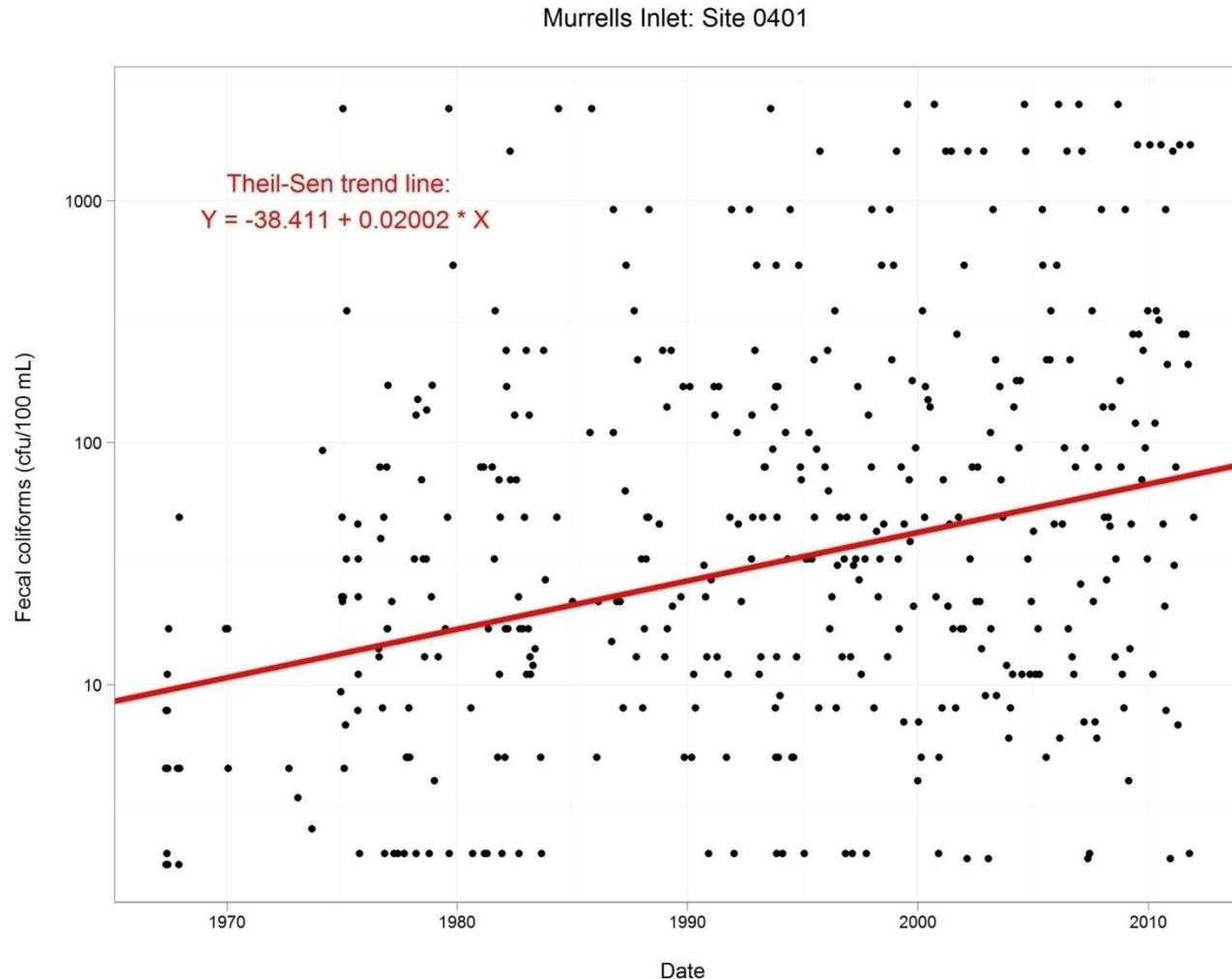


- Water quality standards for shellfish harvesting are the most stringent water quality standards.
 - Issued by FDA
 - Based on raw shellfish consumption.
- Failing the shellfish water quality standard does not suggest water quality is unsafe for other recreational uses.
- Fecal coliform is an indicator organism for the presences of other possible pathogens, viruses
- Fecal indicates a nearby source of animal or human waste or that contaminated sediments have been re-suspended
- Fecal coliform bacteria can persist in an estuary for a long time
- Salt water & sunlight (UV light disinfection) are the enemies of fecal
- Sedimentation is the friend of fecal (can shield bacteria from sunlight)



Data Variability

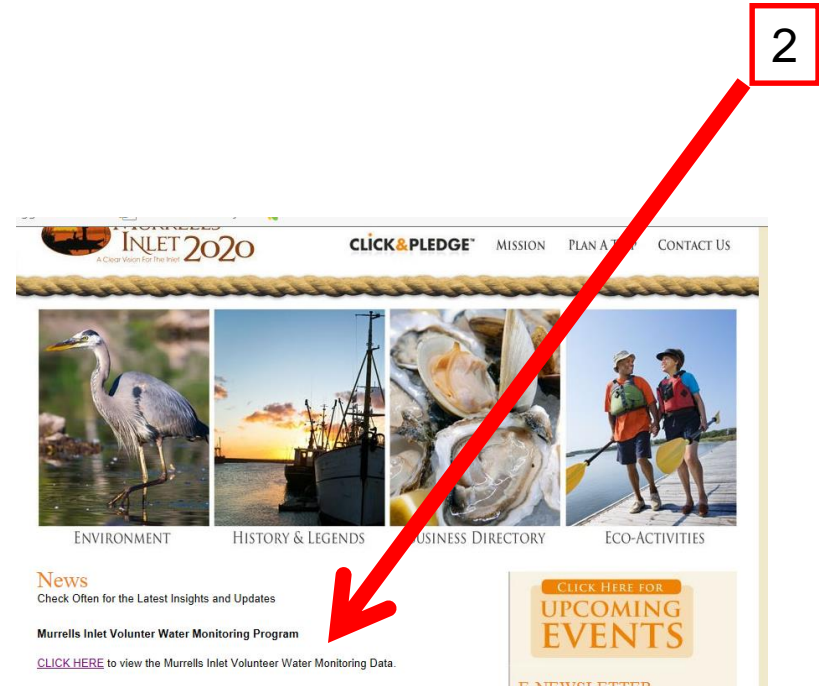
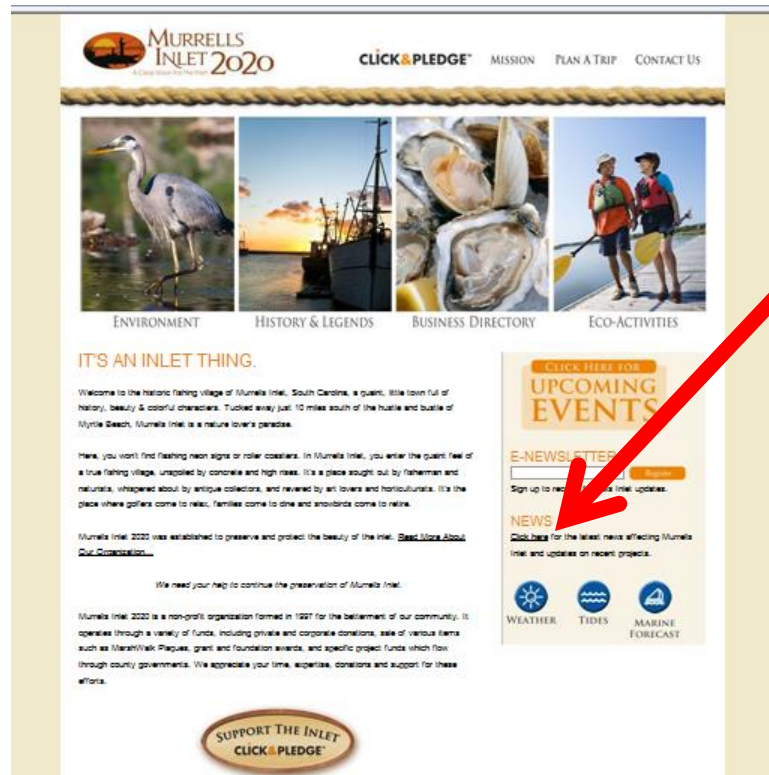
Fecal coliform measurements
have been highly variable, dating back to the 1960's.



So Where's the Data?

Go to the MI 2020 website, www.murrellsinletsc.com

- 1) "Click here" for the latest news
- 2) "Click here" to view the Murrells Inlet Volunteer Monitoring Data



Monitoring Program

Site Findings

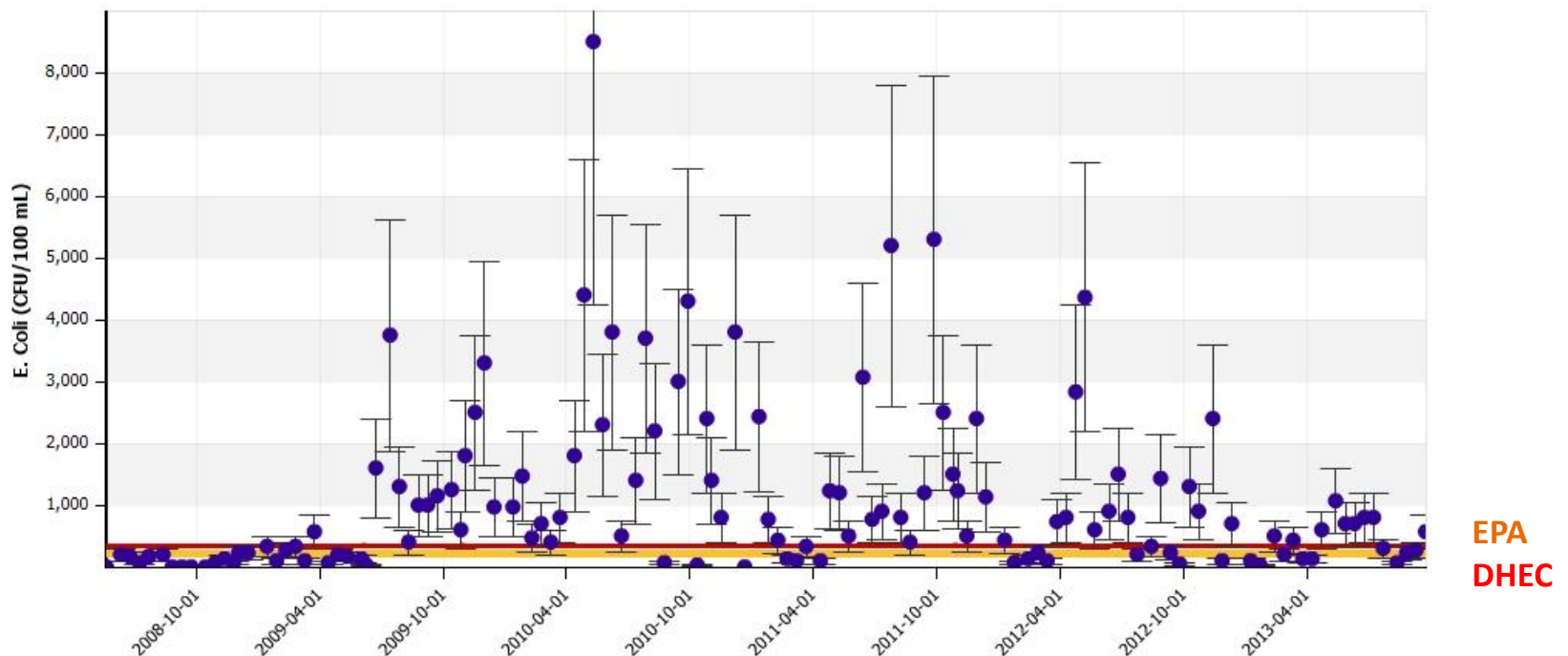


1. Woodland Pond
2. Point Drive Canal
3. Rum Gully Creek
4. Marina Colony Pond
5. Harrelson's creek
6. Boat House Run creek
7. Bike Bridge creek
8. Oyster Landing Beach

Woodland Drive Pond

Monitoring Site	2011	2012	2013
Woodland Drive Pond (partly saline)	<ul style="list-style-type: none"> • High Bacteria • Low Dissolved Oxygen (DO) 	<ul style="list-style-type: none"> • same 	<ul style="list-style-type: none"> • same

E. Coli (CFU/100 mL) values collected between May 20, 2008 and September 24, 2013

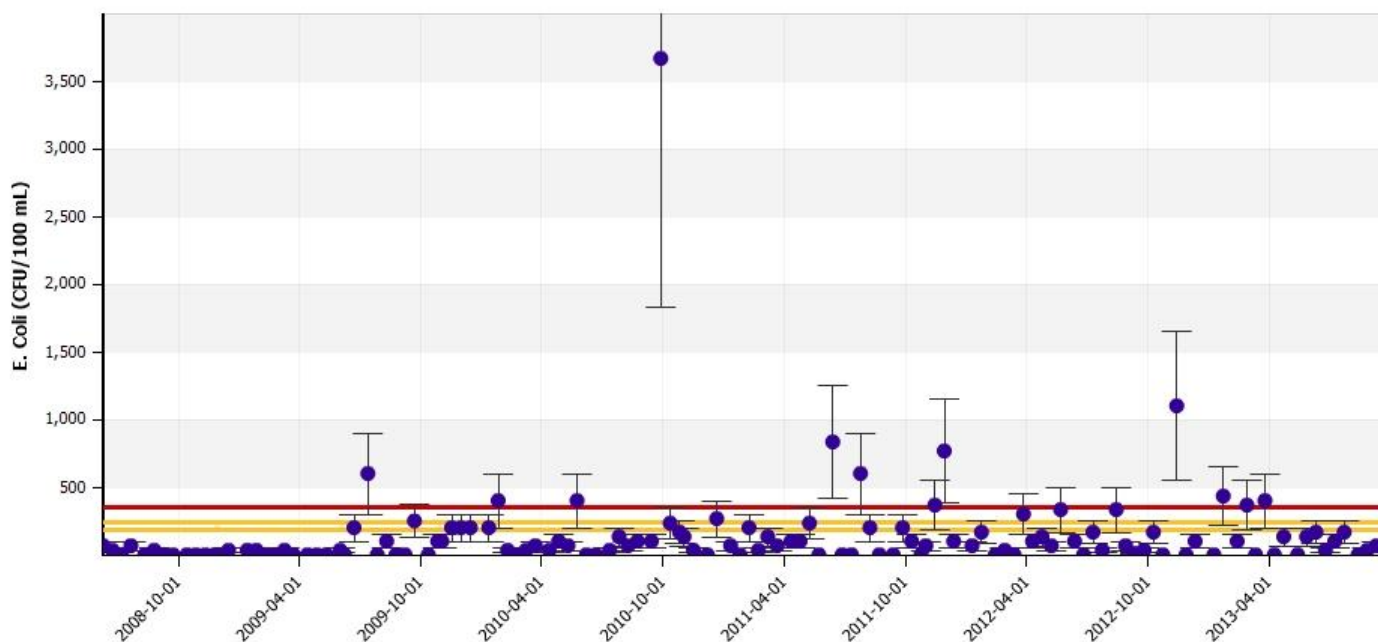




Point Drive Canal

Monitoring Site	2011	2012	2013
Point Drive Canal	<ul style="list-style-type: none">• Low pH (acidic)• Low Dissolved Oxygen (DO)	<ul style="list-style-type: none">• same	<ul style="list-style-type: none">• Low Dissolved Oxygen (DO)

E. Coli (CFU/100 mL) values collected between May 20, 2008 and September 24, 2013

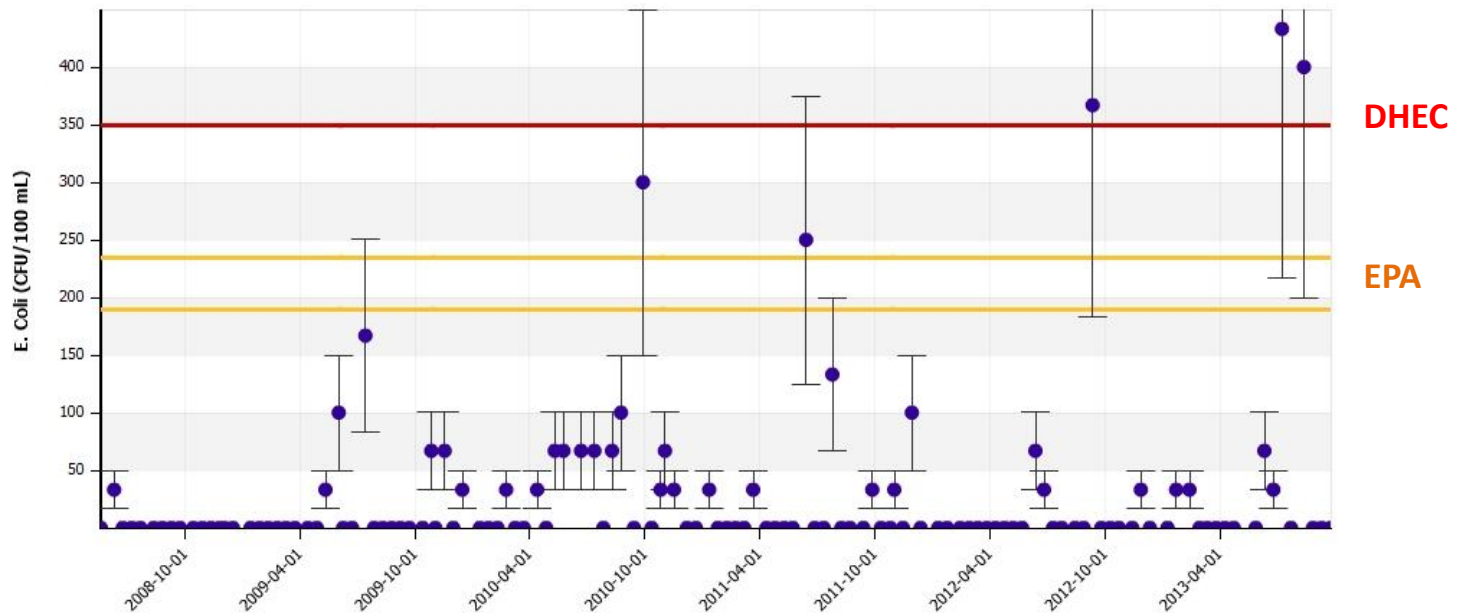


EPA
DHEC

Rum Gully Creek

Monitoring Site	2011	2012	2013
Rum Gully Creek (saline)	<ul style="list-style-type: none"> Low Dissolved Oxygen (DO) 	<ul style="list-style-type: none"> same 	<ul style="list-style-type: none"> Low Dissolved Oxygen (DO) High turbidity

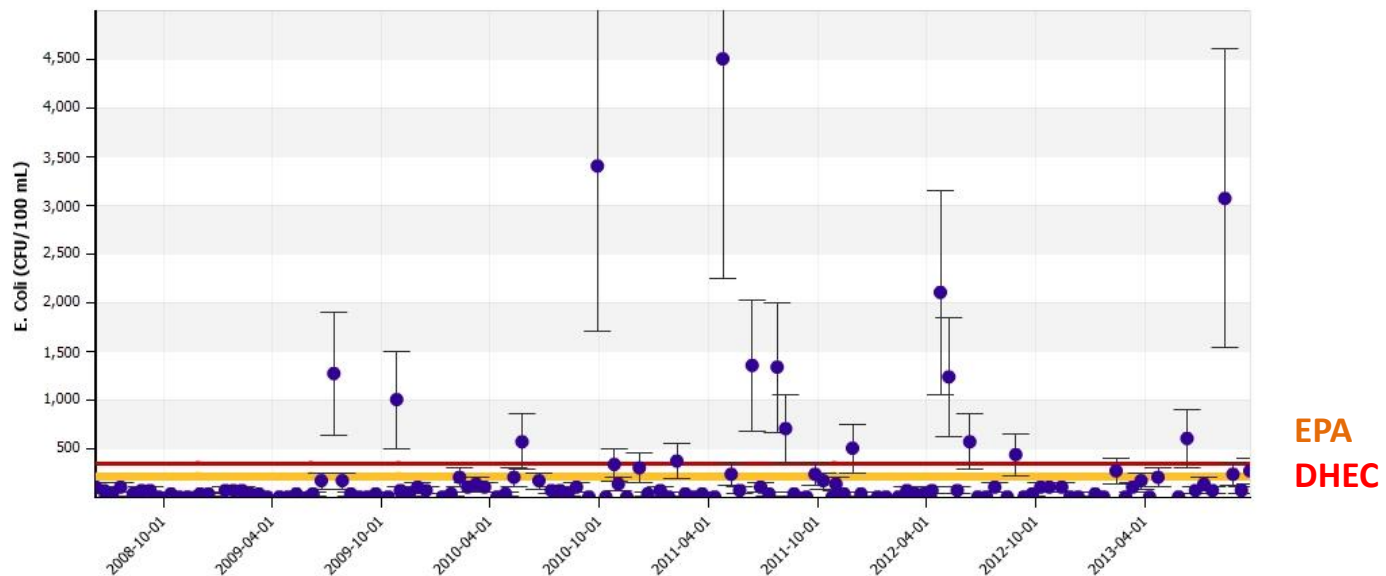
E. Coli (CFU/100 mL) values collected between May 20, 2008 and September 24, 2013



Marina Colony Pond

Monitoring Site	2011	2012	2013
Marina Colony Pond	<ul style="list-style-type: none"> Very low Dissolved Oxygen (DO) Low pH (acidic) 	<ul style="list-style-type: none"> Very low Dissolved Oxygen (DO) High ammonia Low pH (acidic) 	<ul style="list-style-type: none"> Occasionally high bacteria Very low Dissolved Oxygen (DO) High ammonia

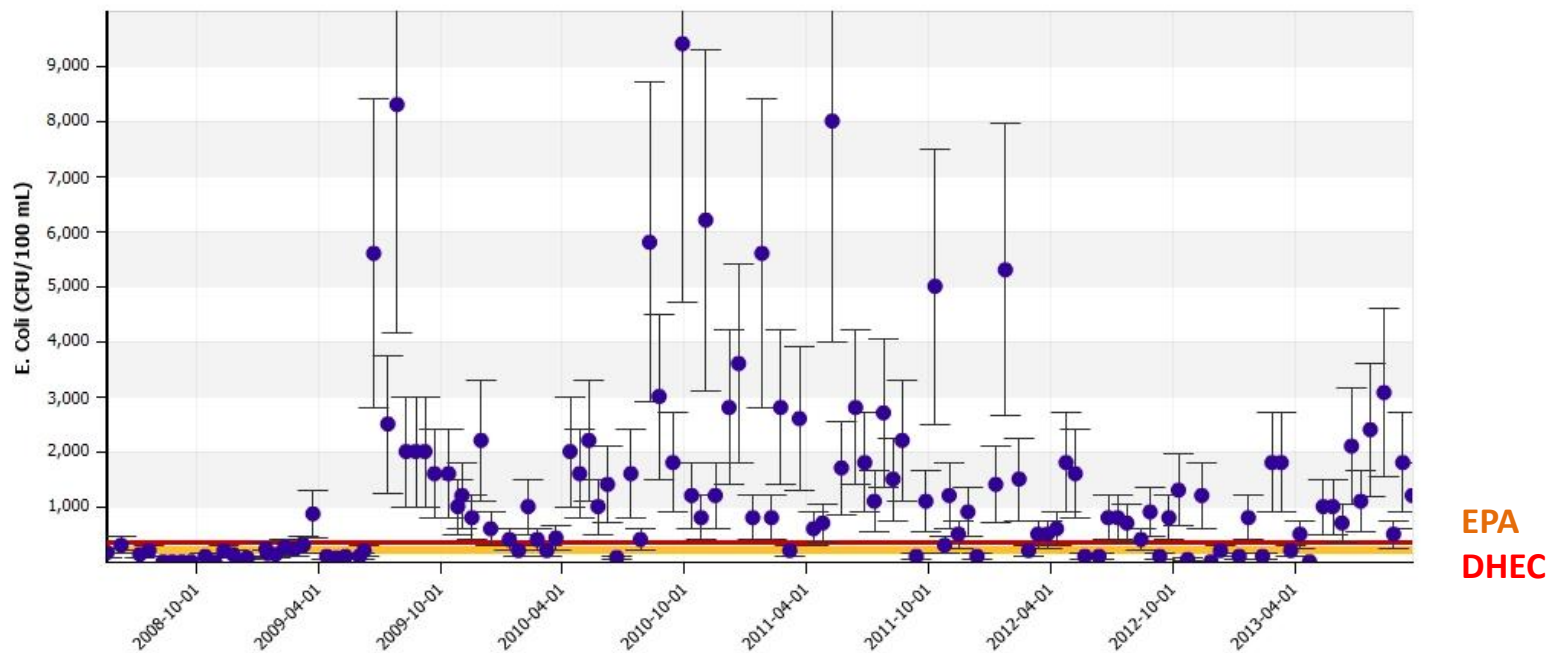
E. Coli (CFU/100 mL) values collected between May 20, 2008 and September 24, 2013



Vaux Hall Creek

Monitoring Site	2011	2012	2013
Vaux Hall creek (partly saline)	<ul style="list-style-type: none"> • Very high bacteria • Low Dissolved Oxygen (DO) • High ammonia 	<ul style="list-style-type: none"> • same 	<ul style="list-style-type: none"> • same

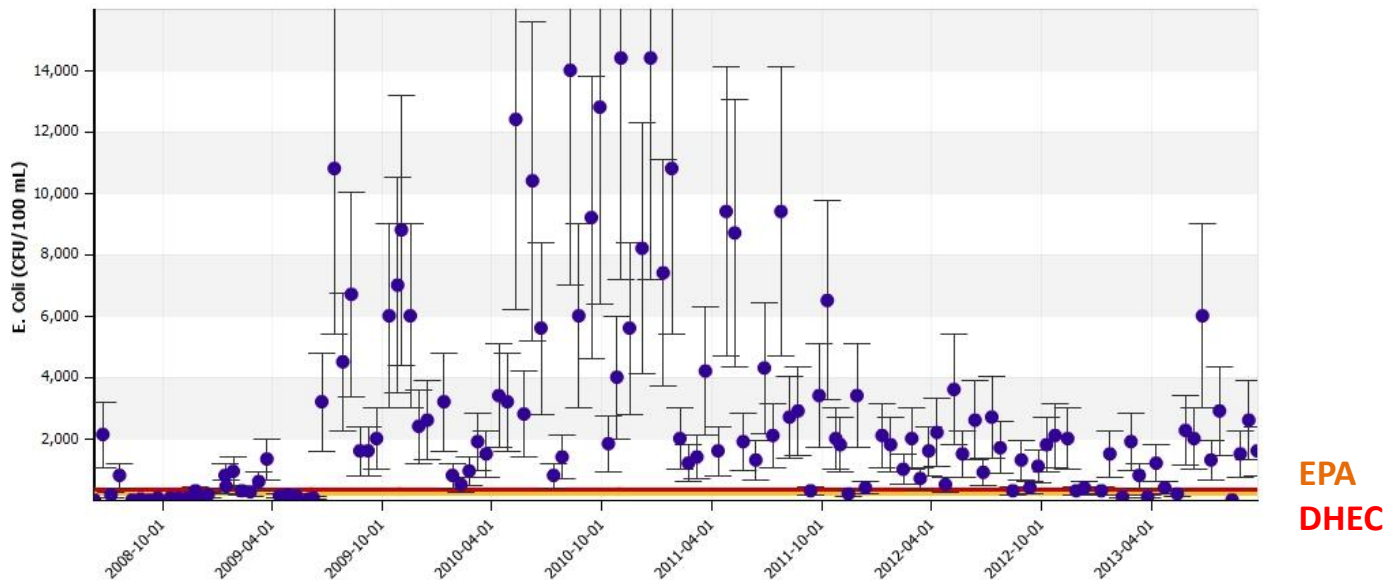
E. Coli (CFU/100 mL) values collected between May 20, 2008 and September 24, 2013



Boathouse Run Creek

Monitoring Site	2011	2012	2013
Boathouse Run creek (partly saline)	<ul style="list-style-type: none"> • Very high bacteria • Low Dissolved Oxygen (DO) • High ammonia 	<ul style="list-style-type: none"> • same 	<ul style="list-style-type: none"> • Very high bacteria • Low Dissolved Oxygen (DO) • Very high ammonia

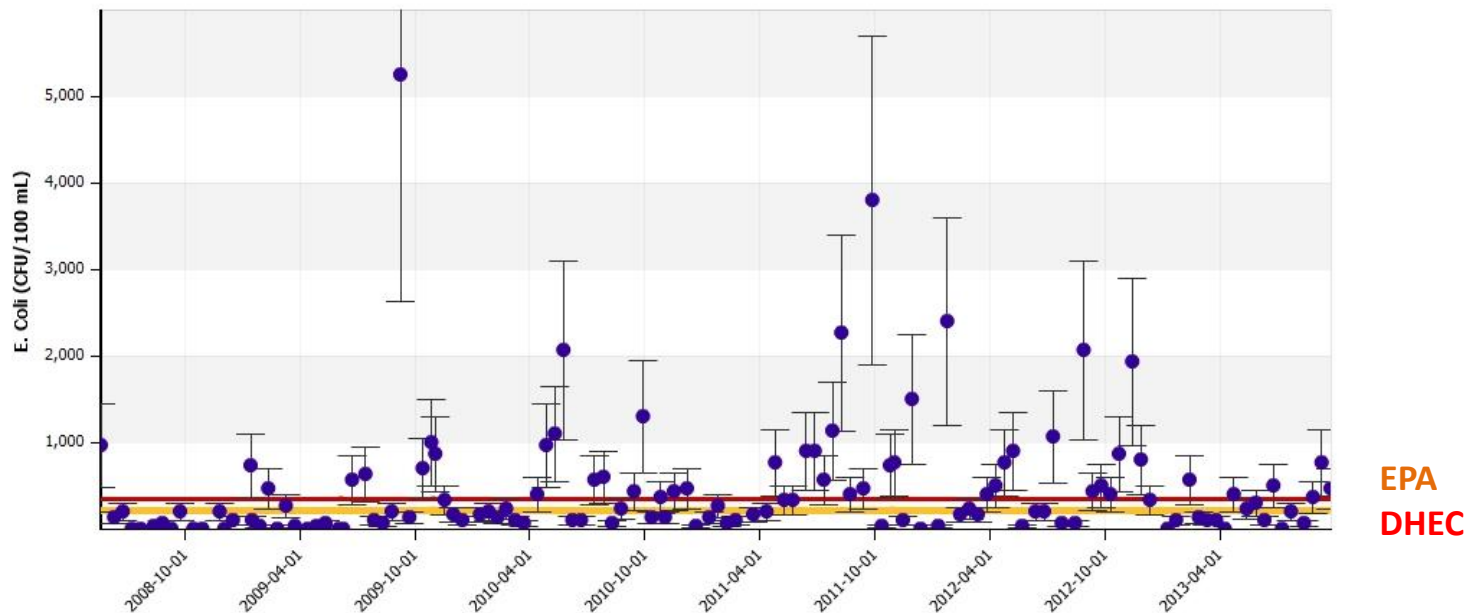
E. Coli (CFU/100 mL) values collected between May 20, 2008 and September 24, 2013



Bike Bridge Creek

Monitoring Site	2011	2012	2013
Bike Bridge creek (partly saline)	<ul style="list-style-type: none"> • High bacteria • Low Dissolved Oxygen (DO) • Very high ammonia 	<ul style="list-style-type: none"> • same 	<ul style="list-style-type: none"> • High bacteria • Low Dissolved Oxygen (DO)

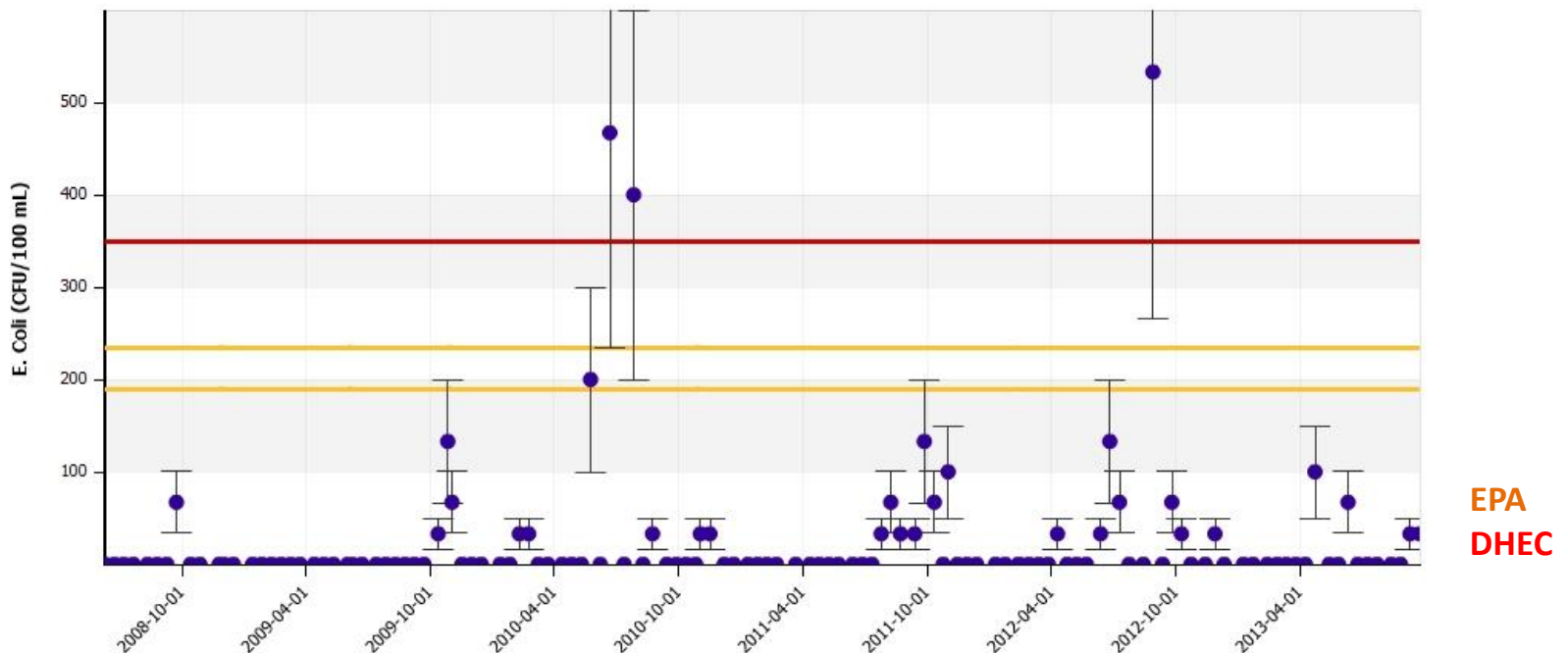
E. Coli (CFU/100 mL) values collected between May 20, 2008 and September 24, 2013



Oyster Landing Beach

Monitoring Site	2011	2012	2013
Oyster Landing Beach (saline)	<ul style="list-style-type: none"> High turbidity 	<ul style="list-style-type: none"> same 	<ul style="list-style-type: none"> High turbidity Low Dissolved Oxygen (DO) Very high ammonia

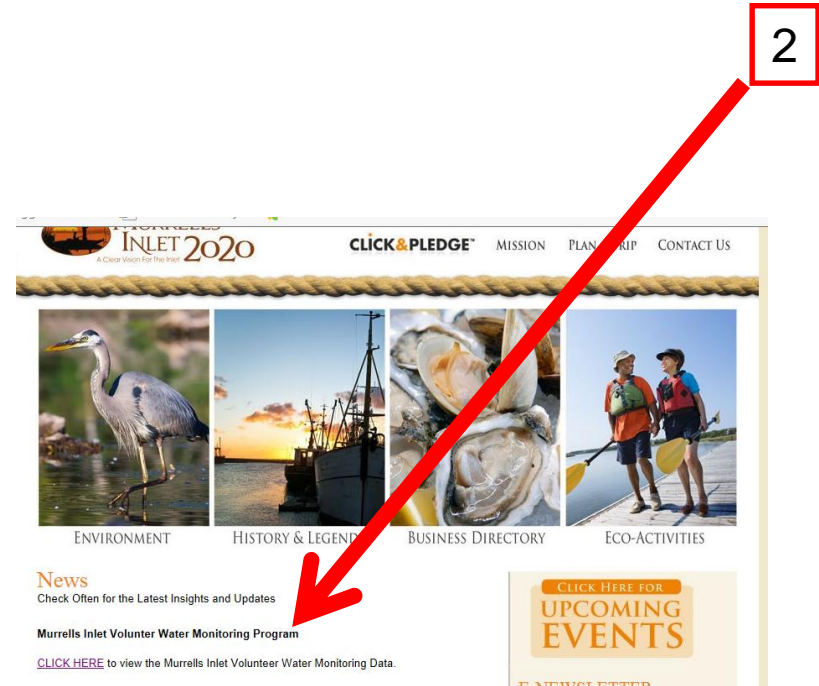
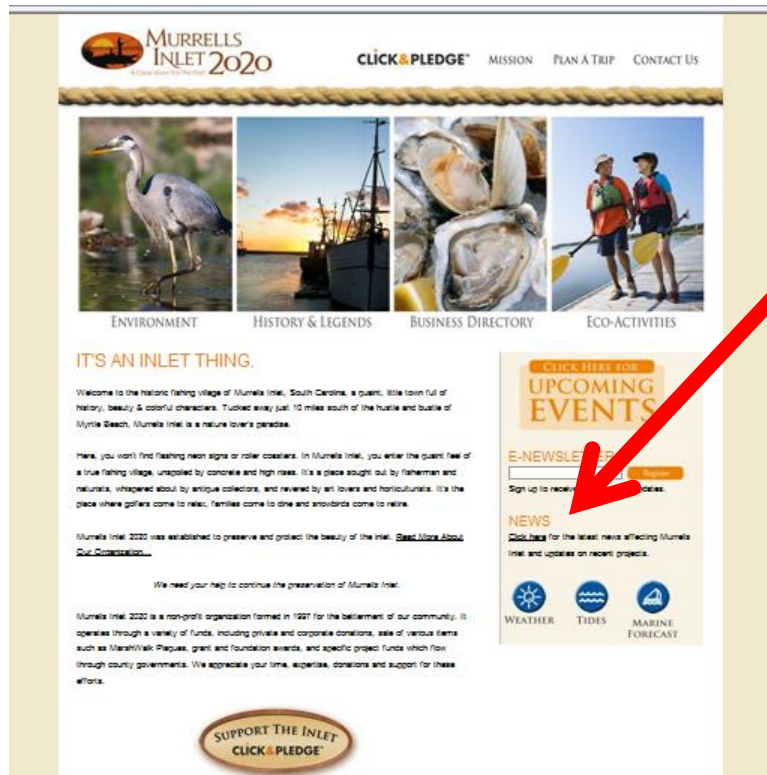
E. Coli (CFU/100 mL) values collected between May 20, 2008 and September 24, 2013



So Where's the Data?

Go to the MI 2020 website, www.murrellsinletsc.com

- 1) "Click here" for the latest news
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What Was on our Radar Screen?

Last Year at this Time

- ✓ Murrells Inlet Economic Impact Study
- ✓ Jetty View Walk
- ✓ Bypass Mowing
- ✓ Murrells Inlet Volunteer Water Monitoring
- ✓ Watershed Management-Based Plan
 - Business 17 Safety
 - Volunteer Program



Murrells Inlet Watershed-based Plan



Project Scope



- **Fecal Coliform Impairments**
- **Shellfish Harvesting Areas**
- **Economic, Environmental, and Cultural Benefits**



Project Timeframe

- **Grant Issued: October 2012**
- **First Draft Deadline:
January 21st, 2014**
- **Final Draft Deadline:
February 21st, 2014**





Project Partners

- **Murrells Inlet 2020**
- **Horry County**
- **Georgetown County**
- **Earthworks Group LLC**
- **Coastal Carolina University**
- **Clemson University**
- **SC DHEC**
- **SC DNR**
- **Georgetown County WSD**
- **Georgetown County WSA**
- **Huntington Beach State Park**
- **University of South Carolina**



9 Elements of Watershed-Based Plans

- 1. Identification of pollutant sources and their causes**
- 2. Estimated load reduction targets**
- 3. Best Management Practices needed to control pollutants**
- 4. Identification of funding and technical assistance needs**
- 5. Public outreach strategy**
- 6. Implementation timeline**
- 7. Implementation milestones to track progress**
- 8. List of criteria to determine if water quality goals are being met.**
- 9. Monitoring strategy to determine effectiveness of plan implementation.**

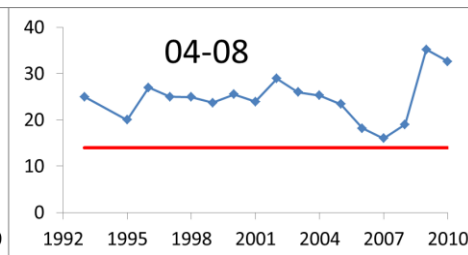
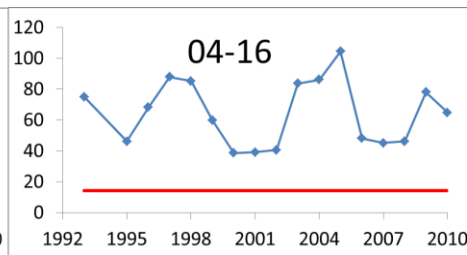
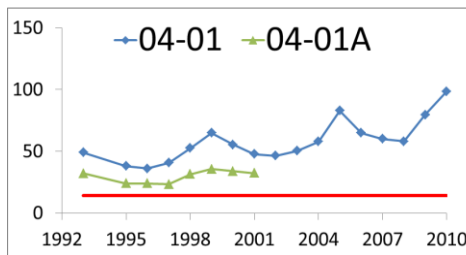
More information about EPA's Watershed-Based Plan recommended elements:

www.epa.gov/owow/nps/watershed_handbook



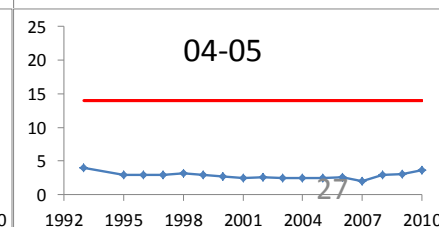
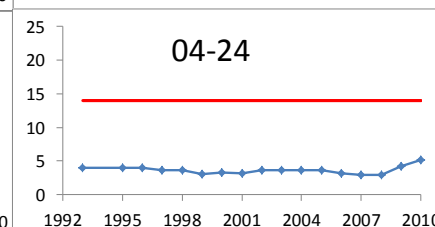
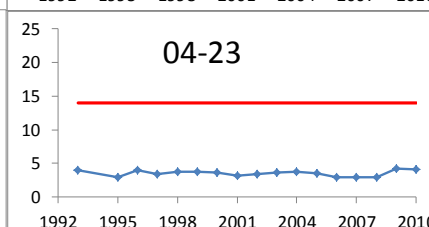
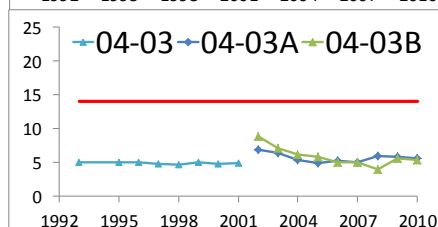
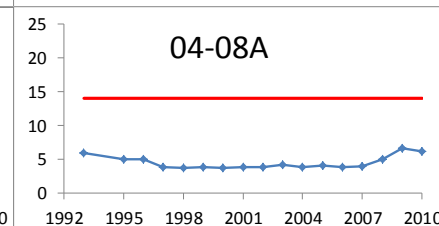
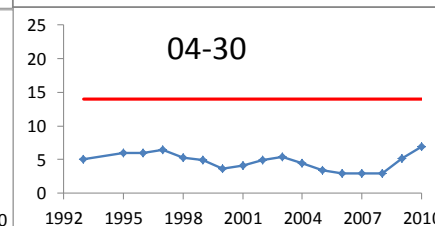
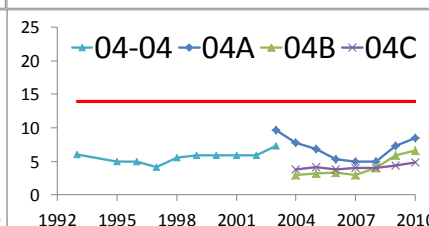
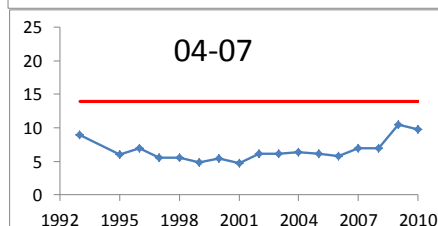
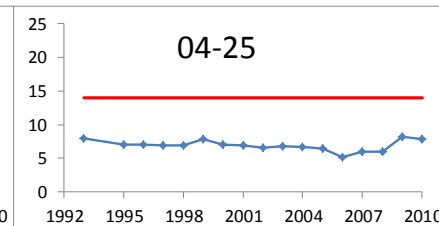
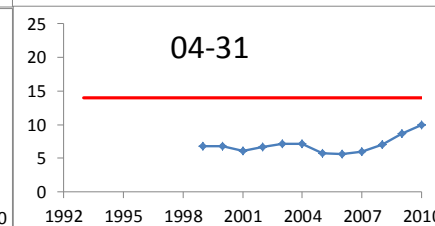
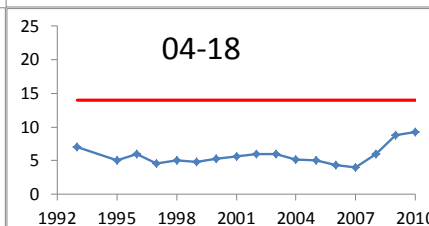
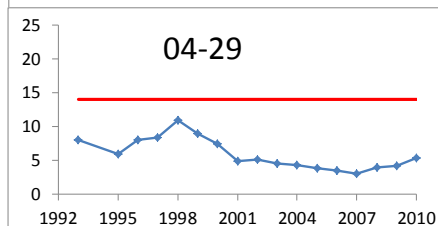
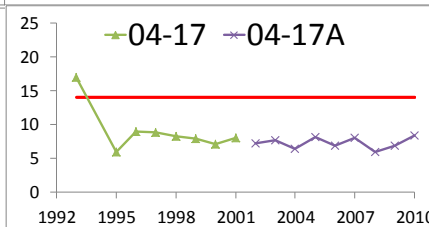
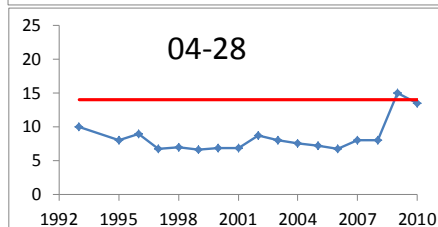
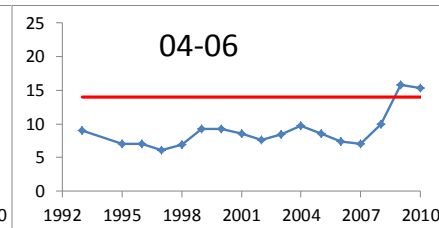
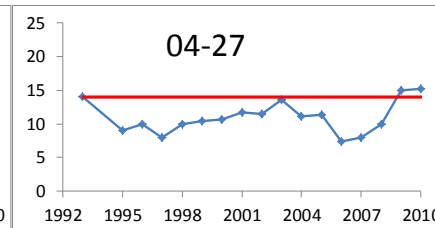
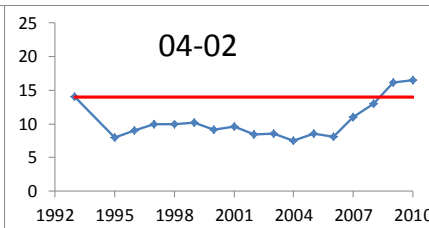
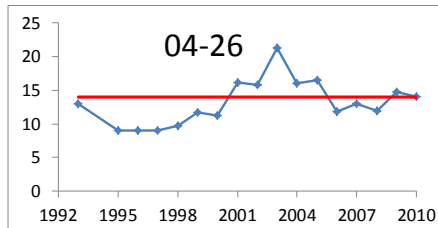
What Have We Been Doing?

- ✓ Analyzed 20 years of DHEC Monitoring Data



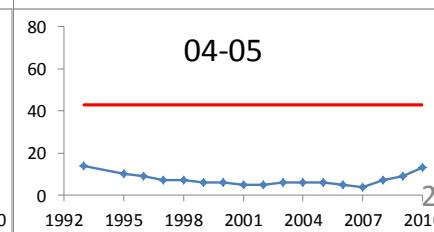
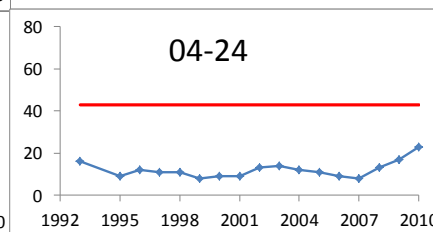
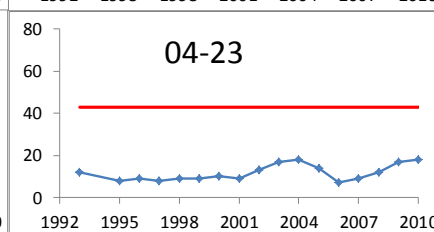
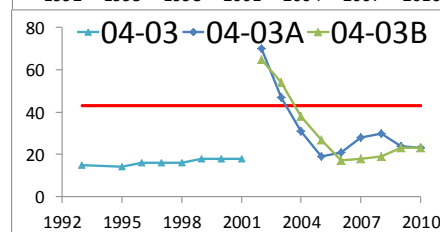
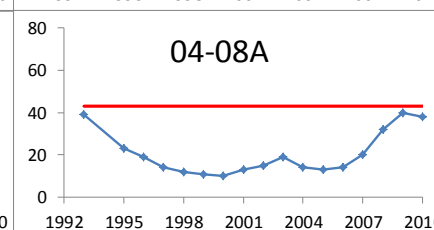
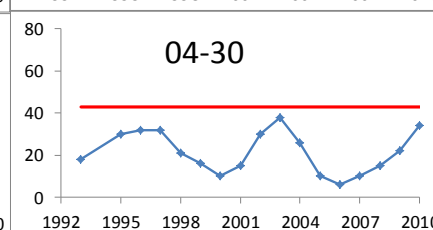
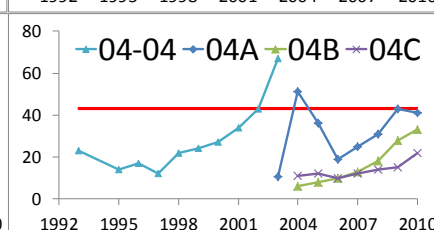
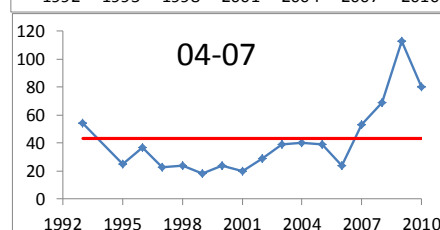
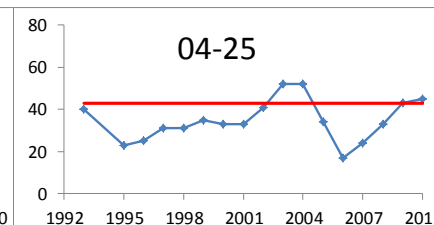
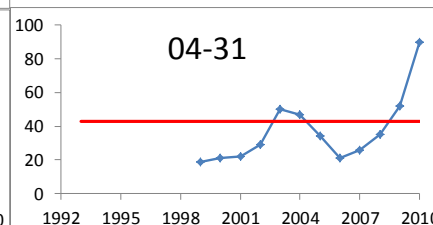
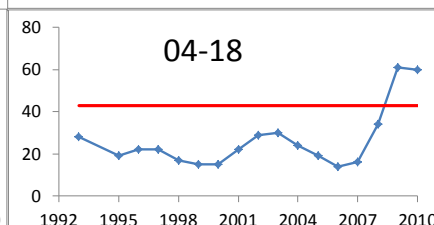
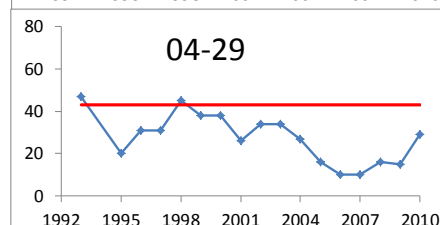
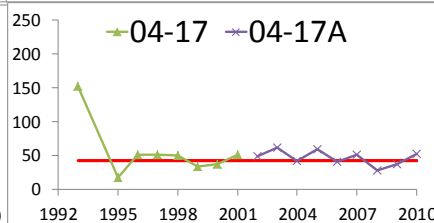
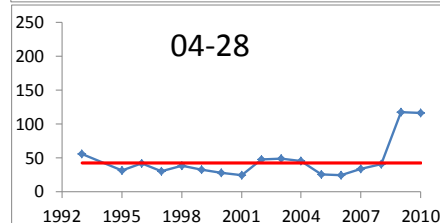
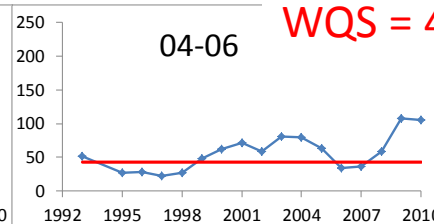
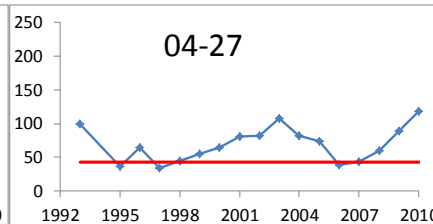
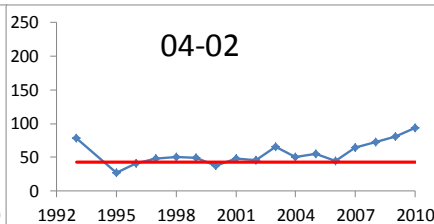
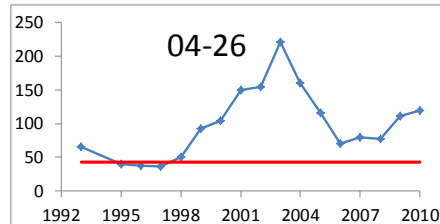
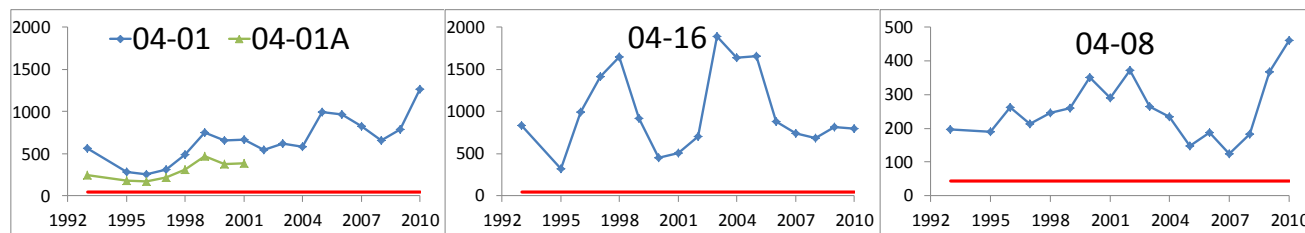
Geomean
time trends

WQS = 14



Est. 90th Percentile time trends

WQS = 43





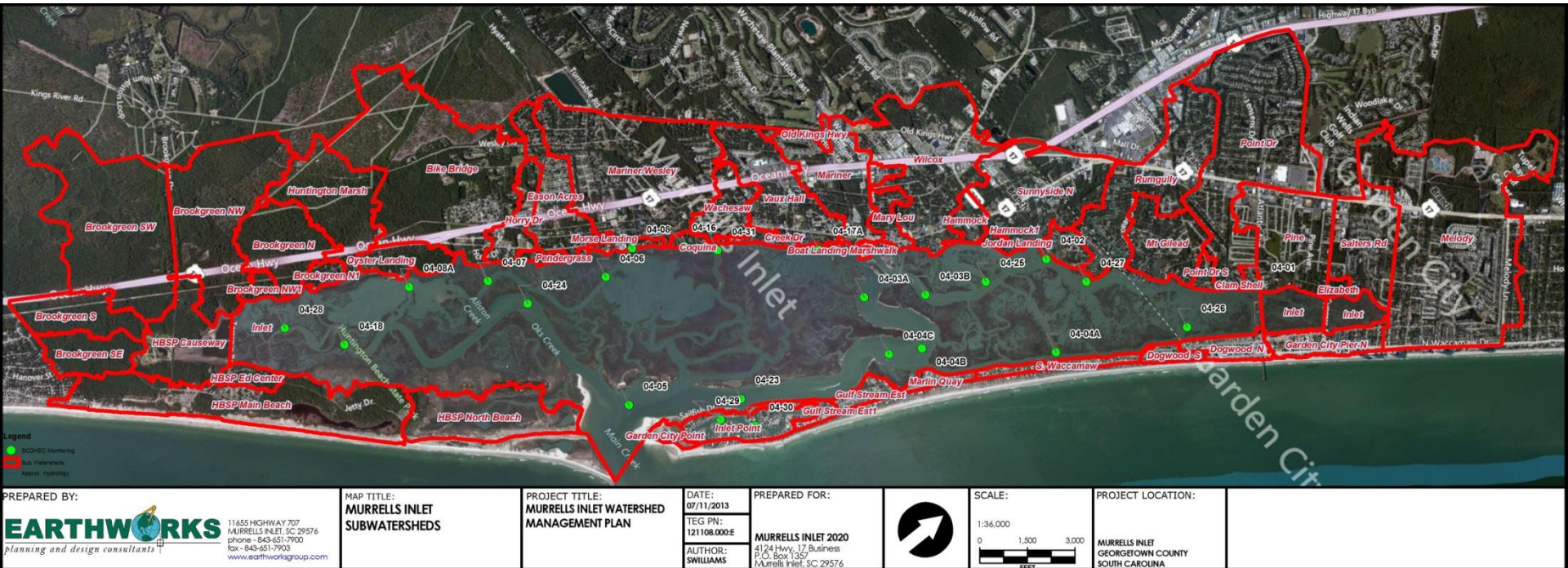
What Have We Been Doing?

- ✓ Analyzed 20 years of DHEC Monitoring Data
- ✓ Studied drainage patterns of the 9,313 acres of the Murrells Inlet Watershed
 - Determined curve numbers and water flow calculations
- ✓ Identified and mapped 53 subwatersheds



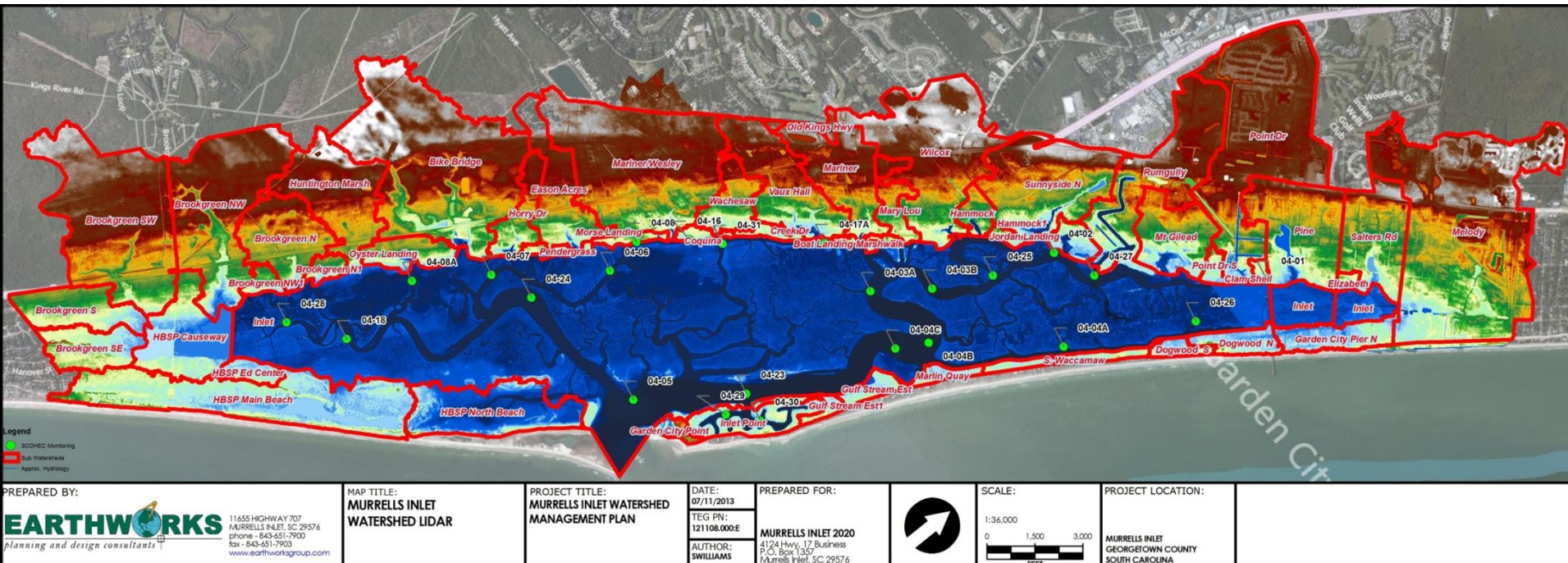


Murrells Inlet Watersheds





Murrells Inlet Watershed Lidar



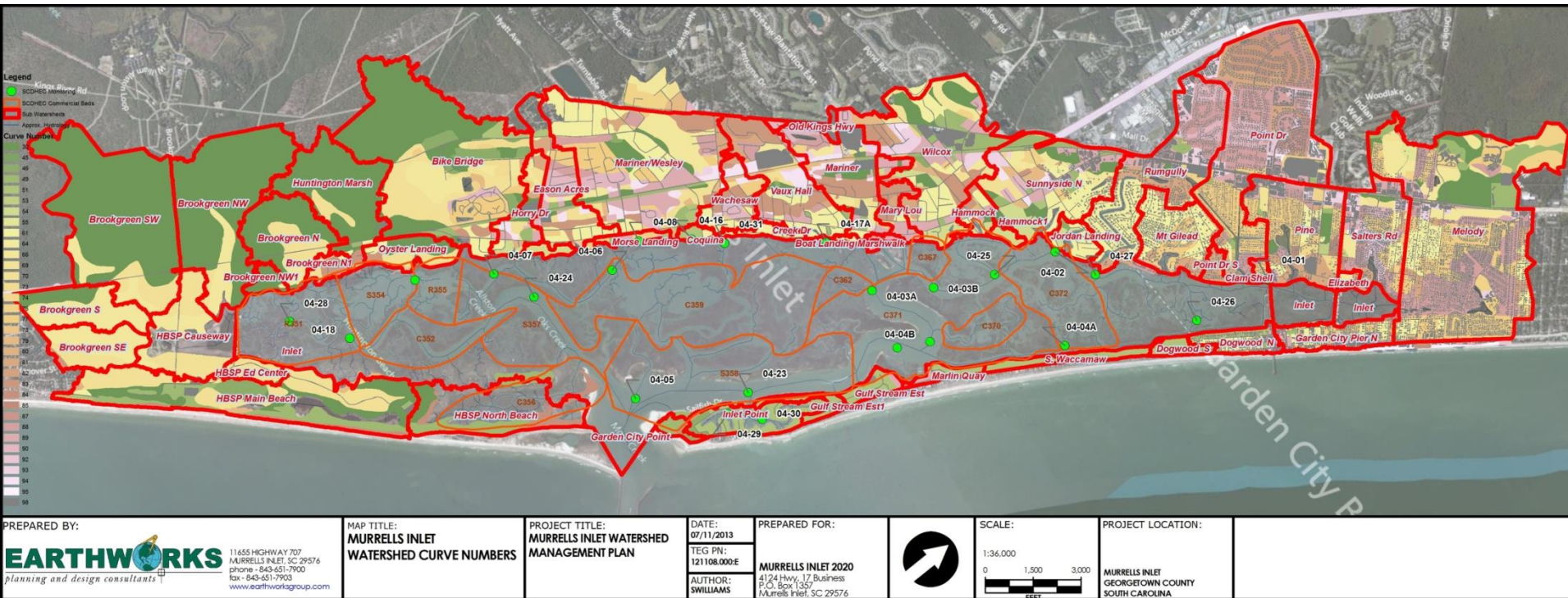
Colors show elevations

- White is highest elevations
- Dark blue is lowest elevations



Murrells Inlet Watersheds

Curve Numbers



Shows the Run-off factor (soils & land-use)

- Browns, pinks & whites – water will run off the fastest
- Greens – slowest run off



Murrells Inlet Subwatersheds & DHEC Station Status



TABLE C-2 90TH PERCENTILE TRENDS BY MONITORING SITE

Sites	1992-1994	1995-1996	1997-1998	1999-2000	2001-2002	2003-2004	2005-2006	2007-2008	2009-2010	2011	% Over
TIER 1											
1	O	O	O	O	O	O	O	O	O	O	100%
8	O	O	O	O	O	O	O	O	O	O	100%
16	O	O	O	O	O	O	O	O	O	O	100%
TIER 2											
2	O	U	U	O	U	O	O	O	O	O	82%
6	O	U	U	U	U	O	O	U	U	O	65%
26	O	U	U	U	O	O	O	O	O	O	82%
27	O	U	O	U	O	O	O	O	O	O	82%
28	O	U	U	U	U	U	O	O	O	O	35%
TIER 3											
7	O	U	U	U	U	U	U	O	O	O	29%
17A	Monitoring not initiated until this date										56%
08A	U	U	U	U	U	U	U	U	U	U	0%
18	U	U	U	U	U	U	U	U	U	U	12%
31	Monitoring not initiated until this date										33%
32	Monitoring not initiated until this date										0%

TABLE C-2 90TH PERCENTILE TRENDS BY MONITORING SITE

OTHER	1A	3	03A	03B	4	04A	04B	04C	5	17	22	23	24	25	29	30	% Year	
	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	59%
	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	19%
	Monitoring not initiated until this date										O	O	U	U	U	U	U	29%
	Monitoring not initiated until this date										O	O	U	U	U	U	U	29%
	U	U	U	U	U	U	U	U	U	U	O	O	U	U	U	U	43%	
	Monitoring not initiated until this date										U	O	U	U	U	U	U	36%
	Monitoring not initiated until this date										U	U	U	U	U	U	U	32%
	Monitoring not initiated until this date										U	U	U	U	U	U	U	41%
	U	U	U	U	U	U	U	U	U	U	O	O	U	U	U	U	50%	
	O	U	O	O	O	O	O	U	O	O	Monitoring discontinued beyond this date						61%	
	O	Monitoring discontinued beyond this date															48%	
	O	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	33%	
	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	21%	
	U	U	U	U	U	U	U	U	U	U	O	O	U	U	U	U	33%	
	O	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	46%	
	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	52%	
NOTES:	O= Over 90 th Percentile Standard of 43MPN/100ml																	
	U= Under 90 th Percentile Standard of																	

NOTES: O= Over 90th Percentile Standard of 43MPN/100ml U= Under 90th Percentile Standard of 43MPN/100ml

PREPARED BY:

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MAP TITLE:

MURRELLS INLET
COMMUNITY STAKEHOLDERS
PLAN UPDATE

PROJECT TITLE:

MURRELLS INLET
WATERSHED-BASED PLAN

DATE:

07/11/2013

TEG PN:

121108.000.E

AUTHOR:

SWILLIAMS

PREPARED FOR:

MURRELLS INLET 2020
1124 Hwy. 17 Business
P.O. Box 1050
Murrells Inlet, SC 29576

SCALE:

1:36,000

PROJECT LOCATION:

MURRELLS INLET
GEORGETOWN COUNTY
SOUTH CAROLINA

Legend

- Community Concern
- SC DHEC Monitoring
- Volunteer Monitoring
- Elevated fecal No
- Elevated fecal Yes
- Sub Watersheds
- Approx. Hydrology



What Have We Been Doing?

- ✓ Analyzed 20 years of DHEC Monitoring Data
- ✓ Studied drainage patterns of the 9,313 acres of the Murrells Inlet Watershed
 - Determined curve numbers & water flow calculations
- ✓ Identified and mapped 53 subwatersheds
- ✓ Additional upstream monitoring on south-end





Upstream Monitoring



Bike Bridge



Vaux Hall



Boat House Run



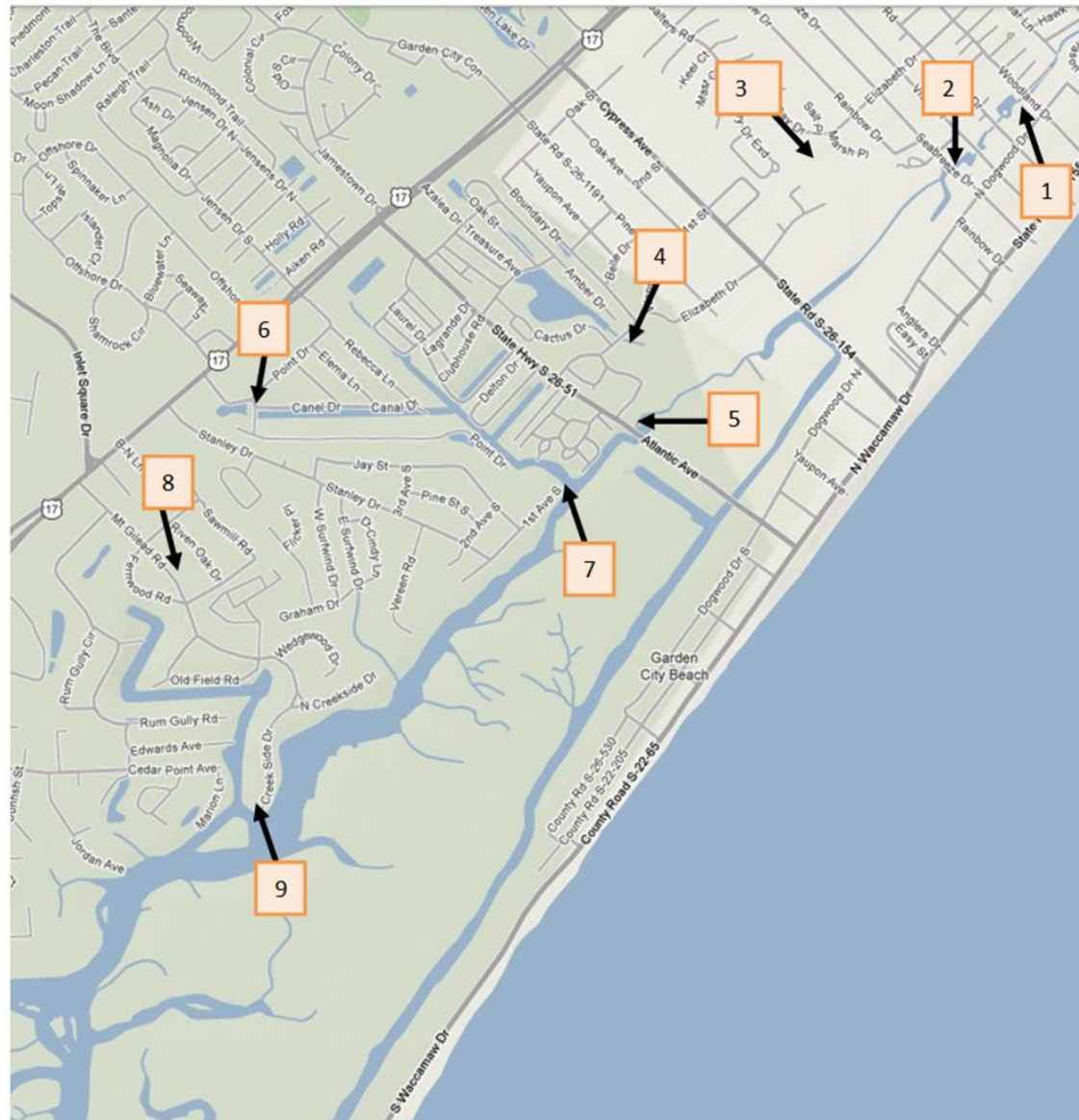
Huntington Beach State Park



What Have We Been Doing?

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- ✓ Studied drainage patterns of the 9,313 acres of the Murrells Inlet Watershed
 - Determined curve numbers and water flow calculations
- ✓ Identified and mapped 53 subwatersheds
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- ✓ Microbial source-tracking on north-end

Microbial Source Tracking





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- ✓ Microbial source-tracking on north-end
- ✓ Learning about septic & sewer impacts



Septic & Sewer

Atlantic Avenue



Melton Avenue



Tupelo Road



Wagon Wheel





What Have We Been Doing?

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 - Determined curve numbers and water flow calculations
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- ✓ Microbial source-tracking on north-end
- ✓ Learning about septic & sewer impacts
- ✓ Prioritized areas of focus



Tier2 ★

04-28 – Oak's Creek approx. 150m from HBSP

Tier 3 ★

(opened 2011, not on map)

Red – DHEC recommends focus



Some Focus Items

- Shallow waters & siltation
 - Reduces flushing
 - Lack of dilution
 - Promotes accumulation of contaminated sediments
- Ditches
 - Convey bacteria in stormwater from the land into the Inlet
 - Homes & highways for raccoons, possum and other critters
- Boat wakes & revving motors at boat ramps in shallow creeks
 - Re-suspend contaminated sediments
 - Erosion
- Hobby farms along the shoreline
- Pet Waste
- Feral Cats
- Wildlife & Waterfowl



For More Information Contact:



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