

Beaufort County Stormwater Management Utility Board (SWMU Board) Meeting Minutes

April 11, 2018 at 2:00 p.m. in Executive Conference Room, Administration Building, Beaufort County Government Robert Smalls Complex, 100 Ribaut Road, Beaufort, South Carolina

Board Members

Present

Don Smith
Marc Feinberg
William Bruggeman
James Fargher
Patrick Mitchell

Absent

Allyn Schneider

Ex-Officio Members

Present

Van Willis
Andy Kinghorn
Scott Liggett
Kim Jones

Absent

Beaufort County Staff

Eric Larson
Patty Wilson
Carolyn Wallace
Katie Herrera

Visitors

Dr. Alan Warren, USCB Lab
Dr. Eric Montie, USCB
Alice Howard, County Council
Denise Parsick, Beaufort SW Conservation District
Joe Mina, Applied Technology & Management
Sam Connor, Citizen

1. Meeting called to order – Don Smith

- A. Agenda – Approved.
- B. March 14, 2018 Minutes – Approved.

2. Introductions – Completed.

3. Public Comment(s) – None.

4. Reports – Mr. Eric Larson and Mr. David Wilhelm provided a written report which is included in the posted agenda and can be accessed at:

<http://www.bcgov.net/departments/Administrative/beaufort-county-council/boards-and-commissions/council-appointed/board-list/stormwater-management-utility-board/agendas/2018/041118.pdf>

A. Utility Update – Eric Larson

In reference to item # (SOLOCO/regionalization), a RFQ has been issued to seek a consultant to assist with the preparation of regional stormwater standards. The committee plan's to reconvene in 90 days to see who participating financially and work to select a consultant. MOAs will be done if a contract is signed.

Mr. Larson introduced Mrs. Katie Herrera, who was hired as the County's MS4 Coordinator.

B. Monitoring Update – Eric Larson

Please reference the report, no additional updates.

C. Stormwater Implementation Committee (SWIC) Report – Eric Larson

Please reference the report, no additional updates.

D. Stormwater Related Projects – Eric Larson

Please reference the report, no additional updates.

E. Professional Contracts Report – Eric Larson

Please reference the report, no additional updates.

F. Regional Coordination – Eric Larson

In reference to item #6, the Fall SESWA Conference, the local community (as a whole) submitted eight papers and two were selected for presentation.

G. Municipal Reports – Eric Larson

In reference to the Mossy Oak Task Force, they are in the process of applying for a grant to fund the first phase of the project (construction). The County has submitted a letter of support for the project, as well as budgeted money for next FY to help fund it.

Ms. Kim Jones mentioned that the Annual Spring May River Clean Up is April 28th.

H. Municipal Separate Storm Sewer System (MS4 Update) – Eric Larson

Mr. Larson shared that Mrs. Katie Herrera has met with Ms. Ellen Comeau to get an update on public education and that County staff participated in Touch-A-Truck on April 7th.

In reference to #5, construction permitting, it has been almost a year since the local stormwater permit requirements took effect and the development community has had a lot of questions. The County is planning a series of meetings with DHEC to be able to help explain the processes to the community and then offer an open house for the development community with DHEC staff. This will help the community understand why there are two permits.

Mr. Don Smith asked who consultant, Beth McLaughlin is with. Mr. Larson responded, McLaughlin Consulting; she is a sole practitioner. He indicated Ms. McLaughlin is helping finishing up a few tasks and transitioning work products over to Mrs. Herrera.

Mr. Smith asked about the Harbor Island Rookery. Mr. Larson explained that is something that Ms. Ellen Comeau did as part of her extension services.

I. Maintenance Projects Report – David Wilhelm

Mr. Smith asked about the bush hogging project and how long a project like that lasts. Mr. Larson replied this project was about six months.

5. Unfinished Business

A. Stormwater Master Plan Update – Mr. Joe Mina with Applied Technology and Management gave a presentation to summarize the scope of work and process to produce the Stormwater Master Plan Update. [Stormwater Management Plan presentation is attached.](#)

Mr. Smith asked why the Coosaw and Morgan River watersheds were chosen to be updated. Mr. Mina explained that it was a combination of the water quality and land cover changes. The level of resolution of the data was much better (the land cover model was updated).

Mr. Mina commented that 2006 plan projects for Hilton Head Island that haven't been completed are still valid today. He noted that models don't always reflect reality. This update reinforced that the original plan was solid to begin with.

Mr. Smith asked if the recommendations considered current or future growth projections. Mr. Mina explained there were few watersheds that met or exceeded the 2006 projections. Mr. Smith asked if current FEMA maps were used, Mr. Mina said current as of 2015. Mr. Smith asked if the 100 year storm was used. Mr. Mina said yes, they used it for evacuation routes and primary roads.

Mr. Billy Bruggeman asked what is next [now that report is complete]. Mr. Larson indicated that the recommendations will become part of Capital Improvement Projects and will be incorporated into the next five-year plan. Mr. Bruggeman asked what action is needed from County Council. Mr. Larson said none, this is a report received and acknowledged only. He indicated that County Council will see the plan in parts, as they vote on the budget for projects.

6. New Business –

A. USCB Grant Proposal Presentation – Dr. Eric Montie and Dr. Alan Warren, USCB –
Dr. Eric Montie and Dr. Alan Warren presented a monitoring pilot study proposal.

Dr. Warren shared DHEC monitoring data for different watersheds that was taken over an 18 year period, one sample taken per month. [Dr. Warren's data presentation is attached.](#)

Chechessee Creek (new TMDL) has a lower fecal count overall, but the same trend exists.

Mr. Marc Feinberg asked looking from economic oyster bed perspective about other municipalities, so if they follow similar trends and same levels. Dr. Warren said he can't answer that. He commented that he could see Charleston and Berkley County data and that the Mt. Pleasant and May River comparison would be interesting. He noted the data from DHEC is readily available.

Dr. Montie presented a [Historical Analysis of Water Quality and Climate Change Endpoints and Monitoring of Natural Resources in the May River – A Pilot Study for Other Watersheds in Beaufort County.](#)

Ms. Kim Jones shared that the Town of Bluffton has committed to help fund this research, and Mr. Larson expressed to her that it may be a good regional effort to partner together to support. Mr. Smith commented that he didn't know all of this historical data was available.

Mr. Feinberg asked if the grant is it mostly data mining vs field work. Dr. Montie said this [proposed amount] is what it takes to do the work, he doesn't know an exact percentage (data vs. field), but the University doesn't provide funding for staff for the labs.

Ms. Jones indicated the value that the Town of Bluffton saw in the partnership was to inform the update of the May River Action Plan and help direct and prioritize resources and efforts. It will show which watersheds are seeing the greatest changes.

In reference to a question, Mr. Larson explained that part of the MS4 requirements are to prove your program is getting better over time and this would help move in that direction. The County would be using expertise to help direct it to where it needs to be. The May River in not just the Town of Bluffton's concern, it is a shared watershed with the County. Thinking regionally and proactive, the County has \$15k pending in the budget for approval to co-support the project.

Dr. Montie shared that this project is a joint effort between his lab and Dr. Warren's lab.

A motion was made to recommend that \$15k in the budget to support the research effort (presented by Dr. Montie).

Brief discussion took place about possible findings, comparisons, and correlations that may be able to be made with this data. Dr. Warren commented there is a large value in being able to compare the watersheds.

The motion to recommend the \$15k in the budget be used to support the project was approved (5/0).

B. Discussion Only – Restructuring of the Stormwater Management Utility Board – Mr. Larson explained that Ms. Alice Howard brought this topic for discussion up, as she is the County Council representative for Natural Resources Committee as well and would like to hear opinions on it. Mr. Larson expressed that the Stormwater Utility Board may not be operating the way it was envisioned it would be. Is it a regional board where all five jurisdictions in Beaufort County (three more if Jasper County is included) equally share what is going on in their programs? Or is it a County board, where only the County program is talked about? Should it be a Utility board only, that meets a few times a year to go over management fees, collection rates, etc.?

Ms. Howard shared that many other boards/committees have one vote for each County district. She commented the municipalities could be represented better than they are now, as there are Ex-Officio members. She also stated that stormwater may not be ready for regionalization, but this could be a step.

Discussion took place on the recommendation/voting process involving the stormwater board. The information goes from SWIC to Stormwater Utility (Advisory) Board, then to Natural Resources Committee and on to County Council.

Mr. Don Smith and Mr. Scott Liggett shared some history of the Stormwater Utility Board and its purpose and accomplishments. Lengthy discussion then took place regarding the topic. As a result of the discussion, a future action recommendation is to organize a workshop to discuss the Stormwater Utility Board.

7. Public Comment(s) – None.

8. Next Meeting Agenda – Approved.

Additions to May 9, 2018 Agenda

- Unfinished Business –
 - Regionalization Update

9. Meeting Adjourned



Beaufort County 2018 Stormwater Management Implementation Guide:

An Update to the 2006 Stormwater Management Plan

Presented to the Stormwater Utility Board
April 11, 2018



APPLIED TECHNOLOGY & MANAGEMENT, INC.
941 Houston Northcutt Blvd., Suite 201 | Mt. Pleasant, SC 29464 | www.appliedtm.com
Coastal, Environmental, Marine & Water Resources Engineering

Overview of Scope of Work

▶ **Kickoff Meeting with the SWIC**

- ▶ Facilitated a meeting of the SWIC to discuss and finalize any changes to the Scope of Services
- ▶ Reviewed schedule of tasks, and established collaboration between jurisdictions

- ▶ **Meeting Held Feb 6, 2016**
- ▶ **Memo summarizing meeting**

Overview of Scope of Work

- ▶ **Review and Analysis of 2006 SWMP**
- ▶ Performed high-level review the 2006 SWMP.
- ▶ Compared this to the current direction of the County and Jurisdictions and worked with the County and SWIC staff to develop format and direction of the changes, updates or corrections needed to the 2006 SWMP.
- ▶ **Emails and in person/phone with County and SWIC staff defining process and products.**
- ▶ **Ongoing from Kickoff to Approx. Aug 2017 when final studies and modeling was completed.**

Overview of Scope of Work

▶ Facilitation of Public Meetings to Gain Citizen Input

- ▶ Preliminary Coordination meeting with SWIC
- ▶ Public meetings were held in:
 - ❖ Burton
 - ❖ St. Helena
 - ❖ Bluffton
 - ❖ Hilton Head Island
- ▶ Public meetings for SWMP Update combined with County BMP Manual Rollout
- ▶ **Meetings held June and September 2016**
- ▶ **Comment cards collected and comments collated**
- ▶ **Interactive map with push pins of problem areas was produced**
- ▶ **Summary Memo.**

Overview of Scope of Work

▶ Review of Collected Water Quality Data Base

- ▶ Gathered Data from years of sampling activity
 - ▶ Performed analyses to characterize the data's central tendencies and variability
 - ▶ Identified locations of increasing concentrations.
 - ▶ Compare model to existing water quality standards to identify possible water quality issues
 - ▶ Coordinated with the SWIC
 - ▶ Identified areas using GIS and tied to the existing sub-watersheds
 - ▶ Recommended changes to the Water Quality Sampling program
-
- ▶ **2 Technical memorandums**
 - ▶ **Meeting with SWIC.**

Overview of Scope of Work

- ▶ **Water Quality and Hydraulic Modeling**
- ▶ Reviewed the modeling information available from the 2006 SWMP
- ▶ Updated Land Use and Cover conditions to 2016 conditions
- ▶ Recommended Watersheds for updating
 - ❖ Calibogue Sound
 - ❖ May River
 - ❖ Colleton River
 - ❖ New River
 - ❖ Beaufort River
 - ❖ Coosaw River
 - ❖ Morgan River
- ▶ Updated Hydraulic and Hydraulics & Water Quality Models

- ▶ **Recommended stormwater system improvements**
- ▶ **Identified projects to correct problems.**
- ▶ **Meetings with SWIC**

Overview of Scope of Work

▶ **Update CIP Based on Model Output**

- ▶ Reviewed current CIP Projects
- ▶ Recommended projects in each watershed
- ▶ Categorized projects by jurisdiction

▶ **Updated CIP Document and information cards**

- ▶ **Meetings with individual jurisdictions to review projects.**

▶ **SW Ordinance and BMP Manuals Recommendations**

- ▶ For use by all jurisdictions for BMP Manual and SWM ordinances.
- ▶ Incorporated by the county in their revised BMP manual (work performed under separate contract for County Manual)

Overview of Scope of Work

▶ **Primary and Secondary Drainage Systems Inventory**

- ▶ Provided a list of priority areas for the County and municipalities to concentrate their primary and secondary drainage system inventory efforts along with a GIS layer showing the priority areas.

▶ **Report Development and Presentations**

- ▶ Documented the result of all tasks into a single document.
- ▶ Presented document to SWIC for input and comments
- ▶ Revised document and created final version

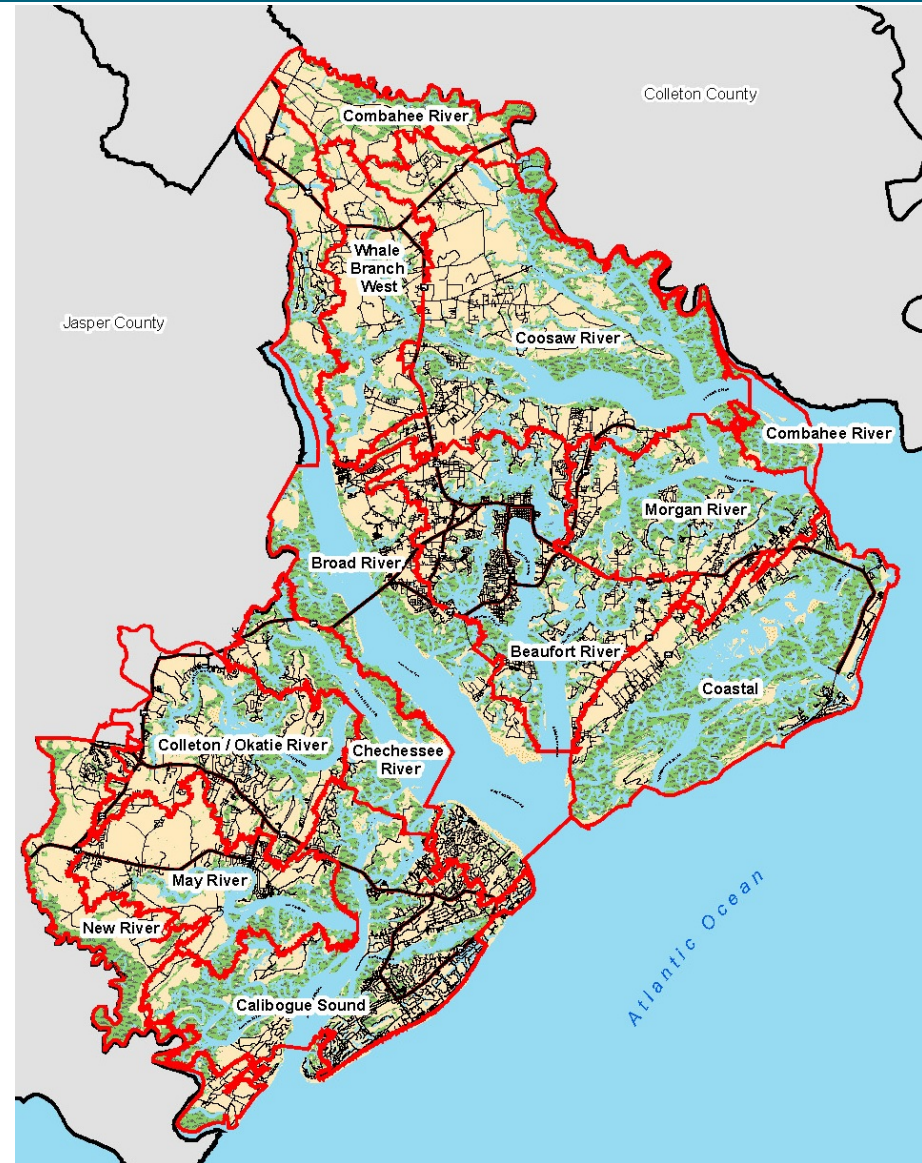
▶ **Final Implementation Guide**

- ▶ **PowerPoint presentation**

Overview of Implementation Guide

▶ Seven Watersheds

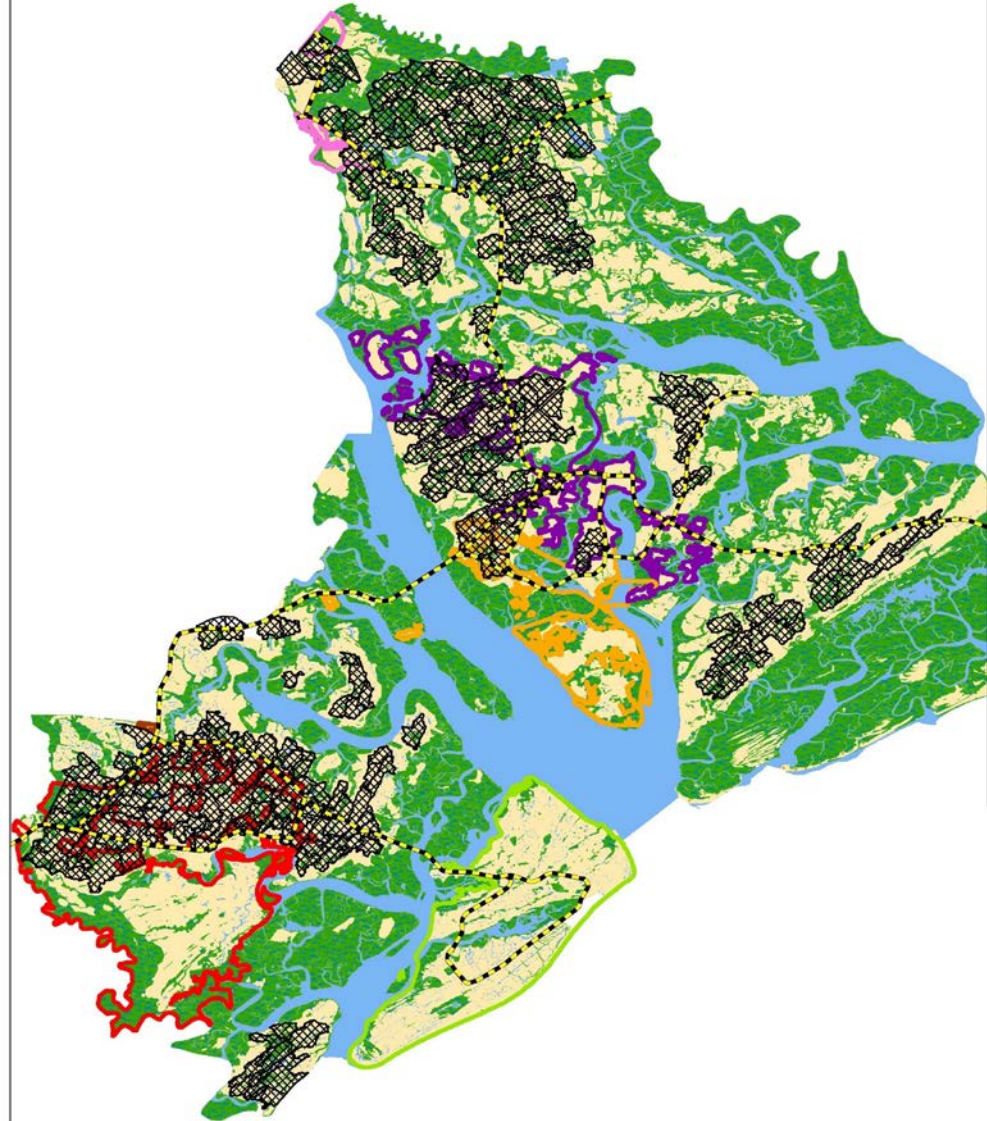
- ▶ Figure ES-1
- ▶ Section 3 Calibogue Sound
- ▶ Section 4 May River
- ▶ Section 6 Colleton River
- ▶ Section 7 New River
- ▶ Section 8 Beaufort River
- ▶ Section 9 Coosaw River
- ▶ Section 11 Morgan River



Overview of Implementation Guide

▶ Areas of H&H Modeling

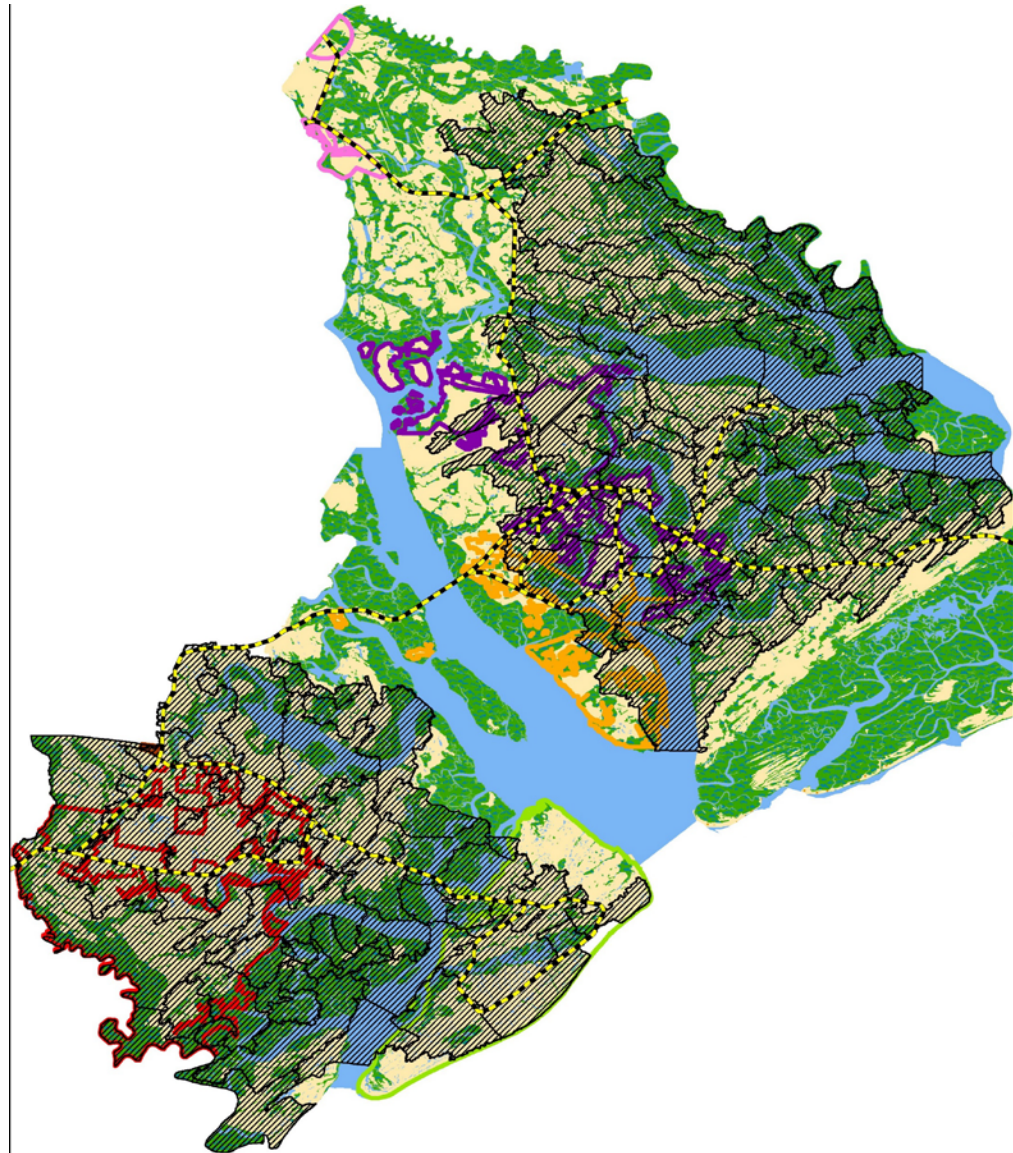
- ▶ Figure ES-2U
- ▶ Limited to specific sub-watersheds
- ▶ Updated Existing Land Use
- ▶ Updated Existing Cover
- ▶ Located Overtopping
- ▶ Recommended Improvements



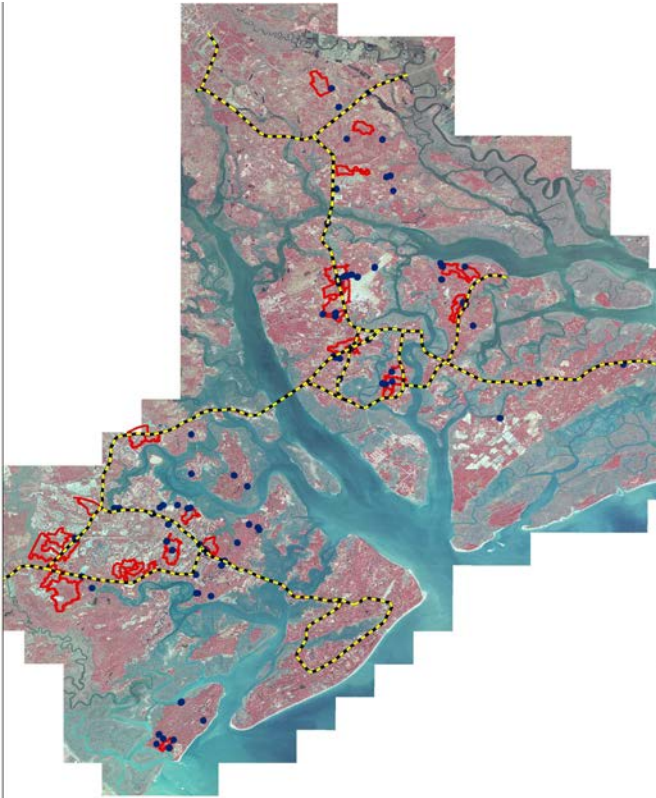
Overview of Implementation Guide

▶ Areas of WQ Modeling

- ▶ Figure ES-3U
- ▶ Limited to specific sub-watersheds
- ▶ Updated Existing Land Use
- ▶ Updated Existing Cover
- ▶ Reviewed Existing Sampling Locations
- ▶ Recommended New Sampling Stations
- ▶ Recommended BMP's



Overview of Implementation Guide

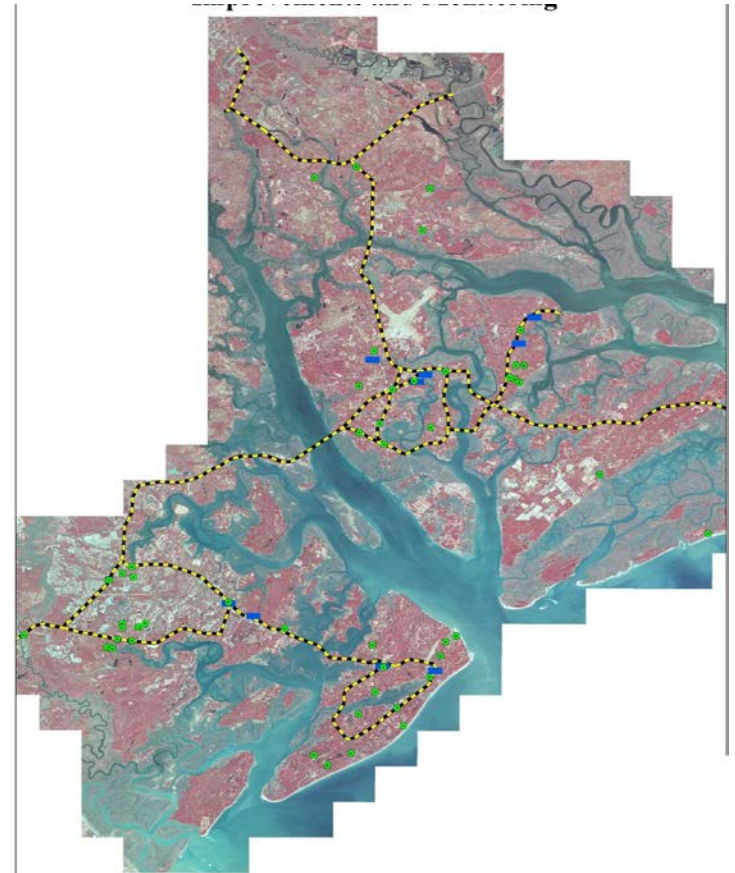


▶ Overtopping Locations

▶ Figure ES-4U

▶ Updated Monitoring and BMP Locations

▶ Figure ES-5U



2018 Update Recommended Capital Improvements Projects

3/3/2018

Project Name	Municipality	2015 Capital Costs	2017 Capital Costs	Notes
Brewer Memorial Park Demonstration Wet Pond Project Feasibility	Beaufort County	\$79,500	\$82,327	From 2015 CIP - In Progress (Funded)
Factory Creek M2	Beaufort County	\$1,740,000	\$1,801,883	From 2015 CIP - In Progress (Funded). Map updated by ATM to show Coleman & Academy Park locations.
Sawmill Creek Overtopping/Forby land	Beaufort County	\$150,000	\$155,335	From 2015 CIP - In Progress (Funded)
Salt Creek South M1	Beaufort County	\$2,045,000	\$2,117,730	From 2015 CIP - In Progress (Funded)
Shanklin Road M2	Beaufort County	\$3,340,000	\$3,458,787	From 2015 CIP - In Progress (Funded)
SC170/Okatie West	Beaufort County	\$975,000	\$1,009,676	From 2015 CIP
Grober Hill M2	Port Royal	\$2,525,000	\$2,614,801	From 2015 CIP
Camp St. Mary M2	Beaufort County	\$3,757,000	\$3,890,617	From 2015 CIP This project is complaint driven (not model driven)
Battery Creek West M1	Beaufort Cty	\$4,140,000	\$4,287,238	From 2015 CIP
Sawmill Branch 1 Regional BMP	Beaufort County	NA	\$2,063,688	This is across the street from the Forby/Sawmill project currently in progress. This project would be a compliment to the current p recommended to be considered, however can take a lower priority than others in this list.
Sawmill Branch 2 Regional BMP	Beaufort County	NA	\$1,071,064	
Jarvis Creek 2 Regional BMP	Hilton Head	NA	\$2,443,649	
Broad Creek 4 Regional BMP	Hilton Head	NA	\$991,759	
Rock Springs Creek 1 Regional BMP	Beaufort County	NA	\$430,524	
Lucy Point Creek Regional BMP	Beaufort County	NA	\$438,293	
Albergotti Creek 2 Regional BMP	Beaufort County	NA	\$602,447	This is in close proximity to the Shanklin Road Project (above) as it is currently being designed and relocated due to project needs. located on a separate tributary than the Shanklin Road Project and therefore it is recommended to be considered, however can take priority than others in this list.
Battery Creek N1 Regional BMP	Beaufort Cty	NA	\$1,369,982	
Battery Creek N2 Regional BMP	Beaufort Cty	NA	\$618,543	

**2017 costs are calculated using historical cost indices from RSMMeans*

Previous (2015) Unfunded Projects	\$11,802,333
NEW ADDITIONAL PROJECTS	\$10,029,949
TOTAL	\$21,832,282

In Progress (Funded) and items from 2015 CIP were reviewed and analyzed against the current update information and are recommended to be retained. Others were removed from the 2015 list. No updates to the attached "cards" were completed with the exception of the Factory Creek M2 project.

TABLE 3-18 (Updated 2017)
 PLANNING LEVEL COST ESTIMATES FOR
 CALIBOGUE SOUND WATERSHED

MODEL CONDUIT	PROJECT	ESTIMATED COST
MS_M-1*	Road overtopping at Masters Drive Replace existing 3 - 18" RCP with 10 - 36" RCP	\$129,000
WP_M-2*	Road overtopping at Bayley Road Replace existing 3 - 24" RCP with 3 - 4'x4' box culverts	\$152,000
WP_M-3*	Road overtopping at Colleton River Drive Replace existing 3 - 18" RCP with 1 - 7'x4' box culverts Raise road 2.9 ft (length of 660 ft)	\$805,000
WT_M-2	Road overtopping at Cooper River Landing Road Replace existing 1 - 30" RCP with 4 - 8'x5' box culverts Raise road 2.4 ft (length of 670 ft)	\$520,000
WT_M-4	Road overtopping at Freeport Road Replace existing 1 - 18" CMP with 20 - 36" RCP Raise road 1.4 ft (length of 640 ft)	\$352,000
	TOTAL	\$1,958,000

TABLE 7-12 (Updated 2017)
 PLANNING LEVEL COST ESTIMATES FOR
 NEW RIVER WATERSHED

MODEL CONDUIT	PROJECT	ESTIMATED COST
DS_M-2	Road overtopping at Benjies Point Road Add 7 - 36" RCP to existing 2 - 36" RCP	\$76,000
E_M-3	Road overtopping at Prospect Road Replace existing 1 - 15" CMP with 2 - 36" RCP	\$33,000
M_M-3	Road overtopping at Prospect Road Replace existing 1 - 24" CMP with 4 - 8'x4' box culverts Raise road 1.8 feet (length of 360 ft)	\$339,000
M_M-7	Road overtopping at School Road Replace existing 1 - 18" RCP with 4 - 36" RCP	\$48,000
OR_M-3	Road overtopping at Prospect Road Add 3 - 36" RCP to existing 1 - 36" CMP Raise road 1.0 feet (length of 260 ft)	\$45,000
OR_M-6	Road overtopping at Beach Drive Raise road 0.8 feet (length of 170 ft)	\$105,000
	TOTAL	\$646,000

TABLE 4-18 (Updated 2017)
 PLANNING LEVEL COST ESTIMATES FOR
 MAY RIVER WATERSHED

MODEL CONDUIT	PROJECT	ESTIMATED COST
AL_M-1	Road overtopping at Ulmer Road Replace existing 1 - 36" RCP and 1 - 30" RCP with 1 - 8'x4' box culvert Raise road 1.8 ft (length of 1,200 ft)	\$756,000
BE_M-4	Road overtopping at SC 46 Replace existing 2 - 36" CMP with 2 - 5'x5' box culverts	\$156,000
MR_M-1	Road overtopping at Palmetto Bluff Road Add 2 48-in RCP culverts to existing 2 - 48" and 1 - 36" RCP	\$67,000
U_M-1	Road overtopping at Alljoy Road Replace existing 1 - 48" CMP with 1 - 5'x5' box culvert	\$212,000
SC_T1-4	Road Overtopping at May River Road (State HWY 46) Raise road from elevation 18.1 ft to elevation 18.3 ft NAVD	\$157,000
U_M-3	Road overtopping at Confederate Avenue Replace existing 2 - 36" RCP with 2 - 8'x4' box culverts	\$173,000
	TOTAL	\$1,521,000

TABLE 11-20 (Updated 2017)
 PLANNING LEVEL COST ESTIMATES FOR
 MORGAN RIVER WATERSHED

MODEL CONDUIT	PROJECT	ESTIMATED COST
CNC_M-6	Road overtopping at Langford Road Replace existing 1 - 24" RCP with 1 - 8'x4' box culvert Raise road 1.1 ft (length of 620 ft)	\$267,000
FC_M-3	Road overtopping at Holly Hall Road Replace existing 1 - 24" RCP with 3 - 8'x4' box culverts	\$226,000
RSC_M-3*	Road overtopping at Sams Point Road Replace existing 1 - 36" RCP with 1 - 8'x6' box culvert	\$117,000
RSC_M-5	Road overtopping at Wade Hampton Drive Replace existing 1 - 24" RCP with 1 - 8'x4' box culvert	\$111,000
	TOTAL	\$721,000



Cost/Benefit for CIP BMP Projects

	Calibogue		Colleton		Beaufort			Coosaw	Morgan
	Jarvis Creek 2	Broad Creek 4	Sawmill Branch 1	Sawmill Branch 2	Albergotti Creek 2	Battery Creek N1	Battery Creek N2	Lucy Point Creek	Rock Spring Creek 1
Parameter	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr
TN	646	527	809	247	270	678	435	120	361
TP	148	130	190	72	82	128	79	30	144
TSS	74000	59910	95912	28495	31783	79724	53190	13256	33583
Total lbs	74794	60567	96911	28814	32135	80530	53704	13406	34088
Cost	\$ 2,443,649	\$ 991,759	\$ 2,063,688	\$ 1,071,064	\$ 602,447	\$ 1,369,982	\$ 618,543	\$ 438,293	\$ 430,524
Cost/lb	\$ 33	\$ 16	\$ 21	\$ 37	\$ 19	\$ 17	\$ 12	\$ 33	\$ 13

Summary of Projects & Costs

▶ Overtopping/Primary Storm System Improvements

- ▶ 76 Locations in Updated Watersheds Only
- ▶ Cost \$22.2 Million
 - ▶ Public Projects \$9.2 Million
 - ▶ Private Projects \$12.9 Million

▶ Water Quality/Regional BMP Improvements

- ▶ 9 Locations in Updated Watersheds Only
- ▶ Cost \$10.0 Million
 - ▶ Includes construction and land acquisition estimate

Summary of Projects & Costs

▶ Other Recommendations

- ▶ Water Quality Monitoring – Monthly Sampling
- ▶ Operation and Maintenance – Keep Systems working
- ▶ Update GIS elevation data – FEMA
 - ▶ \$300,000 budgetary cost estimate
- ▶ Update Software & Models
 - ▶ \$50,000 per year estimate

Questions

Q & A

Joseph A. Mina, P.E.
Applied Technology & Management

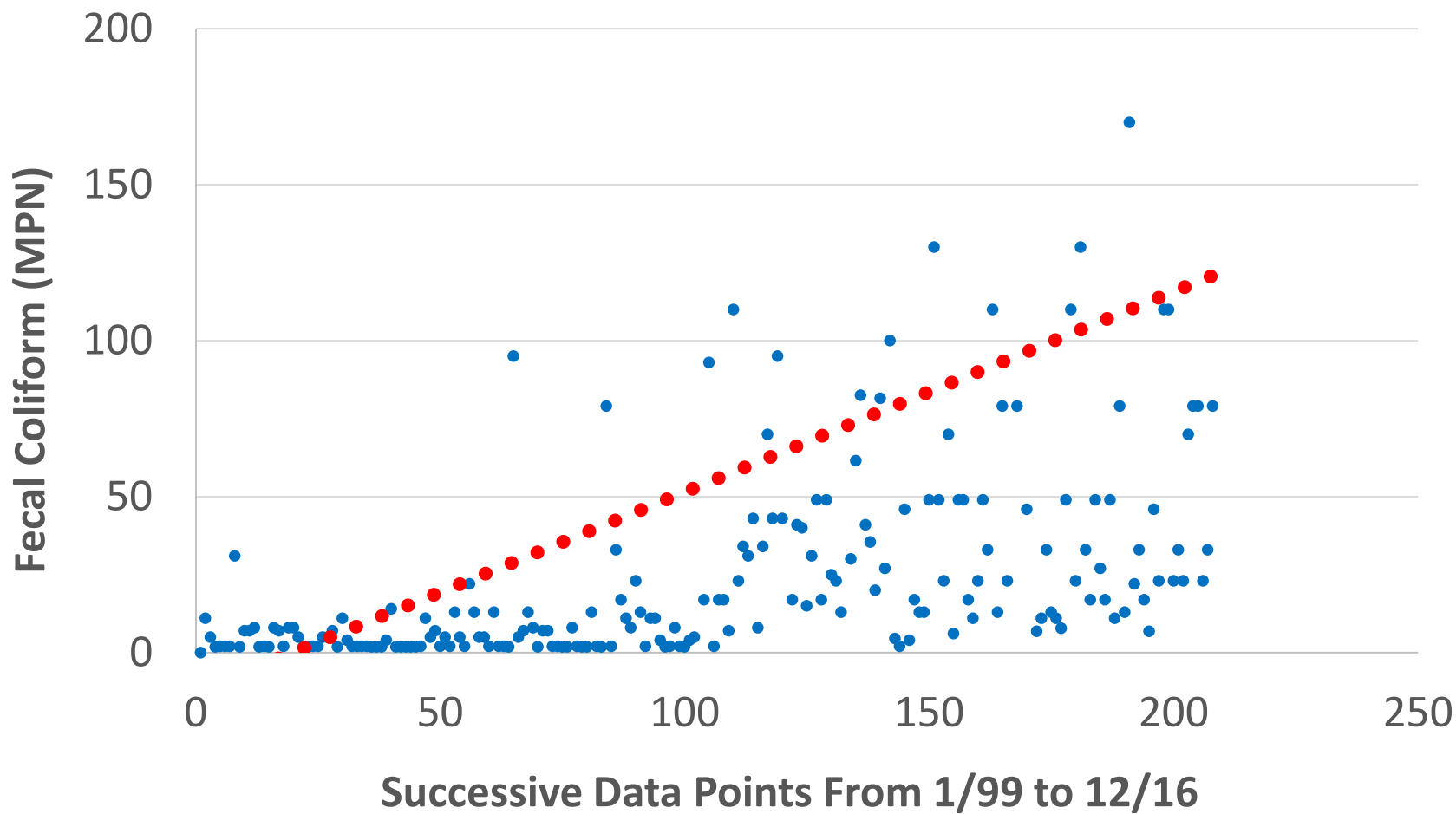
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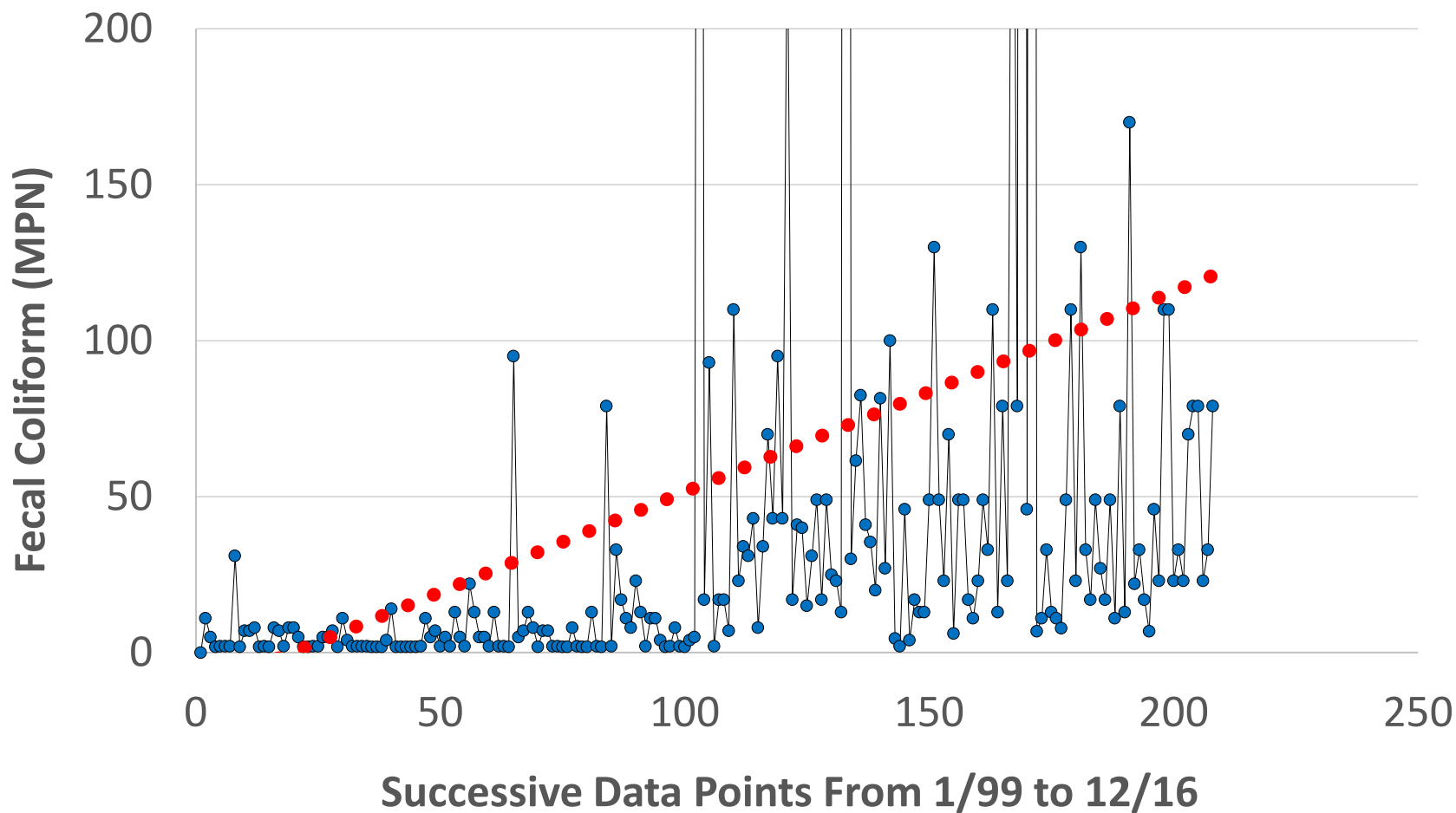
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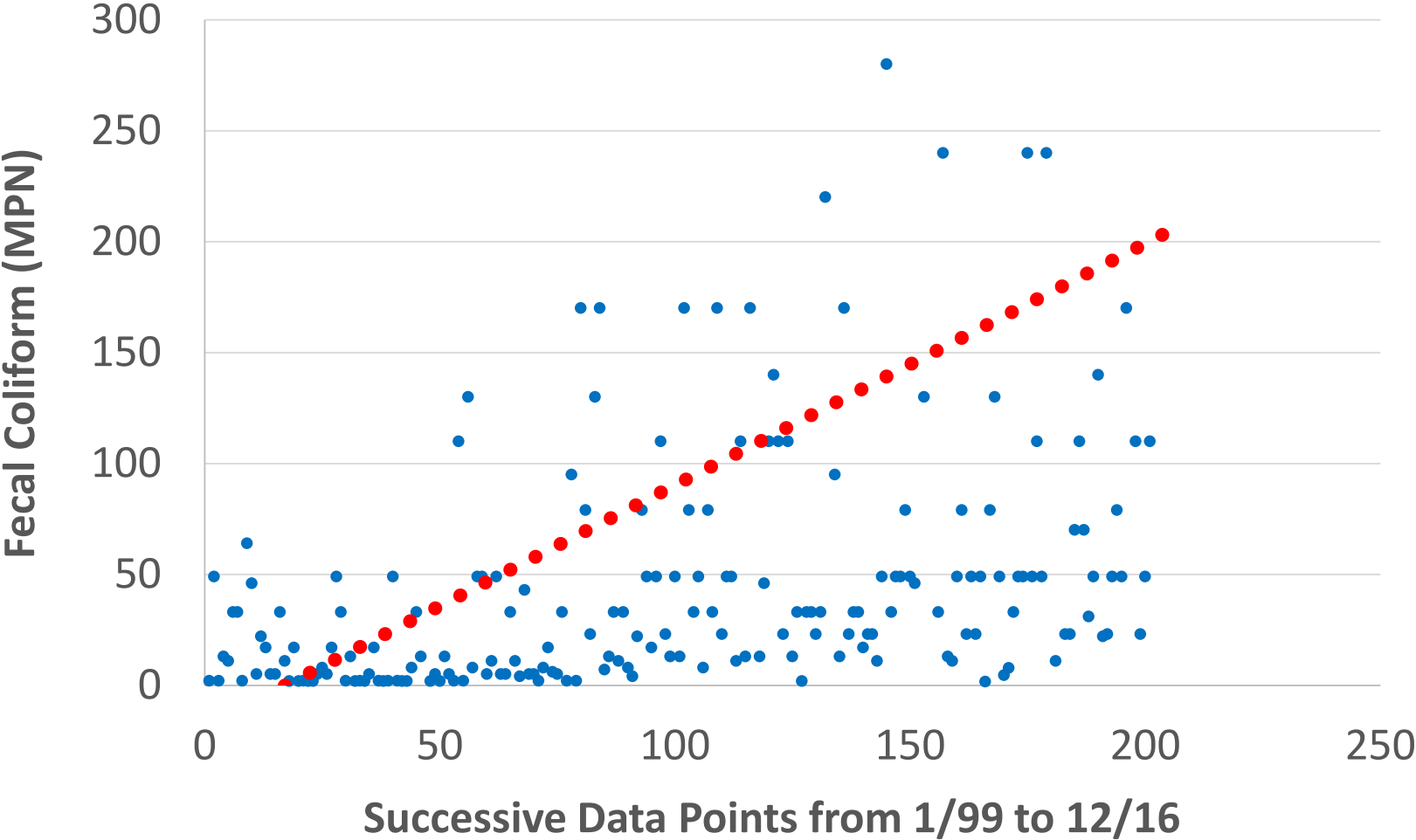
May River Station 19-19 (n=207)



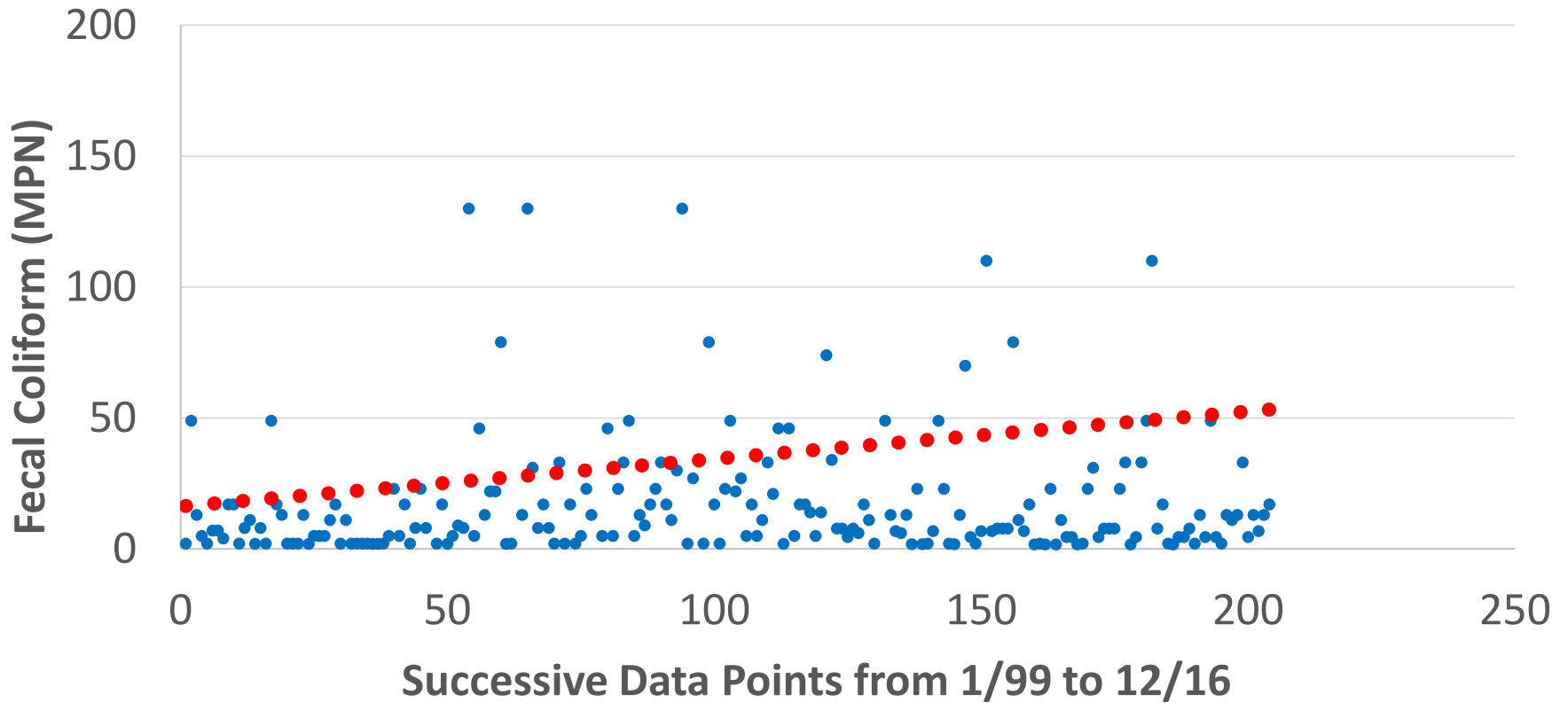
May River Station 19-19 (n=207)



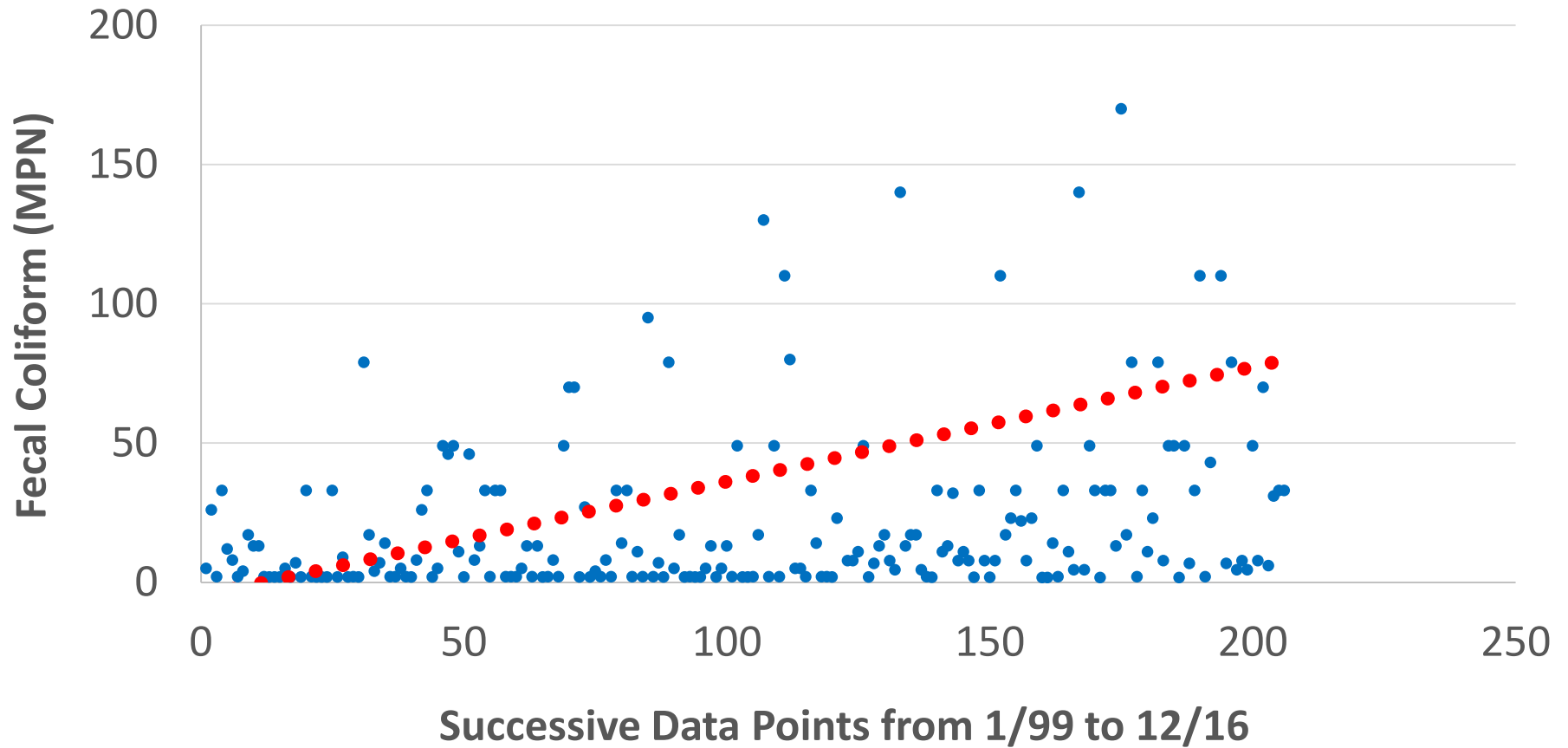
Okatie River Station 18-08 (n=202)



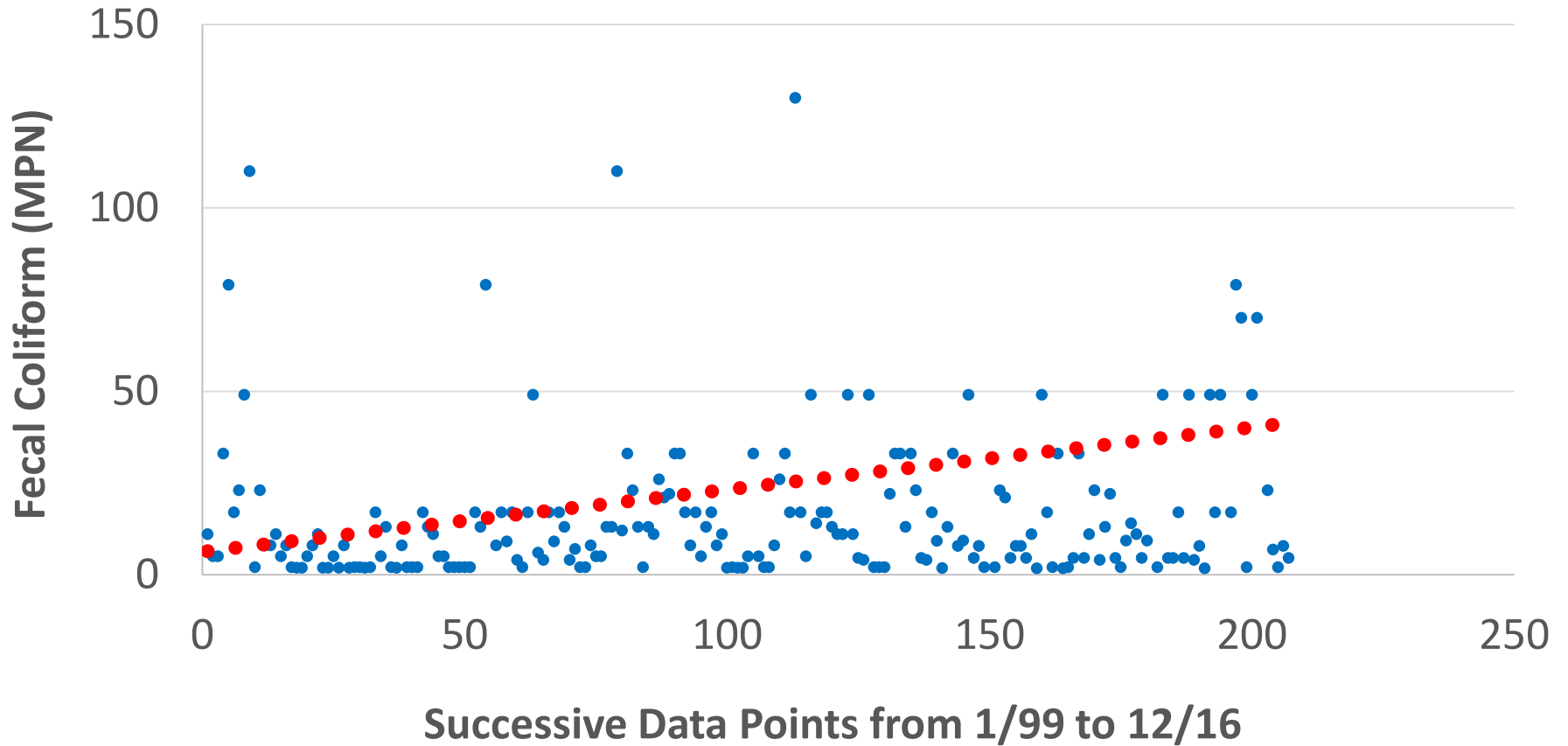
Chechessee Creek Station 18-09 (n=205)



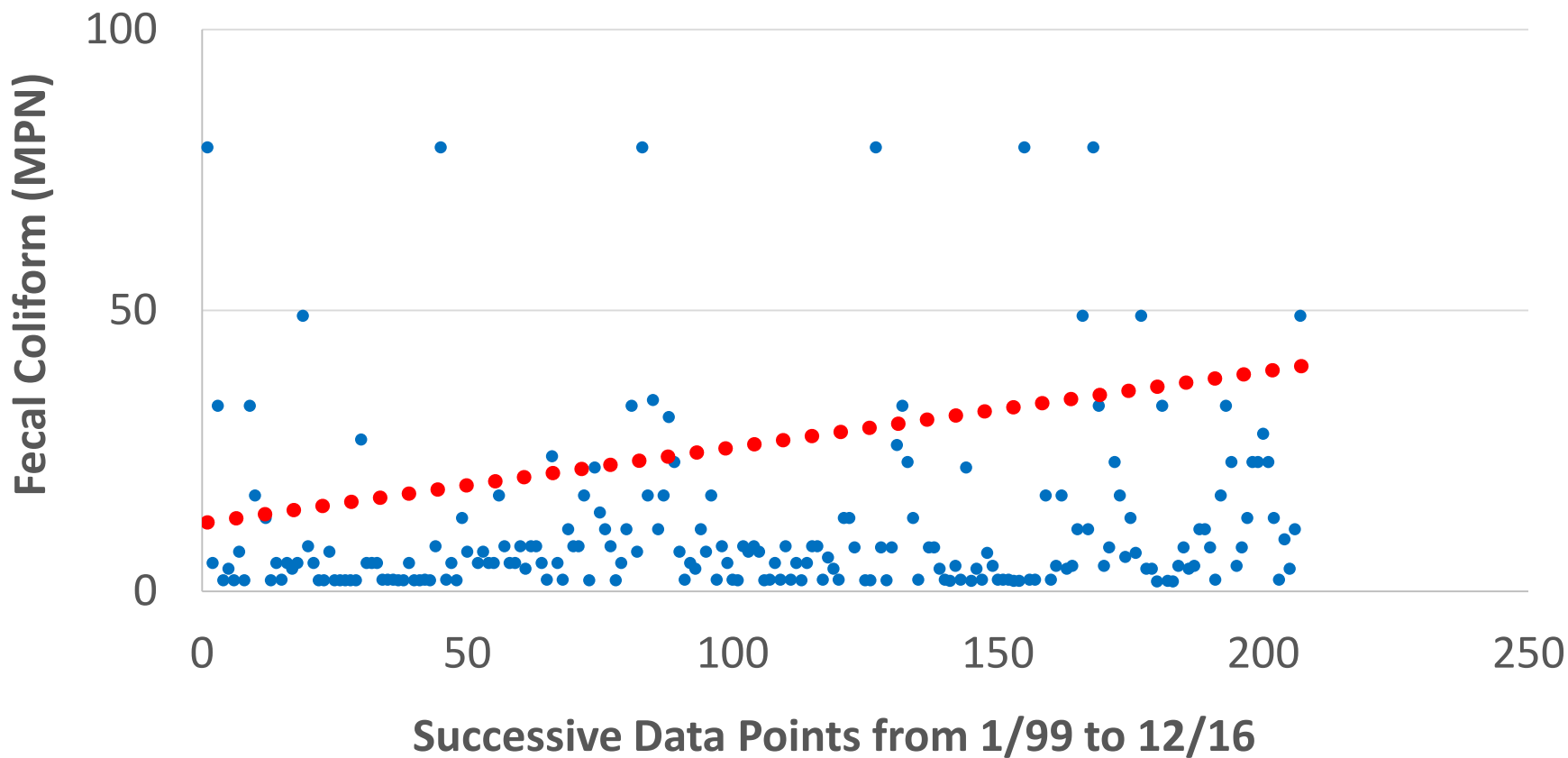
Habersham Creek Station 17-16A (n=207)



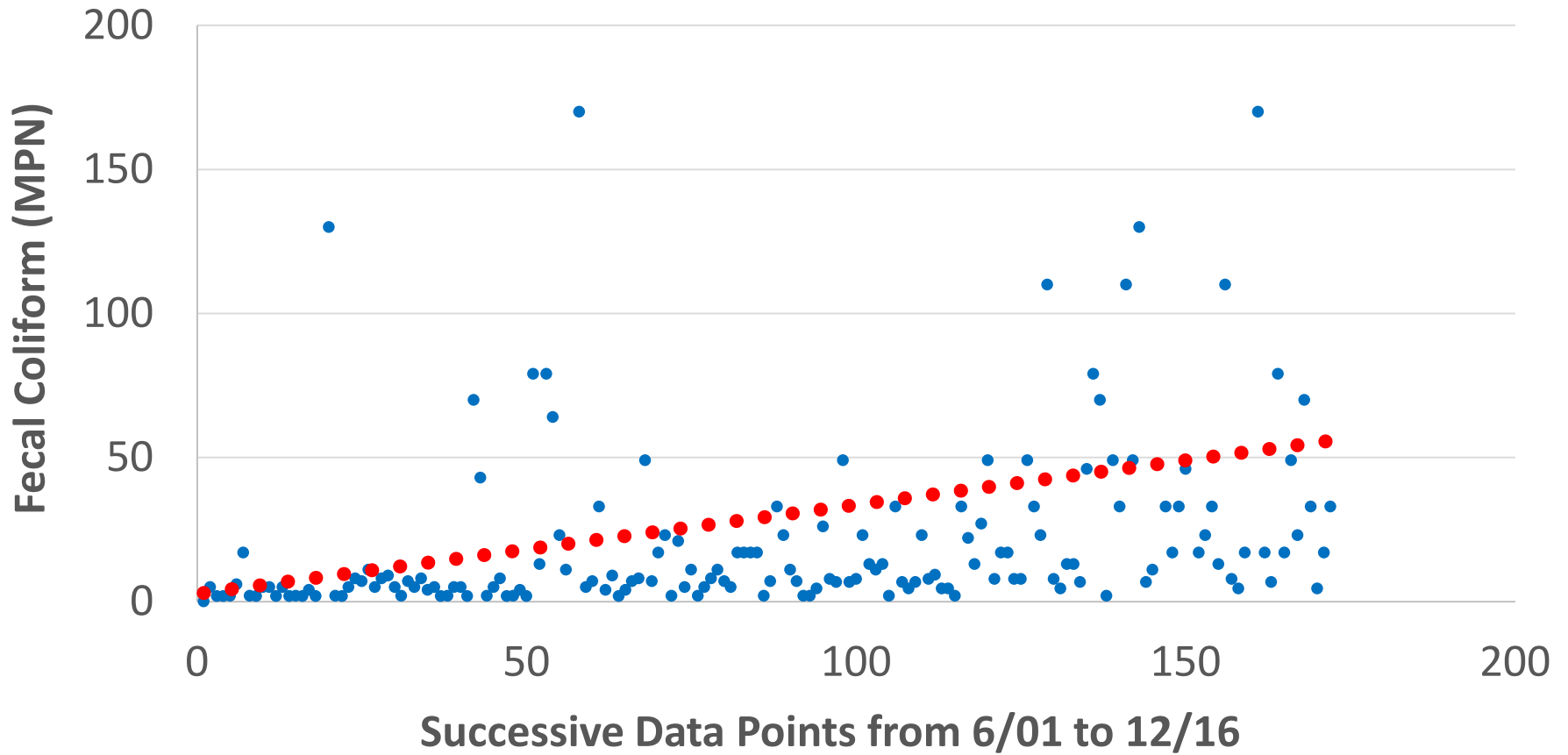
Battery Creek Station 15-19 (n=207)



Campbell Creek at Whale Branch River Station 14-02 (n=207)



Hazzard Creek, Jasper Co. Station 17-25 (n=172)



SCOPE OF SERVICES FISCAL YEAR (July 2018 to June 2019)

“Historical Analysis of Water Quality and Climate Change Endpoints and Monitoring of Natural Resources in the May River – A Pilot Study for Other Watersheds in Beaufort County”

The Scope of Services in this MOU Addendum between the Town of Bluffton and USCB (specifically the Marine Sensory and Neurobiology Lab or USCB-MSNL and the USCB Water Quality Lab or USCB-WQL) includes those activities specified in sections A-E below.

Note: The May River has been chosen for this pilot study because Dr. Montie has been working in this watershed since 2011. The goal will be to focus data mining, statistical analysis, and natural resource monitoring in the May River during the 2018-2019 funding cycle with historical comparisons of water temperature, fecal coliform, and salinity levels to the Okatie River, Broad Creek, and Battery Creek. This focused approach will allow us to formalize our data mining approach and statistical methodology that can then be applied to all watersheds in Beaufort County as future work.

A. Historical Analysis of SCDHEC Shellfish Monitoring Data

1. For each SCDHEC Shellfish Monitoring station in the May River, a historical evaluation will be completed of existing parameters (**i.e., water temperature, fecal coliform, and salinity levels**) from 1999 to 2016. Statistical analysis (i.e., regression analysis) will be performed for each parameter at all monitoring stations.
2. From these data, USCB will determine how these parameters changed over the years and what monitoring stations have undergone the most degradation.

B. Understanding Factors that Influence Fecal Coliform Levels

1. USCB will determine what factors have influenced fecal coliform levels in the May River. Initial factors will include temporal parameters (e.g., year, season, month, lunar phase, tidal phase), geographical parameters (e.g., sampling station, distance from the mouth of the May River, width of river, depth), and environmental data (e.g., water temperature, rainfall, salinity levels, dissolved oxygen, pH). This will be accomplished using specific statistical methods (i.e. General Linear Models).
2. USCB may also explore how changes in human activities have affected fecal coliform levels in the May River by incorporating growth parameters (e.g., population, the amount of impervious surface, forested land).
3. This type of data analysis may help explain why sudden changes in fecal coliform levels appear at certain monitoring stations and could provide some insight into developing more effective best management practices (BMPs).

C. Mining of Other Historical Chemical, Physical, and Biological Data

1. USCB will use the Water Quality Portal to **explore** data sets (NWIS, BioData, Stewards, STORET) for other chemical, physical, and biological parameters in the May River other than fecal coliform. A historical evaluation of some these existing parameters (**e.g., DO and pH**) will be completed if they exist.
2. This type of data analysis may help identify other problematic water quality issues beyond fecal coliform that may affect human health and our natural resources including oysters, shrimp, blue crabs, fish, and bottlenose dolphins.

D. Comparing Historical Data of the May River to Other Watersheds

1. USCB will perform a historical evaluation of **water temperature, fecal coliform, and salinity levels** in the Okatie River, Broad Creek, and Battery Creek, and these changes will be compared to the May River.
2. We understand the importance of performing this work for **all watersheds in Beaufort County** as well as performing comparative analysis to identify what water quality parameters and what watersheds have undergone the most drastic change. However, this detailed analysis is outside the scope of the 2018-2019 work outline. Future work would focus on comparative and statistical analysis of water quality parameters (i.e., fecal coliform, salinity, water temperature, DO, and pH for all watersheds in Beaufort County (i.e., if they exist).

E. Novel Techniques to Monitor Our Natural Resources in the May River

1. Monitoring Environmental Data. Since 2013, USCB-MSNL has been monitoring water temperature and depth continuously using HOBO loggers at three stations. Since 2015, USCB-MSNL has been monitoring salinity, pH, and dissolved oxygen bi-monthly at six stations. USCB will continue these measurements.
2. Monitoring Fish Spawning. Since 2013, USCB-MSNL has been acoustically monitoring fish spawning aggregations of silver perch, black drum, spotted seatrout, and red drum in the May River. USCB-MSNL will continue to monitor these spawning aggregations and will document any changes in these aggregations.
3. Monitoring Juvenile Invertebrates and Fish. In 2016, USCB-MSNL initiated a seining program of tidal pools, creeks, and shorelines in the May River to determine the diversity, yearly abundance, and growth patterns of fish species. USCB-MSNL will continue this seining program and will document any changes in abundance and growth patterns.
4. Monitoring Bottlenose Dolphins. In 2015, USCB-MSNL initiated a bottlenose dolphin monitoring program to document changes in seasonal and yearly abundance, distribution, residency, and health of these apex predators in the May River. USCB-MSNL will continue this program and document any changes.

Table 1. Sampling strategy for environmental parameters, invertebrates, fish, and bottlenose dolphin monitoring in the May River, SC.

	No. of Stations	Sampling Frequency	Laboratory Personal
Water temperature and depth	3	Every 20 min	0
Salinity, pH, DO	6	Bimonthly	2
Acoustic sampling	3	Every 20 min	0
Seining	6	Monthly	4
Bottlenose dolphin surveys	NA	Bimonthly	2

Budget

The budget for the 2018-2019 funding cycle is \$30,000 which covers supplies and salary for employees.

Laboratory Contacts:

<u>Title</u>	<u>Name</u>	<u>Contact</u>
Laboratory Director of USCB-MSNL	Dr. Eric Montie	Office: 843-208-8107
Laboratory Director of USCB-WQL	Dr. Alan Warren	Office: 843-208-8338
Laboratory Manager of USCB-MSNL	Agnieszka Monczak	Office: 843-208-8192
Field Manager of USCB-MSNL	Bradshaw McKinney	Office: 843-208-8192
Laboratory Manager of USCB-WQL	Danielle Mickel	Office: 843-208-8193
Water Quality Analyst of USCB-WQL	Michael Monday	Office: 843-208-8193

Historical Analysis of Water Quality and Climate Change Endpoints and Monitoring of Natural Resources in the May River – A Pilot Study for Other Watersheds in Beaufort County



Eric W. Montie, M.S., Ph.D., and Alan Warren, M.P.H., Ph.D.

Departments of Natural Sciences and Health Promotion

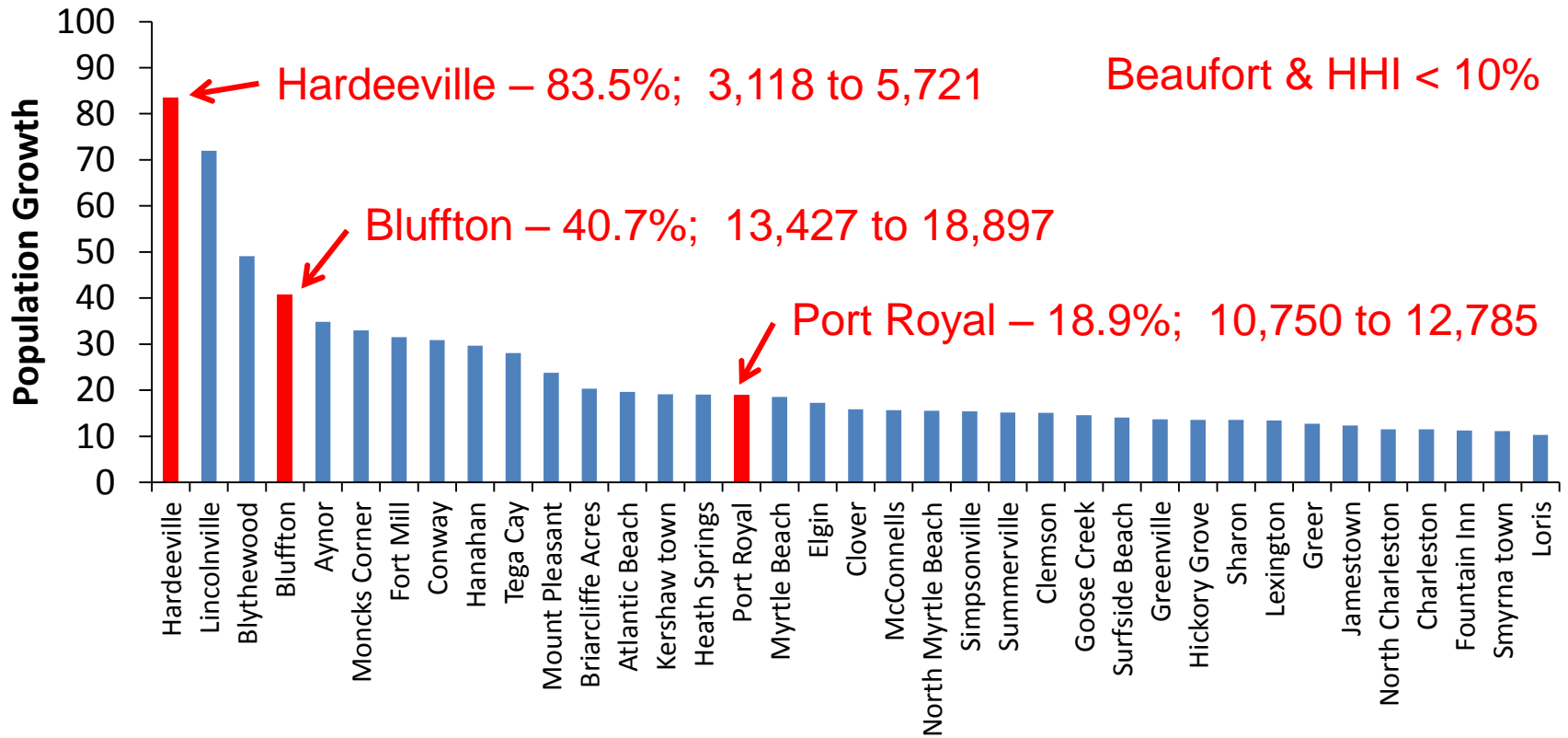
USCB Marine Sensory and Neurobiology Lab

USCB Water Quality Lab

University of South Carolina Beaufort

Hardeeville and Bluffton – Fastest Growing Cities in SC from 2010 to 2016

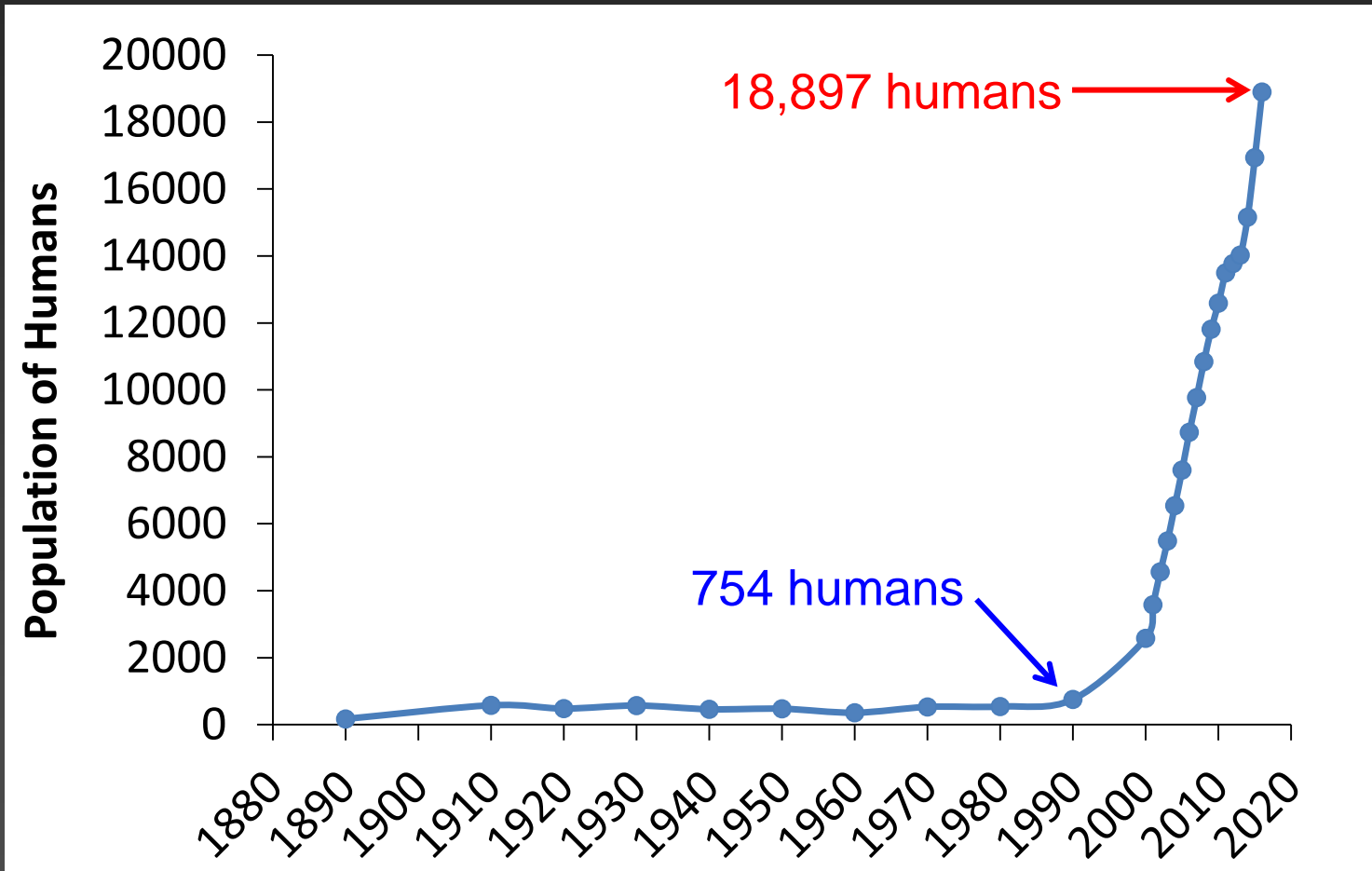
SC Cities with Greater Than 10% Growth Rates



United States Census Bureau

<https://www.census.gov/programs-surveys/popest/data/data-sets.html>

Exponential Growth of Bluffton



United States Census Bureau

<https://www.census.gov/programs-surveys/popest/data/data-sets.html>

Development of May River and Okatie River Watersheds from 1990 to 2016



With Population Growth and Development Comes Increased Stress to the May River

Habitat loss



Fecal coliform pollution



Noise Pollution



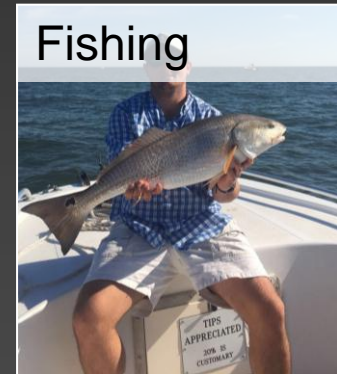
Stormwater runoff



Alteration to shoreline habitat



Fishing



Microplastics



Boat interactions



Pharmaceuticals



Need for Historical Analysis and Long-term Monitoring of Water Quality, Climate Change Endpoints, and Our Natural Resources

Where are we and where are we going?

REVISED MAY RIVER WATERSHED ACTION PLAN:

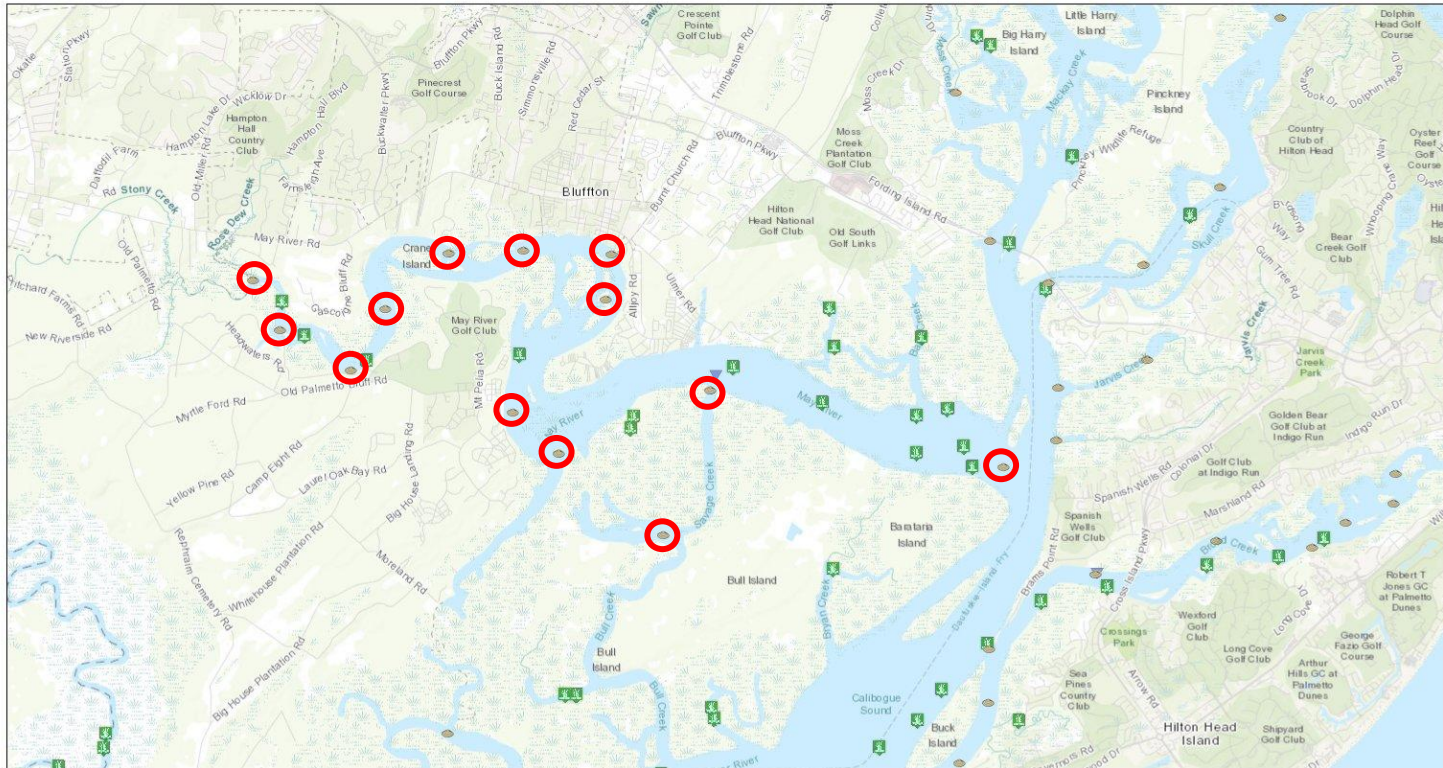
4. Establish new partnerships (e.g., USCB, USGS) to perform in situ long-term monitoring of climate change endpoints such as depth (sea level rise), rainfall, temperature, salinity, conductivity, dissolved oxygen, pH, and possibly chlorophyll and dissolved organic matter.
 - a. Time-series analysis of Fecal Coliform “hot spot” data and Microbial Source Tracking within the May River Watershed.
5. Establish new partnerships (e.g., USCB) to perform long-term monitoring of natural resources in the May River.

Proposed Scope of Work

- A. Historical Analysis of SCDHEC Shellfish Monitoring Data**
- B. Understanding Factors that Influence Fecal Coliform Levels**
- C. Mining of Other Historical Chemical, Physical, and Biological Data**
- D. Comparing Historical Data of the May River to Other Watersheds**
- E. Novel Techniques to Monitor Our Natural Resources in the May River**

A. Historical Analysis of SCDHEC Shellfish Monitoring Data

SCDHEC Monitoring Stations in the May River

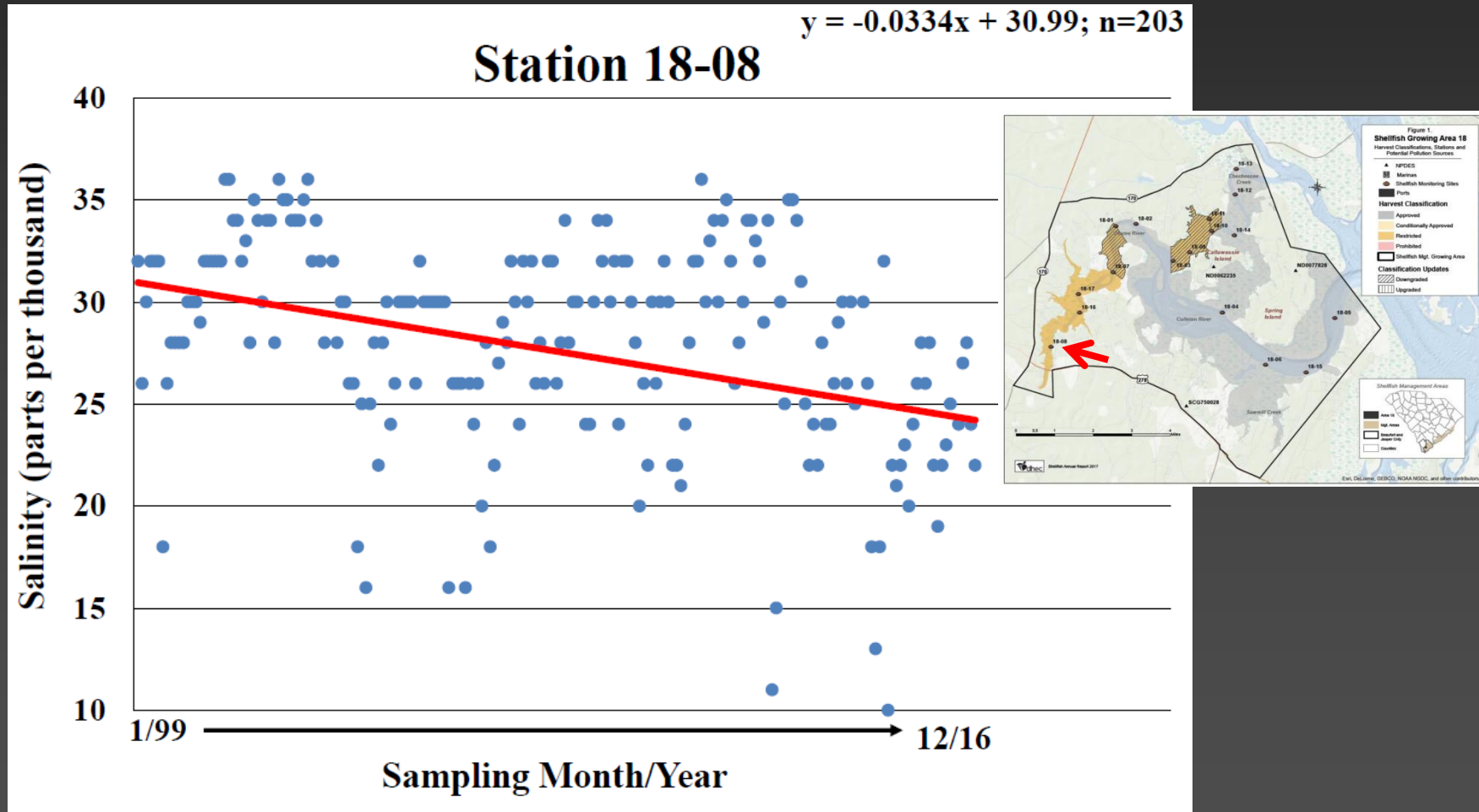


Perform Time Series Analysis from 1999 – 2017:

1. Water temperature
2. Salinity
3. Fecal coliform

A. Historical Analysis of SCDHEC Shellfish Monitoring Data – Okatie River Example

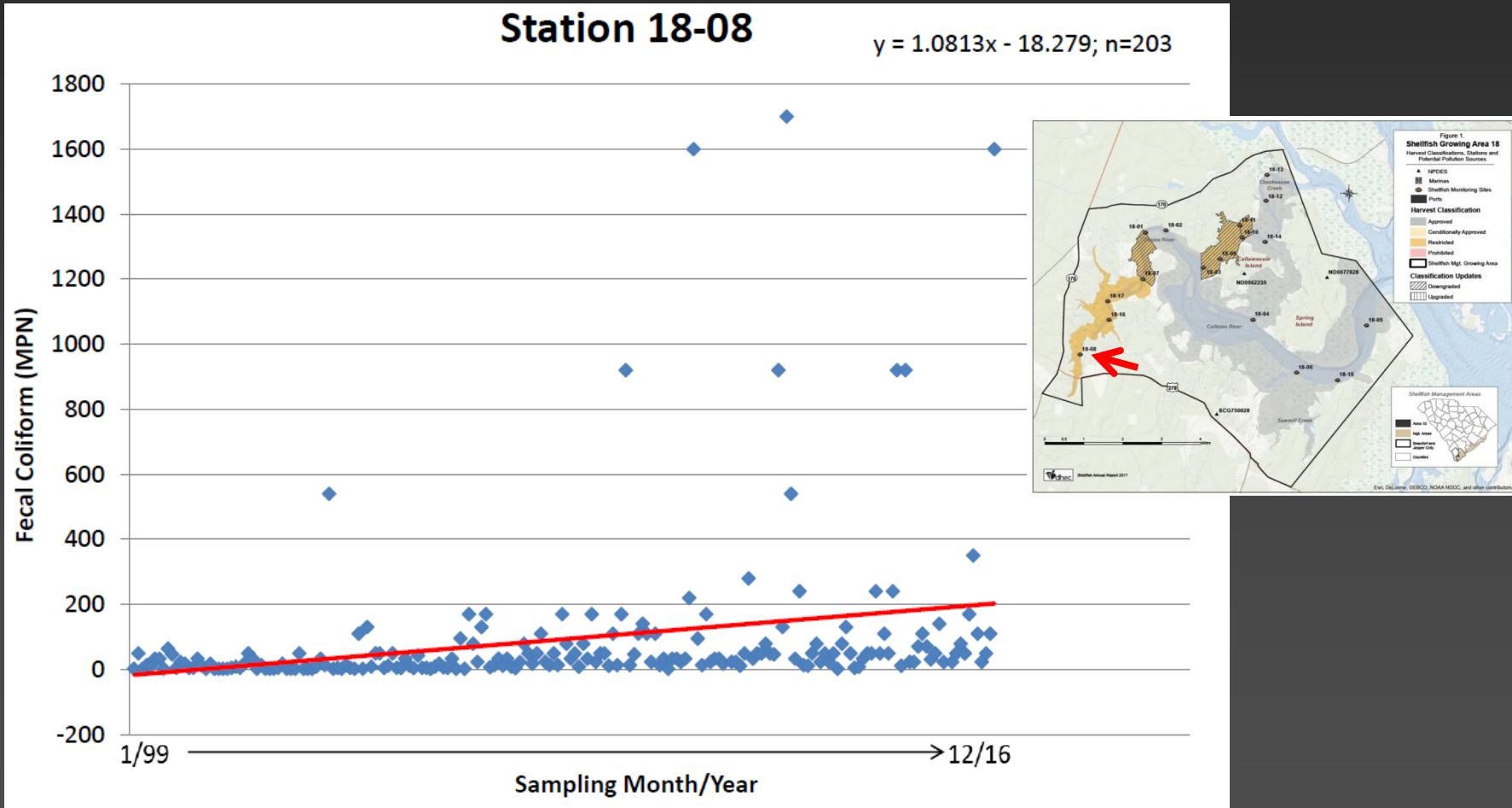
Historical Salinity Data



**Prepared by Alan Warren using SCDHEC Shellfish Monitoring Data.*

A. Historical Analysis of SCDHEC Shellfish Monitoring Data – Okatie River Example

Historical Fecal Coliform Data



**Prepared by Alan Warren using SCDHEC Shellfish Monitoring Data.*

B. Understanding Factors that Influence Fecal Coliform Levels in the May River

Temporal Parameters

- Year
- Season
- Month
- Lunar phase
- Tidal phase

Geographical Parameters

- Sampling station
- Distance from mouth
- Width of river
- Depth



Environmental Parameters

- Water temperature
- Rainfall
- Salinity
- Dissolved oxygen
- pH

Human Parameters

- Population
- Impervious surface
- Forested land
- BMP installments

*Use publicly available data from STORET, NWIS, STEWARDS

C. Mining of Other Historical, Chemical, and Biological Data from the May River

The screenshot shows the homepage of the National Water Quality Monitoring Council (NWQMC) Water Quality Portal. The page features the NWQMC logo and tagline "Working together for clean water". Below the header, there is a section titled "Water Quality Portal" with a description: "The Water Quality Portal (WQP) is a cooperative service sponsored by the United States Geological Survey (USGS), the Environmental Protection Agency (EPA), and the National Water Quality Monitoring Council (NWQMC). It serves data collected by over 400 state, federal, tribal, and local agencies." The main content area is divided into three columns. The left column is titled "DOWNLOAD DATA" and includes a link to "Download water-quality data in Excel, CSV, TSV, and KML formats." The middle column is titled "HOW TO USE THE WQP" and includes links for "User Guide", "Web Services Guide", "FAQs", and "Upload Data". The right column is titled "NATIONAL RESULTS COVERAGE" and includes a link to "Water-quality data in your state." Below this, there is a section titled "ABOUT THE WQP" with links for "What is the WQP?", "Contributing organizations", "Other Water Quality Portals", and "Explore WQP Sites". The footer of the page includes a "Contact us" link and logos for USGS and EPA.

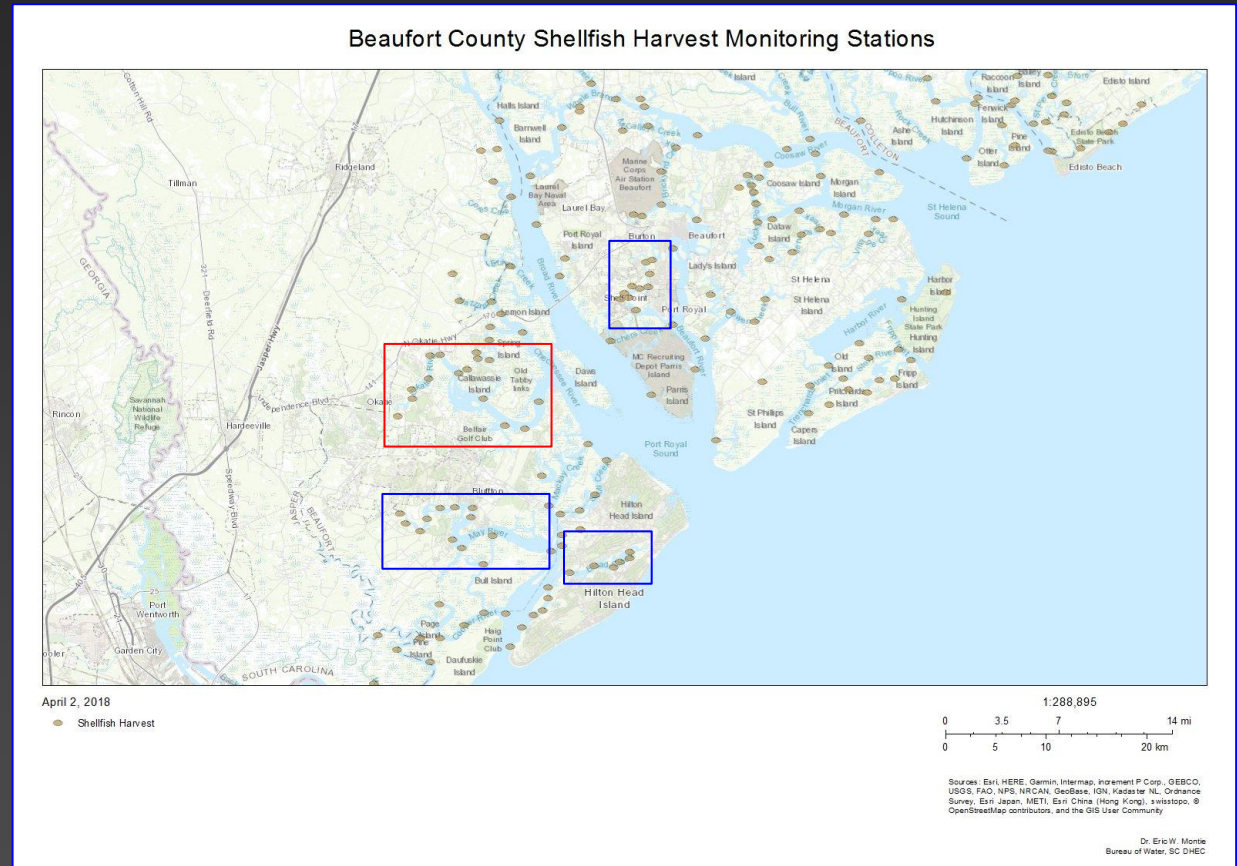
This type of data analysis may help identify other problematic water quality issues beyond fecal coliform that may affect human health and our natural resources including oysters, shrimp, blue crabs, fish, and bottlenose dolphins.

*Use publicly available data from STORET, NWIS, STEWARDS

<https://www.waterqualitydata.us/>

D. Pilot Study - Comparing Historical Data of the May River to Other Watersheds

1. We will perform a historical evaluation of water temperature, fecal coliform, and salinity levels for the Okatie River, Broad Creek, and Battery Creek and compare to the May River.
2. Future work — Analysis of all watersheds in Beaufort County.



*Map created using SC Watershed Atlas <https://gis.dhec.sc.gov/watersheds/>

*Use publicly available data from STORET, NWIS, STEWARDS <https://www.waterqualitydata.us/>

E. Novel Techniques to Monitor Our Natural Resources in the May River

1. *Monitoring Fish Spawning*

- *Seasonal timelines of spawning each year*
- *Total hours of chorusing/yr*



2. *Monitoring Invertebrates and Fish*

- *Diversity*
- *Appearance in the estuary*
- *Abundance*
- *Lengths and seasonal growth curves*



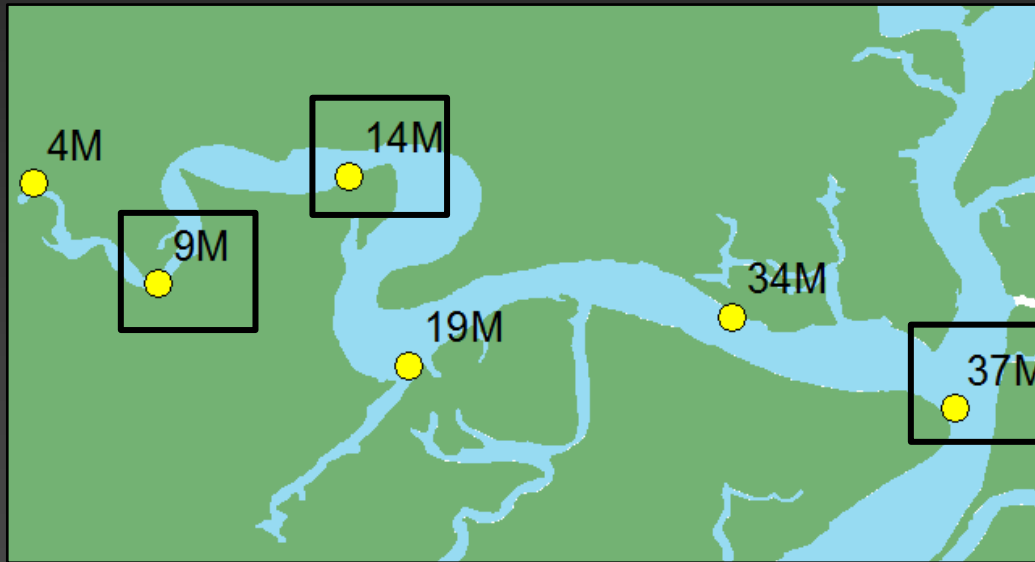
3. *Monitoring Bottlenose Dolphins*

- *Total abundance*
- *Mother/calf pairs*
- *Distribution*
- *Residents vs. migrants*
- *Health*



E. Novel Techniques to Monitor Our Natural Resources in the May River

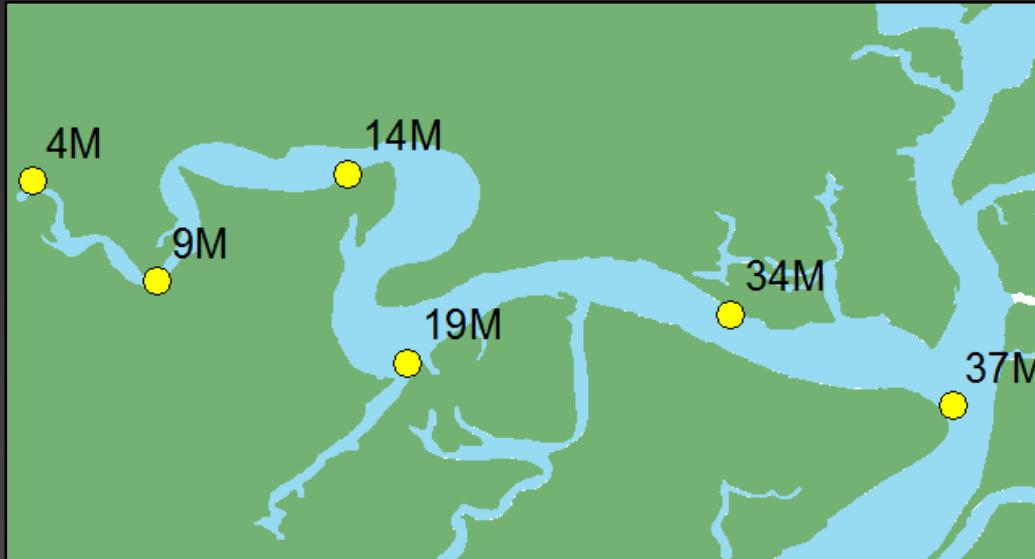
1. Monitoring Fish Spawning – Deployment of Acoustic Recorders



Yellow = bimonthly water quality; **black** = current acoustic stations

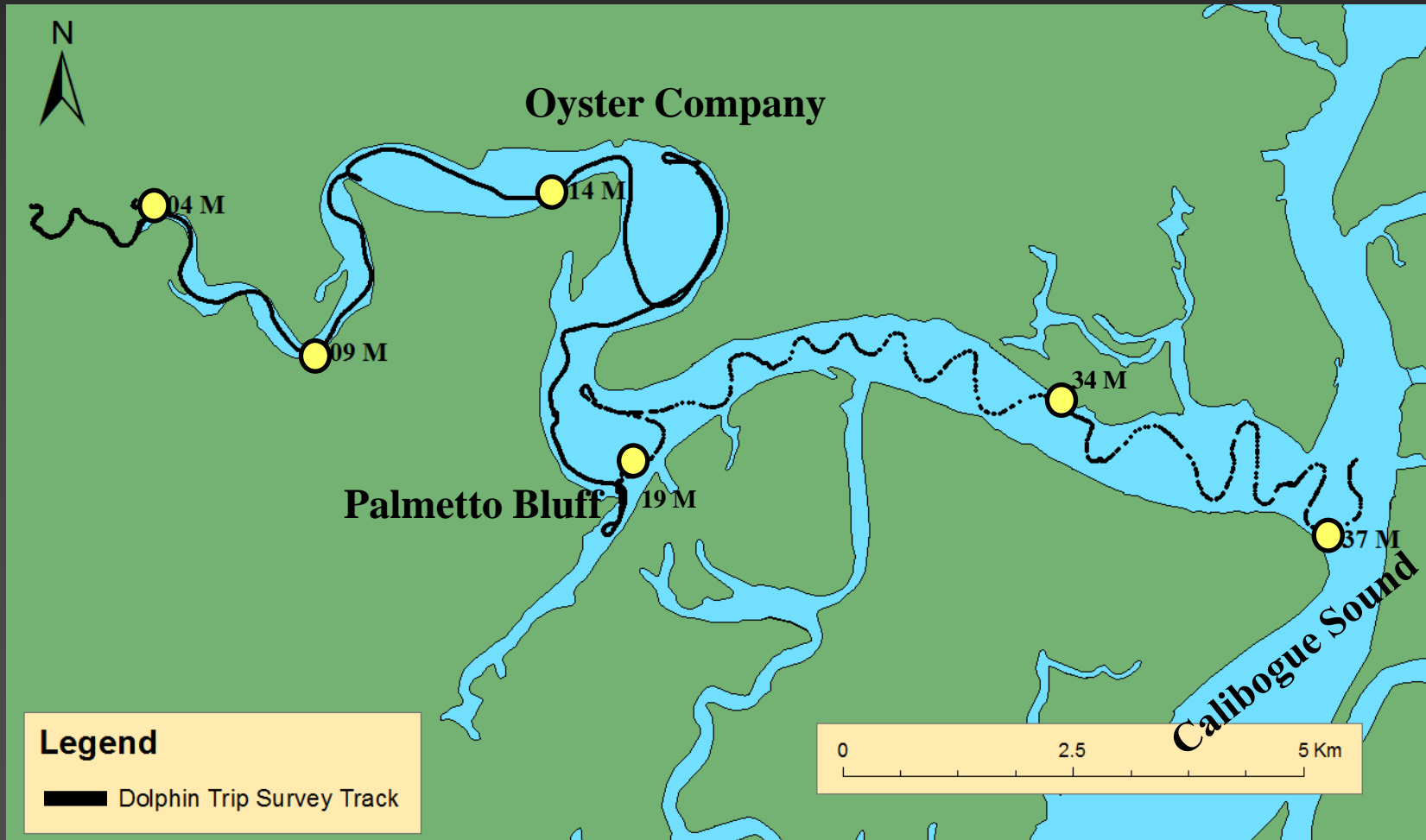
E. Novel Techniques to Monitor Our Natural Resources in the May River

2. Monitoring Invertebrates and Fish – Monthly Seining Surveys



E. Novel Techniques to Monitor Our Natural Resources in the May River

3. Monitoring Bottlenose Dolphin – Bimonthly Boat Surveys



USCB Marine Sensory and Neurobiology Lab



Lab Manager
(Agnieszka Monczak)



Field Manager
(Bradshaw McKinney)



Graduate Students
(Alyssa Marian)

Interns
(Jamileh Soueidan, Eva May)

USCB Students
(Ashlee Seder, Jake Morgenstern, Shaneel Bivek, Austin Roller, Caleb Shedd)

Funding Request for 2018-2019

Budget

USCB-MSNL supplies and salaries for employees \$30,000

- No funding request for USCB-WQL.
- No funding request for Montie salary.