

**Proposal
For a**

BEAUFORT COUNTY SALINITY STUDY

Proposed by:

**South Carolina Department of Natural Resources
Marine Resources Division
217 Ft. Johnson Rd.
Charleston, SC 29412**

and

**University of South Carolina – Beaufort
Sponsored Awards Management
901 Sumter Street, 5th Floor
Columbia, SC 29208**

Submitted to:

**Beaufort County
P.O. Drawer 1228
Beaufort, SC 29901**

BEAUFORT COUNTY SALINITY STUDY

Introduction: Beaufort County and the Town of Bluffton are concerned about stormwater runoff and the impacts on receiving water bodies. They have conducted a number of studies to assess these impacts, particularly as it relates to pollutant concentrations, especially bacterial concentrations. Beaufort County has also implemented stormwater standards to mitigate these impacts. Beaufort County, in collaboration with the Town of Bluffton, is now working toward adding additional Best Management Practices (BMPs) to ensure that water quality is maintained and shellfish bed closures are minimized or reduced from current conditions. Primary efforts are focused on three watersheds over the next five years. The watersheds of interest to the County are Battery Creek, Okatie River and May River. The Town of Bluffton's efforts are focused only on the May River. Each of these systems has restricted shellfish harvesting in a portion of their upper waterways. One of the key factors missing from their studies to date is an understanding of the relationship between rainfall and the volume of freshwater runoff entering these tidal creek systems, as well as how that water translates downstream.

Ultimate Goal of Beaufort County and Town of Bluffton: Define appropriate measurement criteria for volume sensitive waters. Define the extent of volume sensitive waters for selected watersheds, with an ultimate goal of being able to define the area of volume sensitive waters for all watersheds in Beaufort County. Identify potential biological effects of major rain events in volume sensitive waters (not covered in this proposal).

Purpose of This Effort: To assess the relationship between rainfall, water level, and salinity range throughout the upper portions of these watersheds in order to better define what portion of the watersheds should be considered volume sensitive.

Participants: This effort is a cooperative program involving Beaufort County, the Town of Bluffton, the SC Department of Natural Resources, Marine Resources Division (SCDNR-MRD) and University of South Carolina-Beaufort (USCB). The SCDNR Waddell Mariculture Center, which is part of the Marine Resources Division, is located in Beaufort County and has a wide range of expertise and facilities to assist Beaufort County. In particular, Waddell staff will participate in this project by collecting the rainfall, salinity and temperature data for a number of the systems. This local staffing capability will be complemented by staff from the Marine Resources Research Institute (MRRRI) in Charleston. USCB is currently conducting a research project investigating spawning aggregations of Sciaenids using passive acoustics (i.e., the act of listening to underwater sounds). This effort has collected environmental sampling at 30 stations throughout the May River. This monitoring provides a leveraging opportunity to expand to more continuous salinity and temperature data collections. The Town of Bluffton will also be involved in the project given their existing efforts which will provide some historical data that can be analyzed as well as rainfall data for the May River watershed. The National Oceanic and Atmospheric Administration's (NOAA) Hollings Marine Laboratory will also participate in the modeling of stormwater runoff.

Study Design: The proposed study outlined here will monitor the salinity, temperature, depth, and rainfall within several watersheds. The identified watersheds include the (1) upper Okatie River (Waddell monitored), (2) Burton/Grober branch of Battery Creek (Waddell monitored), (3) County complex branch of Battery Creek (Waddell monitored), and (4) upper May River (USCB monitored). After the data from the first year are analyzed, expansion of the sampling effort to other important drainage systems within the county or additional new studies may be proposed.

Each system will be monitored for a period of time to capture a range of rainfall events. The time period is expected to be at least three months with review of the range of rainfall events captured during the initial 3 month period. In addition, an analysis of May River and EMPACT (an EPA-funded Charleston Harbor tidal creek study) will then identify the appropriate number and ranges of events to capture within each system. Sampling sites in each creek system will be established from the headwaters to a downstream location that should extend into what should be considered volume "insensitive" waters. The downstream location will be identified based on previous data such as shellfish bed harvesting classification change, an indication that the system is no longer volume sensitive. Six sites will be equally distributed down the system (dependent on available deployment locations). At each site, a salinity/temperature data logger will be installed near the bottom of the water column. In addition, a depth sensor will be installed to monitor tidal stage at a minimum of one location. A rain gauge will be installed at a central location during the period each watershed is sampled. If one rain gauge is already established in the system, the second gauge will be placed at the other end of the system, when possible. Due to the limited funding, only the May River and one other watershed will be sampled simultaneously. Once a sufficient data set has been obtained in a watershed, the instrumentation will be retrieved and re-deployed in the next watershed (except for the May River).

Data analysis will include relating rainfall to salinity range or another measure of salinity variance and comparing the six sites to see how the precipitation-induced freshet translates downstream with respect to duration and extent of salinity change attributable to that rainfall event. The six sites in each system will provide us with a fine scale distribution of the salinity change thereby providing information for the determination of volume sensitivity. The stormwater runoff will be modeled by Anne Blair of the NOAA Hollings Marine Laboratory using a modified NRCS method to provide an estimate of the expected runoff due to varying soil conditions.

Data analysis will be conducted on existing data sets, if appropriate, from previous studies in the May River, Okatie River, and Charleston Harbor EMPACT creeks. Analysis of the mined data sets will be similar to the analysis of the new data and will be compared to the results of the proposed studies.

SCDNR Responsibilities: The SCDNR-MRD will be responsible for sampling the (1) upper Okatie River, (2) Burton/Grober branch of Battery Creek, (3) County complex branch of Battery Creek. Sampling in each system will be a minimum of 3 months. Waddell staff will monitor the rainfall, salinity, temperature, and depth in each systems for a minimum of 3 months (as outlined above) using a series of HOBO recording devices. Six sites will be located in each of the systems based on existing shellfish monitoring sites and access to record salinity and temperature at 30 min intervals on a continuous basis. One of the sites will also be monitored for tidal height, and a centralized location in each drainage system will be monitored continuously for rainfall. Sampling locations will generally be visited by staff at two-week intervals to download data. Figures 1-3 indicate the rough locations of sampling devices in the three systems that the sampling units will be moved between.

USCB Responsibilities and Feasibility: USCB will be responsible for sampling the May River in association with their existing efforts. They will measure rainfall levels at station 19-19 and temperature/salinity at 11 stations (red dots) using HOBO recording devices. Six of the sites in the upper May River will have continuous deployment of salinity/temperature gauges for the required time period. The other sites may be monitored less frequently. At three stations, water level will be measured. Sites will be located in this system based on existing shellfish and fish acoustic monitoring sites and access (Figure 4).

Currently, USCB has 11 salinity/temperature HOBO loggers and 3 water level HOBO loggers that are being used for a fish acoustics project and collecting data at the stations indicated (Figure 4). Thus, these data will be available for the current research on stormwater runoff. This equipment totals \$10,980.

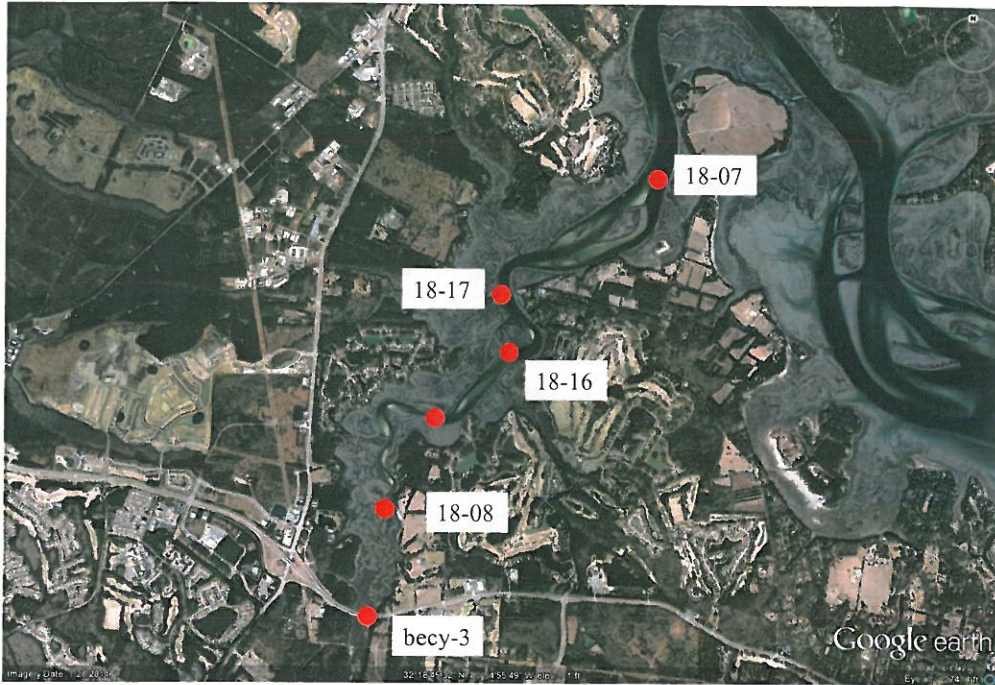


Figure 1. Approximate locations for the Okatie River sampling sites. The shellfish monitoring stations are designated.



Figure 2. Approximate locations for the county complex branch of Battery Creek sampling sites. The shellfish monitoring stations are designated.



Figure 3. Approximate locations for the Burton/Grober branch of Battery Creek sampling sites. The shellfish monitoring stations are designated.



Figure 4. Approximate locations for the May River sampling sites. The shellfish monitoring stations are designated with numbers.

SCDNR Budget

Category	Base Rate	Beaufort County		DNR Match	
		#@mo	Total	#/mo	Total
Personnel		2@1.5	8,508	1@1	5,064
Fringe (35%)			2,978		1,772
Indirect (12.05)			0		1635
Vehicle	0.505	744 mi	376		
Supplies			4,947		2,391
SCDNR Grand Total			16,808		10,862

Budget Justification: SCDNR will purchase one rain gauge, two salinity/temperature sensors, and software to download data. County will purchase remaining 4 salinity/temperature sensor, depth sensor, and data shuttle device.

USCB Budget

	Beaufort County
SALARIES with Fringe	
Personnel	5,192
TOTAL	5,192
SUPPLIES	
Supplies	3,000
TOTAL	3,000
Total Direct Costs	8192
TOTAL FUNDS REQUESTED	8,192

Budget Justification: Supplies include fuel for boat and gear for deployment of loggers.