Monitoring to Establish Reference Conditions for Nutrients and Algal Conditions in Estuarine and Coastal Water Bodies

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PREFACE

Mississippi Department of Environmental Quality (MDEQ), supported by funding from Grant Number MX974432-02, worked to support the U.S. Environmental Protection Agency's (USEPA) initiative to develop nutrient criteria for the Nation's water bodies. USEPA developed a National strategy which described the Agency's approach in developing nutrient information to help the States adopt nutrient criteria as part of their water quality standards. In support of this initiative, MDEQ monitored the Mississippi coastal waters and gathered data to support development of nutrient criteria. MDEQ conducted sampling in the states' coastal and estuarine water bodies under monitoring efforts that included monitoring at fixed stations, beach monitoring, National Coastal Assessment monitoring and special projects monitoring. The study funded by this grant continued the monitoring activity focusing on estuarine and coastal waters where nutrient data were needed. The Mississippi coastal waters were monitored over several annual cycles and the data were analyzed and used to develop preliminary approaches for development of nutrient criteria for the Mississippi Coastal Waters.

A preliminary evaluation of these data was conducted to determine if water body classification, with specific nutrient criteria, would enhance the protection of the designated uses within MS coastal and estuarine waters. Box and whisker plots were used to assess difference among sites based on different areal regions and major hydrologic subunit. Based on the preliminary analyses, chlorophyll concentrations do not appear to be statistically different across the Mississippi Sound even though differences in salinity and total suspended solids exist, regardless of the classification scheme. Nitrate concentrations are different among different zones with both classification schemes even though Total Kjeldahl nitrogen concentrations are relatively similar regardless of the classification scheme.

Recommendations on additional sampling sites were conducted during 2007 monitoring to obtain quality assured chlorophyll and associated water quality data for use in developing effects-based nutrient criteria. These data were included in this final report.

PART I: INTRODUCTION AND BACKGROUND

PROBLEM DEFINITION AND BACKGROUND

Nutrient overenrichment is a common thread that ties together a diverse suite of coastal problems such as red tides, fish kills, some marine mammal deaths, outbreaks of shellfish poisonings, loss of seagrass and bottom shellfish habitats, coral reef destruction, and hypoxia and anoxia now experienced as the Gulf of Mexico's "dead zone." Additionally, recent evidence suggests that nutrient enrichment can exacerbate human health effects. Nutrient overenrichment is often preceded by primary symptoms (e.g., an increase in the rate of organic matter supply, changes in algal dominance and loss of water clarity).

USEPA has developed a National strategy that describes the Agency's approach in developing nutrient information to help the States adopt nutrient criteria as part of State water quality standards. In support of this initiative, the Mississippi Department of Environmental Quality (MDEQ) is aggressively moving forward to develop clear numerical criteria that will allow discernment of natural nutrient concentrations from heightened anthropogenic concentrations in water bodies where increased nutrients may cause harm to the quality, usability or ecological health of the State's water bodies.

An expanded definition of estuaries is used for this project. Estuaries are defined as semi-enclosed coastal water bodies which have a free connection to the open sea and within which sea water is measurably diluted with freshwater derived from the land. However, to accommodate the full range of diversity, the classical definition is expanded to include coastal mixing near the Mississippi River, and wetlands (e.g., coastal marshes).

An annual cycle of water quality sampling for Mississippi's estuaries and coastal waters was initiated during June 2003 under funding from Gulf of Mexico Program Office and the Coastal Impact Assistance Program. The funding provided by this grant supported a second annual cycle of water quality sampling for these water bodies.

Purpose and Scope

The purpose of this study was to gather additional data on seasonal variations of nutrients and other water quality parameters in the estuarine waters for use in developing numeric nutrient criteria for estuaries and coastal waters. These data provided needed data and allowed better determination of nutrient levels in the coastal waters. The project was intended to facilitate a better understanding of cause-and-effect relationships in these complex systems.

Approach

The work outlined for this project included historical water quality data gathering and analysis, water quality monitoring, laboratory analyses, database development and analyses, and development of reference conditions for the estuarine and coastal water bodies. Water quality data was collected from water bodies in the Mississippi Coastal Region to support Mississippi's nutrient criteria initiative.

This project involved the collection of data on total phosphorus (TP) and total nitrogen (TN) as primary causal variables of eutrophication, and measures of algal biomass (e.g., chlorophyll *a* for phytoplankton and ash-free dry weight for macroalgae) and a measure of water clarity (e.g., Secchi depth or electronic photometers) as primary response variables. In addition, for those water bodies that have hypoxia or anoxia problems, dissolved oxygen data was collected as a primary response variable.

PROJECT/TASK DESCRIPTION

The MDEQ established a Nutrients Task Force of independent scientists and engineers to evaluate data from the State water bodies and recommend nutrient criteria. This task force reviewed existing databases for Mississippi's estuaries and coastal, and wetlands water bodies and determined that additional physical, chemical, and biological data are needed to recommend defensible nutrient criteria. The work involved conducting nutrient and chlorophyll-a assessments in Mississippi estuaries and coastal water bodies to support development of nutrient criteria for these water bodies.

Historical Data Evaluation

Historical data evaluations were performed during the first phase of sampling in these water bodies. MDEQ and other State and Federal agencies have nutrient water quality data. These sources were the basis for an initial data search. In many cases, water quality information resides in more than one State and Federal agency. Some historical databases have been obtained with limited data from the estuarine and coastal water bodies. In addition, the work performed under the EPA Northern Gulf Nutrient Pilot Study Project was helpful in providing data and assessments by screening existing U.S. EPA Legacy Storage and Retrieval (STORET) and Ocean Data Evaluation System (ODES) databases for information with respect to the four initial parameters, and dissolved oxygen. Historical databases for MDEQ include the Ambient Fixed Station Network, Basinwide Network, Coastal 2000, Beach Monitoring Network, and special studies monitoring. All of these databases were evaluated along with the data collected during this study.

Historical information is important to establish a perspective on the condition of a given water body. Has its condition changed radically in recent years? Is the system stable over time? What is the variability? Has there been a trend up or down in trophic condition? Only an assessment of the historical record can provide these answers. Valid historical information is particularly important to coastal and estuarine nutrient criteria development because of the difficulty in establishing classes and the scarcity of reference water bodies.

Sampling Approach

One of the most prominent indicators of coastal environmental stress is estuarine water quality, particularly with respect to the inputs of nutrients. Nutrient concentrations and biological indicators was characterized for the Mississippi estuaries and coastal water bodies by sampling these water bodies to determine existing conditions and trends. Sampling of the Mississippi Sound estuarine systems and sub-systems were conducted at both routine and variable intervals over annual cycles. This sampling approach provided information on seasonal conditions as well as attempt to characterize peak concentrations observed during the annual cycle such as those associated with the spring runoff. Sampling over an annual cycle at varying intervals also provided ancillary information on the timing and duration of elevated and/or low chlorophyll/algal concentrations in response to variable environmental conditions. Each parameter was characterized for three salinity zones (tidal fresh 0-0.5 ppt, mixing 0.5–25 ppt, seawater >25 ppt).

The actual instructions for the field sampling crews were as follows:

1. Use GPS to find site (need to be within 0.02 nautical miles) and set anchor.
2. While bottom is settling down, get containers, petri dishes, and coffee bags ready for sampling. Sample time should be time of arrival. (Make sure labels are completed and clear tape is placed around labels to hold the labels in place and prevent them from ripping.) Also the header information on the forms may be filled out. The containers should be written on with marker (sharpie), while the forms are written on

with ink (preferably write in the rain pens). Make sure surface, middle, and bottom samples are distinguished on both the labels and the forms.

3. Take Secchi readings and record on proper form.

4. Sampling Depths:

   Rinse Van Dorn and three-gallon containers with site water and empty into discard bucket Station depth is determined by depth gauge on boat Deploy the Van Dorn to 0.5 meters and empty small amount into gallon container to rinse. Once rinsed, pour remaining water into gallon container and place in shaded area. Do the same for the mid-depth and at 0.5 meters off the bottom. If total depth is less than 2 m – only collect surface and bottom. If surface and bottom samples overlap when collected – only collect mid depth.

5. Chlorophyll a Sampling:

   Start with top gallon container and rinse syringe with DI water. Mix water in gallon container then rinse syringe with site water. Fill the syringe with 60cc of water. Make sure filter is in filter holder, attach to syringe and then filter water. In the shade, open filter holder and using forceps, fold filter in half and place in pre-labeled petri dish. Keep petri dish with filter shaded. Repeat this step 3 more times until 4 filters are in petri dish. Place petri dish in coffee bag, seal and place in cooler with dry ice making sure the coffee bag is touching the dry ice. Be sure amount filtered and number of filters are written on both the Petri dish and the coffee bag. All of the above steps must be repeated for the mid and bottom water samples as well.

6. Water Column Sampling:

   The remaining water is used to fill the squat containers and take a turbidity reading. Starting with the top gallon container, the squat containers are rinsed, filled, and reserved accordingly and placed in the cooler on wet ice. Then the turbidity vials are rinsed 3 times, filled, and read. This value is recorded on the appropriate forms. The procedure is then repeated for each of the gallon containers collected. Record salinity on nutrient container labels.

7. Profiling:

   Profiling began at the 0.5-meter mark, and then at the 1, 1.5, and 2 meter marks. After the 2-meter mark data will recorded at every meter till 0.5 meter from the bottom is reached. Dissolved oxygen, pH, salinity, water temperature, and depth should be recorded.

Sampling Design and Station Locations

A detailed monitoring program was developed in coordination with MDEQ and the Coastal and Estuaries Subcommittee of the Nutrient Task Force using the preliminary site locations recommended by the subcommittee.

Stations were located using a global positioning system (GPS) with expected accuracy of better than 10 meters. In the event that a site proved impossible to sample, the limiting condition were noted, and then appropriate QAPP and protocols were followed.

Laboratory Analysis and Monitoring Parameters

Monitoring studies included: algal taxonomy, total nitrogen, total phosphorous, chlorophyll-a, a measure of turbidity, and traditional water chemistry parameters such as dissolved oxygen, temperature, specific conductance, and salinity. Previous studies have indicated that the estuaries in the Mississippi Sound have medium and high concentrations of nitrogen, phosphorus, and chlorophyll-a. The monitoring activities focused primarily on the water column. Following each sampling event, the samples were analyzed according to an approved QAPP and defined QA/QC procedures. Table 1 presents the parameter suite, analytical methods, preservation requirements, holding times, and detection limits that were proposed for processing samples collected under this monitoring program.

Table 1. List Of Water Quality Sampling Parameters And Methods.

Parameter	EPA Analytical Method [1]	Preservation	Holding Times Recommended/ Regulatory Maximum	Detection Limits
Ammonia, total	**610**	**Analyze immediately, or add H_2SO_4 to pH < 2 and refrigerate at 4^0C.**	**7 days/28 days**	**0.1 mg/L**
Total Kjeldahl Nitrogen (TKN)	**351.3**	**Add H_2SO_4 to pH < 2 and refrigerate at 4^0C.**	**7 days/28 days**	**0.1 mg/L**
Nitrite-Nitrate, total	**353.4**	**Add H_2SO_4 to pH < 2 and refrigerate at 4^0C.**	**None/28 days**	**0.1 mg/L**
Total Phosphorus (TP)	**365.4**	**Refrigerate**	**28 days**	**0.01 mg/L**
Suspended Solids	**160.2**	**Refrigerate**	**7 days**	**5 mg/L**
Chlorophyll a		**Refrigerate**	**30 days**	**0.001 mg/l**

[1] SM = Standard Method (APMA, 1989).

All dissolved nutrient samples were filtered in the field through Whatman® GF/F glass fiber filters (0.70 µm nominal pore size) and the samples placed and maintained on dry ice or wet ice in the field. The samples were placed in an ultra freezer as soon as possible upon arrival onshore. Dissolved nutrient samples were maintained at –50°C until transported to the Laboratory.

Samples for chlorophyll *a* (chl *a*) were filtered through Whatman® GF/F glass fiber filters (0.70 µm nominal pore size) at the same time dissolved nutrients were collected. The filters were placed in plastic petri dishes and stored and maintained on dry ice in the field. Samples for chl *a* will be maintained at –50°C until analysis at GCRL according to QAPP protocols.

Analytical procedures provide performance equivalent to those of the EMAP Program and the NCA QAPP, including those for analyses of blanks and standard reference materials. Information shall be reported on recovery of spiked blanks, analytical precision with standard reference materials, and duplicate analyses according to QAPP protocols.

A database was maintained to manage sample tracking and laboratory results for the duration of the project. The data and associated sampling and laboratory information was provided in electronic format. Quarterly updates on the progress of the project were provided to the Gulf of Mexico Program, Program Officer.

Field Water Quality Data Collection

A water quality probe was used to measure pH, temperature, conductivity, and dissolved oxygen during every sampling event. A standard operating procedure was developed to properly maintain and operate the water quality probe to ensure proper functioning at all times. Data generated with the probe was provided in an acceptable electronic format.

Data Analysis

Data analysis involves the analysis of all data and assessments of nutrient conditions for the estuary and coastal water bodies. QA/QC activities included not only proper training, record keeping, and a system of quantitative checks and systematic field and laboratory audits/reviews, but reports on all related activities. QA/QC activities also included a system of data validation and comparison with measurement and data quality objectives. The results of this work will be made available to EPA and other Gulf Coast states for potential use in establishing nutrient criteria and guidance documents.

The monitoring activities focused primarily on the water column. Following each sampling event, the samples were analyzed according to an approved QAPP and defined QA/QC procedures.

Quality Assurance Procedures

A quality assurance project plan (QAPP) was developed that included information on data collection procedures, training, logistical considerations, and QA/QC considerations. The QAPP was prepared according to guidance provided in the document *EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations* (EPA QA/R-5, U.S. Environmental Protection Agency, Quality Assurance Management Staff, Washington, DC, Draft Interim Final, March 2001) to ensure that environmental and related data collected, compiled, and/or generated for this project are complete, accurate, and of the type, quantity, and quality required for their intended use. The QAPP was prepared prior to beginning monitoring and will be distributed to all staff involved in any of the activities of the monitoring program to guide the implementation of the program.

The QAPP specifies, in an organizational chart, the roles and responsibilities of each member of the monitoring program team from the project manager and QA/QC officer to the staff responsible for field sampling and measurement. Project management responsibilities include overall project implementation, sample collection, and data management. Quality management responsibilities include conducting checks of sample collection or data entry, data validation, and system audits. The QAPP also describes the tasks to be accomplished, the data quality objectives for the kinds of data to be collected, any special training or certification needed by participants in the monitoring program, and the kinds of documents and records to be prepared and how they will be maintained. Standard operating procedures (SOPs) for field and laboratory tasks are also referenced in the QAPP. SOPs provide a step-by-step description of technical activities to ensure that project personnel perform sampling, analysis, and data handling activities in a consistent manner throughout the duration of the project, and to allow for data comparability.

Project Outputs

This work provides nutrient data to support the development of nutrient criteria for Mississippi. This effort was in strong support of the EPA National Strategy for the Development of Regional Nutrient Criteria. The results were transferred to the EPA National database (STORET) for use by other states working on nutrient criteria. This project supports the effort by Mississippi to establish nutrient criteria in support of the Clean Water Act goals of preventing, reducing, and eliminating water pollution. This project complements on-going water quality monitoring and assessments by the State of Mississippi.

QUALITY OBJECTIVES AND CRITERIA FOR MEASUREMENT DATA

Standard measurement quality objectives (MQOs) used for environmental monitoring methods include precision and accuracy. Precision, defined as the similarity of replicated or duplicated samples or splits, can be evaluated by calculating the relative percent difference between two samples. Accuracy is defined as the nearness of a measurement to actual conditions. Accuracy of laboratory analyses were assessed through the use of laboratory control spikes and standard reference materials. Precision of laboratory analyses were assessed through the use of duplicate analyses of samples spiked with the target analyte.

Water Quality Meters

For baseline and wet-weather sampling, the meters were calibrated at the beginning of the event and checked with standards/buffers at the end of the event. Successful calibration of these instruments indicated acceptable operation of the instrument.

Inaccuracies due to instrument drift between calibrations are inevitable. The extent of instrument drift between calibrations was documented using pre- and post-calibration instrument readings. Procedures for assessing the accuracy and drift of field equipment for the measurement of pH, DO, temperature, conductivity, and level are described below. Two pieces of equipment properly functioning and calibrated should produce comparable measurements. All extra measurements that were taken during the course of field sampling were recorded in the field notebook.

Calibration and cleaning of the monitoring equipment was accomplished biweekly. Routine maintenance (e.g. membrane, electrolyte change) was accomplished per manufacturer's specifications or when indicated by instrument operation characteristics.

pH Sensors: Two point calibration of pH sensors using NIST traceable buffers that encompass the pH range was performed per manufacture's specifications. Changes in accuracy due to drift was evaluated by comparing pre- and post-calibration readings at the time of calibration.

DO Sensors: DO sensors used in the project were calibrated per manufacturer's specifications using the air calibration method. This is the calibration method recommended for the DO sensor in the YSI 600XLM sonde. Changes in accuracy due to drift was evaluated by comparing pre- and post-calibration readings at the time of calibration.

Temperature Sensors: Temperature calibrations with the YSI 600XLM are not possible. The accuracy of temperature sensors used in this project was checked using a NIST traceable thermometer.

Conductivity Sensors: Conductivity sensors used in this project were calibrated using standard solutions per manufacturer's specifications. Changes in accuracy due to drift were evaluated by comparing pre- and post-calibration readings at the time of calibration.

Stage Sensors: The stage measured by the transducers was used to calculate flow at the stations where one is installed. Benchmark referenced stage data at these stations were obtained from USGS stream gauging records for those stations.

Discharge Measurements

Discharge data obtained from USGS was assumed to be accurate for the purposes of this project unless otherwise indicated by USGS. Accuracy of discharge measurements at stations with transducers was assumed if routine calibration procedures of the depth sensor are successful, no indications of sensor malfunction are observed, and changes in depth as measured by the sensor and the staff gauge agree within 0.05 ft.

Field Blanks

Non-Automated Station Water Samples: Sample contamination from the grab sample collection device used at the sampling stations was assessed as follows. During the collection of the first set of baseline samples and once midway through the project, the sampling device was rinsed once in the field with sterile, laboratory water and then filled again with sterile, laboratory water. The laboratory provided the sterile laboratory water. The laboratory water was then dispensed among sample containers, preserved as appropriate, placed on ice, and submitted for analysis with the other samples collected that day. A "sample rinse" (using sample to be collected to rinse the sampling apparatus) was performed before collecting each grab sample. This method of blank collection simulates the collection of a grab sample. A total of 2 sets of grab sample blanks were collected and analyzed for the parameter list found in Table 2, with the exception of Chlorophyll-a.

Acceptance criteria: Acceptance criteria for laboratory analyses of grab and automated sample blanks were provided in the QAPP.

Field Duplicates

Field duplicate samples were collected and analyzed for the parameter list found in Table 2, with the exception of Chlorophyll-a. Field duplicates were identified on the Chain-of-Custody form with a "D" after the sample number.

Laboratory Analyses

Information on the frequency of laboratory QC samples and procedures, as well as acceptance criteria, was provided in the Quality Assurance Plan for Laboratory Procedures.

Precision and accuracy of laboratory analyses were assessed through routine analysis of duplicates and spikes on 10% of the samples. Precision and accuracy of laboratory analyses was assessed through the use of duplicate spiked samples, laboratory control samples (laboratory water spiked with the target analyte and subjected to analytical procedure), and standard reference materials, respectively.

Corrective Action

Laboratory analyses showing spike recoveries or duplicate deviations that are outside acceptance criteria for a given analysis or that appear otherwise anomalous was brought to the attention of the Laboratory Manager. The Project Manager and Laboratory Manager identified appropriate corrective action. QA results that were outside of acceptance criteria may indicate the need for repeating the analysis or re-sampling.

Analyses of field blanks that indicate analyte concentrations in excess of the practical quantification limits were repeated with additional steps taken to rinse sampling equipment.

PART II: MONITORING

INTRODUCTION TO MONITORING

The work presented in this section was accomplished by the University of Southern Mississippi's Gulf Coast Research Laboratory (GCRL) under the direction of Ms. Harriet Perry, Ms. Christine Trigg, Mr. John Anderson, and Ms Lisa Hendon. This section of the report was prepared by the Gulf Coast Research Laboratory under contract to MDEQ.

The GCRL project was organized as follows:

Principal Investigator:	Harriet Perry, Director Center for Fisheries Research and development Gulf Coast Research Laboratory University of Southern Mississippi Ocean Springs, MS 39566-7000
Project Manager:	Barbara Viskup Mississippi Department of Environmental Quality Biloxi, MS 39530
Analytical Chemistry QC Leader	Christine Trigg Center for Fisheries Research and development Gulf Coast Research Laboratory University of Southern Mississippi Ocean Springs, MS 39566-7000
Field Sampling QC Leader	John Anderson Center for Fisheries Research and development Gulf Coast Research Laboratory University of Southern Mississippi Ocean Springs, MS 39566-7000
Project QA Manager	Lisa Hendon Center for Fisheries Research and development Gulf Coast Research Laboratory University of Southern Mississippi Ocean Springs, MS 39566-7000

BACKGROUND

"Monitoring to Support Nutrient Criteria Development and the Identification of Nitrogen Sensitive Coastal Water Bodies" was conducted in order to gather data for use in developing nutrient criteria for Mississippi's estuarine waters. For this report the study is referred to as the "Estuarine Nutrient Study" (ENS). This monitoring program was developed in coordination with Mississippi Department of Environmental Quality (MDEQ) and the Coastal and Estuaries Subcommittee of the Nutrient Task Force, and targeted site locations recommended by the subcommittee. This project is intended to facilitate a better understanding of cause-and-effect relationships in complex estuarine systems and to provide data so that reference conditions for nutrients can be established for Mississippi's coastal water bodies.

The United States Environmental Protection Agency (USEPA) has developed a national strategy that describes the agency's approach in developing information to help states adopt numerical criteria for nutrient concentrations as part of their water quality standards. In support of this initiative, the MDEQ and the Gulf Coast Research Laboratory (GCRL)/Center for Fisheries Research and Development (CFRD) are working cooperatively to determine, describe, and provide data that will allow discernment of normal background conditions from elevated levels associated with anthropogenic activities. When combined with historic data, these will contribute to the development of nutrient water quality criteria for estuarine waters of Mississippi. Data will be included in the USEPA STORET database and will be made available to other Gulf Coast states for use in establishing nutrient criteria and guidance documents.

MATERIALS AND METHODS

A Quality Assurance Project Plan for Monitoring to Establish Reference Conditions for Nutrients and Algal Conditions in Estuarine and Coastal Water bodies (QAPP/ENS) was prepared by the MDEQ and the GCRL/CFRD[1]. The QAPP was approved by MDEQ, GCRL/CFRD, and the USEPA in August of 2003 and contains detailed protocols for all aspects of this project.

Waters of Mississippi's Coastal Basin were sampled during seven seasons beginning in the spring of 2003 and ending in the fall of 2004. Eight beach stations and 20 deep water stations were sampled (Figure 1, Table 1). Latitude and longitude were determined at each station with a Garmin Model II Plus Global Positioning System. Water transparency (m) was determined with a Secchi disc. A Hydrolab DataSonde 4 Multiparameter Water Quality Meter and a Surveyor 4 Datalogger were used for water column profiling at 0.5 m depth intervals. Appropriate sensors attached to the meter measured depth (m), dissolved oxygen (DO in mg/L)), temperature (ºC), salinity (ppt), and pH (SU). Water samples were taken at the surface for beach stations and at surface, mid- and bottom (depending on water depth) for deep water stations using a 3 L horizontal Van Dorn sampler. Turbidity (NTU) was measured with a LaMotte 2020 Turbidimeter. Samples for chlorophyll *a* were filtered in the field using a 60 ml syringe and filter assembly. At the laboratory samples were analyzed for total Kjeldahl nitrogen (TKN in mg/L-N), total ammonia (NH_4-NH_3-N in mg/L), nitrate + nitrite (NO_3-NO_2-N in mg/L), total phosphate (P in mg/L), chlorophyll *a* (µ/L), and total suspended solids (TSS in mg/L) (Figure 2). Methods used in chemical analysis are listed in Table 2.

BRIEF SYNOPSIS OF RESULTS

For ease of interpretation, data have been summarized in a series of figures and maps that contain descriptive statistics, frequency data, and a histogram of pooled concentrations (bin) versus frequency for each measured parameter. Maps were created that depict the maximum concentrations of total ammonia, chlorophyll *a*, total Kjeldahl nitrogen, nitrate + nitrite, total phosphate, and total suspended solids at all sites for all levels and for surface, mid-, and bottom waters for all seasons. For dissolved oxygen in surface and bottom waters, minimum values were provided. Histograms are found in Figures 4-14. To more easily share geographical and associated environmental data, water quality information was made accessible online using an interactive

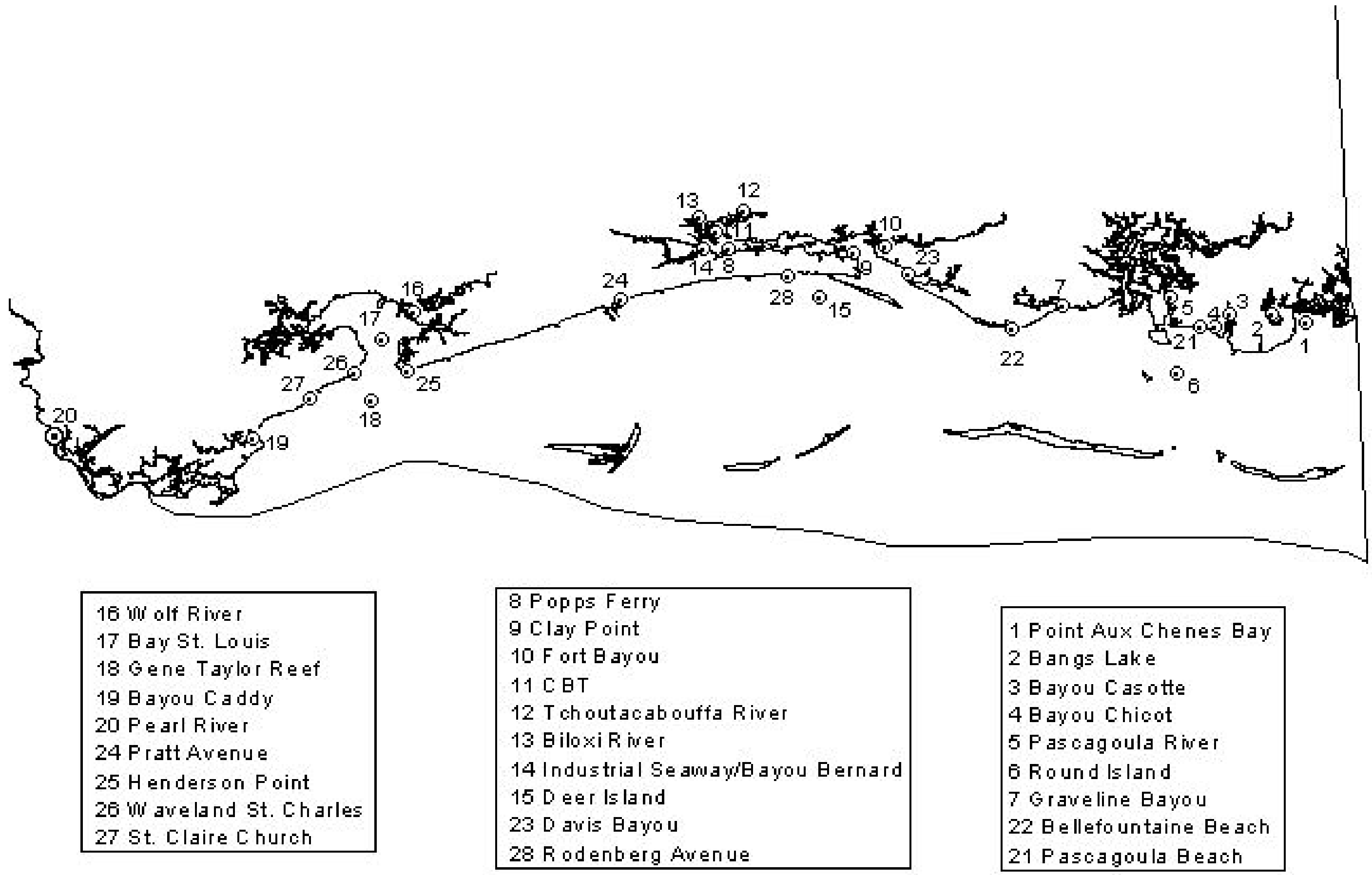


Figure 1. Map of Estuarine Nutrient Study Sampling Sites

Table 1. Estuarine Nutrient Study Site Locations

Site	Location	Latitude (W)	Longitude (N)
PAC01	Point Aux Chenes Bay	30 20' 48.6"	88 26' 02.8"
BAL02	Bangs Lake	30 21' 18.0"	88 28' 01.9"
BCA03	Bayou Cassote	30 21' 20.5"	88 30' 23.3"
BCH04	Bayou Chicot	30 20' 33.7"	88 31' 13.1"
PAR05	Pascagoula River	30 22' 14.1"	88 33' 45.2"
ROI06	Round Island	30 18' 36.9"	88 32' 41.1"
GRB07	Graveline Bayou	30 21' 45.9"	88 39' 59.1"
POF08	Popp's Ferry	30 24' 57.3"	88 58' 40.6"
CLP09	Clay Point	30 24' 44.5"	88 51' 43.2"
OFB10	Old Fort Bayou	30 25' 08.5"	88 49' 56.5"
CBT11	Confluence of Tchoutacabouffa and Biloxi rivers	30 25' 56.9"	88 59' 25.5"
TCR12	Tchoutacabouffa River	30 27' 10.4"	88 57' 55.7"
BIR13	Biloxi River	30 26' 47.0"	89 00' 26.7"
BBI14	Bayou Bernard/Industrial Seaway	30 24' 57.3"	89 00' 13.6"
DEI15	Deer Island	30 21' 35.8"	88 54' 09.2"
WOR16	Wolf River	30 21' 27.5"	89 16' 36.4"
CST17	Center of St. Louis Bay	30 19' 52.4"	89 18' 18.0"
GTR18	Gene Taylor Reef	30 16' 24.9"	89 18' 58.2"
BAC19	Bayou Caddy	30 14' 16.5"	89 25' 41.1"
PER20	Pearl River	30 14' 24.7"	89 36' 52.1"
PAB21	Pascagoula Beach	30 20' 33.6"	88 32' 07.2"
BLF22	Bellefountaine Beach	30 20' 31.2"	88 42' 45.6"
DAB23	Davis Bayou Beach	30 23' 37.8"	88 48' 37.2"
PRA24	Pratt Avenue Beach	30 22' 12.0"	89 04' 47.0"
HEP25	Henderson Point Beach	30 18' 12.6"	89 16' 54.2"
SCS26	St. Charles Street Beach	30 18' 00.0"	89 20' 02.2"
WAV27	Waveland Beach	30 16' 37.1"	89 22' 25.2"
ROA28	Rodenberg Ave. Beach	30 23' 32.6"	88 56' 17.5"

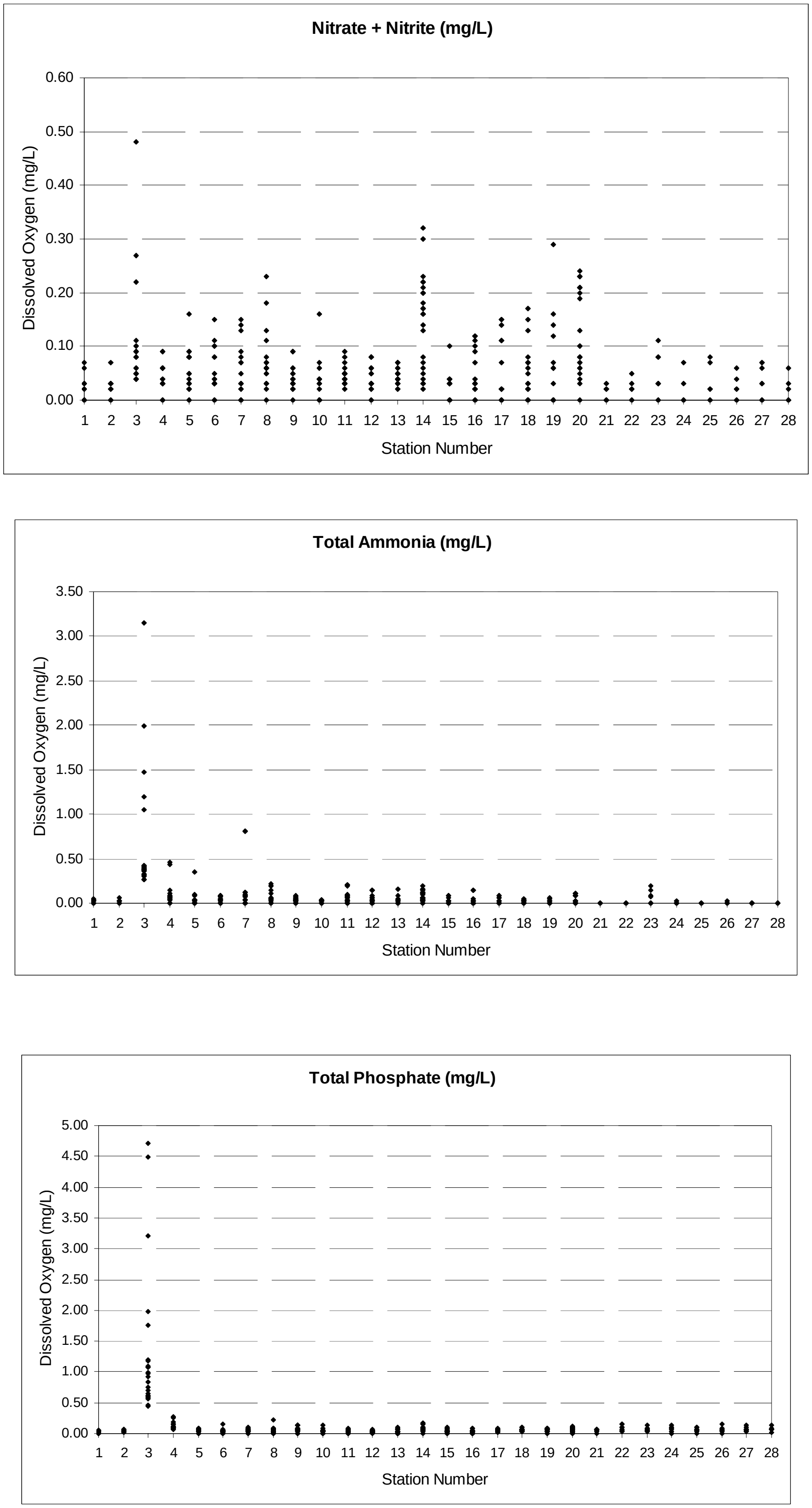
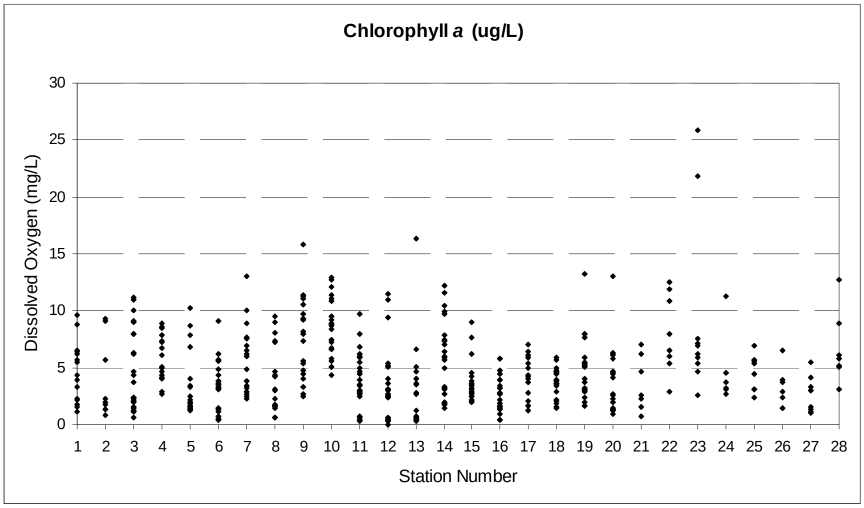


Figure 2. Results of Laboratory Analyses



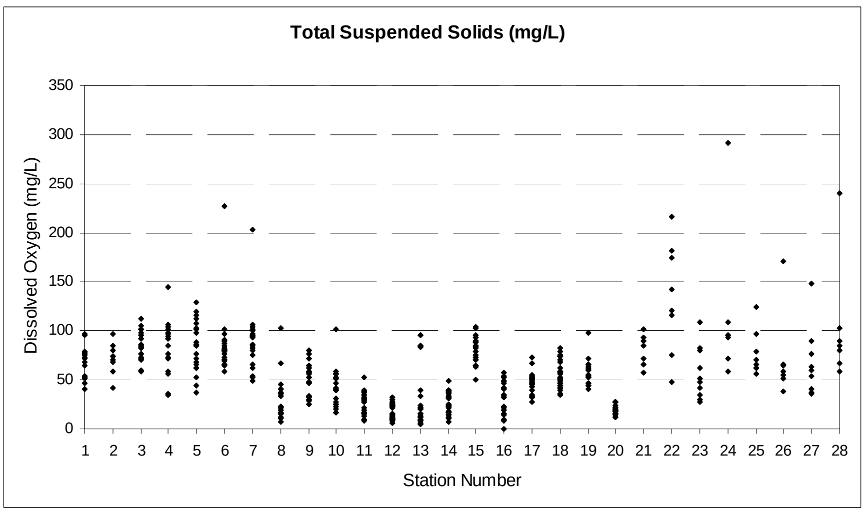


Figure 2. Results of Laboratory Analyses (Concluded)

Table 2. Chemical Methods for the Estuarine Nutrient Study

Analyte	Analysis Methods	Sample Volume	Holding Time	Method Quantitation Limit
Total Suspended Solids (0.1 mg/L)	EPA[1] Method 160.2 Residue, Non-Filterable (Gravimetric, Dried at 103-105EC)	100 L	7 days	4.0 mg/L
Total Ammonia (mg/L)	EPA[1] Method 350.3 Nitrogen, Ammonia (Potentiometric, Ion Selective Electrode)	50 mL	28 days	0.02 mg/L
Total Nitrate + Nitrite (mg/L)	EPA[1] Method 353.3 Nitrogen, Nitrate-Nitrite (Cadmium Reduction Method)	25 mL	28 days	0.02 mg/L
Total Kjeldahl Nitrogen (mg/L)	EPA[1] Method 350.3 Nitrogen, Ammonia (Potentiometric, Ion Selective Electrode)	50 mL	28 days	0.05 mg/L
Total Phosphate (mg/L)	EPA[1] Method 365.2 Phosphorus, All Forms (Colorimetric, Ascorbic Acid Method)	50 mL	28 days	0.02 mg/L
Chlorophyll *a* (µg/L)	Standard[2] Methods for the Examination of Water and Wastewater, 20th ed., 1998	240 mL	28 days	0.02 mg/L

Literature Cited:

[1]Methods for Chemical Analysis of Water and Wastes. 1983. EPA-600/4-79-020. Environmental Monitoring and Support Laboratory United States Environmental Protection Agency. Cincinnati, Ohio, 45268.

[2]Standard Methods for the Examination of Water and Wastewater, 20th ed. 1998. APHA, AWWA, WEF. United Book Press, Inc., Washington, DC, 20005-2605.

Geographic Information System (ArcIMS® DHTML viewer). Maps may be accessed at the GCRL website (http://www.usm.edu/gcrl/fisheries_center/research.php); once in the website select Estuarine Nutrient Study 2003-2004.

Water temperatures followed seasonal trends ranging from 9.80ºC to 33.32ºC with a mean ± standard deviation of 22.92 ± 5.67ºC (Figure 4). Water temperatures above 33ºC occurred at beach sites; Bellefountaine (BLF22) in summer 2004 and Rodenberg Avenue (ROA28) in spring 2003. Bottom water temperatures were below 10ºC in the Pascagoula River in winter 2004.

Water pH ranged from 4.89 to 9.15 with a mean of 7.41 ± 0.56 (Figure 5). Highest pH readings occurred in May 2004 at the mouth of Big Lake (POF08). All readings of pH below 6 occurred in June 2003 in the Biloxi River (BIR13), the Tchoutacabouffa River (TCR12), and at their confluence (CBT11).

Salinity ranged from 0.00 ppt to 33.27 ppt (Figure 6). Overall mean salinity was 12.20 ± 9.38 ppt. Highest salinities were noted in eastern Mississippi Sound in Jackson County. Salinities in excess of 32 ppt were found in the Pascagoula River (PAR05) in the spring of 2004 in waters of 3 m and below. Readings above 28 ppt occurred in the Pascagoula River (PAR05), Bayou Casotte (BCA03), Bayou Chicot (BCH04), and Round Island (ROI06). Salinities < 0.05 ppt occurred at Popp's Ferry (POF08), the Biloxi River (BIR13), the Pearl River (PER20), and the Tchoutacabouffa River (TCR12) in the spring and/or winter.

An example of descriptive statistics and frequency data histogram for dissolved oxygen (DO) is found in Figure 7. Values for DO ranged from 1.82 mg/L to 11.83 mg/L with a mean of 6.73 ± 1.87 mg/L (Figure 7). Highest levels of DO occurred in the winter of 2004 at Pratt Avenue (PRA24), Clay Point (CLP09), and Rodenberg Avenue in surface waters. The majority of the DO readings below 3 mg/L were found during summer, spring or fall months at the following sites: Pearl River (PER20), Bayou Bernard (BBI14), Bayou Casotte (BCA03), Biloxi River (BIR13), Popp's Ferry (POF08), Pascagoula River (PAR05), and

Deer Island (DEI15). Lowest reading occurred during the fall of 2004 in bottom waters of the Pearl River (PER20, 1.82 – 1.84 mg/L).

An example of descriptive statistics and frequency data for Chlorophyll *a* are found in Figure 8. Chlorophyll *a* concentrations ranged from 0.30 to 25.91 µg/L with a mean of 4.59 ± 3.29 µg/L. Ninety-three percent of samples had chlorophyll *a* levels less than 10 µg/L. Highest readings were in Davis Bayou (DAB21) in spring of 2003.

Descriptive statistics and frequency data for turbidity are found in Figure 9. Turbidity ranged from 1.1 to 380.0 NTU with a mean value of 15.4 ± 27.1 NTU. Eighty-four percent of water samples had turbidity values of ≤ 20 NTU. The highest reading of 380.0 NTU was measured at Bellefountaine (BLF22). Readings ≥ 100 mg/L occurred at Rodenberg Avenue (ROA28), the Biloxi River (BIR13), Pratt Avenue (PRA24), Round Island (ROI06), and the Pascagoula River (PAR05). High readings at these stations may have been influenced by waves and currents that suspended sand and particulate matter in the water column.

Descriptive statistics and frequency data for total suspended solids are found in Figure 10. Total suspended solids ranged from <4 mg/L to 292 mg/L. The mean TSS was 57 ± 36 mg/L. Highest total suspended solids occurred in waters at beach stations. Measurements above 200 mg/L occurred at Pratt Avenue (PRA24), Rodenberg Avenue (ROA28), Bellefountaine Beach (BLF22), Graveline Bayou (GRB07) and Round Island (ROI06).

Descriptive statistics and frequency data for total ammonia are found in Figure 11. Total ammonia ranged from < 0.02 to 3.15 mg/L with a mean of 0.07 ± 0.22 mg/L. Total ammonia concentrations were normally low (≤ 0.10 mg/L NH_4-NH_3-N) at most sites. The majority of samples (52%) were below the detection limit of 0.02 mg/L for total ammonia, and levels were ≤ 0.15 mg/L for 91% of samples collected. Bayou Casotte (BCA03) had the highest levels of ammonia (0.26 mg/L to 3.15 mg/L).

Temperature ºC	
Mean	22.92
Standard Error	0.20
Median	23.39
Mode	19.17
Standard Deviation	5.67
Sample Variance	32.19
Kurtosis	-0.62
Skewness	-0.56
Range	23.52
Minimum	9.80
Maximum	33.32
Sum	17856.16
Count	779
Confidence Level (95.0%)	0.40

Bin	*Frequency*
10	3
11	7
12	18
12	30
13	7
14	13
15	33
16	11
17	8
18	17
19	29
19	21
20	30
21	18
22	35
23	60
24	65
25	47
25	25
26	34
27	56
28	52
29	40
30	44
31	51
32	23
32	0
More	2

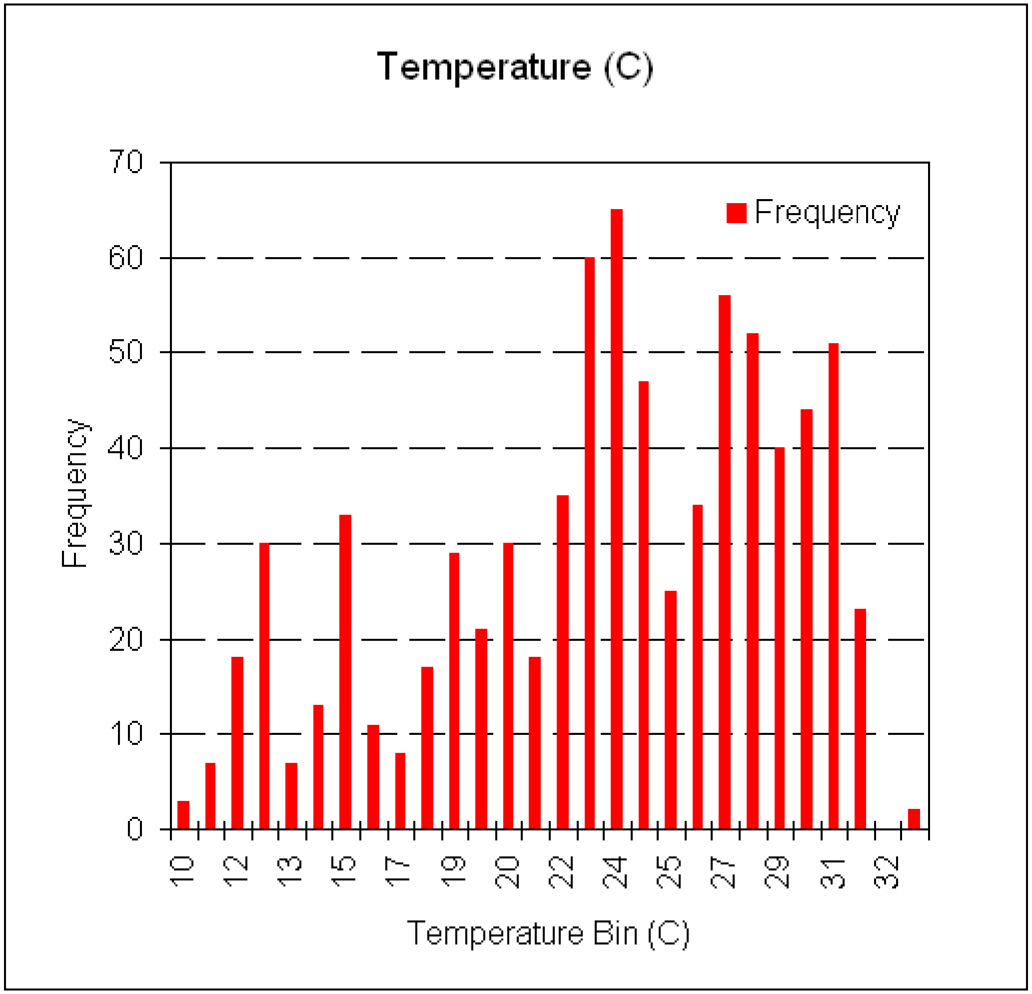


Figure 4. Estuarine Nutrient Study (2003-04) descriptive statistics and frequency data for temperature (ºC) . Data are pooled into bins and graphed against frequency.

pH	
Mean	7.41
Standard Error	0.02
Median	7.52
Mode	7.67
Standard Deviation	0.56
Sample Variance	0.31
Kurtosis	4.72
Skewness	-1.67
Range	4.26
Minimum	4.89
Maximum	9.15
Sum	5770.34
Count	779
Confidence Level (95.0%)	0.04

Bin	*Frequency*
4.89	1
5.05	1
5.21	11
5.36	1
5.52	3
5.68	3
5.84	0
5.99	0
6.15	7
6.31	8
6.47	5
6.63	9
6.78	21
6.94	25
7.10	63
7.26	109
7.41	67
7.57	91
7.73	130
7.89	110
8.05	76
8.20	23
8.36	11
8.52	2
8.68	1
8.83	0
8.99	0
More	1

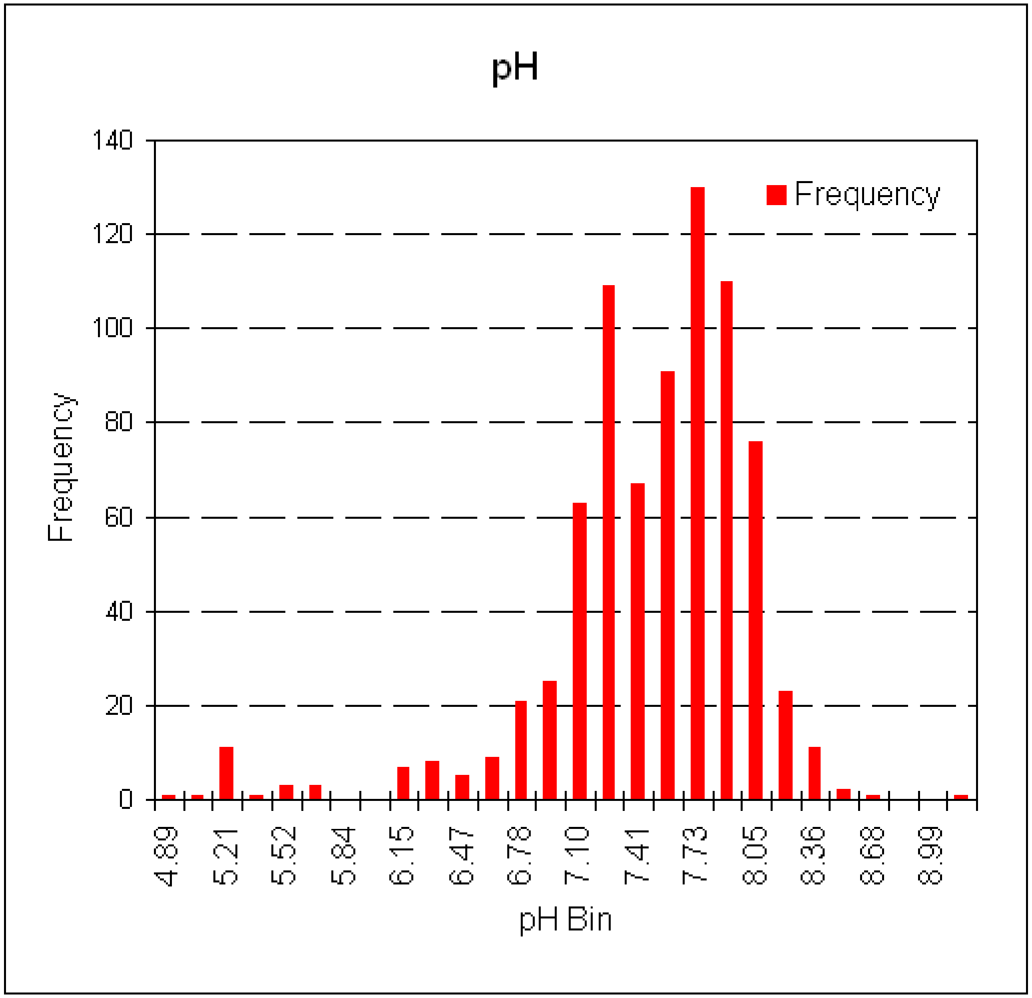


Figure 5. Estuarine Nutrient Study (2003-04) descriptive statistics and frequency data for water pH . Data are pooled into bins and graphed against frequency.

(ppt)	
Mean	12.20
Standard Error	0.34
Median	10.71
Mode	0.01
Standard Deviation	9.38
Sample Variance	87.89
Kurtosis	-1.10
Skewness	0.36
Range	33.27
Minimum	0.00
Maximum	33.27
Sum	9503.16
Count	779
Confidence Level (95.0%)	0.66

Bin	*Frequency*
0	3
1	120
2	30
4	45
5	38
6	29
7	25
9	28
10	38
11	46
12	26
14	35
15	35
16	17
17	17
18	20
20	24
21	16
22	20
23	31
25	36
26	21
27	16
28	24
30	19
31	15
32	0
More	5

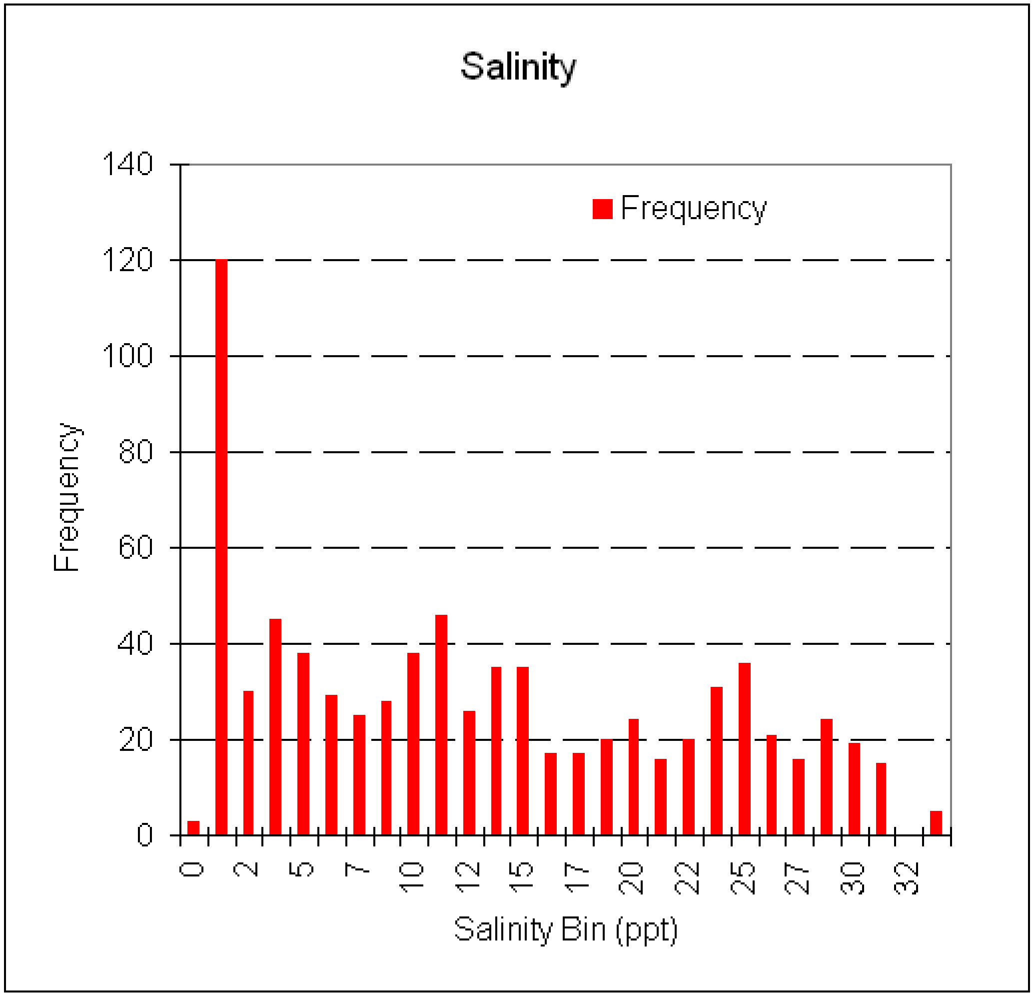


Figure 6. Estuarine Nutrient Study (2003-04) descriptive statistics and frequency data for salinity (ppt) . Data are pooled into bins and graphed against frequency.

DO (mg/L)	
Mean	6.73
Standard Error	0.07
Median	6.67
Mode	6.90
Standard Deviation	1.87
Sample Variance	3.50
Kurtosis	-0.25
Skewness	0.10
Range	10.01
Minimum	1.82
Maximum	11.83
Sum	5243.08
Count	779
Confidence Level (95.0%)	0.13

Bin	*Frequency*
1.8	1
2.2	5
2.6	1
2.9	7
3.3	10
3.7	11
4.0	15
4.4	35
4.8	28
5.2	37
5.5	67
5.9	53
6.3	56
6.6	58
7.0	70
7.4	50
7.8	50
8.1	41
8.5	42
8.9	35
9.2	29
9.6	27
10.0	22
10.3	5
10.7	6
11.1	9
11.5	7
More	2

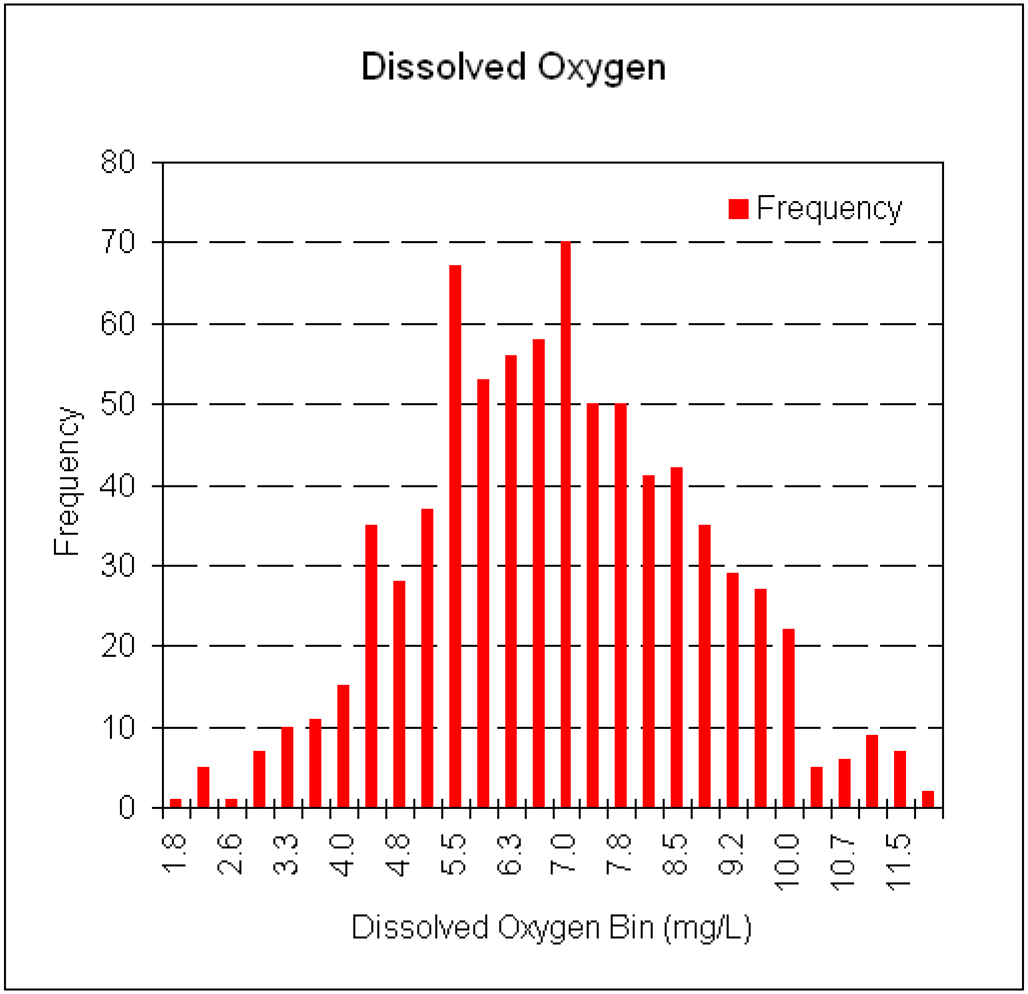


Figure 7. Estuarine Nutrient Study (2003-04) descriptive statistics and frequency data for dissolved oxygen (mg/L) Data are pooled into bins and graphed against frequency.

Chl-a Value (ug/L)	
Mean	4.59
Standard Error	0.15
Median	3.84
Mode	0.45
Standard Deviation	3.29
Sample Variance	10.80
Kurtosis	4.89
Skewness	1.56
Range	25.61
Minimum	0.30
Maximum	25.91
Sum	2215.12
Count	483
Confidence Level(95.0%)	0.29

Bin	*Frequency*
0.3	1
1.5	72
2.7	89
4.0	86
5.2	68
6.4	55
7.6	32
8.8	24
10.1	24
11.3	13
12.5	8
13.7	7
14.9	0
16.2	1
17.4	1
18.6	0
19.8	0
21.0	0
22.3	1
23.5	0
24.7	0
More	1

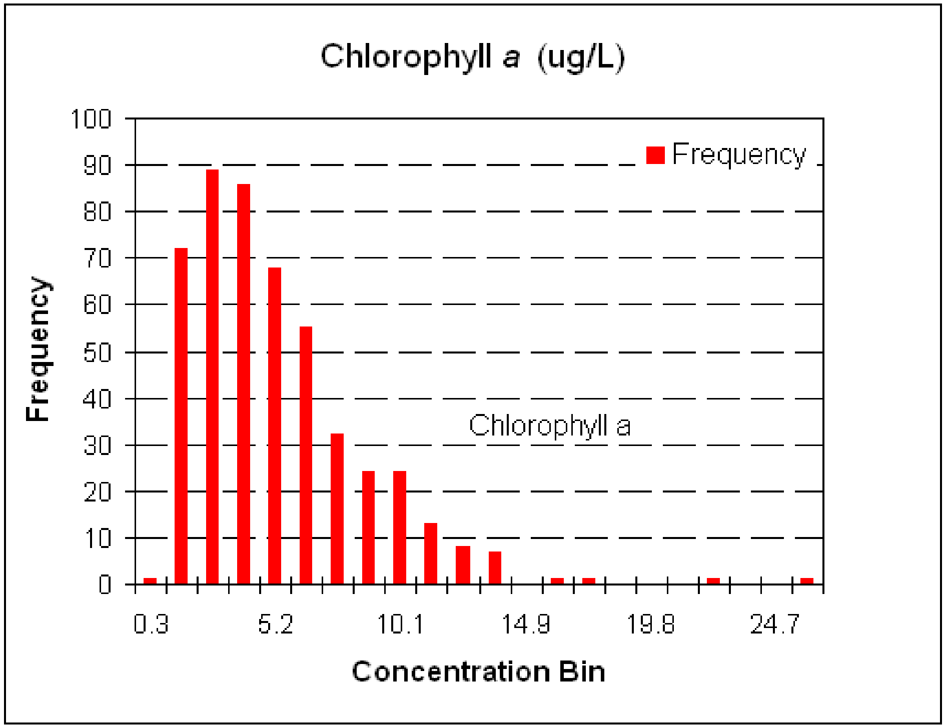


Figure 8. Estuarine Nutrient Study (2003-04) descriptive statistics and frequency data for chlorophyll *a* (µg/L). Data are pooled into bins and graphed against frequency.

TURBIDITY (NTU)	
Mean	15.4
Standard Error	1.3
Median	8.8
Mode	13.0
Standard Deviation	27.1
Sample Variance	736.8
Kurtosis	81.7
Skewness	7.5
Range	378.9
Minimum	1.1
Maximum	380.0
Sum	6784.0
Count	440
Confidence Level(95.0%)	2.5

Bin	*Frequency*
1	1
20	367
39	47
58	9
77	2
96	5
115	2
134	3
153	1
172	1
191	1
209	0
228	0
247	0
266	0
285	0
304	0
323	0
342	0
361	0
More	1

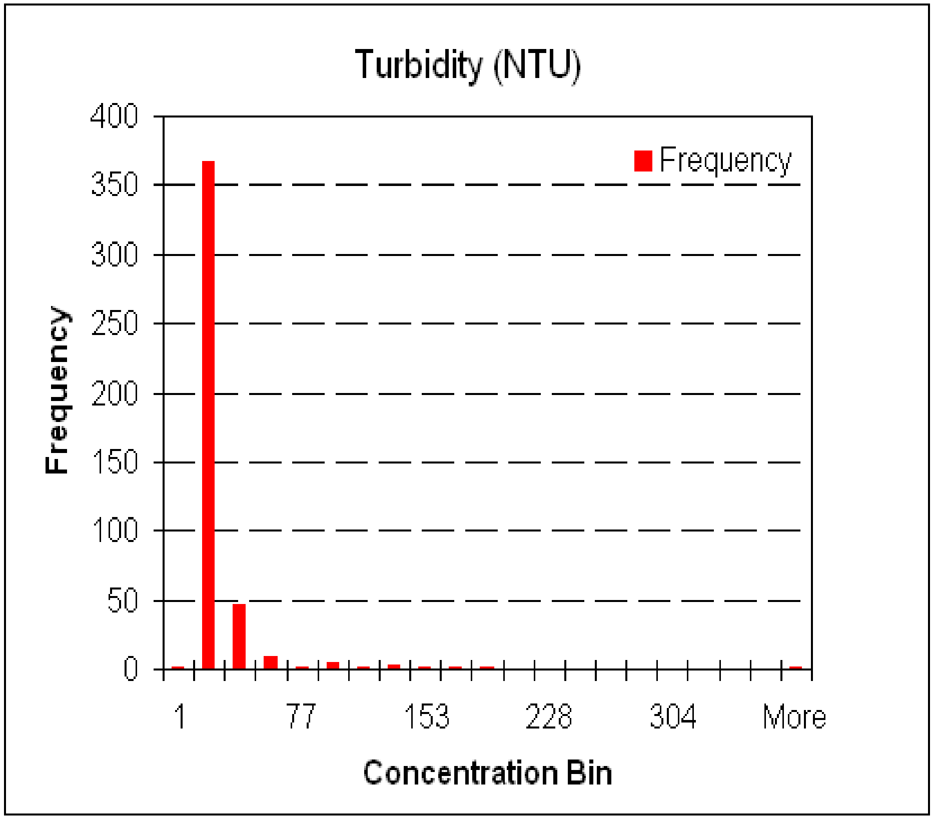


Figure 9. Estuarine Nutrient Study (2003-04) descriptive statistics and frequency data for turbidity (NTU). Data are pooled into bins and graphed against frequency.

TSS (mg/L)	
Mean	57
Standard Error	2
Median	54
Mode	85
Standard Deviation	36
Sample Variance	1329
Kurtosis	6
Skewness	2
Range	292
Minimum	0
Maximum	292
Sum	27589
Count	483
Confidence Level(95.0%)	3

Bin	*Frequency*
0	1
14	34
28	78
42	70
56	68
70	64
83	62
97	59
111	28
125	7
139	1
153	3
167	0
181	2
195	1
209	1
222	1
236	1
250	1
264	0
278	0
More	1

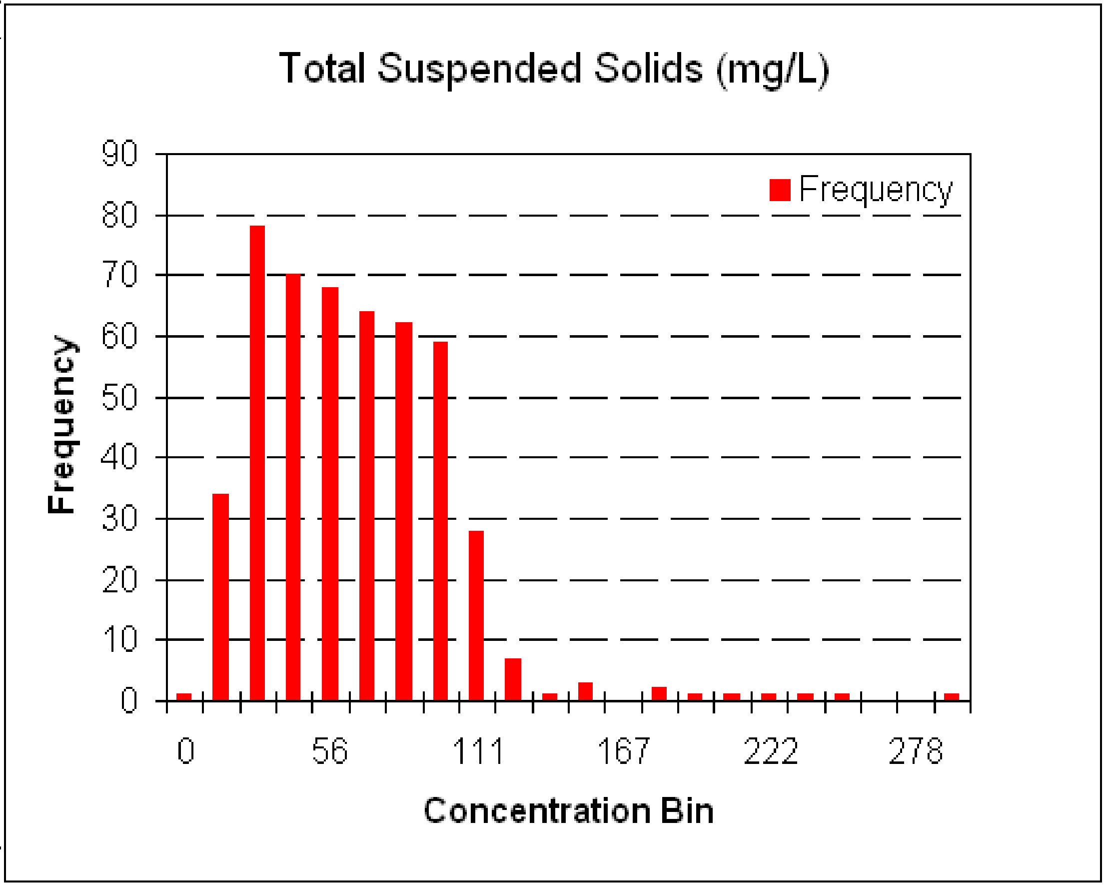


Figure 10. Estuarine Nutrient Study (2003-04) descriptive statistics and frequency data for total suspended solids (mg/L).

Data are pooled into bins and graphed against frequency.

AMMONIA (mg/L)		*Bin*	*Frequency*
		0.00	253
Mean	0.07	0.15	187
Standard Error	0.01	0.30	17
Median	0.00	0.45	17
Mode	0.00	0.60	1
Standard Deviation	0.22	0.75	0
Sample Variance	0.05	0.90	3
Kurtosis	103.63	1.05	1
Skewness	8.90	1.20	1
Range	3.15	1.35	0
Minimum	0.00	1.50	1
Maximum	3.15	1.65	0
Sum	32.17	1.80	0
Count	483	1.95	0
Confidence Level(95.0%)	0.02	2.10	1
		2.25	0
		2.40	0
		2.55	0
		2.70	0
		2.85	0
		3.00	0
		More	1

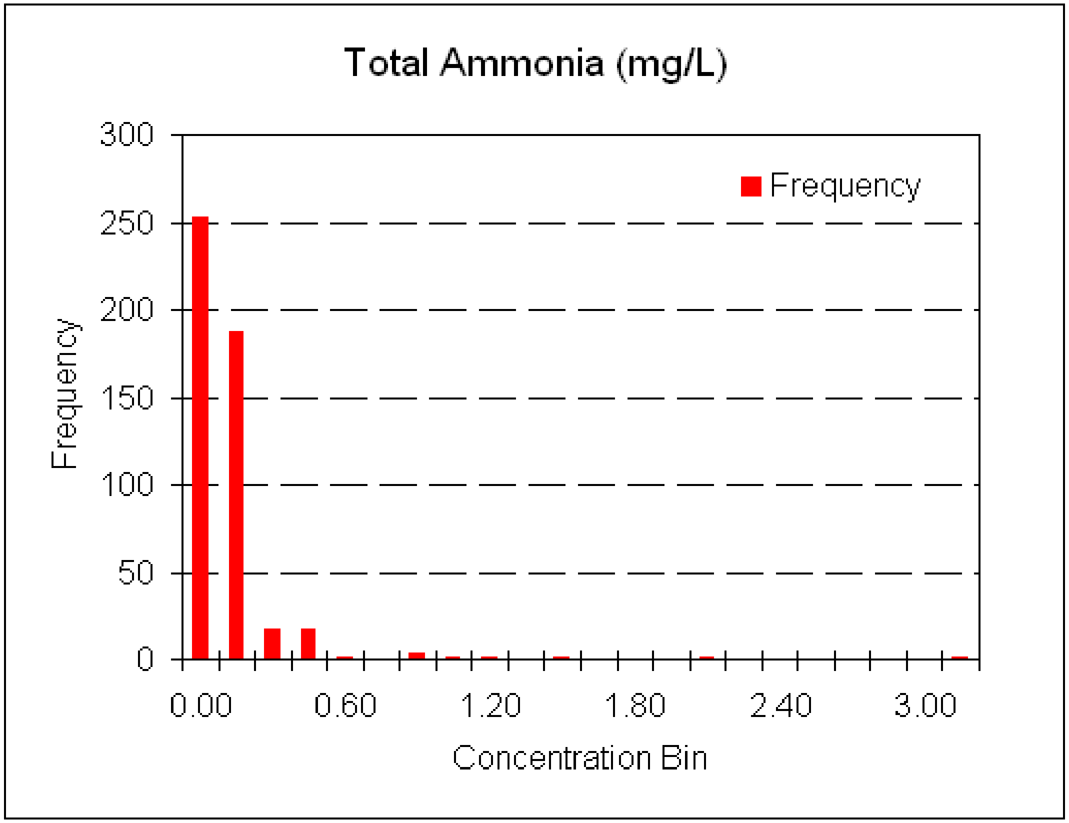


Figure 11. Estuarine Nutrient Study (2003-04) descriptive statistics and frequency data for total ammonia (mg/L). Data are pooled into bins and graphed against frequency.

Descriptive statistics and frequency data histogram for Total Kjeldahl nitrogen are found in Figure 12. Total Kjeldahl nitrogen ranged from < 0.05 mg/L to 3.73 mg/L. Mean TKN was 0.46 ± 0.37 mg/L. Ninety-eight percent of samples were below 1.25 mg/L TKN. Levels between 1.00 and 1.25 mg/L were found in the late spring/early summer at Graveline Bayou (GRB07), Bayou Casotte (BCA03), Bellefountaine Beach (BLF22), Bayou Caddy (BCA03), Davis Bayou (BCA03), Bangs Lake (BAL02), Tchoutacabouffa River (TCR12), Rodenberg Avenue (ROA28), and Bayou Chicot (BCH04). The Bayou Casotte site (BCA03) had the highest readings; 1.44 to 3.73 mg/L.

Descriptive statistics and frequency data histogram for nitrate + nitrite are found in Figure 13. Total nitrate + nitrite concentrations were generally low, ranging from < 0.02 to 0.48 mg/L. The mean concentration was 0.05 ± 0.06 mg/L. Ninety-five percent of samples were less than 0.20 mg/L. Highest levels (0.20 to 0.48 mg/L) were found at Bayou Casotte (BCA03), Bayou Bernard/Industrial Seaway (BBI14), Bayou Caddy (BAC19), Pearl River (PER20), and Popp's Ferry (PER20).

Descriptive statistics and frequency data histogram for total phosphate are found in Figure 14. Total phosphate ranged from < 0.02 to 4.71 mg/L with a mean of 0.12 ± 0.38 mg/L. Phosphate was generally low at most sites with 95% of the samples ≤ 0.22 mg/L total phosphate. Highest readings (0.44 to 4.71 mg/L) all occurred at Bayou Casotte (BCA03).

TKN (mg/L)	
Mean	0.46
Standard Error	0.02
Median	0.37
Mode	0.28
Standard Deviation	0.37
Sample Variance	0.14
Kurtosis	21.43
Skewness	3.52
Range	3.73
Minimum	0.00
Maximum	3.73
Sum	223.81
Count	483
Confidence Level(95.0%)	0.03

Bin	*Frequency*
0.00	3
0.18	60
0.36	169
0.53	99
0.71	66
0.89	43
1.07	25
1.24	9
1.42	1
1.60	1
1.78	2
1.95	0
2.13	0
2.31	0
2.49	1
2.66	1
2.84	2
3.02	0
3.20	0
3.37	0
3.55	0
More	1

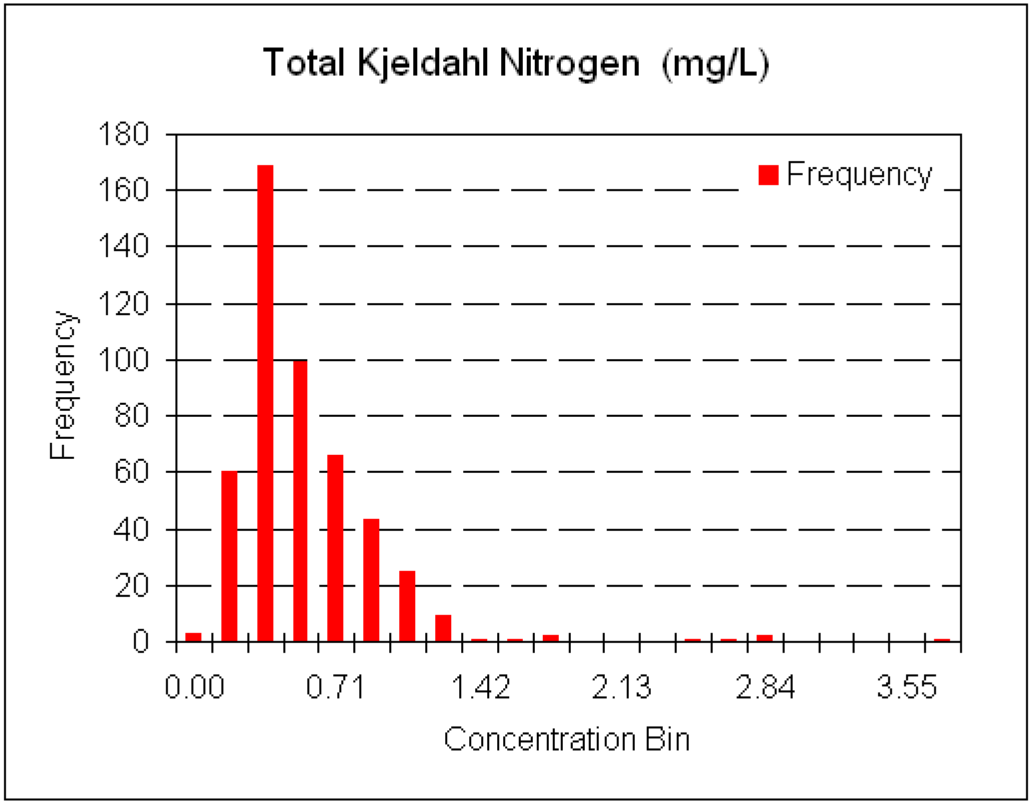


Figure 12. Estuarine Nutrient Study (2003-04) descriptive statistics and frequency data for total Kjeldahl nitrogen (mg/L). Data are pooled into bins and graphed against frequency.

Nitrate + Nitrite (mg/L)	
Mean	0.05
Standard Error	0.00
Median	0.03
Mode	0.00
Standard Deviation	0.06
Sample Variance	0.00
Kurtosis	8.50
Skewness	2.37
Range	0.48
Minimum	0.00
Maximum	0.48
Sum	23.81
Count	483
Confidence Level(95.0%)	0.01

Bin	*Frequency*
0.00	140
0.02	41
0.05	111
0.07	64
0.09	63
0.11	15
0.14	8
0.16	14
0.18	5
0.21	4
0.23	7
0.25	6
0.27	1
0.30	1
0.32	2
0.34	0
0.37	0
0.39	0
0.41	0
0.43	0
0.46	0
More	1

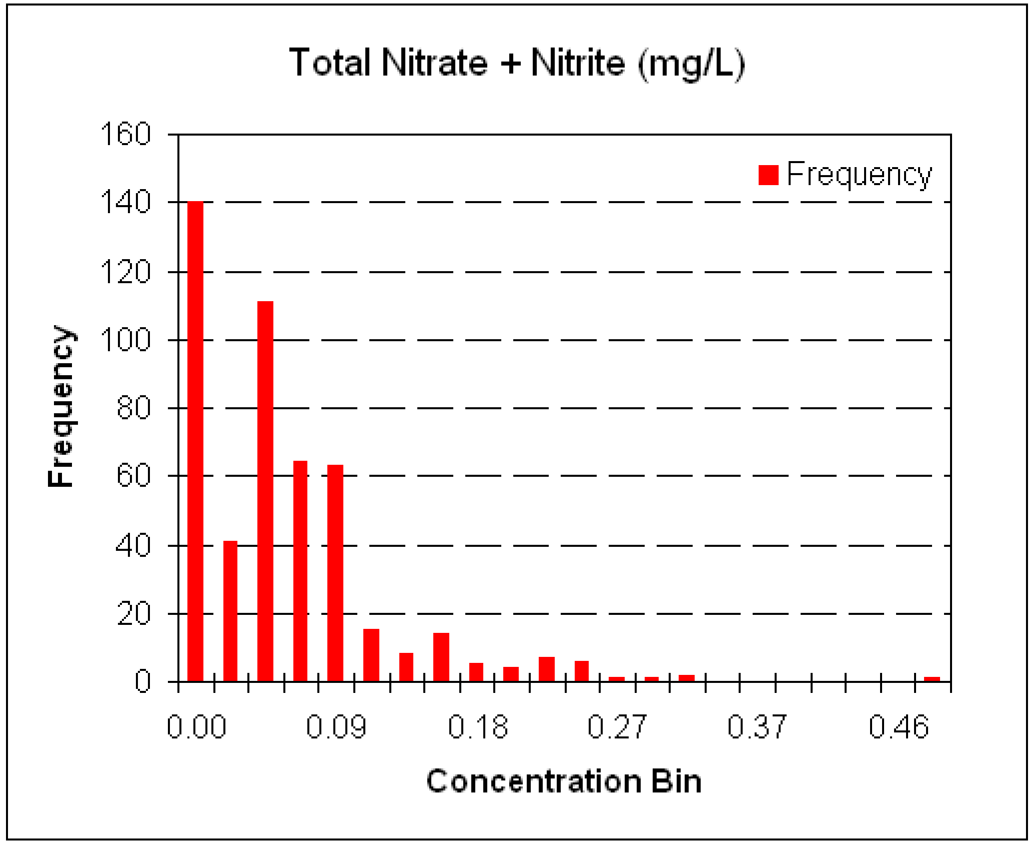


Figure 13. Estuarine Nutrient Study (2003-04) descriptive statistics and frequency data for total nitrate + nitrite (mg/L). Data are pooled into bins and graphed against frequency.

PHOSPHATE (mg/L)	
Mean	0.12
Standard Error	0.02
Median	0.05
Mode	0.05
Standard Deviation	0.38
Sample Variance	0.14
Kurtosis	93.63
Skewness	8.91
Range	4.71
Minimum	0.00
Maximum	4.71
Sum	55.61
Count	483
Confidence Level(95.0%)	0.03

Bin	*Frequency*
0.00	57
0.22	400
0.45	3
0.67	7
0.90	3
1.12	6
1.35	2
1.57	0
1.79	1
2.02	1
2.24	0
2.47	0
2.69	0
2.92	0
3.14	0
3.36	1
3.59	0
3.81	0
4.04	0
4.26	0
4.49	0
More	2

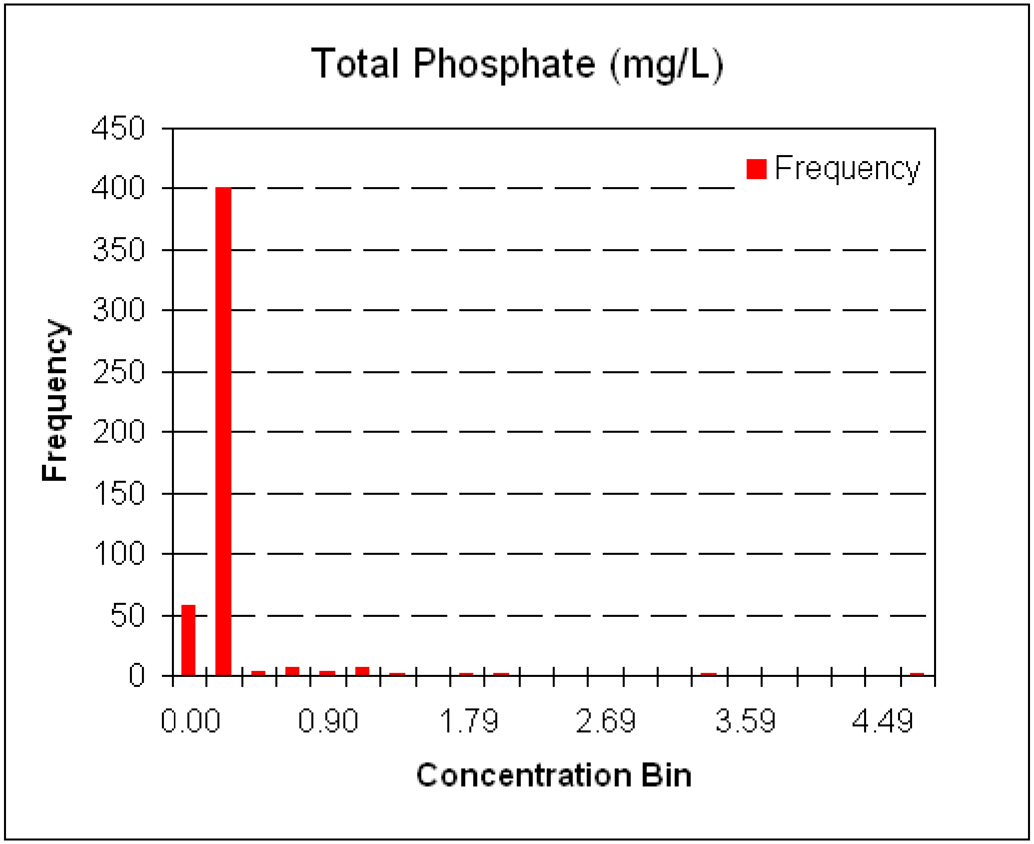


Figure 14. Estuarine Nutrient Study (2003-04) descriptive statistics and frequency data for total phosphate (mg/L). Data are pooled into bins and graphed against frequency.

SUMMARY

Nutrients were analyzed and physical/chemical parameters collected across the Mississippi Gulf Coast water bodies in order to aid in the development of numerical criteria for Mississippi's estuarine waters. The Mississippi Beach Monitoring Program's (MBMP) maximum observed concentrations for nutrients are as follows: TKN = 2.0 mg/l, nitrate/nitrite = 0.3 mg/l, ammonia = 0.3 mg/l, and phosphate = 0.2 mg/l. Assessments using these values indicate that overall water quality was good. Areas where nutrient concentrations exceeded maximum observed amounts as defined in the MBMP were limited to six sites: four in Jackson County and two in Harrison County. In Jackson County, ammonia and phosphate levels in Bayou Casotte were high throughout the study period. Total Kjeldahl nitrogen and nitrate/nitrite concentrations were high in this area in the fall. Levels of ammonia above 0.3 mg/L were observed in Bayou Chicot (Spring 2004), Pascagoula River (Fall 2004), and Graveline Bayou (Fall 2003). In fall of 2003 phosphate concentrations were slightly elevated in Bayou Chicot. Two readings in Harrison County barely exceeded the MBMP levels; Bayou Bernard/Industrial Seaway (nitrate+nitrite, 0.32 mg/L) and Popps Ferry (phosphate, 0.22 mg/L). High readings for turbidity and total suspended solids primarily occurred at beach stations and at deeper sites at the mouths of rivers where strong currents were prevalent.

Physical/chemical parameters collected included: water temperature, salinity, pH, and dissolved oxygen. Water temperatures were within seasonal norms. In general, salinities were highest in the eastern Sound with maxima in bottom waters of the Pascagoula River. Lowest salinities occurred at river sites in Hancock and Harrison Counties. Over 97% of the pH readings were above 6.0. In spring 2003, the Biloxi River, Tchoutacabouffa River, and confluence of the Tchoutacabouffa and Biloxi rivers were acidic with pH values of 4.89 to 5.57. Although both of these rivers have low inland pH values characteristic of blackwater streams, readings at their mouths are usually above 6.0. Dissolved oxygen levels were above 3.0 mg/L in 98% of the samples. Values for dissolved oxygen were usually lowest in bottom samples.

PART III: DATA ANALYSES

The data analyses section of this report was prepared by FTN, Inc. under contract with MDEQ. The FTN, Inc. report is provided in Appendix A.

PART IV: SUMMARY AND CONCLUSIONS

MONITORING

A summary of the monitoring activities is as follows:

- Beach Monitoring Data includes the following: TKN = 2.0 mg/l, nitrate/nitrite = 0.3 mg/l, ammonia = 0.3 mg/l, and phosphate = 0.2 mg/l. Assessments using these values indicate that overall water quality was good.
- Areas where nutrient concentrations exceeded maximum observed amounts, as defined in the Beach Monitoring Data, were limited to six sites: four in Jackson County and two in Harrison County.
  - In Jackson County, ammonia and phosphate levels in Bayou Casotte were high throughout the study period. Total Kjeldahl nitrogen and nitrate/nitrite concentrations were high in this area in the fall;
  - Levels of ammonia above 0.3 mg/L were observed in Bayou Chicot (Spring 2004), Pascagoula River (Fall 2004), and Graveline Bayou (Fall 2003); and
  - In the fall of 2003 phosphate concentrations were slightly elevated in Bayou Chicot.
- Two readings in Harrison County barely exceeded the Beach Monitoring Levels:
  - Bayou Bernard/Industrial Seaway (nitrate+nitrite, 0.32 mg/L); and
  - Popps Ferry (phosphate, 0.22 mg/L). High readings for turbidity and total suspended solids primarily occurred at beach stations and at deeper sites at the mouths of rivers where strong currents were prevalent.
- Physical/chemical parameters collected included:
  - Water temperature, salinity, pH, and dissolved oxygen. Water temperatures were within seasonal norms;
  - In general, salinities were highest in the eastern Sound with maxima in bottom waters of the Pascagoula River;

- Lowest salinities occurred at river sites in Hancock and Harrison Counties. Over 97% of the pH readings were above 6.0;
- In the Spring of 2003, the Biloxi River, Tchoutacabouffa River, and confluence of the Tchoutacabouffa and Biloxi rivers pH values were 4.89 to 5.57. Although both of these rivers have low inland pH values characteristic of blackwater streams, readings at their mouths are usually above 6.0; and
- Dissolved oxygen levels were above 3.0 mg/L in 98% of the samples. Values for dissolved oxygen were usually lowest in bottom samples.

Additional data supporting the these summaries and conclusions for monitoring are provided in Appendices B and C.

DATA ANALYSES AND NUTRIENT-ENDPOINT RELATIONSHIPS

The following is a summary of the data analyses and findings presented in Appendix A:

- There were no consistent differences in water quality, including chlorophyll and clarity, among bays and areas within the Sound (i.e., east versus central versus west).
- Responses of effect-based endpoints, such as chlorophyll and clarity to nutrients, are different for open water Sound locations versus bay locations. In general, Sound locations showed lower nutrient and chlorophyll levels and greater clarity than bay locations. Different numeric nutrient criteria will likely be appropriate for these areas.
- Variation in nutrient concentrations accounts for a significant portion of the variance in effect-based endpoints, such as chlorophyll and Secchi depth. These relationships provide one link in the causal chain between nutrient enrichment and designated use impairment. However, the development of true effects-based endpoints requires knowledge of the quantitative linkages between levels of chlorophyll and clarity versus levels of use attainment. This final linkage cannot be established with the available data. Therefore true effect-based criteria cannot be developed at this time.

- The use of seagrass as an effect-based endpoint will require further analysis to:
    - Identify the target depth distribution;
    - Identify the benchmark turbidity level; and
    - Calibrate existing bio-optical models to quantify the interaction between turbidity, chlorophyll, and water clarity.
- Statistical analysis of thresholds for endpoint (chlorophyll, clarity) relationships with nutrients showed evidence of thresholds for total phosphorus and nitrite-nitrate in the bays and total phosphorus in the Sound. The shapes of the bivariate plots for these relationship were consistent with the following:
    - Increased chlorophyll yield at higher total phosphorus concentrations in bays;
    - Leveling off of chlorophyll yield at higher nitrite-nitrate concentrations in bays;
    - Leveling off of chlorophyll yield at higher total phosphorus concentrations in the Sound; and
    - Regression tree analysis provided preliminary target nutrient values (Table 6.1) that could be used as a point of initiation for draft nutrient criteria development.
- Background TP concentrations might be estimated using the TP versus chlorophyll relationships for phosphorus versus nitrogen-limited waters, as described in Smith (2008).
- Recommendations for future data collection include the following:
    - Collection of nutrient data that is consistent with other coastal and estuarine studies, namely;
        - Obtaining measurements of dissolved inorganic phosphorus with appropriately low detection limits;
        - Lower analytical detection limits for nitrite-nitrate to reduce the proportion of censored data and improve estimates of total nitrogen and total inorganic nitrogen; and

  - Measurements of CDOM to allow evaluation of water clarity using bio-optical models.

- Potential target nutrient thresholds for bays and the Mississippi Sound using chlorophyll and Secchi depth as effect-based endpoints.

Potential Target Nutrient Threshold (mg/L as N or P)	Bays		Sound	
	Chlorophyll	Secchi Depth	Chlorophyll	Secchi Depth
TP	0.090	0.100	0.090	--
TKN	1.021	0.800	0.650	0.729
Nitrite-nitrate	0.080	--	--	0.030
Ammonia	0.012	--	0.046	0.070

APPENDIX A:

RECOMMENDATIONS FOR TARGET NUTRIENT VALUES FOR MISSISSIPPI COASTAL WATERS

RECOMMENDATIONS ON NUTRIENT TARGET VALUES FOR MISSISSIPPI COASTAL WATERS

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INTRODUCTION

The United States Environmental Protection Agency (EPA) has developed a national strategy that describes EPA's approach for developing nutrient information to help the US adopt nutrient criteria as part of State Water Quality Standards (WQS). In support of this initiative, the Mississippi Department of Environmental Quality (MDEQ) is aggressively moving forward to develop clear numerical criteria that will distinguish natural background nutrient concentrations from anthropogenic nutrient contributions in water bodies (streams and rivers, lakes and reservoirs, estuaries and coastal waters) where increased nutrients may cause harm to water quality, usability, or ecological health.

Estuaries are defined as semi-enclosed coastal water bodies that have a free connection to the open sea, and within which seawater is measurably diluted with freshwater derived from the land. To accommodate the full range of diversity of Mississippi coastal waters, the Mississippi Sound is considered an estuary for the purpose of this project, even though it does not have all of the characteristics included in the classical definition.

The purpose of this project was to perform data analysis and interpretation to support development of effects-based nutrient criteria for Mississippi coastal and estuarine waters. The project included two tasks.

Task 1: Data Analysis and Classification of Water bodies

The Coastal and Estuarine Nutrient Subcommittee has considered classifying the Mississippi Estuaries and coastal waters for nutrient criteria by:

1. Freshwater influenced regions – Pearl River, Wolfe/Jourdan Rivers, Back Bay of Biloxi, Pascagoula, and Mobile Bay;
2. Areal regions – Pearl River, St. Louis Bay, Biloxi Bay, and Pascagoula River; and

3. Major hydrologic subunits – Western Mississippi Sound, Central Mississippi Sound, and Eastern Mississippi Sound.

Data analysis was performed on an updated data set to evaluate these and other possible classification schemes appropriate for nutrient criteria.

Task 2: Nutrient-Endpoint Relationships

A literature review and data analysis were conducted to identify empirical relationships relating estuarine nutrient concentrations (particularly nitrogen) to quantifiable endpoints or effects, such as chlorophyll a, water clarity, and seagrass extent. This work utilized the data collected through MDEQ's Estuarine Nutrient Study and as part of a special coastal chlorophyll study conducted in 2007.

GENERAL APPROACH

A weight of evidence approach is being used to develop recommendations for integrated, effects-based numeric nutrient criteria for Mississippi's estuaries and coastal waters. This weight of evidence approach includes:

1. Formulation of a conceptual model to guide the process;
2. Review of designated uses for Mississippi estuaries and coastal waters, including determination of highest uses for protection;
3. Review of other States' nutrient criteria and approaches;
4. Review of existing information (scientific literature, reports, etc.);
5. Selection of effects-based endpoints; and
6. Statistical analyses, including classification analyses and development of nutrient-endpoint relationships.

Conceptual Model

Figure 2.1 illustrates the conceptual model formulated to guide the development process. The conceptual model serves to illustrate the relationships among designated uses, endpoints, and nutrients, and to provide an heuristic tool for better understanding of these relationships by the public and decision-makers.

Designated uses

The designated uses for Mississippi estuarine and coastal waters are:

1. Aquatic life support,
2. Primary and secondary contact recreation, and
3. Shellfish harvesting and consumption.

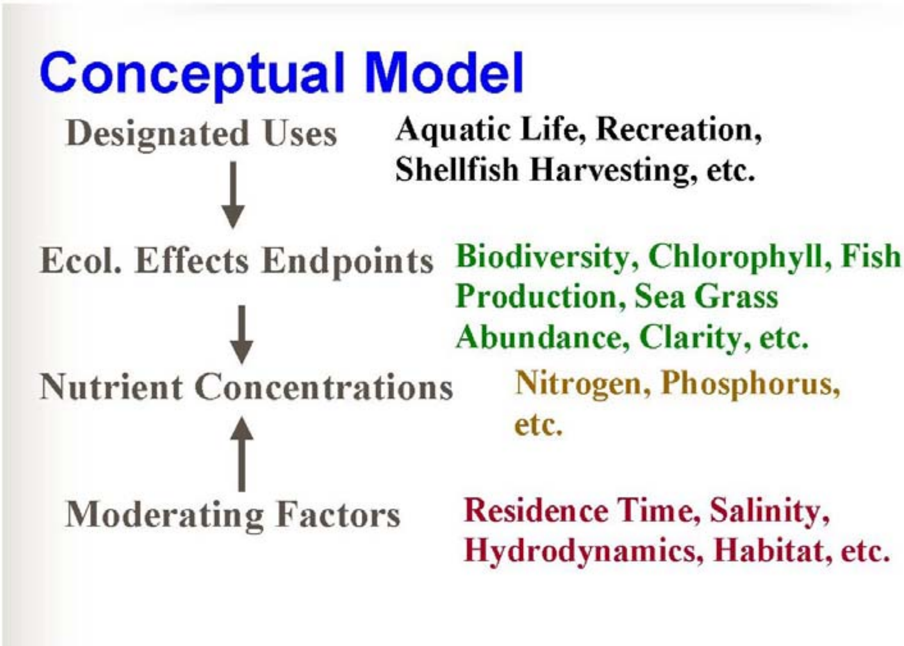


Figure 2.1. Conceptual model illustrating the relationships among designated uses, ecological effects endpoints, and nutrient concentrations, as modified by various factors.

Review of State Approaches and Coastal Criteria

The Gulf of Mexico Alliance includes state and federal agencies with regulatory and management responsibility in the Gulf of Mexico, including state agencies in Alabama, Florida, Louisiana, Mississippi, and Texas, the EPA, and the National Oceanic and Atmospheric Administration. A Gulf of Mexico Alliance meeting was held at Gulf Breeze, Florida, in January 2007. At this meeting, EPA provided an overview of the national strategy and each state presented their respective strategies for nutrient criteria development in estuarine and coastal waters. The MDEQ strategy and approach was consistent with the EPA national strategy and. No Gulf of Mexico states have final numeric, effects-based nutrient criteria for estuarine and coastal waters. MDEQ is the GOMA lead for the priority issue team addressing the reduction of nutrient inputs to coastal ecosystems. In 2008, the GOMA drafted a nutrient criteria research framework to address a number of questions related to development of coastal nutrient criteria in the Gulf of Mexico.

Information Review

Information databases have been developed by Battelle National Laboratory and EPA Headquarters to support the development of numeric nutrient criteria for estuarine and coastal waters. The Battelle information database is specific to the Gulf of Mexico, while the EPA database is for all water body types in the US. The Battelle report, *A Scientific Assessment of Nutrient Concentrations, Loads, and Biological Responses in the Northern Gulf of Mexico*, (Battelle 2004) documents the database and provides summary information for all the Gulf of Mexico states. The Battelle database has limited information on Mississippi estuaries and coastal waters.

The EPA database, N-STEPS (National Scientific Technical Exchange Partnership and Support), provides presentations by state nutrient experts and water managers, fact sheets, and guidance documents on nutrient water quality criteria, scientific literature on nutrient-algal dynamics, sampling designs for determining ecosystem-specific nutrient dynamics, and statistical analyses of selected waters to assess nutrient-algal dynamics. The site also permits states to ask questions of nutrient experts and see the responses to questions raised by other states. Information from the N-STEPS source, along with an information search performed at the University of Arkansas Mullins Library using InfoLinks (University of Arkansas electronic library catalog of books) and the University of Arkansas at Little Rock Ottenheimer Library, was reviewed to provide insight and background for possible nutrient-effects-based endpoints, nutrient-algal dynamics for estuarine and coastal waters, and possible factors moderating these relationships. The literature reviewed is included in the bibliography at the end of this document.

Thresholds identified in this literature are listed in Table 2.1. There are several federal programs involved in studying US estuaries and coastal waters. These include the National Coastal Assessment, the Gulf of Mexico Program, the National Estuary Program, the National Estuary Eutrophication Assessment, and the US Ocean Action Plan. These programs bring together federal and state agencies along with academia to gain greater understanding of estuarine ecosystems. In general, productivity in estuarine and coastal waters is believed to be nitrogen-limited. Recently, however, work by Schindler et al. (2008) suggests that estuarine systems are phosphorus-limited. Schindler et al. (2008) argue that the short incubation periods of mesocosm and bioassay studies can produce artificial nitrogen limitation results that may not reflect conditions in the ecosystem. Livingston (2001) suggests that the issue of nitrogen versus phosphorus limitation in estuarine systems is not resolved, and that nitrogen and phosphorus limitation may occur at different times of the year depending on annual hydrologic cycles.

Table 2.1. Threshold concentrations for estuarine chlorophyll, nitrogen, phosphorus concentrations, and water clarity. From Literature.

Source	Threshold Concentration
National	
Bricker et al. 2007	Chlorophyll 20 μg/L
Smith et al. 1999 Eutrophic marine	Chlorophyll 3 μg/L
Federal Gulf of Mexico	
EPA 2001	Chlorophyll 50 μg/L
EPA 2004, NEP 2007	Chlorophyll 20 μg/L DIN 0.5 mg/L DIP 0.05 mg/L Water Clarity Index 1
Gulf of Mexico Sites	
Tampa Bay	Chlorophyll 4.6 – 13.2 μg/L
Charlotte Bay	25% incident light at 2.2m
Other States	
Chesapeake Bay (www.Chesapeakebay.net)	Seasonal chlorophyll 2.8 – 7.7 μg/L
Seagrass Protection (Chesapeake)	TN < 0.65 mg/L TP < 0.037 mg/L Water Clarity 13 – 22% light penetration
New Hampshire (Trowbridge 2008)	90^{th} percentile summer chlorophyll 10 μg/L Annual median Total Nitrogen 0.5 – 0.67 mg/L
Seagrass Protection (New Hampshire)	Annual median Total Nitrogen 0.32 mg/L
Hawaii (www.epa.gov)	Geometric mean chlorophyll 2 – 3.5 μg/L
Virginia	Phosphorus 0.1 μg/L
Cape Cod (Costa 2000)	Mean summer chlorophyll 3 – 5 μg/L
Neuse R Estuary, NC (NCEMC 2007)	Chlorophyll a 40 μg/L
Other Countries	
Australia, New Zealand (ANZECC & ARMCANZ 2000)	Chlorophyll 4 – 5 μg/L Total Nitrogen 300 μg/L Total Phosphorus 30 μg/L
Norway marine eutrophic classification (Molvaer et al. 1997)	Chlorophyll 7 μg/L
Scotland (2008)	Chlorophyll 20 – 25 μg/L DIN 0.25 – 0.38 mg/L

DEVELOPMENT OF POTENTIAL CRITERIA

Effects-Based Endpoints and Nutrient Criteria

Nutrients (with the exception of ammonia, which can be toxic) typically have little direct effect on designated uses (e.g., Aquatic Life, Shellfish Harvesting, Contact Recreation). Nutrients elicit their effects through increased primary productivity that then impacts designated uses through a number of possible mechanisms (e.g., bottom dissolved oxygen (DO) depletion, reduced clarity, toxicity, altered biotic community structure). The actual impact of a stressor such as nutrient enrichment on designated uses will also depend on factors that moderate the action of pollutants in aquatic ecosystems. These factors include 1) the residence time of water and nutrients in the system; 2) the natural processing capacity of the system for the pollutant including the pathways that decompose, bind, bioaccumulate, or sequester the material; and 3) ancillary factors that modify the form of a pollutant, the rate of processing, or the kind of action the pollutant exerts within the ecosystem. For example, Livingston (2001) observed that bottom DO depletion in Perdido Bay, Florida, resulted not only from nutrient enrichment due to increased loading from the watershed, but also due to the development of a strong halocline that was, in turn, the result of channel modifications of the estuary inlet that allowed more high-salinity seawater to enter the bay. A simplified illustration of some possible pathways between nutrient enrichment and impairment of designated uses is presented in Figure 3.1. It should be noted that error and uncertainty accumulate as one moves down any causal pathway from nutrients to designated use.

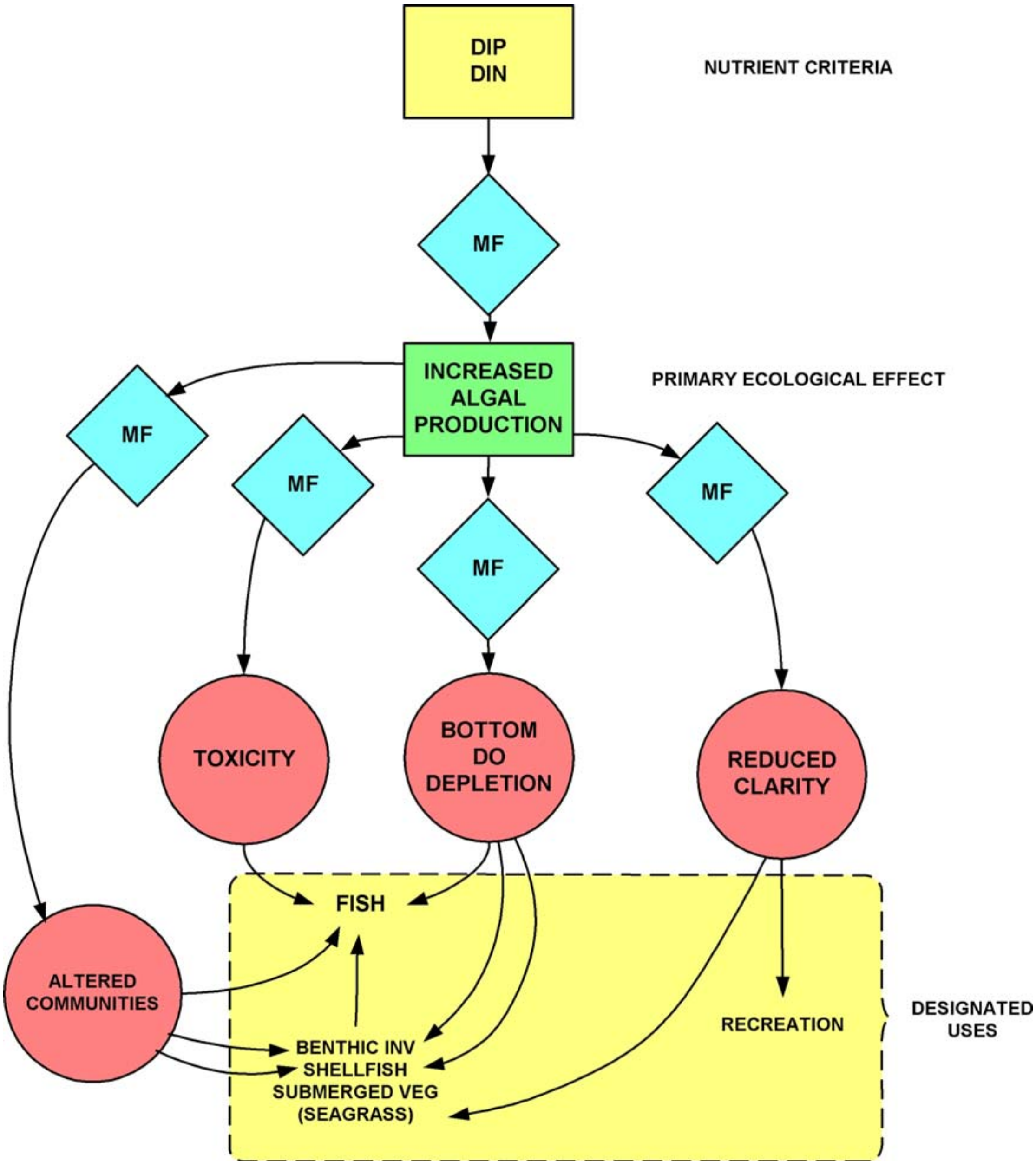


Figure 3.1. Conceptual model showing causal pathways between nutrient enrichment and designated use impairment.

MF = moderating factors; DIN = dissolve inorganic nitrogen; DIP = dissolved inorganic phosphorus.

One approach to setting nutrient criteria involves choosing a threshold (e.g., a percentile) based on the distribution of existing data. A disadvantage of this approach is that the chosen threshold is arbitrary, is not based on an actual effect that causes impairment, and ensures that some percentage of systems will be designated as impaired. A more desirable approach is to choose nutrient criteria based on concentrations associated with actual effects. An "effects-based" endpoint in the present context is a physical or biological property of the ecosystem that undergoes changes in response to changes in nutrient concentrations *and* is linked causally to designated use attainment. Effects-based endpoints are desirable because they are more closely linked than nutrient concentrations to the designated uses that are to be protected. In principle, an effects-based endpoint could be any ecosystem property other than the nutrient concentrations themselves.

Once effects-based endpoints are identified, additional data are required to identify a value of the endpoint that is associated with a threshold of or increased probability of designated use impairment. For example, chlorophyll and clarity are effects-based endpoints that often show strong relationships with nutrient levels. However, the nutrient/chlorophyll relationship by itself is of little use without data (preferably from concurrent measurements) that indicate chlorophyll levels associated with, for example, bottom DO depletion (which can be presumed to impair some biological communities) or an increased probability of toxic algae blooms. Similarly, although data might show strong relationships among nutrients, chlorophyll, and clarity, the relationships are of little use without data that identify a minimum level of clarity that, for example, is necessary to support the growth of seagrasses. It is this information on the response of the designated use to changes in nutrients or to effects-based endpoints that is typically lacking and must be inferred from other studies or first principles. Such is the case with the present evaluation.

Seagrasses as an Effects-Based Endpoint

Seagrasses represent a potential effects-based endpoint because they are known to respond to changes in water clarity. However, if seagrasses are considered as only an effects-based endpoint, the quantitative link between seagrass extent and designated use attainment must still be made. In this case, a causal link between nutrients and seagrass by itself is no more useful than a link between chlorophyll and nutrients by itself. Alternatively, if seagrasses are considered to be a part of the aquatic life designated use, then protection of seagrass in and of itself becomes important and the causal link between nutrients, clarity and seagrass can be used as part of the weight of evidence to set criteria. Because seagrass communities play an important, if not crucial role in the trophodymanics of estuaries (Dennison et al. 1993; Heminga and Duarte 2000), it seems valid to consider them to be an appropriate direct indicator of aquatic life use attainment.

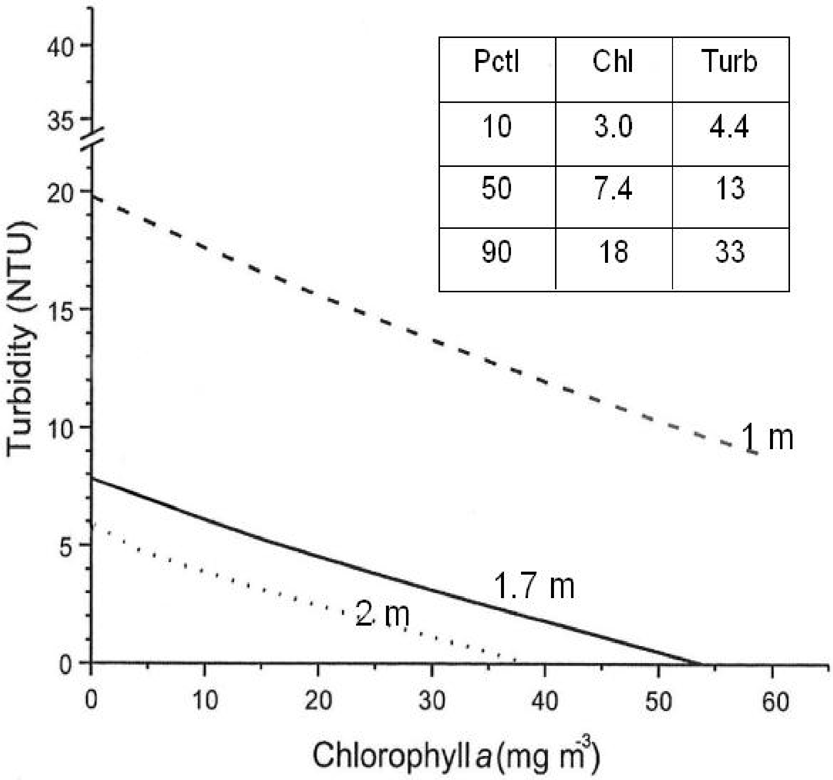
The mechanism for seagrass decline due to nutrient enrichment involves an increase in standing stocks of suspended algae that out-compete seagrasses for light due to the lower light requirements of the suspended algae. The result is a decline or disappearance of seagrass meadows (Sand-Jensen 1977, Borum 1985, Hauxwell et al. 2001). Any factor causing decreased light availability can lead to a similar outcome so that light attenuation due to suspended particles (algae, non-algal suspended matter), color (due to dissolved organic matter) and water depth are major variables controlling seagrass distribution and abundance (Kenworthy and Fonesca 1996, Steward et al. 2005).

Recent research has focused on model development to predict seagrass distribution based on absorption and scattering of light in optically complex coastal waters (Gallegos 2005; Gallegos and Biber 2004; Biber and Gallegos 2008). These bio-optical models are calibrated by relating optical properties of coastal water to commonly measured water quality parameters (e.g., turbidity, chlorophyll) to predict the depth of 22% light penetration, which is a level commonly thought to represent the minimum light required for long-term seagrass survival (Dennison et al. 1993, Kenworthy and Fonesca 1996, Steward et al. 2005). Because of variation in “colored dissolved organic matter” (CDOM), optical properties will vary among water bodies and separate calibrations of the model are needed for different regions.

The first issue to be considered in applying these models is that the target level of water clarity will depend on the depth to which the seagrass community is to be protected. The greater the depth distribution, the greater the level of clarity required. This depth can sometimes be estimated from historical records of seagrass bed extent (Biber and Gallegos 2008).

The second issue is the suitability of the physical habitat for seagrass development. For example, despite high levels of seagrass abundance in Charlotte Harbor, Florida, high inflows of freshwater result in a highly dynamic estuarine environment causing high interannual variability in seagrass coverage unrelated to the influences of nutrient mediated changes in water clarity. For this reason, seagrass extent is not considered to be a reliable indicator of estuarine health in Charlotte Harbor (Corbett et al. 2005). Seagrass protection might not be an appropriate endpoint if other physical-chemical-hydrological factors limit distribution and abundance more than nutrient-clarity interactions. This issue might be addressed by considering water quality (i.e., clarity and associated nutrient conditions) that protects seagrasses to be protective of aquatic life uses, regardless of whether other factors might limit seagrass distribution and abundance.

The third, and more problematic issue, is the influence of non-algal suspended solids (as indicated by turbidity) in determining light limitation of seagrasses. A bio-optical model calibration for the North River, NC, adapted from Biber and Gallegos (2008) is presented in Figure 3.2. This figure is presented only as an example because the slope and intercepts for the calibration lines will vary among water bodies due to differences in optical qualities (Biber and Gallegos 2008). In the figure, calibration lines for 1, 1.7 and 2-meter depths are drawn. Any combination of chlorophyll and turbidity that lies above a line indicates water quality that does not protect seagrass survival at that depth. A summary of chlorophyll and turbidity measurements from the MDEQ data set is also provided in the figure for comparison purposes. Examination of the calibration plot indicates that the chlorophyll concentration that protects seagrasses can be very high or very low depending on the turbidity and the depth. Therefore, any approach to criteria development based on the relationship between water clarity and seagrass protection must also include an approach to identify a "benchmark" turbidity level. This benchmark could be based on an estimate of background turbidity levels or chosen based on a "non-limiting" level of turbidity that might be available in the literature or from best scientific judgment.



Pctl	Chl	Turb
10	3.0	4.4
50	7.4	13
90	18	33

Figure 3.2. Light threshold model applied to North River NC adapted from Biber and Gallegos (2008).

Threshold lines for 3 depths are presented. Data points (turbidity/chlorophyll) plotted above a given threshold line indicate water quality not supporting seagrass at that depth. The table provides percentile values for chlororphyll (ug/L) and turbidity (NTU) from MDEQ 2007 coastal and estuarine data set.

Approach to Criteria Development

For the present evaluation, no data were available on designated uses within Mississippi coastal waters or estuaries that could be used to link designated use attainment, or impairment, to particular endpoint values. Accordingly, potential thresholds provided herein used chlorophyll and clarity as effects-based endpoints based on their presumed link to designated use attainment. The values themselves were chosen using regression trees (Morgan and Sonquist 1963) to identify thresholds in nutrient concentrations associated with changes in the response of the endpoint to the nutrient. The approach is closely related to classical clustering and regression modeling (Wilkinson 1999) and is illustrated in Figure 3.3.

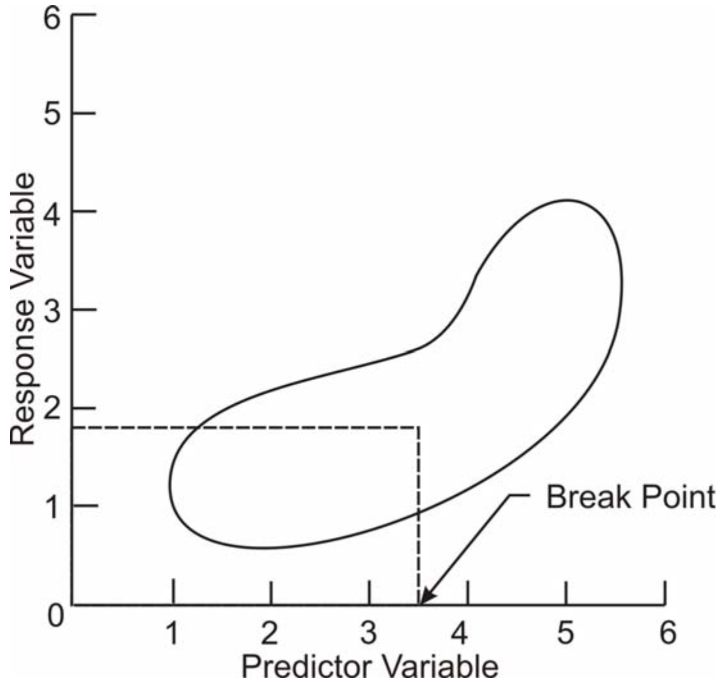


Figure 3.3. Illustration of regression tree analysis.

The data ellipse indicates a change in the predictor/response relationship when the predictor value reaches about 3.5. The break point is where the response values associated with predictor values < 3.5 are significantly different from response values associated with predictor values > 3.5.

The program (TREES in SYSTAT 9) examines a regression between a predictor variable and a response variable and finds a break point on the predictor variable that splits the response variable into two groups that are statistically different from one another. With continuous data, this break point will correspond to a threshold where the relationship of the response to the predictor variable changes. In the present application nutrient parameters (total phosphorus (TP), total nitrogen (TN), total inorganic nitrogen (TIN), and nitrite-nitrate and ammonia) are the predictor variables and the response variables are the effects-based endpoints (chlorophyll and clarity). It should be noted that identifying a break point in the predictor variable only shows that there is a change in the response of the endpoint. The change might be a leveling off in the response of the endpoint, as in the case of a limiting nutrient, or an abrupt increase in the response of the endpoint, such as a shift in algal community composition. The change might or might not be associated with impairment of designated uses.

The first step in this analysis was to identify sub-classes within the entire data set because performing the regression tree analysis on the entire data set might lead to misleading results. For example, if the data set contained data from two groups that simply had different mean values for predictor and response variables, the procedure might identify a break point that was simply due to pooling two different data sets, rather than a change in the predictor response relationship. Therefore, considerable effort was expended to identify a way to classify the data and to understand the underlying structure of the data set. Once relatively homogeneous sub-categories were identified, separate regression tree analyses were performed on the sub-categories.

DATA ANALYSIS

This analysis focused on data collected:

- During three annual cycles of water quality sampling for Mississippi's estuaries and coastal waters (i.e., Spring 2003 through Fall 2004, and 2007) in three salinity zones (tidal fresh 0 to 0.5 ppt, mixing 0.5 to 25 ppt, seawater >25 ppt);
- Through MDEQ's Estuarine Nutrient Study; and
- As part of a special coastal chlorophyll study conducted in 2007.

Due to methodological issues with the analyses, chlorophyll data collected during 2003 and 2004 could not be used in these analyses. The methodological issues were resolved before the 2007 special coastal chlorophyll study. Where data among years were pooled in the following analysis, only sampling conducted during the summer months (June through September) were considered. Except for nitrite-nitrate, parameter measurements that were less than detection limits were estimated by choosing a random value between zero and the detection limit from a uniform distribution. The intent of this modification was to reduce the impact of truncated distributions on the statistical analyses while having very little effect on the mean values. Because nearly one-third of the nitrite-nitrate data were below the detection limit (0.02 mg/L), censored nitrite-nitrate data were set equal to one-half the detection limit. Censored nitrite-nitrate data also resulted in a truncated distribution of TN data.

Classification

Sampling locations for 2007 and *a priori* classes are shown in Figure 4.1. The Coastal and Estuarine Nutrient Subcommittee suggested dividing the Mississippi coast into the following *a priori* classes:

1. Freshwater influenced regions – Pearl River, Wolfe/Jourdan Rivers, Back Bay of Biloxi, Pascagoula, and Mobile Bay;
2. Areal regions – Pearl River, St. Louis Bay, Biloxi Bay, and Pascagoula River; and
3. Major hydrologic subunits – Western Mississippi Sound, Central Mississippi Sound, and Eastern Mississippi Sound.

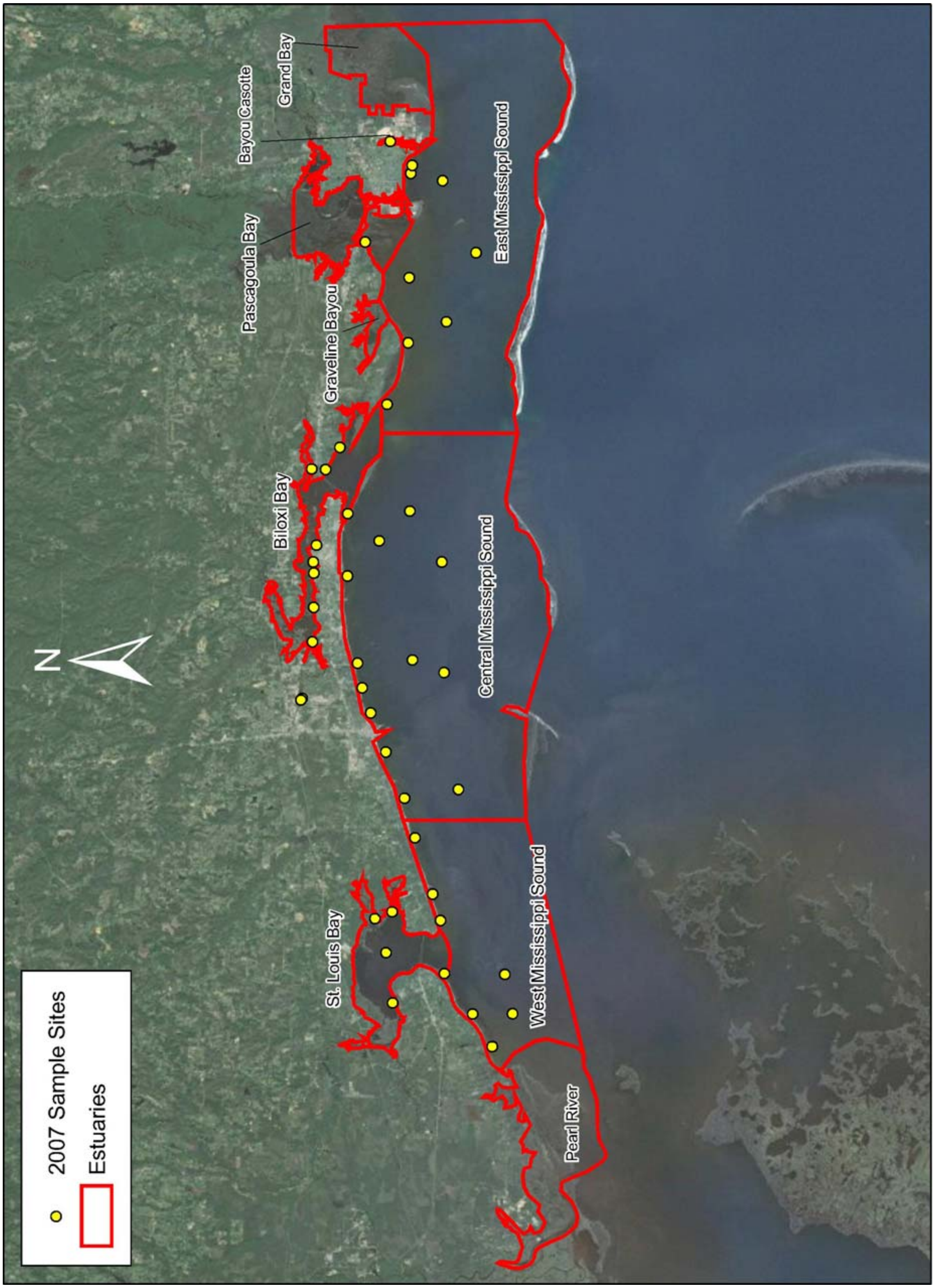


Figure 4.1. Sampling locations for 2007 and *a priori* water body classes.

The usefulness of these *a priori* classes was evaluated by examining the dataset for differences among these classes based on the following:

1. Comparisons of nutrient concentrations (TN and TP) or endpoint levels (clarity, chlorophyll) among classes; or
2. Overall similarity among sampling locations.

Comparisons of Nutrient and Endpoint Values Among Classes

For this analysis, box and whisker plots were used to assess differences among site groupings based on areal regions and major hydrologic subunits for summer sampling conducted in 2003, 2004, and 2007.

<u>Areal Regions</u>

Among the 2003, 2004, and 2007 data sets, the St. Louis Bay, Biloxi Bay and Pascagoula River regions were common to all data sets. Parameter distributions are compared among the three locations across years in Figure 4.2. No clear consistent patterns among locations across years are evident in this analysis. There was a slight tendency (2 out of 3 years) for Biloxi Bay to show higher TP and TKN concentrations and a greater range of salinity.

<u>Major hydrologic subunits</u>

Parameter distributions are compared among the eastern, central, and western Mississippi Sound sub-areas across years in Figure 4.3. Comparisons among sub-regions indicate a tendency for an east-west gradient in nutrients and salinity with slightly higher levels in the eastern Sound, and tending to decrease in the central and western Sound. There was also a tendency for more variability in TP and TKN concentrations in the eastern Sound.

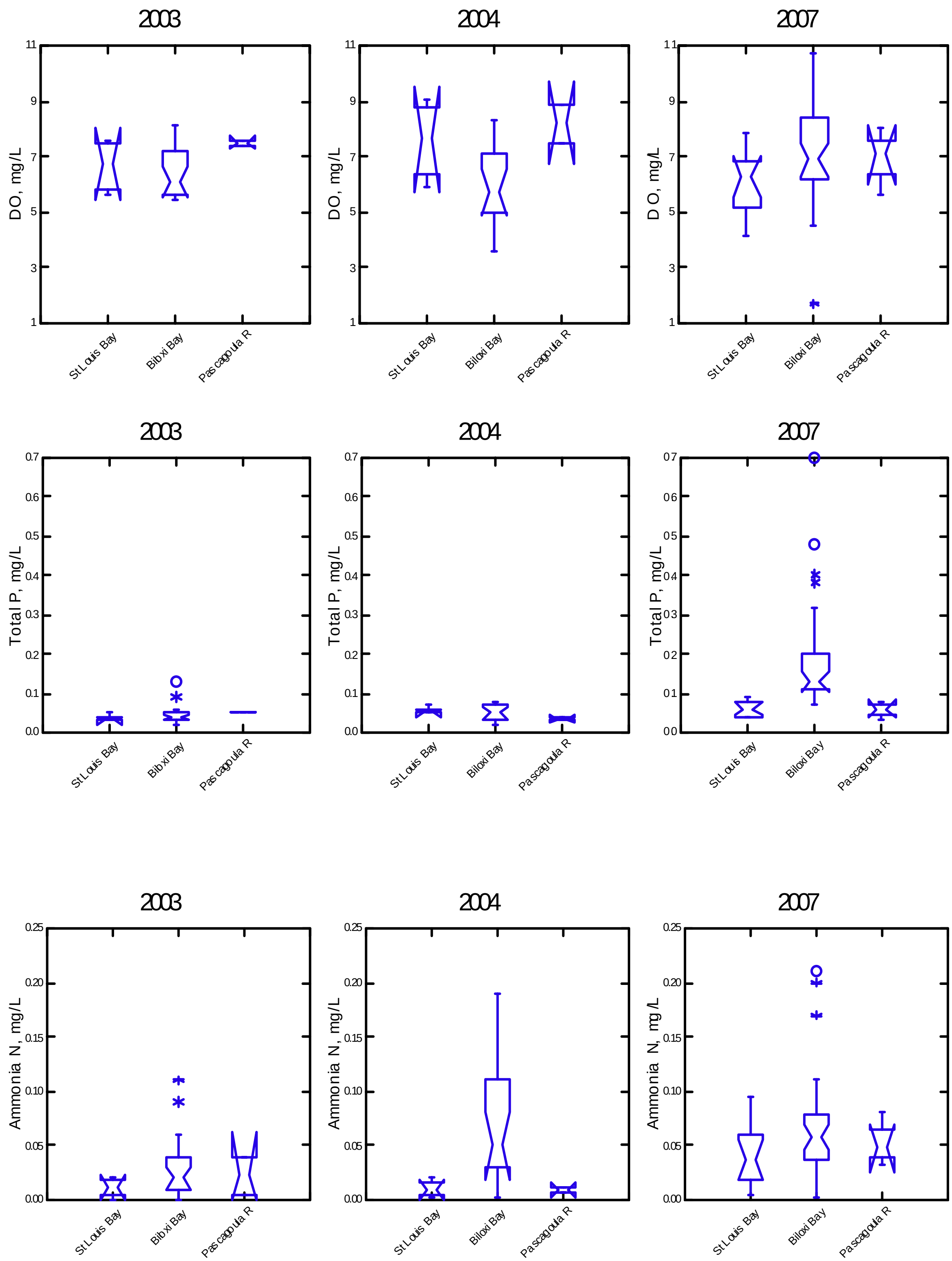


Figure 4.2. Box and whisker plots comparing selected areal regions across sampling years.

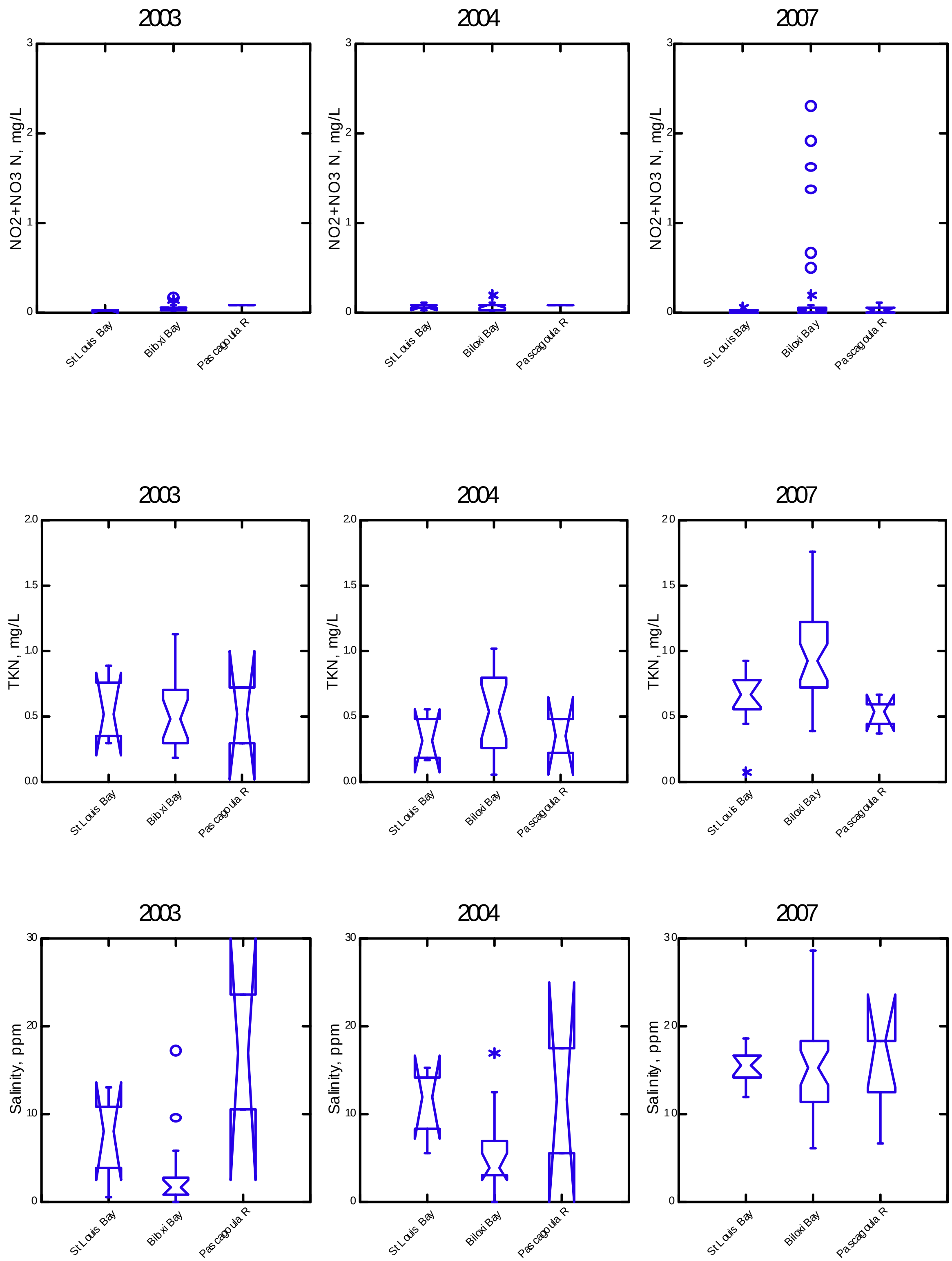


Figure 4.2. Box and whisker plots comparing selected areal regions across sampling years (Continued).

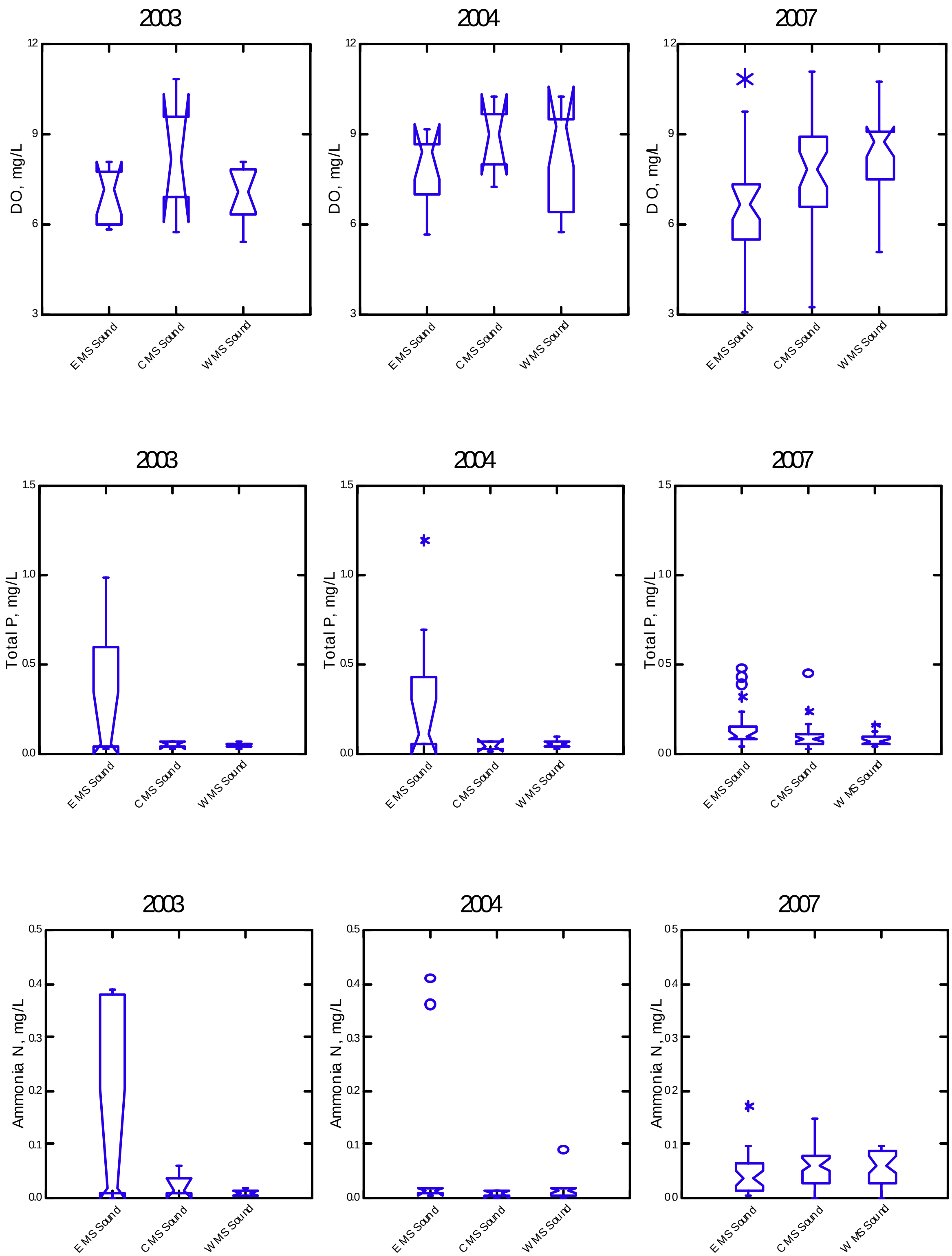


Figure 4.3. Box and whisker plots comparing hydrologic sub-regions (eastern, central, and western Mississippi Sound.

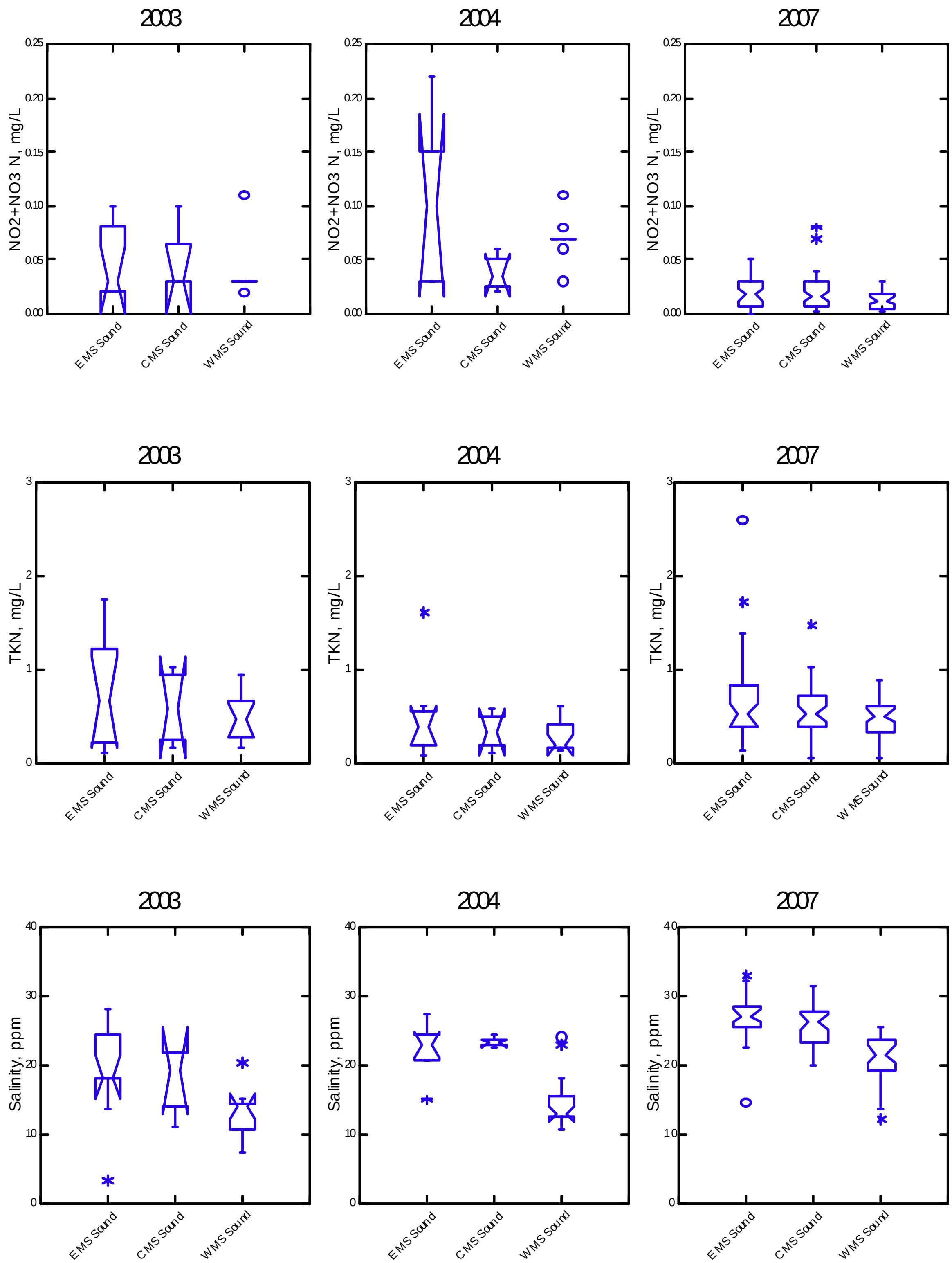


Figure 4.3. Box and whisker plots comparing hydrologic subregions (eastern, central and western Mississippi Sound (Continued).

Overall Similarity Among Sampling Locations

Two methods, cluster analysis and principal components analysis (PCA), were used to evaluate the *a priori* classes based on overall similarity among sampling locations. The analysis of overall similarity among sampling locations focused on the 2007 data collection because this data set included a valid chlorophyll data set. The results of cluster analyses and PCA are often sensitive to missing variables when there are relatively few variables, as was the case in this analysis. Because the chlorophyll data were incomplete across years, only the more complete 2007 data set was included in the PCA and cluster analysis to avoid difficulties in interpretation.

Cluster Analysis

Cluster analysis is an exploratory classification procedure that can be used to examine multivariate water quality data to identify hierarchical structure or sets of sampling sites made up of non-overlapping (or nearly so) classes based on overall similarity among sampling stations. The analysis was used to further evaluate the *a priori* classes suggested by the Coastal and Estuarine Nutrient Subcommittee, as well as to identify other classes indicated by the data. Although a number of linkage methods (e,g., Ward's, single linkage, centroid) using Euclidian distance were applied to the data set, the results reported herein refer to analyses performed using Ward's linkage method. Ward's linkage method has been shown to perform well in discriminating sites of different trophic status (Primpas et al. 2008). Parameters included in this analysis were ammonia, nitrite-nitrate, TKN, TP, DO, salinity, TSS, chlorophyll, and Secchi depth.

Examples of the results of the cluster analyses are provided in Figures 4.4 and 4.5. Figure 4.4 shows two main clusters. Although the smaller cluster is composed entirely of Biloxi Bay sites, numerous Biloxi Bay sites are also included in the larger cluster. Figure 4.5 shows the same analysis performed to include data from the Mississippi Sound sites. In this analysis, the *a priori* classes were "Mississippi Sound" and "Bays". There is only weak clustering as indicated by the large number of clusters, with only small differences in the distances separating them. Mississippi Sound and Bay sites show no tendency to associate into distinct classes. Overall, the cluster analysis did not indicate that the pre-selected classes represent distinct divisions that can be identified based on their overall similarity within classes and dissimilarity between classes.

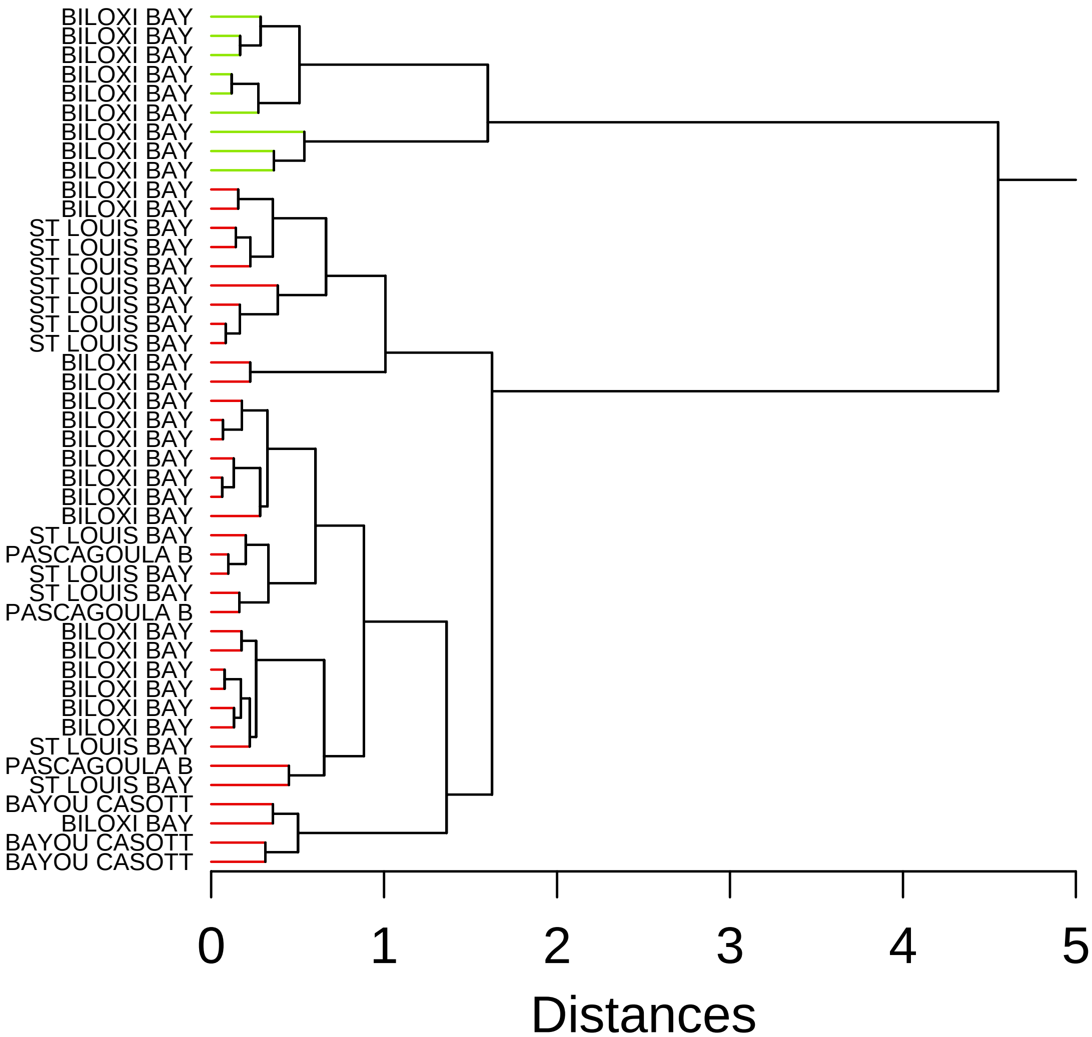


Figure 4.4. Results of cluster analysis (Ward's method using Euclidian distances) using areal regions (Bayou Casott, St. Louis Bay, Biloxi Bay, Pascagoula Bay) as a priori classes.

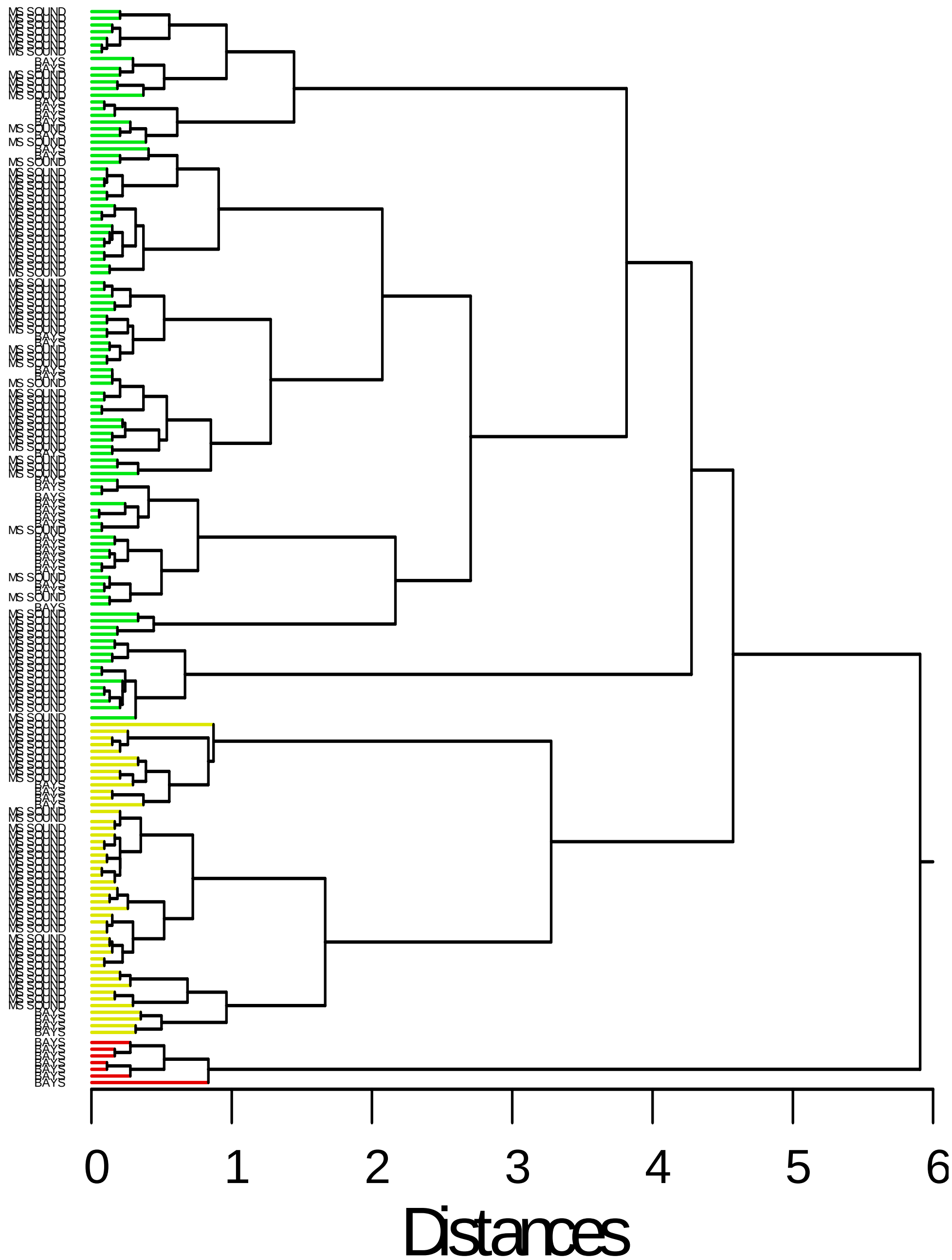


Figure 4.5. Results of cluster analysis (Ward's method using Euclidian distances) using "bays" versus Mississippi Sound.

Principal Components Analysis

Principal components analysis (PCA) is an exploratory ordination procedure that can be used to evaluate structure within a data set by analyzing correlations among variables. The analysis can be used to:

1. Visually evaluate potential classes or subsets of data points within the data set. While the evaluation is subjective, it allows consideration of overlap among potential classes that is difficult using cluster analysis.
2. Identify groups of correlated variables. Correlations among variables can be useful in criteria development by documenting linkages among causal variables such as nitrogen and phosphorus versus response variables such as chlorophyll and clarity.

The variables included in this analysis (ammonia, nitrite-nitrate, TKN, TP, pH, DO, salinity, TSS, chlorophyll, and Secchi depth) were measured in the Mississippi estuarine and coastal waters during 2007. The analysis was conducted on log-transformed data using Varimax rotation of the original axes.

Results of the PCA are summarized in Table 4.1. The first three PCA axes accounted for 59% of the total variance in the data set. The interpretations of the PCA axes suggested by the variable loading on the PCA axes are also provided in Table 4.1. The first axis was associated with nutrient-chlorophyll relationships (chlorophyll, TKN, NO2 + NO3, TP). The second axis was primarily associated with physical components (TSS, salinity), while the third axis was associated with primary production (DO, pH, Secchi). Variables with high loadings on the same axis are not only correlated with the axis, but with each other.

Table 4.1. Summary of PCA analysis.

	PCA Axis			
	1	**2**	**3**	**4**
L10Chla	0.752	-0.012	-0.226	-0.388
L10TKN	0.762	-0.080	-0.163	0.052
L10NO3/NO2	0.723	-0.252	0.278	0.210
L10TP	0.794	0.243	-0.231	0.098
L10TSS	0.136	0.875	-0.013	-0.079
L10SAL	-0.413	0.754	0.225	0.191
L10SECCHI	-0.300	-0.330	0.662	0.124
L10DO	0.024	0.075	0.684	-0.352
pH	-0.120	0.232	0.734	0.058
L10NH3	0.080	0.027	-0.083	0.878
% of Variance Explained	26	16	17	12
Interpretation	Increasing Nutrients and Chlorophyll	Increasing Salinity and Solids	Increasing Productivity	Increasing Ammonia Nitrogen

Shaded cells indicate loadings used to interpret axes.

To evaluate the *a priori* classifications using this ordination procedure, principal component (PC) factor scores for each sampling location were plotted for PC axis 1 versus 2 and PC axis 2 versus 3. Figures 4.6 and 4.7 show sampling locations classified by areal regions and major hydrographic subunits, respectively. Examination of Figure 4.6 indicates a high degree of overlap among clusters of sampling points from the different areal regions. Between the regions that have the most data (Biloxi Bay and St. Louis Bay), Biloxi Bay showed the greatest variation along all three axes.

Among major hydrographic sub-unit Sound sites, there was a tendency for the western Mississippi Sound to have lower factor scores than eastern Mississippi Sound for all three factors, while the central Mississippi Sound strongly overlapped both eastern and western scores (Figure 4.7). This slight separation between eastern and western locations corresponds to differences in salinity, nutrients, and clarity noted in the individual parameter comparisons summarized in the previous section.

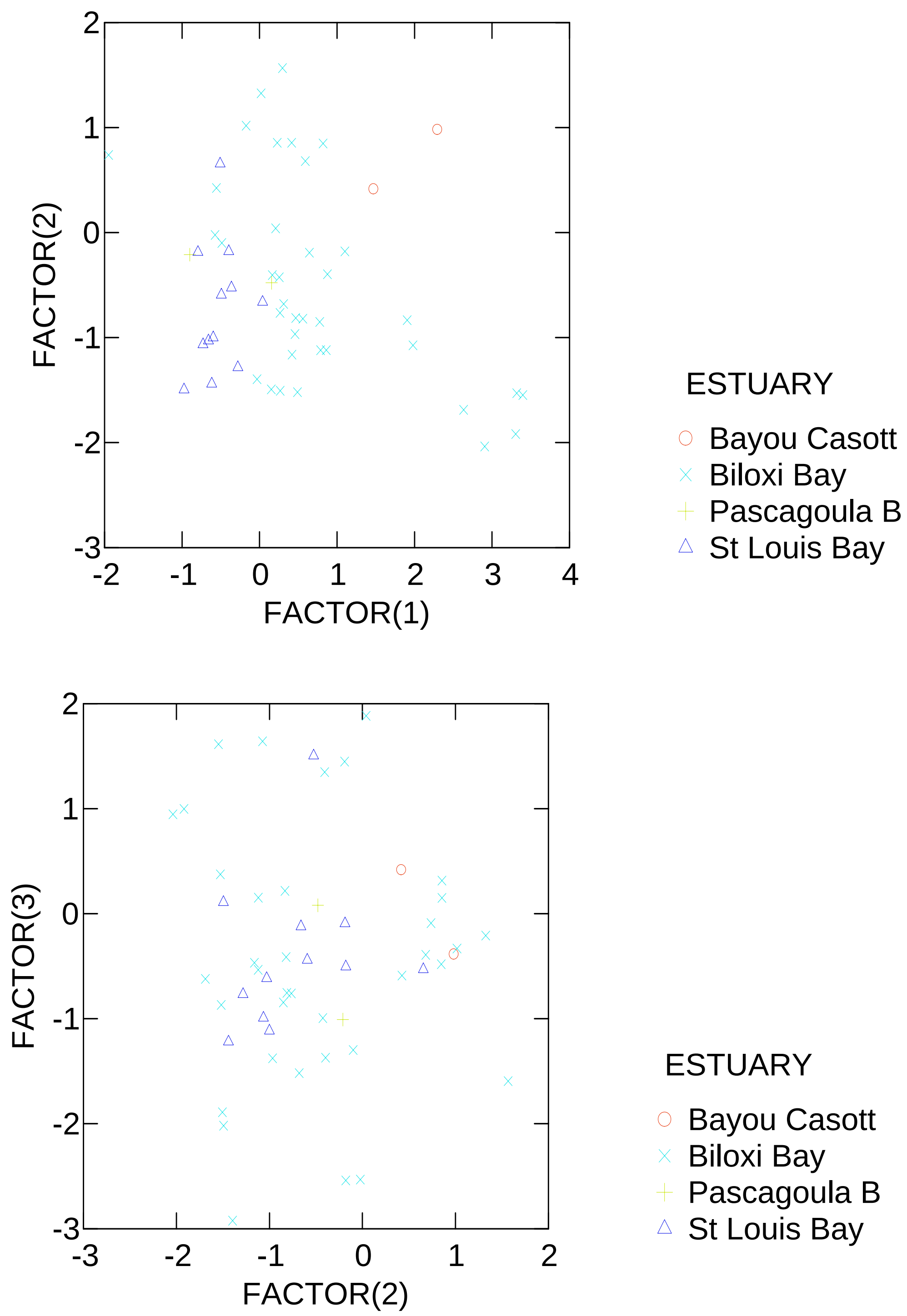


Figure 4.6. Plots of PCA factor scores classified by estuary.

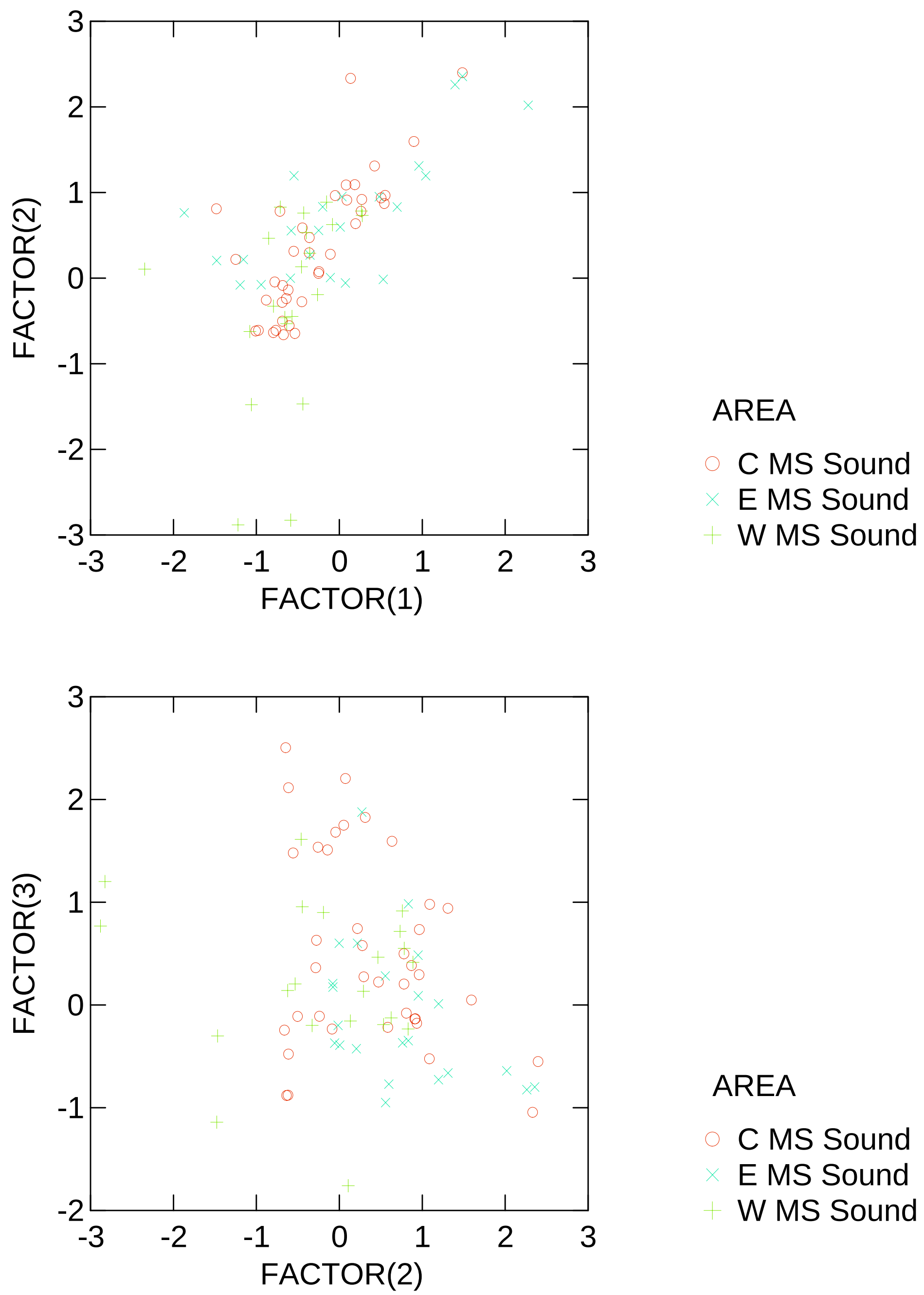


Figure 4.7. Plots of PCA factor scores classified by major hydrographic sub-units (eastern, central and western Mississippi Sound).

Further evaluation of the PCA data set indicated that, while there is substantial overlap among bay sites and among Sound sub-areas, there is better differentiation between open-water Mississippi Sound sites and bay sites (Figure 4.8). Examination of Figure 4.8 indicates that pooling of the bay and Sound data sets could lead to spurious correlations between nutrient and response variables because the Sound and bay factor scores tend to lie in different quadrants of the plots. This possibility was examined by visually evaluating correlations between salinity and other parameters (TP, TKN, chlorophyll and clarity). Salinity was chosen because it showed high loading on a PCA axis (Table 4.1) and because salinity gradients are known to be a dominant feature in the physical-chemical regime of estuaries (Hemminga and Duarte 2000; Levinton 2001). Scatter plots of these comparisons are presented in Figures 4.9, 4.10, and 4.11. Visual examination of these scatter pots clearly indicates that spurious correlations will arise if the bay and Sound data are pooled. This is because, in almost all cases, the Sound data have high salinity and low nutrient and chlorophyll values, which places them in the lower right quadrant of almost all scatter plots. When pooled with data that typically have lower salinity and higher nutrient and chlorophyll values, spurious correlations will result. Therefore, correlations based on the pooled bay and Sound data set are not a valid basis for establishing linkages among causal and response variables.

Classification Analysis Conclusions

Cluster analysis indicated:

1. There is only weak clustering overall in the data set as a whole, and
2. The pre-selected classes did not represent distinct divisions that can be identified based on overall similarity among sampling locations within classes.

The ordination (PCA) analysis indicted that:

1. Mississippi Sound and sites in different regions of the different bays show a high degree of overlap with little or no tendency to associate into distinct classes,

2. There was better separation along ordination axes when sampling locations were classified as bay and Sound, and

3. The correlation structure between variables is likely to be different for bay locations as a group versus Sound locations.

The classification analysis indicated that a classification of locations into bay and Sound would be appropriate for further evaluation of the data using regression tree analysis.

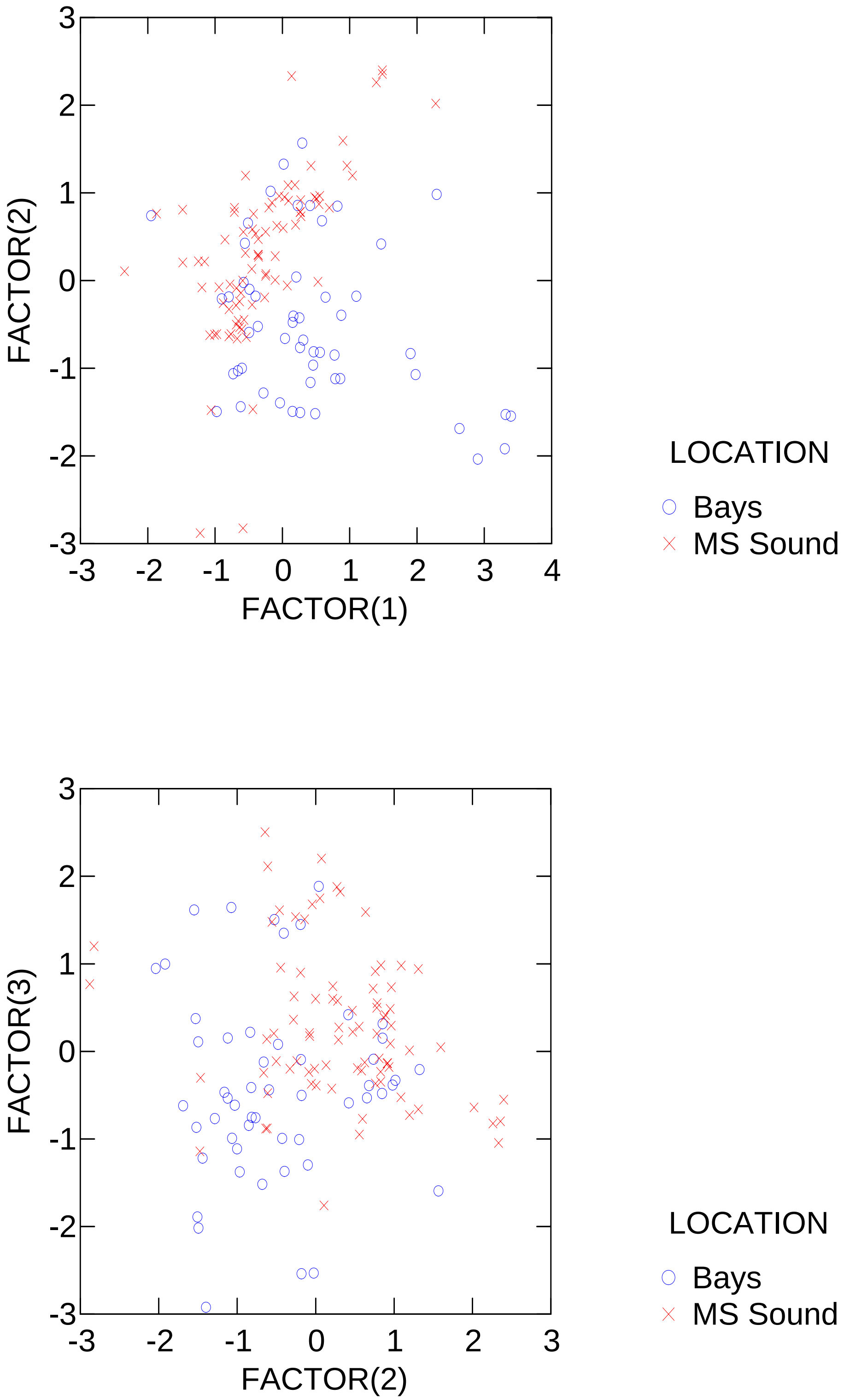
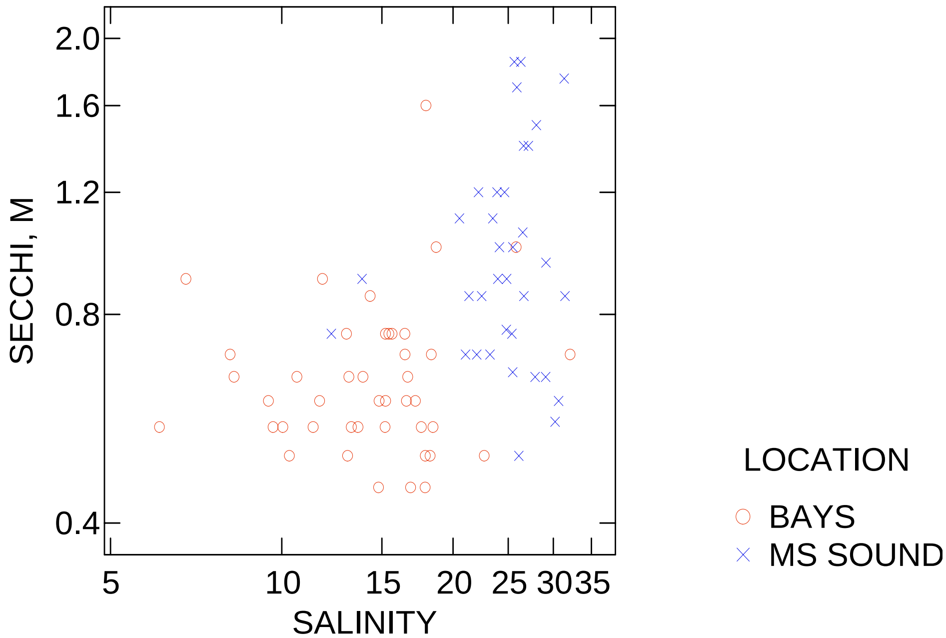


Figure 4.8. Factor plots with locations classified as bays or Mississippi Sound.



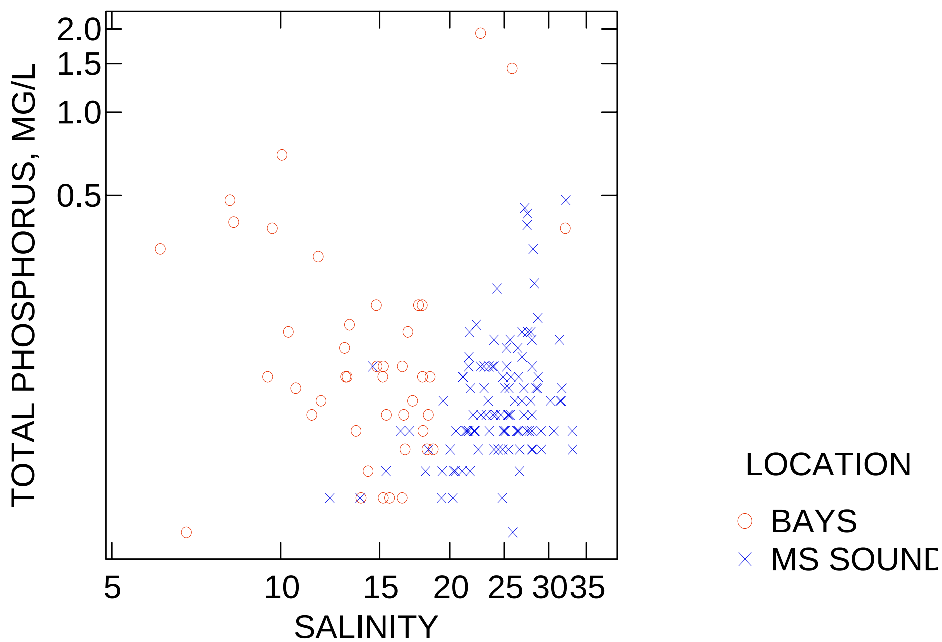
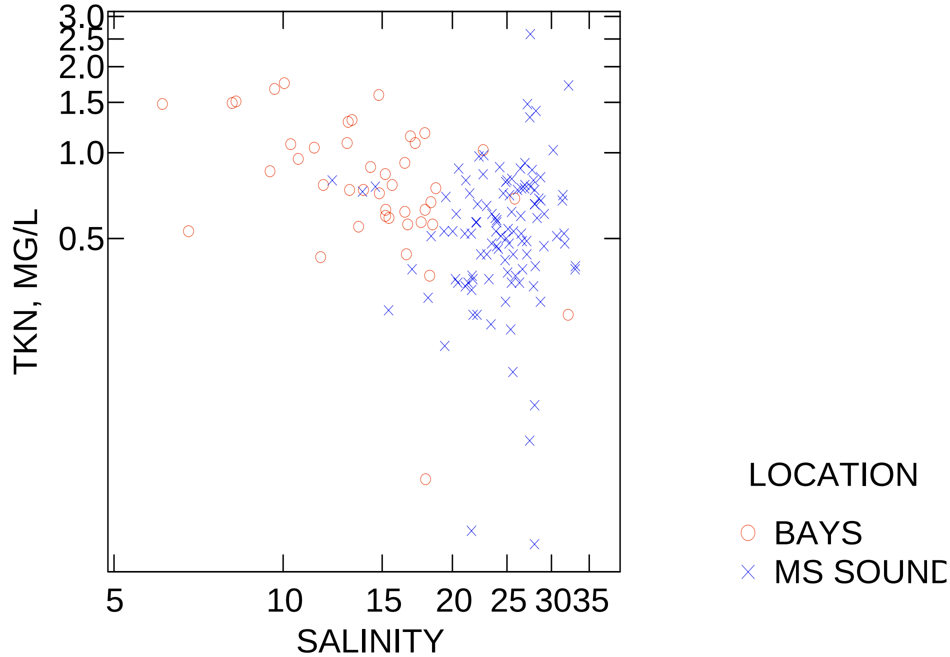


Figure 4.9. Scatter plots of salinity versus secchi disk (top figure) and salinity versus total phosphorus (bottom figure) for bays and Mississippi Sound locations combined.



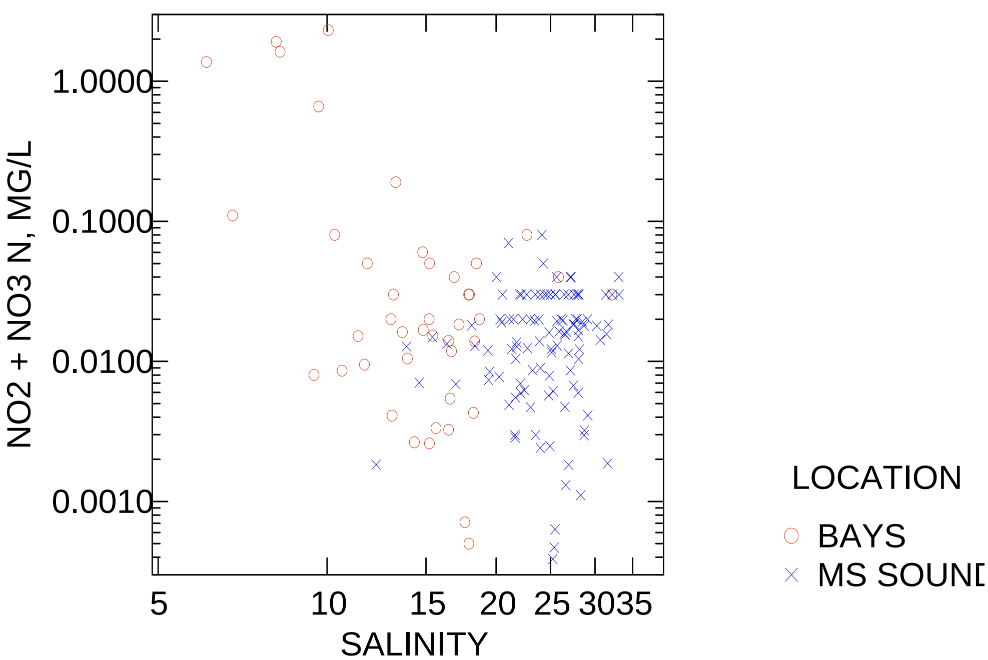


Figure 4.10. Scatter plots of salinity versus TKN (top figure) and salinity versus nitrite-nitrate (bottom figure) for bays and Mississippi Sound locations combined.

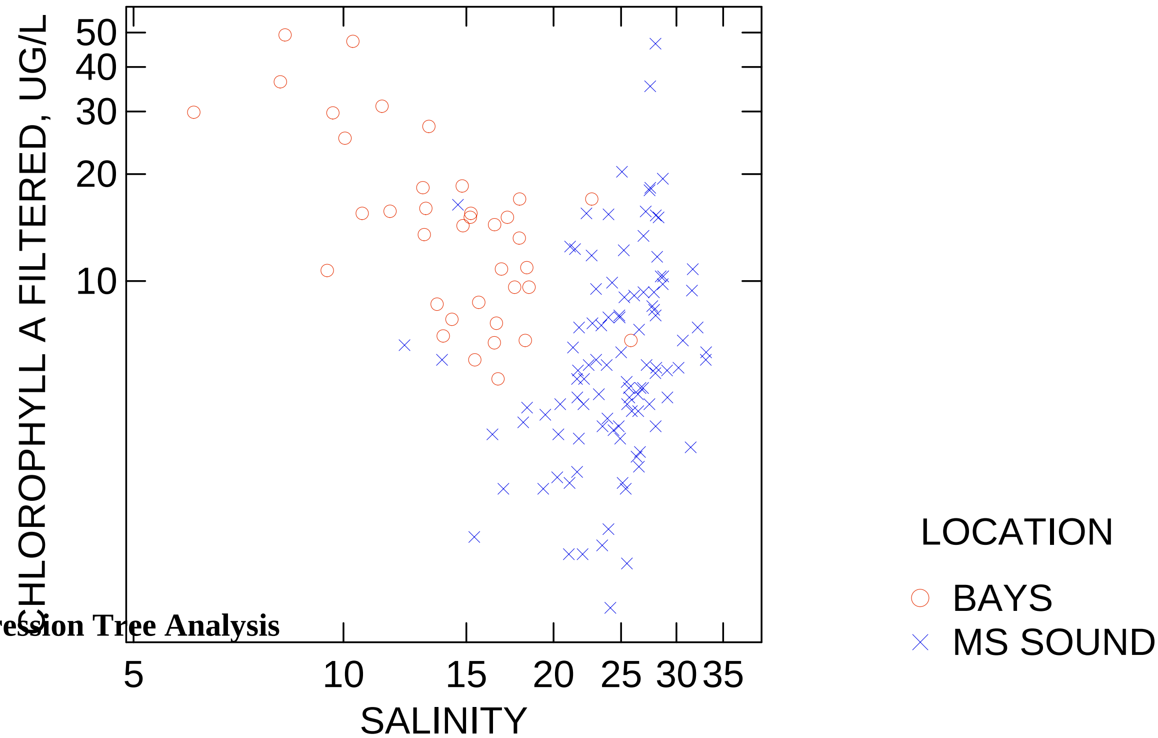


Figure 4.11. Scatter plot of salinity versus chlorophyll for bays and Mississippi Sound locations combined.

Regression Tree Analysis

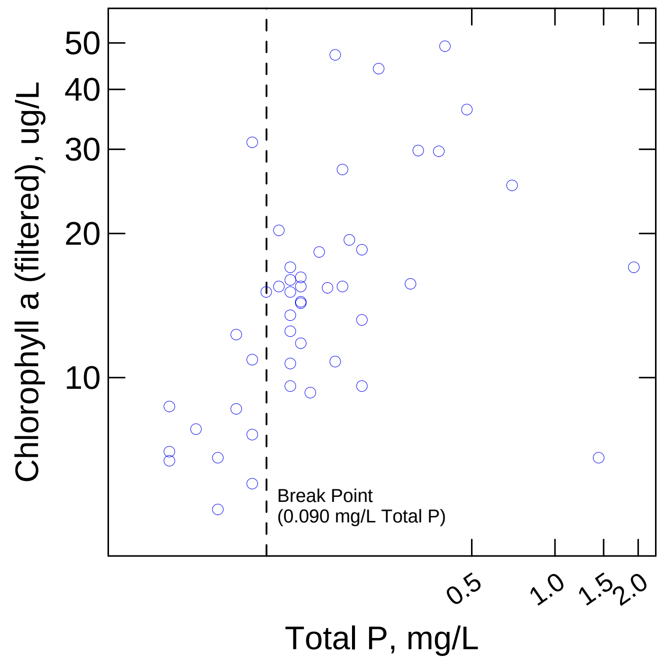
Sampling locations were classified as "bay" or "Sound" and analyzed separately using regression tree analyses. Response variables were chlorophyll and Secchi depth, and predictor variables were TP, TN, TKN, TIN, Nitrite-nitrate and ammonia. Significant results (i.e., break points in the predictor variables) are summarized in Table 4.2. Bivariate plots of the predictor versus response variable are presented in Figures 4.12 through 4.17.

In general, the plots do not provide compelling visual support for the presence of break points or thresholds as indicated by the results of the regression tree analyses. Possible exceptions to this are the response of chlorophyll to TP and nitrite-nitrate in bays (Figures 4.12 and 4.14, respectively), and chlorophyll to TP in the Sound (Figure 4.17).

Table 4.2. Nutrient thresholds (mg/L as N or P) from regression tree analyses of predictor variables (nutrients) and effect-based endpoints (chlorophyll and Secchi depth).

Predictor Variable	Bays		Sound	
(mg/L as N or P)	Chlorophyll	Secchi Depth	Chlorophyll	Secchi Depth
TP	0.09	0.1	0.09	None
TKN	1.021	0.8	0.65	0.729
Nitrite-nitrate	0.08	None	None	0.03
Ammonia	0.012	None	0.046	0.07

BAYS DATA



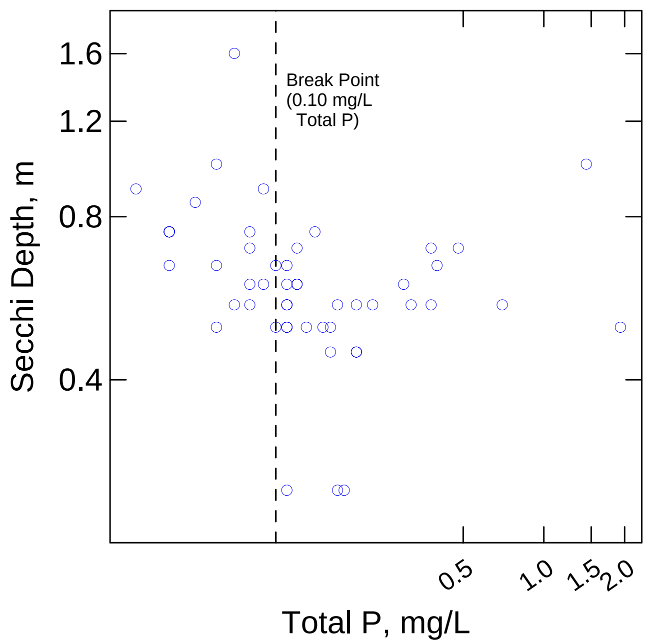
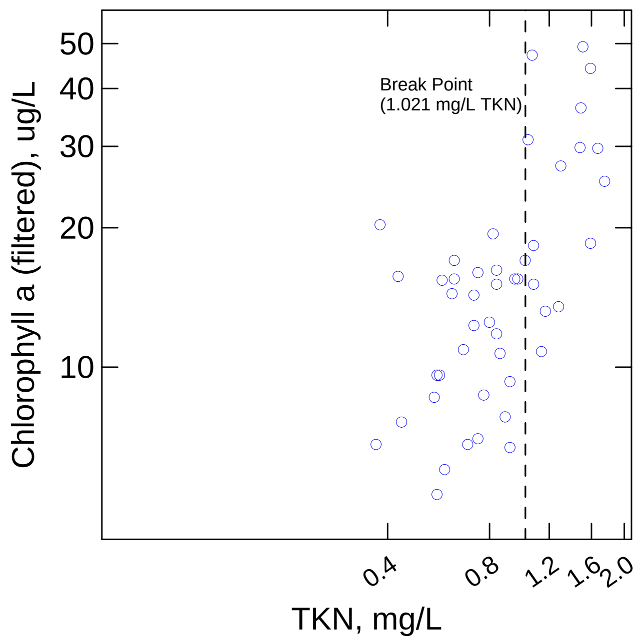


Figure 4.12. Plots of total phosphorus versus chlorophyll and Secchi depth from bay locations.

BAYS DATA



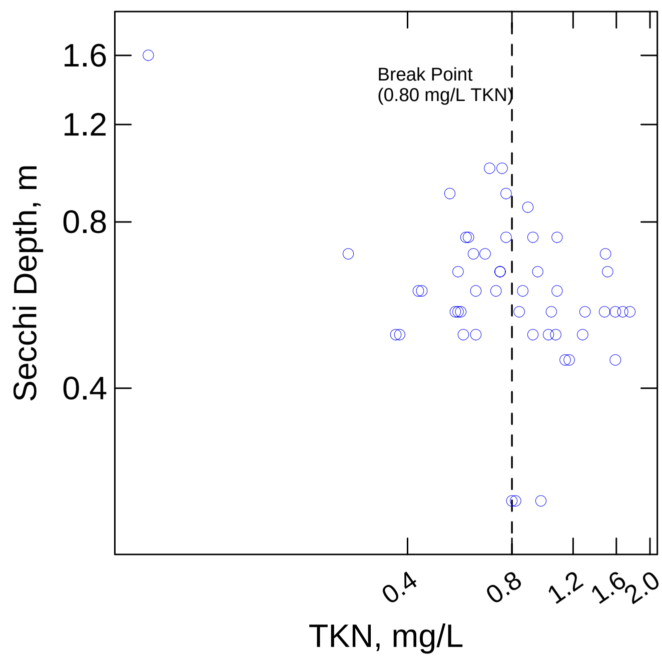
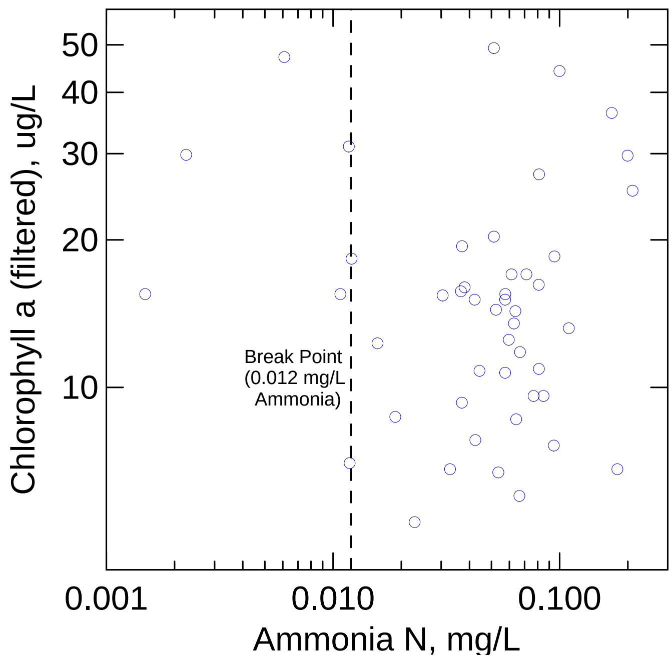


Figure 4.13. Plots of total Kjeldahl nitrogen versus chlorophyll and Secchi depth from bay locations.

BAYS DATA



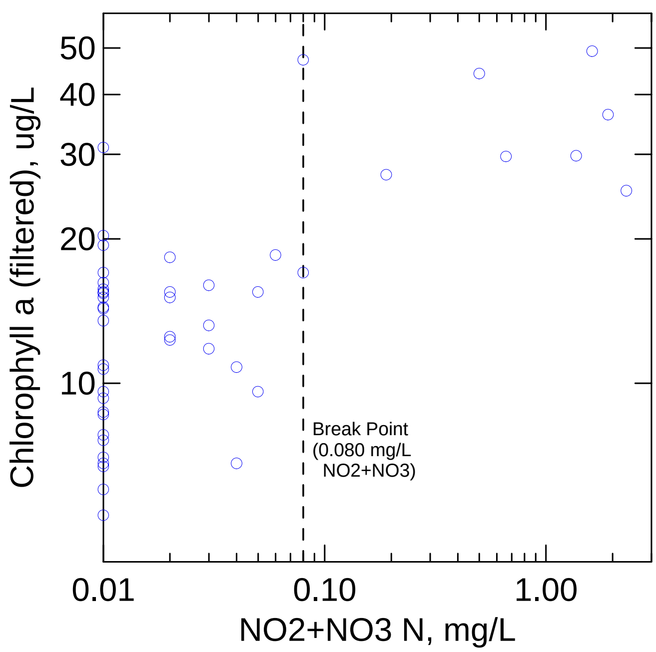


Figure 4.14. Plots of nitrate-nitrate and ammonia versus chlorophyll from bay locations.

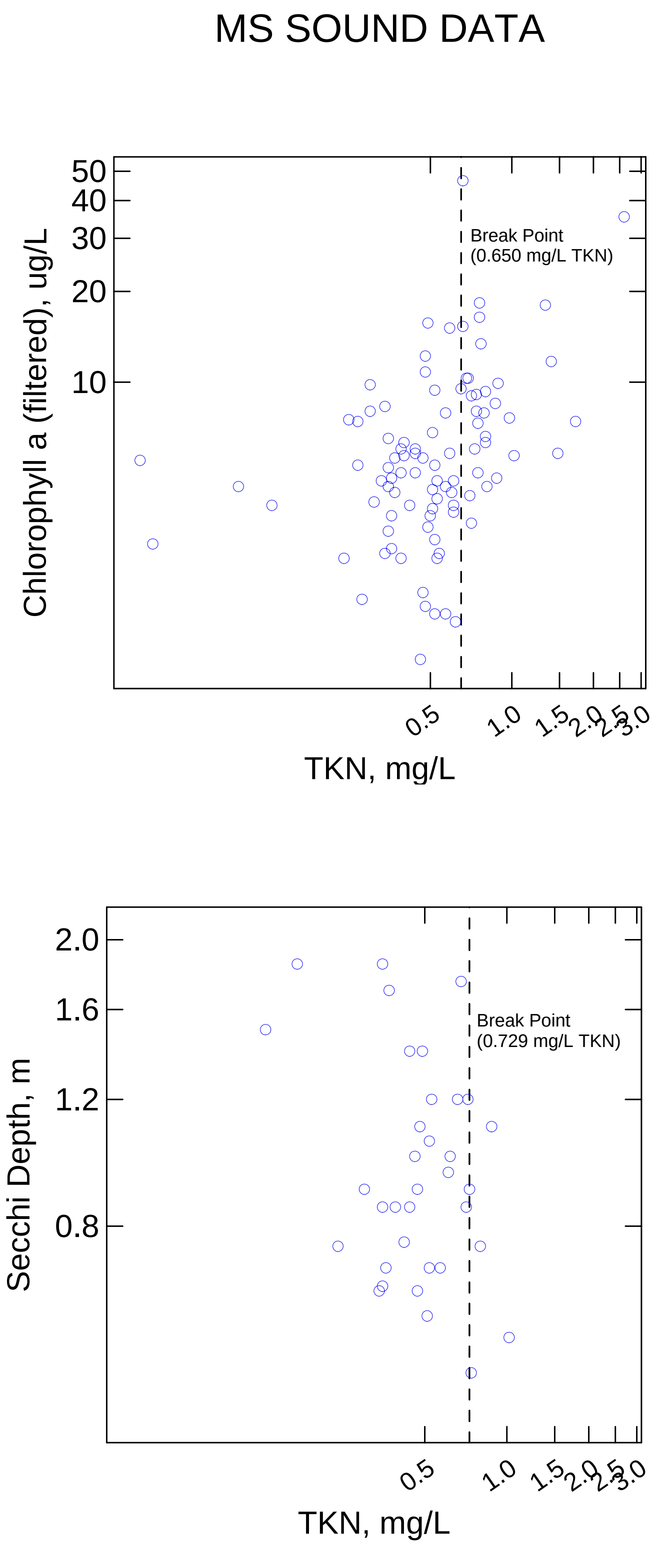
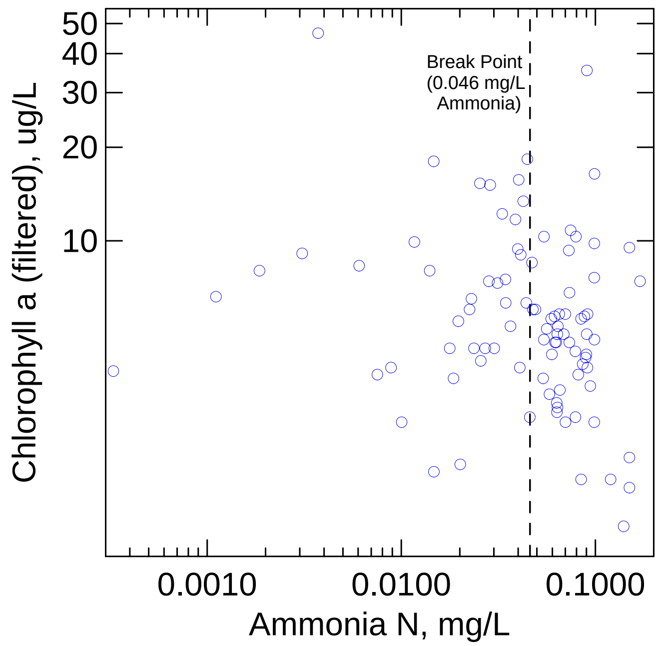


Figure 4.15. Plots of total Kjeldahl nitrogen versus chlorophyll and Secchi depth from Sound locations.

MS SOUND DATA



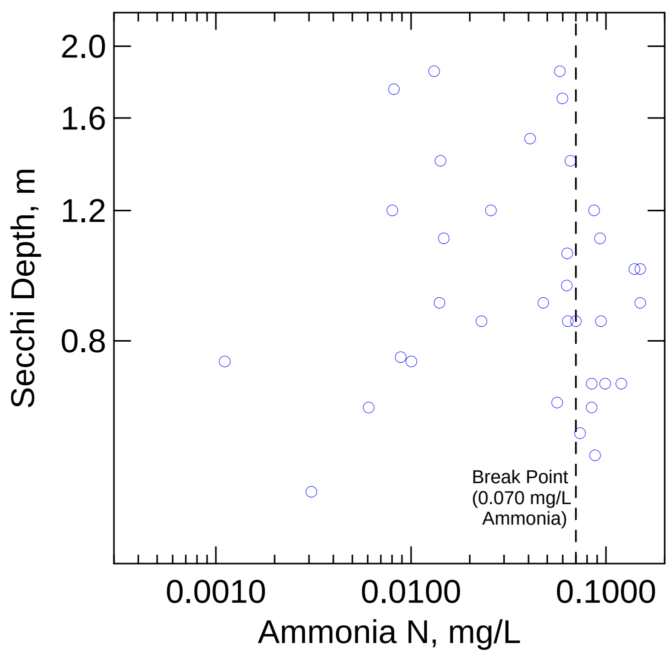


Figure 4.16. Plots of ammonia versus chlorophyll and Secchi depth from Sound locations.

MS SOUND DATA

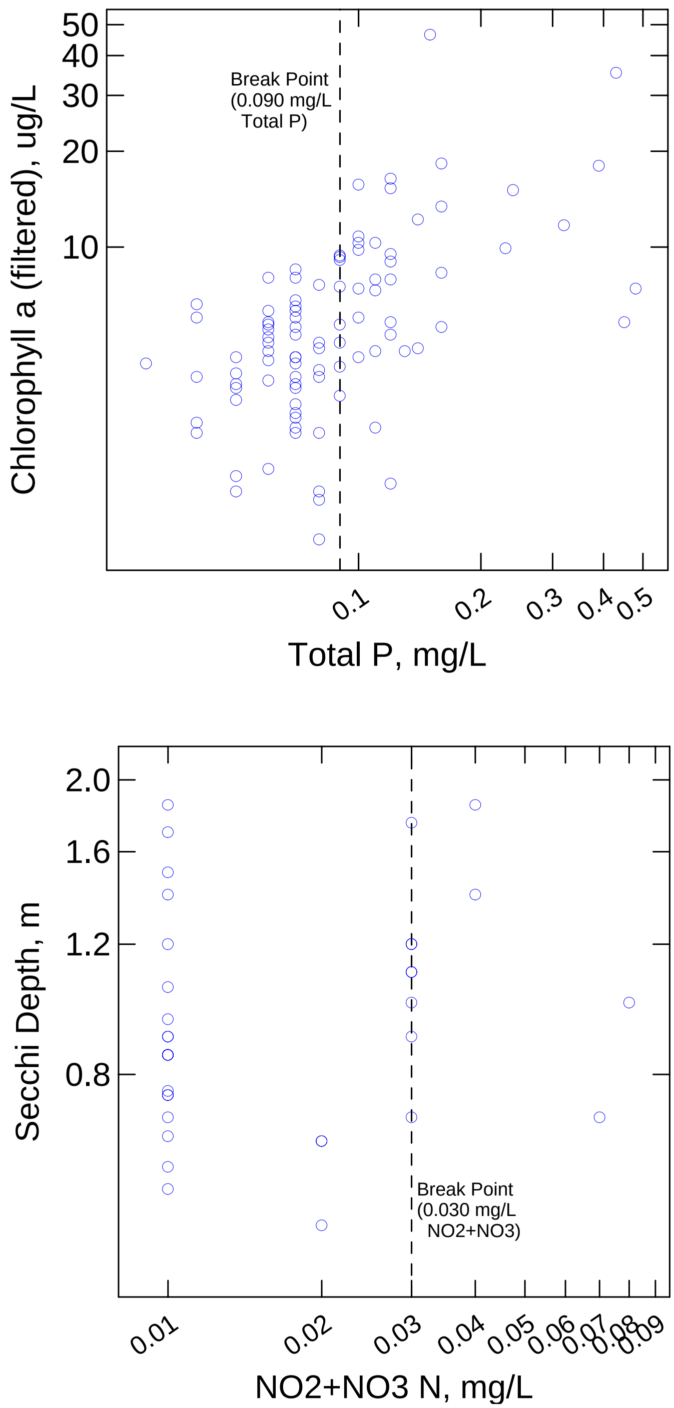


Figure 4.17. Plots of total phosphorus versus chlorophyll (top figure) and nitrite-nitrate versus Secchi depth (bottom figure) from Sound locations.

Examination of Figure 4.12 indicates that there is an increase in the response of chlorophyll to TP when the TP concentrations reach the computed threshold of 0.090 mg/L. This pattern could indicate a shift in algal community composition at TP greater than 0.090 mg/L.

Figure 4.14 indicates a possible leveling off of the response of chlorophyll to nitrite-nitrate at the computed threshold. This pattern is consistent with nitrogen limitation below the computed threshold of 0.080-mg/L nitrite-nitrate nitrogen and other limiting factors operating above the threshold. Similarly, Figure 4.17 indicates a possible leveling off of the chlorophyll response to TP at roughly the computed threshold TP concentration of 0.090 mg/L. This pattern would be consistent with phosphorus limitation at TP concentrations below the computed thresholds.

Regression Tree Analysis Conclusions

Although not visually compelling, some of the predictor versus response relationships indicate discontinuities that suggest thresholds for TP and nitrite-nitrate relative to chlorophyll responses. These relationships are consistent with different limiting factors (e.g., nitrogen versus phosphorus) at different locations at different times of the year. This pattern is consistent with the conclusions of Guildford and Hecky (2000), De Jong (2006), Hoyer et al. (2000), and Smith (2006) that marine and estuarine systems are at times either nitrogen- or phosphorus-limited. This suggests that basin-wide management of eutrophication in coastal waters will require consideration of both nitrogen and phosphorus.

Even if there were clear and consistent correspondence between the regression tree results and the bivariate plots, there is no empirical linkage between the thresholds and adverse effects on designated uses. At the present time, however, the thresholds identified by the regression tree analysis provide an alternative for interpreting the nutrient and effect-based endpoint relationships presented herein. Therefore, the nutrient thresholds summarized in Table 4.2 are presented as a point for initiation of development of draft criteria. A weight of evidence approach can be used to refine and modify these criteria. Where thresholds based on both chlorophyll and Secchi depth are available, the potential nutrient criteria could be computed as an average value from the two endpoints, or chosen from the more restrictive or ecologically relevant to the designated use of the two. Again, a weight of evidence approach should be used to derive the proposed nutrient and effects-based criteria.

ADDITIONAL ANALYSES AND CONSIDERATIONS

Estimation of Background Phosphorus Concentrations

Smith (2006) used a meta-analysis to investigate nitrogen and phosphorus limitation in estuarine and coastal marine waters based on 335 cases derived from 92 estuarine and coastal sites worldwide. One finding was that chlorophyll yield as a function of phosphorus concentration was different for phosphorus-limited versus nitrogen-limited conditions as indicated by N:P ratios. This finding is illustrated in Figure 5.1 and provides a potential means to evaluate background phosphorus concentrations based on annual mean concentrations. Smith (2006) suggests that the relationships shown in Figure 5.1 provide support for the hypothesis (references cited in Smith 2006) that more pristine marine environments tend to be phosphorus-limited while nutrient-enriched environments tend to be consistently nitrogen-limited. In considering how to evaluate background phosphorus in a hypothetically nutrient-enriched and therefore (presumably) nitrogen-limited condition, the question could be asked, “Given the observed total phosphorus concentration of the enriched condition, what would be the corresponding phosphorus concentration in a phosphorus-limited condition?” This phosphorus-limited phosphorus concentration could be evaluated using the relationships provided in Figure 5.1, as shown in Figure 5.2. This approach would essentially define background phosphorus as the concentration that would result in phosphorus limitation. This could form the basis for water body specific (e.g., for specific bays) phosphorus criteria based on water body specific annual mean phosphorus concentrations.

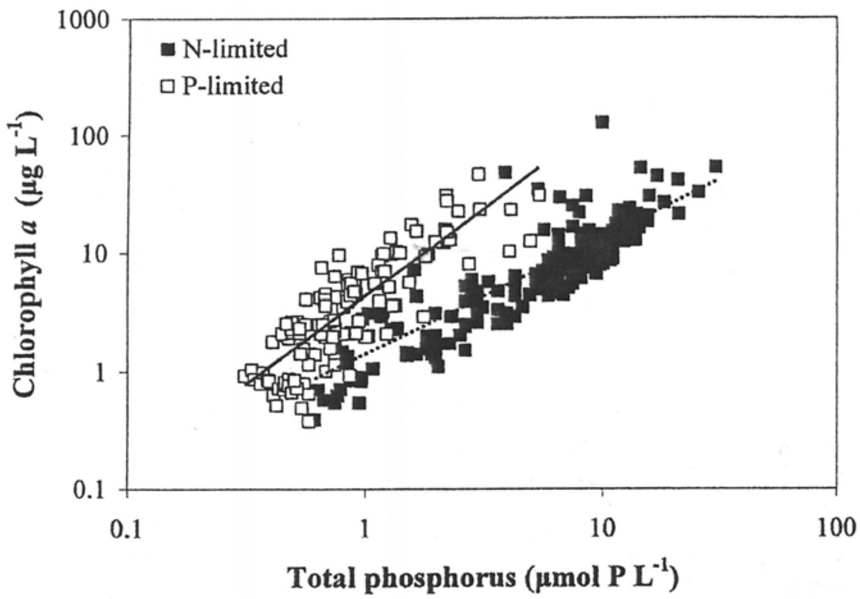


Figure 5.1. Relationship between annual mean chlorophyll and annual mean total phosphorus concentrations from 92 estuarine and coastal sites worldwide. Nitrogen versus phosphorus limitation was inferred from N:P ratios. From Smith (2006).

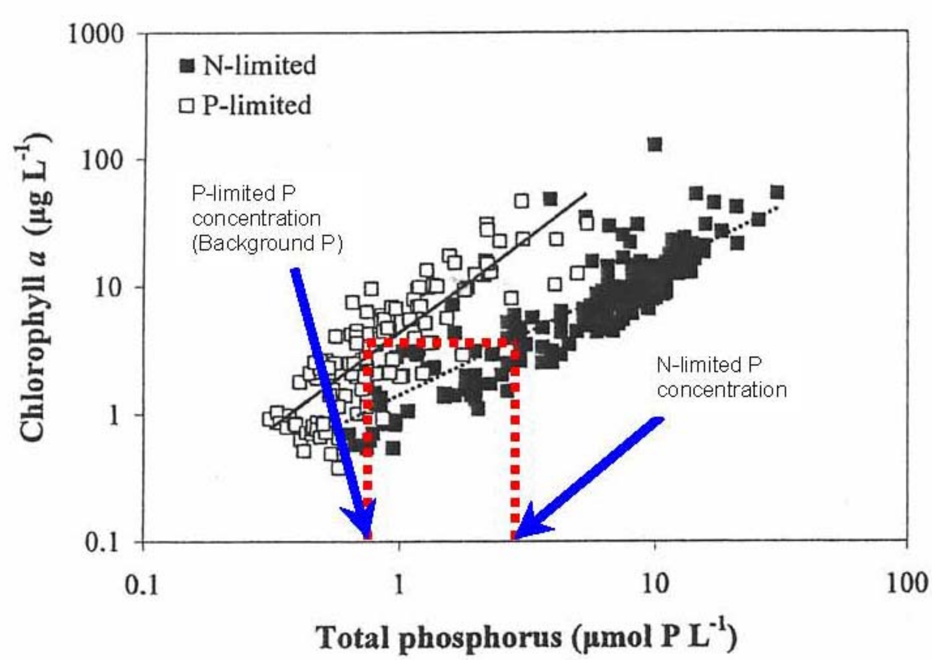


Figure 5.2. Illustration of possible approach to estimating background phosphorus concentrations using relationship between annual mean chlorophyll and annual mean total phosphorus concentrations from Smith (2006).

SUMMARY

1. There were no consistent differences in water quality, including chlorophyll and clarity, among bays and areas within the Sound (i.e., east versus central versus west).

2. Responses of effect-based endpoints, such as chlorophyll and clarity to nutrients, are different for open water Sound locations versus bay locations. In general, Sound locations showed lower nutrient and chlorophyll levels and greater clarity than bay locations. Different numeric nutrient criteria will likely be appropriate for these areas.

3. Variation in nutrient concentrations accounts for a significant portion of the variance in effect-based endpoints, such as chlorophyll and Secchi depth. These relationships provide one link in the causal chain between nutrient enrichment and designated use impairment. However, the development of true effects-based endpoints requires knowledge of the quantitative linkages between levels of chlorophyll and clarity versus levels of use attainment. This final linkage cannot be established with the available data. Therefore true effect-based criteria cannot be developed at this time.

4. The use of seagrass as an effect-based endpoint will require further analysis to:

   a. Identify the target depth distribution;

   b. Identify the benchmark turbidity level; and

   c. Calibrate existing bio-optical models to quantify the interaction between turbidity, chlorophyll, and water clarity.

5. Statistical analysis of thresholds for endpoint (chlorophyll, clarity) relationships with nutrients showed evidence of thresholds for total phosphorus and nitrite-nitrate in the bays and total phosphorus in the Sound.

The shapes of the bivariate plots for these relationship were consistent with the following:

a. Increased chlorophyll yield at higher total phosphorus concentrations in bays,

b. Leveling off of chlorophyll yield at higher nitrite-nitrate concentrations in bays, and

c. Leveling off of chlorophyll yield at higher total phosphorus concentrations in the Sound.

d. Regression tree analysis provided preliminary target nutrient values (Table 6.1) that could be used as a point of initiation for draft nutrient criteria development.

6. Background TP concentrations might be estimated using the TP versus chlorophyll relationships for phosphorus versus nitrogen-limited waters, as described in Smith (2008).

7. Recommendations for future data collection include the following:

a. Collection of nutrient data that is consistent with other coastal and estuarine studies, namely;

i. Obtaining measurements of dissolved inorganic phosphorus with appropriately low detection limits;

ii. Lower analytical detection limits for nitrite-nitrate to reduce the proportion of censored data and improve estimates of total nitrogen and total inorganic nitrogen; and

iii. Measurements of CDOM to allow evaluation of water clarity using bio-optical models.

Table 6.1. Potential target nutrient thresholds for bays and the Mississippi Sound using chlorophyll and Secchi depth as effect-based endpoints.

Potential Target Nutrient Threshold (mg/L as N or P)	Bays		Sound	
	Chlorophyll	Secchi Depth	Chlorophyll	Secchi Depth
TP	0.090	0.100	0.090	--
TKN	1.021	0.800	0.650	0.729
Nitrite-nitrate	0.080	--	--	0.030
Ammonia	0.012	--	0.046	0.070

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Appendix B

Listing of Nutrient Data by Season

STATION NUMBER	LEVEL	BLANK DUP.	SAMPLE LOCATION	LATITUDE (º ')	LONGITUDE (º ')	DATE	TIME	DEPTH (m)	TURBIDITY (NTU)	Chl-a Value (ug/L)	Pheo-a value (ug/L)	TOTAL AMMONIA (mg/L-N)	TKN (mg/L-N)	TOTAL T NO_3-NO_2 (mg/L-N)	TOTAL PHOS. (mg/L-P)	TOTAL SUS. SOLIDS (mg/L)	COUNTY
PAC01	SURFACE		POINT AUX CHENES BAY	30 20 48.6	88 26 02.8	06/18/03	11:15	0.5	9.3	6.17	2.15	<0.02	0.91	0.03	0.05	54	JACKSON
PAC01	MID		POINT AUX CHENES BAY	30 20 48.6	88 26 02.8	06/18/03	11:15	1.0	18.0	6.54	2.95	<0.02	0.95	0.03	0.05	65	JACKSON
PAC01	BOTTOM		POINT AUX CHENES BAY	30 20 48.6	88 26 02.8	06/18/03	11:15	1.5	29.0	8.79	3.67	<0.02	0.74	0.03	0.05	72	JACKSON
BAL02	SURFACE		BANGS LAKE	30 21 18.0	88 28 01.9	06/18/03	12:20	0.5	24.0	9.36	4.65	<0.02	1.09	0.02	0.06	71	JACKSON
BAL02	BOTTOM		BANGS LAKE	30 21 18.0	88 28 01.9	06/18/03	12:20	0.8	32.0	9.15	3.76	<0.02	1.01	0.02	0.05	74	JACKSON
BCA03	SURFACE		BAYOU CASOTTE	30 21 20.5	88 30 23.3	06/18/03	9:25	0.5	9.3	9.15	4.61	0.39	1.24	0.1	0.98	85	JACKSON
BCA03	SURFACE	FIELD DUP.	BAYOU CASOTTE	30 21 20.5	88 30 23.3	06/18/03	9:25	0.5		9.02	4.34	0.38	1.76	0.09	0.99	86	JACKSON
BCA03	MID		BAYOU CASOTTE	30 21 20.5	88 30 23.3	06/18/03	9:25	2.3	13.0	7.93	3.50	0.37	1.17	0.08	1.07	92	JACKSON
BCA03	MID	FIELD DUP.	BAYOU CASOTTE	30 21 20.5	88 30 23.3	06/18/03	9:25	2.3		7.96	3.67	0.33	1.12	0.08	1.07	83	JACKSON
BCA03	BOTTOM		BAYOU CASOTTE	30 21 20.5	88 30 23.3	06/18/03	9:25	4.0	20.0	6.32	2.95	0.30	0.82	0.09	1.17	102	JACKSON
BCA03	BOTTOM	FIELD DUP.	BAYOU CASOTTE	30 21 20.5	88 30 23.3	06/18/03	9:25	4.0		6.24	2.93	0.27	1.44	0.09	1.09	101	JACKSON
BCH04	SURFACE		BAYOU CHICOT	30 20 33.7	88 31 13.1	06/12/03	11:52	0.5	17.0	6.73	3.35	0.08	0.98	0.03	0.11	36	JACKSON
BCH04	MID		BAYOU CHICOT	30 20 33.7	88 31 13.1	06/12/03	11:52	1.0	20.0	8.48	3.93	0.05	0.91	0.03	0.10	35	JACKSON
BCH04	BOTTOM		BAYOU CHICOT	30 20 33.7	88 31 13.1	06/12/03	11:52	1.4	65.0	7.25	3.64	0.07	1.01	0.04	0.19	56	JACKSON
PAR05	SURFACE		PASCAGOULA RIVER	30 22 14.1	88 33 45.2	06/16/03	8:52	0.5	5.9	6.86	3.08	<0.02	0.73	0.08	0.05	44	JACKSON
PAR05	MID		PASCAGOULA RIVER	30 22 14.1	88 33 45.2	06/16/03	8:52	3.5	7.9	3.29	1.04	<0.02	0.28	0.05	0.06	103	JACKSON
PAR05	BOTTOM		PASCAGOULA RIVER	30 22 14.1	88 33 45.2	06/16/03	8:52	6.9	21.0	4.05	1.82	<0.02	0.9	0.08	0.07	129	JACKSON
ROI06	SURFACE		ROUND ISLAND	30 18 36.9	88 32 41.1	06/16/03	10:22	0.5	4.1	3.19	1.07	<0.02	0.65	0.03	0.03	59	JACKSON
ROI06	SURFACE	FIELD DUP.	ROUND ISLAND	30 18 36.9	88 32 41.1	06/16/03	10:22	0.5		3.62	1.10	<0.02	0.61	0.03	0.05	64	JACKSON
ROI06	MID		ROUND ISLAND	30 18 36.9	88 32 41.1	06/16/03	10:22	1.2	5.7	4.31	1.98	<0.02	0.69	0.03	0.04	70	JACKSON
ROI06	MID	FIELD DUP.	ROUND ISLAND	30 18 36.9	88 32 41.1	06/16/03	10:22	1.2		3.85	1.31	<0.02	0.71	0.03	0.03	73	JACKSON
ROI06	BOTTOM		ROUND ISLAND	30 18 36.9	88 32 41.1	06/16/03	10:22	1.9	5.9	5.63	2.26	<0.02	0.68	0.03	0.03	76	JACKSON
ROI06	BOTTOM	FIELD DUP.	ROUND ISLAND	30 18 36.9	88 32 41.1	06/16/03	10:22	1.9		5.68	2.27	<0.02	0.91	0.03	0.04	80	JACKSON
GRB07	SURFACE		GRAVELINE BAYOU	30 21 45.9	88 39 59.1	06/12/03	9:11	0.5	85.0	8.85	4.25	<0.02	1.12	0.08	0.07	82	JACKSON
GRB07	MID		GRAVELINE BAYOU	30 21 45.9	88 39 59.1	06/12/03	9:11	1.5	80.0	6.95	3.18	<0.02	1.25	0.07	0.06	96	JACKSON
GRB07	BOTTOM		GRAVELINE BAYOU	30 21 45.9	88 39 59.1	06/12/03	9:11	2.6	85.0	7.68	3.73	<0.02	1.17	0.07	0.05	85	JACKSON
POF08	SURFACE		POPP'S FERRY	30 24 57.3	88 58 40.6	06/11/03	11:18	0.5	9.3	1.81	0.90	0.11	0.55	0.06	0.04	12	HARRISON
POF08	MID		POPP'S FERRY	30 24 57.3	88 58 40.6	06/11/03	11:18	3.8	14.0	1.49	0.66	0.15	0.64	0.05	0.05	19	HARRISON

POF08	BOTTOM		POPP'S FERRY	30 24 57.3	88 58 40.6	06/11/03	11:18	7.0	28.0	1.62	0.74	0.22	0.93	0.05	0.06	37	HARRISON
CLP09	SURFACE		CLAY POINT	30 24 44.5	88 51 43.2	06/09/03	10:05	0.5	17.0	3.33	0.68	0.05	0.67	0.06	0.05	25	HARRISON
CLP09	MID		CLAY POINT	30 24 44.5	88 51 43.2	06/09/03	10:05	1.0	16.0	2.66	0.55	0.07	0.75	0.05	0.06	34	HARRISON
CLP09	BOTTOM		CLAY POINT	30 24 44.5	88 51 43.2	06/09/03	10:05	1.5	17.0	2.48	0.43	0.09	0.71	0.06	0.05	29	HARRISON
OFB10	SURFACE		OLD FORT BAYOU	30 25 08.5	88 49 56.5	06/11/03	8:50	0.5	11.0	8.90	4.51	<0.02	0.85	<0.02	0.04	17	JACKSON
OFB10	MID		OLD FORT BAYOU	30 25 08.5	88 49 56.5	06/11/03	8:50	2.2	11.0	9.51	5.16	<0.02	0.89	<0.02	0.04	17	JACKSON
OFB10	BOTTOM		OLD FORT BAYOU	30 25 08.5	88 49 56.5	06/11/03	8:50	3.9	12.0	7.45	3.28	<0.02	0.88	<0.02	0.04	23	JACKSON
CBT11	SURFACE		CONFLUENCE TCHOUTACABOUFFA & BILOXI R	30 25 56.9	88 59 25.5	06/10/03	12:45	0.5	13.0	3.41	0.72	0.06	0.68	0.06	0.03	9	HARRISON
CBT11	MID		CONFLUENCE TCHOUTACABOUFFA & BILOXI R	30 25 56.9	88 59 25.5	06/10/03	12:45	2.6	13.0	0.58	0.36	0.09	0.64	0.04	0.03	10	HARRISON
CBT11	BOTTOM		CONFLUENCE TCHOUTACABOUFFA & BILOXI R	30 25 56.9	88 59 25.5	06/10/03	12:45	4.7	28.0	0.71	0.42	0.10	0.69	0.02	0.02	16	HARRISON
TCR12	SURFACE		TCHOUTACABOUFFA RIVER	30 27 10.4	88 57 55.7	06/10/03	9:10	0.5	11.0	0.53	0.35	0.09	0.7	0.02	0.02	9	HARRISON
TCR12	MID		TCHOUTACABOUFFA RIVER	30 27 10.4	88 57 55.7	06/10/03	9:10	2.2	12.0	0.46	0.32	<0.02	0.58	<0.02	0.02	8	HARRISON
TCR12	BOTTOM		TCHOUTACABOUFFA RIVER	30 27 10.4	88 57 55.7	06/10/03	9:10	3.9	13.0	0.30	0.18	<0.02	0.42	<0.02	0.02	10	HARRISON
		FIELD Bk 1	TCHOUTACABOUFFA RIVER	30 27 10.4	88 57 55.7	06/10/03	9:10			0.01	0.00	<0.02	<0.10	<0.02	<0.02	<4	HANCOCK
BIR13	SURFACE		BILOXI RIVER	30 26 47.0	89 00 26.7	06/10/03	11:20	0.5	12.0	0.70	0.41	0.04	0.57	0.04	<0.02	8	HARRISON
BIR13	MID		BILOXI RIVER	30 26 47.0	89 00 26.7	06/10/03	11:20	2.6	14.0	0.44	0.29	0.04	0.52	0.06	<0.02	5	HARRISON
BIR13	BOTTOM		BILOXI RIVER	30 26 47.0	89 00 26.7	06/10/03	11:20	4.8	14.0	0.45	0.30	0.02	0.54	0.06	<0.02	8	HARRISON
BBI14	SURFACE		BAYOU BERNARD/INDUSTRIAL SEAWAY	30 24 57.3	89 00 13.6	06/11/03	10:20	0.5	15.0	4.98	2.27	0.04	0.95	0.07	0.05	7	HARRISON
BBI14	MID		BAYOU BERNARD/INDUSTRIAL SEAWAY	30 24 57.3	89 00 13.6	06/11/03	10:20	2.0	12.0	1.99	0.95	0.10	0.88	0.04	0.05	14	HARRISON
BBI14	BOTTOM		BAYOU BERNARD/INDUSTRIAL SEAWAY	30 24 57.3	89 00 13.6	06/11/03	10:20	3.3	17.0	1.40	0.64	0.14	0.66	0.06	0.04	24	HARRISON
DEI15	SURFACE		DEER ISLAND	30 21 35.8	88 54 09.2	06/16/03	13:25	0.5	5.2	3.81	1.39	<0.02	0.84	0.03	0.04	63	HARRISON
DEI15	MID		DEER ISLAND	30 21 35.8	88 54 09.2	06/16/03	13:25	1.7	6.7	4.19	1.90	<0.02	0.5	0.03	0.03	64	HARRISON
DEI15	BOTTOM		DEER ISLAND	30 21 35.8	88 54 09.2	06/16/03	13:25	3.0	28.0	4.57	2.04	<0.02	0.75	0.03	0.08	90	HARRISON
WOR16	SURFACE		WOLF RIVER	30 21 27.5	89 16 36.4	06/19/03	9:38	0.5	12.0	2.70	0.73	<0.02	0.89	0.04	0.03	14	HANCOCK
WOR16	MID		WOLF RIVER	30 21 27.5	89 16 36.4	06/19/03	9:38	2.0	9.7	2.78	0.85	<0.02	0.73	<0.02	0.03	23	HANCOCK
WOR16	BOTTOM		WOLF RIVER	30 21 27.5	89 16 36.4	06/19/03	9:38	3.6	12.0	2.64	0.67	<0.02	0.67	<0.02	0.05	32	HANCOCK
CST17	SURFACE		CENTER OF ST. LOUIS BAY	30 19 52.4	89 18 18.0	06/19/03	11:55	0.5	6.6	3.76	1.03	<0.02	0.64	<0.02	0.04	32	HANCOCK

CST17	MID		CENTER OF ST. LOUIS BAY	30 19 52.4	89 18 18.0	06/19/03	11:55	1.3	12.0	5.37	2.17	<0.02	0.67	<0.02	0.06	43	HANCOCK
CST17	BOTTOM		CENTER OF ST. LOUIS BAY	30 19 52.4	89 18 18.0	06/19/03	11:55	2.0	14.0	4.97	2.15	<0.02	0.74	<0.02	0.06	51	HANCOCK
		FIELD BK 2	CENTER OF ST. LOUIS BAY	30 19 52.4	89 18 18.0	06/19/03	11:55			0.04	0.01	<0.02	<0.10	<0.02	<0.02	<4	HANCOCK
GTR18	SURFACE		GENE TAYLOR REEF	30 16 24.9	89 18 58.2	06/19/03	10:45	0.5	5.7	3.56	0.81	<0.02	0.68	<0.02	0.05	36	HANCOCK
GTR18	MID		GENE TAYLOR REEF	30 16 24.9	89 18 58.2	06/19/03	10:45	1.3	6.2	3.81	1.33	<0.02	0.67	<0.02	0.05	42	HANCOCK
GTR18	BOTTOM		GENE TAYLOR REEF	30 16 24.9	89 18 58.2	06/19/03	10:45	2.0	5.5	3.59	0.97	<0.02	0.33	<0.02	0.06	42	HANCOCK
BAC19	SURFACE		BAYOU CADDY	30 14 16.5	89 25 41.1	06/20/03	11:07	0.5	6.1	3.76	1.42	<0.02	1.19	<0.02	0.06	44	HANCOCK
BAC19	MID		BAYOU CADDY	30 14 16.5	89 25 41.1	06/20/03	11:07	1.6	7.1	4.01	1.65	<0.02	0.55	<0.02	0.06	41	HANCOCK
BAC19	BOTTOM		BAYOU CADDY	30 14 16.5	89 25 41.1	06/20/03	11:07	2.7	7.3	3.20	1.17	<0.02	0.83	<0.02	0.06	46	HANCOCK
PER20	SURFACE		PEARL RIVER	30 14 24.7	89 36 52.1	06/20/03	9:17	0.5	32.0	1.33	0.60	0.02	0.82	0.23	0.12	12	HANCOCK
PER20	MID		PEARL RIVER	30 14 24.7	89 36 52.1	06/20/03	9:17	3.7	33.0	1.43	0.64	0.03	0.74	0.23	0.10	16	HANCOCK
PER20	BOTTOM		PEARL RIVER	30 14 24.7	89 36 52.1	06/20/03	9:17	6.9	34.0	1.21	0.48	0.03	0.72	0.24	0.11	18	HANCOCK
PAB21	SURFACE		PASCAGOULA BEACH	30 20 33.6	88 32 07.2	06/24/03	9:50	0.5	14.0	6.22	2.82	<0.02	0.81	<0.02	0.06	57	JACKSON
		FIELD BK 3	PASCAGOULA BEACH	30 20 33.6	88 32 07.2	06/24/03	9:50			0.05	0.02	0.04	<0.10	<0.02	<0.02	<4	JACKSON
BLF22	SURFACE		BELLEFOUNTAINE BEACH	30 20 31.2	88 42 45.6	06/24/03	8:30	0.5	120.0	6.51	2.38	<0.02	1.21	0.02	0.10	121	JACKSON
DAB23	SURFACE		DAVIS BAYOU	30 23 37.8	88 48 37.2	06/26/03	9:40	0.5	36.0	21.87	9.12	<0.02	0.97	<0.02	0.09	42	JACKSON
DAB23	SURFACE	FIELD DUP.	DAVIS BAYOU	30 23 37.8	88 48 37.2	06/26/03	9:40	0.5		25.91	10.76	<0.02	1.13	0.03	0.13	51	JACKSON
PRA24	SURFACE		PRATT AVENUE BEACH	30 22 12.0	89 04 47.0	06/24/03	11:45	0.5	11.0	4.59	2.01	<0.02	0.95	<0.02	0.07	59	HARRISON
HEP25	SURFACE		HENDERSON POINT	30 18 12.6	89 16 54.2	06/23/03	12:20	0.5	10.0	2.36	0.93	<0.02	0.76	<0.02	0.06	79	HARRISON
SCS26	SURFACE		ST. CHARLES STREET	30 18 00.0	89 20 02.2	06/23/03	11:20	0.5	20.0	2.40	0.98	<0.02	0.61	<0.02	0.03	38	HANCOCK
WAV27	SURFACE		WAVELAND BEACH	30 16 37.1	89 22 25.2	06/23/03	10:24	0.5	9.2	1.35	0.48	<0.02	0.67	<0.02	0.05	41	HANCOCK
ROA28	SURFACE		RODENBERG AVE.	30 23 32.6	88 56 17.5	06/23/03	13:35	0.5	15.0	6.11	2.10	<0.02	1.02	<0.02	0.06	58	HARRISON

STATION NUMBER	LEVEL	BLANK DUP.	SAMPLE LOCATION	LATITUDE (° ')	LONGITUDE (° ')	DATE	TIME	DEPTH (m)	TURBIDITY (NTU)	Chl-a Value (ug/L)	Pheo-a value (ug/L)	TOTAL AMMONIA (mg/L-N)	TKN (mg/L-N)	TOTAL T NO_3-NO_2 (mg/L-N)	TOTAL PHOS (mg/L-P)	TOTAL SUS SOLIDS (mg/L)	COUNTY
PAC01	SURFACE		POINT AUX CHENE BAY	30 20 48.6	88 26 02.8	10/03/03	10:07	0.5	3.5	1.77	0.58	0.05	0.20	<0.02	<0.02	75	JACKSON
PAC01	MID		POINT AUX CHENE BAY	30 20 48.6	88 26 02.8	10/03/03	10:07	1.0	3.5	2.32	0.73	0.04	0.20	<0.02	<0.02	78	JACKSON
PAC01	BOTTOM		POINT AUX CHENE BAY	30 20 48.6	88 26 02.8	10/03/03	10:07	1.5	15.0	2.20	0.65	0.04	0.20	<0.02	<0.02	77	JACKSON
BAL02	SURFACE		BANGS LAKE	30 21 18.0	88 28 01.9	10/03/03	10:53	0.5	3.5	1.34	0.57	0.03	0.35	0.03	0.02	68	JACKSON
BAL02	SURFACE	FIELD DUP.	BANGS LAKE	30 21 18.0	88 28 01.9	10/03/03	10:53	0.5		1.35	0.63	0.03	0.36	0.03	0.03	80	JACKSON
BCA03	SURFACE		BAYOU CASOTTE	30 21 20.5	88 30 23.3	10/03/03	9:02	0.5	4.8	3.76	1.39	0.39	0.66	0.05	0.59	95	JACKSON
BCA03	MID		BAYOU CASOTTE	30 21 20.5	88 30 23.3	10/03/03	9:02	2.5	6.2	4.70	2.38	0.37	0.66	0.05	0.62	76	JACKSON
BCA03	BOTTOM		BAYOU CASOTTE	30 21 20.5	88 30 23.3	10/03/03	9:02	4.6	8.6	4.33	2.06	0.36	0.65	0.05	0.93	96	JACKSON
BCH04	SURFACE		BAYOU CHICOT	30 20 33.7	88 31 13.1	10/07/03	10:24	0.5	15.0	4.39	1.87	0.04	0.32	0.03	0.07	73	JACKSON
BCH04	MID		BAYOU CHICOT	30 20 33.7	88 31 13.1	10/07/03	10:24	1.0	14.0	4.92	2.20	0.04	0.31	0.03	0.07	102	JACKSON
BCH04	BOTTOM		BAYOU CHICOT	30 20 33.7	88 31 13.1	10/07/03	10:24	1.5	45.0	4.69	2.21	0.04	0.31	0.03	0.12	145	JACKSON
PAR05	SURFACE		PASCAGOULA RIVER	30 22 14.1	88 33 45.2	10/07/03	9:11	0.5	2.5	1.57	0.83	0.04	0.29	0.09	0.05	53	JACKSON
PAR05	MID		PASCAGOULA RIVER	30 22 14.1	88 33 45.2	10/07/03	9:11	3.5	3.2	1.22	0.45	0.04	0.28	0.03	0.04	85	JACKSON
PAR05	BOTTOM		PASCAGOULA RIVER	30 22 14.1	88 33 45.2	10/07/03	9:11	6.5	7.1	1.39	0.63	0.03	0.27	0.02	<0.02	102	JACKSON
		FIELD BK 2	PASCAGOULA RIVER	30 22 14.1	88 33 45.2	10/07/03	9:11			0.01	0.00	<0.02	<0.05	<0.02	<0.02	<4	JACKSON
ROI06	SURFACE		ROUND ISLAND	30 18 36.9	88 32 41.1	10/04/03	10:42	0.5	1.9	1.16	0.45	0.04	0.22	0.08	<0.02	87	JACKSON
ROI06	MID		ROUND ISLAND	30 18 36.9	88 32 41.1	10/04/03	10:42	1.0	1.8	1.42	0.61	0.04	0.20	<0.02	0.02	90	JACKSON
ROI06	BOTTOM		ROUND ISLAND	30 18 36.9	88 32 41.1	10/04/03	10:42	1.5	2.3	1.45	0.54	0.04	0.19	<0.02	<0.02	97	JACKSON
GRB07	SURFACE		GRAVELINE BAYOU	30 21 45.9	88 39 59.1	10/03/03	12:42	0.5	13.0	3.41	1.55	0.08	0.33	<0.02	0.05	95	JACKSON
GRB07	MID		GRAVELINE BAYOU	30 21 45.9	88 39 59.1	10/03/03	12:42	1.6	33.0	3.81	1.86	0.08	0.33	<0.02	0.04	100	JACKSON
GRB07	BOTTOM		GRAVELINE BAYOU	30 21 45.9	88 39 59.1	10/03/03	12:42	3.0	31.0	3.43	1.57	0.07	0.34	<0.02	0.04	86	JACKSON
POF08	SURFACE		POPP'S FERRY	30 24 57.3	88 58 40.6	09/30/03	11:18	0.5	9.3	7.28	3.56	<0.02	0.31	0.13	0.04	16	HARRISON
POF08	MID		POPP'S FERRY	30 24 57.3	88 58 40.6	09/30/03	11:18	4.2	7.4	3.00	1.40	0.04	0.34	0.07	0.04	22	HARRISON
POF08	BOTTOM		POPP'S FERRY	30 24 57.3	88 58 40.6	09/30/03	11:18	8.0	14.0	2.32	0.96	0.05	0.34	0.06	0.04	23	HARRISON
		FIELD BK 1	POPP'S FERRY	30 24 57.3	88 58 40.6	09/30/03	12:00			0.02	0.00	<0.02	<0.05	<0.02	<0.02	<4	HARRISON
CLP09	SURFACE		CLAY POINT	30 24 44.5	88 51 43.2	09/30/03	8:48	0.5	11.0	9.75	2.68	0.03	0.34	0.02	0.05	48	HARRISON
CLP09	MID		CLAY POINT	30 24 44.5	88 51 43.2	09/30/03	8:48	1.3	8.6	7.34	2.57	0.03	0.33	0.02	0.04	53	HARRISON
CLP09	BOTTOM		CLAY POINT	30 24 44.5	88 51 43.2	09/30/03	8:48	2.0	16.0	10.59	3.56	<0.02	0.32	0.02	0.04	46	HARRISON
OFB10	SURFACE		OLD FORT BAYOU	30 25 08.5	88 49 56.5	09/30/03	10:09	0.5	5.4	10.90	3.45	<0.02	0.42	0.06	0.03	25	JACKSON

OFB10	MID		OLD FORT BAYOU	30 25 08.5	88 49 56.5	09/30/03	10:09	2.0	5.9	11.10	4.99	<0.02	0.43	0.02	0.03	25	JACKSON
OFB10	BOTTOM		OLD FORT BAYOU	30 25 08.5	88 49 56.5	09/30/03	10:09	3.5	9.6	12.90	5.91	<0.02	0.43	0.16	0.04	39	JACKSON
CBT11	SURFACE		CONFLUENCE TCHOUTACABOUFFA & BILOXI R	30 25 56.9	88 59 25.5	10/02/03	12:00	0.5	6.2	3.98	1.75	0.02	0.24	0.03	0.03	15	HARRISON
CBT11	SURFACE	FIELD DUP.	CONFLUENCE TCHOUTACABOUFFA & BILOXI R	30 25 56.9	88 59 25.5	10/02/03	12:00	0.5		4.48	1.74	<0.02	0.23	0.04	0.03	13	HARRISON
CBT11	MID		CONFLUENCE TCHOUTACABOUFFA & BILOXI R	30 25 56.9	88 59 25.5	10/02/03	12:00	2.8	9.3	2.87	0.86	<0.02	0.28	0.05	0.03	8	HARRISON
CBT11	MID	FIELD DUP.	CONFLUENCE TCHOUTACABOUFFA & BILOXI R	30 25 56.9	88 59 25.5	10/02/03	12:00	2.8		2.83	0.92	<0.02	0.27	0.04	0.03	16	HARRISON
CBT11	BOTTOM		CONFLUENCE TCHOUTACABOUFFA & BILOXI R	30 25 56.9	88 59 25.5	10/02/03	12:00	5.0	5.4	2.96	0.91	0.03	0.22	0.05	0.04	17	HARRISON
CBT11	BOTTOM	FIELD DUP.	CONFLUENCE TCHOUTACABOUFFA & BILOXI R	30 25 56.9	88 59 25.5	10/02/03	12:00	5.0		3.03	1.05	<0.02	0.22	0.05	0.04	17	HARRISON
TCR12	SURFACE		TCHOUTACABOUFFA RIVER	30 27 10.4	88 57 55.7	10/02/03	11:09	0.5	5.9	2.45	0.66	<0.02	0.27	0.03	0.03	11	HARRISON
TCR12	MID		TCHOUTACABOUFFA RIVER	30 27 10.4	88 57 55.7	10/02/03	11:09	2.0	5.8	2.50	0.76	<0.02	0.27	0.03	0.03	8	HARRISON
TCR12	BOTTOM		TCHOUTACABOUFFA RIVER	30 27 10.4	88 57 55.7	10/02/03	11:09	3.5	5.6	2.40	0.49	<0.02	0.28	0.03	0.02	9	HARRISON
BIR13	SURFACE		BILOXI RIVER	30 26 47.0	89 00 26.7	10/02/03	10:18	0.5	15.0	0.64	0.28	<0.02	0.29	0.05	<0.02	10	HARRISON
BIR13	MID		BILOXI RIVER	30 26 47.0	89 00 26.7	10/02/03	10:18	1.5	15.0	0.48	0.25	0.02	0.29	0.05	<0.02	12	HARRISON
BIR13	BOTTOM		BILOXI RIVER	30 26 47.0	89 00 26.7	10/02/03	10:18	2.2	14.0	1.22	0.55	0.02	0.26	0.05	<0.02	13	HARRISON
BBI14	SURFACE		BAYOU BERNARD/INDUSTRIAL SEAWAY	30 24 57.3	89 00 13.6	10/02/03	8:58	0.5	10.0	9.74	2.93	0.03	0.36	0.16	0.06	18	HARRISON
BBI14	MID		BAYOU BERNARD/INDUSTRIAL SEAWAY	30 24 57.3	89 00 13.6	10/02/03	8:58	2.0	11.0	9.93	3.23	0.04	0.34	0.17	0.06	21	HARRISON
BBI14	BOTTOM		BAYOU BERNARD/INDUSTRIAL SEAWAY	30 24 57.3	89 00 13.6	10/02/03	8:58	3.2	18.0	3.18	1.54	0.05	0.37	0.08	0.05	25	HARRISON
DEI15	SURFACE		DEER ISLAND	30 21 35.8	88 54 09.2	10/04/03	9:00	0.5	3.0	2.03	0.80	0.06	0.35	0.10	0.03	75	HARRISON
DEI15	MID		DEER ISLAND	30 21 35.8	88 54 09.2	10/04/03	9:00	1.8	2.6	1.99	0.86	0.09	0.28	<0.02	0.03	70	HARRISON
DEI15	BOTTOM		DEER ISLAND	30 21 35.8	88 54 09.2	10/04/03	9:00	3.0	8.8	3.43	1.57	0.08	0.28	<0.02	0.03	88	HARRISON
WOR16	SURFACE		WOLF RIVER	30 21 27.5	89 16 36.4	10/06/03	13:24	0.5	3.8	3.91	0.63	<0.02	0.41	0.02	0.03	19	HANCOCK
WOR16	MID		WOLF RIVER	30 21 27.5	89 16 36.4	10/06/03	13:24	2.0	7.3	3.39	0.56	<0.02	0.42	0.02	<0.02	35	HANCOCK
WOR16	BOTTOM		WOLF RIVER	30 21 27.5	89 16 36.4	10/06/03	13:24	4.0	13.0	3.25	0.68	<0.02	0.42	0.02	<0.02	49	HANCOCK

CST17	SURFACE		CENTER OF ST. LOUIS BAY	30 19 52.4	89 18 18.0	10/06/03	12:48	0.5	2.1	1.64	0.56	<0.02	0.46	0.11	0.05	28	HANCOCK
CST17	MID		CENTER OF ST. LOUIS BAY	30 19 52.4	89 18 18.0	10/06/03	12:48	1.2	2.1	1.61	0.51	0.02	0.47	0.02	0.05	47	HANCOCK
CST17	BOTTOM		CENTER OF ST. LOUIS BAY	30 19 52.4	89 18 18.0	10/06/03	12:48	2.0	5.7	2.12	0.88	<0.02	0.43	0.02	0.08	45	HANCOCK
GTR18	SURFACE		GENE TAYLOR REEF	30 16 24.9	89 18 58.2	10/06/03	12:06	0.5	2.2	1.84	0.75	<0.02	0.39	<0.02	0.03	35	HANCOCK
GTR18	MID		GENE TAYLOR REEF	30 16 24.9	89 18 58.2	10/06/03	12:06	1.3	3.2	2.11	0.94	<0.02	0.38	0.03	0.04	49	HANCOCK
GTR18	BOTTOM		GENE TAYLOR REEF	30 16 24.9	89 18 58.2	10/06/03	12:06	2.0	3.3	2.15	0.84	<0.02	0.39	<0.02	0.04	46	HANCOCK
BAC19	SURFACE		BAYOU CADDY	30 14 16.5	89 25 41.1	10/06/03	11:00	0.5	3.5	3.01	0.90	<0.02	0.27	0.29	0.03	44	HANCOCK
BAC19	MID		BAYOU CADDY	30 14 16.5	89 25 41.1	10/06/03	11:00	1.7	3.9	2.87	0.72	<0.02	0.22	0.03	0.03	46	HANCOCK
BAC19	BOTTOM		BAYOU CADDY	30 14 16.5	89 25 41.1	10/06/03	11:00	3.0	3.6	3.08	0.97	<0.02	0.26	<0.02	0.04	47	HANCOCK
PER20	SURFACE		PEARL RIVER	30 14 24.7	89 36 52.1	10/06/03	9:40	0.5	6.7	4.67	1.90	<0.02	0.26	0.04	<0.02	16	HANCOCK
PER20	MID		PEARL RIVER	30 14 24.7	89 36 52.1	10/06/03	9:40	3.5	4.9	2.67	1.25	<0.02	0.26	0.06	0.02	12	HANCOCK
PER20	BOTTOM		PEARL RIVER	30 14 24.7	89 36 52.1	10/06/03	9:40	6.5	5.7	1.98	0.72	<0.02	0.24	0.05	0.03	22	HANCOCK
PAB21	SURFACE		PASCAGOULA BEACH	30 20 33.6	88 32 07.2	10/07/03	11:08	0.5	5.8	1.53	0.71	<0.02	0.10	0.02	0.04	72	JACKSON
BLF22	SURFACE		BELLEFOUNTAINE BEACH	30 20 31.2	88 42 45.6	10/07/03	13:00	0.5	17.0	6.04	3.03	<0.02	0.10	0.02	0.04	48	JACKSON
DAB23	SURFACE		DAVIS BAYOU	30 23 37.8	88 48 37.2	10/07/03	13:50	0.5	6.1	4.68	1.90	<0.02	0.18	0.03	0.05	62	JACKSON
PRA24	SURFACE		PRATT AVENUE BEACH	30 22 12.0	89 04 47.0	10/09/03	9:40	0.5	15.0	3.18	1.84	<0.02	0.28	0.03	0.04	72	HARRISON
HEP25	SURFACE		HENDERSON POINT	30 18 12.6	89 16 54.2	10/09/03	10:21	0.5	14.0	4.48	2.09	<0.02	0.29	0.02	<0.02	62	HARRISON
SCS26	SURFACE		ST. CHARLES STREET	30 18 00.0	89 20 02.2	10/09/03	10:51	0.5	9.4	2.93	1.19	<0.02	0.29	0.02	0.05	51	HANCOCK
		FIELD BK 3	ST. CHARLES STREET	30 18 00.0	89 20 2.2	10/09/03	10:51			0.03	0.00	<0.02	<0.05	<0.02	<0.02	<4	HANCOCK
WAV27	SURFACE		WAVELAND BEACH	30 16 37.1	89 22 25.2	10/09/03	11:25	0.5	16.0	3.36	1.56	<0.02	0.17	0.03	0.06	54	HANCOCK
WAV27	SURFACE	FIELD DUP.	WAVELAND BEACH	30 16 37.1	89 22 25.2	10/09/03	11:25	0.5		3.02	1.44	<0.02	0.16	0.03	0.07	63	HANCOCK
ROA28	SURFACE		RODENBERG AVE.	30 23 32.6	88 56 17.5	10/09/03	8:53	0.5	7.3	5.81	2.26	<0.02	0.16	0.03	0.07	85	HARRISON

STATION NUMBER	LEVEL	BLANK DUP.	SAMPLE LOCATION	LATITUDE (° ')	LONGITUDE (° ')	DATE	TIME	DEPTH (m)	TURBIDITY (NTU)	Chl-a Value (ug/L)	Pheo-a value (ug/L)	TOTAL AMMONIA (mg/L-N)	TKN (mg/L-N)	TOTAL T NO_3-NO_2 (mg/L-N)	TOTAL PHOS. (mg/L-P)	TOTAL SUS. SOLIDS (mg/L)	COUNTY
PAC01	SURFACE		POINT AUX CHENE BAY	30 20 48.6	88 26 02.8	12/4/2003	10:02	0.5	2.1	3.27	1.32	0.04	0.30	0.02	0.05	41	JACKSON
PAC01	BOTTOM		POINT AUX CHENE BAY	30 20 48.6	88 26 02.8	12/4/2003	10:02	1.5	1.7	1.14	0.39	0.03	0.28	0.02	0.02	54	JACKSON
BAL02	SURFACE		BANGS LAKE	30 21 18.0	88 28 01.9	12/4/2003	10:40	0.5	1.1	0.80	0.36	0.03	0.36	0.03	0.05	58	JACKSON
BCA03	SURFACE		BAYOU CASOTTE	30 21 20.5	88 30 23.3	12/2/2003	10:00	0.5	4.1	0.65	0.22	1.05	2.48	0.05	4.49	71	JACKSON
BCA03	MID		BAYOU CASOTTE	30 21 20.5	88 30 23.3	12/2/2003	10:00	2.2	4.6	1.14	0.58	1.2	2.64	0.04	4.71	70	JACKSON
BCA03	BOTTOM		BAYOU CASOTTE	30 21 20.5	88 30 23.3	12/2/2003	10:00	4.0	6.3	1.20	0.67	1.47	2.69	0.04	1.75	73	JACKSON
BCH04	SURFACE		BAYOU CHICOT	30 20 33.7	88 31 13.1	11/11/2003	9:55	0.5	5.5	4.10	1.36	0.06	0.30	0.06	0.27	97	JACKSON
BCH04	BOTTOM		BAYOU CHICOT	30 20 33.7	88 31 13.1	11/11/2003	9:55	1.5	8.6	4.07	1.54	0.06	0.32	0.04	0.25	106	JACKSON
PAR05	SURFACE		PASCAGOULA RIVER	30 22 14.1	88 33 45.2	11/11/2003	11:09	0.5	1.2	1.66	0.69	<0.02	0.23	0.09	0.07	62	JACKSON
PAR05	MID		PASCAGOULA RIVER	30 22 14.1	88 33 45.2	11/11/2003	11:09	3.0	4.4	1.58	0.49	<0.02	0.24	0.03	0.07	85	JACKSON
PAR05	BOTTOM		PASCAGOULA RIVER	30 22 14.1	88 33 45.2	11/11/2003	11:09	6.0	8.9	1.57	0.44	<0.02	0.18	0.02	0.07	98	JACKSON
ROI06	SURFACE		ROUND ISLAND	30 18 36.9	88 32 41.1	11/11/2003	9:02	0.5	1.8	0.74	0.26	0.07	0.13	0.10	0.05	79	JACKSON
ROI06	SURFACE	FIELD DUP.	ROUND ISLAND	30 18 36.9	88 32 41.1	11/11/2003	9:02	0.5		0.45	0.23	0.07	0.13	0.10	0.05	91	JACKSON
ROI06	BOTTOM		ROUND ISLAND	30 18 36.9	88 32 41.1	11/11/2003	9:02	1.5	1.7	0.45	0.14	0.05	0.13	<0.02	0.04	80	JACKSON
ROI06	BOTTOM	FIELD DUP.	ROUND ISLAND	30 18 36.9	88 32 41.1	11/11/2003	9:02	1.5		0.47	0.21	0.05	0.15	<0.02	0.05	89	JACKSON
GRB07	SURFACE		GRAVELINE BAYOU	30 21 45.9	88 39 59.1	12/2/2003	12:20	0.5	4.7	2.31	0.92	0.81	0.14	0.09	0.09	97	JACKSON
GRB07	MID		GRAVELINE BAYOU	30 21 45.9	88 39 59.1	12/2/2003	12:20	1.2	3.4	3.21	1.34	0.81	0.14	0.05	0.10	93	JACKSON
GRB07	BOTTOM		GRAVELINE BAYOU	30 21 45.9	88 39 59.1	12/2/2003	12:20	2.0	2.5	3.84	1.58	0.81	0.14	0.02	0.06	102	JACKSON
POF08	SURFACE		POPPS FERRY	30 24 57.3	88 58 40.6	11/10/2003	10:21	0.5	3.1	8.98	3.46	0.05	0.30	0.06	0.09	41	HARRISON
POF08	MID		POPPS FERRY	30 24 57.3	88 58 40.6	11/10/2003	10:21	3.5	4.2	3.06	1.38	0.05	0.30	0.06	0.09	36	HARRISON

POF08	BOTTOM		POPPS FERRY	30 24 57.3	88 58 40.6	11/10/2003	10:21	6.5	50.0	4.22	1.61	0.05	0.34	0.06	0.22	103	HARRISON
CLP09	SURFACE		CLAY POINT	30 24 44.5	88 51 43.2	11/21/2003	11:00	0.5	2.9	4.43	1.51	<0.02	0.9	0.03	<0.02	56	HARRISON
CLP09	SURFACE	FIELD DUP.	CLAY POINT	30 24 44.5	88 51 43.2	11/21/2003	11:00	0.5		5.60	1.60	<0.02	0.88	0.03	0.13	58	HARRISON
CLP09	BOTTOM		CLAY POINT	30 24 44.5	88 51 43.2	11/21/2003	11:00	1.5	10.0	7.93	2.41	<0.02	0.84	0.03	0.14	80	HARRISON
CLP09	BOTTOM	FIELD DUP.	CLAY POINT	30 24 44.5	88 51 43.2	11/21/2003	11:00	1.5		8.22	3.06	<0.02	0.85	0.03	0.14	77	HARRISON
OFB10	SURFACE		OLD FORT BAYOU	30 25 08.5	88 49 56.5	11/21/2003	10:05	0.5	2.9	5.05	1.57	<0.02	0.71	<0.02	<0.02	53	JACKSON
OFB10	MID		OLD FORT BAYOU	30 25 08.5	88 49 56.5	11/21/2003	10:05	2.0	4.6	9.50	4.25	<0.02	0.76	<0.02	<0.02	56	JACKSON
OFB10	BOTTOM		OLD FORT BAYOU	30 25 08.5	88 49 56.5	11/21/2003	10:05	3.5	10.0	6.62	2.90	<0.02	0.76	<0.02	0.13	101	JACKSON
CBT11	SURFACE		CONFLUENCE TCHOUTACABOUFFA & BILOXI R	30 25 56.9	88 59 25.5	11/10/2003	12:23	0.5	2.0	9.75	3.47	<0.02	0.23	0.05	0.07	32	HARRISON
CBT11	MID		CONFLUENCE TCHOUTACABOUFFA & BILOXI R	30 25 56.9	88 59 25.5	11/10/2003	12:23	2.6	2.8	6.83	2.40	<0.02	0.27	0.05	0.06	35	HARRISON
CBT11	BOTTOM		CONFLUENCE TCHOUTACABOUFFA & BILOXI R	30 25 56.9	88 59 25.5	11/10/2003	12:23	5.0	3.1	2.52	0.94	<0.02	0.28	0.05	0.06	31	HARRISON
TCR12	SURFACE		TCHOUTACABOUFFA RIVER	30 27 10.4	88 57 55.7	11/10/2003	11:02	0.5	1.7	11.50	4.36	<0.02	0.31	0.03	0.05	26	HARRISON
TCR12	MID		TCHOUTACABOUFFA RIVER	30 27 10.4	88 57 55.7	11/10/2003	11:02	1.7	1.7	9.40	3.63	<0.02	0.33	0.03	0.04	23	HARRISON
TCR12	BOTTOM		TCHOUTACABOUFFA RIVER	30 27 10.4	88 57 55.7	11/10/2003	11:02	3.0	3.0	5.11	1.95	<0.02	0.33	0.03	0.04	28	HARRISON
BIR13	SURFACE		BILOXI RIVER	30 26 47.0	89 00 26.7	11/10/2003	11:45	0.5	3.3	16.35	5.08	<0.02	0.31	0.04	0.04	16	HARRISON
BIR13	MID		BILOXI RIVER	30 26 47.0	89 00 26.7	11/10/2003	11:45	3.0	2.7	4.61	1.88	<0.02	0.30	0.04	<0.02	21	HARRISON
BIR13	BOTTOM		BILOXI RIVER	30 26 47.0	89 00 26.7	11/10/2003	11:45	5.5	7.6	0.74	0.26	<0.02	0.30	0.07	0.04	39	HARRISON
BBI14	SURFACE		BAYOU BERNARD/INDUSTRIAL SEAWAY	30 24 57.3	89 00 13.6	11/10/2003	9:15	0.5	7.0	7.36	2.49	0.06	0.32	0.18	0.08	32	HARRISON
BBI14	SURFACE	FIELD DUP.	BAYOU BERNARD/INDUSTRIAL SEAWAY	30 24 57.3	89 00 13.6	11/10/2003	9:15	0.5		6.44	2.37	0.06	0.33	0.14	0.09	31	HARRISON
BBI14	MID		BAYOU BERNARD/INDUSTRIAL SEAWAY	30 24 57.3	89 00 13.6	11/10/2003	9:15	1.6	12.0	7.89	2.69	0.06	0.39	0.17	0.10	36	HARRISON
BBI14	MID	FIELD DUP.	BAYOU BERNARD/INDUSTRIAL	30 24 57.3	89 00 13.6	11/10/2003	9:15	1.6		7.03	2.99	0.06	0.38	0.16	0.09	33	HARRISON

			SEAWAY														
BBI14	BOTTOM		BAYOU BERNARD/INDUSTRIAL SEAWAY	30 24 57.3	89 00 13.6	11/10/2003	9:15	3.0	14.0	5.99	2.27	0.16	0.39	0.22	0.17	40	HARRISON
BBI14	BOTTOM	FIELD DUP.	BAYOU BERNARD/INDUSTRIAL SEAWAY	30 24 57.3	89 00 13.6	11/10/2003	9:15	3.0		5.87	2.24	0.16	0.45	0.22	0.16	39	HARRISON
DEI15	SURFACE		DEER ISLAND	30 21 35.8	88 54 09.2	11/21/2003	8:48	0.5	2.2	2.44	0.61	<0.02	0.56	<0.02	<0.02	82	HARRISON
DEI15	MID		DEER ISLAND	30 21 35.8	88 54 09.2	11/21/2003	8:48	1.5	2.1	2.53	0.77	<0.02	0.60	<0.02	0.1	85	HARRISON
DEI15	BOTTOM		DEER ISLAND	30 21 35.8	88 54 09.2	11/21/2003	8:48	2.5	2.6	2.86	0.71	<0.02	0.54	<0.02	0.09	70	HARRISON
WOR16	SURFACE		WOLF RIVER	30 21 27.5	89 16 36.4	11/25/2003	9:40	0.5	3.0	0.89	0.27	0.14	0.24	0.03	<0.02	22	HANCOCK
WOR16	MID		WOLF RIVER	30 21 27.5	89 16 36.4	11/25/2003	9:40	1.7	2.7	1.44	0.68	0.14	0.20	0.03	0.02	35	HANCOCK
WOR16	BOTTOM		WOLF RIVER	30 21 27.5	89 16 36.4	11/25/2003	9:40	3.0	2.8	1.36	0.49	0.14	0.20	0.03	0.09	42	HANCOCK
		FIELD BK 3	WOLF RIVER	30 21 27.5	89 16 36.4	11/25/2003	9:40			0.01	0.01	<0.02	<0.05	<0.02	<0.02	<4	HANCOCK
CST17	SURFACE		CENTER OF ST. LOUIS BAY	30 19 52.4	89 18 18.0	11/25/2003	10:32	0.5	2.9	1.23	0.37	0.06	0.21	0.02	0.02	53	HANCOCK
CST17	BOTTOM		CENTER OF ST. LOUIS BAY	30 19 52.4	89 18 18.0	11/25/2003	10:32	1.5	2.5	1.29	0.48	0.06	0.16	0.02	0.04	55	HANCOCK
GTR18	SURFACE		GENE TAYLOR REEF	30 16 24.9	89 18 58.2	11/25/2003	11:11	0.5	2.7	1.58	0.59	0.05	0.16	0.02	0.11	59	HANCOCK
GTR18	MID		GENE TAYLOR REEF	30 16 24.9	89 18 58.2	11/25/2003	11:11	1.0	2.4	1.46	0.51	0.04	0.17	0.02	0.11	58	HANCOCK
GTR18	BOTTOM		GENE TAYLOR REEF	30 16 24.9	89 18 58.2	11/25/2003	11:11	1.5	4.1	1.55	0.60	0.03	0.16	0.02	0.03	56	HANCOCK
BAC19	SURFACE		BAYOU CADDY	30 14 16.5	89 25 41.1	11/24/2003	11:35	0.5	8.7	1.66	0.24	<0.02	0.50	<0.02	<0.02	52	HANCOCK
BAC19	MID		BAYOU CADDY	30 14 16.5	89 25 41.1	11/24/2003	11:35	1.2	13.0	1.70	0.35	<0.02	0.53	<0.02	0.03	63	HANCOCK
BAC19	BOTTOM		BAYOU CADDY	30 14 16.5	89 25 41.1	11/24/2003	11:35	2.0	13.0	1.97	0.45	<0.02	0.53	<0.02	<0.02	53	HANCOCK
PER20	SURFACE		PEARL RIVER	30 14 24.7	89 36 52.1	11/24/2003	10:08	0.5	3.9	4.70	1.64	<0.02	0.55	0.08	<0.02	27	HANCOCK
PER20	MID		PEARL RIVER	30 14 24.7	89 36 52.1	11/24/2003	10:08	4.2	3.8	4.47	1.51	<0.02	0.61	0.06	0.09	28	HANCOCK
PER20	BOTTOM		PEARL RIVER	30 14 24.7	89 36 52.1	11/24/2003	10:08	8.0	5.0	4.56	1.62	<0.02	0.58	0.07	0.10	19	HANCOCK
PAB21	SURFACE		PASCAGOULA BEACH	30 20 33.6	88 32 07.2	11/11/2003	10:30	0.5	1.2	0.74	0.19	<0.02	0.15	0.02	0.05	89	JACKSON

		FIELD BK 1	PASCAGOULA BEACH	30 20 33.6	88 32 07.2	11/11/2003	10:30			0.03	0.00	<0.02	<0.05	<0.02	<0.02	<4	JACKSON
BLF22	SURFACE		BELLEFOUNTAINE BEACH	30 20 31.2	88 42 45.6	11/14/2003	12:50	0.5	45.0	5.37	2.25	<0.02	0.46	<0.02	0.10	142	JACKSON
		FIELD BK 2	BELLEFOUNTAINE BEACH	30 20 31.2	88 42 45.6	11/14/2003	12:50			0.01	0.00	<0.02	<0.05	<0.02	<0.02	<4	JACKSON
DAB23	SURFACE		DAVIS BAYOU	30 23 37.8	88 48 37.2	11/14/2003	8:21	0.5	4.4	2.61	0.97	<0.02	0.77	<0.02	0.07	80	JACKSON
PRA24	SURFACE		PRATT AVENUE BEACH	30 22 12.0	89 04 47.0	11/14/2003	9:44	0.5	11.0	3.68	1.31	<0.02	0.91	<0.02	0.10	109	HARRISON
HEP25	SURFACE		HENDERSON POINT	30 18 12.6	89 16 54.2	11/14/2003	10:24	0.5	15.0	3.15	1.23	<0.02	0.81	<0.02	0.10	97	HARRISON
SCS26	SURFACE		ST. CHARLES STREET	30 18 00.0	89 20 02.2	11/14/2003	10:52	0.5	4.9	1.48	0.44	<0.02	0.72	<0.02	0.09	64	HANCOCK
WAV27	SURFACE		WAVELAND BEACH	30 16 37.1	89 22 25.2	11/14/2003	11:16	0.5	7.3	1.53	0.77	<0.02	0.69	<0.02	0.11	76	HANCOCK
ROA28	SURFACE		RODENBERG AVE.	30 23 32.6	88 56 17.5	11/14/2003	9:06	0.5	7.8	3.12	1.34	<0.02	0.68	<0.02	0.08	90	HARRISON

STATION NUMBER	LEVEL	BLANK DUP.	SAMPLE LOCATION	LATITUDE (° ')	LONGITUDE (° ')	DATE	TIME	DEPTH (m)	TURBIDITY (NTU)	Chl-a Value (ug/L)	Pheo-a value (ug/L)	TOTAL AMMONIA (mg/L-N)	TKN (mg/L-N)	TOTAL T NO_3-NO_2 (mg/L-N)	TOTAL PHOS. (mg/L-P)	TOTAL SUS. SOLIDS (mg/L)	COUNTY
PAC01	SURFACE		POINT AUX CHENES BAY	30 20 48.6	88 26 02.8	02/26/04	9:38	0.5	13.0	5.69	2.62	<0.02	0.42	<0.02	0.03	51	JACKSON
PAC01	BOTTOM		POINT AUX CHENES BAY	30 20 48.6	88 26 02.8	02/26/04	9:38	1.2	13.0	6.45	2.95	<0.02	0.47	<0.02	0.03	53	JACKSON
BAL02	SURFACE		BANGS LAKE	30 21 18.0	88 28 01.9	02/26/04	10:11	0.5	6.2	1.76	0.75	<0.02	0.58	<0.02	0.04	42	JACKSON
		FIELD BK 3	BANGS LAKE	30 21 18.0	88 28 01.9	02/26/04	10:11			0.02	0.01	<0.02	<0.05	<0.02	<0.02	<4	JACKSON
BCA03	SURFACE		BAYOU CASOTTE	30 21 20.5	88 30 23.3	02/26/04	11:26	0.5	11.0	2.06	0.95	0.40	0.80	0.08	0.75	59	JACKSON
BCA03	MID		BAYOU CASOTTE	30 21 20.5	88 30 23.3	02/26/04	11:26	1.5	24.0	2.32	1.02	0.42	0.74	0.06	0.65	83	JACKSON
BCA03	BOTTOM		BAYOU CASOTTE	30 21 20.5	88 30 23.3	02/26/04	11:26	2.5	23.0	2.11	0.96	0.42	0.72	0.06	0.58	77	JACKSON
BCH04	SURFACE		BAYOU CHICOT	30 20 33.7	88 31 13.1	02/16/04	11:37	0.5	9.6	2.66	1.08	0.15	0.62	0.06	0.11	35	JACKSON
BCH04	BOTTOM		BAYOU CHICOT	30 20 33.7	88 31 13.1	02/16/04	11:37	1.0	17.0	2.88	1.26	0.11	0.56	<0.02	0.09	77	JACKSON
PAR05	SURFACE		PASCAGOULA RIVER	30 22 14.1	88 33 45.2	02/16/04	9:35	0.5	85.0	1.63	0.78	<0.02	0.58	0.04	0.08	68	JACKSON

PAR05	MID		PASCAGOULA RIVER	30 22 14.1	88 33 45.2	02/16/04	9:35	4.0	110.0	1.30	0.52	<0.02	0.57	0.05	0.06	72	JACKSON
PAR05	BOTTOM		PASCAGOULA RIVER	30 22 14.1	88 33 45.2	02/16/04	9:35	7.5	40.0	2.19	0.92	<0.02	0.45	<0.02	0.03	108	JACKSON
ROI06	SURFACE		ROUND ISLAND	30 18 36.9	88 32 41.1	02/16/04	10:30	0.5	20.0	1.34	0.53	<0.02	0.41	0.04	0.04	66	JACKSON
ROI06	BOTTOM		ROUND ISLAND	30 18 36.9	88 32 41.1	02/16/04	10:30	1.2	120.0	3.47	1.51	<0.02	0.51	0.03	0.15	227	JACKSON
GRB07	SURFACE		GRAVELINE BAYOU	30 21 45.9	88 39 59.1	02/26/04	13:00	0.5	8.7	2.53	1.10	0.10	0.47	0.14	0.03	49	JACKSON
GRB07	MID		GRAVELINE BAYOU	30 21 45.9	88 39 59.1	02/26/04	13:00	1.5	9.9	2.65	1.28	0.12	0.48	0.13	0.03	54	JACKSON
GRB07	BOTTOM		GRAVELINE BAYOU	30 21 45.9	88 39 59.1	02/26/04	13:00	2.5	12.0	2.91	1.42	0.12	0.47	0.15	<0.02	62	JACKSON
POF08	SURFACE		POPP'S FERRY	30 24 57.3	88 58 40.6	02/12/04	12:50	0.5	12.0	1.64	0.73	<0.02	0.25	0.08	<0.02	7	HARRISON
POF08	MID		POPP'S FERRY	30 24 57.3	88 58 40.6	02/12/04	12:50	3.6	11.0	1.66	0.69	0.06	0.31	0.18	<0.02	11	HARRISON
POF08	BOTTOM		POPP'S FERRY	30 24 57.3	88 58 40.6	02/12/04	12:50	6.8	10.0	1.58	0.66	<0.02	0.33	0.23	0.07	15	HARRISON
CLP09	SURFACE		CLAY POINT	30 24 44.5	88 51 43.2	02/10/04	11:30	0.5	4.5	9.33	3.21	<0.02	0.52	0.04	<0.02	30	HARRISON
CLP09	BOTTOM		CLAY POINT	30 24 44.5	88 51 43.2	02/10/04	11:30	1.0	3.3	4.72	1.99	<0.02	0.50	0.03	<0.02	32	HARRISON
		FIELD BK 1	CLAY POINT	30 24 44.5	88 51 43.2	02/10/04	11:30			0.05	0.03	<0.02	<0.05	<0.02	<0.02	<4	HARRISON
OFB10	SURFACE		OLD FORT BAYOU	30 25 08.5	88 49 56.5	02/10/04	9:05	0.5	4.8	8.87	3.70	<0.02	0.44	<0.02	<0.02	20	JACKSON
OFB10	MID		OLD FORT BAYOU	30 25 08.5	88 49 56.5	02/10/04	9:05	2.0	3.8	6.76	2.86	<0.02	0.37	<0.02	0.03	28	JACKSON
OFB10	BOTTOM		OLD FORT BAYOU	30 25 08.5	88 49 56.5	02/10/04	9:05	3.3	3.9	5.80	2.42	<0.02	0.31	<0.02	0.08	31	JACKSON
CBT11	SURFACE		CONFLUENCE TCHOUTACABOUFFA & BILOXI R	30 25 56.9	88 59 25.5	02/12/04	11:37	0.5	27.0	0.35	0.14	<0.02	0.22	0.05	0.04	21	HARRISON
CBT11	MID		CONFLUENCE TCHOUTACABOUFFA & BILOXI R	30 25 56.9	88 59 25.5	02/12/04	11:37	2.5	22.0	0.45	0.19	<0.02	0.21	0.05	0.04	16	HARRISON
CBT11	BOTTOM		CONFLUENCE TCHOUTACABOUFFA & BILOXI R	30 25 56.9	88 59 25.5	02/12/04	11:37	4.5	24.0	0.46	0.20	<0.02	0.21	0.05	0.06	19	HARRISON
TCR12	SURFACE		TCHOUTACABOUFFA RIVER	30 27 10.4	88 57 55.7	02/12/04	9:30	0.5	14.0	0.36	0.14	<0.02	0.18	0.06	0.05	6	HARRISON
TCR12	MID		TCHOUTACABOUFFA RIVER	30 27 10.4	88 57 55.7	02/12/04	9:30	1.6	13.0	0.39	0.16	<0.02	0.13	0.06	<0.02	9	HARRISON
TCR12	BOTTOM		TCHOUTACABOUFFA RIVER	30 27 10.4	88 57 55.7	02/12/04	9:30	2.8	18.0	0.63	0.29	<0.02	0.09	0.06	0.03	11	HARRISON

BIR13	SURFACE		BILOXI RIVER	30 26 47.0	89 00 26.7	02/12/04	10:12	0.5	90.0	0.51	0.22	<0.02	0.10	0.04	0.07	84	HARRISON
BIR13	SURFACE	FIELD DUP.	BILOXI RIVER	30 26 47.0	89 00 26.7	02/12/04	10:12	0.5		0.31	0.15	<0.02	0.10	0.04	0.11	85	HARRISON
BIR13	MID		BILOXI RIVER	30 26 47.0	89 00 26.7	02/12/04	10:12	1.3	170.0	0.39	0.16	<0.02	0.15	0.04	0.08	84	HARRISON
BIR13	MID	FIELD DUP.	BILOXI RIVER	30 26 47.0	89 00 26.7	02/12/04	10:12	1.3		0.39	0.19	<0.02	0.13	0.04	0.07	85	HARRISON
BIR13	BOTTOM		BILOXI RIVER	30 26 47.0	89 00 26.7	02/12/04	10:12	2.0	130.0	0.58	0.22	<0.02	0.24	0.05	0.07	95	HARRISON
BIR13	BOTTOM	FIELD DUP.	BILOXI RIVER	30 26 47.0	89 00 26.7	02/12/04	10:12	2.0		0.39	0.18	<0.02	0.23	0.04	0.03	96	HARRISON
BBI14	SURFACE		BAYOU BERNARD/INDUSTRIAL SEAWAY	30 24 57.3	89 00 13.6	02/12/04	12:20	0.5	22.0	3.08	1.29	<0.02	0.37	0.32	0.17	23	HARRISON
BBI14	BOTTOM		BAYOU BERNARD/INDUSTRIAL SEAWAY	30 24 57.3	89 00 13.6	02/12/04	12:20	1.5	18.0	2.67	1.07	<0.02	0.29	0.30	0.16	23	HARRISON
DEI15	SURFACE		DEER ISLAND	30 21 35.8	88 54 09.2	02/10/04	10:24	0.5	4.2	2.49	1.05	<0.02	0.20	<0.02	0.04	50	HARRISON
DEI15	MID		DEER ISLAND	30 21 35.8	88 54 09.2	02/10/04	10:24	1.5	4.0	3.11	1.36	<0.02	0.15	<0.02	0.03	73	HARRISON
DEI15	BOTTOM		DEER ISLAND	30 21 35.8	88 54 09.2	02/10/04	10:24	2.5	15.0	3.22	1.47	<0.02	0.15	<0.02	0.05	84	HARRISON
WOR16	SURFACE		WOLF RIVER	30 21 27.5	89 16 36.4	03/02/04	9:18	0.5	10.0	0.44	0.16	<0.02	0.19	0.12	<0.02	<4	HANCOCK
WOR16	MID		WOLF RIVER	30 21 27.5	89 16 36.4	03/02/04	9:18	2.0	11.0	0.45	0.18	<0.02	0.22	0.12	<0.02	9	HANCOCK
WOR16	BOTTOM		WOLF RIVER	30 21 27.5	89 16 36.4	03/02/04	9:18	3.5	11.0	1.55	0.60	<0.02	0.24	0.11	<0.02	16	HANCOCK
CST17	SURFACE		CENTER OF ST. LOUIS BAY	30 19 52.4	89 18 18.0	03/02/04	12:15	0.5	19.0	7.05	3.13	0.03	0.37	0.15	0.05	32	HANCOCK
CST17	MID		CENTER OF ST. LOUIS BAY	30 19 52.4	89 18 18.0	03/02/04	12:15	1.1	20.0	6.45	2.86	0.03	0.39	0.14	0.06	35	HANCOCK
CST17	BOTTOM		CENTER OF ST. LOUIS BAY	30 19 52.4	89 18 18.0	03/02/04	12:15	1.8	19.0	4.37	1.92	0.03	0.33	0.15	0.05	34	HANCOCK
GTR18	SURFACE		GENE TAYLOR REEF	30 16 24.9	89 18 58.2	03/02/04	10:15	0.5	31.0	3.88	1.83	0.03	0.25	0.17	0.06	44	HANCOCK
GTR18	MID		GENE TAYLOR REEF	30 16 24.9	89 18 58.2	03/02/04	10:15	1.1	30.0	3.45	1.43	0.03	0.23	0.13	0.06	44	HANCOCK
GTR18	BOTTOM		GENE TAYLOR REEF	30 16 24.9	89 18 58.2	03/02/04	10:15	1.8	26.0	2.91	1.24	0.03	0.24	0.15	0.05	39	HANCOCK
BAC19	SURFACE		BAYOU CADDY	30 14 16.5	89 25 41.1	03/02/04	11:04	0.5	55.0	13.19	6.27	0.05	0.17	0.14	0.09	62	HANCOCK
BAC19	MID		BAYOU CADDY	30 14 16.5	89 25 41.1	03/02/04	11:04	1.5	50.0	5.87	2.44	0.05	0.27	0.16	0.08	55	HANCOCK

BAC19	BOTTOM		BAYOU CADDY	30 14 16.5	89 25 41.1	03/02/04	11:04	2.4	40.0	2.40	1.11	0.06	0.24	0.12	0.07	55	HANCOCK
PER20	SURFACE		PEARL RIVER	30 14 24.7	89 36 52.1	03/02/04	14:00	0.5	34.0	1.40	0.42	<0.02	0.37	0.21	0.06	20	HANCOCK
PER20	SURFACE	FIELD DUP.	PEARL RIVER	30 14 24.7	89 36 52.1	03/02/04	14:00	0.5		1.28	0.50	<0.02	0.37	0.21	0.07	14	HANCOCK
PER20	MID		PEARL RIVER	30 14 24.7	89 36 52.1	03/02/04	14:00	3.8	34.0	0.88	0.34	<0.02	0.24	0.23	0.09	18	HANCOCK
PER20	MID	FIELD DUP.	PEARL RIVER	30 14 24.7	89 36 52.1	03/02/04	14:00	3.8		1.27	0.52	<0.02	0.23	0.19	0.08	19	HANCOCK
PER20	BOTTOM		PEARL RIVER	30 14 24.7	89 36 52.1	03/02/04	14:00	7.0	34.0	1.37	0.49	<0.02	0.17	0.20	0.08	19	HANCOCK
PER20	BOTTOM	FIELD DUP.	PEARL RIVER	30 14 24.7	89 36 52.1	03/02/04	14:00	7.0		1.20	0.50	<0.02	0.18	0.21	0.11	16	HANCOCK
PAB21	SURFACE		PASCAGOULA BEACH	30 20 33.6	88 32 07.2	02/16/04	11:11	0.5	5.4	2.28	0.93	<0.02	0.39	<0.02	0.07	85	JACKSON
BLF22	SURFACE		BELLEFOUNTAINE BEACH	30 20 31.2	88 42 45.6	02/13/04	13:51	0.5	12.0	2.94	1.25	<0.02	0.08	0.05	0.03	75	JACKSON
DAB23	SURFACE		DAVIS BAYOU	30 23 37.8	88 48 37.2	02/13/04	8:26	0.5	7.9	5.41	2.42	<0.02	0.21	0.08	0.03	35	JACKSON
DAB23	SURFACE	FIELD DUP.	DAVIS BAYOU	30 23 37.8	88 48 37.2	02/13/04	8:26	0.5		5.86	2.51	<0.02	0.23	0.08	0.05	30	JACKSON
PRA24	SURFACE		PRATT AVENUE BEACH	30 22 12.0	89 04 47.0	02/13/04	12:06	0.5	21.0	4.51	2.07	<0.02	0.24	<0.02	<0.02	96	HARRISON
HEP25	SURFACE		HENDERSON POINT	30 18 12.6	89 16 54.2	02/13/04	11:07	0.5	9.8	3.13	1.24	<0.02	0.23	0.02	0.03	70	HARRISON
		FIELD BK 2	HENDERSON POINT	30 18 12.6	89 16 54.2	02/13/04	11:07			0.05	0.04	<0.02	<0.05	<0.02	<0.02	<4	HANCOCK
SCS26	SURFACE		ST. CHARLES STREET	30 18 00.0	89 20 02.2	02/13/04	10:34	0.5	19.0	3.94	1.74	<0.02	0.13	<0.02	<0.02	59	HANCOCK
WAV27	SURFACE		WAVELAND BEACH	30 16 37.1	89 22 25.2	02/13/04	10:05	0.5	14.0	4.15	1.88	<0.02	0.07	<0.02	0.04	60	HANCOCK
ROA28	SURFACE		RODENBERG AVE.	30 23 32.6	88 56 17.5	02/13/04	12:42	0.5	6.3	5.04	2.30	<0.02	0.07	<0.02	0.02	67	HARRISON

Appendix C

Listing of Hydrographic Profile Data by Season

Site #	Name	Description	Latitude	Longitude	Date Collected	Time Collected	Secchi Disk (m)	Total Depth (m)	Hydrographic profiling Depth (m)	Temp (C)	pH (units)	Salinity (ppt)	DO (%)	DO (mg/L)
PAC01	Point Aux Chenes Bay	Middle of bay	30 20' 48.6"	88 26' 02.8"	6/18/2003	11:15	0.90	1.97	0.5	28.94	7.95	13.51	99.7	7.70
PAC01	Point Aux Chenes Bay	Middle of bay	30 20' 48.6"	88 26' 02.8"	6/18/2003	11:15			1.0	28.20	7.94	13.64	91.5	7.14
PAC01	Point Aux Chenes Bay	Middle of bay	30 20' 48.6"	88 26' 02.8"	6/18/2003	11:15			1.5	28.08	7.89	13.67	83.1	6.48
BAL02	Bangs Lake	Middle of lake	30 21' 18.0"	88 28' 01.9"	6/18/2003	12:20	0.60	1.30	0.5	28.64	7.45	13.31	87.8	6.76
BAL02	Bangs Lake	Middle of lake	30 21' 18.0"	88 28' 01.9"	6/18/2003	12:20			1.0	28.56	7.45	13.30	83.4	6.42
BCA03	Bayou Casotte	North of launch	30 21' 20.5"	88 30' 23.3"	6/18/2003	9:25	0.75	4.54	0.5	27.93	7.78	18.29	74.3	5.79
BCA03	Bayou Casotte	North of launch	30 21' 20.5"	88 30' 23.3"	6/18/2003	9:25			1.0	27.70	7.75	18.50	63.4	4.94
BCA03	Bayou Casotte	North of launch	30 21' 20.5"	88 30' 23.3"	6/18/2003	9:25			1.5	27.48	7.68	19.28	57.4	4.45
BCA03	Bayou Casotte	North of launch	30 21' 20.5"	88 30' 23.3"	6/18/2003	9:25			2.0	27.31	7.65	20.61	48.5	3.96
BCA03	Bayou Casotte	North of launch	30 21' 20.5"	88 30' 23.3"	6/18/2003	9:25			3.0	27.00	7.63	22.48	44.1	3.47
BCA03	Bayou Casotte	North of launch	30 21' 20.5"	88 30' 23.3"	6/18/2003	9:25			4.0	26.78	7.59	23.08	36.9	2.93
BCH04	Bayou Chicot	North of launch	30 20' 33.7"	88 31' 13.1"	6/12/2003	11:52	0.50	1.90	0.5	29.11	7.15	4.84	80.3	6.18
BCH04	Bayou Chicot	North of launch	30 20' 33.7"	88 31' 13.1"	6/12/2003	11:52			1.0	29.06	7.15	4.94	76.8	5.85
BCH04	Bayou Chicot	North of launch	30 20' 33.7"	88 31' 13.1"	6/12/2003	11:52			1.5	29.02	7.10	5.03	73.3	5.47
PAR05	Pascagoula River	South of 90 bridge	30 22' 14.1"	88 33' 45.2"	6/16/2003	8:52	1.00	7.39	0.5	28.24	7.32	10.52	99.3	7.61
PAR05	Pascagoula River	South of 90 bridge	30 22' 14.1"	88 33' 45.2"	6/16/2003	8:52			1.0	27.80	7.65	16.89	77.0	6.10
PAR05	Pascagoula River	South of 90 bridge	30 22' 14.1"	88 33' 45.2"	6/16/2003	8:52			1.5	27.55	7.78	21.99	68.6	5.45
PAR05	Pascagoula River	South of 90 bridge	30 22' 14.1"	88 33' 45.2"	6/16/2003	8:52			2.0	27.32	7.86	23.67	69.8	5.47
PAR05	Pascagoula River	South of 90 bridge	30 22' 14.1"	88 33' 45.2"	6/16/2003	8:52			3.0	26.74	7.86	26.73	59.9	4.75
PAR05	Pascagoula River	South of 90 bridge	30 22' 14.1"	88 33' 45.2"	6/16/2003	8:52			4.0	25.92	7.81	28.55	49.1	3.99
PAR05	Pascagoula River	South of 90 bridge	30 22' 14.1"	88 33' 45.2"	6/16/2003	8:52			5.0	25.67	7.81	29.07	45.4	3.72
PAR05	Pascagoula River	South of 90 bridge	30 22' 14.1"	88 33' 45.2"	6/16/2003	8:52			6.0	25.49	7.78	29.37	41.3	3.36
PAR05	Pascagoula River	South of 90 bridge	30 22' 14.1"	88 33' 45.2"	6/16/2003	8:52			7.0	24.91	7.76	30.16	31.4	2.60
ROI06	Round Island	Marker 3	30 18' 36.9"	88 32' 41.1"	6/16/2003	10:22	2.30	2.36	0.5	29.83	8.00	18.01	101.2	7.72
ROI06	Round Island	Marker 3	30 18' 36.9"	88 32' 41.1"	6/16/2003	10:22			1.0	28.40	7.90	18.65	89.1	7.10
ROI06	Round Island	Marker 3	30 18' 36.9"	88 32' 41.1"	6/16/2003	10:22			1.5	28.55	7.94	19.92	90.0	6.97
ROI06	Round Island	Marker 3	30 18' 36.9"	88 32' 41.1"	6/16/2003	10:22			2.0	28.57	7.96	21.11	89.8	7.03
GRB07	Graveline Bayou	Mouth of bayou	30 21' 45.9"	88 39' 59.1"	6/12/2003	9:11	0.20	3.12	0.5	27.90	7.31	2.55	96.7	7.68
GRB07	Graveline Bayou	Mouth of bayou	30 21' 45.9"	88 39' 59.1"	6/12/2003	9:11			1.0	27.28	7.25	3.02	88.2	6.91
GRB07	Graveline Bayou	Mouth of bayou	30 21' 45.9"	88 39' 59.1"	6/12/2003	9:11			1.5	27.32	7.18	3.05	90.0	6.96
GRB07	Graveline Bayou	Mouth of bayou	30 21' 45.9"	88 39' 59.1"	6/12/2003	9:11			2.0	27.17	7.13	3.72	87.0	6.90
GRB07	Graveline Bayou	Mouth of bayou	30 21' 45.9"	88 39' 59.1"	6/12/2003	9:11			3.0	27.13	7.15	4.02	84.0	6.70
POF08	Popps Ferry	Mouth of Big Lake	30 24' 57.3"	88 58' 40.6"	6/11/2003	11:18	0.90	7.50	0.5	27.77	6.17	0.78	76.0	5.96
POF08	Popps Ferry	Mouth of Big Lake	30 24' 57.3"	88 58' 40.6"	6/11/2003	11:18			1.0	27.77	6.14	0.79	76.0	5.91
POF08	Popps Ferry	Mouth of Big Lake	30 24' 57.3"	88 58' 40.6"	6/11/2003	11:18			1.5	27.85	6.12	1.12	68.5	5.36
POF08	Popps Ferry	Mouth of Big Lake	30 24' 57.3"	88 58' 40.6"	6/11/2003	11:18			2.0	27.88	6.15	1.15	67.8	5.25
POF08	Popps Ferry	Mouth of Big Lake	30 24' 57.3"	88 58' 40.6"	6/11/2003	11:18			3.0	27.93	6.14	1.78	57.1	4.39
POF08	Popps Ferry	Mouth of Big Lake	30 24' 57.3"	88 58' 40.6"	6/11/2003	11:18			4.0	27.95	6.14	2.31	49.8	3.90

POF08	Popps Ferry	Mouth of Big Lake	30 24' 57.3"	88 58' 40.6"	6/11/2003	11:18			5.0	27.83	6.14	2.80	45.4	3.55
POF08	Popps Ferry	Mouth of Big Lake	30 24' 57.3"	88 58' 40.6"	6/11/2003	11:18			6.0	27.54	6.14	4.17	34.2	2.68
POF08	Popps Ferry	Mouth of Big Lake	30 24' 57.3"	88 58' 40.6"	6/11/2003	11:18			7.0	27.43	6.21	4.71	28.0	2.21
CLP09	Clay Point	North of Biloxi Bay Bridge	30 24' 44.5"	88 51' 43.2"	6/9/2003	10:05	0.40	2.04	0.5	28.25	6.26	0.71	71.7	5.58
CLP09	Clay Point	North of Biloxi Bay Bridge	30 24' 44.5"	88 51' 43.2"	6/9/2003	10:05			1.0	26.67	6.17	1.46	56.9	4.53
CLP09	Clay Point	North of Biloxi Bay Bridge	30 24' 44.5"	88 51' 43.2"	6/9/2003	10:05			1.5	26.79	6.16	2.24	52.2	4.13
OFB10	Old Fort Bayou	North of bridge	30 25' 08.5"	88 49' 56.5"	6/11/2003	8:50	0.55	4.37	0.5	28.79	7.09	1.08	73.5	5.44
OFB10	Old Fort Bayou	North of bridge	30 25' 08.5"	88 49' 56.5"	6/11/2003	8:50			1.0	28.85	6.86	1.17	71.9	5.66
OFB10	Old Fort Bayou	North of bridge	30 25' 08.5"	88 49' 56.5"	6/11/2003	8:50			1.5	28.84	6.77	1.16	72.6	5.65
OFB10	Old Fort Bayou	North of bridge	30 25' 08.5"	88 49' 56.5"	6/11/2003	8:50			2.0	28.85	6.72	1.20	71.5	5.60
OFB10	Old Fort Bayou	North of bridge	30 25' 08.5"	88 49' 56.5"	6/11/2003	8:50			3.0	28.91	6.66	1.27	70.4	5.40
OFB10	Old Fort Bayou	North of bridge	30 25' 08.5"	88 49' 56.5"	6/11/2003	8:50			4.0	28.91	6.65	1.30	71.2	5.42
CBT11	Confluence of Tchoutacabouffa and Biloxi River		30 25' 56.9"	88 59' 25.5"	6/10/2003	12:45	0.70	5.20	0.5	27.93	5.57	0.12	74.8	5.85
CBT11	Confluence of Tchoutacabouffa and Biloxi River		30 25' 56.9"	88 59' 25.5"	6/10/2003	12:45			1.0	27.86	5.54	0.12	73.1	5.72
CBT11	Confluence of Tchoutacabouffa and Biloxi River		30 25' 56.9"	88 59' 25.5"	6/10/2003	12:45			1.5	27.86	5.54	0.12	68.4	5.41
CBT11	Confluence of Tchoutacabouffa and Biloxi River		30 25' 56.9"	88 59' 25.5"	6/10/2003	12:45			2.0	26.88	5.40	0.11	66.5	5.29
CBT11	Confluence of Tchoutacabouffa and Biloxi River		30 25' 56.9"	88 59' 25.5"	6/10/2003	12:45			3.0	26.05	5.18	0.08	62.2	5.07
CBT11	Confluence of Tchoutacabouffa and Biloxi River		30 25' 56.9"	88 59' 25.5"	6/10/2003	12:45			4.0	26.00	5.19	0.08	62.2	5.06
CBT11	Confluence of Tchoutacabouffa and Biloxi River		30 25' 56.9"	88 59' 25.5"	6/10/2003	12:45			5.0	25.93	5.14	0.07	60.0	4.87
TCR12	Tchoutacabouffa R.	I.5mi up river from mouth	30 27' 10.4"	88 57' 55.7"	6/10/2003	9:10	0.65	4.39	0.5	26.63	5.45	0.04	70.3	5.46
TCR12	Tchoutacabouffa R.	I.5mi up river from mouth	30 27' 10.4"	88 57' 55.7"	6/10/2003	9:10			1.0	26.47	5.17	0.04	69.1	5.51
TCR12	Tchoutacabouffa R.	I.5mi up river from mouth	30 27' 10.4"	88 57' 55.7"	6/10/2003	9:10			1.5	26.52	5.10	0.05	70.1	5.58
TCR12	Tchoutacabouffa R.	I.5mi up river from mouth	30 27' 10.4"	88 57' 55.7"	6/10/2003	9:10			2.0	26.50	5.08	0.05	66.6	5.38
TCR12	Tchoutacabouffa R.	I.5mi up river from mouth	30 27' 10.4"	88 57' 55.7"	6/10/2003	9:10			3.0	25.42	4.92	0.02	61.1	5.03
TCR12	Tchoutacabouffa R.	I.5mi up river from mouth	30 27' 10.4"	88 57' 55.7"	6/10/2003	9:10			4.0	25.35	4.89	0.02	60.7	4.97
BIR13	Biloxi River	1.2mi up river from mouth	30 26' 47.0"	89 00' 26.7"	6/10/2003	11:20	0.65	5.24	0.5	25.95	5.41	0.01	79.0	6.25
BIR13	Biloxi River	1.2mi up river from mouth	30 26' 47.0"	89 00' 26.7"	6/10/2003	11:20			1.0	25.61	5.21	0.01	78.1	6.31
BIR13	Biloxi River	1.2mi up river from mouth	30 26' 47.0"	89 00' 26.7"	6/10/2003	11:20			1.5	25.14	5.11	0.01	77.2	6.29
BIR13	Biloxi River	1.2mi up river from mouth	30 26' 47.0"	89 00' 26.7"	6/10/2003	11:20			2.0	25.10	5.09	0.01	75.8	6.25
BIR13	Biloxi River	1.2mi up river from mouth	30 26' 47.0"	89 00' 26.7"	6/10/2003	11:20			3.0	24.90	5.07	0.01	73.4	6.00
BIR13	Biloxi River	1.2mi up river from mouth	30 26' 47.0"	89 00' 26.7"	6/10/2003	11:20			4.0	24.90	5.07	0.01	72.2	6.01
BIR13	Biloxi River	1.2mi up river from mouth	30 26' 47.0"	89 00' 26.7"	6/10/2003	11:20			5.0	24.91	5.06	0.01	72.3	6.03
BBI14	Bayou Bernard	Industrial Seaway mouth	30 24' 57.3"	89 00' 13.6"	6/11/2003	10:20	0.55	3.80	0.5	28.14	6.74	0.75	72.9	5.65
BBI14	Bayou Bernard	Industrial Seaway mouth	30 24' 57.3"	89 00' 13.6"	6/11/2003	10:20			1.0	28.02	6.52	1.18	59.3	4.77
BBI14	Bayou Bernard	Industrial Seaway mouth	30 24' 57.3"	89 00' 13.6"	6/11/2003	10:20			1.5	27.89	6.35	1.60	56.7	4.45
BBI14	Bayou Bernard	Industrial Seaway mouth	30 24' 57.3"	89 00' 13.6"	6/11/2003	10:20			2.0	27.83	6.28	1.93	50.1	3.93
BBI14	Bayou Bernard	Industrial Seaway mouth	30 24' 57.3"	89 00' 13.6"	6/11/2003	10:20			3.0	27.77	6.22	2.40	44.2	3.48
BBI14	Bayou Bernard	Industrial Seaway mouth	30 24' 57.3"	89 00' 13.6"	6/11/2003	10:20			3.5	27.74	6.21	2.56	44.5	3.44
DEI15	Deer Island	Marker 2	30 21' 35.8"	88 54' 09.2"	6/16/2003	13:25	1.15	3.45	0.5	30.19	7.97	16.80	108.6	8.01
DEI15	Deer Island	Marker 2	30 21' 35.8"	88 54' 09.2"	6/16/2003	13:25			1.0	28.97	7.94	17.19	98.5	7.56
DEI15	Deer Island	Marker 2	30 21' 35.8"	88 54' 09.2"	6/16/2003	13:25			1.5	28.94	7.90	17.53	93.6	7.19
DEI15	Deer Island	Marker 2	30 21' 35.8"	88 54' 09.2"	6/16/2003	13:25			2.0	28.92	7.83	17.89	88.1	6.71

DEI15	Deer Island	Marker 2	30 21' 35.8"	88 54' 09.2"	6/16/2003	13:25			3.0	28.28	7.80	18.69	80.7	6.20
WOR16	Wolf River	.25mi up river from mouth	30 21' 27.5"	89 16' 36.4"	6/19/2003	9:38	0.75	4.11	0.5	26.51	6.90	0.52	69.7	5.62
WOR16	Wolf River	.25mi up river from mouth	30 21' 27.5"	89 16' 36.4"	6/19/2003	9:38			1.0	27.04	6.51	2.96	67.4	5.33
WOR16	Wolf River	.25mi up river from mouth	30 21' 27.5"	89 16' 36.4"	6/19/2003	9:38			1.5	27.70	6.68	4.80	69.5	5.48
WOR16	Wolf River	.25mi up river from mouth	30 21' 27.5"	89 16' 36.4"	6/19/2003	9:38			2.0	27.95	6.74	5.59	68.9	5.40
WOR16	Wolf River	.25mi up river from mouth	30 21' 27.5"	89 16' 36.4"	6/19/2003	9:38			3.0	28.20	6.84	6.13	67.5	5.24
WOR16	Wolf River	.25mi up river from mouth	30 21' 27.5"	89 16' 36.4"	6/19/2003	9:38			3.5	28.22	6.89	6.20	66.1	5.16
CST17	Center of St. Louis	Marker 1	30 19' 52.4"	89 18' 18.0"	6/19/2003	11:55	0.40	2.50	0.5	29.32	7.87	7.43	104.1	7.89
CST17	Center of St. Louis	Marker 1	30 19' 52.4"	89 18' 18.0"	6/19/2003	11:55			1.0	28.58	7.79	10.56	93.9	7.25
CST17	Center of St. Louis	Marker 1	30 19' 52.4"	89 18' 18.0"	6/19/2003	11:55			1.5	28.52	7.77	10.64	89.1	6.90
CST17	Center of St. Louis	Marker 1	30 19' 52.4"	89 18' 18.0"	6/19/2003	11:55			2.0	28.50	7.74	10.70	87.6	6.81
GTR18	Gene Taylor Reef	Marker 4	30 16' 24.9"	89 18' 58.2"	6/19/2003	10:45	0.55	2.47	0.5	29.15	7.75	9.40	101.4	7.79
GTR18	Gene Taylor Reef	Marker 4	30 16' 24.9"	89 18' 58.2"	6/19/2003	10:45			1.0	28.86	7.78	9.94	99.1	7.62
GTR18	Gene Taylor Reef	Marker 4	30 16' 24.9"	89 18' 58.2"	6/19/2003	10:45			1.5	28.76	7.73	10.16	98.6	7.61
GTR18	Gene Taylor Reef	Marker 4	30 16' 24.9"	89 18' 58.2"	6/19/2003	10:45			2.0	28.54	7.90	10.76	94.9	7.35
BAC19	Bayou Caddy	.2mi up bayou from mouth	30 14' 16.5"	89 25' 41.1"	6/20/2003	11:07	2.00	3.19	0.5	28.40	7.18	10.74	77.9	6.00
BAC19	Bayou Caddy	.2mi up bayou from mouth	30 14' 16.5"	89 25' 41.1"	6/20/2003	11:07			1.0	28.78	7.18	10.78	77.0	5.90
BAC19	Bayou Caddy	.2mi up bayou from mouth	30 14' 16.5"	89 25' 41.1"	6/20/2003	11:07			1.5	28.70	7.16	10.77	75.9	5.85
BAC19	Bayou Caddy	.2mi up bayou from mouth	30 14' 16.5"	89 25' 41.1"	6/20/2003	11:07			2.0	28.70	7.15	10.76	73.7	5.67
BAC19	Bayou Caddy	.2mi up bayou from mouth	30 14' 16.5"	89 25' 41.1"	6/20/2003	11:07			2.7	28.70	7.14	10.80	71.4	5.50
PER20	Pearl River	North of 90 bridge	30 14' 24.7"	89 36' 52.1"	6/20/2003	9:17	0.35	7.43	0.5	26.53	6.84	0.02	69.0	5.53
PER20	Pearl River	North of 90 bridge	30 14' 24.7"	89 36' 52.1"	6/20/2003	9:17			1.0	26.33	6.66	0.02	67.2	5.41
PER20	Pearl River	North of 90 bridge	30 14' 24.7"	89 36' 52.1"	6/20/2003	9:17			1.5	26.24	6.59	0.02	67.0	5.39
PER20	Pearl River	North of 90 bridge	30 14' 24.7"	89 36' 52.1"	6/20/2003	9:17			2.0	26.19	6.53	0.02	67.0	5.41
PER20	Pearl River	North of 90 bridge	30 14' 24.7"	89 36' 52.1"	6/20/2003	9:17			3.0	26.20	6.47	0.02	67.5	5.44
PER20	Pearl River	North of 90 bridge	30 14' 24.7"	89 36' 52.1"	6/20/2003	9:17			4.0	26.13	6.45	0.02	66.9	5.39
PER20	Pearl River	North of 90 bridge	30 14' 24.7"	89 36' 52.1"	6/20/2003	9:17			5.0	26.12	6.44	0.02	66.0	5.30
PER20	Pearl River	North of 90 bridge	30 14' 24.7"	89 36' 52.1"	6/20/2003	9:17			6.0	26.11	6.43	0.02	65.7	5.30
PER20	Pearl River	North of 90 bridge	30 14' 24.7"	89 36' 52.1"	6/20/2003	9:17			7.0	26.12	6.42	0.02	65.4	5.27
PAB21	Pascagoula Beach	Next to pier	30 20' 33.6"	88 32' 07.2"	6/24/2003	9:50	0.45	1.00	0.5	30.78	8.04	13.74	91.5	6.81
BLF22	Bellefountaine Beach	West of water tower	30 20' 31.2"	88 42' 45.6"	6/24/2003	8:30	0.25	1.00	0.5	29.33	7.30	3.32	78.8	5.96
DAB23	Davis Bayou	Beach at Holcomb Street	30 23' 37.8"	88 48' 37.2"	6/26/2003	9:40	0.50	1.00	0.5	28.93	8.29	2.90	104.4	8.09
PRA24	Pratt Avenue Beach	Across from Holiday Inn	30 22' 12.0"	89 04' 47.0"	6/24/2003	11:45	0.60	1.00	0.5	31.14	8.24	14.07	95.3	7.08
HEP25	Henderson Point	Beach at Henderson Point	30 18' 12.6"	89 16' 54.2"	6/23/2003	12:20	1.00	1.00	0.5	31.14	7.67	13.98	99.5	7.23
SCS26	St. Charles Street	Bay St. Louis Beach	30 18' 00.0"	89 20' 02.2"	6/23/2003	11:20	1.00	1.00	0.5	31.07	7.33	8.89	82.2	6.09
WAV27	Waveland Beach	St. Claire Church beach	30 16' 37.1"	89 22' 25.2"	6/23/2003	10:24	0.80	1.00	0.5	30.08	7.24	8.85	71.5	5.38
ROA28	Rodenberg Ave.	Rodenberg Ave. beach	30 23' 32.6"	88 56' 17.5"	6/23/2003	13:35	0.45	1.00	0.5	33.15	8.36	11.27	150.9	10.80

									Hydrographic profiling					
Site #	Name	Description	Latitude	Longitude	Date Collected	Time Collected	Secchi Disk (m)	Total Depth (m)	Depth (m)	Temp (C)	pH (units)	Salinity (ppt)	DO (%)	DO (mg/L)
PAC01	Point Aux Chenes Bay	Middle of bay	30 20' 48.6"	88 26' 02.8"	10/3/2003	10:07	1.10	1.71	0.5	19.65	8.03	22.55	91.1	8.34
PAC01	Point Aux Chenes Bay	Middle of bay	30 20' 48.6"	88 26' 02.8"	10/3/2003	10:07			1.0	19.61	8.07	22.58	88.3	8.14
PAC01	Point Aux Chenes Bay	Middle of bay	30 20' 48.6"	88 26' 02.8"	10/3/2003	10:07			1.5	19.60	8.07	22.45	88.5	8.15
BAL02	Bangs Lake	Middle of lake	30 21' 18.0"	88 28' 01.9"	10/3/2003	10:53	>1.00	1.00	0.5	18.62	7.54	21.62	71.5	6.66
BCA03	Bayou Casotte	North of launch	30 21' 20.5"	88 30' 23.3"	10/3/2003	9:02	1.00	5.10	0.5	24.33	7.92	28.05	76.6	6.44
BCA03	Bayou Casotte	North of launch	30 21' 20.5"	88 30' 23.3"	10/3/2003	9:02			1.0	24.36	7.98	28.06	73.7	6.20
BCA03	Bayou Casotte	North of launch	30 21' 20.5"	88 30' 23.3"	10/3/2003	9:02			1.5	24.18	7.98	27.92	68.4	5.76
BCA03	Bayou Casotte	North of launch	30 21' 20.5"	88 30' 23.3"	10/3/2003	9:02			2.0	23.97	7.98	27.84	70.9	6.01
BCA03	Bayou Casotte	North of launch	30 21' 20.5"	88 30' 23.3"	10/3/2003	9:02			3.0	23.80	7.98	27.94	69.4	5.89
BCA03	Bayou Casotte	North of launch	30 21' 20.5"	88 30' 23.3"	10/3/2003	9:02			4.0	23.61	7.98	27.85	71.5	6.10
BCA03	Bayou Casotte	North of launch	30 21' 20.5"	88 30' 23.3"	10/3/2003	9:02			4.6	23.13	7.97	27.72	74.2	6.37
BCH04	Bayou Chicot	North of launch	30 20' 33.7"	88 31' 13.1"	10/7/2003	10:24	0.60	1.95	0.5	24.30	7.69	24.44	72.9	6.07
BCH04	Bayou Chicot	North of launch	30 20' 33.7"	88 31' 13.1"	10/7/2003	10:24			1.0	24.30	7.68	24.40	61.9	5.19
BCH04	Bayou Chicot	North of launch	30 20' 33.7"	88 31' 13.1"	10/7/2003	10:24			1.5	24.32	7.70	24.36	61.2	5.14
PAR05	Pascagoula River	South of 90 bridge	30 22' 14.1"	88 33' 45.2"	10/7/2003	9:11	2.05	7.00	0.5	24.21	8.03	23.58	88.4	7.43
PAR05	Pascagoula River	South of 90 bridge	30 22' 14.1"	88 33' 45.2"	10/7/2003	9:11			1.0	24.18	8.03	23.41	87.3	7.34
PAR05	Pascagoula River	South of 90 bridge	30 22' 14.1"	88 33' 45.2"	10/7/2003	9:11			1.5	24.25	8.03	24.14	85.7	7.20
PAR05	Pascagoula River	South of 90 bridge	30 22' 14.1"	88 33' 45.2"	10/7/2003	9:11			2.0	24.30	8.05	24.13	85.1	7.15
PAR05	Pascagoula River	South of 90 bridge	30 22' 14.1"	88 33' 45.2"	10/7/2003	9:11			3.0	24.30	8.04	25.00	84.2	7.04
PAR05	Pascagoula River	South of 90 bridge	30 22' 14.1"	88 33' 45.2"	10/7/2003	9:11			4.0	24.23	8.03	26.14	80.3	6.77
PAR05	Pascagoula River	South of 90 bridge	30 22' 14.1"	88 33' 45.2"	10/7/2003	9:11			5.0	24.07	8.01	26.65	72.3	6.03
PAR05	Pascagoula River	South of 90 bridge	30 22' 14.1"	88 33' 45.2"	10/7/2003	9:11			6.0	23.99	8.00	26.83	67.8	5.73
PAR05	Pascagoula River	South of 90 bridge	30 22' 14.1"	88 33' 45.2"	10/7/2003	9:11			6.5	23.98	8.00	26.90	67.3	5.68
ROI06	Round Island	Marker 3	30 18' 36.9"	88 32' 41.1"	10/4/2003	10:42	2.05	2.08	0.5	22.52	8.10	25.99	93.0	8.05
ROI06	Round Island	Marker 3	30 18' 36.9"	88 32' 41.1"	10/4/2003	10:42			1.0	22.28	8.05	26.11	92.7	8.04
ROI06	Round Island	Marker 3	30 18' 36.9"	88 32' 41.1"	10/4/2003	10:42			1.5	22.27	8.06	26.05	91.8	8.00
GRB07	Graveline Bayou	Mouth of bayou	30 21' 45.9"	88 39' 59.1"	10/3/2003	12:42	0.80	3.26	0.5	20.63	7.55	18.73	76.0	6.86
GRB07	Graveline Bayou	Mouth of bayou	30 21' 45.9"	88 39' 59.1"	10/3/2003	12:42			1.0	20.61	7.50	18.75	74.5	6.70
GRB07	Graveline Bayou	Mouth of bayou	30 21' 45.9"	88 39' 59.1"	10/3/2003	12:42			1.5	20.60	7.49	18.70	74.0	6.68
GRB07	Graveline Bayou	Mouth of bayou	30 21' 45.9"	88 39' 59.1"	10/3/2003	12:42			2.0	20.61	7.48	18.74	73.8	6.67
GRB07	Graveline Bayou	Mouth of bayou	30 21' 45.9"	88 39' 59.1"	10/3/2003	12:42			3.0	20.60	7.46	18.80	72.5	6.55
POF08	Popps Ferry	Mouth of Big Lake	30 24' 57.3"	88 58' 40.6"	9/30/2003	11:18	0.75	8.15	0.5	22.94	7.30	2.26	70.1	6.07
POF08	Popps Ferry	Mouth of Big Lake	30 24' 57.3"	88 58' 40.6"	9/30/2003	11:18			1.0	22.86	7.20	2.56	66.7	5.79
POF08	Popps Ferry	Mouth of Big Lake	30 24' 57.3"	88 58' 40.6"	9/30/2003	11:18			1.5	23.05	7.05	2.82	62.2	5.37
POF08	Popps Ferry	Mouth of Big Lake	30 24' 57.3"	88 58' 40.6"	9/30/2003	11:18			2.0	23.12	6.96	2.92	60.6	5.14
POF08	Popps Ferry	Mouth of Big Lake	30 24' 57.3"	88 58' 40.6"	9/30/2003	11:18			3.0	23.22	6.85	3.24	58.6	5.04
POF08	Popps Ferry	Mouth of Big Lake	30 24' 57.3"	88 58' 40.6"	9/30/2003	11:18			4.0	23.07	6.80	3.23	59.5	5.15
POF08	Popps Ferry	Mouth of Big Lake	30 24' 57.3"	88 58' 40.6"	9/30/2003	11:18			5.0	22.96	6.75	3.23	60.4	5.22

POF08	Popps Ferry	Mouth of Big Lake	30 24' 57.3"	88 58' 40.6"	9/30/2003	11:18			6.0	22.88	6.73	3.36	59.7	5.13
POF08	Popps Ferry	Mouth of Big Lake	30 24' 57.3"	88 58' 40.6"	9/30/2003	11:18			7.0	23.03	6.69	3.54	59.6	5.13
POF08	Popps Ferry	Mouth of Big Lake	30 24' 57.3"	88 58' 40.6"	9/30/2003	11:18			8.0	23.08	6.66	3.58	58.7	5.06
CLP09	Clay Point	North of Biloxi Bay Bridge	30 24' 44.5"	88 51' 43.2"	9/30/2003	8:48	0.75	2.24	0.5	23.34	7.53	9.54	83.3	7.16
CLP09	Clay Point	North of Biloxi Bay Bridge	30 24' 44.5"	88 51' 43.2"	9/30/2003	8:48			1.0	23.32	7.52	9.59	80.8	6.95
CLP09	Clay Point	North of Biloxi Bay Bridge	30 24' 44.5"	88 51' 43.2"	9/30/2003	8:48			1.5	23.31	7.51	9.50	79.6	6.79
CLP09	Clay Point	North of Biloxi Bay Bridge	30 24' 44.5"	88 51' 43.2"	9/30/2003	8:48			2.0	23.04	7.51	9.59	79.2	6.83
OFB10	Old Fort Bayou	South of bridge	30 25' 08.5"	88 49' 56.5"	9/30/2003	10:09	0.85	3.71	0.5	23.38	7.21	5.71	66.4	5.61
OFB10	Old Fort Bayou	South of bridge	30 25' 08.5"	88 49' 56.5"	9/30/2003	10:09			1.0	23.38	7.10	5.72	63.2	5.39
OFB10	Old Fort Bayou	South of bridge	30 25' 08.5"	88 49' 56.5"	9/30/2003	10:09			1.5	23.37	7.04	5.72	60.9	5.16
OFB10	Old Fort Bayou	South of bridge	30 25' 08.5"	88 49' 56.5"	9/30/2003	10:09			2.0	23.39	6.99	5.99	58.3	5.05
OFB10	Old Fort Bayou	South of bridge	30 25' 08.5"	88 49' 56.5"	9/30/2003	10:09			3.0	23.88	6.97	7.22	62.8	5.33
OFB10	Old Fort Bayou	South of bridge	30 25' 08.5"	88 49' 56.5"	9/30/2003	10:09			3.5	23.65	7.02	7.56	64.1	5.47
CBT11	Confluence of Tchoutacabouffa and Biloxi River		30 25' 56.9"	88 59' 25.5"	10/2/2003	12:00	1.10	5.22	0.5	22.10	7.18	2.34	75.5	6.63
CBT11	Confluence of Tchoutacabouffa and Biloxi River		30 25' 56.9"	88 59' 25.5"	10/2/2003	12:00			1.0	22.07	6.98	2.35	75.0	6.59
CBT11	Confluence of Tchoutacabouffa and Biloxi River		30 25' 56.9"	88 59' 25.5"	10/2/2003	12:00			1.5	22.05	6.89	2.36	74.4	6.53
CBT11	Confluence of Tchoutacabouffa and Biloxi River		30 25' 56.9"	88 59' 25.5"	10/2/2003	12:00			2.0	22.04	6.77	2.39	74.3	6.53
CBT11	Confluence of Tchoutacabouffa and Biloxi River		30 25' 56.9"	88 59' 25.5"	10/2/2003	12:00			3.0	21.94	6.70	2.65	74.1	6.51
CBT11	Confluence of Tchoutacabouffa and Biloxi River		30 25' 56.9"	88 59' 25.5"	10/2/2003	12:00			4.0	22.03	6.65	3.28	70.0	6.29
CBT11	Confluence of Tchoutacabouffa and Biloxi River		30 25' 56.9"	88 59' 25.5"	10/2/2003	12:00			5.0	22.22	6.64	3.76	72.2	6.33
TCR12	Tchoutacabouffa R.	l.5mi up river from mouth	30 27' 10.4"	88 57' 55.7"	10/2/2003	11:09	0.95	3.88	0.5	23.19	7.27	0.81	65.5	5.63
TCR12	Tchoutacabouffa R.	l.5mi up river from mouth	30 27' 10.4"	88 57' 55.7"	10/2/2003	11:09			1.0	23.16	6.91	0.89	63.9	5.50
TCR12	Tchoutacabouffa R.	l.5mi up river from mouth	30 27' 10.4"	88 57' 55.7"	10/2/2003	11:09			1.5	23.15	6.77	0.97	62.0	5.33
TCR12	Tchoutacabouffa R.	l.5mi up river from mouth	30 27' 10.4"	88 57' 55.7"	10/2/2003	11:09			2.0	23.13	6.68	0.97	61.7	5.31
TCR12	Tchoutacabouffa R.	l.5mi up river from mouth	30 27' 10.4"	88 57' 55.7"	10/2/2003	11:09			3.0	23.10	6.57	1.08	61.5	5.30
TCR12	Tchoutacabouffa R.	l.5mi up river from mouth	30 27' 10.4"	88 57' 55.7"	10/2/2003	11:09			3.5	23.12	6.49	1.13	61.6	5.30
BIR13	Biloxi River	1.2mi up river from mouth	30 26' 47.0"	89 00' 26.7"	10/2/2003	10:18	0.60	2.73	0.5	21.96	7.23	0.46	69.5	6.12
BIR13	Biloxi River	1.2mi up river from mouth	30 26' 47.0"	89 00' 26.7"	10/2/2003	10:18			1.0	22.01	6.96	0.53	67.6	5.94
BIR13	Biloxi River	1.2mi up river from mouth	30 26' 47.0"	89 00' 26.7"	10/2/2003	10:18			1.5	22.03	6.72	0.60	66.0	5.79
BIR13	Biloxi River	1.2mi up river from mouth	30 26' 47.0"	89 00' 26.7"	10/2/2003	10:18			2.0	22.17	6.59	0.78	64.3	5.68
BIR13	Biloxi River	1.2mi up river from mouth	30 26' 47.0"	89 00' 26.7"	10/2/2003	10:18			2.2	22.25	6.52	0.87	63.7	5.53
BBI14	Bayou Bernard	Industrial Seaway mouth	30 24' 57.3"	89 00' 13.6"	10/2/2003	8:58	0.95	3.66	0.5	23.01	7.16	2.49	86.0	7.40
BBI14	Bayou Bernard	Industrial Seaway mouth	30 24' 57.3"	89 00' 13.6"	10/2/2003	8:58			1.0	23.08	7.15	2.51	85.1	7.25
BBI14	Bayou Bernard	Industrial Seaway mouth	30 24' 57.3"	89 00' 13.6"	10/2/2003	8:58			1.5	23.02	7.12	2.48	84.5	7.30
BBI14	Bayou Bernard	Industrial Seaway mouth	30 24' 57.3"	89 00' 13.6"	10/2/2003	8:58			2.0	23.08	7.09	2.49	84.6	7.25
BBI14	Bayou Bernard	Industrial Seaway mouth	30 24' 57.3"	89 00' 13.6"	10/2/2003	8:58			3.0	23.07	7.07	2.47	84.4	7.23
BBI14	Bayou Bernard	Industrial Seaway mouth	30 24' 57.3"	89 00' 13.6"	10/2/2003	8:58			3.2	23.03	7.04	2.46	82.4	7.15
DEI15	Deer Island	Marker 2	30 21' 35.8"	88 54' 09.2"	10/4/2003	9:00	1.50	3.52	0.5	21.07	7.84	21.71	94.0	8.34
DEI15	Deer Island	Marker 2	30 21' 35.8"	88 54' 09.2"	10/4/2003	9:00			1.0	20.97	8.00	21.76	93.9	8.39
DEI15	Deer Island	Marker 2	30 21' 35.8"	88 54' 09.2"	10/4/2003	9:00			1.5	20.95	8.02	21.73	90.7	8.11
DEI15	Deer Island	Marker 2	30 21' 35.8"	88 54' 09.2"	10/4/2003	9:00			2.0	20.91	8.01	21.98	86.6	7.71
DEI15	Deer Island	Marker 2	30 21' 35.8"	88 54' 09.2"	10/4/2003	9:00			3.0	20.85	7.98	22.54	77.9	6.98
WOR16	Wolf River	.25mi up river from mouth	30 21' 27.5"	89 16' 36.4"	10/6/2003	13:24	2.10	4.21	0.5	24.08	7.71	7.14	90.2	7.59

WOR16	Wolf River	.25mi up river from mouth	30 21' 27.5"	89 16' 36.4"	10/6/2003	13:24			1.0	23.89	7.41	8.20	88.1	7.45
WOR16	Wolf River	.25mi up river from mouth	30 21' 27.5"	89 16' 36.4"	10/6/2003	13:24			1.5	23.84	7.39	8.84	88.0	7.45
WOR16	Wolf River	.25mi up river from mouth	30 21' 27.5"	89 16' 36.4"	10/6/2003	13:24			2.0	23.99	7.44	9.90	86.2	7.28
WOR16	Wolf River	.25mi up river from mouth	30 21' 27.5"	89 16' 36.4"	10/6/2003	13:24			3.0	23.99	7.41	10.54	82.4	6.96
WOR16	Wolf River	.25mi up river from mouth	30 21' 27.5"	89 16' 36.4"	10/6/2003	13:24			4.0	23.92	7.43	10.94	79.7	6.74
CST17	Center of St. Louis	Marker 1	30 19' 52.4"	89 18' 18.0"	10/6/2003	12:48	1.75	2.42	0.5	23.56	7.82	12.28	95.2	8.08
CST17	Center of St. Louis	Marker 1	30 19' 52.4"	89 18' 18.0"	10/6/2003	12:48			1.0	22.83	7.82	13.28	94.8	8.18
CST17	Center of St. Louis	Marker 1	30 19' 52.4"	89 18' 18.0"	10/6/2003	12:48			1.5	22.63	7.83	13.72	96.0	8.34
CST17	Center of St. Louis	Marker 1	30 19' 52.4"	89 18' 18.0"	10/6/2003	12:48			2.0	22.62	7.86	13.77	95.0	8.22
GTR18	Gene Taylor Reef	Marker 4	30 16' 24.9"	89 18' 58.2"	10/6/2003	12:06	1.95	2.59	0.5	23.02	7.80	14.66	91.7	7.80
GTR18	Gene Taylor Reef	Marker 4	30 16' 24.9"	89 18' 58.2"	10/6/2003	12:06			1.0	22.52	7.79	14.65	90.6	7.85
GTR18	Gene Taylor Reef	Marker 4	30 16' 24.9"	89 18' 58.2"	10/6/2003	12:06			1.5	22.45	7.80	14.70	88.1	7.64
GTR18	Gene Taylor Reef	Marker 4	30 16' 24.9"	89 18' 58.2"	10/6/2003	12:06			2.0	22.44	7.81	14.67	88.1	7.51
BAC19	Bayou Caddy	.2mi up bayou from mouth	30 14' 16.5"	89 25' 41.1"	10/6/2003	11:00	1.40	3.38	0.5	23.62	7.38	13.47	89.5	7.56
BAC19	Bayou Caddy	.2mi up bayou from mouth	30 14' 16.5"	89 25' 41.1"	10/6/2003	11:00			1.0	23.62	7.37	13.50	87.7	7.47
BAC19	Bayou Caddy	.2mi up bayou from mouth	30 14' 16.5"	89 25' 41.1"	10/6/2003	11:00			1.5	23.61	7.35	13.48	86.5	7.35
BAC19	Bayou Caddy	.2mi up bayou from mouth	30 14' 16.5"	89 25' 41.1"	10/6/2003	11:00			2.0	23.61	7.36	13.47	86.4	7.35
BAC19	Bayou Caddy	.2mi up bayou from mouth	30 14' 16.5"	89 25' 41.1"	10/6/2003	11:00			3.0	23.60	7.36	13.51	85.7	7.29
PER20	Pearl River	North of 90 bridge	30 14' 24.7"	89 36' 52.1"	10/6/2003	9:40	0.95	6.90	0.5	23.19	7.72	2.20	69.5	5.86
PER20	Pearl River	North of 90 bridge	30 14' 24.7"	89 36' 52.1"	10/6/2003	9:40			1.0	23.22	7.45	2.29	66.1	5.66
PER20	Pearl River	North of 90 bridge	30 14' 24.7"	89 36' 52.1"	10/6/2003	9:40			1.5	23.32	7.27	2.71	63.5	5.42
PER20	Pearl River	North of 90 bridge	30 14' 24.7"	89 36' 52.1"	10/6/2003	9:40			2.0	23.39	7.16	3.06	61.2	5.24
PER20	Pearl River	North of 90 bridge	30 14' 24.7"	89 36' 52.1"	10/6/2003	9:40			3.0	23.28	7.03	3.89	54.6	4.73
PER20	Pearl River	North of 90 bridge	30 14' 24.7"	89 36' 52.1"	10/6/2003	9:40			4.0	23.14	6.97	4.45	52.5	4.48
PER20	Pearl River	North of 90 bridge	30 14' 24.7"	89 36' 52.1"	10/6/2003	9:40			5.0	23.08	6.95	4.61	52.1	4.48
PER20	Pearl River	North of 90 bridge	30 14' 24.7"	89 36' 52.1"	10/6/2003	9:40			6.0	23.03	6.94	4.73	50.1	4.31
PER20	Pearl River	North of 90 bridge	30 14' 24.7"	89 36' 52.1"	10/6/2003	9:40			6.5	23.00	6.91	4.77	48.3	4.16
PAB21	Pascagoula Beach	Next to pier	30 20' 33.6"	88 32' 07.2"	10/7/2003	11:08	0.90	1.00	0.5	25.18	8.01	24.39	91.1	7.54
BLF22	Bellefountaine Beach	West of water tower	30 20' 31.2"	88 42' 45.6"	10/7/2003	13:00	0.70	1.00	0.5	26.63	7.86	18.64	96.3	7.70
DAB23	Davis Bayou	Beach at Holcomb Street	30 23' 37.8"	88 48' 37.2"	10/7/2003	13:50	0.75	1.00	0.5	26.12	7.72	17.24	89.7	7.26
PRA24	Pratt Avenue Beach	Across from Holiday Inn	30 22' 12.0"	89 04' 47.0"	10/9/2003	9:40	0.55	1.00	0.5	24.48	7.74	20.42	76.5	6.37
HEP25	Henderson Point	Beach at Henderson Point	30 18' 12.6"	89 16' 54.2"	10/9/2003	10:21	0.60	1.00	0.5	23.59	7.68	15.34	80.8	6.75
SCS26	St. Charles Street	Bay St. Louis Beach	30 18' 00.0"	89 20' 02.2"	10/9/2003	10:51	0.70	1.00	0.5	24.04	7.68	13.03	88.3	7.37
WAV27	Waveland Beach	St. Claire Church beach	30 16' 37.1"	89 22' 25.2"	10/9/2003	11:25	0.55	1.00	0.5	24.43	7.57	14.06	75.4	6.31
ROA28	Rodenberg Ave.	Rodenberg Ave. beach	30 23' 32.6"	88 56' 17.5"	10/9/2003	8:53	0.50	1.00	0.5	23.46	7.72	21.97	67.8	5.76

					Date	Time	Secchi Disk	Total Depth	Hydrographic profiling					
									Depth	Temp	pH	Salinity	DO	DO
Site #	Name	Description	Latitude	Longitude	Collected	Collected	(m)	(m)	(m)	(C)	(units)	(ppt)	(%)	(mg/L)
PAC01	Point Aux Chenes Bay	Middle of bay	30 20' 48.6"	88 26' 02.8"	12/4/2003	10:02	1.75	1.75	0.5	14.23	7.92	16.31	100.4	10.37
PAC01	Point Aux Chenes Bay	Middle of bay	30 20' 48.6"	88 26' 02.8"	12/4/2003	10:02			1.0	14.02	7.88	21.18	94.3	9.81
PAC01	Point Aux Chenes Bay	Middle of bay	30 20' 48.6"	88 26' 02.8"	12/4/2003	10:02			1.5	14.07	7.84	24.99	90.8	9.41
BAL02	Bangs Lake	Middle of lake	30 21' 18.0"	88 28' 01.9"	12/4/2003	10:40	> 1.00	1.00	0.5	14.38	7.82	24.84	91.5	9.27
BCA03	Bayou Casotte	North of launch	30 21' 20.5"	88 30' 23.3"	12/2/2003	10:00	1.25	4.53	0.5	17.22	7.54	29.82	79.5	7.67
BCA03	Bayou Casotte	North of launch	30 21' 20.5"	88 30' 23.3"	12/2/2003	10:00			1.0	17.28	7.59	29.91	78.7	7.62
BCA03	Bayou Casotte	North of launch	30 21' 20.5"	88 30' 23.3"	12/2/2003	10:00			1.5	17.29	7.63	29.87	80.0	7.74
BCA03	Bayou Casotte	North of launch	30 21' 20.5"	88 30' 23.3"	12/2/2003	10:00			2.0	17.35	7.66	29.82	78.8	7.56
BCA03	Bayou Casotte	North of launch	30 21' 20.5"	88 30' 23.3"	12/2/2003	10:00			3.0	17.31	7.69	29.85	78.7	7.50
BCA03	Bayou Casotte	North of launch	30 21' 20.5"	88 30' 23.3"	12/2/2003	10:00			4.0	17.31	7.71	29.93	78.2	7.54
BCH04	Bayou Chicot	North of launch	30 20' 33.7"	88 31' 13.1"	11/11/2003	9:55	0.85	1.70	0.5	21.27	7.72	28.53	77.4	6.88
BCH04	Bayou Chicot	North of launch	30 20' 33.7"	88 31' 13.1"	11/11/2003	9:55			1.0	21.24	7.75	29.08	75.1	6.74
BCH04	Bayou Chicot	North of launch	30 20' 33.7"	88 31' 13.1"	11/11/2003	9:55			1.5	21.32	7.76	28.96	75.0	6.67
PAR05	Pascagoula River	South of 90 bridge	30 22' 14.1"	88 33' 45.2"	11/11/2003	11:09	2.50	6.22	0.5	21.94	7.90	20.89	84.9	7.50
PAR05	Pascagoula River	South of 90 bridge	30 22' 14.1"	88 33' 45.2"	11/11/2003	11:09			1.0	21.91	7.91	24.60	87.3	7.69
PAR05	Pascagoula River	South of 90 bridge	30 22' 14.1"	88 33' 45.2"	11/11/2003	11:09			1.5	21.97	7.98	27.56	89.4	7.86
PAR05	Pascagoula River	South of 90 bridge	30 22' 14.1"	88 33' 45.2"	11/11/2003	11:09			2.0	21.95	8.00	27.79	90.4	7.99
PAR05	Pascagoula River	South of 90 bridge	30 22' 14.1"	88 33' 45.2"	11/11/2003	11:09			3.0	21.99	8.01	28.49	90.4	7.97
PAR05	Pascagoula River	South of 90 bridge	30 22' 14.1"	88 33' 45.2"	11/11/2003	11:09			4.0	22.03	8.01	28.66	89.6	7.90
PAR05	Pascagoula River	South of 90 bridge	30 22' 14.1"	88 33' 45.2"	11/11/2003	11:09			5.0	22.06	8.03	28.65	88.7	7.82
PAR05	Pascagoula River	South of 90 bridge	30 22' 14.1"	88 33' 45.2"	11/11/2003	11:09			6.0	22.07	8.01	28.72	86.3	7.60
ROI06	Round Island	Marker 3	30 18' 36.9"	88 32' 41.1"	11/11/2003	9:02	1.95	1.95	0.5	21.42	8.05	28.32	98.3	8.77
ROI06	Round Island	Marker 3	30 18' 36.9"	88 32' 41.1"	11/11/2003	9:02			1.0	21.42	8.08	28.28	97.1	8.68
ROI06	Round Island	Marker 3	30 18' 36.9"	88 32' 41.1"	11/11/2003	9:02			1.5	21.43	8.08	28.16	96.5	8.61
GRB07	Graveline Bayou	Mouth of bayou	30 21' 45.9"	88 39' 59.1"	12/2/2003	12:20	1.10	2.56	0.5	15.56	8.17	17.64	108.0	10.84
GRB07	Graveline Bayou	Mouth of bayou	30 21' 45.9"	88 39' 59.1"	12/2/2003	12:20			1.0	15.51	8.19	23.24	110.2	11.06
GRB07	Graveline Bayou	Mouth of bayou	30 21' 45.9"	88 39' 59.1"	12/2/2003	12:20			1.5	15.36	8.22	23.91	108.1	10.88
GRB07	Graveline Bayou	Mouth of bayou	30 21' 45.9"	88 39' 59.1"	12/2/2003	12:20			2.0	15.26	8.22	24.17	107.3	10.84
POF08	Popps Ferry	Mouth of Big Lake	30 24' 57.3"	88 58' 40.6"	11/10/2003	10:21	1.20	7.07	0.5	22.30	7.37	9.72	87.4	7.70
POF08	Popps Ferry	Mouth of Big Lake	30 24' 57.3"	88 58' 40.6"	11/10/2003	10:21			1.0	21.84	7.25	10.12	78.5	6.97
POF08	Popps Ferry	Mouth of Big Lake	30 24' 57.3"	88 58' 40.6"	11/10/2003	10:21			1.5	21.89	7.15	10.18	80.0	7.11
POF08	Popps Ferry	Mouth of Big Lake	30 24' 57.3"	88 58' 40.6"	11/10/2003	10:21			2.0	21.90	7.10	10.16	81.6	7.25
POF08	Popps Ferry	Mouth of Big Lake	30 24' 57.3"	88 58' 40.6"	11/10/2003	10:21			3.0	21.86	7.08	10.42	76.6	6.76
POF08	Popps Ferry	Mouth of Big Lake	30 24' 57.3"	88 58' 40.6"	11/10/2003	10:21			4.0	21.87	7.05	10.41	75.0	6.64
POF08	Popps Ferry	Mouth of Big Lake	30 24' 57.3"	88 58' 40.6"	11/10/2003	10:21			5.0	21.91	7.01	10.49	72.5	6.45
POF08	Popps Ferry	Mouth of Big Lake	30 24' 57.3"	88 58' 40.6"	11/10/2003	10:21			6.0	21.99	7.00	10.69	71.3	6.32
POF08	Popps Ferry	Mouth of Big Lake	30 24' 57.3"	88 58' 40.6"	11/10/2003	10:21			6.5	21.99	6.96	10.74	70.7	6.28
CLP09	Clay Point	North of Biloxi Bay Bridge	30 24' 44.5"	88 51' 43.2"	11/21/2003	11:00	1.15	1.89	0.5	18.21	7.85	17.16	99.4	9.40

CLP09	Clay Point	North of Biloxi Bay Bridge	30 24' 44.5"	88 51' 43.2"	11/21/2003	11:00			1.0	17.95	7.78	20.08	92.8	8.86
CLP09	Clay Point	North of Biloxi Bay Bridge	30 24' 44.5"	88 51' 43.2"	11/21/2003	11:00			1.5	17.95	7.80	20.45	88.1	8.41
OFB10	Old Fort Bayou	South of bridge	30 25' 08.5"	88 49' 56.5"	11/21/2003	10:05	1.00	3.89	0.5	17.39	7.77	14.39	86.5	8.35
OFB10	Old Fort Bayou	South of bridge	30 25' 08.5"	88 49' 56.5"	11/21/2003	10:05			1.0	17.29	7.68	14.67	87.1	8.43
OFB10	Old Fort Bayou	South of bridge	30 25' 08.5"	88 49' 56.5"	11/21/2003	10:05			1.5	17.28	7.61	15.06	86.2	8.35
OFB10	Old Fort Bayou	South of bridge	30 25' 08.5"	88 49' 56.5"	11/21/2003	10:05			2.0	17.55	7.57	15.74	88.7	8.54
OFB10	Old Fort Bayou	South of bridge	30 25' 08.5"	88 49' 56.5"	11/21/2003	10:05			3.0	17.89	7.57	16.53	85.5	8.18
OFB10	Old Fort Bayou	South of bridge	30 25' 08.5"	88 49' 56.5"	11/21/2003	10:05			3.5	17.96	7.57	16.60	86.3	8.22
CBT11	Confluence of Tchoutacabouffa and Biloxi River		30 25' 56.9"	88 59' 25.5"	11/10/2003	12:23	1.45	5.26	0.5	22.95	7.11	9.28	95.1	8.27
CBT11	Confluence of Tchoutacabouffa and Biloxi River		30 25' 56.9"	88 59' 25.5"	11/10/2003	12:23			1.0	22.86	7.08	9.37	91.6	7.99
CBT11	Confluence of Tchoutacabouffa and Biloxi River		30 25' 56.9"	88 59' 25.5"	11/10/2003	12:23			1.5	22.70	7.04	9.47	89.7	7.82
CBT11	Confluence of Tchoutacabouffa and Biloxi River		30 25' 56.9"	88 59' 25.5"	11/10/2003	12:23			2.0	22.56	7.02	9.53	87.9	7.71
CBT11	Confluence of Tchoutacabouffa and Biloxi River		30 25' 56.9"	88 59' 25.5"	11/10/2003	12:23			3.0	22.47	6.99	9.64	85.4	7.50
CBT11	Confluence of Tchoutacabouffa and Biloxi River		30 25' 56.9"	88 59' 25.5"	11/10/2003	12:23			4.0	22.20	6.96	9.88	78.3	6.90
CBT11	Confluence of Tchoutacabouffa and Biloxi River		30 25' 56.9"	88 59' 25.5"	11/10/2003	12:23			5.0	22.17	6.91	9.89	76.9	6.77
TCR12	Tchoutacabouffa R.	l.5mi up river from mouth	30 27' 10.4"	88 57' 55.7"	11/10/2003	11:02	1.30	3.46	0.5	22.66	7.22	6.75	83.2	7.28
TCR12	Tchoutacabouffa R.	l.5mi up river from mouth	30 27' 10.4"	88 57' 55.7"	11/10/2003	11:02			1.0	22.61	7.08	6.83	79.9	6.99
TCR12	Tchoutacabouffa R.	l.5mi up river from mouth	30 27' 10.4"	88 57' 55.7"	11/10/2003	11:02			1.5	22.41	7.00	7.10	74.3	6.47
TCR12	Tchoutacabouffa R.	l.5mi up river from mouth	30 27' 10.4"	88 57' 55.7"	11/10/2003	11:02			2.0	22.21	6.93	7.35	65.0	5.70
TCR12	Tchoutacabouffa R.	l.5mi up river from mouth	30 27' 10.4"	88 57' 55.7"	11/10/2003	11:02			3.0	22.19	6.86	7.68	58.8	5.19
BIR13	Biloxi River	1.2mi up river from mouth	30 26' 47.0"	89 00' 26.7"	11/10/2003	11:45	1.05	5.99	0.5	21.89	7.84	4.24	89.4	7.94
BIR13	Biloxi River	1.2mi up river from mouth	30 26' 47.0"	89 00' 26.7"	11/10/2003	11:45			1.0	21.83	7.52	4.85	77.8	6.92
BIR13	Biloxi River	1.2mi up river from mouth	30 26' 47.0"	89 00' 26.7"	11/10/2003	11:45			1.5	22.22	7.29	5.90	60.1	5.28
BIR13	Biloxi River	1.2mi up river from mouth	30 26' 47.0"	89 00' 26.7"	11/10/2003	11:45			2.0	22.75	7.07	7.91	47.3	4.09
BIR13	Biloxi River	1.2mi up river from mouth	30 26' 47.0"	89 00' 26.7"	11/10/2003	11:45			3.0	22.85	6.99	9.08	49.9	4.40
BIR13	Biloxi River	1.2mi up river from mouth	30 26' 47.0"	89 00' 26.7"	11/10/2003	11:45			4.0	23.05	6.90	9.76	43.1	3.65
BIR13	Biloxi River	1.2mi up river from mouth	30 26' 47.0"	89 00' 26.7"	11/10/2003	11:45			5.0	23.09	6.83	9.79	36.1	3.15
BIR13	Biloxi River	1.2mi up river from mouth	30 26' 47.0"	89 00' 26.7"	11/10/2003	11:45			5.5	23.14	6.76	9.85	32.4	2.80
BBI14	Bayou Bernard	Industrial Seaway mouth	30 24' 57.3"	89 00' 13.6"	11/10/2003	9:15	0.90	3.16	0.5	24.54	7.27	8.46	78.9	6.62
BBI14	Bayou Bernard	Industrial Seaway mouth	30 24' 57.3"	89 00' 13.6"	11/10/2003	9:15			1.0	23.95	7.22	8.54	78.5	6.69
BBI14	Bayou Bernard	Industrial Seaway mouth	30 24' 57.3"	89 00' 13.6"	11/10/2003	9:15			1.5	23.65	7.20	8.60	81.0	6.95
BBI14	Bayou Bernard	Industrial Seaway mouth	30 24' 57.3"	89 00' 13.6"	11/10/2003	9:15			2.0	23.21	7.15	8.76	75.6	6.55
BBI14	Bayou Bernard	Industrial Seaway mouth	30 24' 57.3"	89 00' 13.6"	11/10/2003	9:15			3.0	23.49	6.95	10.23	44.5	3.52
DEI15	Deer Island	Marker 2	30 21' 35.8"	88 54' 09.2"	11/21/2003	8:48	1.85	3.07	0.5	17.76	7.88	25.31	94.9	9.09
DEI15	Deer Island	Marker 2	30 21' 35.8"	88 54' 09.2"	11/21/2003	8:48			1.0	17.75	7.98	25.33	93.5	8.93
DEI15	Deer Island	Marker 2	30 21' 35.8"	88 54' 09.2"	11/21/2003	8:48			1.5	17.75	7.97	25.28	92.1	8.84
DEI15	Deer Island	Marker 2	30 21' 35.8"	88 54' 09.2"	11/21/2003	8:48			2.0	17.83	7.98	25.31	91.5	8.73
DEI15	Deer Island	Marker 2	30 21' 35.8"	88 54' 09.2"	11/21/2003	8:48			2.5	17.83	7.99	25.42	90.7	8.65
WOR16	Wolf River	.25mi up river from mouth	30 21' 27.5"	89 16' 36.4"	11/25/2003	9:40	1.50	3.38	0.5	14.84	7.44	6.22	86.7	8.88
WOR16	Wolf River	.25mi up river from mouth	30 21' 27.5"	89 16' 36.4"	11/25/2003	9:40			1.0	14.54	7.28	8.05	83.6	8.53
WOR16	Wolf River	.25mi up river from mouth	30 21' 27.5"	89 16' 36.4"	11/25/2003	9:40			1.5	13.95	7.24	10.40	79.4	8.26
WOR16	Wolf River	.25mi up river from mouth	30 21' 27.5"	89 16' 36.4"	11/25/2003	9:40			2.0	14.11	7.26	10.71	79.7	8.28
WOR16	Wolf River	.25mi up river from mouth	30 21' 27.5"	89 16' 36.4"	11/25/2003	9:40			3.0	14.35	7.29	11.22	79.0	8.11

CST17	Center of St. Louis	Marker 1	30 19' 52.4"	89 18' 18.0"	11/25/2003	10:32	> 1.85	1.87	0.5	14.34	7.80	16.05	92.9	9.46
CST17	Center of St. Louis	Marker 1	30 19' 52.4"	89 18' 18.0"	11/25/2003	10:32			1.0	14.39	7.87	16.14	90.3	9.29
CST17	Center of St. Louis	Marker 1	30 19' 52.4"	89 18' 18.0"	11/25/2003	10:32			1.5	14.53	7.91	16.49	89.9	9.22
GTR18	Gene Taylor Reef	Marker 4	30 16' 24.9"	89 18' 58.2"	11/25/2003	11:11	1.95	2.05	0.5	15.26	8.05	18.55	94.7	9.57
GTR18	Gene Taylor Reef	Marker 4	30 16' 24.9"	89 18' 58.2"	11/25/2003	11:11			1.0	15.26	8.03	18.49	92.9	9.39
GTR18	Gene Taylor Reef	Marker 4	30 16' 24.9"	89 18' 58.2"	11/25/2003	11:11			1.5	15.27	8.07	18.57	92.4	9.31
BAC19	Bayou Caddy	.2mi up bayou from mouth	30 14' 16.5"	89 25' 41.1"	11/24/2003	11:35	0.75	2.50	0.5	16.08	7.31	15.13	62.5	6.18
BAC19	Bayou Caddy	.2mi up bayou from mouth	30 14' 16.5"	89 25' 41.1"	11/24/2003	11:35			1.0	16.08	7.25	15.13	61.3	6.09
BAC19	Bayou Caddy	.2mi up bayou from mouth	30 14' 16.5"	89 25' 41.1"	11/24/2003	11:35			1.5	16.07	7.20	15.13	58.8	5.82
BAC19	Bayou Caddy	.2mi up bayou from mouth	30 14' 16.5"	89 25' 41.1"	11/24/2003	11:35			2.0	16.09	7.21	15.13	58.5	5.80
PER20	Pearl River	North of 90 bridge	30 14' 24.7"	89 36' 52.1"	11/24/2003	10:08	1.10	8.45	0.5	19.18	7.42	4.13	71.5	6.61
PER20	Pearl River	North of 90 bridge	30 14' 24.7"	89 36' 52.1"	11/24/2003	10:08			1.0	19.16	7.37	4.13	69.8	6.46
PER20	Pearl River	North of 90 bridge	30 14' 24.7"	89 36' 52.1"	11/24/2003	10:08			1.5	19.17	7.33	4.13	70.4	6.59
PER20	Pearl River	North of 90 bridge	30 14' 24.7"	89 36' 52.1"	11/24/2003	10:08			2.0	19.17	7.28	4.13	69.8	6.55
PER20	Pearl River	North of 90 bridge	30 14' 24.7"	89 36' 52.1"	11/24/2003	10:08			3.0	19.17	7.24	4.13	69.7	6.44
PER20	Pearl River	North of 90 bridge	30 14' 24.7"	89 36' 52.1"	11/24/2003	10:08			4.0	19.17	7.20	4.13	68.8	6.41
PER20	Pearl River	North of 90 bridge	30 14' 24.7"	89 36' 52.1"	11/24/2003	10:08			5.0	19.18	7.18	4.13	67.3	6.22
PER20	Pearl River	North of 90 bridge	30 14' 24.7"	89 36' 52.1"	11/24/2003	10:08			6.0	19.17	7.16	4.13	68.1	6.33
PER20	Pearl River	North of 90 bridge	30 14' 24.7"	89 36' 52.1"	11/24/2003	10:08			7.0	19.17	7.15	4.13	67.8	6.31
PER20	Pearl River	North of 90 bridge	30 14' 24.7"	89 36' 52.1"	11/24/2003	10:08			8.0	19.17	7.13	4.14	67.0	6.22
PAB21	Pascagoula Beach	Next to pier	30 20' 33.6"	88 32' 07.2"	11/11/2003	10:30	> 1.00	1.00	0.5	21.52	8.06	28.02	101.0	8.98
BLF22	Bellefountaine Beach	West of water tower	30 20' 31.2"	88 42' 45.6"	11/14/2003	12:50	0.35	1.00	0.5	19.36	8.30	27.12	115.6	10.79
DAB23	Davis Bayou	Beach at Holcomb Street	30 23' 37.8"	88 48' 37.2"	11/14/2003	8:21	> 1.00	1.00	0.5	17.51	7.53	21.45	79.0	7.63
PRA24	Pratt Avenue Beach	Across from Holiday Inn	30 22' 12.0"	89 04' 47.0"	11/14/2003	9:44	0.55	1.00	0.5	17.00	8.26	23.52	89.6	8.75
HEP25	Henderson Point	Beach at Henderson Point	30 18' 12.6"	89 16' 54.2"	11/14/2003	10:24	0.60	1.00	0.5	17.95	8.10	19.20	88.6	8.45
SCS26	St. Charles Street	Bay St. Louis Beach	30 18' 00.0"	89 20' 02.2"	11/14/2003	10:52	> 1.00	1.00	0.5	17.64	8.10	16.28	97.5	9.42
WAV27	Waveland Beach	St. Claire Church beach	30 16' 37.1"	89 22' 25.2"	11/14/2003	11:16	0.75	1.00	0.5	19.14	8.12	17.30	97.9	9.18
ROA28	Rodenberg Ave.	Rodenberg Ave. beach	30 23' 32.6"	88 56' 17.5"	11/14/2003	9:06	> 1.00	1.00	0.5	16.16	8.03	24.84	92.1	9.15

									Hydrographic profiling					
Site #	Name	Description	Latitude	Longitude	Date Collected	Time Collected	Secchi Disk (m)	Total Depth (m)	Depth (m)	Temp (C)	pH (units)	Salinity (ppt)	DO (%)	DO (mg/L)
PAC01	Point Aux Chenes Bay	Middle of bay	30 20' 48.6"	88 26' 02.8"	2/26/2004	9:38	0.75	1.68	0.5	13.63	7.56	12.74	91.6	9.53
PAC01	Point Aux Chenes Bay	Middle of bay	30 20' 48.6"	88 26' 02.8"	2/26/2004	9:38	0.75	1.68	1.0	13.64	7.60	12.73	90.1	9.37
PAC01	Point Aux Chenes Bay	Middle of bay	30 20' 48.6"	88 26' 02.8"	2/26/2004	9:38	0.75	1.68	1.2	13.66	7.65	12.79	88.4	9.21
BAL02	Bangs Lake	Middle of lake	30 21' 18.0"	88 28' 01.9"	2/26/2004	10:11	> 0.75	0.75	0.5	13.57	7.70	11.82	84.6	8.75
BCA03	Bayou Casotte	North of launch	30 21' 20.5"	88 30' 23.3"	2/26/2004	11:26	0.70	3.03	0.5	14.52	7.71	18.09	81.1	8.09
BCA03	Bayou Casotte	North of launch	30 21' 20.5"	88 30' 23.3"	2/26/2004	11:26	0.70	3.03	1.0	14.55	7.77	18.78	77.4	7.82
BCA03	Bayou Casotte	North of launch	30 21' 20.5"	88 30' 23.3"	2/26/2004	11:26	0.70	3.03	1.5	14.56	7.80	19.29	76.7	7.81
BCA03	Bayou Casotte	North of launch	30 21' 20.5"	88 30' 23.3"	2/26/2004	11:26	0.70	3.03	2.0	14.57	7.83	19.40	75.7	7.71
BCA03	Bayou Casotte	North of launch	30 21' 20.5"	88 30' 23.3"	2/26/2004	11:26	0.70	3.03	2.5	14.58	7.87	19.71	74.2	7.51
BCH04	Bayou Chicot	North of launch	30 20' 33.7"	88 31' 13.1"	2/16/2004	11:37	0.80	1.35	0.5	10.37	7.82	21.09	85.5	9.59
BCH04	Bayou Chicot	North of launch	30 20' 33.7"	88 31' 13.1"	2/16/2004	11:37	0.80	1.35	1.0	10.95	7.84	21.67	73.4	8.23
PAR05	Pascagoula River	South of 90 bridge	30 22' 14.1"	88 33' 45.2"	2/16/2004	9:35	0.20	8.16	0.5	9.80	8.04	0.11	79.0	9.08
PAR05	Pascagoula River	South of 90 bridge	30 22' 14.1"	88 33' 45.2"	2/16/2004	9:35	0.20	8.16	1.0	9.80	7.78	0.15	77.4	8.89
PAR05	Pascagoula River	South of 90 bridge	30 22' 14.1"	88 33' 45.2"	2/16/2004	9:35	0.20	8.16	1.5	9.81	7.67	0.15	77.1	8.86
PAR05	Pascagoula River	South of 90 bridge	30 22' 14.1"	88 33' 45.2"	2/16/2004	9:35	0.20	8.16	2.0	9.81	7.56	0.10	77.0	8.85
PAR05	Pascagoula River	South of 90 bridge	30 22' 14.1"	88 33' 45.2"	2/16/2004	9:35	0.20	8.16	3.0	9.80	7.50	0.14	76.9	8.77
PAR05	Pascagoula River	South of 90 bridge	30 22' 14.1"	88 33' 45.2"	2/16/2004	9:35	0.20	8.16	4.0	9.81	7.34	0.17	76.4	8.78
PAR05	Pascagoula River	South of 90 bridge	30 22' 14.1"	88 33' 45.2"	2/16/2004	9:35	0.20	8.16	5.0	10.25	7.71	0.87	75.8	8.70
PAR05	Pascagoula River	South of 90 bridge	30 22' 14.1"	88 33' 45.2"	2/16/2004	9:35	0.20	8.16	6.0	12.92	6.68	27.73	78.5	8.39
PAR05	Pascagoula River	South of 90 bridge	30 22' 14.1"	88 33' 45.2"	2/16/2004	9:35	0.20	8.16	7.0	12.94	7.23	27.96	79.4	8.47
PAR05	Pascagoula River	South of 90 bridge	30 22' 14.1"	88 33' 45.2"	2/16/2004	9:35	0.20	8.16	7.5	13.02	7.51	28.23	78.4	8.37
ROI06	Round Island	Marker 3	30 18' 36.9"	88 32' 41.1"	2/16/2004	10:30	0.25	1.64	0.5	10.64	7.70	8.35	80.8	9.11
ROI06	Round Island	Marker 3	30 18' 36.9"	88 32' 41.1"	2/16/2004	10:30	0.25	1.64	1.0	10.73	7.62	11.90	80.0	8.97
ROI06	Round Island	Marker 3	30 18' 36.9"	88 32' 41.1"	2/16/2004	10:30	0.25	1.64	1.5	11.14	7.63	17.65	77.8	8.66
GRB07	Graveline Bayou	Mouth of bayou	30 21' 45.9"	88 39' 59.1"	2/26/2004	13:00	0.85	2.84	0.5	13.69	8.01	11.85	82.9	8.53
GRB07	Graveline Bayou	Mouth of bayou	30 21' 45.9"	88 39' 59.1"	2/26/2004	13:00	0.85	2.84	1.0	13.92	7.91	13.38	80.2	8.28
GRB07	Graveline Bayou	Mouth of bayou	30 21' 45.9"	88 39' 59.1"	2/26/2004	13:00	0.85	2.84	1.5	13.98	7.90	13.85	78.3	8.01
GRB07	Graveline Bayou	Mouth of bayou	30 21' 45.9"	88 39' 59.1"	2/26/2004	13:00	0.85	2.84	2.0	13.98	7.89	14.00	76.0	7.83
GRB07	Graveline Bayou	Mouth of bayou	30 21' 45.9"	88 39' 59.1"	2/26/2004	13:00	0.85	2.84	2.5	13.96	7.89	14.37	77.5	7.98
POF08	Popps Ferry	Mouth of Big Lake	30 24' 57.3"	88 58' 40.6"	2/12/2004	12:50	0.70	7.26	0.5	11.97	7.25	0.93	90.2	9.77
POF08	Popps Ferry	Mouth of Big Lake	30 24' 57.3"	88 58' 40.6"	2/12/2004	12:50	0.70	7.26	1.0	11.97	7.20	0.94	86.7	9.33
POF08	Popps Ferry	Mouth of Big Lake	30 24' 57.3"	88 58' 40.6"	2/12/2004	12:50	0.70	7.26	1.5	11.98	7.16	1.00	85.3	9.25
POF08	Popps Ferry	Mouth of Big Lake	30 24' 57.3"	88 58' 40.6"	2/12/2004	12:50	0.70	7.26	2.0	12.03	7.07	1.23	84.7	9.16
POF08	Popps Ferry	Mouth of Big Lake	30 24' 57.3"	88 58' 40.6"	2/12/2004	12:50	0.70	7.26	3.0	12.22	7.01	1.53	81.1	8.72
POF08	Popps Ferry	Mouth of Big Lake	30 24' 57.3"	88 58' 40.6"	2/12/2004	12:50	0.70	7.26	4.0	12.31	6.97	1.99	79.0	8.50
POF08	Popps Ferry	Mouth of Big Lake	30 24' 57.3"	88 58' 40.6"	2/12/2004	12:50	0.70	7.26	5.0	12.34	6.93	2.58	78.6	8.43
POF08	Popps Ferry	Mouth of Big Lake	30 24' 57.3"	88 58' 40.6"	2/12/2004	12:50	0.70	7.26	6.0	12.30	6.92	3.20	77.3	8.32
POF08	Popps Ferry	Mouth of Big Lake	30 24' 57.3"	88 58' 40.6"	2/12/2004	12:50	0.70	7.26	7.0	12.31	6.94	3.41	77.2	8.28

CLP09	Clay Point	North of Biloxi Bay Bridge	30 24' 44.5"	88 51' 43.2"	2/10/2004	11:30	1.60	1.51	0.5	11.87	8.33	9.13	107.3	11.72
CLP09	Clay Point	North of Biloxi Bay Bridge	30 24' 44.5"	88 51' 43.2"	2/10/2004	11:30	1.60	1.51	1.0	11.79	8.26	9.26	102.6	11.22
OFB10	Old Fort Bayou	South of bridge	30 25' 08.5"	88 49' 56.5"	2/10/2004	9:05	1.10	3.80	0.5	12.11	7.45	6.63	90.7	9.86
OFB10	Old Fort Bayou	South of bridge	30 25' 08.5"	88 49' 56.5"	2/10/2004	9:05	1.10	3.80	1.0	12.12	7.43	6.97	91.4	9.93
OFB10	Old Fort Bayou	South of bridge	30 25' 08.5"	88 49' 56.5"	2/10/2004	9:05	1.10	3.80	1.5	12.02	7.42	8.21	95.7	10.38
OFB10	Old Fort Bayou	South of bridge	30 25' 08.5"	88 49' 56.5"	2/10/2004	9:05	1.10	3.80	2.0	11.88	7.49	8.76	99.7	10.88
OFB10	Old Fort Bayou	South of bridge	30 25' 08.5"	88 49' 56.5"	2/10/2004	9:05	1.10	3.80	3.0	12.14	7.62	9.51	104.8	11.41
OFB10	Old Fort Bayou	South of bridge	30 25' 08.5"	88 49' 56.5"	2/10/2004	9:05	1.10	3.80	3.5	12.25	7.76	9.65	105.2	11.41
CBT11	Confluence of Tchoutacabouffa and Biloxi River		30 25' 56.9"	88 59' 25.5"	2/12/2004	11:37	0.45	5.11	0.5	11.69	7.26	0.12	91.8	10.01
CBT11	Confluence of Tchoutacabouffa and Biloxi River		30 25' 56.9"	88 59' 25.5"	2/12/2004	11:37	0.45	5.11	1.0	11.67	7.20	0.13	89.3	9.74
CBT11	Confluence of Tchoutacabouffa and Biloxi River		30 25' 56.9"	88 59' 25.5"	2/12/2004	11:37	0.45	5.11	1.5	11.66	7.12	0.13	86.2	9.36
CBT11	Confluence of Tchoutacabouffa and Biloxi River		30 25' 56.9"	88 59' 25.5"	2/12/2004	11:37	0.45	5.11	2.0	11.66	7.10	0.13	85.3	9.31
CBT11	Confluence of Tchoutacabouffa and Biloxi River		30 25' 56.9"	88 59' 25.5"	2/12/2004	11:37	0.45	5.11	3.0	11.64	7.01	0.21	85.1	9.26
CBT11	Confluence of Tchoutacabouffa and Biloxi River		30 25' 56.9"	88 59' 25.5"	2/12/2004	11:37	0.45	5.11	4.0	11.71	6.93	0.26	83.1	9.02
CBT11	Confluence of Tchoutacabouffa and Biloxi River		30 25' 56.9"	88 59' 25.5"	2/12/2004	11:37	0.45	5.11	5.0	11.76	6.95	0.28	83.5	9.10
TCR12	Tchoutacabouffa R.	l.5mi up river from mouth	30 27' 10.4"	88 57' 55.7"	2/12/2004	9:30	0.50	3.26	0.5	11.17	8.12	0.03	90.2	9.95
TCR12	Tchoutacabouffa R.	l.5mi up river from mouth	30 27' 10.4"	88 57' 55.7"	2/12/2004	9:30	0.50	3.26	1.0	11.17	7.79	0.04	89.5	9.87
TCR12	Tchoutacabouffa R.	l.5mi up river from mouth	30 27' 10.4"	88 57' 55.7"	2/12/2004	9:30	0.50	3.26	1.5	11.16	7.61	0.04	89.3	9.85
TCR12	Tchoutacabouffa R.	l.5mi up river from mouth	30 27' 10.4"	88 57' 55.7"	2/12/2004	9:30	0.50	3.26	2.0	11.16	7.54	0.03	89.5	9.88
TCR12	Tchoutacabouffa R.	l.5mi up river from mouth	30 27' 10.4"	88 57' 55.7"	2/12/2004	9:30	0.50	3.26	3.0	11.16	7.44	0.04	89.4	9.88
BIR13	Biloxi River	1.2mi up river from mouth	30 26' 47.0"	89 00' 26.7"	2/12/2004	10:12	0.20	2.49	0.5	12.18	8.12	0.01	91.3	9.84
BIR13	Biloxi River	1.2mi up river from mouth	30 26' 47.0"	89 00' 26.7"	2/12/2004	10:12	0.20	2.49	1.0	12.18	7.70	0.00	91.4	9.86
BIR13	Biloxi River	1.2mi up river from mouth	30 26' 47.0"	89 00' 26.7"	2/12/2004	10:12	0.20	2.49	1.5	12.18	7.45	0.01	90.7	9.78
BIR13	Biloxi River	1.2mi up river from mouth	30 26' 47.0"	89 00' 26.7"	2/12/2004	10:12	0.20	2.49	2.0	12.17	7.22	0.01	90.7	9.79
BBI14	Bayou Bernard	Industrial Seaway mouth	30 24' 57.3"	89 00' 13.6"	2/12/2004	12:20	0.40	2.11	0.5	12.74	6.92	1.28	85.3	8.84
BBI14	Bayou Bernard	Industrial Seaway mouth	30 24' 57.3"	89 00' 13.6"	2/12/2004	12:20	0.40	2.11	1.0	12.75	6.97	1.31	80.2	8.48
BBI14	Bayou Bernard	Industrial Seaway mouth	30 24' 57.3"	89 00' 13.6"	2/12/2004	12:20	0.40	2.11	1.5	12.74	6.98	1.59	78.7	8.39
BBI14	Bayou Bernard	Industrial Seaway mouth	30 24' 57.3"	89 00' 13.6"	2/12/2004	12:20	0.40	2.11	2.0	12.73	6.99	1.80	78.2	8.33
DEI15	Deer Island	Marker 2	30 21' 35.8"	88 54' 09.2"	2/10/2004	10:24	1.50	3.02	0.5	10.97	7.97	21.02	100.3	11.20
DEI15	Deer Island	Marker 2	30 21' 35.8"	88 54' 09.2"	2/10/2004	10:24	1.50	3.02	1.0	10.94	8.01	21.03	97.8	10.88
DEI15	Deer Island	Marker 2	30 21' 35.8"	88 54' 09.2"	2/10/2004	10:24	1.50	3.02	1.5	10.93	8.03	21.03	95.8	10.68
DEI15	Deer Island	Marker 2	30 21' 35.8"	88 54' 09.2"	2/10/2004	10:24	1.50	3.02	2.0	10.98	8.05	21.47	94.1	10.49
DEI15	Deer Island	Marker 2	30 21' 35.8"	88 54' 09.2"	2/10/2004	10:24	1.50	3.02	2.5	10.94	8.03	22.38	86.5	9.66
WOR16	Wolf River	.25mi up river from mouth	30 21' 27.5"	89 16' 36.4"	3/2/2004	9:18	0.65	4.08	0.5	14.64	7.42	0.13	84.3	8.64
WOR16	Wolf River	.25mi up river from mouth	30 21' 27.5"	89 16' 36.4"	3/2/2004	9:18	0.65	4.08	1.0	14.63	7.30	0.19	83.4	8.55
WOR16	Wolf River	.25mi up river from mouth	30 21' 27.5"	89 16' 36.4"	3/2/2004	9:18	0.65	4.08	1.5	14.63	7.15	0.29	80.2	8.11
WOR16	Wolf River	.25mi up river from mouth	30 21' 27.5"	89 16' 36.4"	3/2/2004	9:18	0.65	4.08	2.0	14.63	7.11	0.31	78.8	8.11
WOR16	Wolf River	.25mi up river from mouth	30 21' 27.5"	89 16' 36.4"	3/2/2004	9:18	0.65	4.08	3.0	14.66	6.97	0.45	81.4	8.34
WOR16	Wolf River	.25mi up river from mouth	30 21' 27.5"	89 16' 36.4"	3/2/2004	9:18	0.65	4.08	3.5	14.76	6.84	1.06	80.5	8.23
CST17	Center of St. Louis Bay	Marker 1	30 19' 52.4"	89 18' 18.0"	3/2/2004	12:15	0.50	2.23	0.5	16.32	7.42	3.42	104.20	10.38
CST17	Center of St. Louis Bay	Marker 1	30 19' 52.4"	89 18' 18.0"	3/2/2004	12:15	0.50	2.23	1.0	15.45	7.40	4.07	99.0	9.98
CST17	Center of St. Louis Bay	Marker 1	30 19' 52.4"	89 18' 18.0"	3/2/2004	12:15	0.50	2.23	1.5	15.01	7.37	4.51	94.1	9.57
CST17	Center of St. Louis Bay	Marker 1	30 19' 52.4"	89 18' 18.0"	3/2/2004	12:15	0.50	2.23	2.0	14.96	7.36	4.69	92.0	9.36

GTR18	Gene Taylor Reef	Marker 4	30 16' 24.9"	89 18' 58.2"	3/2/2004	10:15	0.30	2.22	0.5	15.09	7.15	3.03	96.1	9.77
GTR18	Gene Taylor Reef	Marker 4	30 16' 24.9"	89 18' 58.2"	3/2/2004	10:15	0.30	2.22	1.0	14.82	7.17	3.12	95.7	9.77
GTR18	Gene Taylor Reef	Marker 4	30 16' 24.9"	89 18' 58.2"	3/2/2004	10:15	0.30	2.22	1.5	14.86	7.17	3.16	95.8	9.77
GTR18	Gene Taylor Reef	Marker 4	30 16' 24.9"	89 18' 58.2"	3/2/2004	10:15	0.30	2.22	2.0	14.88	7.17	3.69	93.8	9.71
BAC19	Bayou Caddy	.2mi up bayou from mouth	30 14' 16.5"	89 25' 41.1"	3/2/2004	11:04	0.25	2.83	0.5	17.16	7.47	1.57	99.30	9.68
BAC19	Bayou Caddy	.2mi up bayou from mouth	30 14' 16.5"	89 25' 41.1"	3/2/2004	11:04	0.25	2.83	1.0	16.55	7.43	1.73	92.2	9.11
BAC19	Bayou Caddy	.2mi up bayou from mouth	30 14' 16.5"	89 25' 41.1"	3/2/2004	11:04	0.25	2.83	1.5	16.14	7.32	1.84	84.0	8.32
BAC19	Bayou Caddy	.2mi up bayou from mouth	30 14' 16.5"	89 25' 41.1"	3/2/2004	11:04	0.25	2.83	2.0	15.89	7.28	1.89	77.7	7.81
BAC19	Bayou Caddy	.2mi up bayou from mouth	30 14' 16.5"	89 25' 41.1"	3/2/2004	11:04	0.25	2.83	2.5	15.82	7.24	1.95	75.3	7.52
PER20	Pearl River	North of 90 bridge	30 14' 24.7"	89 36' 52.1"	3/2/2004	14:00	0.40	7.55	0.5	14.40	8.05	0.00	87.9	8.96
PER20	Pearl River	North of 90 bridge	30 14' 24.7"	89 36' 52.1"	3/2/2004	14:00	0.40	7.55	1.0	14.39	7.83	0.01	88.5	9.52
PER20	Pearl River	North of 90 bridge	30 14' 24.7"	89 36' 52.1"	3/2/2004	14:00	0.40	7.55	1.5	14.39	7.69	0.01	90.7	9.24
PER20	Pearl River	North of 90 bridge	30 14' 24.7"	89 36' 52.1"	3/2/2004	14:00	0.40	7.55	2.0	14.37	7.57	0.00	93.0	9.00
PER20	Pearl River	North of 90 bridge	30 14' 24.7"	89 36' 52.1"	3/2/2004	14:00	0.40	7.55	3.0	14.38	7.51	0.01	98.7	10.17
PER20	Pearl River	North of 90 bridge	30 14' 24.7"	89 36' 52.1"	3/2/2004	14:00	0.40	7.55	4.0	14.37	7.46	0.01	84.2	9.22
PER20	Pearl River	North of 90 bridge	30 14' 24.7"	89 36' 52.1"	3/2/2004	14:00	0.40	7.55	5.0	14.38	7.15	0.01	80.6	8.42
PER20	Pearl River	North of 90 bridge	30 14' 24.7"	89 36' 52.1"	3/2/2004	14:00	0.40	7.55	6.0	14.38	7.18	0.01	79.8	8.23
PER20	Pearl River	North of 90 bridge	30 14' 24.7"	89 36' 52.1"	3/2/2004	14:00	0.40	7.55	7.0	14.38	7.23	0.01	80.1	8.26
PAB21	Pascagoula Beach	Next to pier	30 20' 33.6"	88 32' 07.2"	2/16/2004	11:11	> 1.0	1.00	0.5	11.65	7.64	22.89	83.9	9.18
BLF22	Bellefountaine Beach	West of water tower	30 20' 31.2"	88 42' 45.6"	2/13/2004	13:51	0.45	1.00	0.5	11.81	7.74	18.24	97.4	10.65
DAB23	Davis Bayou	Beach at Holcomb Street	30 23' 37.8"	88 48' 37.2"	2/13/2004	8:26	0.55	1.00	0.5	11.06	7.47	7.11	89.8	9.73
PRA24	Pratt Avenue Beach	Across from Holiday Inn	30 22' 12.0"	89 04' 47.0"	2/13/2004	12:06	0.40	1.00	0.5	11.33	7.88	19.68	107.4	11.83
HEP25	Henderson Point	Beach at Henderson Point	30 18' 12.6"	89 16' 54.2"	2/13/2004	11:07	0.80	1.00	0.5	11.12	7.64	17.95	100.4	11.14
SCS26	St. Charles Street	Bay St. Louis Beach	30 18' 00.0"	89 20' 02.2"	2/13/2004	10:34	0.40	1.00	0.5	10.56	7.82	8.75	98.2	11.05
WAV27	Waveland Beach	St. Claire Church beach	30 16' 37.1"	89 22' 25.2"	2/13/2004	10:05	0.55	1.00	0.5	10.74	7.48	11.95	100.9	11.23
ROA28	Rodenberg Ave.	Rodenberg Ave. beach	30 23' 32.6"	88 56' 17.5"	2/13/2004	12:42	0.80	1.00	0.5	11.24	7.95	18.76	101.7	11.45