

MOBILE BAY SUB-ESTUARY MONITORING PROGRAM REPORT

Bayou la Batre

Sub-Estuary

Mobile Bay National Estuary Program
Alabama Department of Environmental Management
Gulf of Mexico Program
US Environmental Protection Agency



Mobile Bay National Estuary Program

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Prepared for the Mobile Bay National Estuary Program

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Acronyms

ADEM	Alabama Department of Environmental Management
ADCP	Acoustic Doppler Current Profiler
ADPH	Alabama Department of Public Health
BMP	Best Management Practice
CCMP	Comprehensive Conservation Management Plan
DISL	Dauphin Island Sea Lab
DO	Dissolved Oxygen
EPA(USEPA)	Environmental Protection Agency
GPS (DGPS)	(Differential) Global Positioning System
GSA	Geological Survey of Alabama
HAB	Harmful Algal Bloom
HUC	Hydrologic Unit Code
MBNEP	Mobile Bay National Estuary Program
NCA	National Coastal Assessment (Coastal 2000)
MDN	Mercury Deposition Network
NEP	National Estuary Program
NOAA	National Oceanic and Atmospheric Administration
NADP	National Atmospheric Deposition Program
NPDES	National Pollution Discharge Elimination System
NPS	Non-Point Source
NRCS	National Resource Conservation Service
NTU	Nephelometric Turbidity Units
PAHs	Polycyclic Aromatic Hydrocarbons
QAQC	Quality Assurance Quality Control
SAV	Submerged Aquatic Vegetation
TMDL	Total Maximum Daily Load
USACE	US Army Corps of Engineers
USFDA	US Food and Drug Administration
USFWS	US Fish and Wildlife Service
USGS	US Geological Survey
WQ	Water Quality
WWTP	Waste Water Treatment Plant

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Executive Summary

In 2005 the Mobile Bay National Estuary Program (MBNEP) initiated a monitoring program within the Sub-Estuarines of Mobile Bay. The project area consisted of portions of Mobile Bay and adjoining waterbodies in coastal Alabama. This report covers actions initiated by the MBNEP in an agreement between the Alabama Department of Environmental Management (ADEM) and the Dauphin Island Sea Lab pursuant to an appropriation by the Environmental Protection Agency (EPA) and on behalf of the MBNEP.

This report describes the findings of the second of several sub-estuaries that were evaluated for the monitoring program, Bayou la Batre. The Bon Secour River / Intracoastal Waterway / Oyster Bay Sub-Estuary in southwestern Baldwin County (Southeastern Mobile Bay) and Dog River sub-estuaries were also evaluated under this program.

Of the five ADEM sampling locations evaluated, two stations (BLBM-2 and BLBM-4) were “Supporting” their use classification. The other three, (BLBM-1, BLB-1, and BLBM-3) were “Non-Supporting” and failed to meet Alabama Department of Environmental Management (ADEM) water quality criteria.

Based on National Coastal Assessment water quality index, the lower half of the Bayou la Batre Sub-Estuary is rated “Fair” with one tributary rated “Fair” (Snake Bayou, BBM-6) and one tributary (unnamed, BBM-5) rated “Poor”. The upper half is rated “Poor” and one tributary also rated “Poor” (Carl’s Creek, BLBM-3).

Based on nitrogen and chlorophyll-a data, nutrient loadings to the sub-estuary appears to be moderate. Phosphorous does not appear to be a factor. Of the 10 sampling stations, 5 exceeded the NCA “Poor” threshold for nitrogen for a poor rating of 50% (based on number of stations). Only 1 station exceeded the NCA “Poor” threshold for a 10% poor rating. None of the stations exceeded the poor threshold for phosphorus and water clarity does not seem to be effected by poor water quality.

While there were ERL excedances for sediment metals, no location exceeded the criterion (<5 ERL), and none of the locations had an ERM exceedance. Also, no location had an excedence of PAHs or Pesticides. Thus, each site received a “Good” for Sediment Contaminants and a “Good” for the overall Sediment Contaminants by Estuary or Region Criteria.

Introduction

In 2005 the Mobile Bay National Estuary Program (MBNEP) initiated a monitoring program within the Sub-Estuaries of Mobile Bay. The project area consisted of portions of Mobile Bay and adjoining waterbodies in coastal Alabama. This report covers actions initiated by the MBNEP in an agreement between the Alabama Department of Environmental Management (ADEM) and the Dauphin Island Sea Lab pursuant to an appropriation by the Environmental Protection Agency (EPA) and on behalf of the MBNEP.

This report describes the findings of the second of several sub-estuaries that were evaluated for the monitoring program. The Bon Secour River / Intracoastal Waterway / Oyster Bay Sub-Estuary in southwestern Baldwin County was the first sub-estuary to be evaluated under this program. Subsequent studies were conducted in the Bayou la Batre and Dog River sub-estuaries.

The program also provided support for components of the Mobile Bay National Estuary Program Plan (August 2000) and was consistent with the MBNEP Comprehensive Conservation and Management Plan (CCMP). Further, it was designed to fulfill the needs of the ADEM by using departmental personnel and procedures. In this way, data generated by the MBNEP will supplement ADEM monitoring. Thus, both agencies benefit from the collaborative effort.

To be consistent with ADEM procedures, the data was analyzed using the standard operating procedures of the department. The data was compared to use criteria for differing waterbody classifications as set forth by the ADEM. Sections 305(b) and 303(d) of the federal Clean Water Act direct states to monitor and report the condition of their water resources. Alabama's Final Methodology for Use Support Determinations (Applicable Prior to 2006 Integrated Report), established a process to assess the status of surface waters in Alabama relative to the beneficial uses assigned to each waterbody.

Data collected for the MBNEP by Federal, State, and/or Local agencies have the same goal of measuring estuarine conditions. While data cannot be directly compared due to differing methodologies, NEPs are able to choose data and methods that best fit their environmental concerns. Both State and Federal methodologies were used in the assessment of the sub-estuary, ADEM water quality standards (assessment and listing methodology) and EPA's National Coastal Assessment (NCA).

Methods

Water Quality Monitoring

Standardized methods were used in this project, to assure consistency, quality, and reliability of data and results generated by this program. These methods were developed for use by the ADEM as the Standard Operating Procedures (SOPs) and are specified in the Quality Assurance Management Plan (QAMP, 2005).

The Bon Secour River/ Intracoastal Waterway/Oyster Bay sub-estuary monitoring program was conducted with the previous QAMP (2003). A major difference between the 2003 and 2005 QAMP was that for the 2005QAMP, a geometric mean for bacteria was calculated from no less than five samples collected at a given station over a 30-day period at intervals not less than 24 hours.

The MBNEP coordinated the Sub-Estuary monitoring effort with ADEM's ambient monitoring program. The ADEM conducted water quality monitoring within the aforementioned sub-estuaries by agreement with the MBNEP and simultaneously through the ADEM Ambient monitoring program. The total effort involved the following:

ADEM established 7 judgmentally located sampling locations within the sub-estuary and 3 judgmentally located sampling locations near major tributaries for a total of 13 locations sampled quarterly. The ADEM Water Quality Branch also requested that 4 of the 10 stations be sampled on a monthly basis in 2006 in addition to the quarterly sampling for the MBNEP.

In-situ measurements made at each site included: Dissolved Oxygen (mg/l), Temperature (C), pH, Salinity (ppt), Specific Conductance (mS/cm) and Depth (m). These measurements were made with a YSI® 650MDS and 600QS multiparameter water quality datasondes. Light penetration was measured using a photometer and a standard Secchi disk. Water samples were a composite of the Photic zone using a submersible pump (Except for the bacteria sample from the sub-surface). The photic zone was calculated by lowering the photometer until a depth of 1% of the sub-surface was reached.

Water Flow data was collected using a vessel mounted Acoustic Doppler Current Profiler (ADCP) flow meter. 72 hour diurnal *in situ* water quality data were collected at 3 locations using a YSI® 600XLM water quality data logger (BBM-1, BBM-5, and BLB-1).

Laboratory parameters analyzed at each monitoring location included:

- Turbidity
- Total Suspended Solids
- Total Dissolved Solids
- Ammonia
- Total Nitrogen (TN)
- Total Phosphorus (TP)
- Dissolved Reactive Phosphorus, (ortho-phosphate)
- Total Kjeldahl Nitrogen (TKN)
- Chlorophyll-a
- 5-day Carbonaceous Biochemical Oxygen Demand (CBOD5)
- Hardness
- Pathogens

Sediment was collected once at each monitoring location and analyzed for the following:

- Aluminum
- Arsenic
- Cadmium
- Chromium
- Copper
- Lead
- Mercury
- Nickel
- Silver
- Tin
- Zinc
- Antimony
- Iron
- Manganese
- Selenium
- Polynuclear Aromatic Hydrocarbons (PAHs)
- Pesticides (DDD, DDE, DDT, Dieldrin, Heptachlor, BHC)

Sediment samples were collected at each station from subsamples of composited surficial sediment collected with a 0.052m² modified stainless steel Ponar sampler.

It should be noted that ADEM regulations, 335-6-10-.09§4(iii), recognize that in tidal estuaries, dissolved oxygen (DO) may be lower than normal due to natural conditions. In tidal estuaries DO shall not be less than 5mg/l, except in dystrophic waters or where natural conditions cause the value to be depressed. In such cases, DO may range between 5mg/l and 4mg/l.

ADEM Water Quality Criteria Used

Alabama's assessment and listing methodology establishes a process, consistent with EPA guidance, to assess the status of surface waters in Alabama relative to the designated uses assigned to each. This methodology is not intended to limit the data or information that the State considers as it prepares an integrated water quality assessment report. Rather, it is intended to establish a rational and consistent process for reporting the status of Alabama's surface waters relative to their designated uses.

The EPA guidelines for preparation of the §305(b) Water Quality Report to Congress offer the following guidance regarding use support determinations using conventional water quality parameters (i.e. dissolved oxygen, temperature, pH).

- Fully Supporting – For any one pollutant or stressor the criteria is exceeded in ≤ 10 percent of the measurements.
- Partially Supporting – For any one pollutant or stressor the criteria is exceeded in 11 to 25 percent of the measurements.
- Not Supporting – For any one pollutant or stressor the criteria is exceeded in > 25 percent of the measurements.

Water quality standards consist of three components: designated uses, numeric and narrative criteria, and an antidegradation policy. Data collected for the MBNEP (by Federal, State, and/or Local agencies), have the same goal of measuring estuarine conditions. While data cannot be directly compared due to differing methodologies, NEPs are able to choose data and methods that best fit their environmental concerns.

NCA Criteria Used

The National Coastal Assessment relies on 5 water quality indicators to estimate an estuarine Water Quality Index: Dissolved Inorganic nitrogen (DIN), Dissolved Inorganic Phosphorous (DIP), Chlorophyll a, water clarity, and bottom dissolved oxygen. During discussions with the EPA Gulf Ecology Division it was recommended that the criteria set for DIN and DIP was inappropriate for sub-estuary sampling due to lower salinity. It should be noted that although high salinity was recorded near the bottom (salt wedge), water quality samples were collected in the photic zone above the salt wedge. Therefore, TN & TP were substituted and criteria was amended from USEPA Recommended Values of TN & TP for Alabama Ecoregion 75 (USEPA 2000).

*National Coastal Assessment's (NCA) *Water Quality Criteria*

GOOD	FAIR	POOR
-Total nitrogen (TN) Good = < 0.02 mg/L Fair = 0.02 – 0.04 mg/L Poor = >0.04 mg/L	-Chlorophyll-a Good = < 5 µg/L Fair = 5 – 20µ g/L Poor = >20µg/L	-*Water Clarity Good = > 10% Fair =5 – 10% Poor = <5% *Comparison of percent light penetration at a depth of 1.0 meter
-Total phosphorus (TP) Good = < 0.4 mg/L Fair = 0.4 – 0.8 mg/L Poor = >0.9 mg/L	-Bottom dissolved oxygen Good = > 5 mg/L Fair = 2 – 5mg/L Poor = >2 mg/L	

*Amended to correspond to EPA recommended values of TN & TP for Alabama Ecoregion 75 (USEPA 2000).

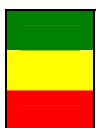
NCA Water Quality Index

A water quality index, developed for the Gulf Coast by the U.S. EPA, was used to determine the condition of Alabama's coastal waters for the National Coastal Condition Report. At each sampling location, these indicators were ranked good, fair, or poor. For the water quality index, each of these rankings was used to determine an index ranking for the specific sampling point. For a site to be ranked as good, it could have no more than one indicator rated as fair. For a site to be ranked as fair, it would have one indicator rated as poor or two or more indicators rated as fair. A site would be ranked as poor if it had two or more indicators rated as poor.

NCA Sediment Contaminants

Sediments were examined in Alabama's coastal waters for a total of 15 trace metals, 25 polynuclear aromatic hydrocarbons (PAHs), 21 polychlorinated biphenyls (PCBs), and 22 pesticides. Effects Range Median (ERM) and Effects Range Low (ERL) values were published for many of these contaminants by Long *et al* (1995), and are used as guidelines for contamination by the EPA (NCA) as well as Alabama. These values are shown in Table 3. ERM is the concentration which would result in adverse effects in 50 percent of the studies examined. ERL is the concentration which would result in adverse effects in 10 percent of the studies examined. These ERM and ERL values are used to assess sediment contamination. The Sub-Estuary Monitoring Program has adopted criteria similar to that of the EPA National Coastal Assessment (See Table 1).

National Coastal Assessment's (NCA) Sediment Contaminants Criteria

	Good = No ERM exceeded and < 5 ERL concentrations exceeded
	Fair = 5 or more ERL concentrations exceeded
	Poor = An ERM concentrations exceeded

**Criteria for Assessing Sediment Contaminants by NEP Estuary or Region*



Good = <5% of estuary is in poor condition

Fair = 5-15% of estuary is in poor condition

Poor = >15% of estuary is in poor condition

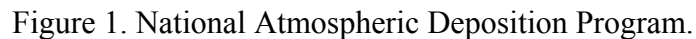
*Adopted from National Estuary Program Coastal Condition Report (USEPA) 2006

Table 1. Guidance Values for ERM and ERL		
Long et al, 1995		
Metals ug/g (ppm)	ERL	ERM
Arsenic (As)	8.2	70
Cadmium (Cd)	1.2	9.6
Chromium (Cr)	81	370
Copper (Cu)	34	270
Lead (Pb)	46.7	218
Mercury (Hg)	0.15	0.71
Nickel (Ni)	20.9	51.6
Silver (Ag)	1	3.7
Zinc (Zn)	150	410
Analyte ng/g (ppb)	ERL	ERM
Acenaphthene	16	500
Acenaphthylene	44	640
Anthracene	85.3	1100
Flourene	19	540
2-Methyl naphthalene	70	670
Napthalene	160	2100
Phenanthrene	240	1500
Benz(a)anthracene	261	1600
Benzo(a)pyrene	430	1600
Chrysene	384	2800
Dibenzo(a,h)anthracene	63.4	260
Flouranthene	600	5100
Pyrene	665	2600
Low molecular weight PAH	552	3160
High molecular weight PAH	1700	9600
Total PAHs	4020	44800
4,4'-DDE	2.2	27
Total DDT	1.6	46.1
Total PCBs	22.7	180

Table 1. Guidance Values for ERM and ERL (Long et al,1995).

ADEM operates several Particulate monitors throughout the state and 2 wet deposition monitors in Mobile and Baldwin Counties that are partially funded by the MBNEP. These monitors are part of the National Atmospheric Deposition Program (NADP). Data was evaluated on a regional basis, as opposed to individual monitors and are evaluations from NADP regional data.

Atmospheric loading to waterbodies can happen via dry or wet deposition of a pollutant either by direct or indirect deposition. Spatial and temporal limitations of monitoring networks as well as uncertainties and data gaps for specific pollutants make it difficult to report loading to waterbodies (See Figure 1).



Fish Tissue Monitoring

The ADEM Fish Tissue Monitoring Program (FTMP) provides statewide screening of bioaccumulative contaminants in fish tissue, and provides the Alabama Department of Public Health (ADPH) with data needed for issuance, modification, or removal of fish consumption advisories in accordance with US Environmental Protection Agency (EPA) guidance levels. It should be noted that the ADPH began using the EPA guidance in 2005. Formerly, ADPH used Food and Drug Administration (FDA) guidance.

ADEM collected fish in the ship channel south of and into the mouth of Bayou la Batre. Fish were also collected for the NCA program however analyses for contamination were done using the whole body of the fish which differs from ADEM procedures. ADEM procedures call for the removal and analysis of the left and right fillets rather than whole body. Neither EPA nor FDA guidance criteria exist for whole body contaminants, therefore no comparison to consumption advisories can be made with NCA results.

National Coastal Assessment's (NCA) Summarization of Indices for Overall Condition

The overall condition of the sub-estuary is calculated by summing the scores for the available indices and dividing by the number of available indices. Good =5, Fair =4, 3, or 2 and Poor = 1. The NCA summarization is based on the following indices: Water Quality, Sediment Quality, Benthic Index, and Fish Tissue Contaminants. Enough data exists to calculate overall condition based on Water and Sediment Quality; however, Benthic samples were not included in the program. Also, ADEM fish tissue collection methods differ from NCA methods and a direct comparison cannot be made.

Sampling Platform

A twenty -two foot gasoline powered research vessel (*R/V Tensaw*) with crew was provided by ADEM (See figure 3). Stations were located using Differential Global Positioning System (DGPS) receiver with accuracies of better than 10 meters. BLBM-4 could not be accessed by boat due to downed trees from Hurricane Katrina and was accessed from the bridge at Davenport Street.

Analytical Requirements

The ADEM gathered data collected from sub-estuary sample locations and compare it to ADEM's Specific Water Quality Criteria as set forth in ADEM Administrative Code R. 335-6. As a part of its water quality assessment program, ADEM has created a use support methodology. The purpose of this protocol is to assess if a waterbody is supporting its use classification.

Data Management

Measurements and observations were entered directly onto ADEM Field Sheets or in a bound Field Book. Field records were then transferred into the appropriate electronic format as required by the Mobile Bay NEP.

All raw data, field records, and laboratory reports were provided to the MBNEP. Request for data should be submitted to the MBNEP or to ADEM Public Records Officer, P.O. Box 301463, Montgomery, AL 36130-1463.

Monitoring Locations

ADEM established 7 judgmentally located sampling locations within the sub-estuary and 3 judgmentally located sampling locations near major tributaries. Figure 3 is a map of sampling locations. Table 1 shows latitude and longitude coordinates for sampling locations.

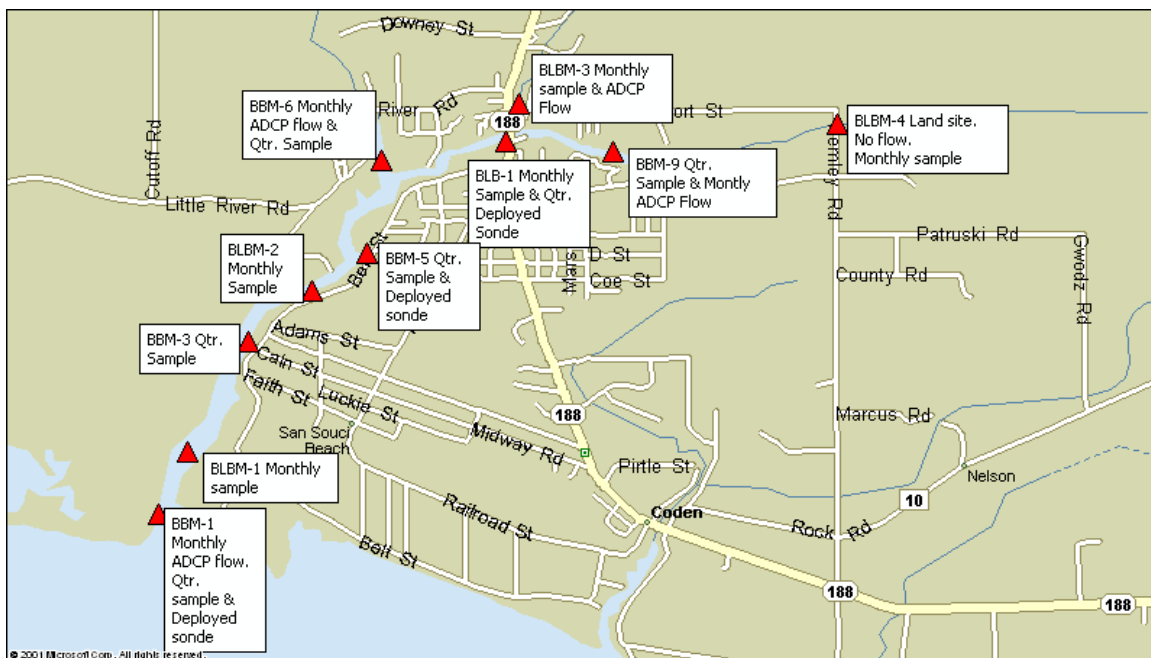


Figure 2. Map of sampling locations.

Station	lat	long	Site Description
BBM-1	30.38342	-88.27160	Mouth of Bayou la Batre,
BLBM-1	30.38695	-88.26963	0.4 miles upstream of mouth.
BBM-3	30.39585	-88.26459	Downstream of seafood industry area.
BLBM-2	30.39687	-88.26056	Downstream of shipbuilding industry area.
BBM-5	30.39860	-88.25735	Near opening to salt marsh.
BBM-6	30.40406	-88.25639	Mouth of Snake Bayou
BLB-1	30.40593	-88.24773	Hwy 188 bridge.
BLBM-3	30.40651	-88.24740	Mouth of Carl's Creek
BBM-9	30.40458	-88.24065	Downstream of new home sites.
BLBM-4	30.40620	-88.22540	Davenport Street Bridge.

Table 2. Sampling Stations.

Hydrologic Flow and Modeling

Hydrologic flow data was collected at select sites to determine fresh water input and tidal exchange. A boat-mounted Acoustic Doppler Current Profiler (ADCP) was used to collect flow data during the study (see Figures 3 & 4). The flow data, along with in-situ data and samples collected from various media will be entered into a water quality model developed by the USEPA and a hydrologic model developed by Tetra Tech.



Figure 3. Boat mounted ADCP.



Figure 4. ADCP with custom mount.

Tetra Tech, Inc. was contracted in 2001 to develop a system of models for the entire Mobile Bay System in collaboration with USEPA. The models include a hydrologic and water quality model of the watershed that projects the flows and nutrient loads to the lower estuarine portion of the system, and a receiving water and water quality model for Mobile Bay.

Tetra Tech and EPA have utilized the Hydrologic Simulation Program in Fortran (HSPF) based watershed model, Loading Simulation Program in C++ (LSPC) for watershed simulation and the Environmental Fluid Dynamics Code (EFDC) and the Water Quality Analysis and Simulation Program (WASP) for three-dimensional dynamic flow and water quality simulations of Mobile Bay, respectively (See Figure 15). Once completed, the bay model can be employed to develop TMDLs and wasteload allocations for Mobile Bay. The model considers the effects of wind-driven residual transport, salinity intrusion, loadings and oxygen uptake from adjacent salt marshes, sediment oxygen demand, primary productivity, and point source discharge from municipal and industrial permits.

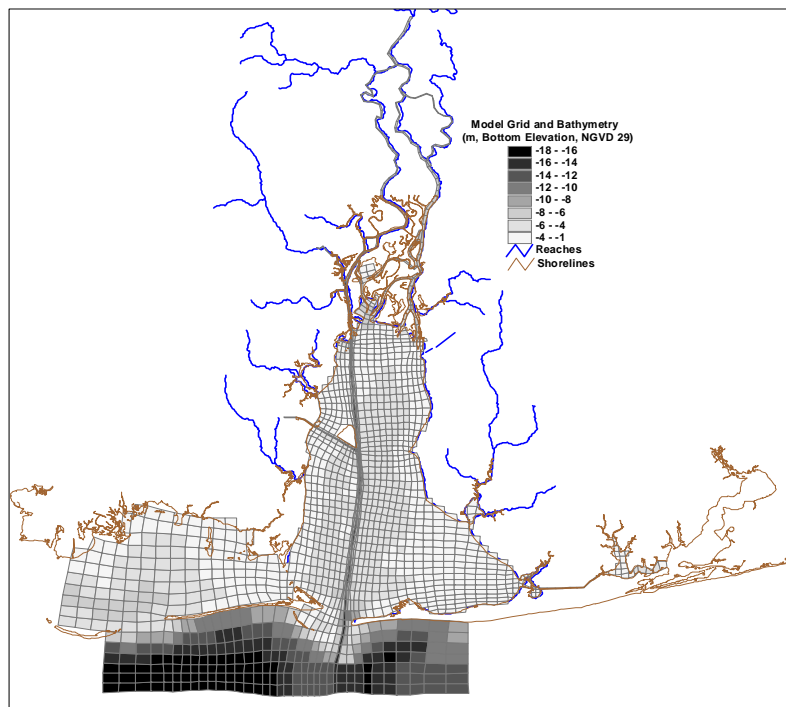


Figure 7. Tetra Tech Mobile Bay Model Grid.

Geographical Information

The Mobile Bay and its estuaries are connected to the Gulf of Mexico and Mississippi Sound. The Mobile Bay watershed covers approximately 43,630 square miles including fresh water inputs. Mobile Bay experiences daily tidal exchanges with the Gulf of Mexico and Mississippi Sound. Waterbodies that have an open connection to the Mobile Bay estuary and meet the definition of an estuary are called sub-estuaries.

Bayou la Batre is located in the Escatawpa River Basin in southwestern Alabama and has an open water connection to Mobile Bay via the Mississippi Sound.

Hydrologic Modifications

A ship channel was dredged in 1965 as authorized by the River and Harbor Act in Bayou la Batre. From the mouth of the bayou, a 12ft deep by 100 ft wide channel to a point about 2,800 feet south of the highway bridge, thence a channel 12 x 75 feet to the bridge, an overall distance of about 33,500 feet, with channel widened 0.6 miles below bridge to provide turning basin 12 feet deep and about 2.6 acres in area.

The Water Resources Development Act (WRDA) of 1990 authorized an improvement to an 18-foot-deep by 100-foot-wide channel up Bayou La Batre through and including the existing turning basin with a transition to a 14-foot-deep by 75-foot-wide channel to a

point 1,500 feet above Highway 188 bridge; and a 14-foot-deep by 50-foot-wide side channel up Snake Bayou for 500 feet, then a 12-foot-deep by 50-foot-wide channel for an additional 800 feet. Total length of the improved channel was about 23 miles. See Figure 9.

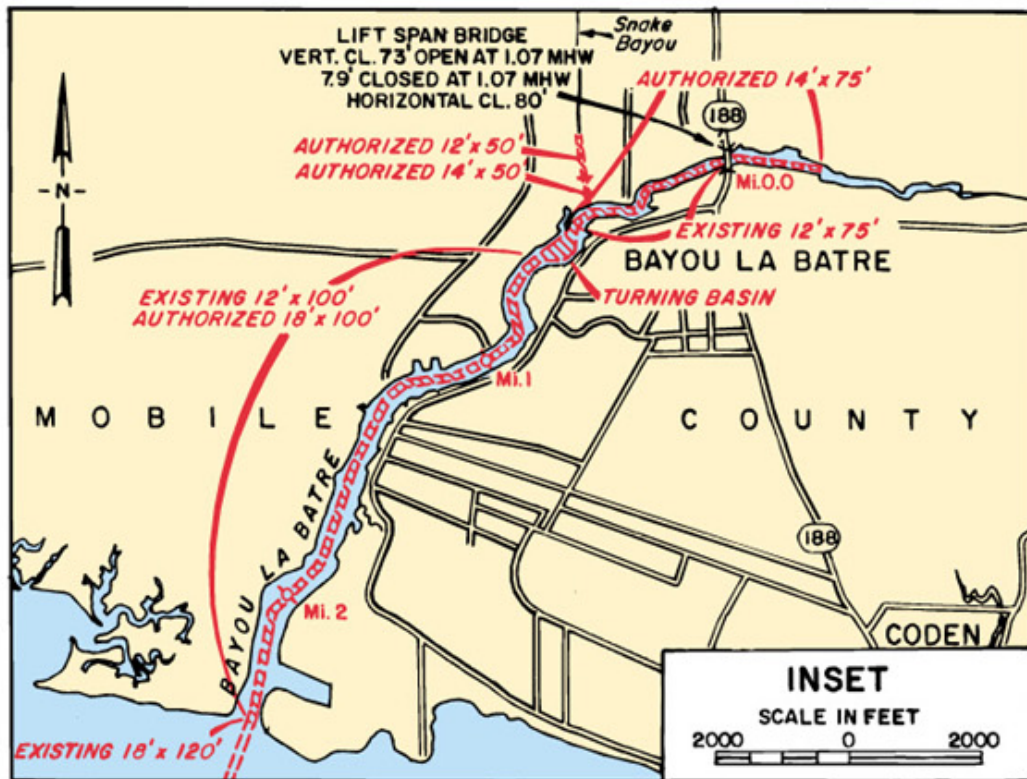


Figure 6. Hydrologic Modification through Channel Dredging (USACE 2008).

Climate

The coastal region of Alabama is characterized by a humid subtropical climate with mild winters and warm summers. Average annual precipitation is 68.1 inches. Tropical cyclones or hurricanes are frequent in the Gulf of Mexico and landfall areas can experience wind damage and flooding that can alter shoreline and bathymetry.

On August 29, 2005, Hurricane Katrina's storm surge severely damaged the City of Bayou La Batre. Approximately 65% of all occupied housing units in the City were damaged or destroyed. In addition, the existing municipal wastewater treatment plant (WWTP) suffered severe damage from the storm surge and now runs at a reduced capacity.

Land Use

Land use for the Bayou la Batre sub-estuary was determined by the department using land use datasets for fall 2001 derived from the 2001 National Land Cover Dataset Zone 46. The total drainage area was approximately 30.1 square miles with 31% agricultural uses and 46% silviculture (23.6% other).

Tidal Discharge

Mobile Bay has a diurnal tidal cycle with one high and one low tide in a 24 hour period and two high and two low tides during neap tides and spring tides. Bayou la Batre receives tidal in flow from Mobile Bay, Mississippi Sound and Portersville Bay.

Point Source Discharges

ADEM regulates point source discharges with 2 program types: National Pollution Discharge Elimination System (NPDES) and State Indirect Discharge (SID). Facilities with these permits must provide their own monitoring records or Discharge Monitoring Reports (DMRs) and subject to ADEM Compliance Sampling Inspections (CSIs). The existing WWTP for Bayou la Batre and the planned WWTP both discharge to Portersville Bay.

Results

ADEM Water Quality Criteria

A major difference between the previous sub-estuary evaluation and Bayou la Batre was the inclusion of Intensive Bacteria Study for pathogens. Two geometric means were calculated with no less than five samples collected at 5 stations over a 30-day period at intervals not less than 24 hours for both events (A & B). Enterococci was the indicator species for the intensive study.

Three of the 5 stations sampled failed to support their use classification. See Table 3. Also, Bayou la Batre was delisted from the 303(d) list for Dissolved Oxygen and is allowed a lower range of 5mg/l to 4mg/l. However DO was observed in the sub-estuary to less than 4mg/l.

Station	Single Sample Exceedance Rate (%)	Geomean Limit	Geomean Value Event A	Geomean Value Event B	Use Support Result
BLBM-1	0.06%	35	23	48	Non-Supporting
BLBM-2	0.00%	35	17	15	Supporting
BLB-1	0.06%	35	23	48	Non-Supporting
BLBM-3	14.30%	35	25	95	Non-Supporting
BLBM-4	13%	35	31	19	Supporting

Table 3. Geometric Mean for Bacteria.

NCA Water Quality Criteria

Bottom Dissolved Oxygen Bottom Dissolved Oxygen (DO) concentrations were rated as “Good” for two stations, BBM-1 and BBM-9. BLB-1 was rated as “Poor” and all other stations were rated as “Fair”. Bottom DO was at times higher than the state regulated DO (DO at 5ft if >10feet depth/DO at mid-depth if <10 feet depth). This is due to a salt wedge at the bottom of the water column usually present during sampling.

Total Nitrogen Total nitrogen concentrations divided the sub-estuary in half. 50% of the stations were rated as “Good” and 50% of the stations were rated as “Poor”. There were no “Fair” ratings.

Total Phosphorus Total Phosphorous concentrations were rated as “Good” at each sampling location.

Chlorophyll-a Chlorophyll-a concentrations were “Fair” at every sampling location except BBM-9, which was rated “Good” and BLBM-4 which was rated “Poor”.

Water Clarity Water Clarity was rated as “Good” at all sampling locations except BLBM-4 which was not evaluated for water clarity due to being a bridge site.

Water Quality Index

Based on the National Coastal Assessment water quality index, 50% of Bayou la Batre sampling locations are rated “Fair” while 40% are rated “Poor”, and 10% are rated good. (See Figure).

NCA Sediment Contaminants

While there were ERL exceedances for metals, no location exceeded the criterion (<5 ERL), and none of the locations had an ERM exceedance. Also, no location had an exceedance of PAHs or Pesticides. Thus, each site received a “Good” rating for Sediment Contaminants and a “Good” rating for the overall Sediment Contaminants by Estuary or Region Criteria. See Table 3.

Station	Bottom DO	Assessment	TN	Assessment	TP	Assessment	Chlor- a	Assessment	Water Clarity	Assessment	WQ Index	Sediment
BBM-1	6.26	GOOD	0.012	GOOD	0.051	GOOD	7.075	GOOD	0.84	GOOD	GOOD	GOOD
BBM-3	3.77	FAIR	0.017	GOOD	0.06725	GOOD	7.3	GOOD	0.75	GOOD	FAIR	GOOD
BBM-5	3.9	FAIR	0.051	POOR	0.0505	GOOD	6.4667	GOOD	0.71	GOOD	POOR	GOOD
BBM-6	3.5	FAIR	0.019	GOOD	0.0575	GOOD	8.1333	GOOD	0.65	GOOD	FAIR	GOOD
BBM-9	5.6	GOOD	0.114	POOR	0.05	GOOD	2.0667	GOOD	0.6	GOOD	FAIR	GOOD
BLB-1	1.96	POOR	0.047	POOR	0.0672	GOOD	15.067	GOOD	0.76	GOOD	POOR	GOOD
BLBM-1	4.86	FAIR	0.010	GOOD	0.062	GOOD	14.083	GOOD	0.65	GOOD	FAIR	GOOD
BLBM-2	2.64	FAIR	0.019	GOOD	0.0786	GOOD	12.2	GOOD	0.58	GOOD	FAIR	GOOD
BLBM-3	3.2	FAIR	0.145	POOR	0.05478	GOOD	5.56	GOOD	0.79	GOOD	POOR	GOOD
BLBM-4	2.65	FAIR	0.127	POOR	0.0295	GOOD	24.9	POOR	na	na	POOR	GOOD

Table 4. NCA Water Quality Index.

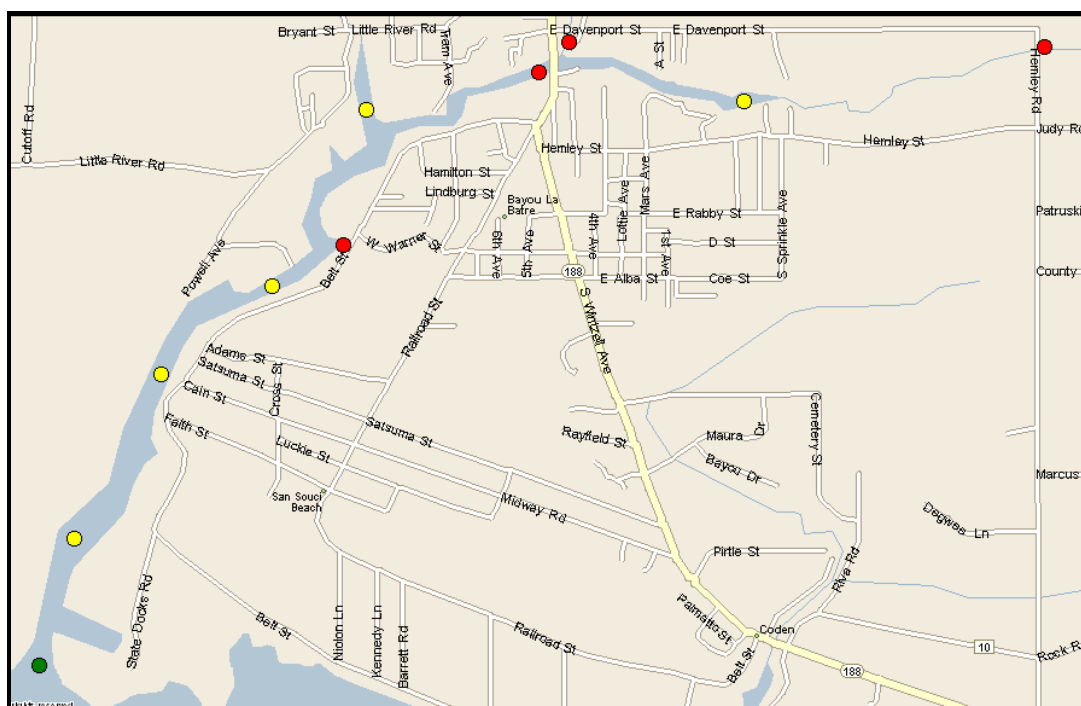


Figure 7. Water Quality Index.

Atmospheric Input

Data compiled by the National Atmospheric Deposition Program and Mercury Deposition Network in 2006 were lower than in 2005 (see Figure 8). Atmospheric mercury deposition in the Mobile Bay area was at mid-level compared to the rest of the nation.

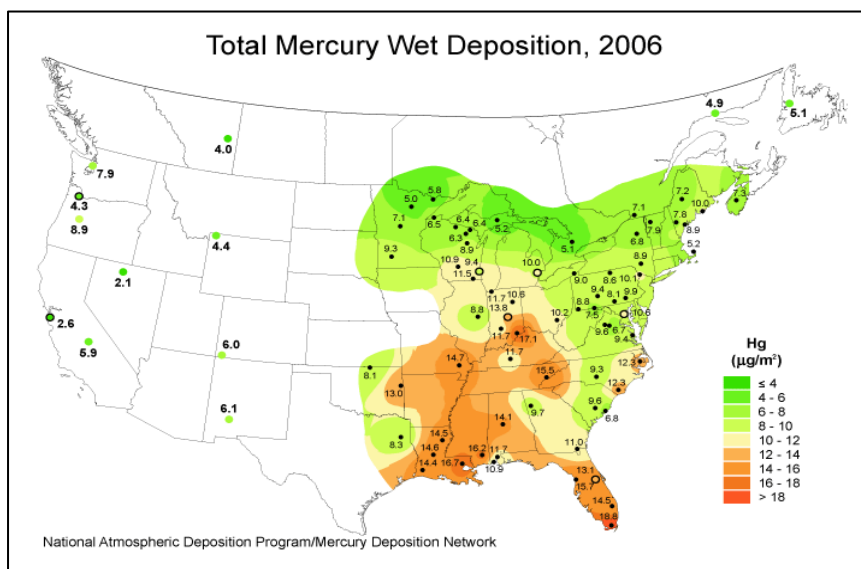


Figure 8. Total Mercury wet deposition for 2006.

Fish Tissue Monitoring

The Alabama Department of Public Health (ADPH) did not issue a No Consumption Advisory for any species in Bayou la Batre based on fish tissue collection and analysis by ADEM. Fish tissue analysis or the NCA program only had one exceedance for PAHs.

Conclusion

Of the five ADEM sampling locations evaluated, two stations (BLBM-2 and BLBM-4) were “Supporting” their use classification. The other three, (BLBM-1, BLB-1, and BLBM-3) were “Non-Supporting” and failed to meet Alabama Department of Environmental Management (ADEM) water quality criteria.

Based on National Coastal Assessment water quality index, the lower half of the Bayou la Batre Sub-Estuary is rated “Fair” with one tributary rated “Fair” (Snake Bayou, BBM-6) and one tributary (unnamed, BBM-5) rated “Poor”. The upper half is rated “Poor” and one tributary also rated “Poor” (Carl’s Creek, BLBM-3).

While the two criteria, ADEM and NCA, seem to differ on their statements of water quality, the ADEM criteria highlights a problem with bacteria yet does not evaluate nutrient loading. The NCA criterion highlights nutrient loading yet it does not evaluate bacteria. Therefore, both criteria were used to assess the sub-estuary.

Based on nitrogen and chlorophyll data, nutrient loadings to the sub-estuary appears to be moderate. Phosphorous does not appear to be a factor. Of the 10 sampling stations, 5 exceeded the NCA “Poor” threshold for nitrogen for a poor rating of 50% (based on number of stations). Only 1 station exceeded the NCA “Poor” threshold for a 10% poor rating. None of the stations exceeded the poor threshold for phosphorus and water clarity does not seem to be effected by poor water quality.

While there were ERL exceedances for sediment metals, no location exceeded the criterion (<5 ERL), and none of the locations had an ERM exceedance. Also, no location had an exceedence of PAHs or Pesticides. Thus, each site received a “Good” for Sediment Contaminants and a “Good” for the overall Sediment Contaminants by Estuary or Region Criteria.

ADEM is continually monitoring Coastal Long-Term Trend Stations (see Figure 10). There are two long term trend stations in the Bayou la Batre Sub-Estuary, BLB-1 and BLBM-1. ADEM and the MBNEP are also working together on other programs in the Mobile Bay area.

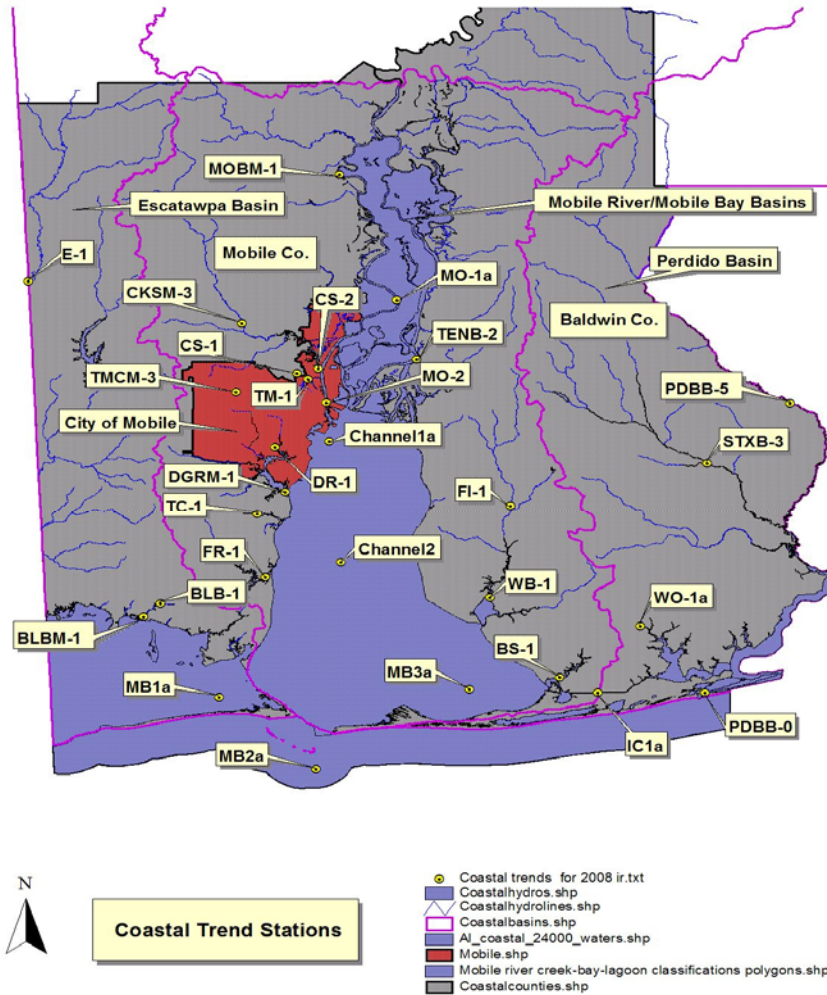


Figure 9. Coastal Long-Term Trend Stations.

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