Louisiana Department of Environmental Quality
Office of Environmental Assessment
Water Quality Assessment Division
Nonpoint Source Pollution Unit

Watershed Implementation Plan
Dissolved Oxygen

Barataria Basin
Bayou Segnette Watershed
Subsegment 020701

BAYOU SEGNETTE IMPLEMENTATION PLAN FOR DISSOLVED OXYGEN

EXECUTIVE SUMMARY

Louisiana is constituted of extensive surface water resources including miles of freshwater swamps, streams, bayous, rivers and lakes. Water has always been important to the history and development of Louisiana. Surface water resources in Louisiana are used for a wide variety of purposes including human consumption, agricultural irrigation, transportation, industrial processes, recreation, seafood production, wildlife and so much more. A great portion of the Louisiana economy and cultural heritage is directly linked to the surface water resources that exist today.

The Bayou Segnette watershed is subsegment 020701 of the Barataria Basin (Basin 02). It is located in southern Louisiana south of New Orleans. The size of the subsegment is approximately 35 square miles. The primary land uses are marsh and wetland forest. The LDEQ Final 2002 303 (d) list stated that the subsegment was found to not be supporting its designated fish and wildlife propagation use. The suspected causes of impairment included organic enrichment/low DO and nutrients; and the suspected sources were municipal point sources, collection system failure, inflow and infiltration, urban runoff/storm sewers/, other urban runoff, and natural sources. Meeting the water quality standard for DO of 5.0 mg/L will require man-made nonpoint sources to be reduced by 100% during the summer months and 71% for the winter months. In addition to the nonpoint reductions, natural background sources will have to be reduced by 31% during the summer months. The explicit margin of safety was set to 20% of the sum of the man-made nonpoint sources and the point sources. This margin of safety accounts for future growth as well as uncertainty and assumptions that were made in the modeling process.

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1.0 INTRODUCTION

Nonpoint source pollution is a diffuse source of water pollution that flows across land transporting contaminants to a water body. Common land-use categories that contribute to water quality impairments from nonpoint sources of pollution include agriculture, forestry, urban runoff, construction, home sewerage systems, resource extraction, and hydromodification. Detailed explanations of each category can be found in the State of Louisiana Water Quality Management Plan, Volume 6, *Louisiana's Nonpoint Source Management*, 2000.

Water quality has been one of the major environmental issues across the country for over 30 years (Adams et al. 2000). Many of the water bodies across the state have become impaired. Negative impacts caused by the activities of man have resulted in many Louisiana water bodies not meeting the state of Louisiana's water quality standards. The Clean Water Act of 1972 requires that water bodies in all states meet minimum surface water quality standards. Pollutants from both point sources (ex. factories, sewage facilities) and nonpoint sources (ex. yards, pastures, field runoff) play a role in poor water quality. Louisiana has over 285 stream segments listed on the 303(d) list of impaired steams.

Major efforts are now underway in Louisiana to improve the quality of surface waters. State and federal agencies, universities, industries, business and citizen groups have formed a wide variety of partnerships to move forward in solving water quality problems in the state. Water quality solutions are often complicated and require cooperation of all stakeholders.

Surface water quality management is approached by many state and federal agencies on a watershed basis. A watershed is simply an area of land drained by a particular set of streams and rivers. Louisiana has 12 major watersheds composed of smaller sub-watersheds. Watersheds often cross political boundaries. Several watersheds in Louisiana are shared with the neighboring states of Arkansas, Mississippi and Texas.

Most of the cleanup effort is being focused first on those watersheds in the state with the most serious water quality challenges. The Louisiana Department of Environmental Quality (LDEQ) Nonpoint Source Program is responsible for determining water quality problems in each watershed. Total Maximum Daily Loads (TMDL) are now being established for all watersheds in the state that do not meet their designated uses. Both the USEPA and LDEQ work to establish TMDLs in Louisiana. The amount of pollutants allowed to enter an impaired water body (a water body on the 303-d list) will be limited under the TMDL program. Municipalities, homeowners, farmers, business and industry will all be expected to minimize pollutant runoff in watersheds that contain impaired water bodies.

Helpful programs designed to promote good surface water quality in agricultural areas are managed by the Natural Resource Conservation Service (NRCS) in Louisiana. Many farmers and landowners participate in the Environment Quality Incentive Program (EQIP), Wetlands Reserve Program (WRP) and Conservation Reserve Program (CRP). These and other USDA

conservation program provide cost-share and technical assistance to help improve environmental quality.

Figure 1: River Basins of Louisiana

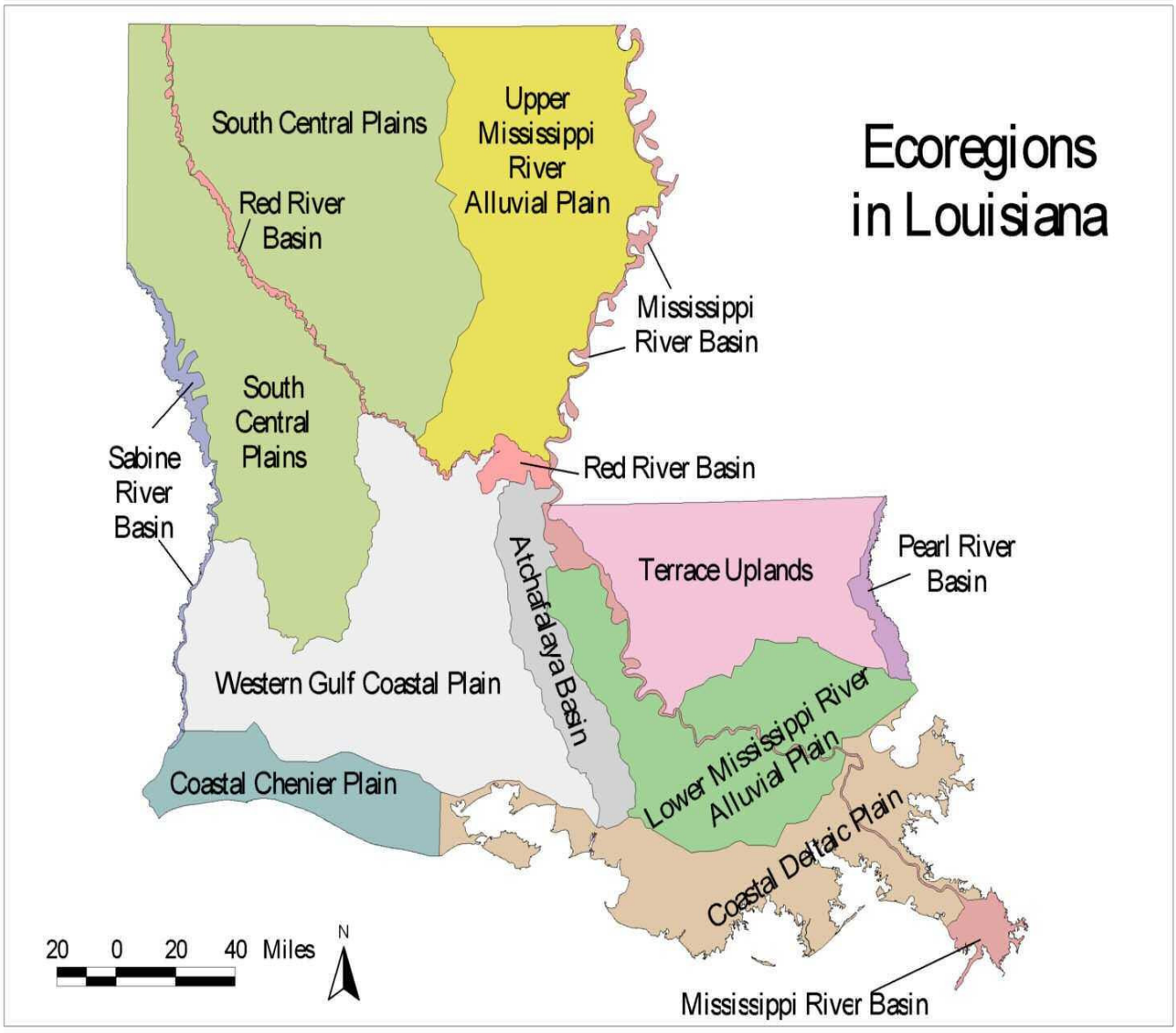


Figure 2: Ecoregions in Louisiana

2.0 DESCRIPTION OF LOUISIANA ECOREGIONS

2.1 Description of the Barataria River Basin:

The Barataria Basin lies in the Lower Mississippi River Alluvial Plain and Coastal Deltaic Plain Ecoregion of the state of Louisiana and is bounded on the north and east by the Lower Mississippi River, on the west by Bayou Lafourche and on the south by the Gulf of Mexico. The major receiving water body in the basin is Barataria Bay. The Barataria Basin consists largely of wooded lowlands and fresh to brackish marshes, with some saline marsh on the fringes of Barataria Bay. Elevations in this basin range from minus two to four feet above sea level.

2.2 Description of Bayou Segnette Watershed

Bayou Segnette is located in southern Louisiana in the Barataria Basin south of New Orleans. Bayou Segnette begins along the south edge of Westwego and extends generally southward for approximately 12 miles to Bayou Villars. The northern and northeastern boundaries of the subsegment are formed by levees that protect Westwego and other developed areas from flooding due to back water from the Gulf of Mexico. This subsegment is not heavily populated, but is adjacent to heavily populated areas. Subsegment 020701 includes the entire length of Bayou Segnette and covers an area approximately 35 square miles. Bayou Segnette receives runoff from within subsegment 020701 as well as runoff from Westwego and other developed areas where runoff is pumped over the levees at 5 pumping stations along the north and northeast edges of the subsegment.

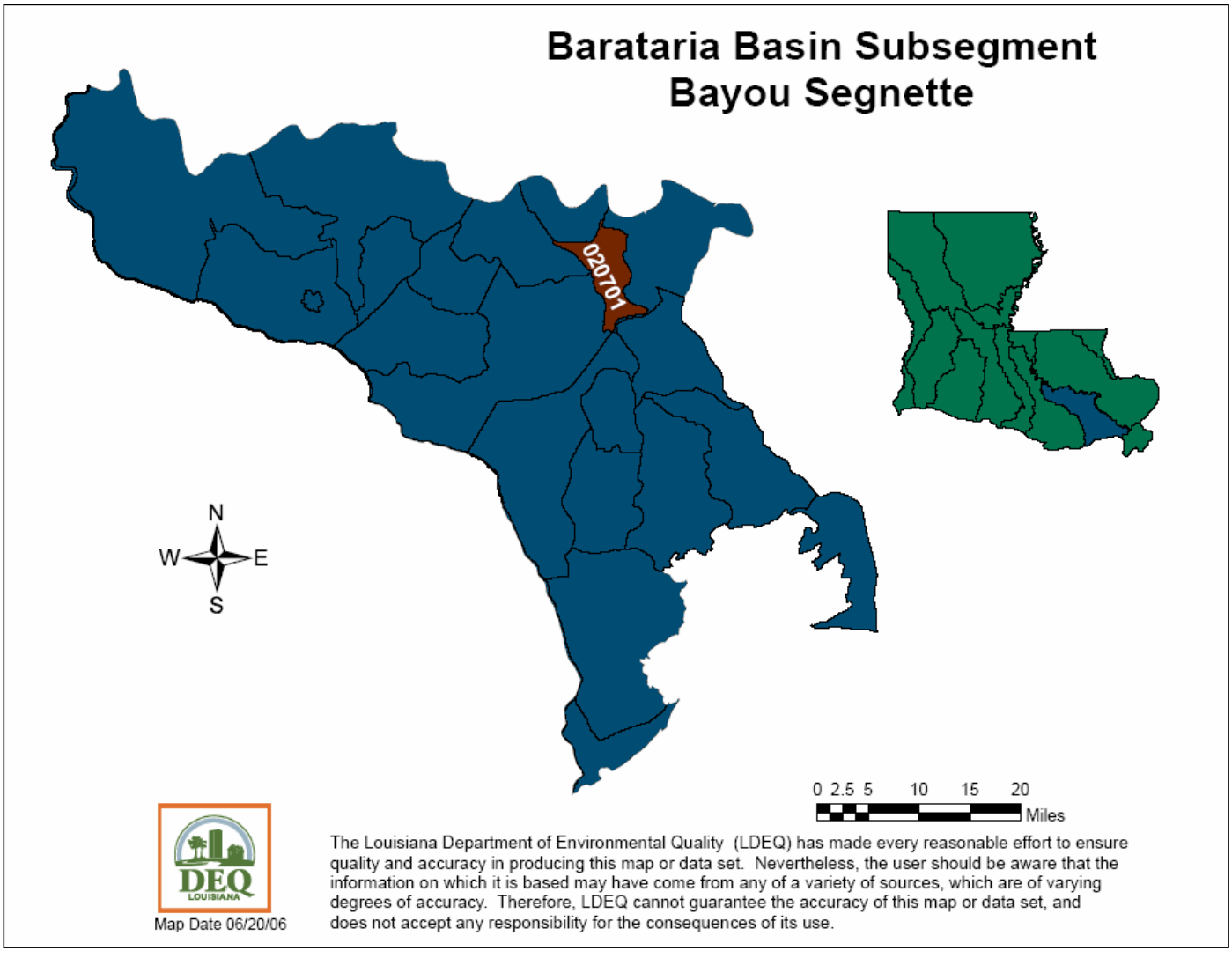
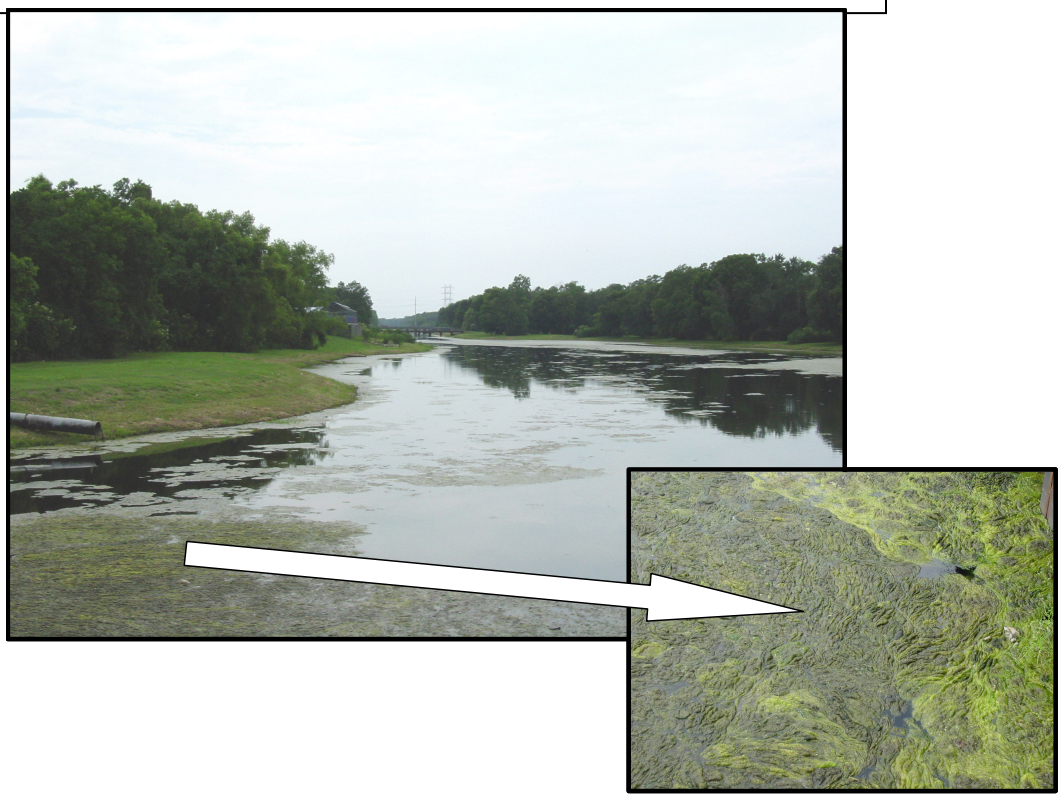


Figure 3: Location of Bayou Segnette in Barataria Basin

Figure 4: Bayou Segnette Pumping Station with Wastewater



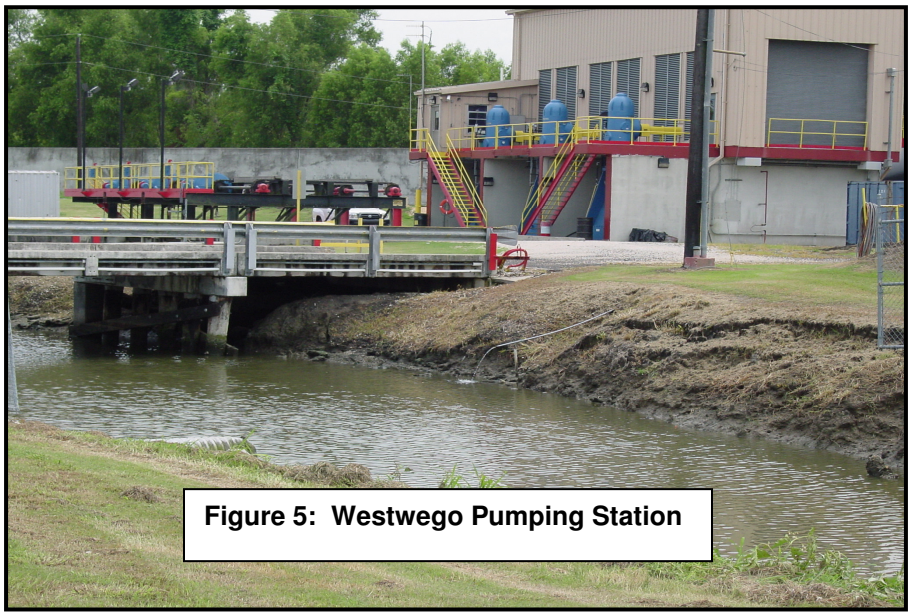


Figure 5: Westwego Pumping Station

Name of Pumping Station	Receiving Water	Pumping Capacity	Area Draining to Pump Station	Other Miscellaneous Information
Bayou Segnette	Bayou Segnette	936 cfs	5,170 acres	Some of the runoff within this drainage area probably flows westward in Main Canal and is pumped into Lake Cataouatche
Westwego 1	Bayou Segnette	300 cfs	1,816 acres is combined drainage area for Westwego 1 & 2 (drainage is interconnected)	Westwego 1 is a backup for Westwego 2 (it is operated only when Westwego 2 can not keep water levels low enough)
Westwego 2	Bayou Segnette	936 cfs		
Westminster	Unnamed canal draining to Bayou	1,248 cfs	4,041 acres is combined drainage area for Ames and Westminster (drainage is interconnected)	Westminster is a backup for Ames (it is operated only when Ames can not keep water levels low enough)
Ames	Millaudon Canal (drains to Bayou Segnette)	1,930 cfs		

Table 1: Pumping Stations Affecting Bayou Segnette

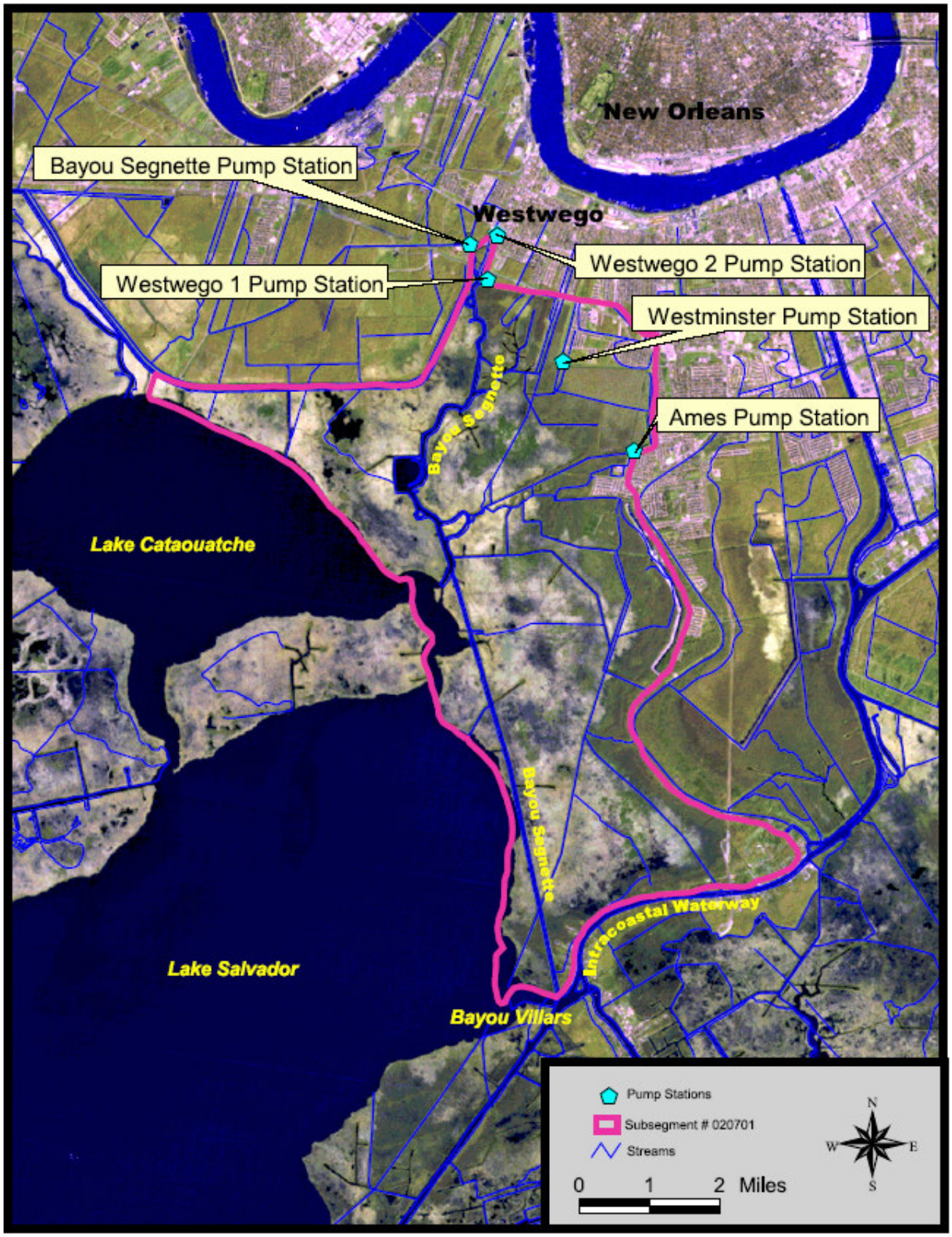


Figure 6: Bayou Segnette Subsegment Map of Pumping Stations

Bayou Segnette has numerous connections with the surrounding marshes and with other water bodies (e.g., Lake Cataouatche, Lake Salvador, canals along the east side of Bayou Segnette, Bayou Villars on the south end). Some of the flow from the upper end of Bayou Segnette may be directed into Lake Salvador. Bayou Segnette is influenced by tides from the Gulf of Mexico and is also affected by wind tides.

2.3 Watershed Land and Designated Use Activities

Figure 7: Bayou Segnette Waterway and Hiking Trail

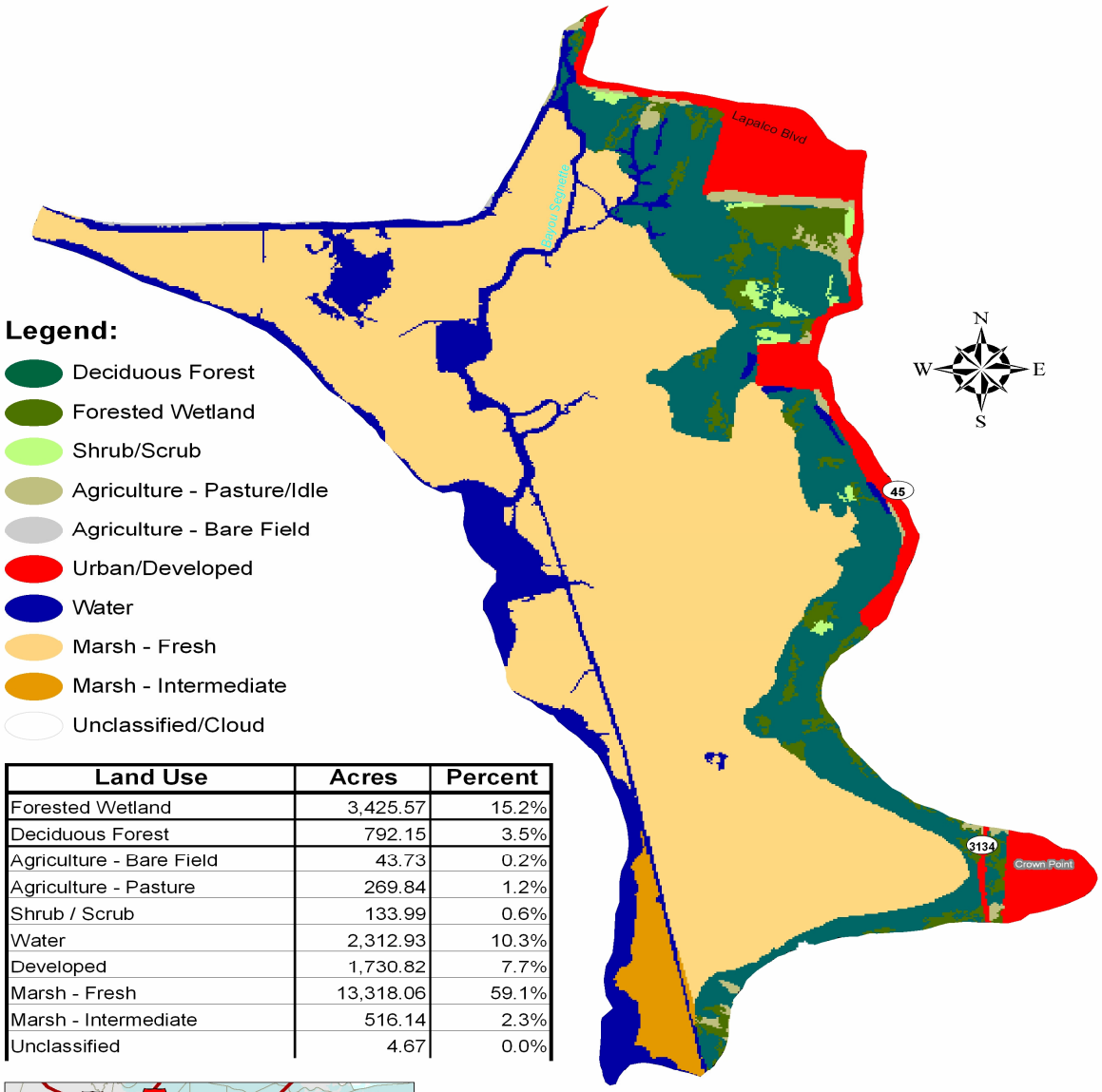
The predominant land uses in the Bayou Segnette subsegment are freshwater marsh and wetland forest. Most of the urban/residential land is along the outer edges of the subsegment, except for some camps concentrated along the middle portion of Bayou Segnette.

Land Use Type	Percent of Total Area
Fresh Marsh	43.0%
Intermediate Marsh	10.3%
Wetland Forest Deciduous	22.2%
Upland Forest Deciduous	0.4%
Upland Forest Mixed	0.7%
Wetland Scrub/Shrub Deciduous	2.0%
Wetland Scrub/Shrub Evergreen	2.0%
Upland Scrub/Shrub Mixed	1.0%
Agriculture/Cropland/Grassland	1.6%
Vegetated Urban	4.1%
Non-vegetated Urban	0.0%
Wetland Barren	0.0%
Upland Barren	0.0%
Water	12.7%
TOTAL	**100%**

Table 2: Land Use for Bayou Segnette

2005 Land Use / Land Cover for Bayou Segnette

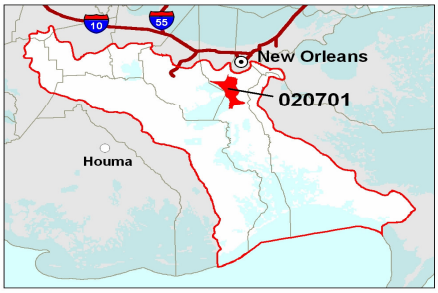
LDEQ Basin Subsegment 020701



Legend:

- Deciduous Forest
- Forested Wetland
- Shrub/Scrub
- Agriculture - Pasture/Idle
- Agriculture - Bare Field
- Urban/Developed
- Water
- Marsh - Fresh
- Marsh - Intermediate
- Unclassified/Cloud

Land Use	Acres	Percent
Forested Wetland	3,425.57	15.2%
Deciduous Forest	792.15	3.5%
Agriculture - Bare Field	43.73	0.2%
Agriculture - Pasture	269.84	1.2%
Shrub / Scrub	133.99	0.6%
Water	2,312.93	10.3%
Developed	1,730.82	7.7%
Marsh - Fresh	13,318.06	59.1%
Marsh - Intermediate	516.14	2.3%
Unclassified	4.67	0.0%



Barataria Basin

Date: December 12, 2005
Map Number: 200601012
Projection: UTM Zone 15, NAD 1983
Sources: LDEQ 2005 Barataria Basin Land Use Classification,
LDWF & NBS 2001 Louisiana Coastal Marsh-Vegetative Type Map,
LOSCO 2004 TIGER/Line Hydrographic Polygons for Louisiana,
LOSCO 2004 TIGER/Line Places for Louisiana,
LDEQ 2004 Basin Subsegments,
ESRI GDT Streams, GDT roads, LDOTD Parish Boundaries

0 1 2 3 Miles

0 1 2 3 Kilometers

Designated Uses:

Subsegment 020701 has three designated uses; Primary Contact Recreation, Secondary Contact Recreation, and Propagation of Fish and Wildlife. Bayou Segnette was listed as impaired on both EPA 1999 Court Ordered 303 (d) list for Louisiana and the LDEQ Final 2002 303 (d) list. The subsegment was not supporting its designated use of fish and wildlife propagation.

Subsegment Number:	020701
Subsegment Name:	Bayou Segnette – Origin to Bayou Villars
Designated Uses:	A, B, C
Criteria	**Numerical Criteria**
DO	5.0 mg/L
Chloride	600 mg/L
Sulfate	100 mg/L
pH	6.0 – 8.5
Bacteria	*see note 1 below
Temperature	32^0 C
TDS	1,320 mg/L

Table 3: Subsegment Designated Uses and Criteria

A – Primary Contact Recreation; B – Secondary Contact Recreation; C – Propagation of Fish and Wildlife; D – Drinking Water Supply; E – Oyster Propagation; F – Agriculture; G – Outstanding Natural Resource Water; L – Limited Aquatic Life and Wildlife Use
(Note 1 – 200 colonies/100 mL maximum log mean and no more than 25% of samples exceeding 400 colonies/100mL for May through October; 1000 colonies/100mL maximum log mean and no more than 25% of samples exceeding 2000 colonies/100mL for November through April**)**

3.0 NONPOINT SOURCE POLLUTION

Nonpoint source pollution (NPS) is water pollution, which occurs from many diverse areas of human activity within watersheds. It is transported by the storm water system or other surface water flows to local streams and rivers. In contrast, a particular ongoing discharge from a wastewater plant or industrial facility is considered a point source of water pollution.

NPS of streams and surface water is growing in importance as a national environmental issue. Unlike water pollutants that come from a single-point source (such as factories or wastewater treatment plants), nonpoint source pollutants originate from a variety of locations and are carried into storm drainage systems and creeks by storm water and other runoff. There are no treatment plants to manage nonpoint source pollution in our creeks, streams and rivers. Prevention is the most effective way to reduce, minimize, and eliminate storm water pollution.

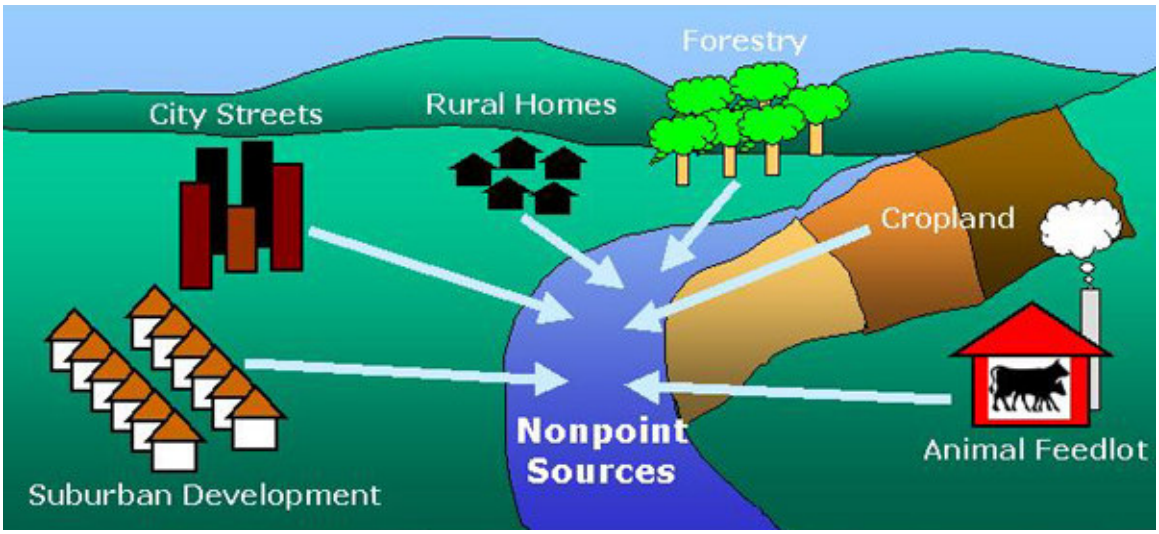


Figure 9: Nonpoint Sources of Pollution

The major sources of NPS pollution in Louisiana are related to land use activities that occur throughout watersheds and include: (1) agriculture, (2) forestry (silviculture), (3) urban runoff, (e.g., from construction sites, roads and highways, septic systems), (4) hydromodification activities, (5) sewage and (6) resource extraction (e.g., mining). Atmospheric deposition is also a source of NPS pollution. Examples of pollutants associated with specific land use activities include:

- Excess pesticides and fertilizers from agricultural lands, urban lawns, and parks;
- Oil, grease, heavy metals, and chemicals from urban streets, parking lots, and industrial sites;
- Sediment from improperly managed construction sites, crop and forest lands, abandoned roads, and eroding stream banks;
- Bacteria and nutrients from livestock, pet wastes, and faulty septic systems; and
- Other pollutants (e.g., salt from irrigation practices, acid from abandoned mines).

NPS pollution in the Bayou Segnette Watershed is a result of suburban and urban water runoff. This type of runoff is due to business, residential, and recreational (e.g., parks, camping grounds) areas.

3.1 Sources of Nonpoint Source Pollution

The most common problem of NPS pollution in the Bayou Segnette watershed is urban runoff. Urban runoff is a problem where the growth of populations expand into forested or wetland areas with impervious roads and roofs that causes high flow volumes to increase by a factor of

four or five times. Urbanization replaces the natural vegetative cover in a watershed with impervious surfaces and causes runoff to be the dominant hydrologic factor. Sediment and pollutants generated by human activities are deposited on the impervious surfaces between storm events and can be washed into streams by storm runoff. This erodes natural stream channels below, produces sediment, and produces a hydrologic overload on all structures downstream. The drainage control system is then altered by sediment accumulation in streams; and ultimately pipes, ditches and bridges can be washed out. These inputs to the stream modify physical, chemical, and biological pathways and processes in the aquatic ecosystem. Human influences impact stream ecology with respect to flow regime, habitat structure, water quality, and biotic interaction.

Wetlands that would normally help relieve flooding by themselves at high flows, are often drained and filled in the process of settlement. In clearing for development the tree canopy is reduced. Trees evaporate intercepted rain and snow. Rain is also evaporated by transpiration as tree roots take up soil moisture, which tends to make the soil dry. With abundant tree cover, soil generally has more water storage capacity to take up the first part of a rain. Therefore, trees are important in reducing flooding.

Public education is also a proactive approach to many nonpoint source pollution problems. Education may accelerate a greater concern about the environment, and thereby encourage the community to take action without additional regulation. Awareness of these problems is needed along with education about the various Best Management Practices (BMPs) for business owners and homeowners in general. More information on Nonpoint Source Pollution (NPS) can be found at LDEQ's NPS website at http://nonpoint.deq.louisiana.gov/wqa/default.htm.

3.2 Bayou Segnette Nonpoint Pollution Sources

Suspected nonpoint sources for subsegment 020701 have been listed in the EPA Modified Court Ordered 303 (d) List for Louisiana (EPA 2000). These sources include collection system failure, inflow and infiltration, urban runoff/storm sewers, other urban runoff, and natural sources. Collection system failure refers to overflows or other failures of wastewater collection systems. Inflow and infiltration refers to ambient stormwater leaking into sewer pipes, which can cause the waste water collection system to overflow, or the wastewater treatment plant to be overloaded (resulting in some waste water bypassing the treatment facility and entering the receiving water without treatment). According to a report by LDEQ (1990), "the upper section of Bayou Segnette is impacted by sewage treatment plant bypasses during periods of heavy rain."

Subsegment Number	Water body Description	Suspected Sources	Suspected Causes	Priority Ranking (1=highest)
020701	Bayou Segnette – Origin to Bayou Villars	❖ Municipal point sources ❖ Collection system failure ❖ Inflow and infiltration ❖ Urban runoff/storm sewers ❖ Other urban runoff ❖ Natural sources	❖ Organic Enrichment/low DO ❖ Pathogen Indicators ❖ Oil & Grease ❖ Nutrients	3

Table 4: 303 (d) Listing (EPA 2000)

Another nonpoint source that was not accounted for in the EPA 303 (d) list is the domestic wastewater from approximately 150 camps and house along the banks of Bayou Segnette. These camps and houses are all located within approximately 1.3 miles of the middle portion of Bayou Segnette. It is not known whether these camps and houses have individual wastewater treatment systems (package plants) or whether they discharge untreated wastewater to the bayou.

Figure 10: Cabins along Bayou Segnette

3.3 Urban Development Impacts

Figure 11: Residential Drainage System near Bayou Segnette State Park

The most significant NPS effects on many of the region's waters are from existing urban development and from the ongoing conversion of other land uses to urban uses. Impacts associated with urbanization include:

- Elimination of natural channels, including the loss of wetlands, wildlife, fisheries and riparian habitat;
- Increased sedimentation due to construction activities;
- Unmitigated changes in hydrology that upset the geomorphic equilibrium of streams, causing destabilization and erosion of channels and more frequent flooding;

- Introduction and perpetuation of non-native invasive species of plants and animals (from landscaping, aquaria, etc.); and
- Increased pollutant loads associated with urban human activity (nutrients, pathogens, pesticides, PCBs (polychlorinated biphenyl [pathogenic]), PAHs (polycyclic aromatic hydrocarbon [carcinogenic]), petroleum, salts, nitrates, metals, trash, sediment, etc.).

3.4 Hydromodification Impacts

Most new urban development projects involve some level of hydromodification. Hydromodification impacts are also caused by the construction of major highways and railways, utility projects, marinas, and flood protection projects for existing urban development. The adverse impacts to water quality and beneficial uses associated with hydromodification projects in the Bayou Segnette Watershed include:

- Elimination of natural channels and associated habitat complexity, including loss of wetlands, wildlife, fisheries and riparian habitat
- Increased sedimentation due to construction activities
- Changes in hydrology that upset the geomorphic equilibrium of streams causing destabilization and erosion of channels
- Increased water temperatures
- Introduction and perpetuation of non-native invasive species of plants and animals
- Decreased natural water quality purification functions that could otherwise intercept and assimilate or detoxify pollutants
- Petroleum discharges from fueling stations and from vessels
- Illicit sewage discharges from vessels and from faulty pump out facilities
- Release of biocides from boat hull paint through passive leaching and in-water hull cleaning activities
- Release of pollutants during topside cleaning, maintenance, and repair activities
- Discharges of fish waste, spent zinc anodes, trash, and other vessel material

3.5 Programs

USEPA and NOAA directed the states to develop a Coastal Nonpoint Source Pollution Program, which would include best management practices for marinas. LDEQ and LDNR continue to make progress in theses areas.

The *NPS Program with LDEQ* funded a composting project entitled “Seafood Composting” in 1997. A fish waste disposal system was developed so that fish waste would not be deposited directly into Coastal Waters. Composting of fish waste is an alternative to other methods of disposal which would are more costly and time consuming. This project was implemented in the Lafitte-Barataria area of Louisiana which has a large amount of commercial and recreational fishing.

One of the best management practices to be implemented at all coastal marinas was a fish waste disposal system so that the waste would not be deposited in coastal waters. Decomposition of these wastes utilizes dissolved oxygen, which may cause water quality problems. Often sports and commercial fishermen clean their catch on dockside and the waste may be collected and discarded directly into the water body at the end of the day. In order to discourage fish marina operators and fish processors from discarding fish cleaning/processing residuals directly into the water bodies, a method by which fish processing waste could be disposed of was needed. In the absence of other economical and viable technologies, composting emerged as a practical solution to the waste disposal problem. Low-technology composting methods have been evaluated as a means for fish processing disposal at marina sites.

In 1997, LSU worked with LDEQ on implementing a fish composting demonstration project in the Lafitte-Barataria area, on Bayou Barataria. This area was selected due to its thriving commercial and recreational fisheries. Lafitte and Barataria are old commercial and recreational fishing communities located within the marshes of south Louisiana. A three-bin composting system was installed at the marina in December 1997 and fish residuals and bulking material (hardwood bark and rice hulls) were added on a routine basis. Fish residuals were added to the composting system 7 times during the testing period. Fresh bark and rice hulls were added 5 times during the same testing period. The results of the project indicated that the composting systems were very effective with full decomposition occurring within 75 days. An educational-outreach session was held to illustrate the results of the project to other marina operations within the basin (http://nonpoint.deq.louisiana.gov; under *319 Projects*).

The Coastal NPS Program with LDNR developed the Louisiana Clean Marina Program. The Louisiana Clean Marina Program promotes and celebrates voluntary adoption of measures to assist marinas and recreational boaters in protecting Louisiana's waters. Designated "clean marinas" are recognized as environmentally responsible businesses and enjoy the positive goodwill and economic feedback of being able to promote their business as: A LOUISIANA CLEAN MARINA.

Figure 12: Boat Docks along Bayou Segnette

Marina operators adopt Best Management Practices (BMPs) in the operation and maintenance of their marinas. These BMPS are provided to operators in a guidebook and in other educational materials. In addition, technical help and advice is provided by members of the various Louisiana Clean Marina member committees.

Clean Marina Certification is achieved after a marina has met a minimum score on the checklist criteria based on BMP practices or options. Operators will conduct self-assessments which will be verified by representatives of the Certification Committee. Certification is maintained through a yearly re-evaluation of marina best management practices (http://dnr.louisiana.gov/crm/coastmgt/interagencyaff/nonpoint/marina_cleanmarina.asp).

4.0 BAYOU SEGNETTE HISTORICAL WATER QUALITY DATA

The water quality data that LDEQ used to assess Subsegment 020701 were ambient monitoring data collected at LDEQ station 0296 (Bayou Segnette near Westwego). Data were collected at this station between 1991 and 2000. The DO data for this station had values that were below the water quality standard of 5.0 mg/L.

Table 5: Comparison of Historical and Survey Data

	Historical data at LDEQ station 0296 for May and June (16 samples)	*Historical data at LDEQ station 0296 for May and June (16 samples)*	*Survey data at BS-1 on 5/22/03*
PARAMETER	**RANGE**	**MEDIAN**	
Temperature (C)	22.3 – 33.6	27.6	27.5
DO (mg/L)	1.8 – 8.7	3.3	2.5
Conductivity (umhos)	188 – 4837	802	665
$NO_2 + NO_3$ (mg/L of N)	0.06 – 2.84	0.26	0.24
TKN (mg/L of N)	0.91 – 2.80	1.90	1.88
Total Phosphorus (mg/L)	0.07 – 0.82	0.53	0.58
TOC (mg/L)	7.5 – 18.6	14.9	13.4

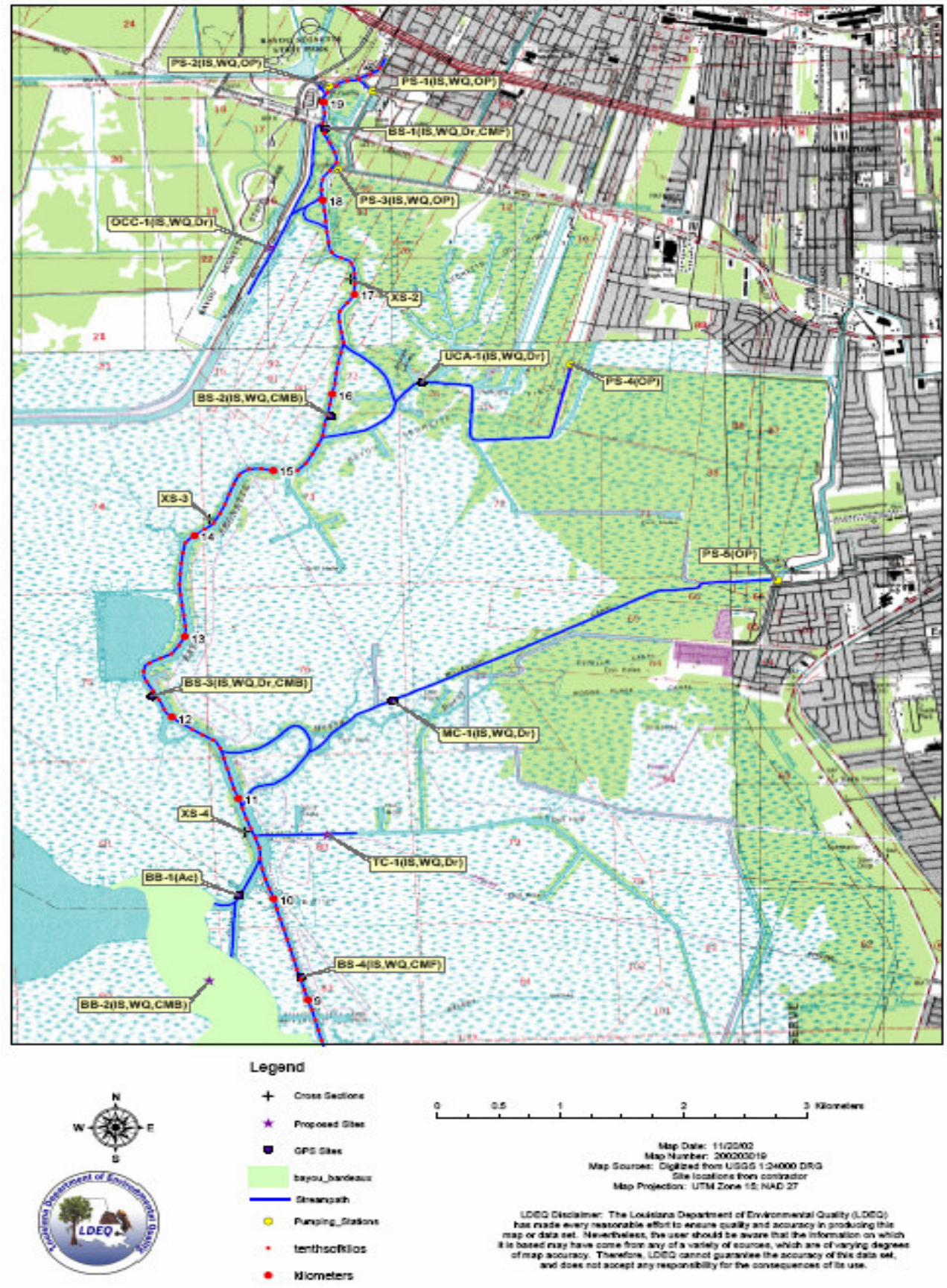


Figure 13: Pumping Station Designations in Bayou Segnette

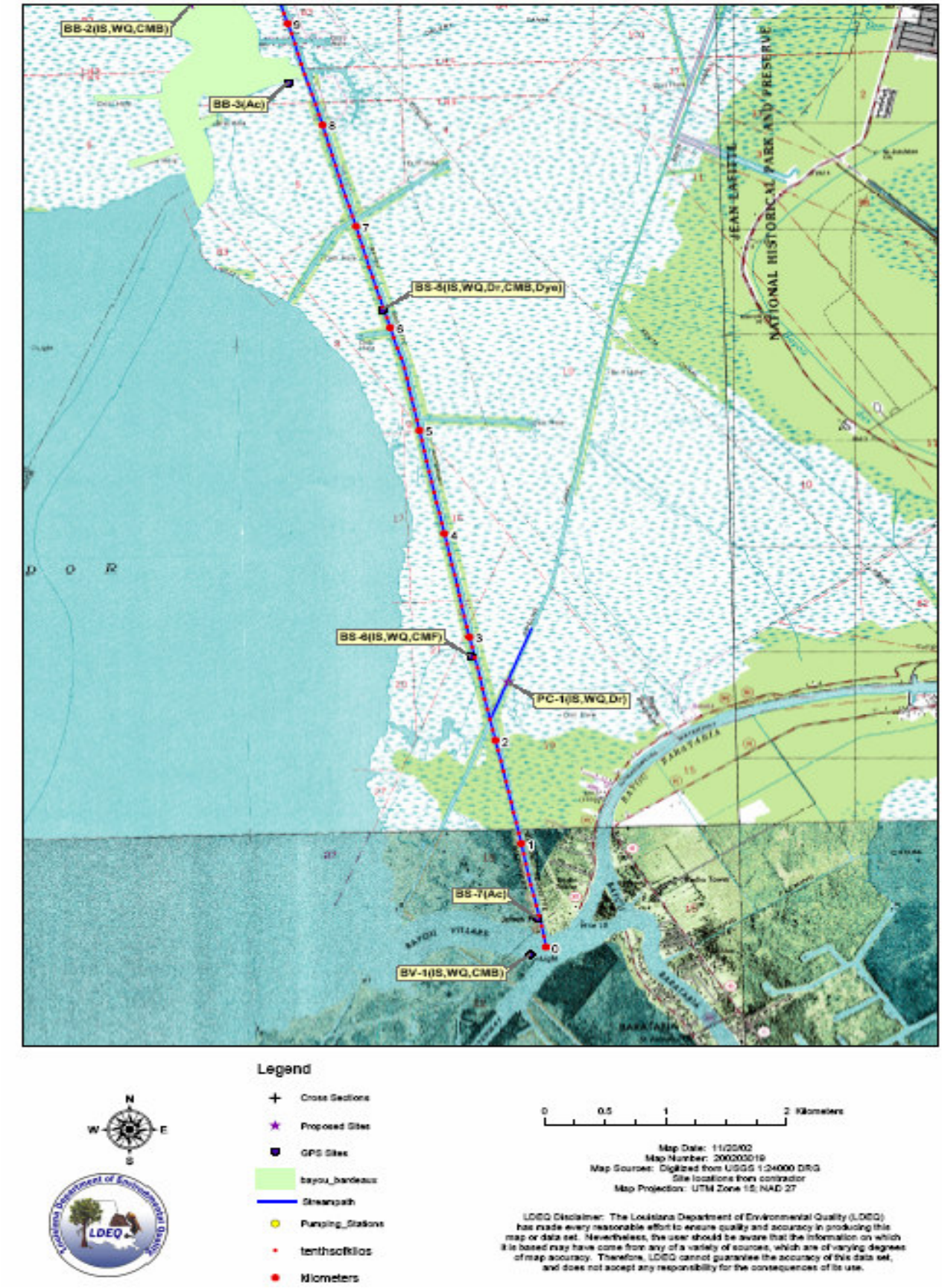


Figure 14: Pumping Station Designations in Bayou Segnette (2)

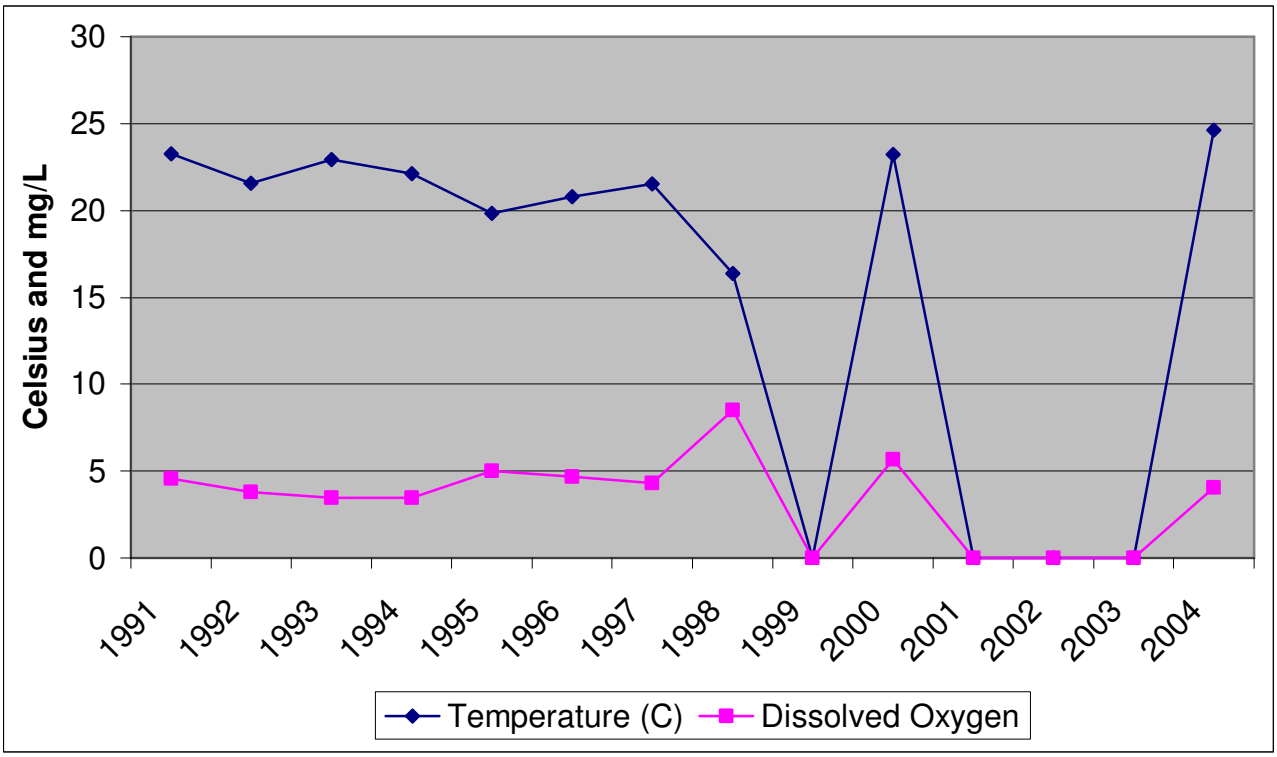


Figure 15: Dissolved Oxygen Values for Bayou Segnette near Westwego, LA
*Data unavailable for 1999, 2001, 2002, and 2003

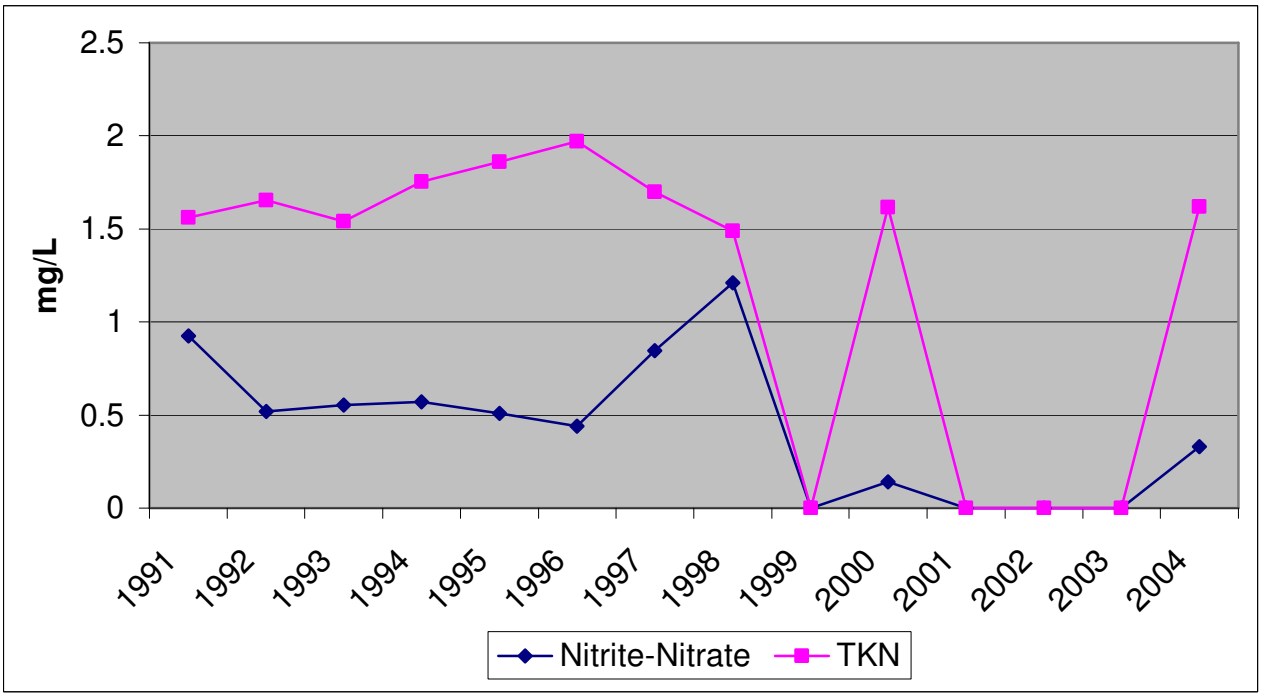


Figure 16: NO_2-NO_3 and TKN Values for Bayou Segnette near Westwego, LA
*Data unavailable for 1999, 2001, 2002, and 2003

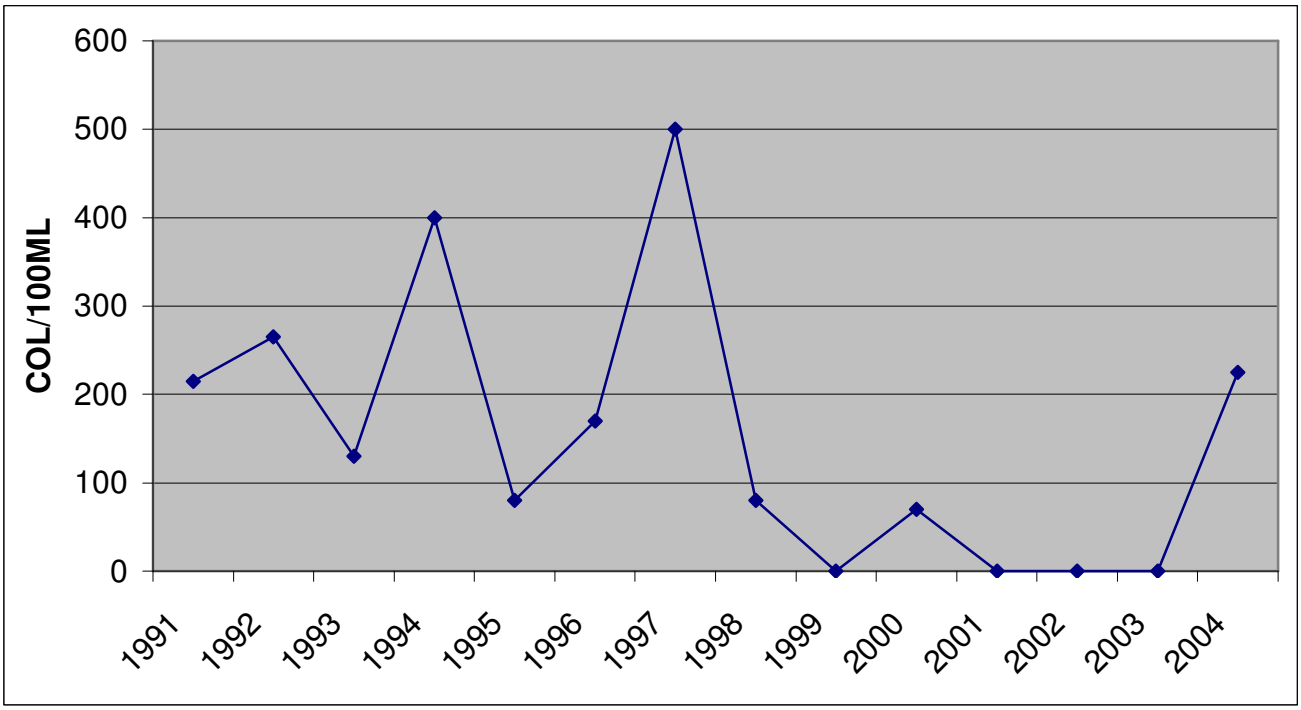


Figure 17: Fecal Coliform Values for Bayou Segnette near Westwego, LA
*Data unavailable for 1999, 2001, 2002, and 2003

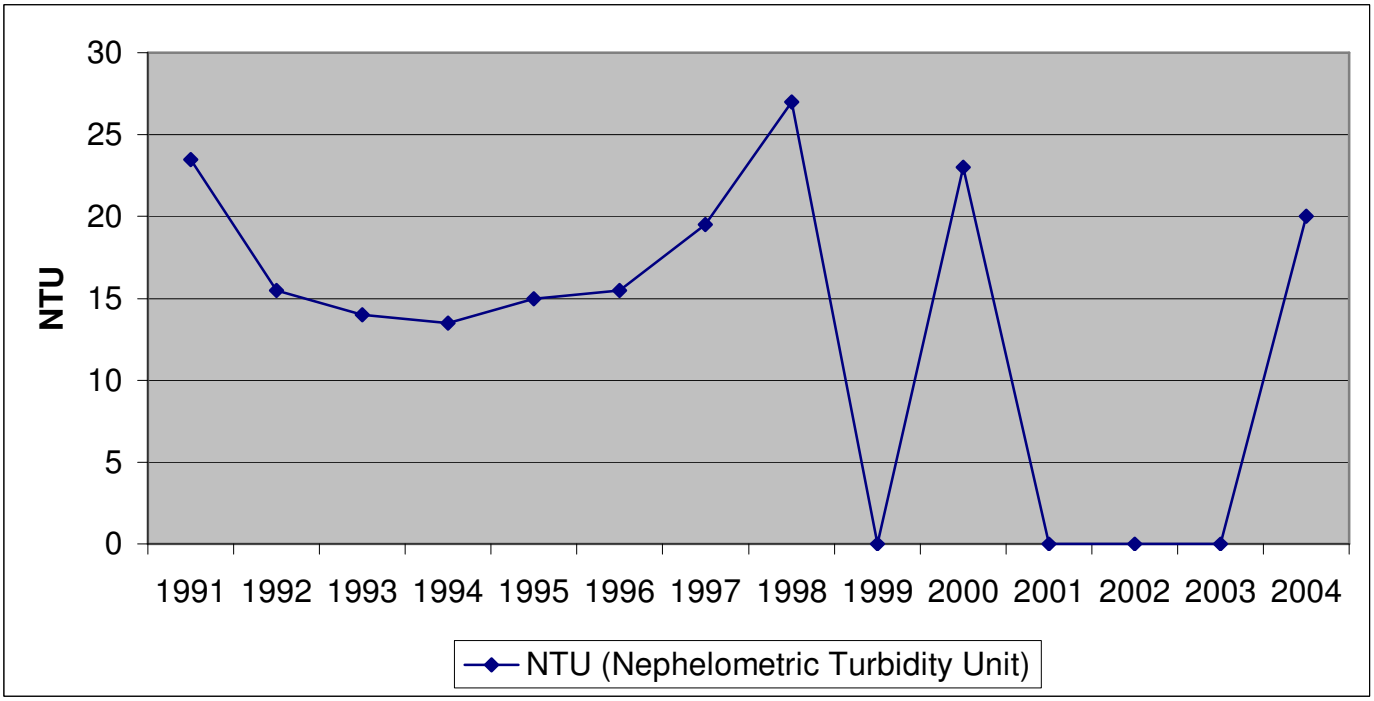
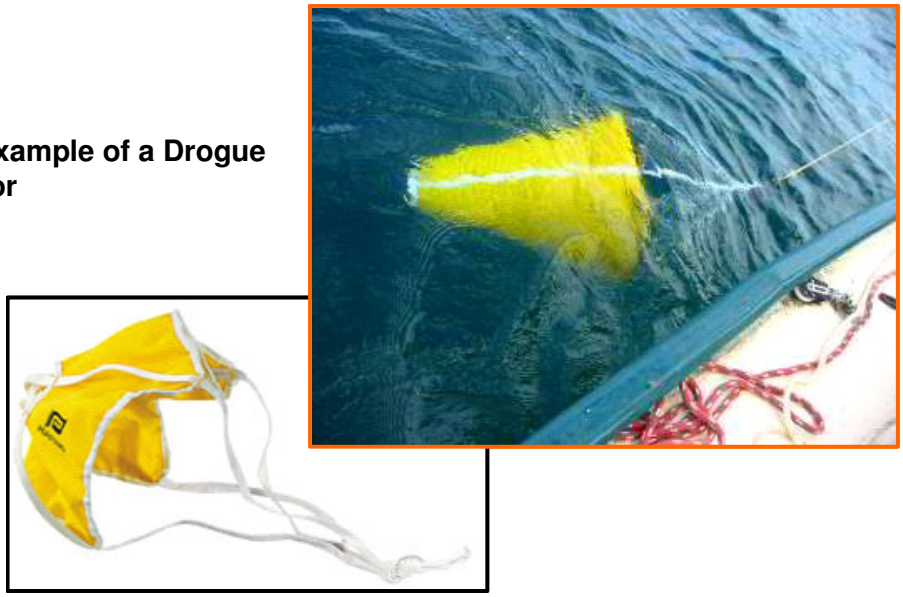


Figure 18: Turbidity Values for Bayou Segnette near Westwego, LA
*Data unavailable for 1999, 2001, 2002, and 2003

An intensive field survey was conducted by LDEQ personnel on Bayou Segnette during the week of May 19-23, 2003. The purpose of this survey was to gather information about the subsegment and collect data that would be needed to set up and calibrate a water quality model. The field data that were collected included water quality samples and in situ measurements, continuous in situ monitoring, cross sections, velocity measurements with drogues (i.e., sea anchor), an acoustic Doppler flow measurement, and a dye study for tie of travel and dispersion.

Figure 19: Example of a Drogue or Sea Anchor



Continuous in situ monitoring was measured during May 15-22, 2003. Water quality samples and in situ data were collected for most of the sites on May 22. Due to rainfall in the area on May 20-21, water quality samples at some of the boundary stations were collected on both May 21 and May 22 to characterize inflows entering the bayou from the pump stations. Rainfall totals of 1.5 to 3.9 inches were reported at the pump stations during May 20-21, 2003.

The water quality sampling data and the in situ data collected with the water quality samples revealed that only 4 out of 25 (16%) instantaneous DO readings were above the water quality standard of 5.0 mg/L. The 4 DO readings above the standard were taken in Bayou Bardeaux in Bayou Villars, both of which represent surrounding water quality and are not indicative of water quality in Bayou Segnette.

Because Bayou Segnette has no continuous point source loading, it experiences the highest loading of pollutants during storm conditions due to urban runoff pumped from outside the subsegment and nonpoint source runoff from within the subsegment. The model calibration, the LDEQ and USGS historical water quality data, and the intensive survey sampling results all show that the urban runoff from the pumping stations has a significant impact on DO in parts of Bayou Segnette. In the Bayou Segnette calibration, the minimum DO occurred at the upstream end of the model near the location where the Westwego Pump Station 2 was pumping poor quality urban runoff into the bayou. At this location, there is virtually no upstream or immediately adjacent watershed to provide better quality runoff to dilute the pumped water.

Therefore, larger volumes of pumped water (i.e., larger storms) would be expected to result in higher BOD concentrations and possibly lower DO concentrations at the upper end of Bayou Segnette.

In order to identify any existing correlation between DO in the bayou and volume of urban runoff being pumped, the LDEQ historical DO data were plotted against 3-day antecedent rainfall at the New Orleans Audubon station (located just across the Mississippi River from Westwego). Low DO values occurred under a wide range of hydrologic conditions.

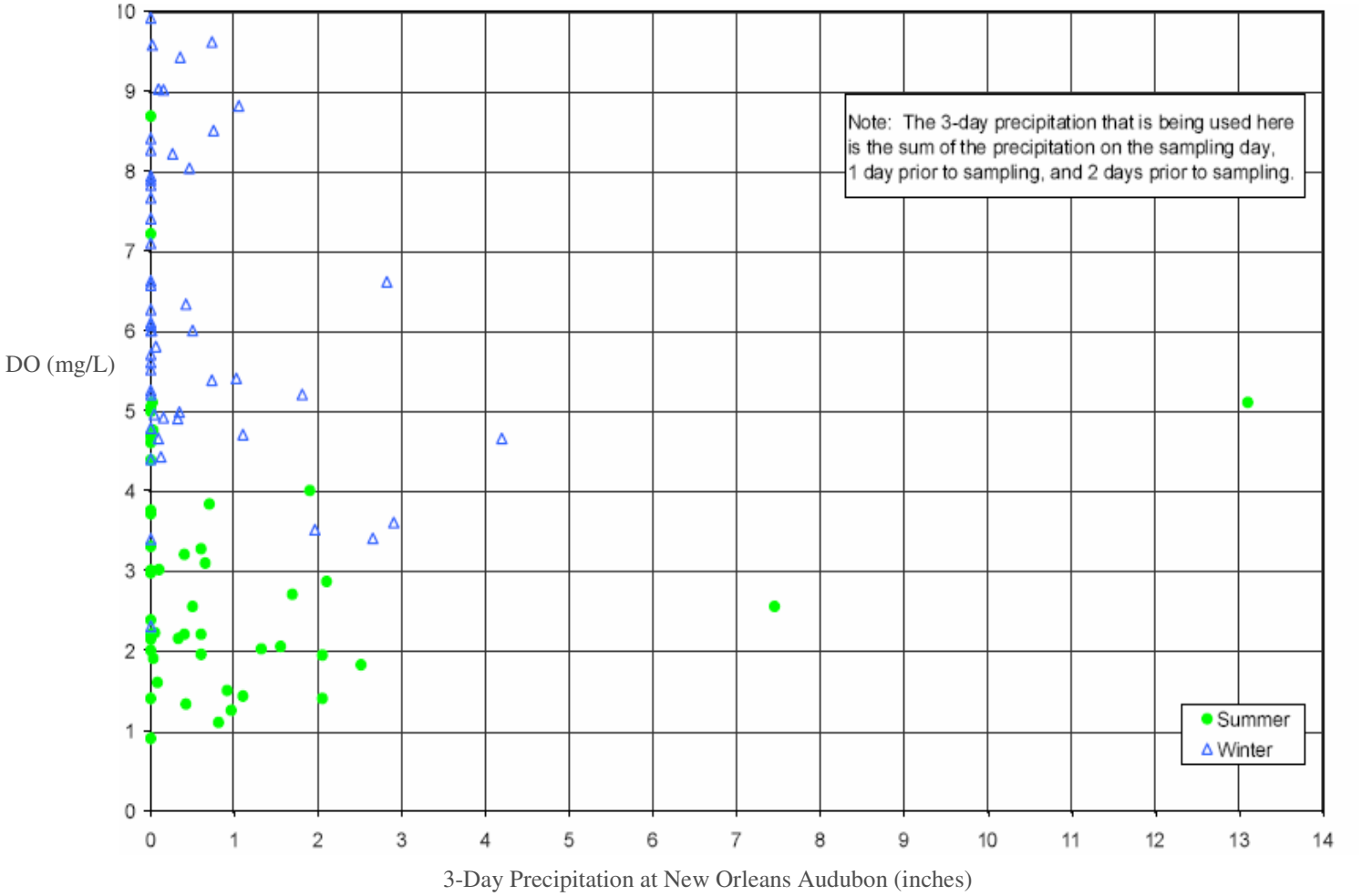


Figure 20: DO at Station 0296 vs. 3-Day Precipitation

The intensive survey from May 2003 was conducted after a storm event for which rainfall totals reported at the pump stations ranged from 1.5 to 3.9 inches. The hydrologic conditions from the intensive survey were considered to be acceptable for critical conditions for this DO TMDL, which was based on the analysis of DO and rainfall and the water quality characteristics of the upper end of Bayou Segnette.

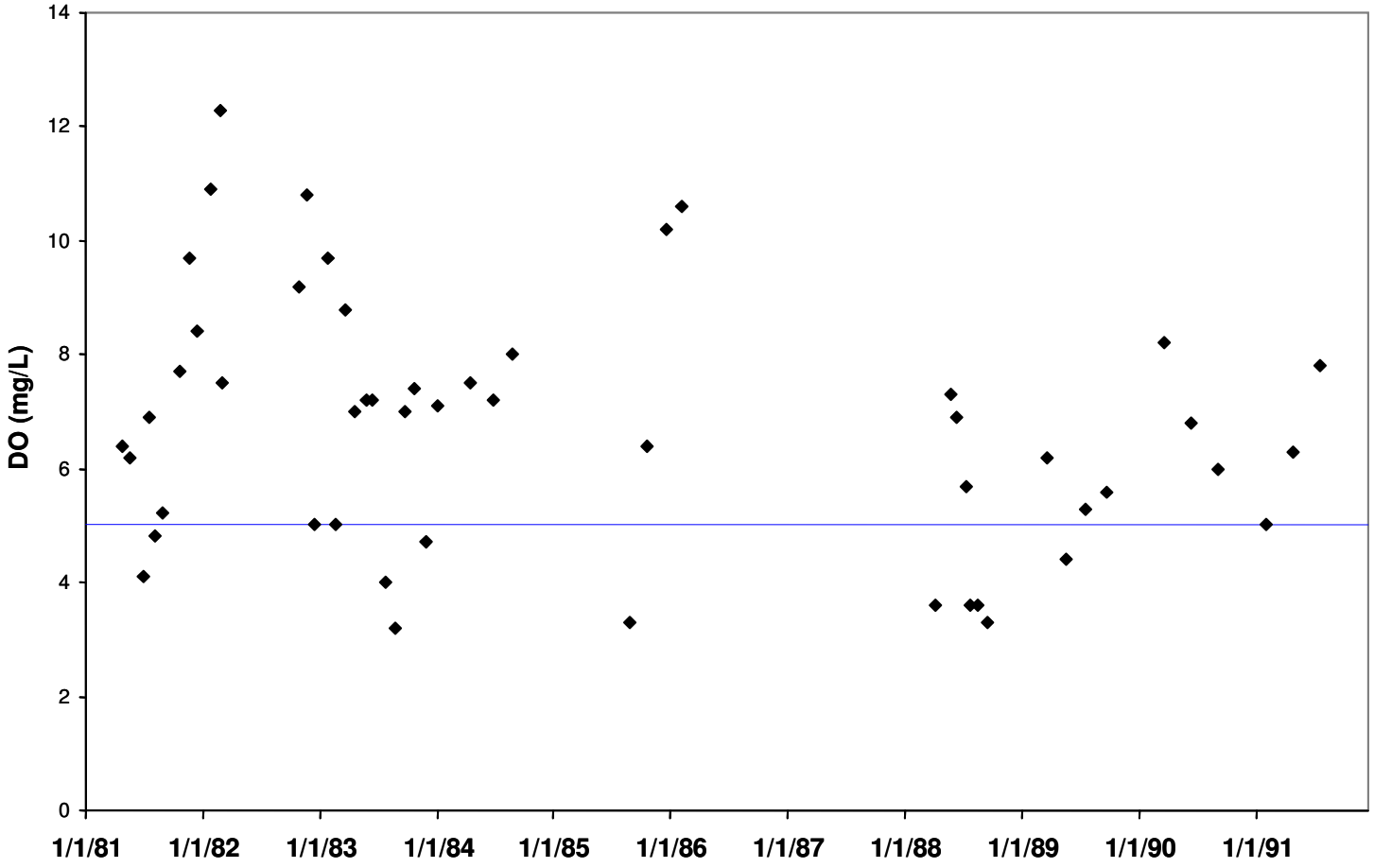


Figure 21: USGS DO Data for Bayou Segnette

Using the intensive survey conditions to represent critical hydrologic conditions was also supported by the fact that the morning DO values from the continuous monitoring at station BS-1 during May 21-22, 2003 (about 2 mg/L) were similar to the lowest DO values that have been historically observed at LDEQ station 0296 (1-2 mg/L).

The modeling incorporates various conservative assumptions that establish an implicit MOS. In addition, an explicit MOS of 20% was used for all man-made loads to account for future growth, safety, model uncertainty, and data inadequacies.

The nonpoint source values were calculated for each projection scenario using a load equivalent spreadsheet. An analysis was made of the calibration nonpoint source and SOD loads in terms of total loading in units of $g/m^2/day$ and compared to the reference stream loads in the same terms (which accounted for the width differences between the reference and the

modeled streams). Calibration values were used where they were smaller than reference stream values. The same spreadsheet also calculated load reductions for the tributary inflows.

LDEQ has collected and measured the CBOD and NBOD oxygen demand loading components for a number of years. These loads have been found in all streams including the non-impacted reference streams. It is LDEQ's opinion that much of this loading is attributable to runoff loads which are flushed into the stream during runoff events, and subsequently settle to the bottom in the slow moving streams. These benthic loads decay and breakdown during the year, becoming easily resuspended into the water column during the high temperature season. This season has historically been identified as the critical dissolved oxygen season.

LDEQ simulates part of the nonpoint source oxygen demand loading as resuspended benthic load and SOD. The calibrated nonpoint loads (CBODu, NBODu, and SOD) are summed to produce the total calibrated benthic load. The total calibrated benthic load is then reduced by the total background benthic load (determined from LDEQ's reference stream research) to determine the total manmade benthic loading. The manmade portion is then reduced incrementally on a percentage basis to determine the necessary percentage reduction of manmade loading required to meet the water body's dissolved oxygen criteria. These reductions are applied uniformly to all reaches sharing similar hydrology and land uses.

5.0 BAYOU SEGNETTE REFERENCE STREAM DATA

LDEQ's reference stream data were examined to identify reference streams that might be applicable for estimating background loads for Bayou Segnette. Although none of the reference streams are located in or near the Barataria basin, four reference streams were identified as having some characteristics (i.e., sediment type and velocity) similar to Bayou Segnette. The nonpoint source loads estimated by LDEQ for these four reference streams are shown in the table below. All of the reference streams were shallower than Bayou Segnette, but the four shown in the table are the four deepest LDEQ reference streams. Based on previous experience with DO TMDLs in Louisiana, the total nonpoint source loads for Saline Bayou and Beaucoup Bayou (3.9 to 4.0 g/m2/day) seemed unreasonably high as estimates of background loading for Bayou Segnette. Therefore, the background load for Bayou Segnette was set to 2.0 g/m2/day based on the estimated loads for Big Roaring Bayou and Indian Bayou.

	Big Roaring Bayou	Indian Bayou	Beaucoup Bayou	Saline Bayou Site 2-3
Sediment Type	Silt	Silt	Silt	Silt
Velocity During Survey (m/sec)	0.00	0.00	0.00	0.23
Depth during survey (m)	1.08	0.64	0.67	0.93
NPS CBODu load ($g/m^2/day$)	0.688	0.218	0.169	0.531
NPS NBODu load ($g/m^2/day$)	0.095	0.090	0.498	1.637
SOD at 20^0C ($g/m^2/day$)	1.45	1.52	4.20	2.25
Temperature During Survey (^0C)	20.15	20.82	16.45	16.11
SOD at Stream Temperature ($g/m^2/day$)	1.46	1.60	3.36	1.76
Total NPS load ($g/m^2/day$)	2.24	1.91	4.03	3.93
CBODu Concentration (mg/L)	3.48	2.94	2.72	1.60
NBODu Concentration (mg/L)	5.41	7.26	5.80	3.70

Table 6: Data from Selected LDEQ Reference Streams (Smythe 1999)

For the Bayou Segnette projections, it was assumed that reductions of CBODu and NBODu in tributary inflows would also result in improvements in the DO concentrations of the tributary inflows. Therefore, the DO concentrations for tributary inflows were set assuming that measured values from the survey (adjusted to daily averages) represented no reduction of nonpoint sources, 90% saturation represented complete reduction of man-made nonpoint sources, and 100% saturation represented complete reduction of man-made and natural nonpoint sources.

The load reductions that were required for the model to show the DO standard being met included both a complete elimination of man-made nonpoint sources and some reduction of background of nonpoint sources during summer. For each scenario, a uniform percent reduction was applied to all reaches in the model.

	Man-made Nonpoint Sources	Background Nonpoint Sources
Summer (May – October)	100%	34%
Winter (November – April)	71%	0%

Table 7: Summary of Nonpoint Source Load

7.0 TMDL RESULTS AND RECOMMENDATIONS

What is a TMDL?

Pollutants from a variety of sources have impaired the quality of some of Louisiana's lakes, rivers, and streams. However, since the signing of the federal Clean Water Act (CWA) in 1972, water quality has improved greatly, primarily through regulation of point source discharges. Although great strides have been made in restoring our state waters, there are still degraded lakes, streams, and rivers that need attention. Restoring their quality is crucial in maintaining a healthy environment and ensuring the sustainability of these waters for all to use and enjoy. Restoration can be done using TMDLs to monitor and regulate the amount of pollutants entering the water body. TMDLs are as follows:

- TMDL is an acronym for Total Maximum Daily Load. It determines the greatest amount of a given pollutant that a water body can receive without violating water quality standards and designated uses.
- TMDLs set pollution reduction goals that are necessary to improve the quality of impaired waters.
- A TMDL utilizes a watershed approach in determining the pollutant load that can be allowed in a given lake or stream. By taking a watershed approach, a TMDL considers all potential sources of pollutants, both point and non-point sources. It also takes into account a margin

of safety, which reflects scientific uncertainty and future growth. The effects of seasonal variation are also included.

- A TMDL is calculated using the following equation:

TMDL= WLA + LA + MOS + SV

Where: WLA= Waste Load Allocation (point sources)
LA= Load Allocation (non-point sources)
MOS= Margin of Safety
SV= Seasonal Variation

Section 303(d) of the Clean Water Act does not require the inclusion of an Implementation Plan as part of a TMDL. However, Louisiana Department of Environmental Quality (LDEQ) has taken the initiative to include Implementation Plans for TMDLs that have been developed for the Bayou Segnette Watershed.

Subsegment 020701 was listed as impaired on both the EPA 1999 Court Ordered 303(d) list for Louisiana and the LDEQ Final 2002 303(d) list. The subsegment was found to not be supporting its designated use of fish and wildlife propagation. Bayou Segnette was subsequently scheduled for TMDL development with other listed waters in the Barataria basin. According to the 1999 Court Ordered 303(d) list, the suspected causes of impairment included organic enrichment/low DO and nutrients; and the suspected sources were municipal point sources, collection system failure, inflow and infiltration, urban runoff/storm sewers, other urban runoff, and natural sources. This TMDL addresses the organic enrichment/low DO impairment and the nutrient impairment.

8.0 LDEQ's MONITORING PLAN

LDEQ has implemented a watershed approach to ambient water quality monitoring. Beginning in 2004 LDEQ changed from a five-year rotating monitoring cycle to a four-year cycle. This change allows for the same level of water quality monitoring over a shorter period of time. At the same time, it allows regional field staff who is responsible for the sampling to more evenly distribute their monitoring workload. The four-year cycle will also allow for a more balanced schedule of water quality assessments for Integrated Reporting (305(b) and 303(d)) purposes.

Within each basin, all monitored subsegments will be sampled over the year or years specified under each cycle period. Water quality assessments for the Integrated Report will be conducted for each basin following the last year of its monitoring period.

Sampling is conducted on a monthly basis or more frequently if necessary to yield at least 12 samples per site each year. Sampling sites are located where they are considered to be representative of the water body. Under the current monitoring schedule, targeted basins follow the TMDL priorities. In this manner, the first TMDLs will have been implemented by the time the first priority basins will be monitored again in the second four-year cycle. This will allow LDEQ to determine whether there has been any improvement in water quality following implementation of the TMDLs. As the monitoring results are evaluated at the end of each year, water bodies

may be added to or removed from the 303(d) list. The sampling schedule for the four-year cycle is shown below:

Basin	First 4-Year Cycle	Second 4-Year Cycle
Mermentau	2004, 2005, 2006, 2007	2008, 2009, 2010, 2011
Vermilion-Teche	2004, 2005, 2006, 2007	2008, 2009, 2010, 2011
Calcasieu River	2004,2005	2008,2009
Ouachita River	2004,2005	2008,2009
Barataria	2004,2005	2008,2009
Terrebonne	2004,2005	2008,2009
Mississippi River	2004,2005	2008,2009
Lake Pontchartrain	2006,2007	2010,2011
Pearl River	2006	2010
Red River	2004,2005,2006,2007	2008,2009,2010,2011
Sabine River	2006,2007	2010,2011
Atchafalaya River	2004,2005	2008,2009

Table 8: LDEQ Sampling Schedule

9.0 REGULATORY AUTHORITY

9.1 Federal Authority

Section 319 of the Clean Water Act (PL 100-4, February 4, 1987) was enacted to specifically address problems attributed to nonpoint sources of pollution. Its objective is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters (Sec. 101; PL 100-4), instructed the Governor of each State to prepare and submit a Nonpoint Source Management Program for reduction and control of pollution from nonpoint sources to navigable waters within the State by implementation of a four-year plan (submitted within 18 months of the day of enactment).

9.2 State Authority

In response to the federal law, the State of Louisiana passed Revised Statute 30:2011, signed by the Governor in 1987 as Act 272. Act 272 designated the Louisiana Department of Environmental Quality as the Lead Agency for development and implementation of the State's Nonpoint Source Management Plan. The Louisiana Revised Statutes R.S. 30:2011.D (20) includes the following provision as the authority for LDEQ to implement the State's NPS Program.

To develop and implement a non-point source management and ground water quality protection program and a conservation and management plan for estuaries, to receive federal funds for this purpose and provide matching state funds when required, and to comply with terms and conditions necessary to receive federal grants. The nonpoint source conservation and management plan, the groundwater protection plan, and the plan for estuaries shall be developed in coordination with, and with the concurrence of the appropriate state agencies, including but not limited to, the Department of Natural Resources, the Department of Wildlife

and Fisheries, the Department of Agriculture and Forestry and the State Soil and Water Conservation Committee in those areas pertaining to their respective jurisdictions.

10.0 BEST MANAGEMENT PRACTICES FOR BAYOU SEGNETTE WATERSHED

10.1 Best Management Practices (BMPs)

An essential step in achieving effective local stormwater runoff water-quality management programs are developing technically valid approaches for assessing the water-quality significance of chemical constituents and pathogens in urban runoff. Best management practices (BMPs) are effective practices that act to reduce the nonpoint pollution load in water systems and decrease the velocity of runoff after storm events. These practices are usually created and maintained for long-term use and coincide with the local water quality standards for a particular area. Selection and suitability of a BMP should be based on: site specific conditions, type of land use activity, the physical makeup of the watershed, and consideration of the pollutant(s) involved. LDEQ will be working with the Environmental Protection Agency (EPA) in the regulation of stormwater control and management.

A BMP is any practice or routine procedure designed to either reduce pollutants that can be picked up by run-off or reduce the amount of pollutants in the run-off before it gets to a body of water. BMPs are designed to reduce pollutants such as sediments, nutrients, heavy metals, bacteria, pesticides, or any form of stormwater pollutant in run-off. BMP demonstration projects will be targeted by the Urban NPS Program for implementation in urban areas of the state. Although a wide variety of BMPs are available which may be applied to the Bayou Segnette Watershed, specific BMPs designed to address the problems in Bayou Segnette are recommended in this document.

Examples include pollution source controls (proper fertilizer application techniques), solid waste collection (proper storage containers) and disposal (proper leaf and household hazardous waste disposal), run-off collection and distribution (detention ponds and landscaping), and discharge treatment (constructed wetlands). Many of these methods are already standard practices, known to be both environmentally and economically sustainable

Other types of source control activities involve local government initiatives such as creation and enforcement of litter laws, penalties for used motor oil dumping, zoning laws and enforcement for landuse, and requirements for proper source controls to be included in construction of new development (landscaping parking lots, grass buffer strips, and detention ponds).

The goal of BMPs is to protect Louisiana's water resources from degradation, while maintaining the economic viability of Louisiana's agriculture and related industries. Ideally, these practices will improve producer profitability.

10.2 Urban and Suburban BMPs

Filter Strips

Filter strips are wide areas of vegetation that act to intercept runoff into lakes, rivers, or bayous. They can consist of any type of rock and dense vegetation from woodlands to grass and can remove various pollutants, such as heavy metals, sediment loads, and excess organic materials.

Figure 22: Vegetative Filter Strip

Swales

Swales are shallow channel depressions where runoff flows. These swales slow the flow of the runoff water and allow particulates to settle out and water to infiltrate into the soil. These swales can effectively remove small amounts of excess nutrients and heavy metals.

Figure 23: Vegetative Swale

Constructed Wetlands

Constructed wetlands are often used in mitigation of other areas that have lost wetlands due to development. Both natural and constructed wetland areas are saturated for sufficient time periods and are able to support unique vegetation adapted for life in such conditions. Wetlands are extremely efficient in filtering sediment, nutrients, and some heavy metals from storm water runoff and overflow of nearby water systems.

Figure 24: Constructed Wetland

Detention Ponds

Structures are often built in residential areas to alleviate stormwater runoff and retain or detain precipitation from storm events. Detention ponds are basins that temporarily store runoff, which is ideal for Louisiana, from a site and release it at a controlled rate to minimize downstream flooding. These dry ponds (temporarily wet) are quite effective for pollutant removal, especially suspended sediments, if well designed. Properly designed, operated, and maintained ponds will only temporarily hold water and will not be breeding grounds for mosquitoes. To help control mosquitoes in their wet ponds, some localities introduce mosquito predators such as mosquito fish.
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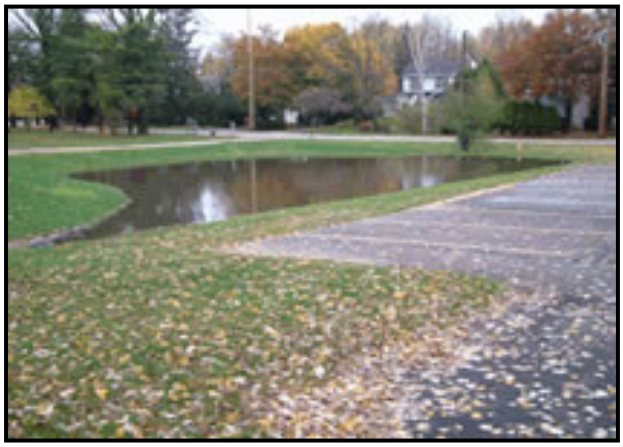


Figure 25: Detention Pond

Infiltration Trenches

These trenches are shallow, usually three to eight feet deep, and backfilled with gravel to create underground reservoirs. Runoff, therefore, is diverted to the trenches and percolates into the subsoil. Such a practice effectively removes sediments and similar particles from stormwater runoff. This practice is commonly used in both commercial and residential areas.

Figure 26: Infiltration Trench

Rain Barrels and Cisterns

A rain barrel (left) or rain cistern (right) allows for collection of stormwater runoff from roof tops to be used as a water supply during dry months or for watering garden plants, for example. Not only are pollutants being stopped from running off of roof tops, but the economic value of collecting rainwater for landscaping uses instead of using hose water is quite beneficial.

Figure 27: Rain Barrel (left) and Rain Cistern (right)

Pervious or Porous Pavement

Pervious or porous materials allow water to enter the ground cover through spaces in the material. Water-pervious materials such as gravel, crushed stone, open paving blocks or pervious paving blocks for driveways, parking areas, walkways, and patios minimize runoff from those areas, as well as increase infiltration. Pervious pavements can be made of concrete, asphalt, open-celled stones, and gravel that are mixed in a manner that creates an open cell structure allowing water and air to pass through. Unlike traditional concrete or asphalt, pervious pavement typically provides a void content of 15-25%, offering improved filtration and an enormous amount of surface area to catch oils and chemical pollutants. Parking lots, in particular, hold a tremendous potential for this material because of the amount of oil and other hydro-carbon liquids that seep from parked cars.

Figure 28: Water Filtration through Pervious Pavement

Rain Gardens

A rain garden is a man-made depression in the ground that is used as a landscape tool to improve water quality. The rain garden forms a bioretention area by collecting water runoff and storing it, permitting it to be filtered and slowly absorbed by the soil. The site for the rain garden should be placed strategically to intercept water runoff. It is also necessary to use Louisiana native wetland plants (e.g., Copper Iris and Duck Potato) when constructing a rain garden. Using indigenous species will ensure a stable ecological environment.

Copper Iris
(Iris fulva)

Duck Potato
(Sagittaria latifolia)

Figure 29: Rain Garden with Louisiana Native Wetland Plants

Construction Sites

Construction sites, while under development, can implement many BMPs to reduce runoff, decrease pollutant loads to nearby water systems, and decrease the amount of soil washed from the site. Simple practices, such as setting up straw bales, silt fences, or even filter fabrics can act to slow runoff and retain sediment during storm events. Other practices, such as sediment basins to detain runoff or stabilizing entrances of construction, further decrease sediment and pollutant runoff.

Figure 30: Silt Fence

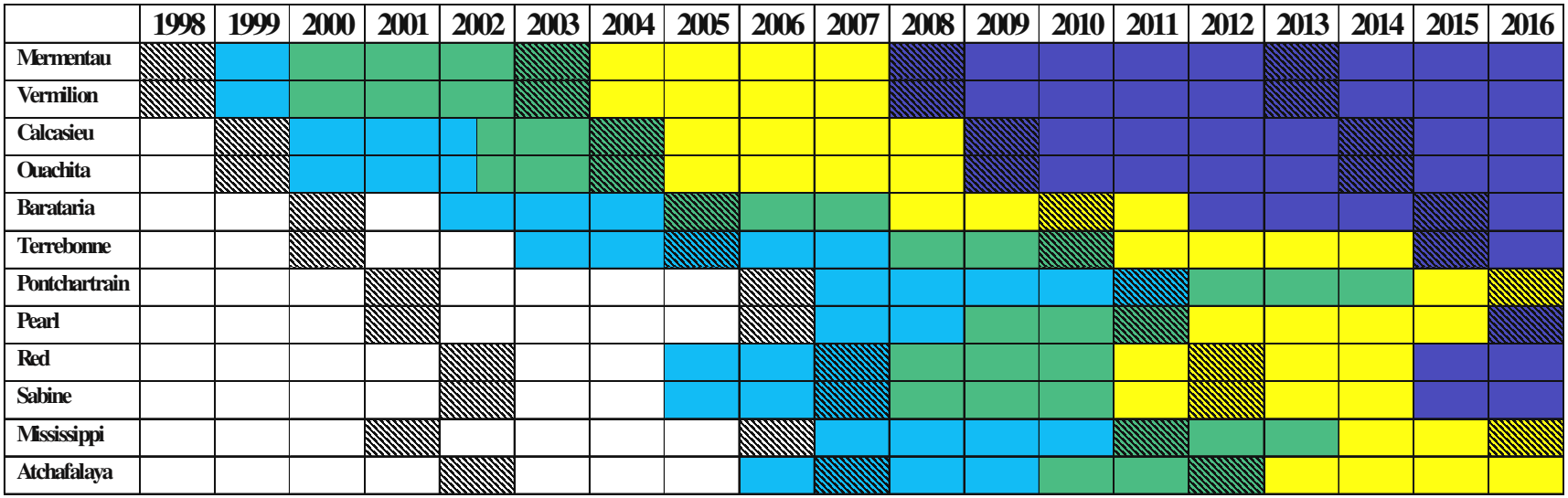
11.0 MAINTENANCE PRACTICES

Citizens, commercial businesses, and even local and state agencies can implement and maintain efficient BMPs by taking the conservative approach to many everyday landscaping events. For example, fertilizing and sufficiently seeding grass to promote long-term stabilization of soil surfaces and planting wildflower cover (a practice used by many highway departments to provide aesthetically pleasing vegetation along roadways) greatly reduces the potential for erosion by securing the surfaces with plant roots. Other practices such as sodding and mulching can also be applied and have similar effective results.

12.0 TMDL TIMELINE FOR NPS IMPLEMENTATION PLAN

The NPS Implementation Plan for the Bayou Segnette Watershed outlines a 5-year management plan to reduce NPS pollutants reaching the waterway. LDEQ intensively samples each watershed in the state once every 5 years to see if the water bodies are meeting water quality standards. The 5-year cyclic sampling began during 2000 for the Barataria Basin, including Bayou Segnette, and occurred again in 2003. Sampling will also occur in 2005, 2008, and in 2009 (**Table 8**). The data from 2003 will be used as a baseline to measure the rate of water quality improvement in samples taken in subsequent years. If no improvement in water quality is witnessed by the 2009 sampling, LDEQ will revise the NPS Implementation Plan to include additional corrective actions to bring the waterway into compliance. Additional BMPs and or other options will be employed, if necessary, until water quality standards are achieved and Bayou Segnette is restored to its designated uses.

Table 9: Revised Timeline for Watershed Planning and Implementation



1. Black Stripes = Collect Water Quality Data to Develop Total Maximum Daily Loads (TMDLs) and to Track Water Quality Improvement at the Watershed Level **[Objective 1**]
2. Light Blue = Develop Total Maximum Daily Loads for the Watersheds on the 303(d) List [**Objective 2]**
3. Green = Develop Watershed Management Plans to Implement the NPS Component of the TMDL **[Objective 3]**
4. Yellow = Implement the Watershed Management Plans **[Objectives 4-8]**
5. Dark Blue = Develop and Implement Additional Corrective Actions Necessary to Restore the Designated Uses to the Water Bodies **[Objective 9-10]**

13.0 MAKING THE IMPLEMENTATION PLAN WORK

To implement BMPs and/or other conservation practices in order to reduce the NPS load in the Bayou Segnette Watershed so that it meets its designated uses and is no longer listed on the 303(d) list, will require programs that provide technical assistance, funding, incentives, as well as foster a sense of stewardship. Many of these programs that are designed to assist the landowner are already in place. The LDEQ's Nonpoint Source Unit provides monies distributed through the USEPA under Section 319 of the CWA. The funds are utilized to implement BMPs for all types of land uses within the watershed in order to reduce and/or prevent the NPS pollutants and achieve the river's designated uses. The USDA and NRCS are federal government agencies that have several such programs made available by way of the Farm Security and Rural Investment Act of 2002. These programs are made available through the local Soil and Conservation District (SWCD). The NRCS has a list of BMPs for almost all types of programs to facilitate their use.

Parish-wide cooperation and coordination will be necessary in order to protect the water quality within the watershed. The Barataria Basin Watershed is especially challenging since it encompasses four different parishes. Though challenging, it is an opportunity and reason for leaders, officials, and local citizens to come together for a common interest. As a result, people develop new relationships. The watershed approach helps build new levels of cooperation and coordination, which is necessary to successfully control NPS loading.

14.0 TIMELINE OF MILESTONES TO ACHIEVE TMDL GOALS

The NPS Management Plan (LDEQ, 2000) outlines an eighteen-year schedule for watershed implementation of all TMDLs in Louisiana (**Table 9)**. This schedule was based on the TMDL timeline for all of the water bodies listed on the 303(d) list. The Bayou Segnette watershed, located in the Barataria Basin will follow the schedule for the entire basin, which is represented in the **Table 9**. In 2000, intensive monitoring of the Barataria Basin began for the 1st time since the TMDL was completed (the 5-year cycle of water quality sampling began in 2000 for the Barataria Basin). In 2005, LDEQ will sample the bayou to see if there has been any improvement since 2000. In 2010, LDEQ will sample again in the watershed to see if there has been improvement as the result of BMPs. If there has not been sufficient improvement, LDEQ will revise the implementation plan to include additional corrective actions to bring the waterway into compliance. Additional BMPs will be employed, if necessary, beginning in 2011 and increased until water quality standards are achieved by 2015. The long-term goal for restoring the waterway is 2016.

15.0 LONG-TERM NONPOINT SOURCE MANAGEMENT GOALS

LDEQ has four broad goals for nonpoint source management in the Barataria Basin Region:

1. Monitor and assess ambient water quality and beneficial uses to determine the need for and performance of nonpoint source management measures throughout the region.
2. Ensure effective implementation of land-use specific nonpoint source pollution management measures throughout the region.
3. Facilitate implementation of watershed management plans for prevention and control of nonpoint source pollution throughout the region.

4. Provide technical assistance and education to the public, public agencies, and private landowners and other interested parties about prevention and correction of nonpoint source pollution problems.

16.0 ACTIONS BEING IMPLEMENTED BY OTHER AGENCIES

The U.S. Department of Agriculture (USDA) and Natural Resource Conservation Service (NRCS) offers landowners financial, technical, and educational assistance to implement conservation practices and/or BMPs on privately owned land to reduce soil erosion, improve water quality, and enhance crop land, forest land, wetlands, grazing lands and wildlife habitat. The new "Farm Security and Rural Investment Act of 2002", known as the 2002 Farm Bill provides funding to various conservation programs for each state by way of the NRCS and the State's local Soil and Water Conservation Districts (SWCD). Although most of these programs are designed to assist agriculture, there may be cases where the may be utilized for conservation practices for other land uses. A complete list of agriculture BMPs is provided by the NRCS in their Technical Guide Handbook. The handbook includes a description of each BMP and their recommended uses. Each BMP is listed by a code, i.e. Field Border (386).

The Barataria-Terrebonne National Estuary Program (BTNEP) main goals are to help prevent activities that threaten an estuary's public water supply, are harmful to fish, shellfish, and wildlife populations, and negatively impact recreational opportunities for estuary residents. BTNEP's water quality action plans to reduce NPS pollution include a reduction of agricultural pollution and storm water management. The plan proposes to reduce agricultural components by applying BMPs. The results are improved water quality and estuarine ecosystem health. LDEQ's monitoring program provides data as to the success of the implemented action plan. Long term success in the implementation of BMPs will be seen in the reduction of urban NPS pollutants and a reduction in the number of water subsegments not meeting water quality criteria due to urban runoff. The plan promotes the use of alternative methodologies for the disposal of storm waters. Storm water management will be accomplished by performing studies that will increase the knowledge base of alternative stormwater disposal. These programs will focus to reduce 1) loadings of nutrients, fecal coliform bacteria, and pollutants to water bodies and 2) improved water quality in support of enhanced natural resources and 3) enhanced wetland vegetation.

17.0 SUMMARY

In order to restore accepted water quality parameters in Subsegment 020701 in the Bayou Segnette Watershed, it will require a concerted effort from all of the stakeholders within it, including government (local, state, and federal), private and public groups and local citizens. A person who lives there and/or owns property in the watershed is a stakeholder and stands to benefit from their contribution toward protecting it. Public education is the first critical element for accomplishing goals and objectives, because it is necessary that they understand and support efforts to implement BMPs. Successful outcomes are more likely, when citizens understand what is occurring and why. When stakeholders volunteer to demonstrate conservation practices on their land, they should receive positive recognition and other incentives. Soon, there will be even greater participation.

The dominant land use in the watershed is freshwater marsh followed closely by urban residential and natural areas. Each type of land use that is identified within Subsegment 020701 has BMPs that are known for reducing NPS pollutants loads and therefore increasing DO levels. Prevention of sediment runoff and runoff containing excess nutrients from land use activities occurring within the Bayou Segnette Watershed will make significant DO water quality improvements in Bayou Segnette. Improved DO water quality will help to achieve and to sustain the bayou's designated uses, which in turn benefits other natural resources and future generations to come. Urban stormwater runoff BMPs should be implemented and always practiced. Education and participation is likely the greatest strategies for controlling NPS loading from urban residential sites. Use of maps for identifying near by streams, land topography, and drainage patterns can effectively increase a residential area's strategy when developing a plan for preventing NPS loading by implementing BMPs. Additionally, vegetation could be established on any sloping areas of the site. These types of BMPs are very simple and very cost-effective, although there may be others types, which may or may not be more effective at preventing NPS loading.

Although some of the BMPs and the recommended course of actions were described within this plan, a consolidated list of BMPs recommended for each of these land uses can be viewed in the State of Louisiana Water Quality Management Plan, Volume 6, *Louisiana's Nonpoint Source Management,* 2000 located online at http://nonpoint.deq.louisiana.gov/wqa/NPSManagementPlan.htm.