Flat River Watershed Implementation Plan

Subsegment 100406

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1.0 INTRODUCTION

According to the United States Environmental Protection Agency (USEPA), Nonpoint Source Pollution (NPS), unlike pollution from industrial and sewage treatment plants, comes from many different sources, such as rainfall or snowmelt moving over and through the ground. As the runoff moves, it picks up and carries away natural and man-made pollutants, finally depositing them into lakes, rivers, wetlands, coastal waters, and even our underground sources of drinking water. These pollutants can include excess fertilizers, herbicides, and insecticides from agricultural lands and residential areas; oil, grease, and toxic chemicals from urban runoff and energy production; sediment from improperly managed construction sites, crop and forest lands, and eroding stream banks; salt from irrigation practices and acid drainage from abandoned mines; bacteria and nutrients from livestock, pet wastes, and faulty septic systems. The effects of nonpoint source pollutants on specific waters vary and may not always be detrimental. However, some states report that nonpoint source pollution is the leading remaining cause of water quality problems. In addition, it is known that these pollutants have harmful effects on water used for drinking, recreation, and fish and wildlife propagation.

Louisiana is one of the states where NPS pollution is still a problem. Of the state's 476 hydrologic subsegments, the majority are listed as impaired for designated uses such as Primary Contact Recreation, Secondary Contact Recreation, and Fish and Wildlife Propagation. Maps of impaired subsegments can be found in the Addendum. Approximately 670 TMDLs have been performed for watersheds within the state, and the majority of them have indicated that NPS pollution is the largest remaining water quality issue that needs to be addressed. A map of subsegments with completed TMDLs and watershed implementation plans can be found in the Addendum.

Subsegment 100406 was listed on the 2008 303(d) List for Louisiana as not fully supporting its designated uses of Primary Contact Recreation and Fish and Wildlife Propagation. The causes for impairment cited in the 303(d) List included fecal coliform bacteria, non-native aquatic plants, total dissolved solids, and low levels of dissolved oxygen (DO). The water quality criterion for DO in this subsegment is 5 mg/L year-round, and Louisiana currently does not have numerical nutrient criteria for the Flat River subsegment.

As a result of these impairments**,** a Total Maximum Daily Load report (TMDL) was prepared for the Flat River Watershed, Subsegment 100406, by the Louisiana Department of Environmental Quality (LDEQ), in March of 2008. The TMDL summarized the maximum amount of oxygen demanding pollutants that the Flat River can assimilate and still meet water quality standards for its designated uses, in addition to meeting the goals for the reduction of those pollutants.

A calibrated water quality model for the watershed was developed and projections were modeled to quantify the nonpoint source load reductions which would be necessary in order for Flat River, Subsegment 100406, to comply with its established water quality standards and criteria. According to the TMDL, summer nonpoint source oxygen demand loads will need to be reduced by 75% to 92% and winter loads will need to be reduced by 3% to 49% in order to maintain the DO standard of 5.0 mg/L throughout Subsegment 100406. Because the Flat River's average total phosphorus and total nitrogen concentrations were higher than the average concentration in the reference streams, nutrient loads may also need to be reduced. Up to a 62% reduction in total phosphorus loads would be needed for the Flat River average total phosphorus concentration to be similar to the reference stream average concentration, and up to a 30% reduction in total nitrogen loads would be needed for the Flat River average total nitrogen concentration to be similar to the reference stream average concentration. LDEQ and EPA are still working on the approach that will be utilized to derive nutrient criteria for inland streams and rivers, but reference streams do provide a basis for nutrient loads in natural systems that are least impacted by man-made activities.

High priority areas for BMPs for this watershed are gullies that drain agricultural fields into the river. Stream banks that are prone to erosion and locations of urban runoff are also key areas for BMPs. All of these sources can contribute to low DO and high levels of fecal coliform bacteria and solids. Some of the BMPs and suggested courses of action for these areas are described within this plan in Section 4.0, and a consolidated list of BMPs recommended for various land uses can be viewed in the LDEQ NPS Program's 2000 Management Plan - http://nonpoint.deq.louisiana.gov/wqa/NPSManagementPlan.htm - under the Statewide Educational Programs heading.

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). The Louisiana Department of Environmental Quality (LDEQ) is presently the designated lead agency to implement the Louisiana Nonpoint Source Program. The LDEQ Nonpoint Source Unit and the Louisiana Department of Agriculture and Forestry (LDAF) provide 319(h) funds to assist in the implementation of BMPs to address water quality problems in subsegments listed on the 303(d) list. USEPA 319(h) funds are utilized to sponsor cost sharing, monitoring, and education projects. These monies are available to designated state and tribal agencies to implement their approved nonpoint source management programs. Once the funds have been secured, the state and tribal agencies are free to distribute them to any entity that can assist them with implementing parts of their state or tribal plan.

Beginning with FY04 grants, the United States Environmental Protection Agency (EPA) requires all implementation, demonstration, and outreach-education projects funded under Section 319 of the federal Clean Water Act to be supported by a Watershed Plan which includes the following nine listed elements in order to receive incremental funds. The nine EPA required elements, and the location of the plan component addressing these elements are listed below.

EPA Nine Required Elements

A. An identification of the causes and sources or groups of similar sources that will need to be controlled to achieve the load reductions estimated in this watershed based plan (and to achieve any other watershed goals identified in the watershed based plan), as discussed in item (b) immediately below.

B. An estimate of the load reductions expected for the management measures described under paragraph (c) below (recognizing the natural variability and the difficulty in precisely predicting the performance of management measures over time).

C. A description of the NPS management measures that will need to be implemented to achieve the load reductions estimated under paragraph (b) above (as well as to achieve other watershed goals identified in this watershed-based plan), and an identification (using a map or a description) of the critical areas in which those measures will be needed to implement this plan.

D. An estimate of the amounts of technical and financial assistance needed, associated costs, and/or the sources and authorities that will be relied upon, to implement this plan

E. An information/education component that will be used to enhance public understanding of the project and encourage their early and continued participation in selecting, designing, and implementing the NPS management measures that will be implemented.

F. A schedule for implementing the NPS management measures identified in this plan that is reasonably expeditious.

G. A description of interim, measurable milestones for determining whether NPS management measures or other control actions are being implemented.

H. A set of criteria that can be used to determine whether loading reductions are being achieved over time and substantial progress is being made towards attaining water quality standards and, if not, the criteria for determining whether this watershed based plan needs to be revised or, if a NPS TMDL has been established, whether the NPS TMDL needs to be revised.

I. A monitoring component to evaluate the effectiveness of the implementation efforts over time, measured against the criteria established under item (h) immediately above.

This watershed implementation plan is structured on the nine key elements and lays out a course of action that can be implemented with the goal of reducing nonpoint source pollution in the watershed so that water bodies meet water quality standards. This plan will be the basis for outlining how and where state and local cooperators should focus their efforts and resources within the watershed in order to improve water quality and help the watershed re-attain its designated uses.

Since temperatures vary from season to season, natural variation of dissolved oxygen from one season to another is a given. Most slow-moving rivers and bayous in Louisiana exhibit low DO concentrations during the summer months. In trying to improve and protect water quality, all residents and interested government parties should partake in public education, with the idea that they will support efforts to implement the best management practices (BMPs). In watersheds similar to the Flat River, implementation of BMPs such as strip cropping, conservation tillage, field borders, riparian zones, filter strips, fencing, and residue management are some of the recommended courses of action for reducing pollutant runoff from crops and pastures. Creation of a buffer ordinance that directs new development away from streams and rivers, inspecting 100% of newly installed septic systems, and refraining from using septic system additives are among the many BMPs recommended for urban and residential development.

2.0 ELEMENT A – SOURCES & TYPES OF IMPAIRMENTS

The Flat River watershed is located in Bossier and Red River parishes. Flat River (Subsegment 100406) is located in northwestern Louisiana in the Red River Basin. Within this subsegment, Flat River extends approximately 54 kilometers (34 miles) from its headwaters north of Shreveport, Louisiana, near Black Lake, in a southeasterly direction, roughly parallel to the Red River channel, to Loggy Bayou. A significant portion of this watershed contains urban areas, including part of Bossier City (population 62,384) and Barksdale Air Force Base. Red Chute Bayou is one of the significant tributaries to Flat River within Subsegment 100406.

Subsegment 100406 covers 117 square miles and includes most of three 12-digit USGS Hydrologic Unit Code (HUC) areas. They are 111402040301 (Upper Flat River – 59.59 sq. miles/38,139 acres), 111402040302 (Cooper Bayou – 21.43 sq. miles/13,715 acres), and 111402040303 (Lower Flat River – 56.56 sq. miles/36,198 acres). All three of these 12-digit HUC areas are located in HUC 8 area 11140204 (Red Chute).

There are four LDEQ ambient water quality monitoring stations in this subsegment: Station 272 (Flat River east of Taylortown), Station 363 (Flat River Drainage Canal north of Bossier City), Station 389 (Flat River Drainage Canal northeast of Bossier City), and Station 390 (Flat River Drainage Canal northeast of Shreveport). Station 272 is located in the Lower Flat River HUC, and the other three stations are in the Upper Flat River HUC.

Of the three 12-digit HUCs in the Flat River subsegment, Cooper Bayou has the highest proportion of Urban/Developed area. It contains the majority of Bossier City and Barksdale Air Force Base. The other two HUCs, Upper and Lower Flat River, are mostly agricultural and forested land. A table, provided in Figure 1, shows 2004 statistics for Land Use type in acres and percent for subsegment 100406.

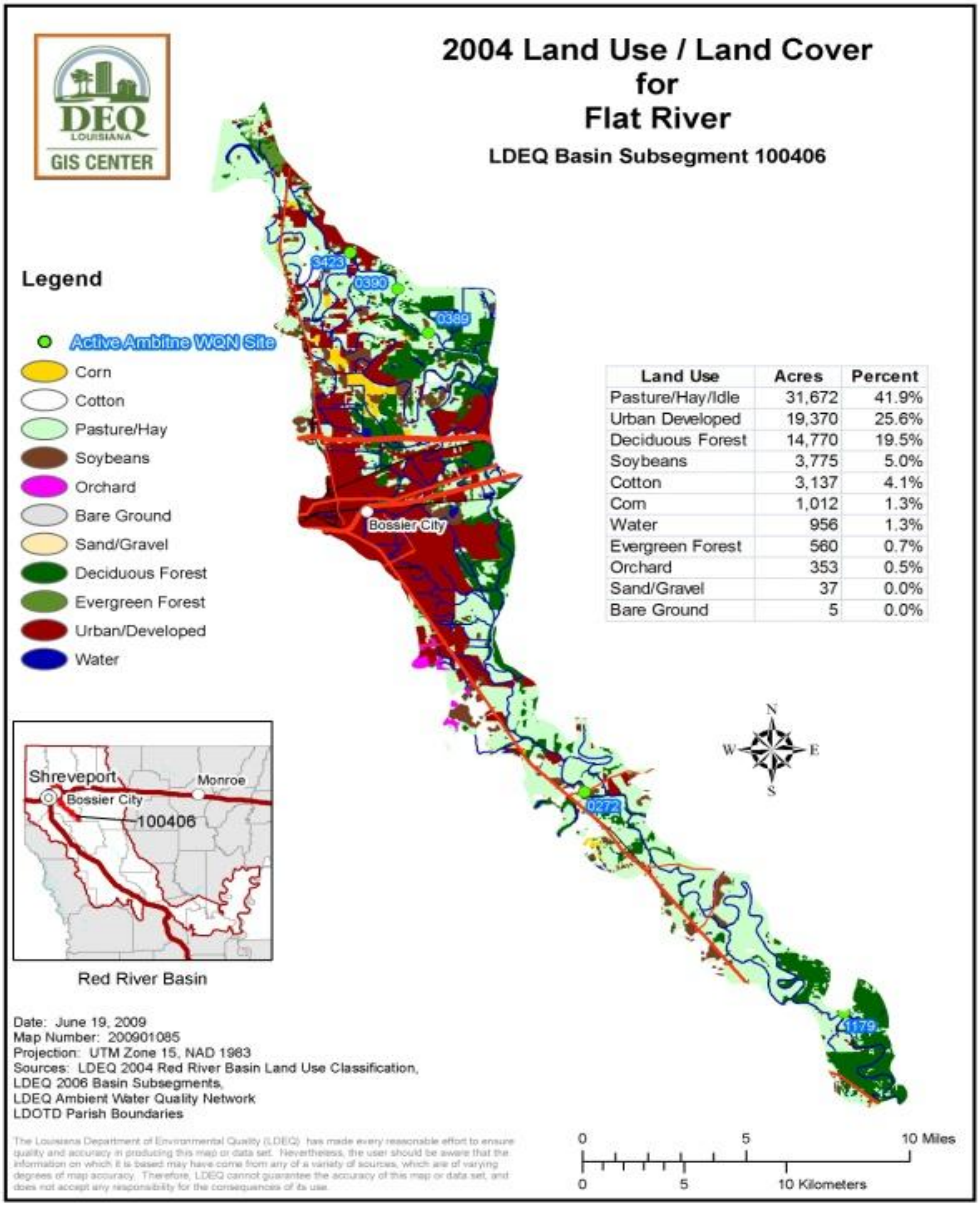


Figure 1 – Land Use/Land Cover for Flat River

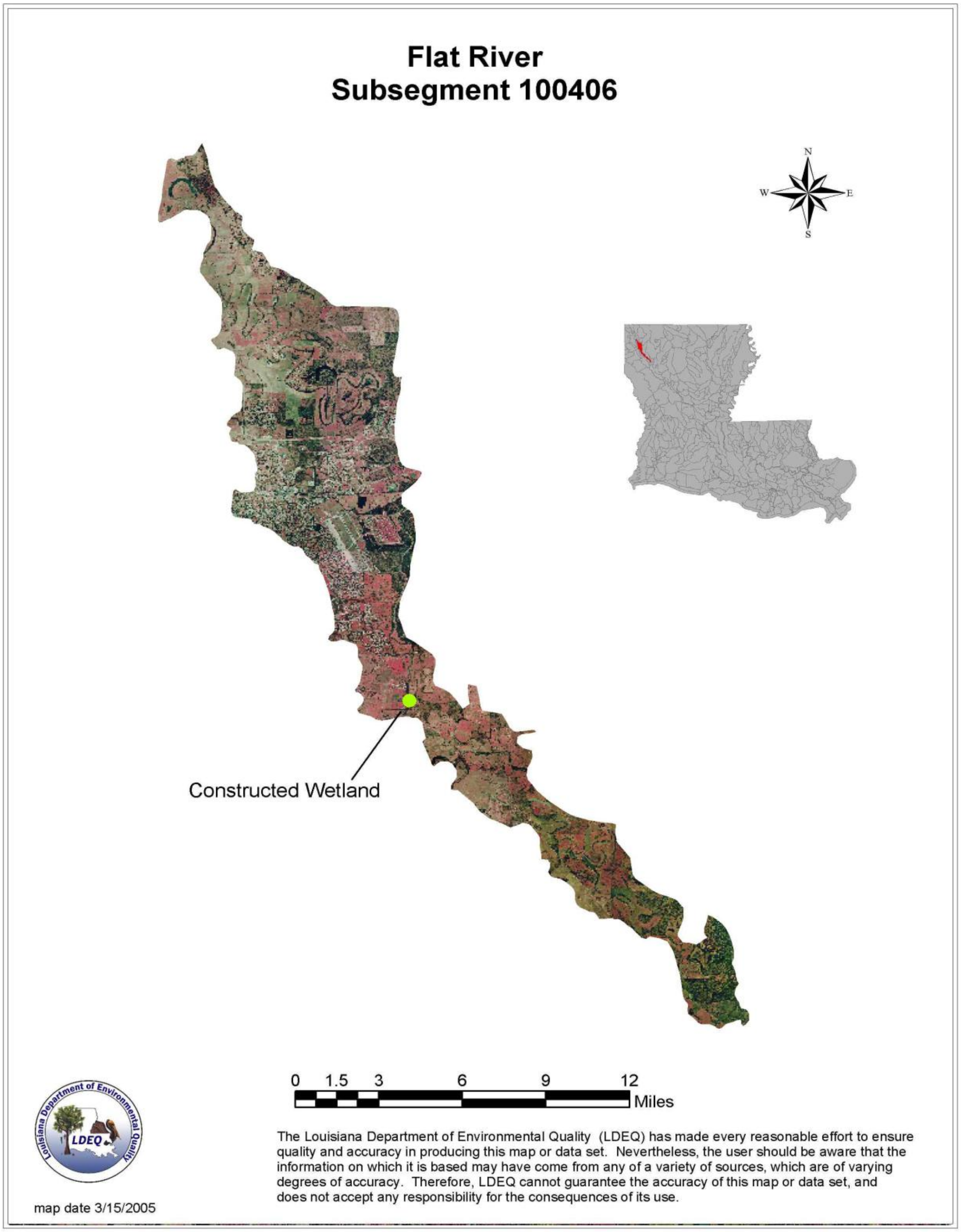


Figure 2 – Flat River Subsegment 100406

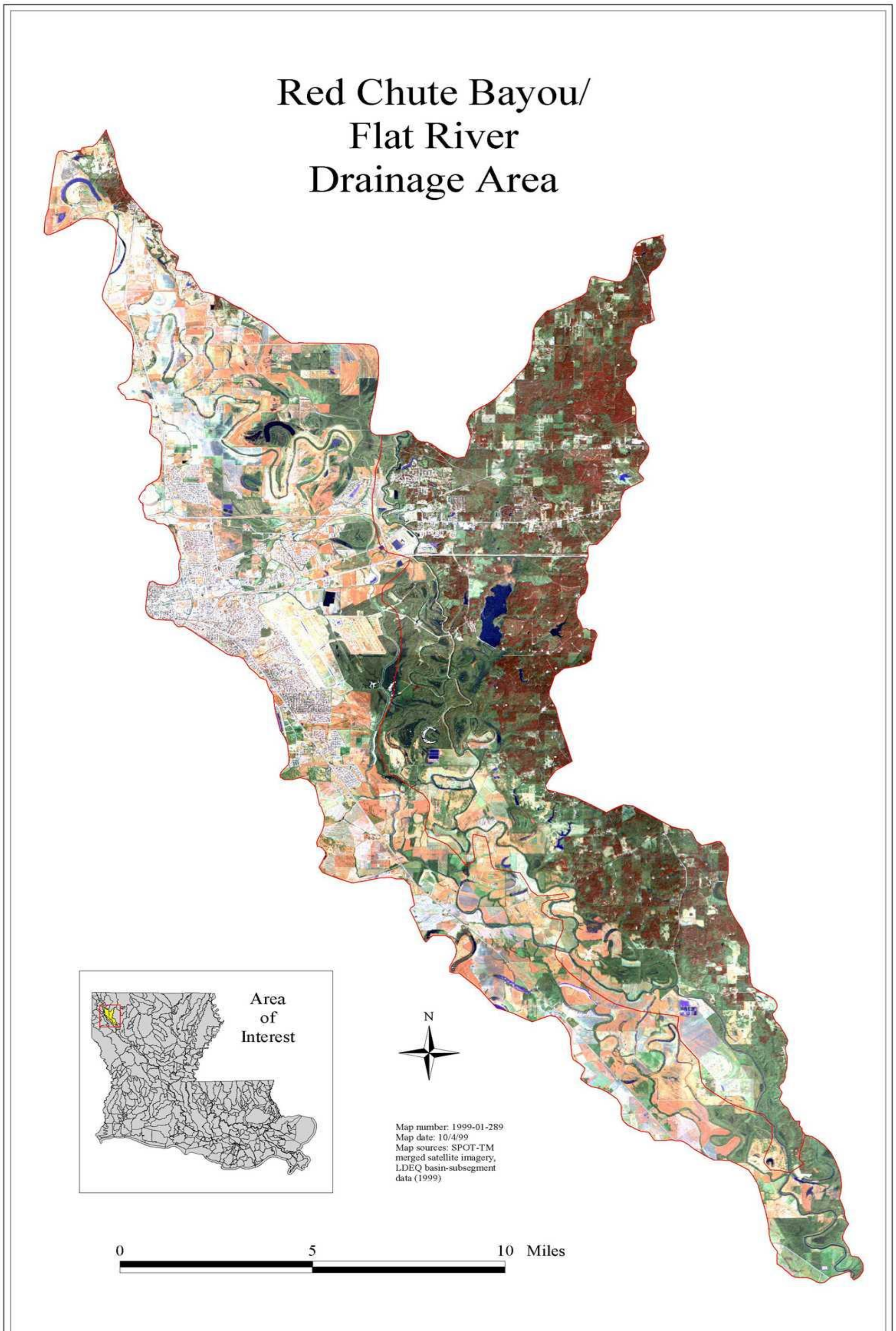


Figure 3 – Red Chute Bayou/Flat River Drainage Area

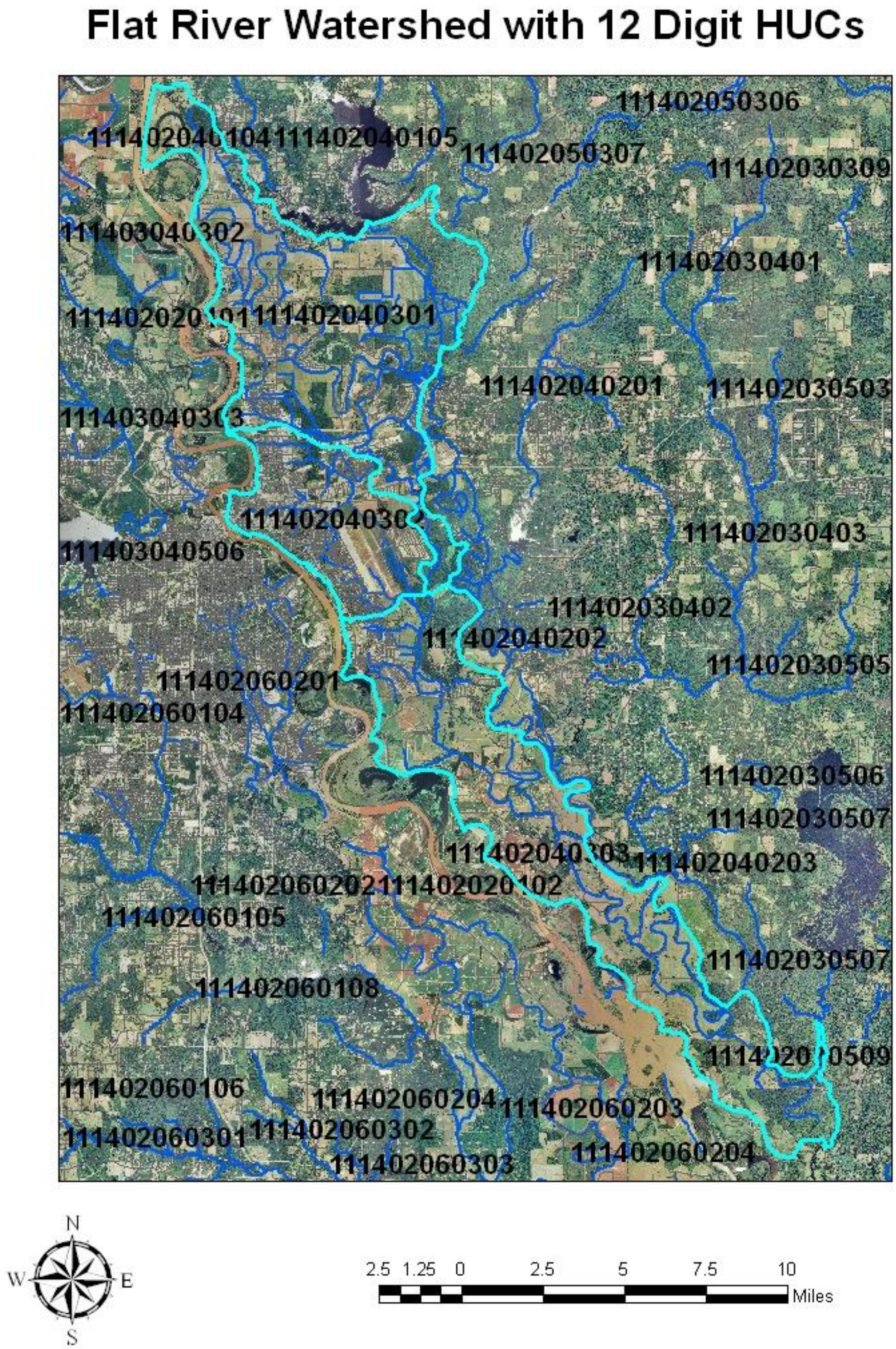


Figure 4 – Flat River Watershed with 12 Digit HUCs

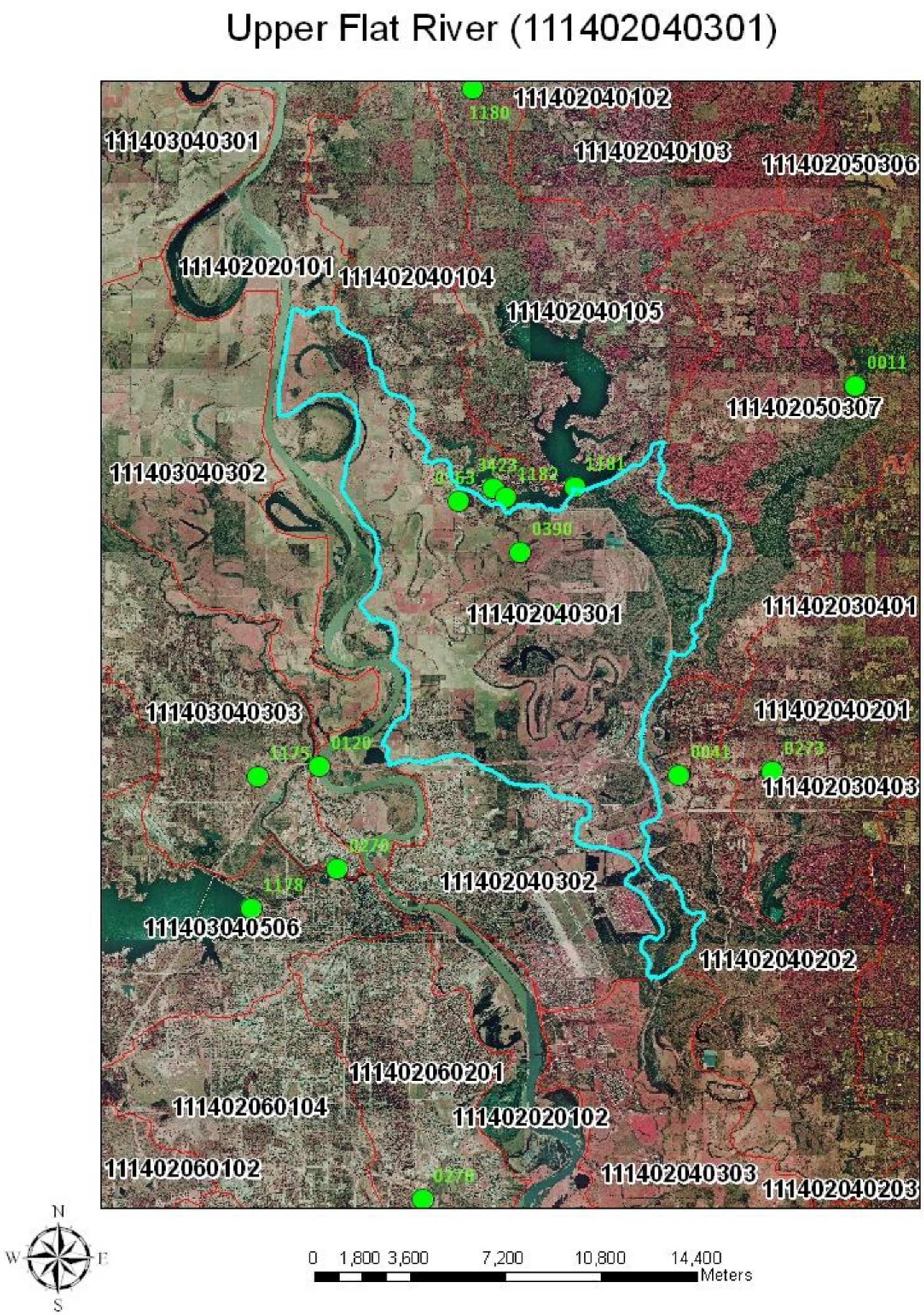


Figure 5 – Upper Flat River

Cooper Bayou (111402040302)

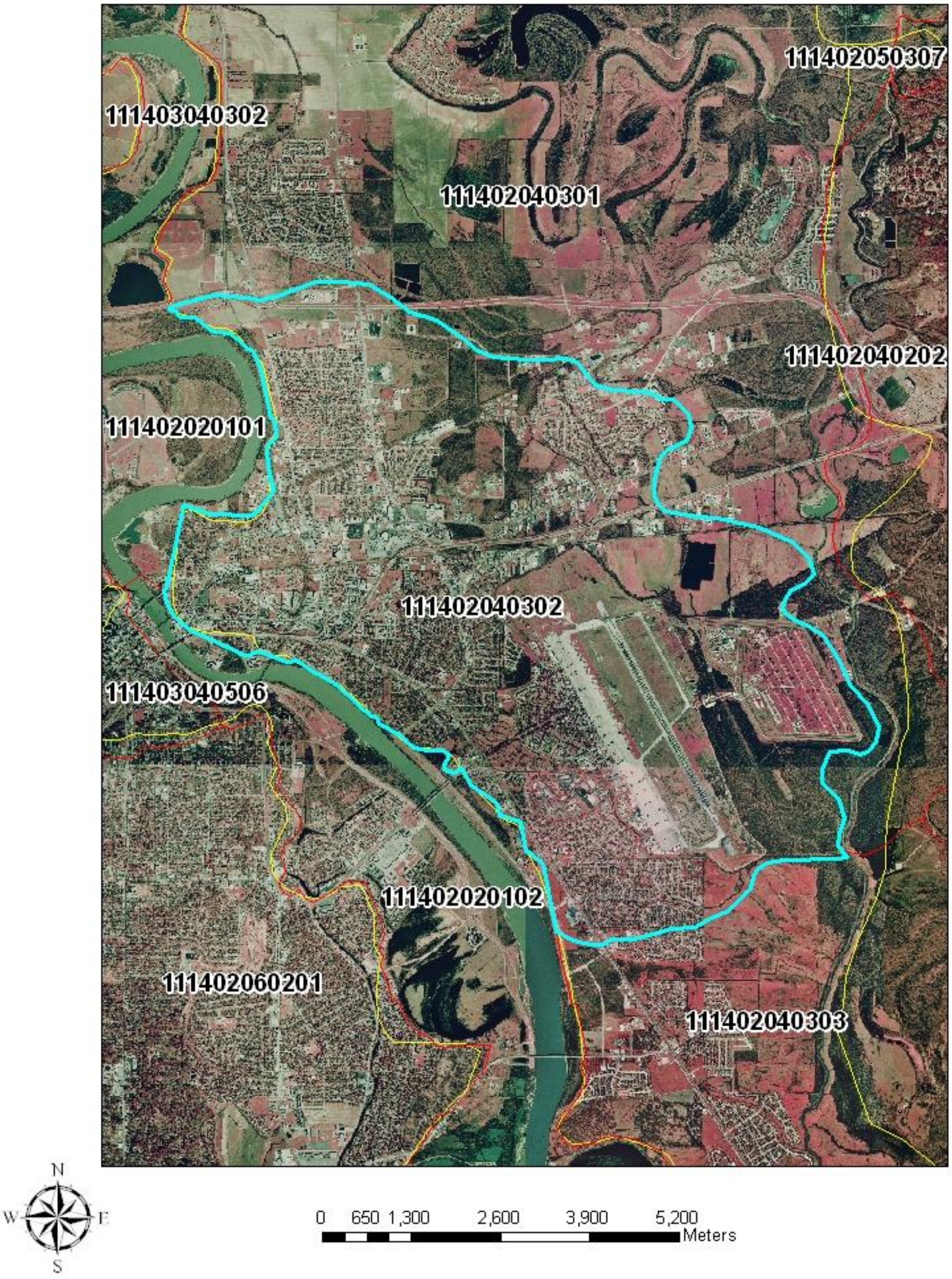


Figure 6 – Cooper Bayou

Lower Flat River (111402040303)

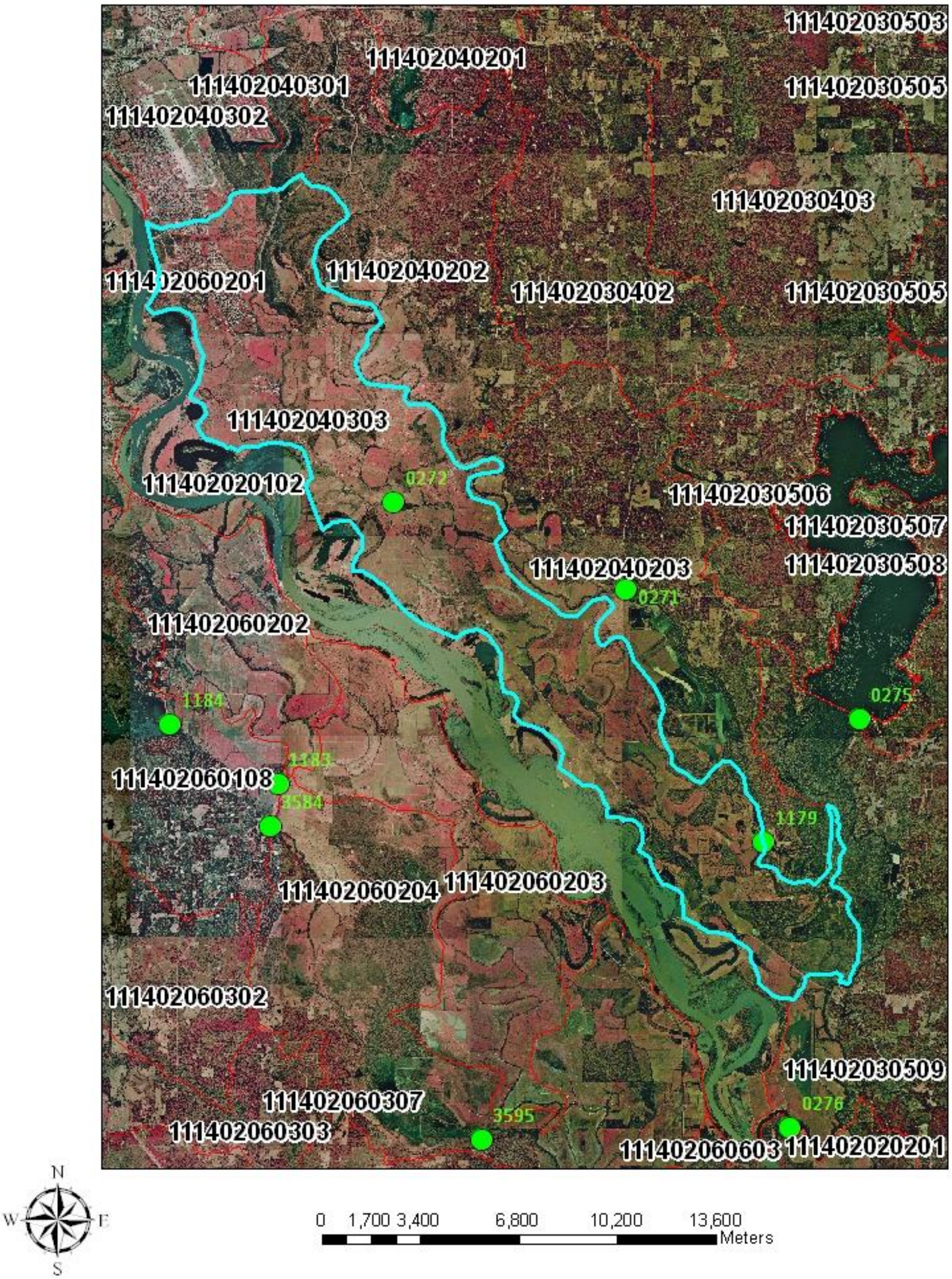


Figure 7 – Lower Flat River

Bossier City, which is located primarily in subsegment 100406, has a stormwater drainage system of pipes, ditches, and bayous that directs excess storm water to the Red River, Red Chute Bayou, and various tributaries. This stormwater is not treated before it enters these bodies of water.

The city currently holds a Louisiana Pollutant Discharge Elimination System general permit under the EPA's MS4 (Municipal Separate Storm Sewer System) Phase II program, and is responsible for preventing and reducing pollution in local waterways. A Storm Water Management Plan (SWMP) was developed to reduce discharge of pollutants to the storm water sewer system to the maximum extent practicable to protect water quality. The plan addresses six minimum control measures identified and required by the Environmental Protection Agency as necessary to protect surface waters. The six minimum control measures are:

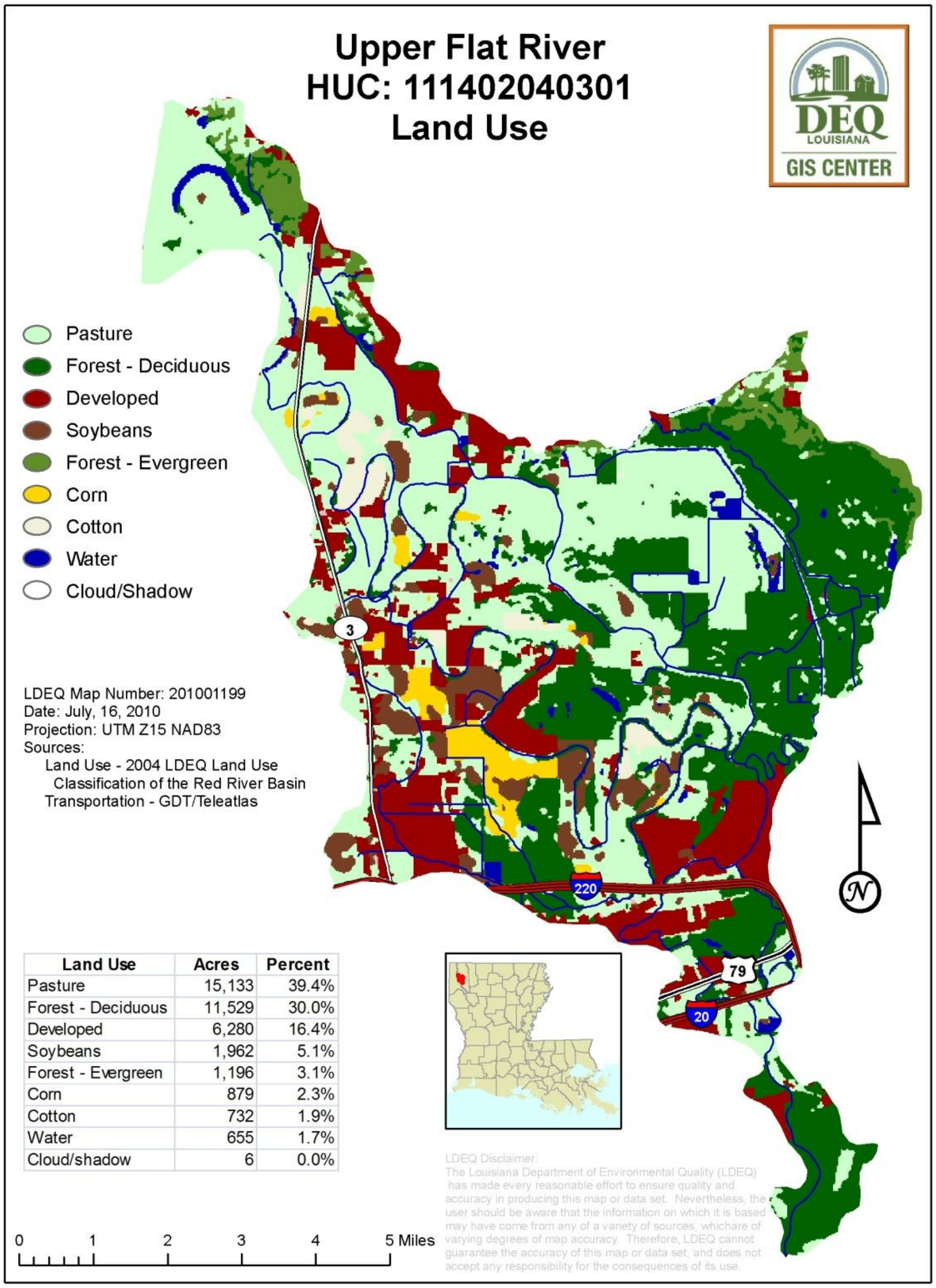
- Public Education and Outreach
- Public Involvement/Participation
- Illicit Discharge Detection and Elimination
- Construction Site Storm Water Runoff Control
- Post-Construction Storm Water Management in New Development and Redevelopment
- Pollution Prevention/Good Housekeeping for Municipal Operations

There are very few exceptions to allowable discharges to Bossier City's storm drains, streets, bayous and ditches. Some prohibited substances include

- Used oil
- Anti-freeze
- Leaves and grass clippings
- Animal wastes
- Paint and brush clean-up water
- Litter and trash
- Pesticides and herbicides

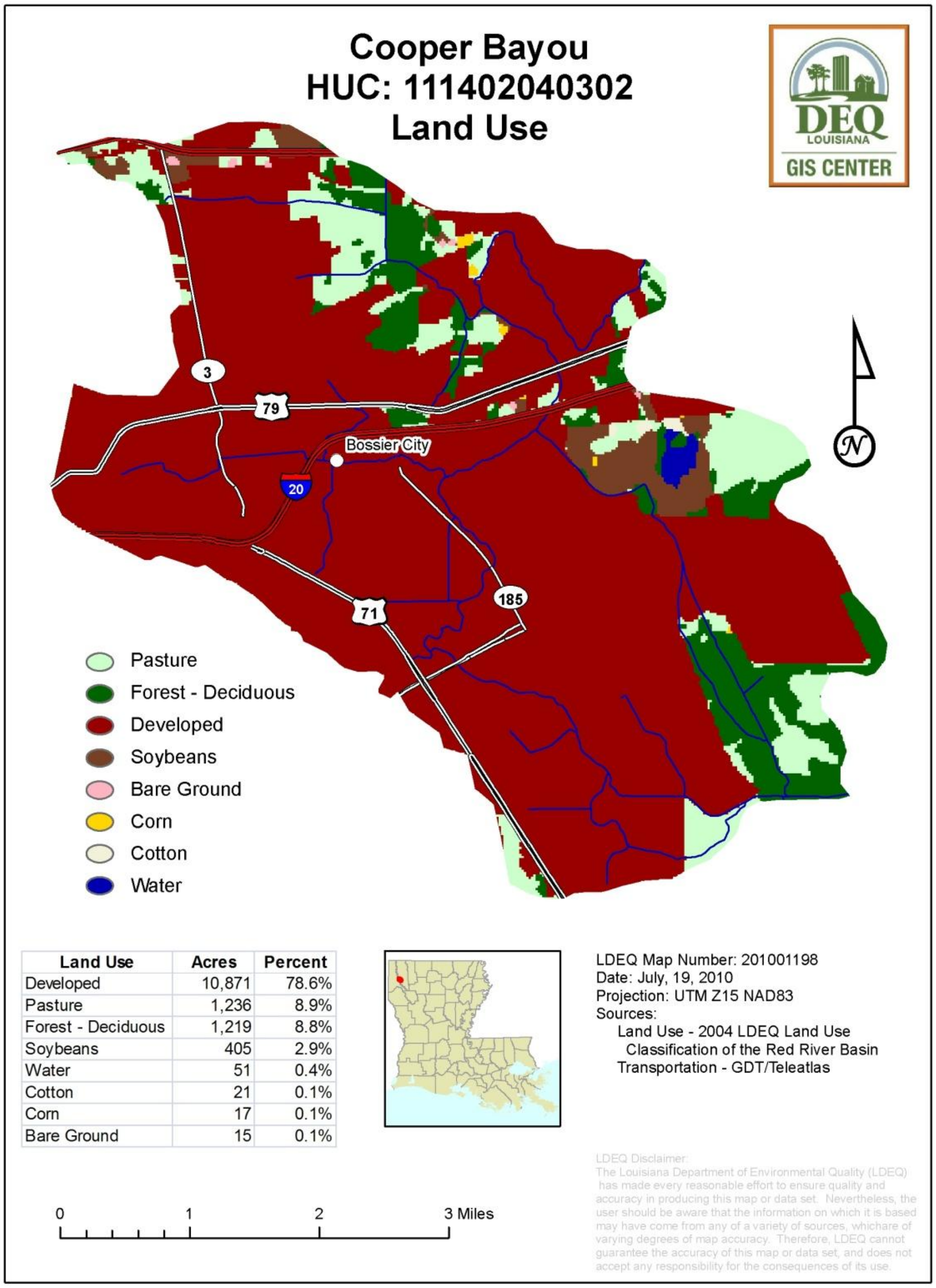
More information about Bossier City's MS4 program (including annual reports) can be found by searching for AI 107095 at LDEQ's Electronic Document Monitoring System (EDMS) website - http://www.deq.louisiana.gov/portal/tabid/2604/Default.aspx

Accidental Spills and illegal discharges to the storm water drainage system that occur within Bossier City limits can be reported to the Storm Water Division of Environmental Affairs at (318) 213-2159 during Monday-Friday from 7 AM to 4 PM. During weekends and after hours the Division can be reached at (318) 741-8371. Accidental Spills and illegal discharges to the storm water drainage system that occur outside of Bossier City limits can be reported to the Louisiana Department of Environmental Quality hotline at (225) 219-3640.



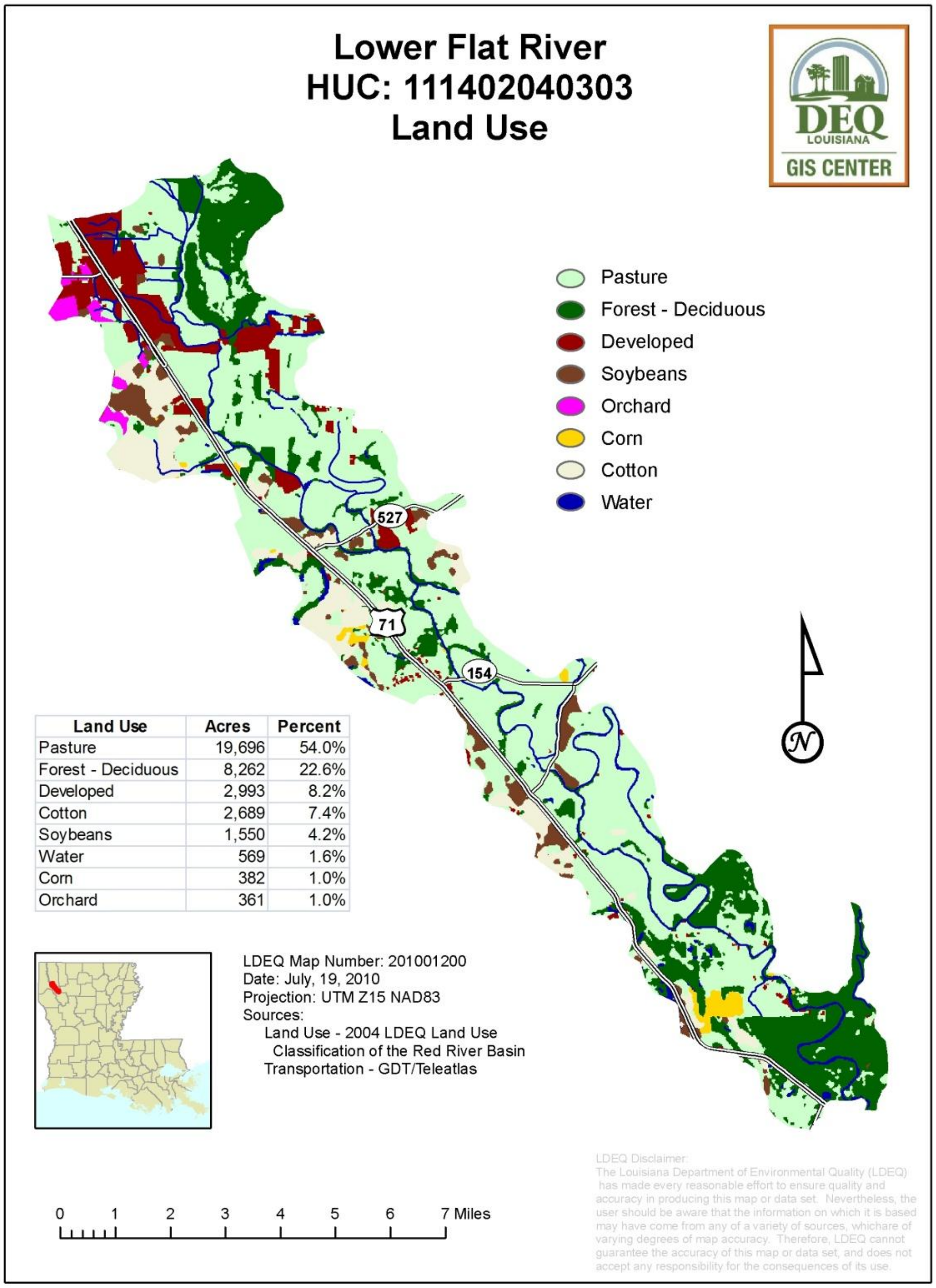
Land Use	Acres	Percent
Pasture	15,133	39.4%
Forest - Deciduous	11,529	30.0%
Developed	6,280	16.4%
Soybeans	1,962	5.1%
Forest - Evergreen	1,196	3.1%
Corn	879	2.3%
Cotton	732	1.9%
Water	655	1.7%
Cloud/shadow	6	0.0%

Figure 8 – Upper Flat River Land Use



Land Use	Acres	Percent
Developed	10,871	78.6%
Pasture	1,236	8.9%
Forest - Deciduous	1,219	8.8%
Soybeans	405	2.9%
Water	51	0.4%
Cotton	21	0.1%
Corn	17	0.1%
Bare Ground	15	0.1%

Figure 9 – Cooper Bayou Land Use



Land Use	Acres	Percent
Pasture	19,696	54.0%
Forest - Deciduous	8,262	22.6%
Developed	2,993	8.2%
Cotton	2,689	7.4%
Soybeans	1,550	4.2%
Water	569	1.6%
Corn	382	1.0%
Orchard	361	1.0%

Figure 10 – Lower Flat River Land Use

The previous three figures show land use in acres and percent for the individual 12-digit HUC areas in subsegment 100406.

Of the three 12-digit HUCs in the Flat River subsegment, Cooper Bayou has the highest proportion of Developed area – 75.6%. The other two HUCs, Upper and Lower Flat River, are mostly Pasture and Forest land, with Developed areas of 16.4% and 8.2%, respectively.

The main crops in subsegment 100406 are Soybeans (3,917 acres), Cotton (3,442 acres), and Corn (1,278 acres), and. They are grown primarily in the Upper and Lower Flat River HUCs.

2.1 WATER QUALITY ANALYSIS

The Flat River subsegment was modeled to quantify the point source and nonpoint source waste load reductions necessary in order for the water body to comply with its established water quality standards and criteria. The designated uses and water quality standards for Flat River are Primary Contact Recreation, Secondary Contact Recreation, and Fish and Wildlife Propagation. The primary numeric criteria for the DO TMDL presented in this report are the DO criterion of 5 mg/L (year-round) and the temperature criterion of 32°C. These water quality standards form the basis for implementing the best management practices to control the nonpoint sources of water pollution.

The Title 33 Environmental Regulatory Code does not include numeric criteria for nutrients, but it does include the following narrative criteria for nutrients (LAC 33: IX.1113.B.8):
"The naturally occurring range of nitrogen-phosphorous ratios shall be maintained. This range shall not apply to designated intermittent streams. To establish the appropriate range of ratios and compensate for natural seasonal fluctuations, the administrative authority will use site-specific studies to establish limits for nutrients. Nutrient concentrations that produce aquatic growth to the extent that it creates a public nuisance or interferes with designated water uses shall not be added to any surface waters."

Louisiana water quality standards also include an antidegradation policy (LAC 33: IX.1109.A). This policy states that waters exhibiting high water quality should be maintained at that high level of water quality. If this is not possible, water quality of a level that supports designated uses of the water body should be maintained. Changing the designated uses of a water body to allow a lower level of water quality can only be achieved through a use attainability analysis.

Subsegment 100406 was listed as impaired on the 2008 303(d) List for Louisiana as not fully supporting the designated uses of Primary Contact Recreation and Fish and Wildlife Propagation. The causes for impairment cited in the 303(d) List included fecal coliform bacteria, non-native plants, total dissolved solids, and low levels of dissolved oxygen. Suspected sources include managed pasture grazing, introduction of non-native organisms, and residential districts. The water quality criterion for DO in this subsegment is 5 mg/L year-round, and Louisiana has not currently specified nutrient criteria for this subsegment. Because of the impairments, this subsegment required the development of a total maximum daily load (TMDL) for oxygen-demanding substances and nutrients.

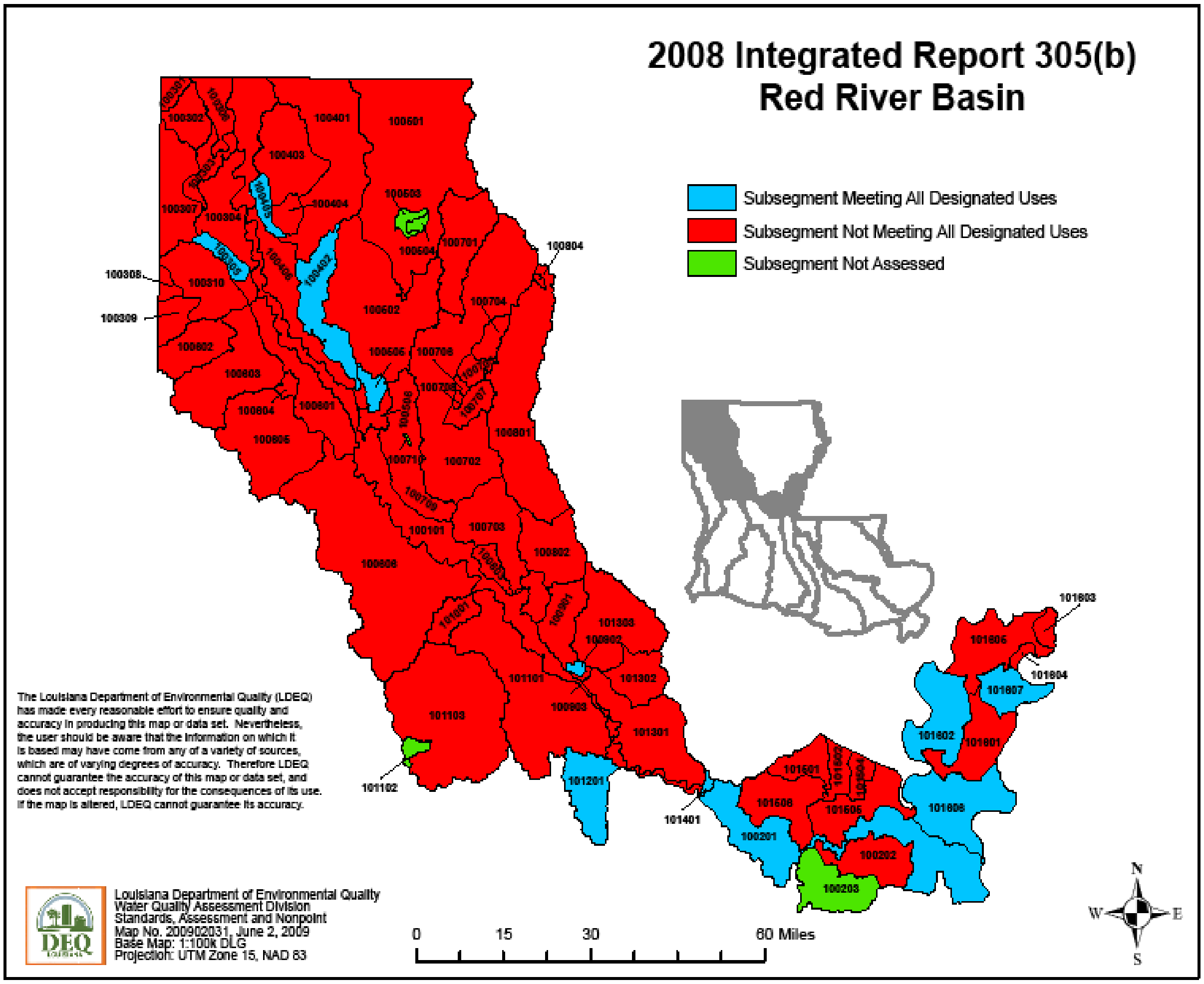


Figure 11 – 2008 Integrated Report 305(b) Red River Basin

The 2008 303(d) list shows that the subsegment is supporting its designated use of Secondary Contact Recreation. It is, however, not supporting its uses of Primary Contact Recreation and Fish and Wildlife Propagation and still has low levels of dissolved oxygen. The suspected cause of impairment for Primary Contact Recreation is fecal coliform bacteria from managed pasture grazing. The suspected causes of impairment for Fish and Wildlife Propagation are total dissolved solids from residential districts and the introduction of non-native aquatic plants.

Total dissolved solids (TDS) is a term that refers to all minerals, salts, metals, cations, and anions dissolved in water. This includes anything present in water other than the pure water molecules and suspended solids. Suspended solids are those that are unable to pass through a filter with a pore size of 2 micrometers. Dissolved solids can come from inorganic materials such as rocks, and may contain calcium bicarbonate, nitrogen, iron, phosphorus, sulfur, and other minerals. Some dissolved solids may also originate from organic sources such as leaves, silt, plankton, and industrial waste and sewage. Other sources are runoff from urban areas, salts placed on roads during the winter, and fertilizers and pesticides used on lawns and farms. Water may also pick up metals such as lead and copper as it travels through pipes which are used to distribute water to consumers.

Fecal coliform bacteria are present in large numbers in the feces and intestinal tracts of humans and other warm-blooded animals, and can enter water bodies via human and animal waste. If a large number of fecal coliform bacteria (over 200 colonies/100 milliliters of water sample) are found in water, it is possible that pathogenic (disease- or illness-causing) organisms are also present in the water. Fecal coliform per se are usually not pathogenic - they are indicator organisms, which means they may indicate the presence of other pathogenic bacteria. Pathogens are typically present in such small amounts that it is impractical to monitor them directly.

Swimming in waters with high levels of fecal coliform bacteria increases the chance of developing an illness (fever, nausea or stomach cramps) from pathogens entering the body through the mouth, nose, ears, or cuts in the skin. Diseases and illnesses that can be contracted in water with high fecal coliform counts include typhoid fever, hepatitis, gastroenteritis, dysentery, and ear infections. Fecal coliform, like other bacteria, can usually be killed by boiling water or by treating water with chlorine. Washing thoroughly with soap after contact with contaminated water can also help prevent infections.

There are many sources and factors that affect the concentration of fecal coliform bacteria. Community wastewater and septic system effluent are sources of bacteria, and fecal coliform is present in human waste. The bacteria travel down the drains in our buildings and can enter streams from illegal or leaky sanitary sewer connections, poorly functioning septic systems, and effluent from malfunctioning wastewater treatment plants. Fecal coliform is also found in wastes produced by domestic animals and wildlife. This can be a serious problem for waters near cattle feedlots, hog farms, dairies, and barnyards if waste is not properly contained. In urban areas, fecal coliform can be transported to surface water by animals when their feces is carried into storm drains, creeks, and lakes during storms.

Bacteria multiply faster at higher temperatures, and their growth rate slows drastically at very low temperatures. Fecal coliform bacteria were cited as a cause of impairment for the Flat River system, and one source may be managed pasture grazing.

The introduction of non-native species of aquatic plants into an area can result in significant changes to the ecosystem. Changes can be beneficial, detrimental, or environmentally neutral. And the introduction may be intentional or unintentional. For example, plants may be present on recreational watercraft as they are transported from out-of-state and unknowingly deposited into Louisiana waters. Or a resident may decide to plant vegetation that was purchased at a nursery, and the vegetation ends up spreading into the community.

2.2 TMDL STUDY

The purpose of a TMDL (Total Maximum Daily Load) is to determine the pollutant loading that a water body can assimilate without exceeding the water quality standard for that pollutant, and to establish the load reduction that is necessary to meet the standard in a water body. With a TMDL, pollutant loads can be assigned to point and nonpoint sources that discharge to the water body.

The TMDL is the sum of the waste load allocation (WLA), the load allocation (LA), and a margin of safety (MOS). The WLA is the load allocated to point sources of the pollutant of concern, and the LA is the load allocated to nonpoint sources, including the natural background. The MOS is a percentage of the TMDL that accounts for the uncertainty associated with the model assumptions, data inadequacies, and future growth. Expressed as a formula, TMDL = WLA + LA + MOS.

A water quality model was developed for DO, CBOD, ammonia nitrogen, and organic nitrogen. Projections for summer and winter were run at critical flows and temperatures. TMDLs were calculated in March of 2008 for DO, total phosphorus, total nitrogen, and oxygen-demanding substances (CBOD, ammonia nitrogen, organic nitrogen, and sediment oxygen demand). The nutrient TMDL was calculated using the allowable nitrogen loadings from the DO modeling and the naturally occurring ratio of total nitrogen to total phosphorus from reference streams in the South Central Plains Ecoregion.

In order to maintain the DO standard of 5.0 mg/L throughout Subsegment 100406, summer nonpoint source oxygen demand loads will need to be reduced by 75% to 92% and winter loads will need to be reduced by 3% to 49%. Because the Flat River's average total phosphorus and total nitrogen concentrations were higher than the average concentration in the reference streams, nutrient loads may also need to be reduced. Up to a 62% reduction in total phosphorus loads would be needed for the Flat River average total phosphorus concentration to be similar to the reference stream average concentration, and up to a 30% reduction in total nitrogen loads would be needed for Flat River average total nitrogen concentration to be similar to the reference stream average concentration. Reductions of point source discharges are not required as a result of this TMDL.

According to the Executive Summary for this TMDL, "*It is recommended that as a first step to implement this nutrient TMDL, the point sources should be given nutrient monitoring requirements in their permits to determine if the point sources are causing or contributing nutrients. However, final decisions for point source nutrient limitations will be made by LDEQ on a case-by-case basis during the re-issuance of each permit. Because point source discharges represent a very small portion of the total nutrient loading, it is possible that no reductions of point source discharges may be needed as a result of this TMDL.*"

Further information regarding the TMDL documents for this subsegment may be found at http://www.epa.gov/Region6/water/npdes/tmdl/2008/louisiana/final/6flat_donutf_tmdl.pdf and at http://www.epa.gov/waters/tmdldocs/34483_6flat_donutf_appa_j.pdf

3.0 ELEMENT B – ESTABLISH LOAD REDUCTIONS FROM BMPS

As mentioned above, in order to maintain the DO standard of 5.0 mg/L throughout Subsegment 100406, summer nonpoint source oxygen demand loads will need to be reduced by 75% to 92% and winter loads will need to be reduced by 3% to 49%. Up to a 62% reduction in total phosphorus loads would be needed for the Flat River average total phosphorus concentration to be similar to the reference stream average concentration, and up to a 30% reduction in total nitrogen loads would be needed for Flat River average total nitrogen concentration to be similar to the reference stream average concentration. BMPs need to be implemented in the watershed In order to reduce these loads and restore Flat River to meet water quality standards. Recommended BMPs for the Flat River watershed are described in Section 4.0, but there may be other practices which are equally or more practical and effective.

A consolidated list of BMPs recommended for various land uses can be viewed in the LDEQ NPS Program's Management Plan - http://nonpoint.deq.louisiana.gov/wqa/NPSManagementPlan.htm - under the Statewide Educational Programs heading. More information on the BMPs recommended in Section 4.0 can be found in the LDEQ NPS Program's 2000 Management Plan under Statewide Educational Programs, pages 17 to 37 of the Agriculture section, and pages 15 to 21 of the Urban Runoff section.

According to the Agriculture section of LDEQ NPS Program's 2000 Management Plan under Statewide Educational Programs, "*The agricultural best management practices which have been included in the state's Nonpoint Source Management Program are practices currently recommended by the Natural Resource Conservation Service and, if installed according to their standards and specifications, should result in reduction and control of the pollutants which they were designed to mitigate. Each of the BMPs are classified according to the type of pollutant which they were designed to mitigate and are ranked according to their effectiveness in improving surface and ground water quality. The BMPs have been reviewed by the NPS Interagency Committee and by a series of committees at the LSU Agricultural Center. These committees consisted of experts within the LSU College of Agriculture who work with production of agricultural commodities each day. Their review and recommendations have been considered by the Louisiana Department of Environmental Quality in this revision of the NPS Management Program.*"

Accurately quantifying the efficiency of a specific best management practice is difficult, since conditions vary (e.g., soil type, climate, vegetation, material(s) used) from site to site. Estimating the efficiency, however, of various BMPs is necessary in order to select the proper strategies for the location. Listed in the LDEQ NPS Program's 2000 Management Plan under Statewide Educational Programs, page 3 of the Urban Runoff section: *"The effects of urban runoff on receiving water quality are extremely complex. There are many highly variable factors involved including: the type, size, and hydrological characteristics of the receiving waters; the urban runoff quality and quantity characteristics; the designated beneficial uses; and behavioral characteristics and concentration levels of the specific pollutants that affect those uses."*

Of the BMPs recommended in Section 4.0, text from Water Quality: Diffuse Pollution and Watershed Management, Novotny, 2003 states for Filter Strips: "*Effective stabilization can reduce sediment loading by 90% but is highly dependent on the type of vegetation used and the stability and width of the reclaimed area. When combined with riparian area restoration, removal rates of 50 to 70% of phosphorus and 80 to 90% for nitrogen have been found. When planted in conjunction with a grass filter strip, load reductions of 80% TSS, 60 to 90% of total nitrogen, and 30 to 90% total phosphorus are possible.*"

4.0 ELEMENTS C AND D – DESCRIBE NPS BMPS AND GIVE COST

Agricultural production can generate contaminants which may have negative effects on surface and ground water supplies. Contaminants that are associated with cropping and livestock practices include sediment, nutrients (nitrogen and phosphorus) from inorganic fertilizers and organic livestock wastes, crop protection chemicals such as herbicides and insecticides, microorganisms from livestock wastes, and salts and trace elements from irrigation residue. Contaminants may be transported, either attached to sediment or dissolved in water, to surface and groundwater through all phases of the hydrologic cycle. Impaired water quality may restrict the amount of water available for uses such as drinking, stock watering, irrigation, sport fishing, and recreation.

Pastures may require substantial amounts of fertilizer in order to produce hay and keep a healthy food supply for grazing animals. Excessive fertilizer concentrations near waterways can increase the probability of nutrients getting washed into the water. In addition, livestock can produce large amounts of fecal waste, and this waste may contain considerable amounts of nutrients. Rainfall can carry this waste to nearby waterways, where high nutrient concentrations may lead to eutrophic conditions that promote algal and vegetative growth and eventually reduce oxygen levels.

Livestock may also contribute to increased loads of sediments entering a water body. When cattle are concentrated in a single location, such as feeding and watering areas, they often remove vegetative cover and expose the soil beneath. This soil can be dislodged by rainfall and then carried to water bodies by runoff. Sediment increases the turbidity of water, thereby reducing light penetration, impairing photosynthesis, and altering oxygen relationships, which consequently may reduce food supplies for certain aquatic organisms. Sediment can adversely affect fish populations in areas where deposits cover spawning beds, and it may also fill bayous, lakes, and shipping channels.

High priority areas for subsegment 100406 were determined by analysis of land use information, water quality data, and a tour of the Flat River watershed. High priority areas for BMPs for this watershed are gullies that drain agricultural fields into the river. Stream banks that are prone to erosion and locations of urban runoff are also key areas for BMPs. All of these sources can contribute to low DO and high levels of fecal coliform bacteria and solids, and examples can be seen in the pictures below in this section.

Leaving a natural area of land undisturbed is sometimes the most effective BMP. But if an area of soil is exposed, it is more prone to erosion since there is no vegetative cover or natural material to shield against particle detachment and consequent transport from flowing water, wind, and precipitation. The lack of vegetation also means that there is no root system to improve soil structure and decrease the chance of erosion from water or wind.

Planting a grass filter strip or trees as cover in an area of exposed soil on or near the stream bank is an effective BMP for the prevention of soil loss. Filter strips are areas of vegetation that intercept runoff into lakes, rivers, and streams. They can remove various pollutants such as heavy metals, sediment loads, and excess organic material. Filter strips perform well with small, light-intensity rainfalls, and they should be shaped uniformly so that water moves into the vegetative strip without being concentrated. Filter strips also increase infiltration, which directs more water into the soil where nutrients and pollutants can be sorbed to particles. The cost of this practice is relatively low; the cost of a filter strip was around $400 per acre in 2010, according to an NRCS cost list.

A list of agricultural BMPs is provided by the NRCS in their electronic Field Office Technical Guides - http://www.nrcs.usda.gov/technical/eFOTG/ - which include a description of each BMP and its recommended uses. Each BMP is listed by a code - e.g., Filter Strip (393). A user can click on the State, then County/Parish, then Section 1, and then D. Cost Data, and Cost Lists. Lists of average costs for various programs and practices will appear.

Gullies are a severe form of erosion and are often caused by the flow of concentrated water on erodible soils. The water responsible may begin as sheet flow, and then produce rills. Some of these rills will become gullies over time. Gullies will typically continue to develop until they reach resistant material. It is best to prevent gully formation, and stabilize existing gullies to keep them from expanding. Gully stabilization often involves reducing or eliminating the source of water that flows through the gully and inserting dikes, dams, or other check structures in the gully. Reshaping and stabilization of steep banks may also be needed.

Below is a picture of a gully with a concrete dam that has collapsed. It is now less effective as a control structure, and needs to be rebuilt in order to prevent further erosion.

Costs associated with the construction and maintenance of check structures vary, depending on the type and quantity of materials and site preparation needed. Effectiveness of check structures also varies, depending on the design of the structure itself.

Runoff from pastures and agricultural fields does not have to flow through a noticeable channel such as a gully or a rill in order to enter a water body. Sheet erosion may occur as water moves in sheets over the land and transports sediment.

One effective BMP for pastures and livestock is using fencing to keep the grazing animals away from the water body. By not allowing animals to enter the water, they are unable to detach sediment on the banks and defecate directly in the water body. Troughs and tanks can be installed as an alternative water source. Costs of fencing vary, depending on area treated and type of material used. According to a 2010 NRCS cost list, the price for a Fence (382) as a BMP is approximately $2.50 per linear foot.

The main crops in subsegment 100406 are Soybeans, Cotton, and Corn. Numerous BMPs (e.g., Conservation tillage) and corresponding NRCS codes for these and other crops can be found in LSU's Agronomic Crops Best Management Practices publication. It is available in printed form and online - http://www.lsuagcenter.com/NR/rdonlyres/3EF63A05-7F99-4D72-84ED-1ABBC9628879/3109/pub2807CropsBMP2.pdf

Another concern in the watershed is runoff from households and businesses that washes into the Flat River. Given the population growth in the Bossier City area, this may continue to be a factor in impairment. <u>It is important to remember that everything that is blown, sprayed, poured, or thrown on the ground can pollute Louisiana's waters.</u> And this is especially important if one's property is adjacent to or nearby a water body. For example, simply by mulching or bagging grass clippings, one can keep this material from entering the water.

Several other BMPs applicable for this situation are presented in the paragraph below, and the cost involved to implement them is minimal or nonexistent. DEQ has also begun a campaign titled "Be the Solution!" that is directed toward urban NPS pollution. It can be found online -

http://www.deq.louisiana.gov/portal/tabid/2953/Default.aspx - and a copy of the poster for the campaign is attached in the Addendum.

Nonpoint source pollution prevention in urban areas involves managing existing sources of pollution and preventing new ones. Public education, awareness, and participation combine to make an effective strategy against nonpoint source pollution. Another consideration involves decision-making regarding land-use planning for current and future development. BMPs are best implemented though site plan controls, storm water management plans, local ordinances, and erosion control guidelines and standards. The following are simple tasks that everyone can use to reduce nonpoint source pollution:

- Keep litter, pet wastes, leaves, and other debris out of street gutters and storm drains
- Mark storm drains with messages to warn citizens of the environmental hazards of dumping materials into them
- Apply lawn and garden chemicals sparingly and according to directions
- Dispose of used oil, antifreeze, paints and other household chemicals properly - not in sewers or drains
- Clean up spilled brake fluid, oil, grease, and antifreeze. Do not wash it into the street where it will eventually reach local streams, lakes, and bayous
- Control soil erosion on your property by planting ground cover and stabilizing erosion- prone areas
- Encourage local government officials to develop construction erosion/sediment control ordinances in your community
- Purchase household detergents and cleaners that are low in phosphorus to reduce the amount of nutrients discharged in our water bodies
- Wash your car on grass so the soapy water soaks into the ground. Use a hose nozzle to prevent water from flowing when not in use

4.1 SOURCES OF ASSISTANCE

The LDEQ is currently designated as the lead agency for implementation of the Louisiana Nonpoint Source Program. The LDEQ Nonpoint Source Pollution Unit provides USEPA Section 319(h) funds to assist in the implementation of BMPs and to address water quality problems in subsegments listed on the 303(d) list.

USEPA 319(h) funds are utilized to sponsor cost-sharing, monitoring, and educational projects. These monies are available to designated state and tribal agencies to implement approved nonpoint source management programs. In accordance with guidance issued by EPA under Clean Water Act Section 319, Section 319(h) funding decisions are made by the states. States submit their proposed funding plans to EPA, and, if consistent with grant eligibility requirements and procedures, EPA then awards the funds requested by the states. The LDEQ Nonpoint Source Pollution Unit is presently cooperating with such organizations on approximately 35 active nonpoint source projects throughout the state.

The U.S. Department of Agriculture (USDA) and Natural Resources Conservation Service (NRCS) offer 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 cropland, forested land, wetlands, grazing land, and wildlife habitats. The Food, Conservation, and Energy Act of 2008 (2008 Farm Bill) provides funding to various conservation programs in each state by way of the NRCS and the state's local Soil and Water Conservation Districts (SWCD). The local Soil and Water Conservation District (SWCD) office in Benton, Louisiana is a source of assistance with BMPs.

Although most of these programs are designed to assist agriculture, there may be cases where they can be utilized for conservation practices for other land uses. The following are just a few examples of the USDA Natural Resources Conservation Service national priorities and programs:

<u>Agricultural Management Assistance Program</u>

This program provides cost-share assistance to agricultural producers who will voluntarily address issues such as water management, water quality, and erosion control by incorporating conservation into their farming operations. Practices might include constructing an irrigation control structure, planting trees to improve water quality, or adopting a resource conservation strategy such as soil erosion control or integrated pest management.

<u>Environmental Quality Incentives Program (EQIP)</u>

EQIP was re-authorized in the 2002 Farm Bill to provide a voluntary conservation program for farmers and ranchers who promote agricultural production and environmental quality as compatible goals. This program offers financial and technical assistance to eligible participants to develop management practices on their agricultural land.

Conservation Reserve Program (CRP)

The CRP provides technical and financial assistance on a voluntary basis to eligible farmers and ranchers in addressing soil, water, and related natural resource concerns to protect highly erodible and environmentally sensitive lands. It encourages farmers to convert these lands to vegetative cover, such as tame or native grasses, wildlife plantings, trees, filter strips, or riparian buffers.

Watershed Operations

Watershed Operations is a voluntary program under the authority of the Watershed Protection and Flood Prevention Act of 1954 (P.L. 83-566) and the Flood Control Act of 1944 (P.L. 78-534). Under this program, the NRCS provides technical and financial assistance to states, local governments, and tribes to implement authorized watershed project plans for the purpose of watershed protection, flood mitigation, soil erosion reduction, irrigation water management, sediment control, fish and wildlife enhancement, and wetlands creation and restoration.

Rapid Watershed Assessments

NRCS is encouraging the development of rapid watershed assessments in order to increase the speed and efficiency needed to guide conservation implementation. In summary, this program will provide quick and inexpensive plans for setting priorities in a watershed and taking necessary action.

Wetlands Reserve Program

This voluntary program provides technical and financial assistance from the NRCS to help landowners in protecting, restoring, and enhancing wetlands on their property. The goal of this program is to maximize wetland function and value, along with an optimum wildlife habitat, for all wetlands enrolled in the program.

Wildlife Habitat Incentives Program (WHIP)

WHIP is a voluntary program for landowners interested in developing and improving wildlife habitats. Technical assistance and up to 75% cost-share assistance is provided in order to establish and improve habitats for fish and wildlife. A WHIP agreement between the NRCS and the participant generally lasts from one year after the last conservation practice is implemented, but no more than 10 years from the date the agreement is signed.

Master Farmer Program

This program was developed by the Louisiana State University Agricultural Center. The voluntary program is based on educating farmers about environmental stewardship, resource-based production, and resource management. Master Farmer certification involves classroom instruction on water quality regulations, conservation practices, crop-specific best management practices and implementation, and USDA conservation funding. Participants will visit model farms to view the implementation of best management practices that are installed to reduce sediment runoff. Finally, a farm-specific conservation plan will be developed. Attainment of "Master Farmer" status can set an example for the agricultural community to become involved in implementing best management practices and in helping to control nonpoint source pollution. Economical and effective best management practices can make a huge impact on reducing agriculture's contribution to water quality problems.

In addition to the programs previously mentioned, the following organizations have signed a Memorandum of Understanding (MOU) with LDEQ under the state's NPS Management Plan that each will aid LDEQ in achieving the goals of the plan:

- Louisiana Department of Agriculture and Forestry
- Louisiana Department of Health and Hospitals
- Louisiana Department of Wildlife and Fisheries
- Louisiana Department of Transportation and Development
- Louisiana Department of Natural Resources
- Louisiana State University Agricultural Center
- Natural Resources Conservation Service
- USDA - Farm Services Agency
- Louisiana Forestry Association
- US Fish and Wildlife Service
- USDA - Forest Service
- US Army Corps of Engineers
- US Geological Survey
- Federal Emergency Management Agency
- Louisiana Farm Bureau Federation

5.0 ELEMENT E – EDUCATION AND OUTREACH

Public education is a proactive approach and the first critical element needed to accomplish goals and objectives, because it is imperative that the public understands and supports efforts to implement BMPs. A person who lives in and/or owns property in the watershed is a stakeholder and stands to benefit from his or her contribution towards protecting it. Successful outcomes are more likely when citizens understand what is occurring and why. Education may instill a greater concern toward the environment, and inspire the community to take action and eliminate the need for additional regulation. When stakeholders volunteer to demonstrate conservation practices on their land they should receive positive recognition and other incentives – this may encourage others to do the same. More information on nonpoint source pollution can be found at LDEQ's NPS website - http://nonpoint.deq.louisiana.gov

Education and participation are the best approaches for controlling NPS loading from urban residential sites. Urban storm water runoff BMPs should be implemented and maintained to reduce or eliminate the amount of nonpoint source pollution entering water bodies. The use of maps for identifying nearby streams, topography, and drainage patterns can improve a residential area's strategy for developing a plan to prevent NPS loading by implementing BMPs. For example, implementation can be as easy as helping to establish vegetation on sloping areas of a site. These types of BMPs are very simple and cost-effective, although there may be other types which could be more effective at preventing NPS pollution.

LDEQ has recently partnered with several Resource Conservation & Development Districts across the state to hire Watershed Coordinator personnel for each RC&D. The Trailblazer RC&D - http://www.trailblazer.org/ - is located in Ruston and employs a Watershed Coordinator whose job is to, among other responsibilities, provide education and outreach on NPS issues to citizens in the watershed and throughout Trailblazer's eight-parish area of responsibility. The Trailblazer Watershed Coordinator has attended and presented at numerous NPS-related events in the state.

6.0 ELEMENT F – IMPLEMENTATION SCHEDULE

From 2005 to 2009, the Environmental Quality Incentives Program and Wetlands Reserve Program, along with general conservation technical assistance, were used to implement BMPs throughout subsegment 100406.

In the Cooper Bayou HUC (13,715 acres), EQIP was used in 2005 and 2007 to install 91 total acres of Residue Management BMPs. Cooper Bayou is easily the most urban of the three HUCs in the Flat River subsegment, and the percentage of land covered by BMPs is .66%.

In the Upper Flat River HUC (38,139 acres), EQIP and technical assistance were used for multiple BMPs from 2005 to 2009. Conservation Crop Rotation was employed on 1,570 acres. Residue Management BMPs were used on 2,691 acres, and Prescribed Grazing was used for 235 acres. Other BMPs listed included Mulching (6 acres), Critical Area Planting (6 acres), Nutrient Management (115 acres), Wetland Wildlife Habitat Management (37 acres), and a Pond (6 acres). The Total amount of BMPs in this subsegment is 4,670 acres - the BMP coverage is 12.24%.

The Lower Flat River HUC (36,198 acres) had the highest Total amount of BMPs used from 2005 to 2009 for the Flat River subsegment – 9,831 acres. This represents a BMP coverage value of 27.16%. The WRP was used for multiple BMPs – Critical Area Planting (66 acres), Dikes (26 acres), Riparian Forest Buffers (256 acres), Access Control (450 acres), Mulching (26 acres), Tree/Shrub Site Preparation (256 acres), Structures for Water Control (187 acres), Tree/Shrub Establishment (355 acres), Wetland Wildlife Habitat Management (204 acres), Shallow Water Development and Management (26 acres), and Wetland Restoration (1,274 acres). EQIP was also used for numerous BMPs – Brush Management (208 acres), Conservation Crop Rotation (639 acres), Residue and Tillage Management (633 acres), Critical Area Planting (40 acres), Fencing (427 acres), Grade Stabilization Structure (40 acres), Mulching (40 acres), Forage and Biomass Planting (20 acres), Pipeline (339 acres), Prescribed Grazing (2,299 acres), Heavy Use Area Protection (47 acres), Nutrient Management (93 acres), Integrated Pest Management (461 acres), and a Water Well (21 acres).

The local Soil and Water Conservation District (SWCD) office in Benton, Louisiana is a source of assistance with these and other BMPs.

7.0 ELEMENTS G AND H – CRITERIA AND MILESTONES

A water quality standard is a definite numerical criterion value or general criterion statement to enhance or maintain water quality and provide for, and fully protect, the designated uses of a water body. There are four LDEQ ambient water quality monitoring stations in this subsegment: Station 272 (Flat River east of Taylortown), Station 363 (Flat River Drainage Canal north of Bossier City), Station 389 (Flat River Drainage Canal northeast of Bossier City), and Station 390 (Flat River Drainage Canal northeast of Shreveport). Data information from these stations was obtained from the LDEQ Water Quality Assessment Division, Standards and Assessment Unit. This data was used to develop the TMDL. Analyses of the data are presented in the graphs in this section, and a map of the monitoring stations can be found in this section as well.

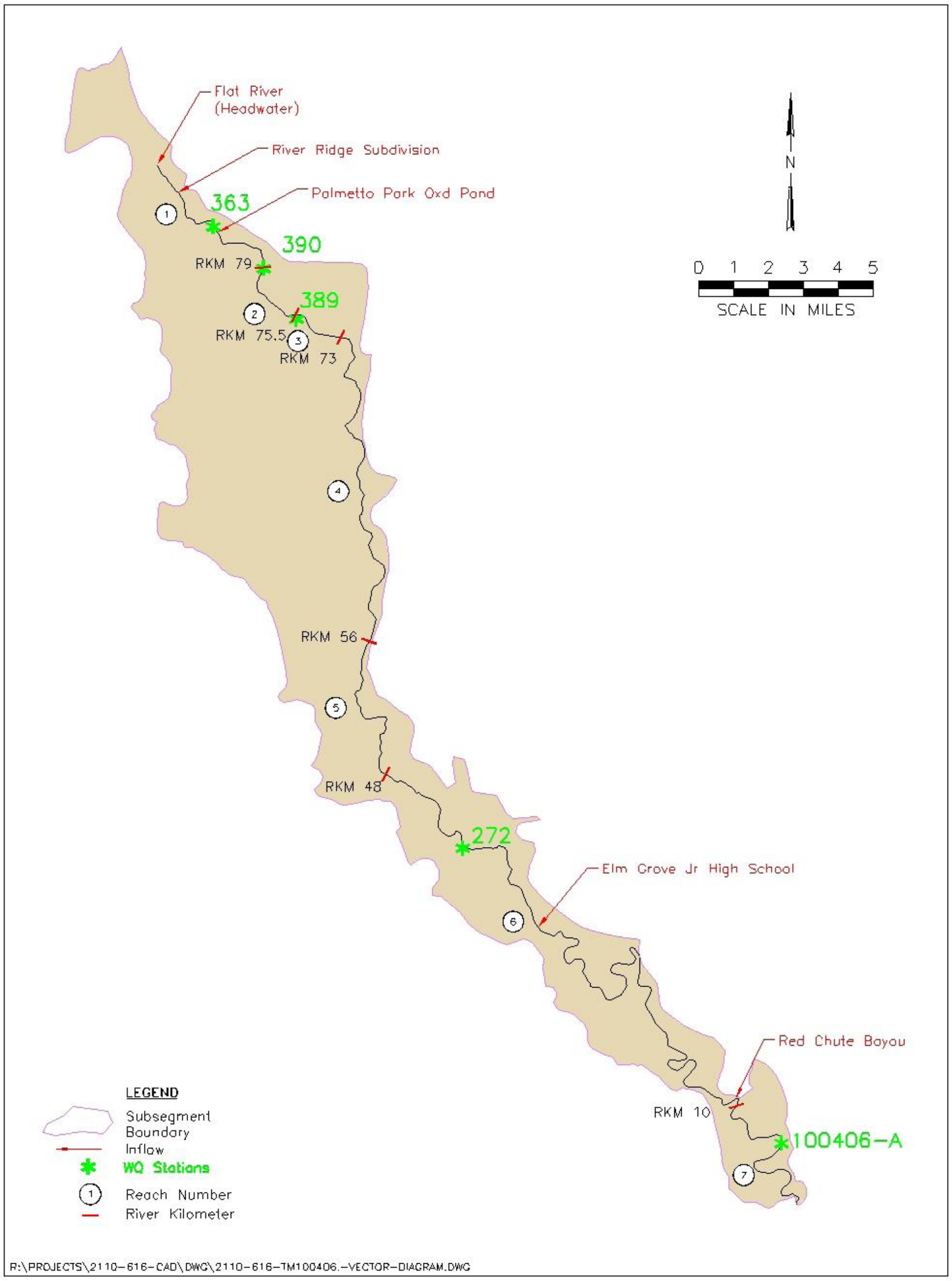


Figure 12 – Monitoring Station Locations

Perhaps the two most important milestones for water quality criteria are those for DO (5 mg/L year-round) and Fecal Coliform Bacteria (no more than 25% of samples collected on a monthly or near-monthly basis exceeding 400 colonies/100 mL for the period of May through October).

Attainment of these milestones would allow Flat River Subsegment 100406 to be delisted for Primary Contact Recreation (Fecal Coliform Bacteria) and Fish and Wildlife Propagation (DO).

Data was taken regularly at monitoring stations from 1990 to 1994 for stations 363, 389, and 390, and from 1990 to 1998, plus 2002 and 2007 for station 272. Numerous parameters were measured, including Turbidity, Dissolved Oxygen, Fecal Coliform Bacteria, Total Coliform Bacteria, Kjeldahl Nitrogen, Hardness, Mercury, Nitrate+Nitrite Nitrogen, Lead, Sulfates, Total Dissolved Solids, Temperature, Phosphorus, Total Organic Carbon, Total Suspended Solids, Alkalinity, Arsenic, Cadmium, Chloride, Chemical Oxygen Demand, Color, Specific Conductance, Chromium, pH, Ammonia, and Zinc.

For the following graphs in this section, the data collected were plotted on the same chart to illustrate comparisons at a particular station over the years within a parameter. This format can show water quality improvement or decline. Agricultural activities, such as fertilizing, irrigating, and tilling, typically occur during certain times of the year and can cause seasonal water quality deterioration. If seasonal trends are present, they will be apparent. Numerical criteria for the parameters tracked in the graphs can be found in Title 33 Environmental Regulatory Code LAC 33:IX.1123, Table 3.

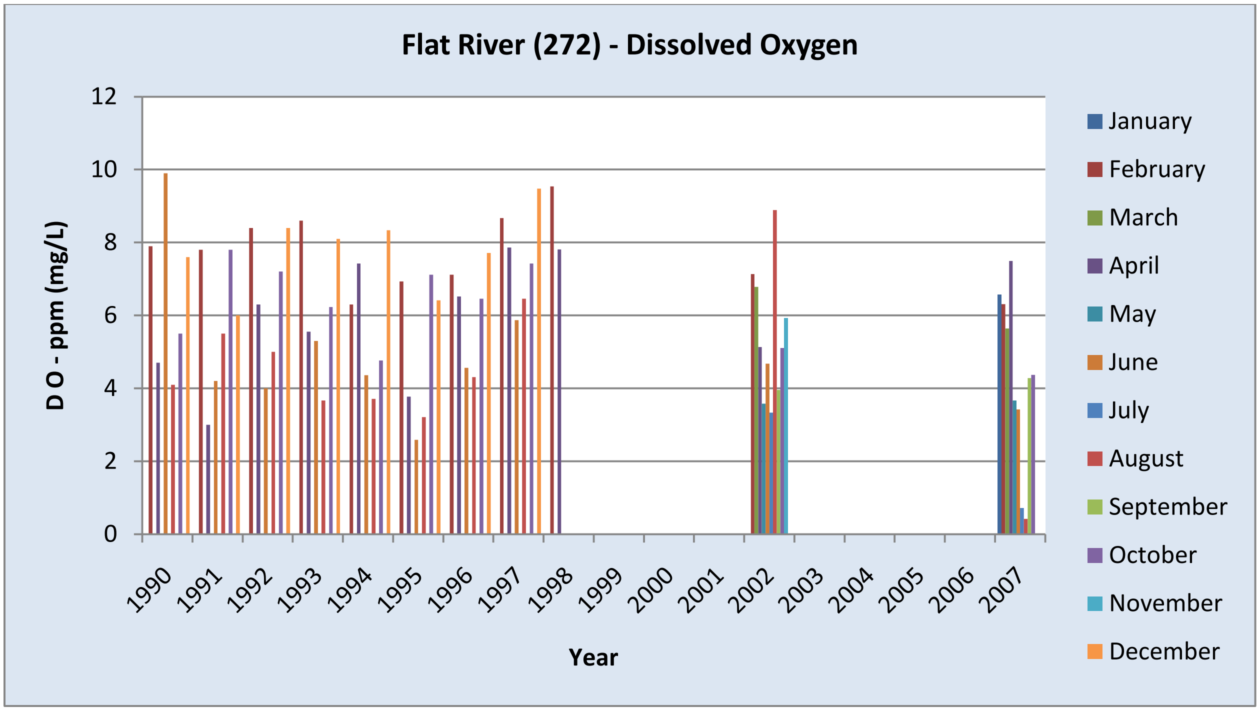


Figure 13– Dissolved Oxygen (272)

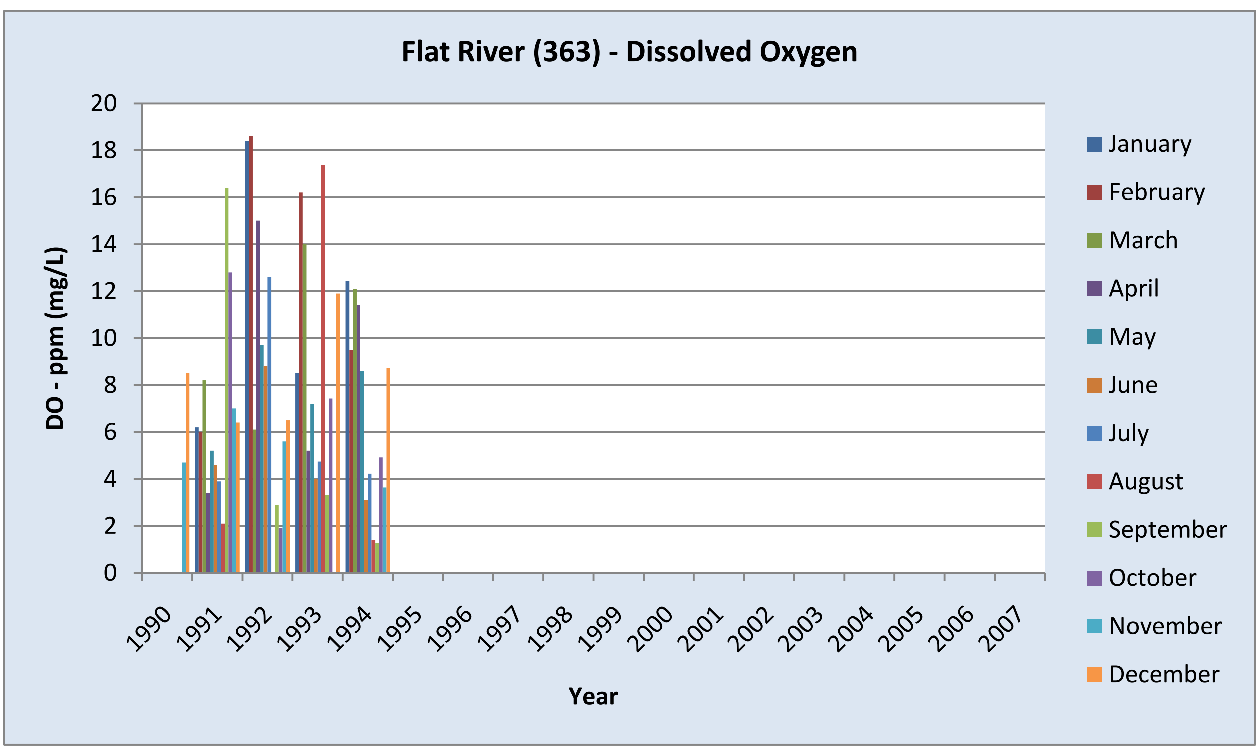


Figure 14 – Dissolved Oxygen (363)

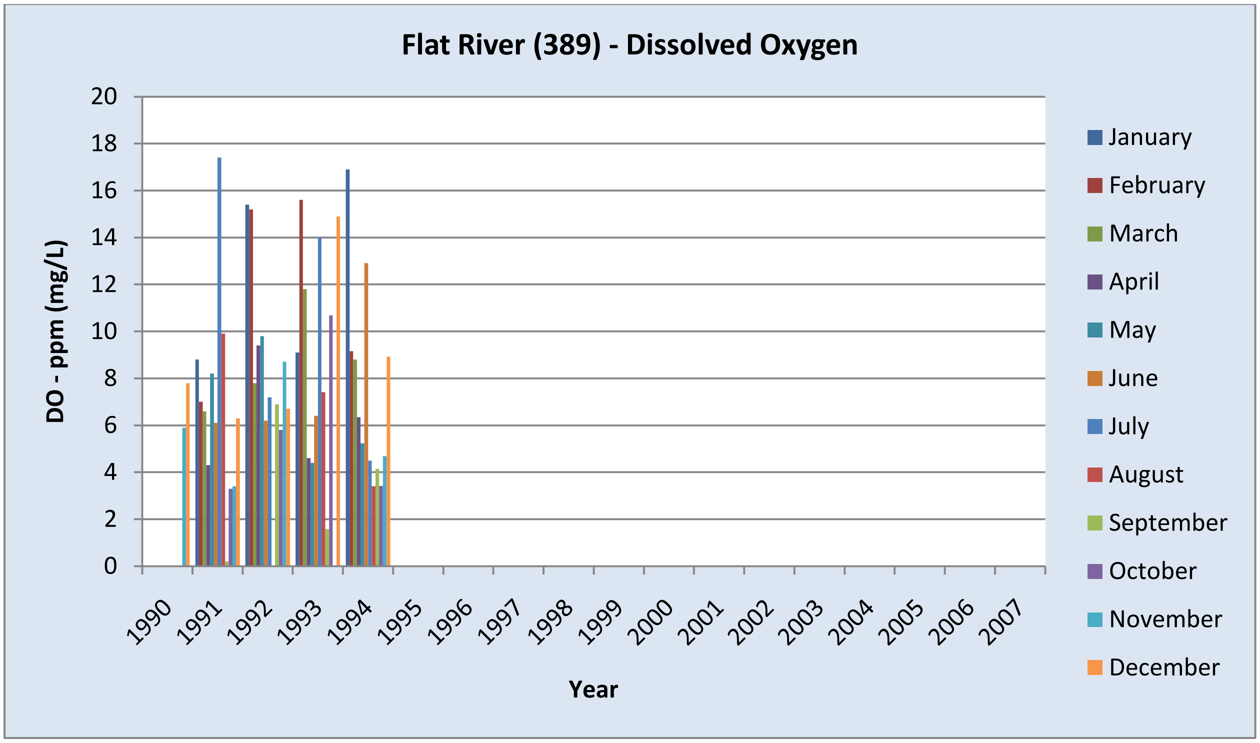


Figure 15 – Dissolved Oxygen (389)

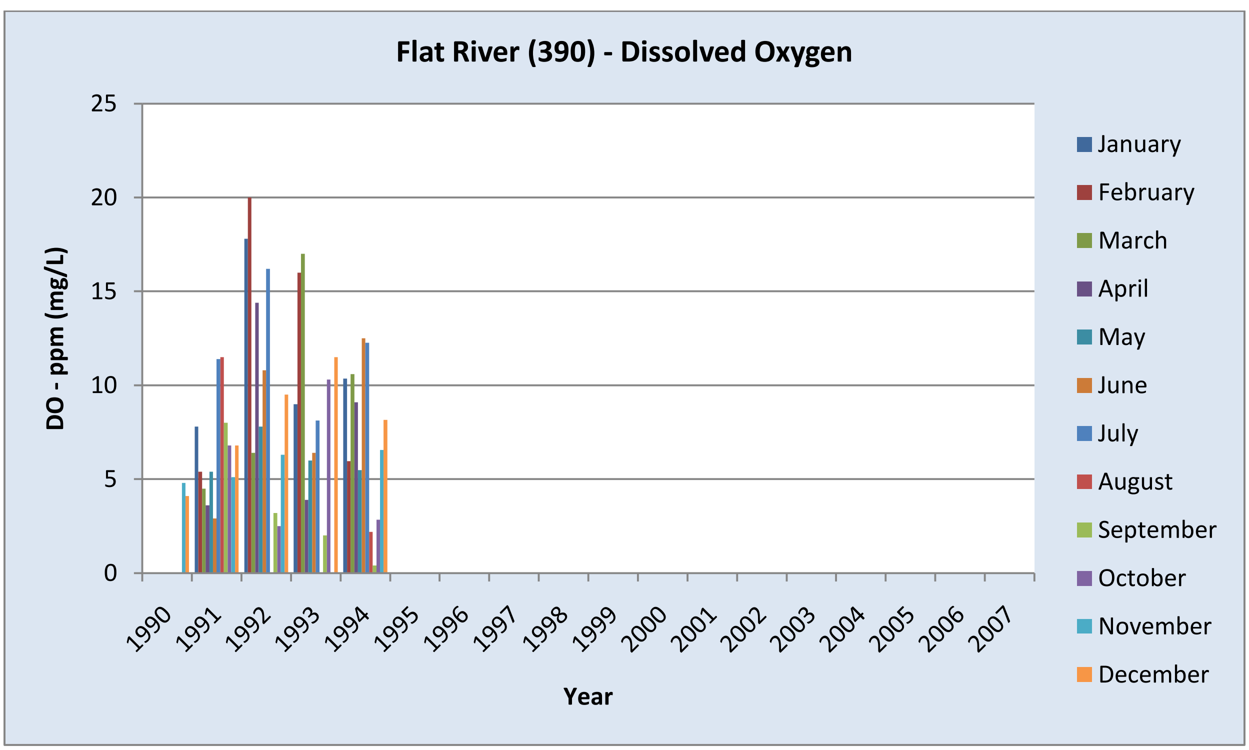


Figure 16 – Dissolved Oxygen (390)

Dissolved Oxygen criteria are designed to protect native wildlife and aquatic life species associated with the aquatic environment. Naturally occurring variations below the specified criterion may occur for short periods, but no waste discharge or human activity shall lower the DO concentration below the specific minimum. The Flat River watershed is considered fresh water, and the DO concentration shall be at or above 5 mg/L (ppm – parts per million) for a diversified population of fresh warmwater biota, including sport fish.

Levels of Dissolved Oxygen in the Flat River have followed a pattern of higher concentrations of DO in the cooler winter months, and lower concentrations of DO in the warmer summer months. This is expected, as cooler water is able to hold more DO than warmer water. For site 272, average DO levels for the last two years sampled appeared to be slightly lower than those from the first eight years. Some of the values, however, were well below the standard of 5 mg/L. Values from the other three sites also had a seasonal trend, with some readings less than the 5 mg/L standard.

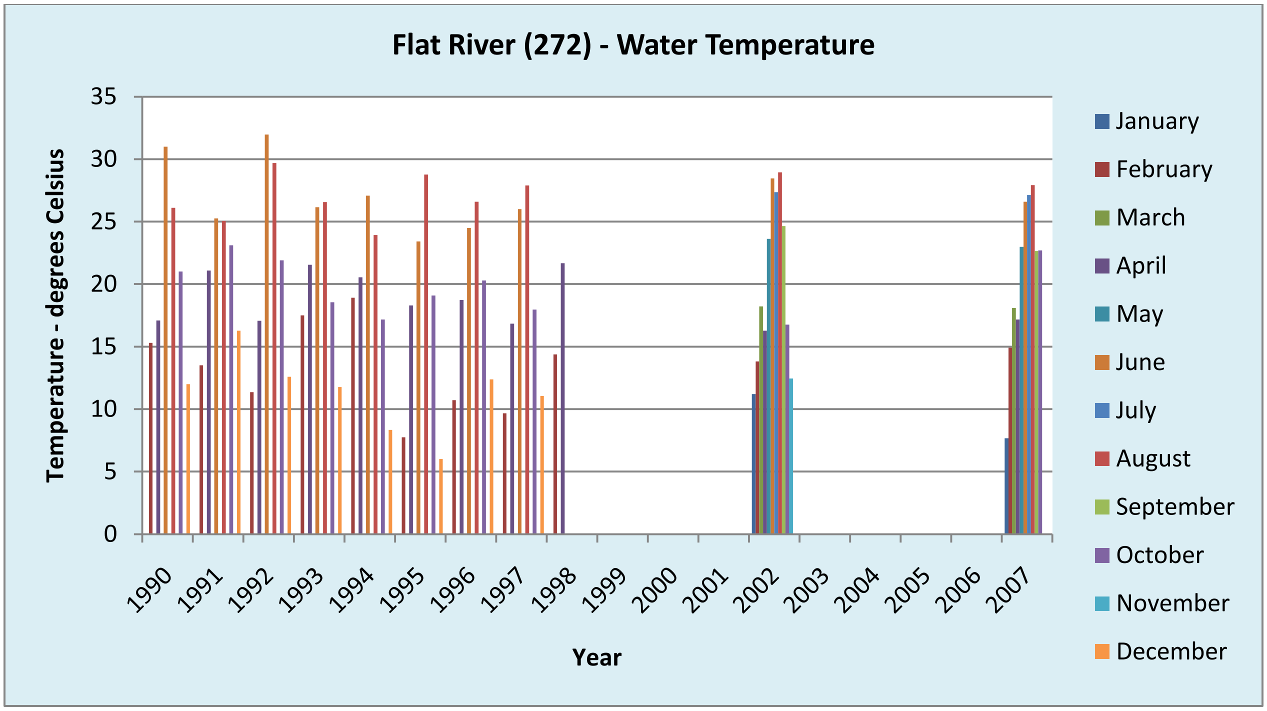


Figure 17 – Water Temperature (272)

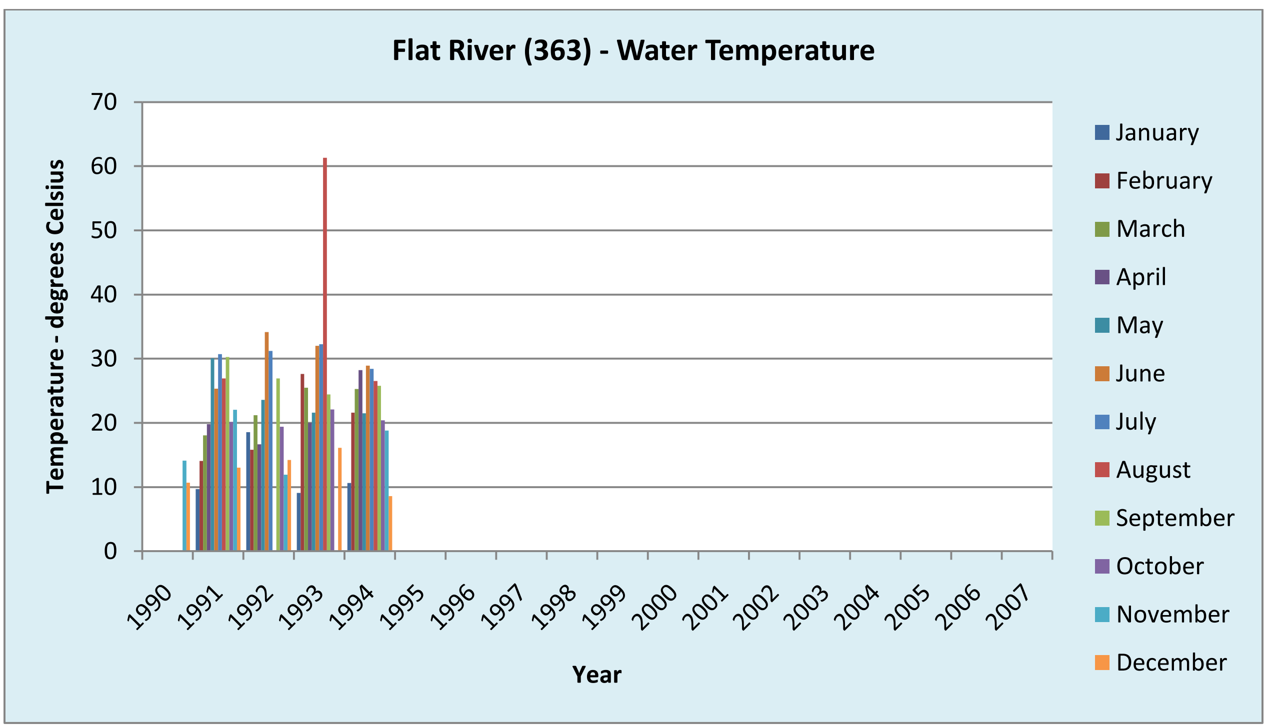


Figure 18 – Water Temperature (363)

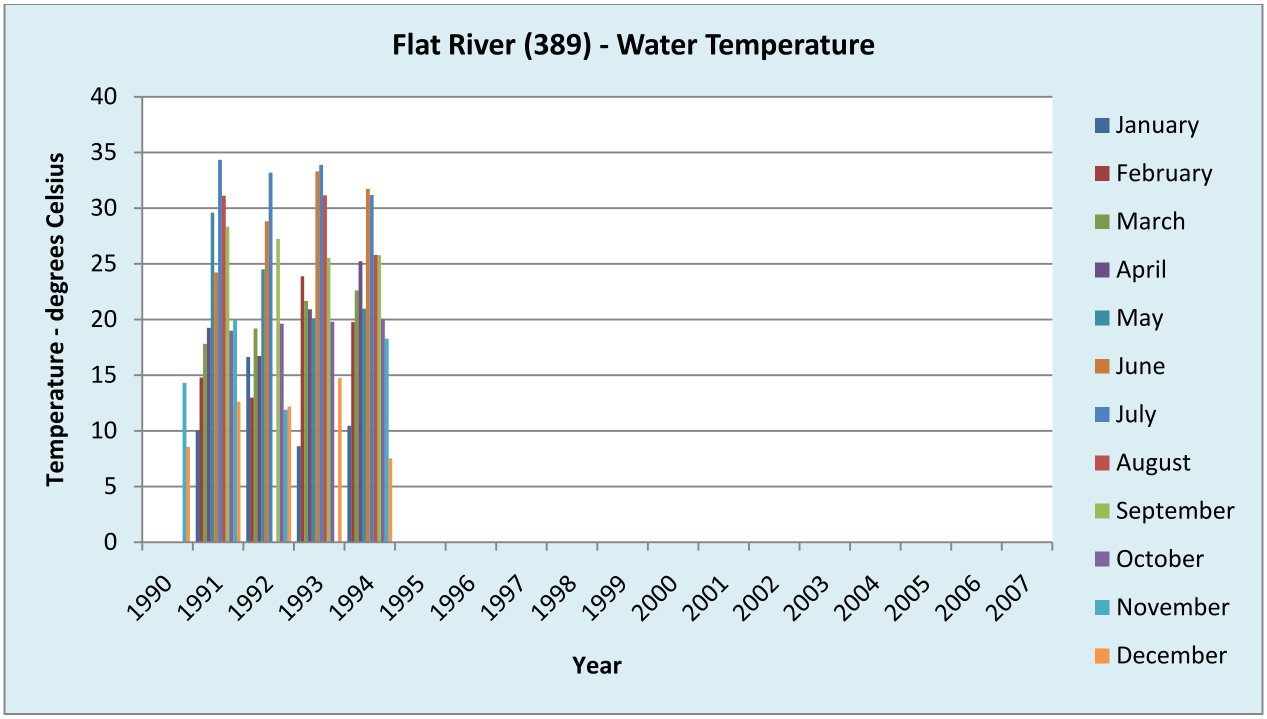


Figure 19 – Water Temperature (389)

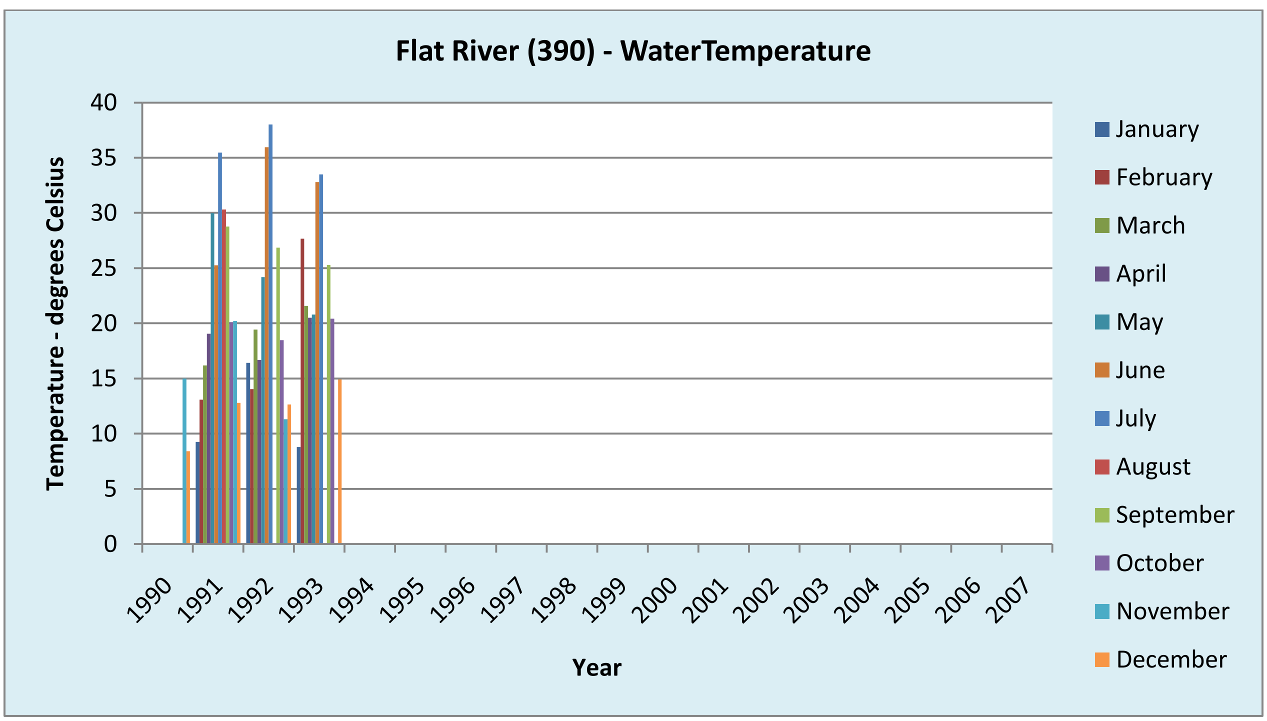


Figure 20 – Water Temperature (390)

The Flat River watershed is designated as freshwater, and the maximum ambient water temperature is set at 32 degrees Celsius. A rise of 2.8 degrees Celsius is permitted for streams and rivers, and a rise of 1.7 degrees Celsius is permitted for lakes and reservoirs. This temperature may be changed on a case-by-case basis to allow for the effects of natural conditions such as unusually hot and dry weather.

Water temperatures in the Flat River also followed seasonal patterns. Temperatures were typically lowest in January and highest in July due to differences in solar radiation and the resulting atmospheric temperatures. Water temperatures year-by-year were fairly consistent. All samples for site 272 were below the maximum standard of 32 degrees Celsius. Some of the samples in sites 389 and 390 had values greater than the standard.

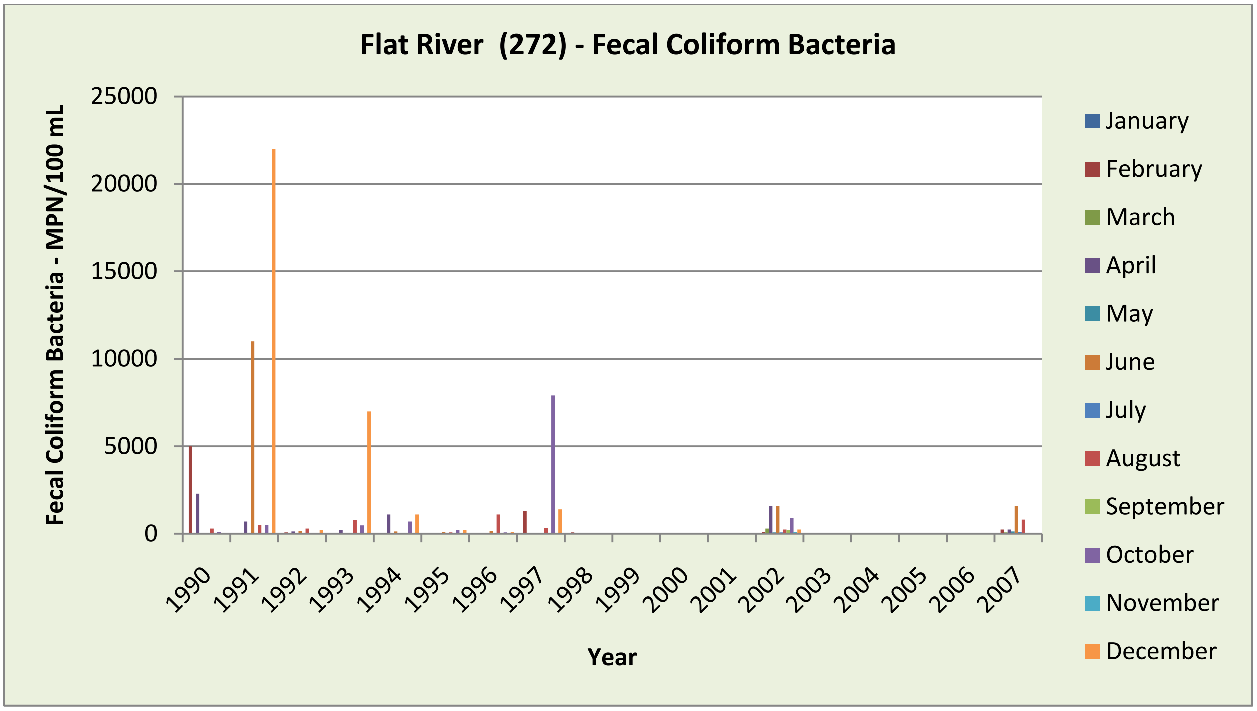


Figure 21 – Fecal Coliform Bacteria (272)

Criteria for Fecal Coliform Bacteria have been established to protect the public from possible illness and even death from the ingestion of significant amounts of pathogenic organisms.

Data for Fecal Coliform Bacteria was recorded in subsegment 100406 only for site 272. Levels of Fecal Coliform Bacteria in the Flat River varied month-to-month and year-to-year. The Flat River appears to be adhering to the Primary Contact Recreation fecal coliform standard of no more than 25% of samples collected on a monthly or near-monthly basis exceeding 400 colonies/100 mL for the period of May through October. The standard of no more than 25% of the samples collected on a monthly or near-monthly basis exceeding 2000 colonies/100 mL (which is the non-recreational period of November through April for Primary Contact Recreation and the year-round standard for Secondary Contact Recreation) also appears to have been met. A small number of samples had elevated “spiked” values, however.

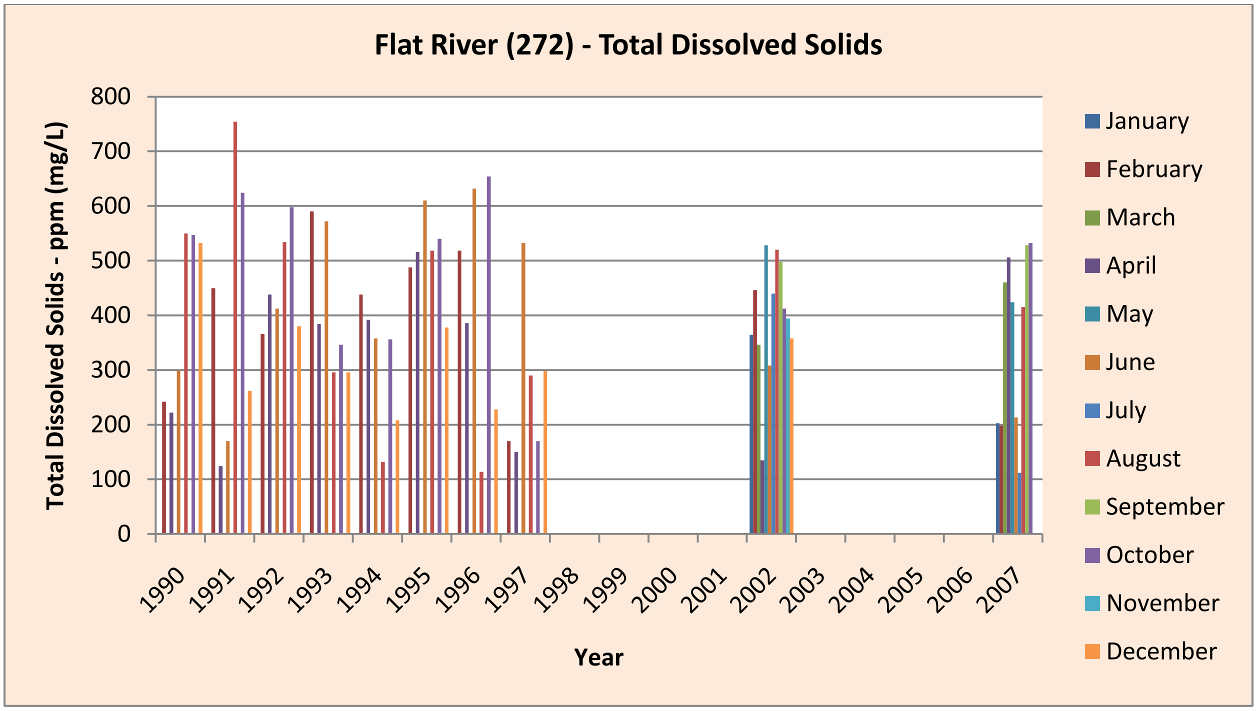


Figure 22 – Total Dissolved Solids (272)

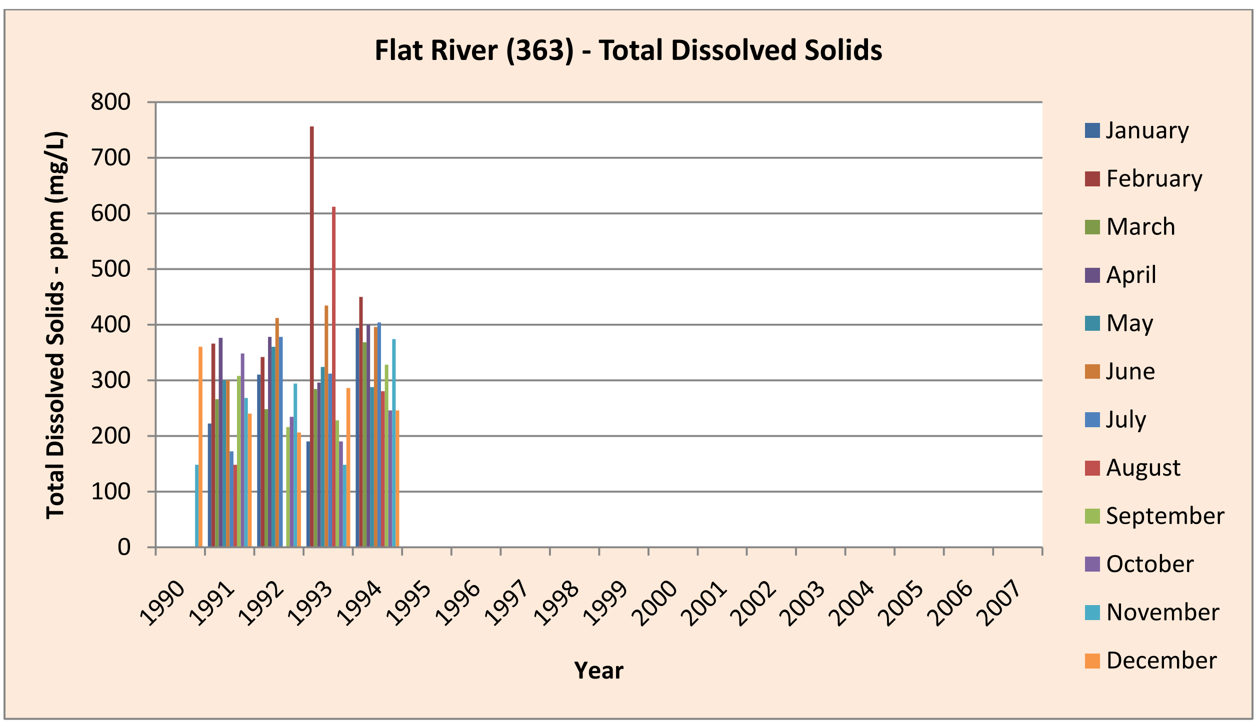


Figure 23 – Total Dissolved Solids (363)

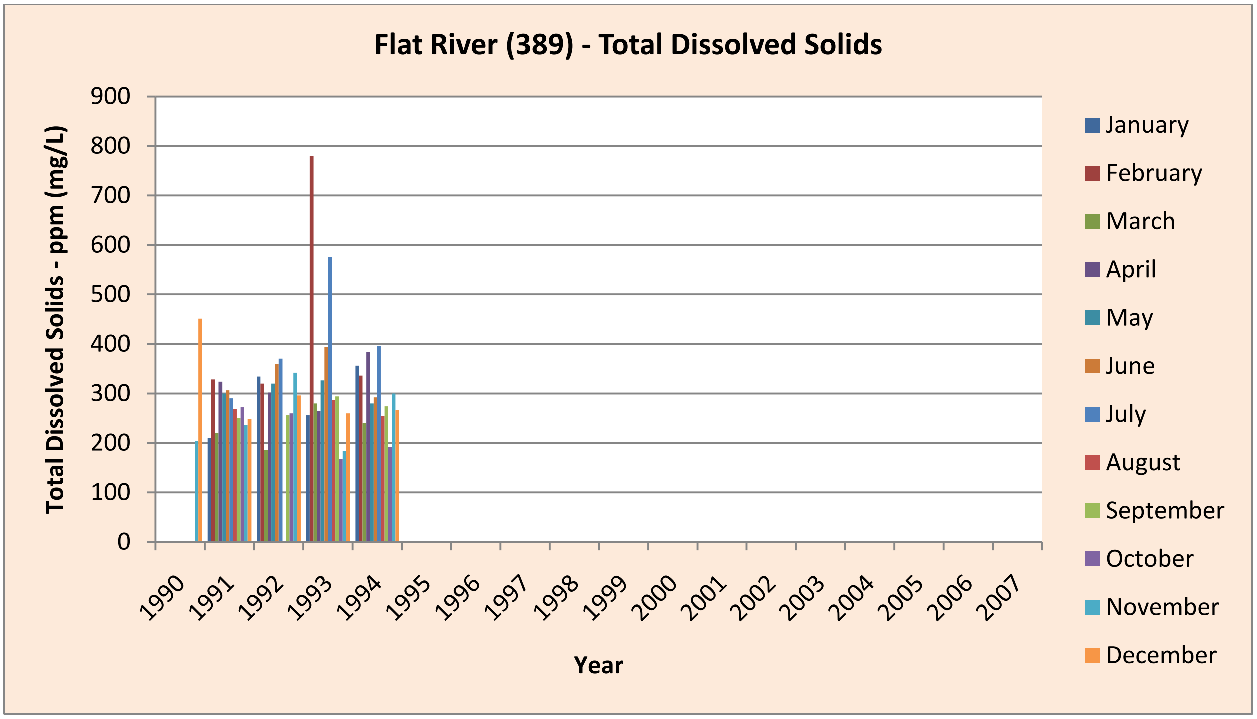


Figure 24 – Total Dissolved Solids (389)

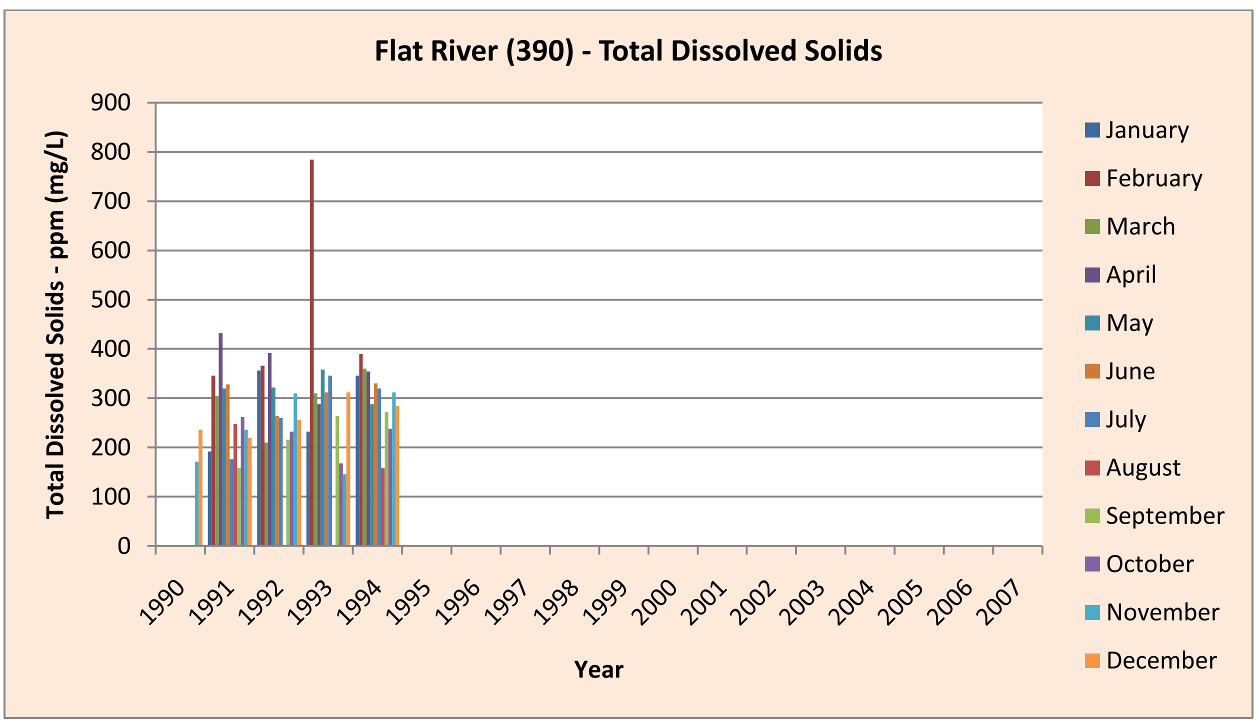


Figure 25 – Total Dissolved Solids (390)

Numerical criteria for total dissolved solids, sulfates, and chlorides typically represent the arithmetic mean of existing data from the nearest sampling data plus three standard deviations. Excessive concentrations of these substances can be harmful to aquatic life. Whereas Louisiana has not yet adopted numerical criteria for phosphorus and nitrogen concentrations in the Flat River, an overabundance of these two nutrients can be detrimental to aquatic life.

Concentrations of Total Dissolved Solids for the Flat River also fluctuated from month-to-month and year-to-year. The average value for site 272 was approximately 400 mg/L (parts per million), which is greater than the standard of 300 mg/L. The average value for the other three sites was approximately 300 mg/L, and each site had a spiked value between 700 and 800 mg/L during February of 1993. No clear seasonal pattern or association with other parameters was seen, and, unlike data for fecal coliform bacteria, no value differs by an order of magnitude (times ten) from another.

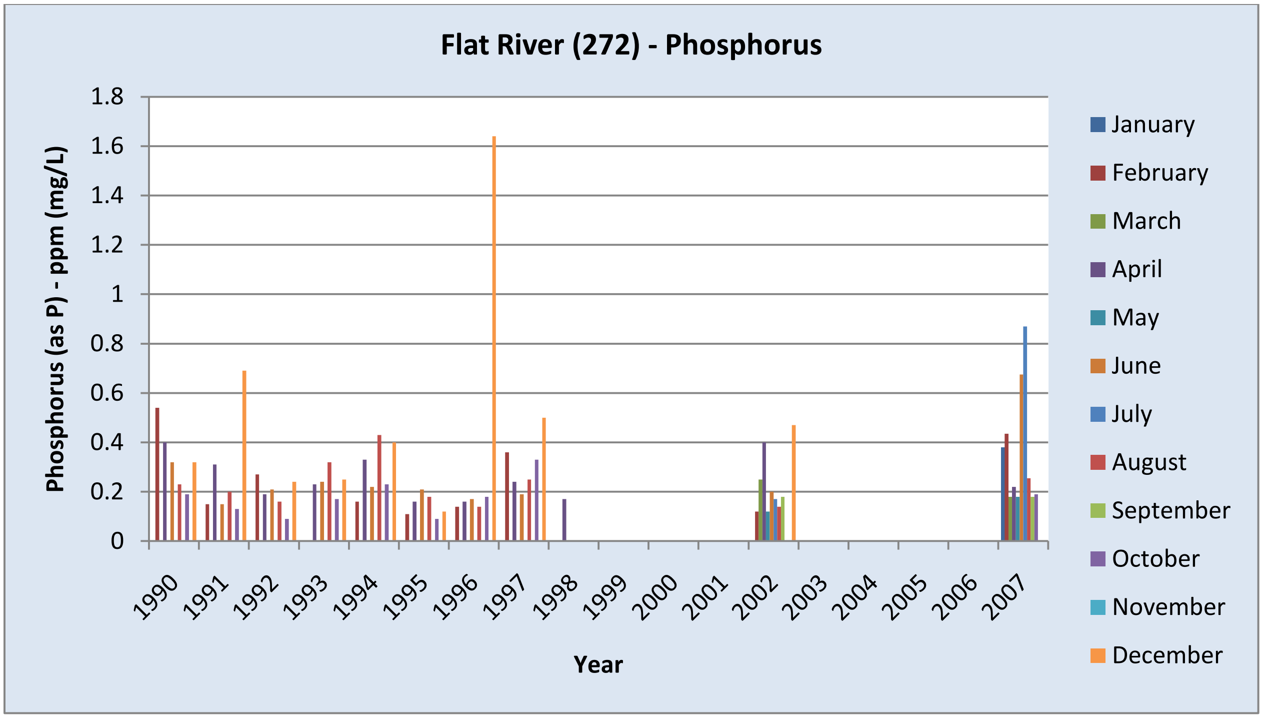


Figure 26 – Phosphorus (272)

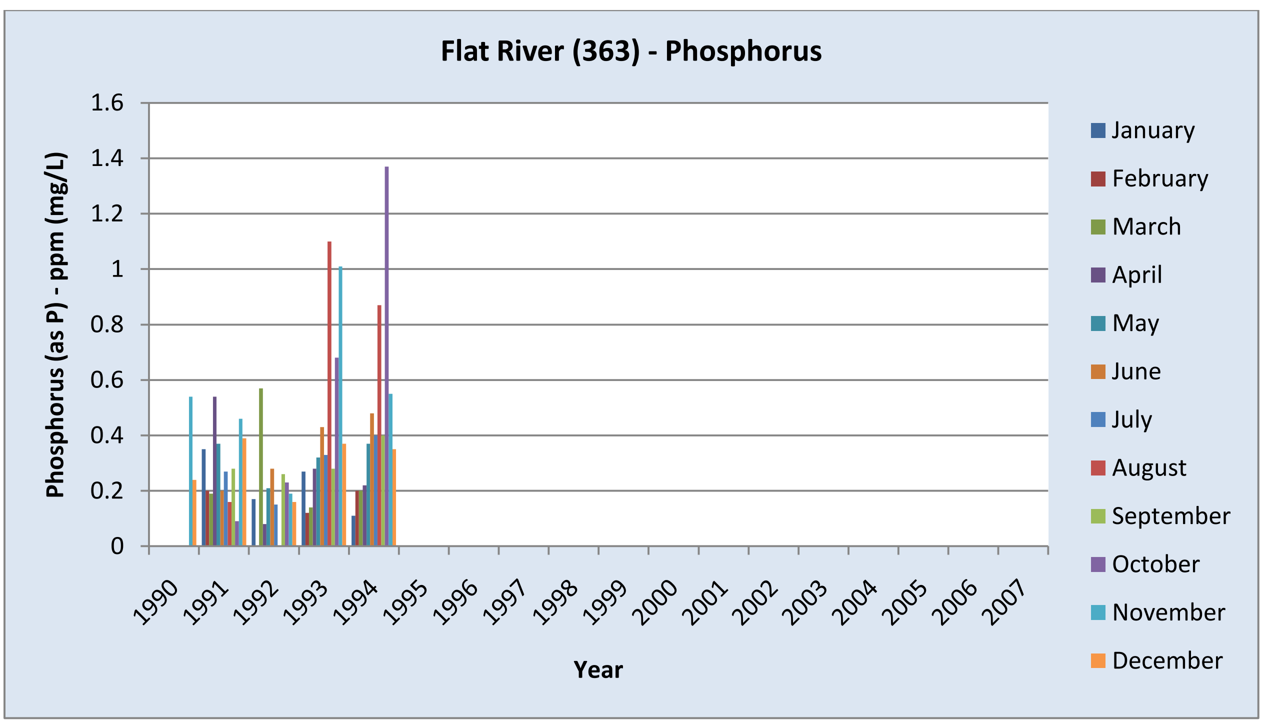


Figure 27 – Phosphorus (363)

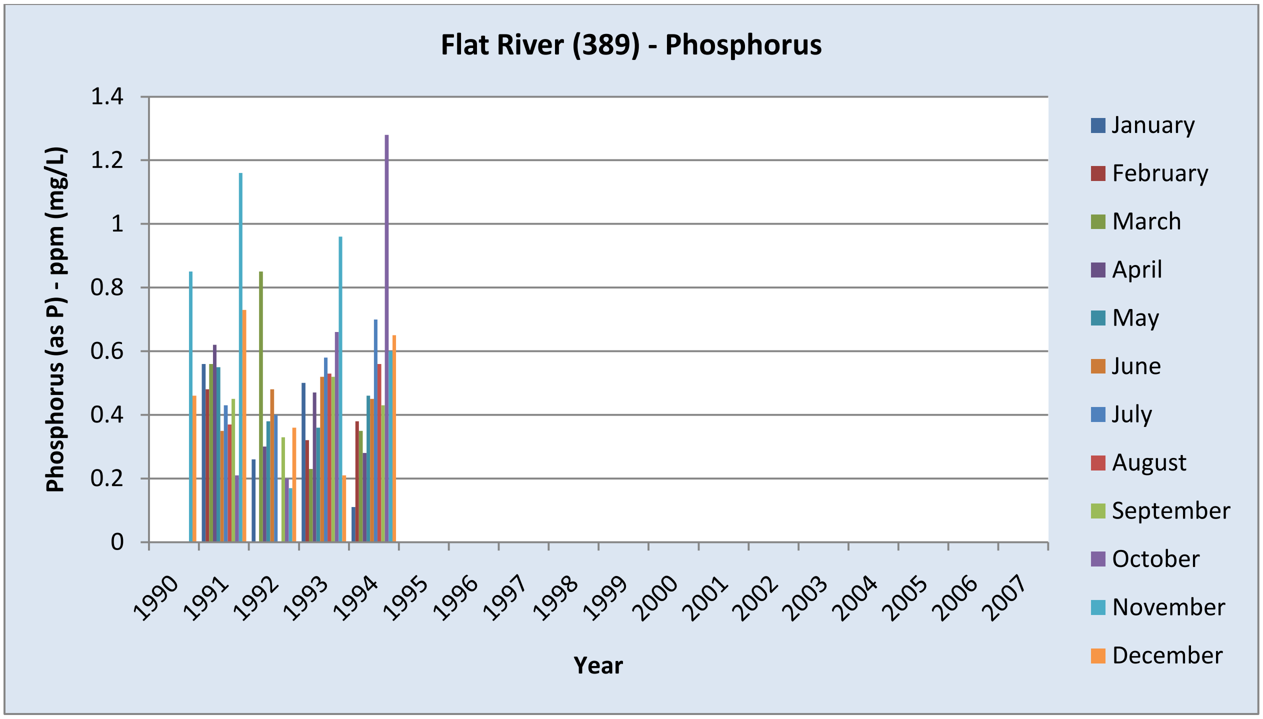


Figure 28 – Phosphorus (389)

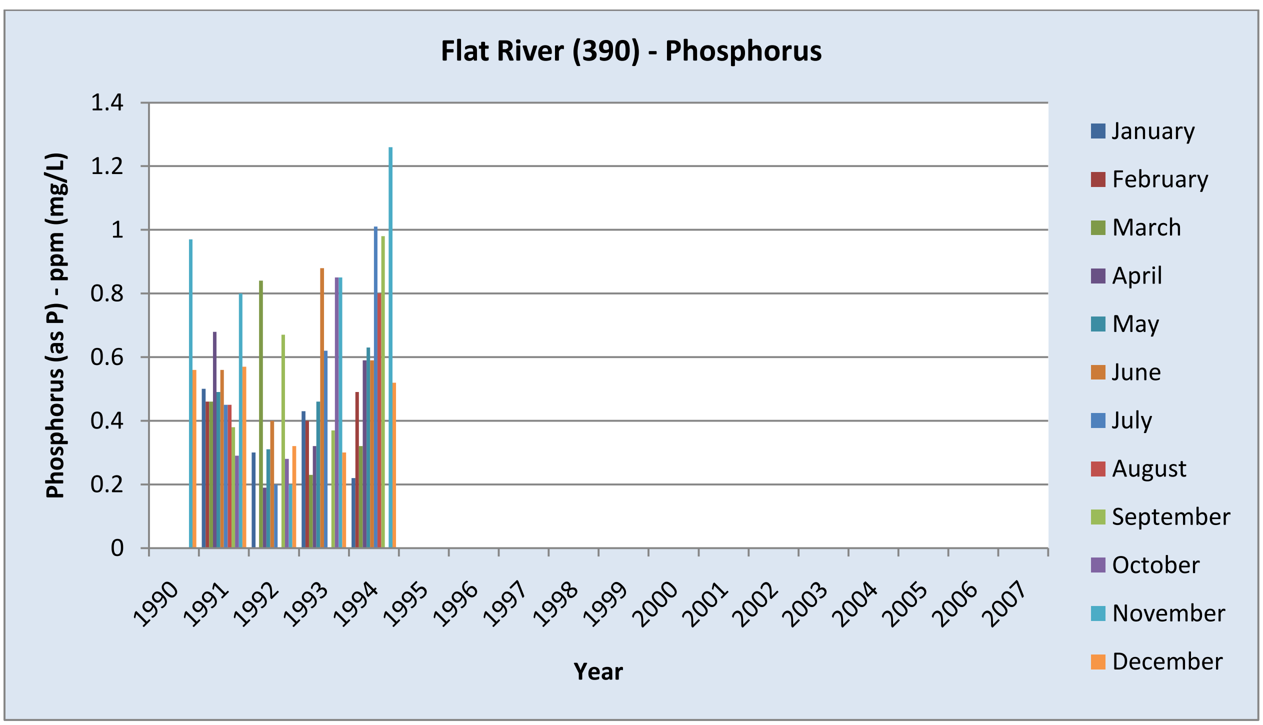


Figure 29 – Phosphorus (390)

Phosphorus is typically the most limiting nutrient for vegetative growth in bodie*s* of fresh water. It is present in high concentrations in poultry litter, which is often applied to land as an alternative form of fertilizer. If runoff from a pasture enters a water body, it may cause eutrophication (excessive vegetative or algal growth) and reduce the level of dissolved oxygen in the water. Low levels of DO can alter an ecosystem by killing fish and other forms of aquatic life.

Average values for Phosphorus at all four sites over the years were similar. Values did not follow a monthly or seasonal trend.

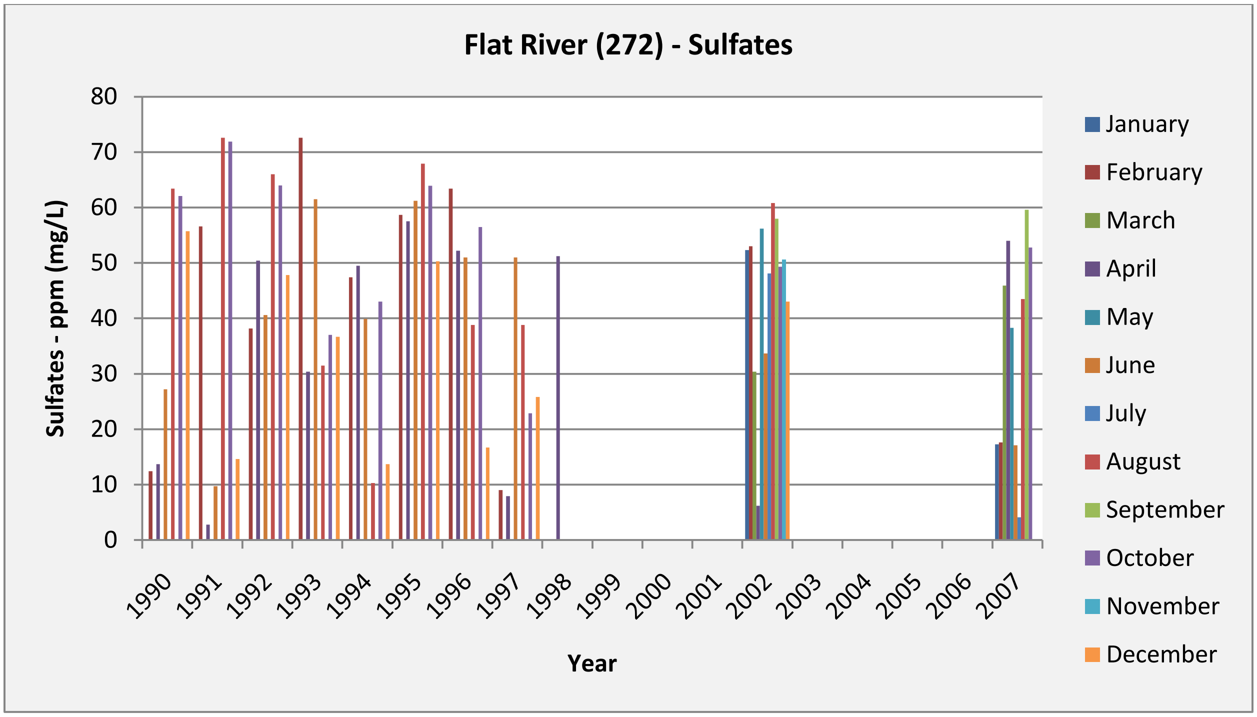


Figure 30 – Sulfates (272)

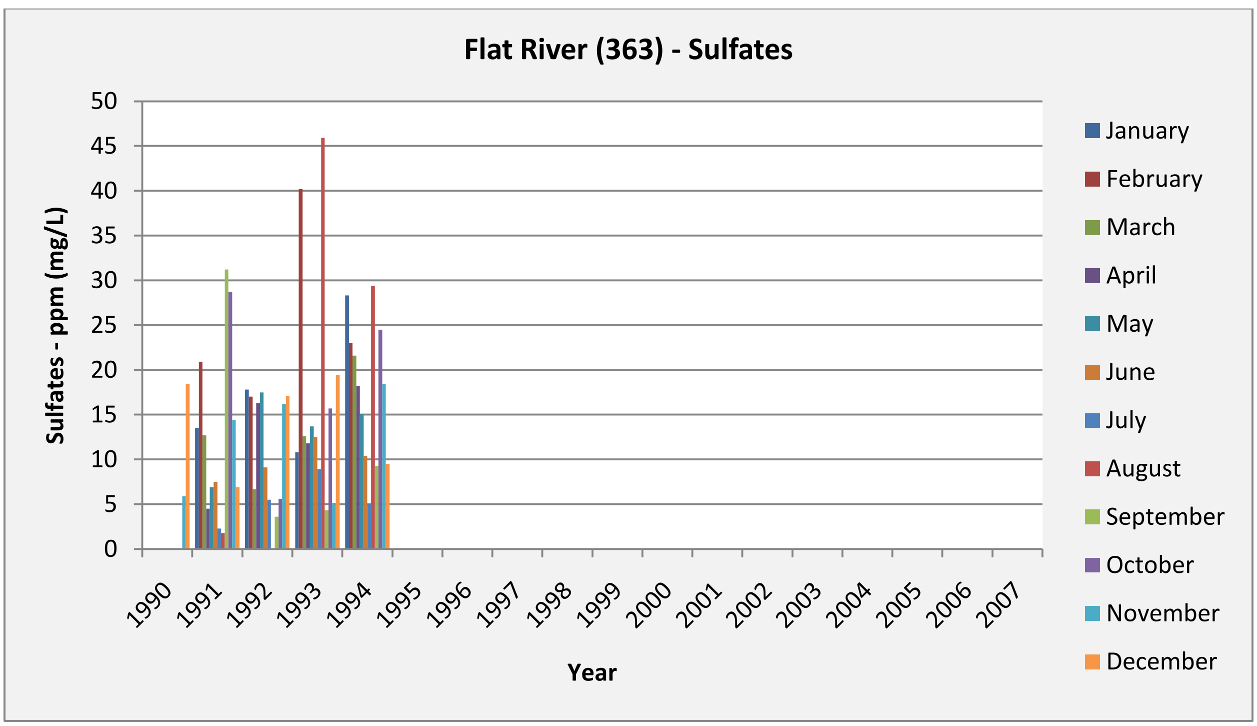


Figure 31 – Sulfates (363)

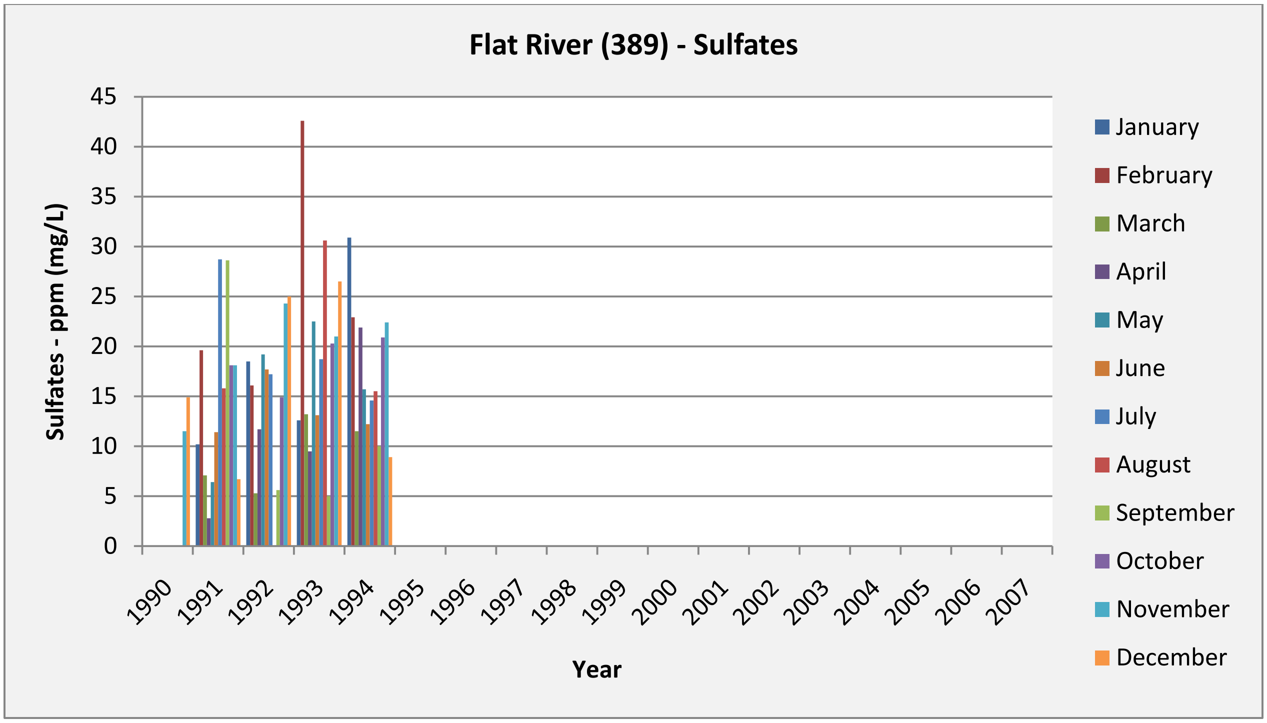


Figure 32 – Sulfates (389)

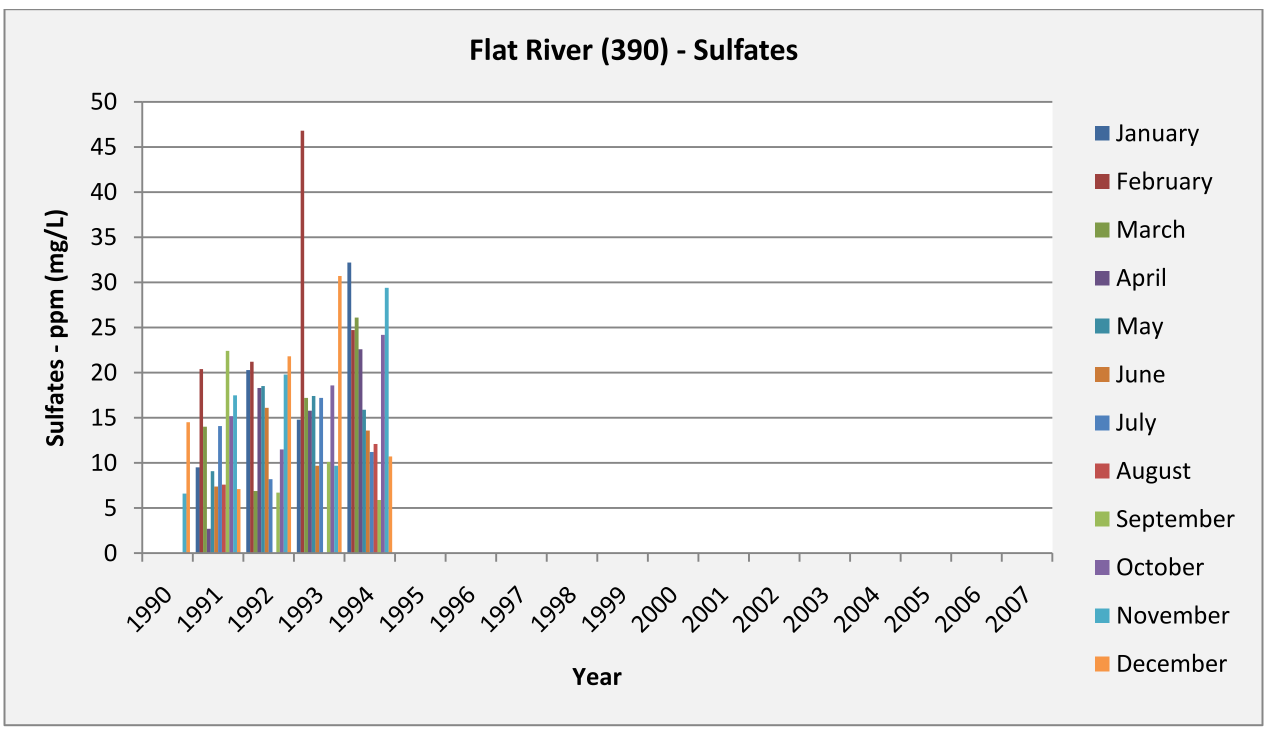


Figure 33 – Sulfates (390)

Sulfate concentrations in the Flat River from 1990 to 2007 ranged from 9 to 72 ppm for site 272. Values for any site did not follow a pattern by season or year. The numeric criterion for sulfates is set at 75 ppm, and all of the samples were at an acceptable level.

Average concentration values for the upper three sites - 363, 389, and 390 - were much lower (~15 mg/L vs. ~41 mg/L) than site 272. All three of the lower sites recorded a spiked value during February of 1993.

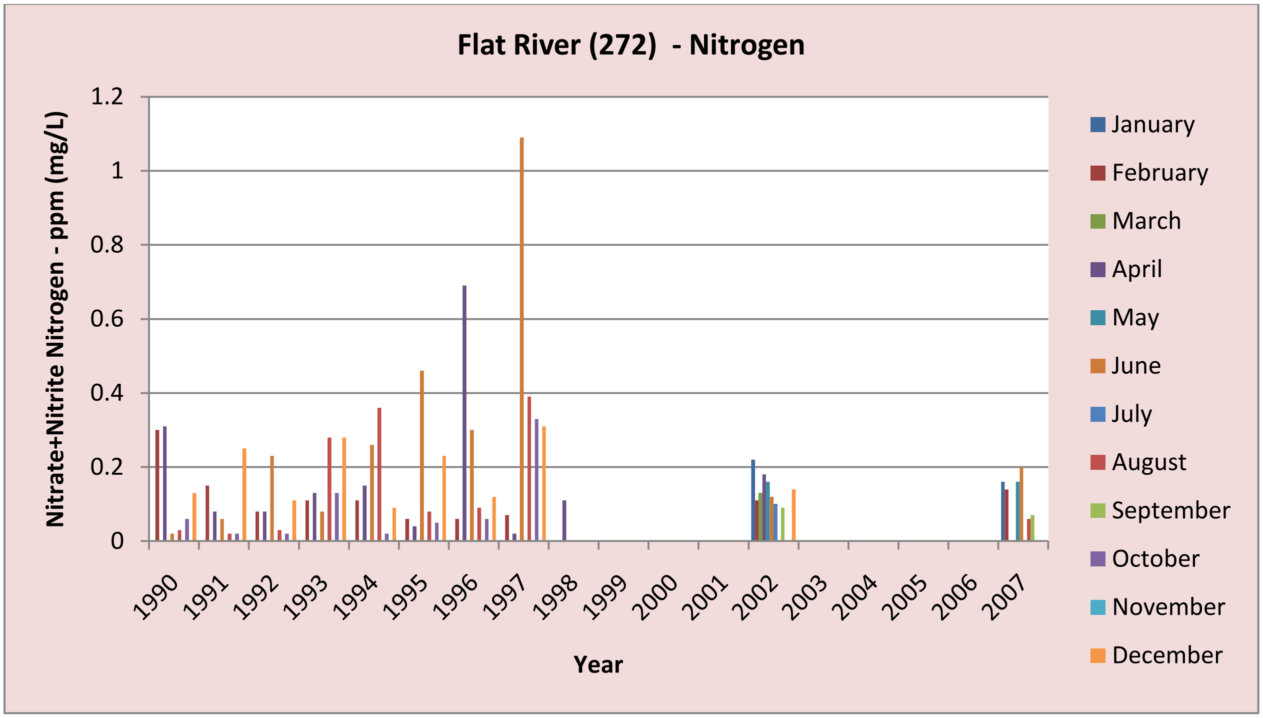


Figure 34 – Nitrogen (272)

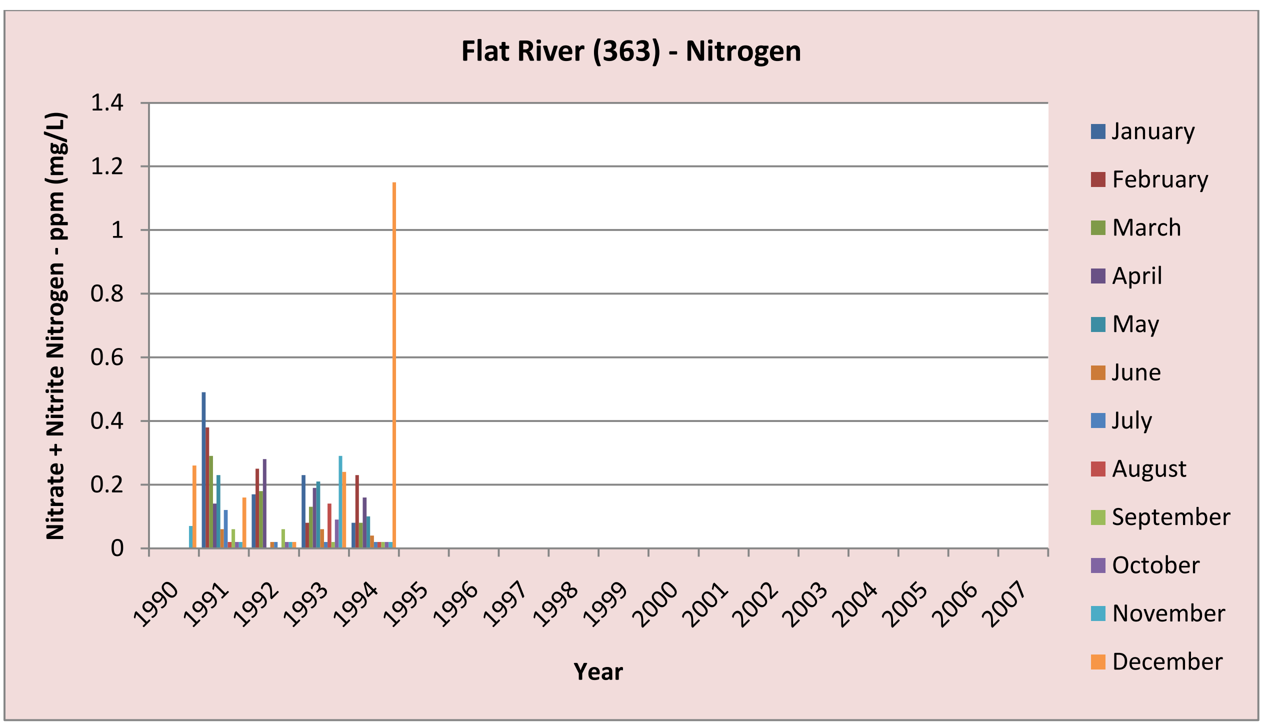


Figure 35 – Nitrogen (363)

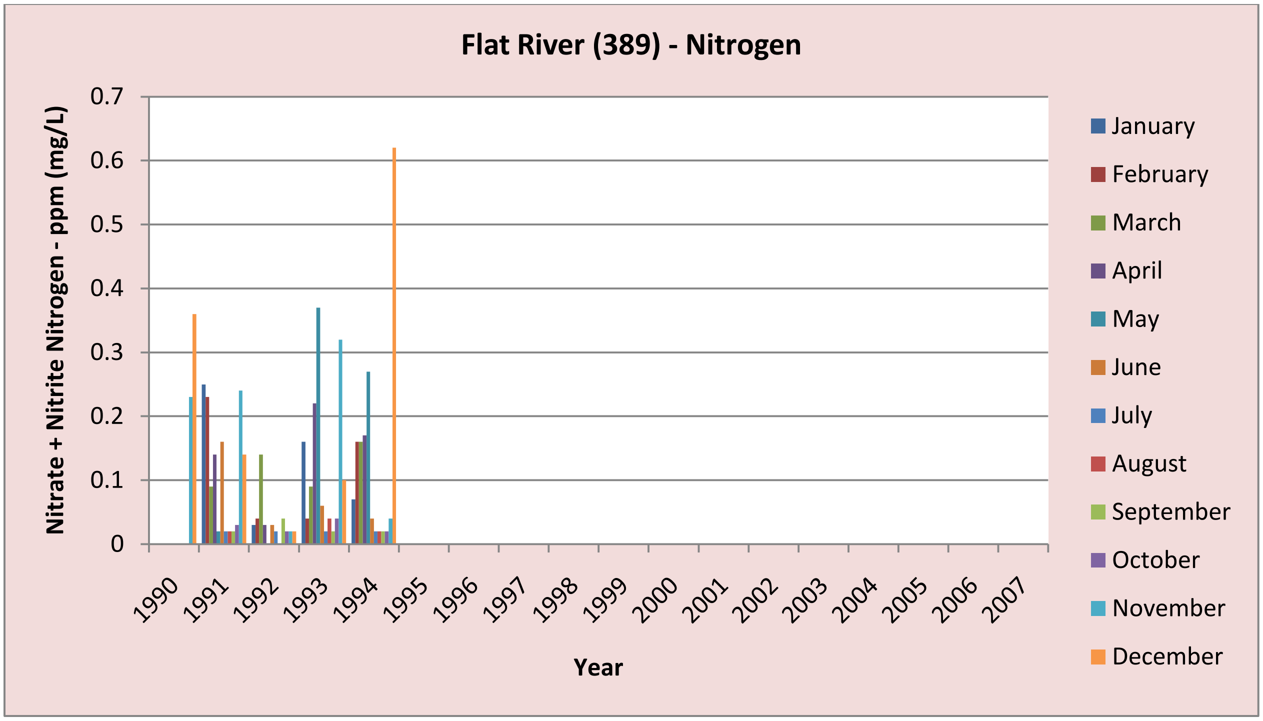


Figure 36 – Nitrogen (389)

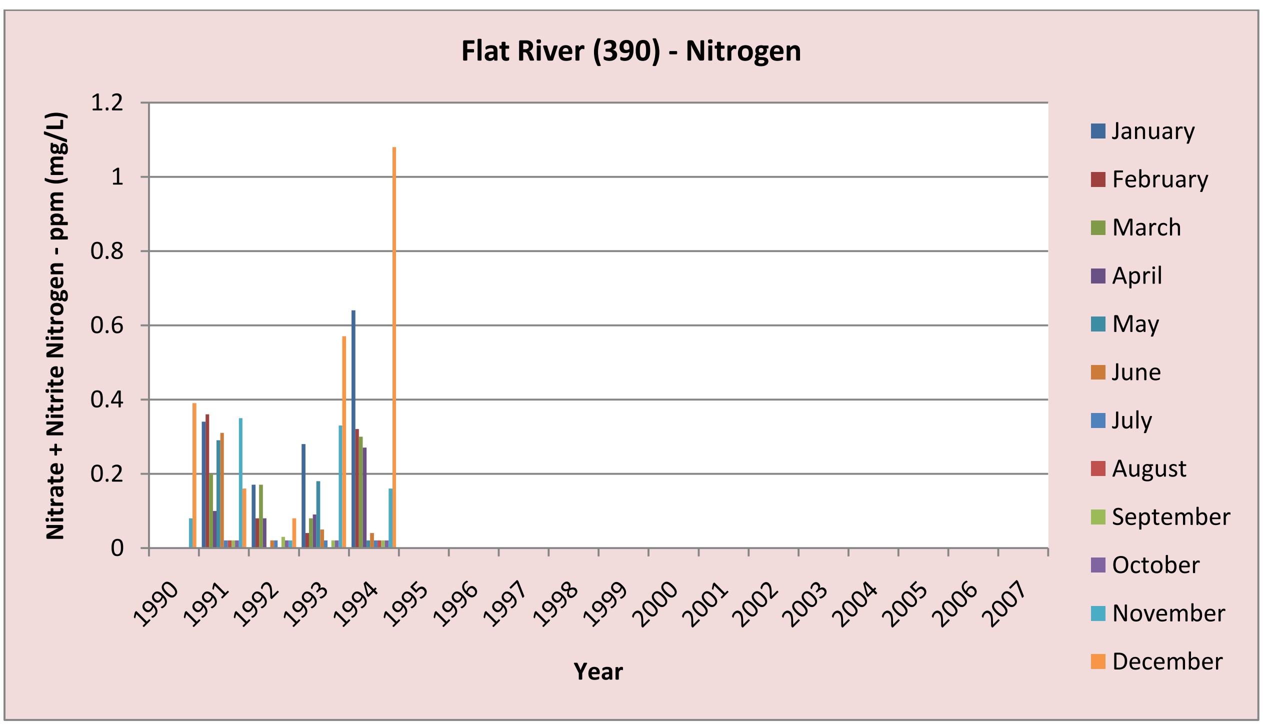


Figure 37 – Nitrogen (390)

Nitrogen is considered to be the most-limiting nutrient in saltwater bodies. Nitrate plus Nitrite Nitrogen levels for site 272 for the Flat River varied without a seasonal or yearly pattern. Values for the warmer months appeared to be lower for the upper sites.

Average values were similar for all four sites, though the three upper sites all registered spiked values in December of 2004 – the last sampled value at those sites. However, none of the spiked values present from 1990 to 1994/1998 were seen in 2002 or 2007.

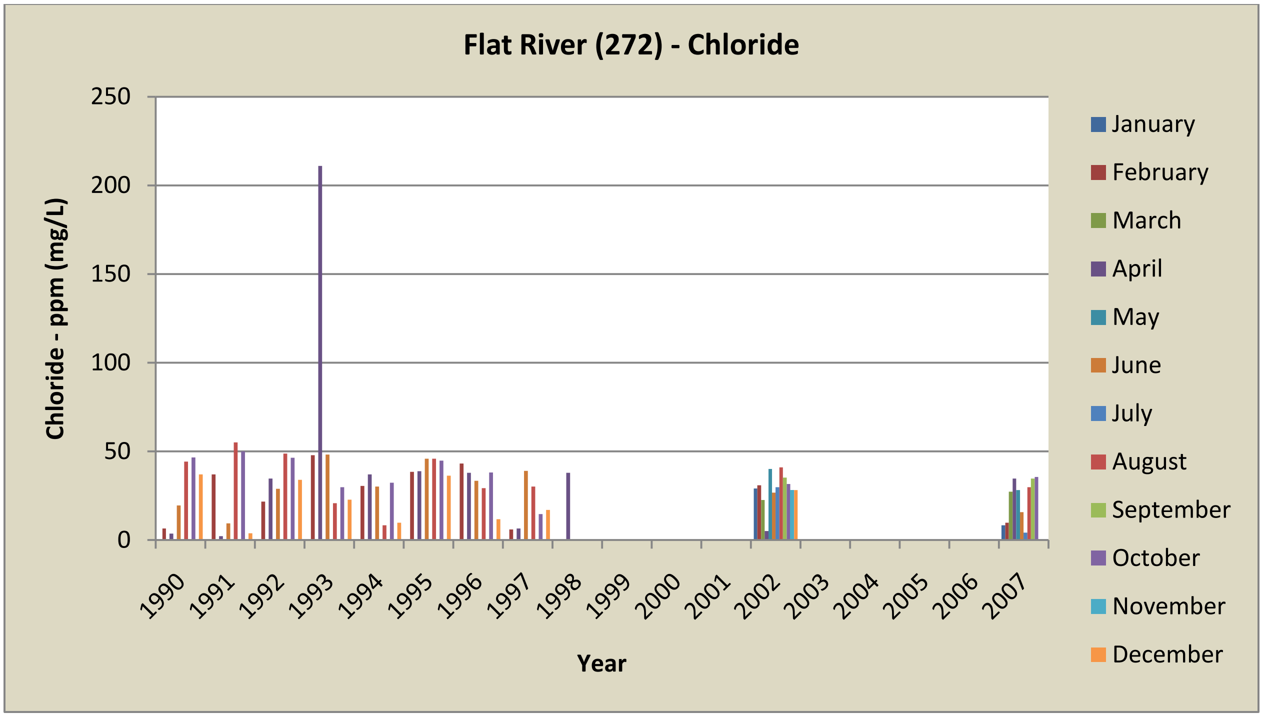


Figure 38 – Chloride (272)

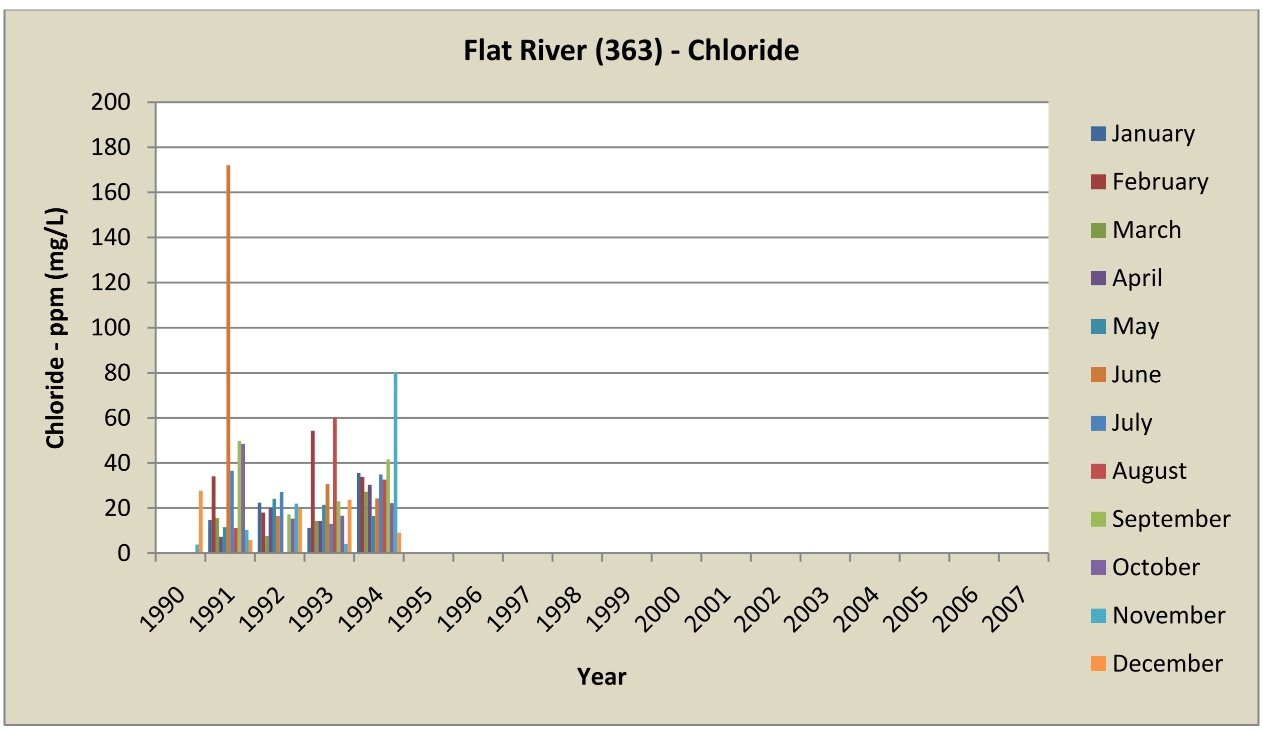


Figure 39 – Chloride (363)

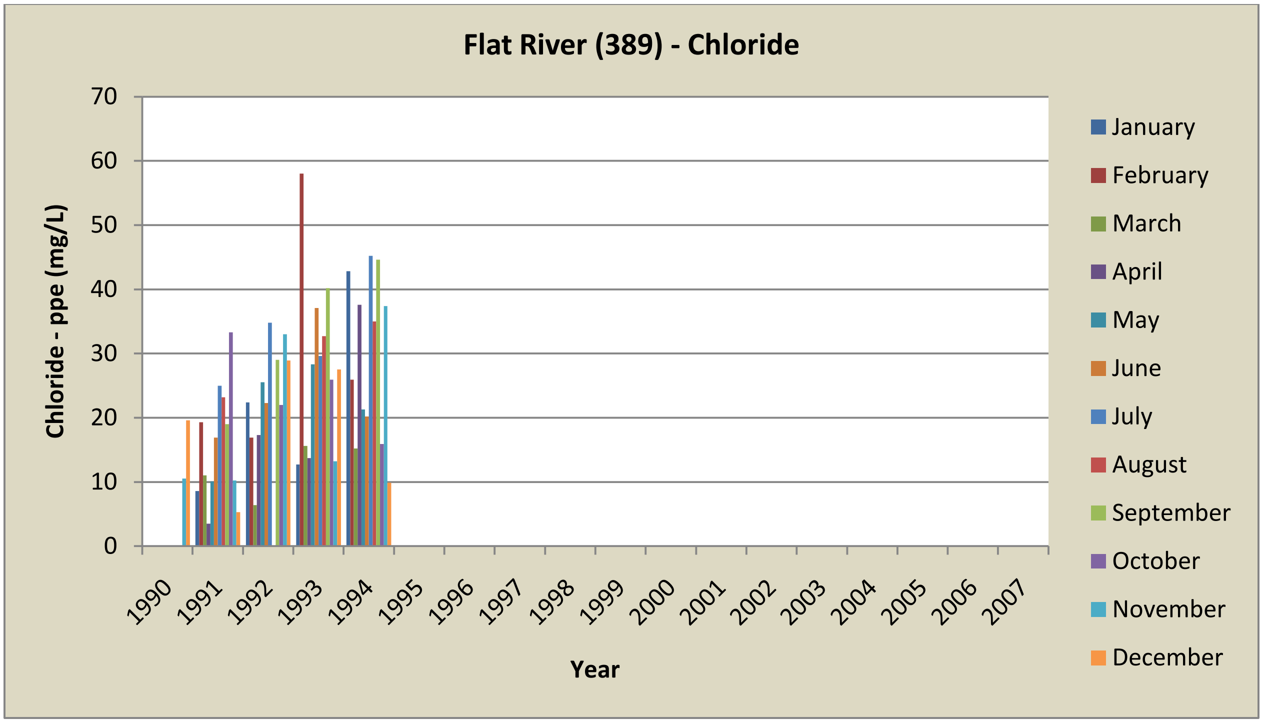


Figure 40 – Chloride (389)

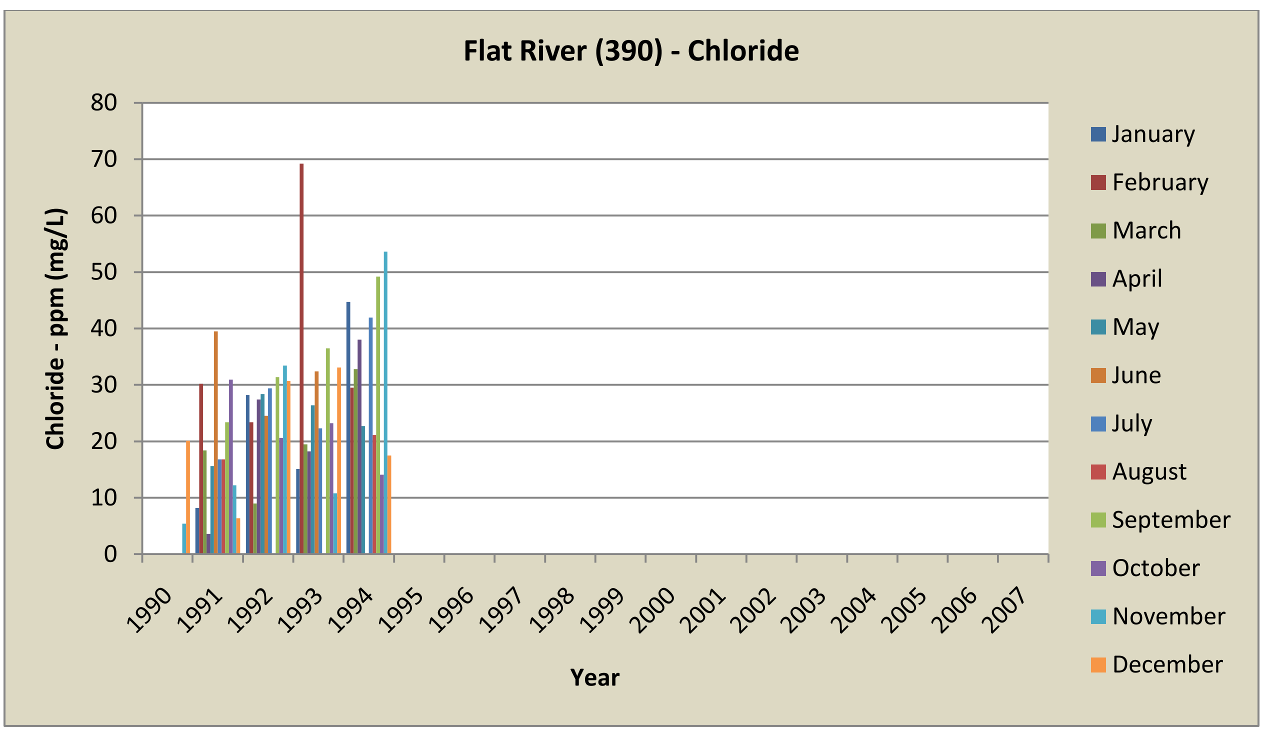


Figure 41 – Chloride (389)

All values for chloride concentrations at all four sites in the Flat River were under the criterion limit of 250 ppm. Average concentrations for all sites were similar. The highest spiked value of 211 ppm was measured in April, 1993 at site 272.

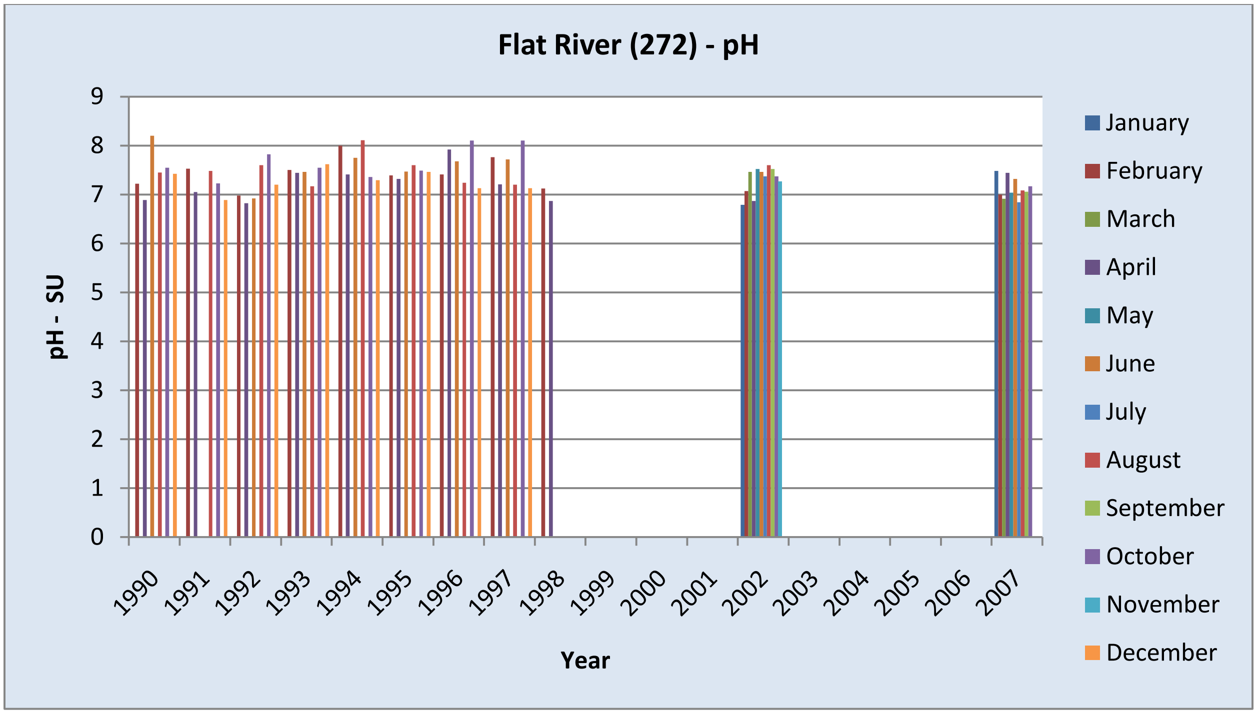


Figure 42 – pH (272)

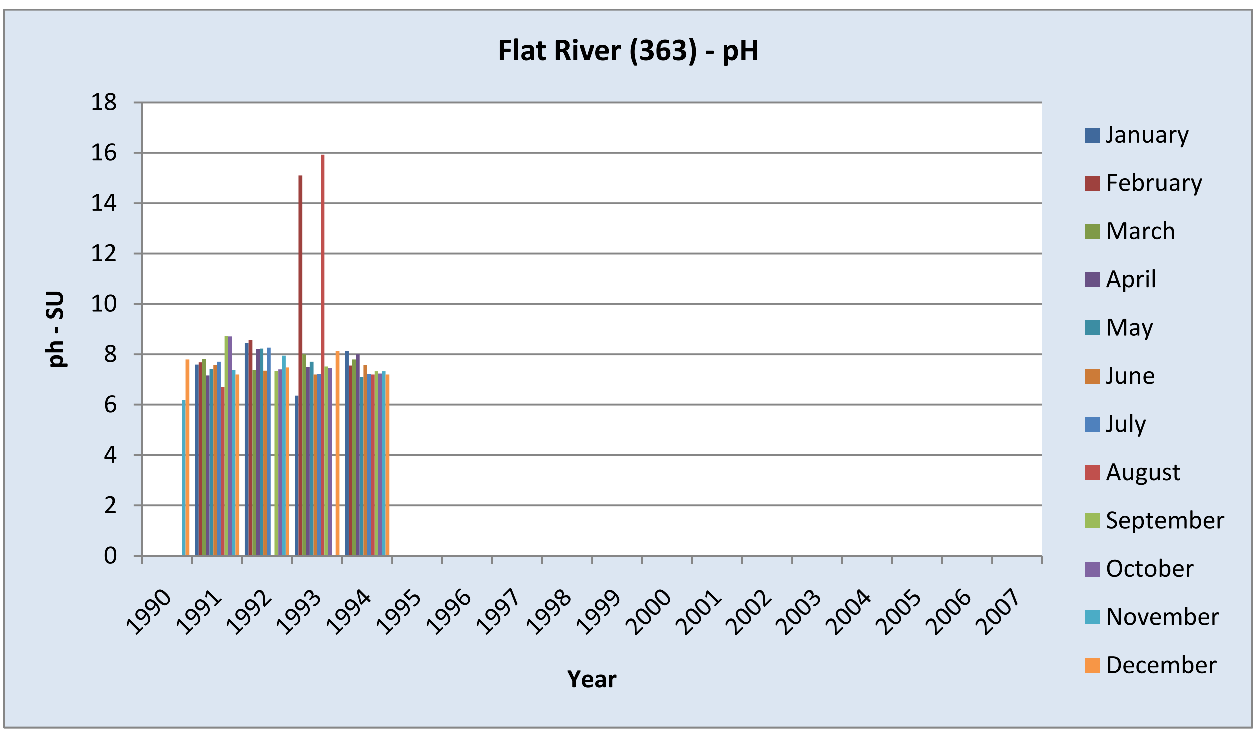


Figure 43 – pH (363)

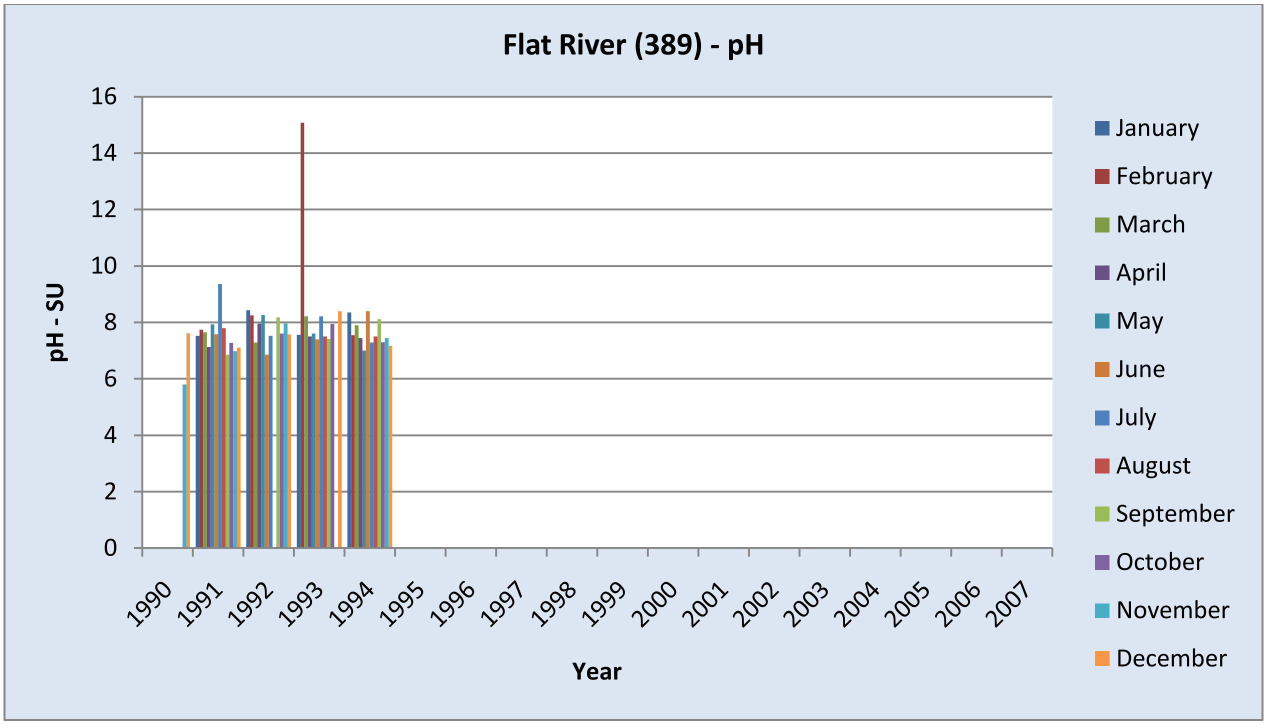


Figure 44 – pH (389)

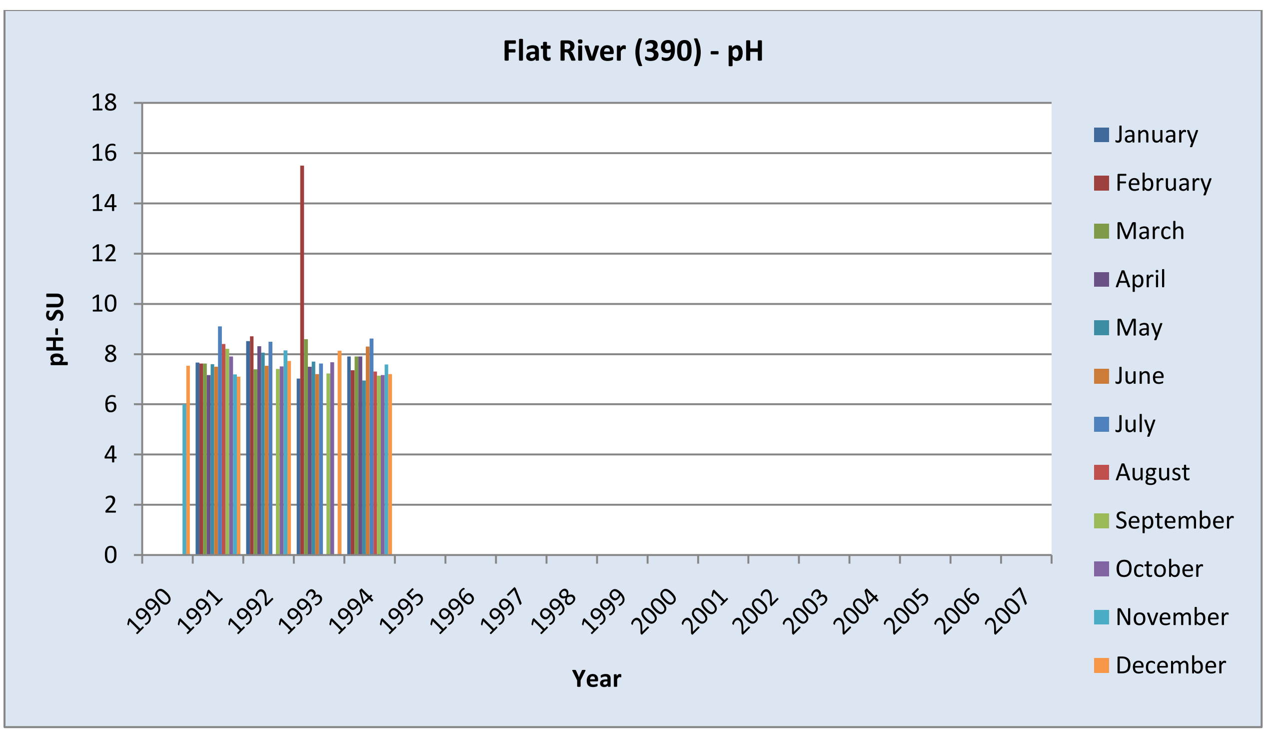


Figure 45 – pH (390)

The measure of pH refers to the acidity or basicity of a substance. Values typically range between 0 and 14, with 0 – 6 acidic, 8 – 14 alkaline, and 7 considered neutral. Most bodies of freshwater have a natural pH between 6 and 8. As pH nears 5, populations of fish decline and fish may eventually disappear if pH drops below 4.5. Harmful and toxic effects may also occur if pH rises to approximately 9.5,

The pH values for the four sampling sites in the Flat River were among the most uniform of all parameters measured. The majority fell within the numerical criteria of 6.5 – 8.0. No seasonal or year-to-year data trends were observed.

8.0 ELEMENT I – MONITORING FOR EFFECTIVENESS

The NPS Implementation Plan for the Flat River outlines a four-year management plan to reduce the amount of NPS pollutants that reach the waterway. LDEQ intensively samples each basin in the state once every four years to see if the water bodies are meeting water quality standards. Subsegment 100406 is located in the Red River basin.

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	2004, 2005	2008, 2009
Ouachita	2004, 2005	2008, 2009
Barataria	2004, 2005	2008, 2009
Terrebonne	2004, 2005	2008, 2009
Mississippi	2004, 2005	2008, 2009
Pontchartrain	2006, 2007	2010, 2011
Pearl	2006	2010
Red River	2004, 2005, 2006, 2007	2008, 2009, 2010, 2011
Sabine	2006, 2007	2010, 2011
Atchafalaya	2004, 2005	2008, 2009

Figure 46 – Sampling Schedule

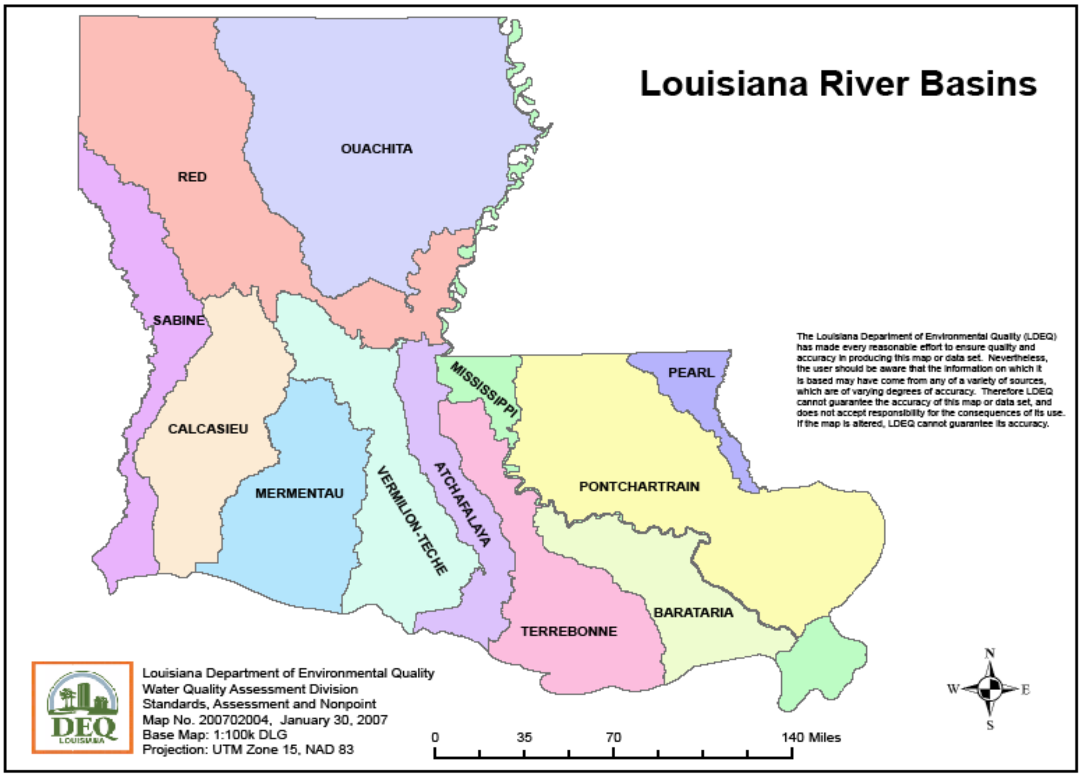


Figure 47 – Louisiana River Basins

Prior to 2004, Louisiana water bodies were sampled once every five years. Sampling began during 2004 for the Red River basin, including Flat River Subsegment 100406, and occurred again in 2008. Sampling will also take place during 2009 through 2011. The data from 2004 was used as a baseline to measure the rate of water quality improvement for samples taken in later years. Since Subsegment 100406 was listed as not meeting its uses of Primary Contact Recreation and Fish and Wildlife Propagation and the TMDL indicated a large reduction in oxygen-demanding substances, LDEQ developed this NPS Implementation Plan. It includes data, maps, and other types of information to assist local organizations, agencies and people that live within the watershed to begin their discussions on what actions can be taken to implement the plan. As local stakeholder groups meet and talk about this plan, they may have additional ideas that need to be incorporated into the watershed implementation plan. Additional BMPs and/or other options will be employed, if necessary, until water quality standards are achieved and the Flat River is restored to its designated uses. LDEQ is interested in working with interested partners on watershed implementation and further planning that is aimed at restoring the Flat River designated uses.

9.0 CONCLUSIONS

BMPs and/or other conservation practices will need to be implemented in order to reduce the NPS pollution load in the Flat River watershed so it can meet its designated uses for Primary Contact Recreation and Fish and Wildlife Propagation and be removed from the 303(d) list. According to the TMDL, summer nonpoint source oxygen demand loads will need to be reduced by 75% to 92% and winter loads will need to be reduced by 3% to 49% in order to maintain the DO standard of 5.0 mg/L throughout Subsegment 100406. Because the Flat River's average total phosphorus and total nitrogen concentrations were higher than the average concentration in the reference streams, nutrient loads will also need to be reduced. Up to a 62% reduction in total phosphorus loads would be needed for the Flat River average total phosphorus concentration to be similar to the reference stream average concentration, and up to a 30% reduction in total nitrogen loads would be needed for Flat River average total nitrogen concentration to be similar to the reference stream average concentration.

Some of the BMPs and suggested courses of action were described within this plan in Section 4.0, and a consolidated list of BMPs recommended for various land uses can be viewed in the LDEQ NPS Program's Management Plan - http://nonpoint.deq.louisiana.gov/wqa/NPSManagementPlan.htm - under the Statewide Educational Programs heading.

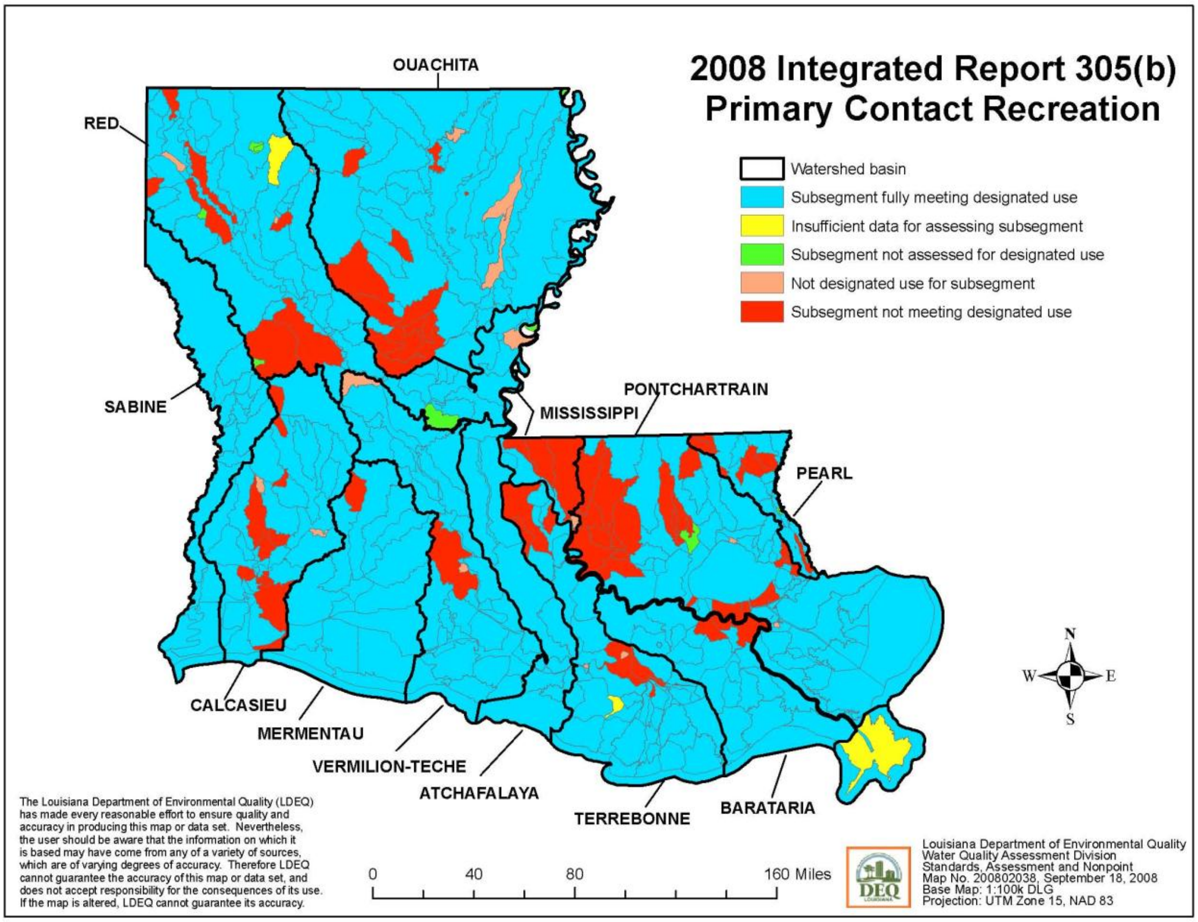
This is a challenge that will require programs that provide technical assistance, funding, incentives, and also foster a sense of stewardship. Many of these programs, which are designed to assist the landowner, are already in place and listed in Section 4.1. The USDA and NRCS are federal agencies that have several such programs made available through the Food, Conservation, and Energy Act of 2008 (2008 Farm Bill). These programs are offered through local Soil and Conservation Districts (SWCD), and the NRCS has a list of BMPs for many types of programs. The LDEQ's Nonpoint Source Unit provides funding that is distributed through the EPA under Section 319 of the Clean Water Act. These funds are utilized to implement BMPs for all types of land uses within a watershed in order to reduce and/or prevent NPS pollution and achieve the watershed's designated use goals. The LDAF's Office of Soil and Water Conservation also provide Section 319 funds as cost-share to implement BMPs.

Parish-wide cooperation and coordination will be necessary in order to protect water quality within the Flat River watershed. Though challenging, it is an opportunity for leaders, officials, and local citizens to unite for a common interest. As a result, people develop new relationships that will benefit the community and their watershed. The watershed approach helps build new levels of cooperation and coordination, which is necessary to successfully control NPS loading and thus restore and protect the Flat River.

Every stakeholder in a watershed partnership brings important information, viewpoints, and ideas to the group. Local citizens have a good awareness of issues within their watershed. They are able to provide input as practical solutions are developed. Historical information essential to watershed planning concerning past land use and associated problems can be provided by residents. Environmental scientists, biologists, engineers, and resource managers can provide their technical expertise as well. This partnership works together to prioritize problem areas and develop viable solutions. The water body itself helps to promote cooperation among stakeholders in the watershed partnership because most people want to protect and restore their natural resources for future generations. The locally-based watershed partnership provides a means for stakeholders to communicate with each other, share resources, work on common goals, and assist in bringing funding into the area for special projects, BMP cost-share programs, and education.

ADDENDUM


MAKE CHANGES
BE THE SOLUTION!
Everything you blow, spray, pour or throw on the ground can get washed down the storm drain – polluting Louisiana's waters
Recycle oil
Use less fertilizer and pesticides
Mulch or bag grass clippings
Bag pet waste
Don't litter
DEQ
LOUISIANA
EPA
Find out more at: WWW.DEQ.LOUISIANA.GOV


2008 Integrated Report 305(b)
Primary Contact Recreation
Watershed basin
Subsegment fully meeting designated use
Insufficient data for assessing subsegment
Subsegment not assessed for designated use
Not designated use for subsegment
Subsegment not meeting designated use
OUACHITA
RED
SABINE
PONTCHARTRAIN
MISSISSIPPI
PEARL
CALCASIEU
MERMENTAU
VERMILION-TECHE
ATCHAFALAYA
TERREBONNE
BARATARIA
N
W
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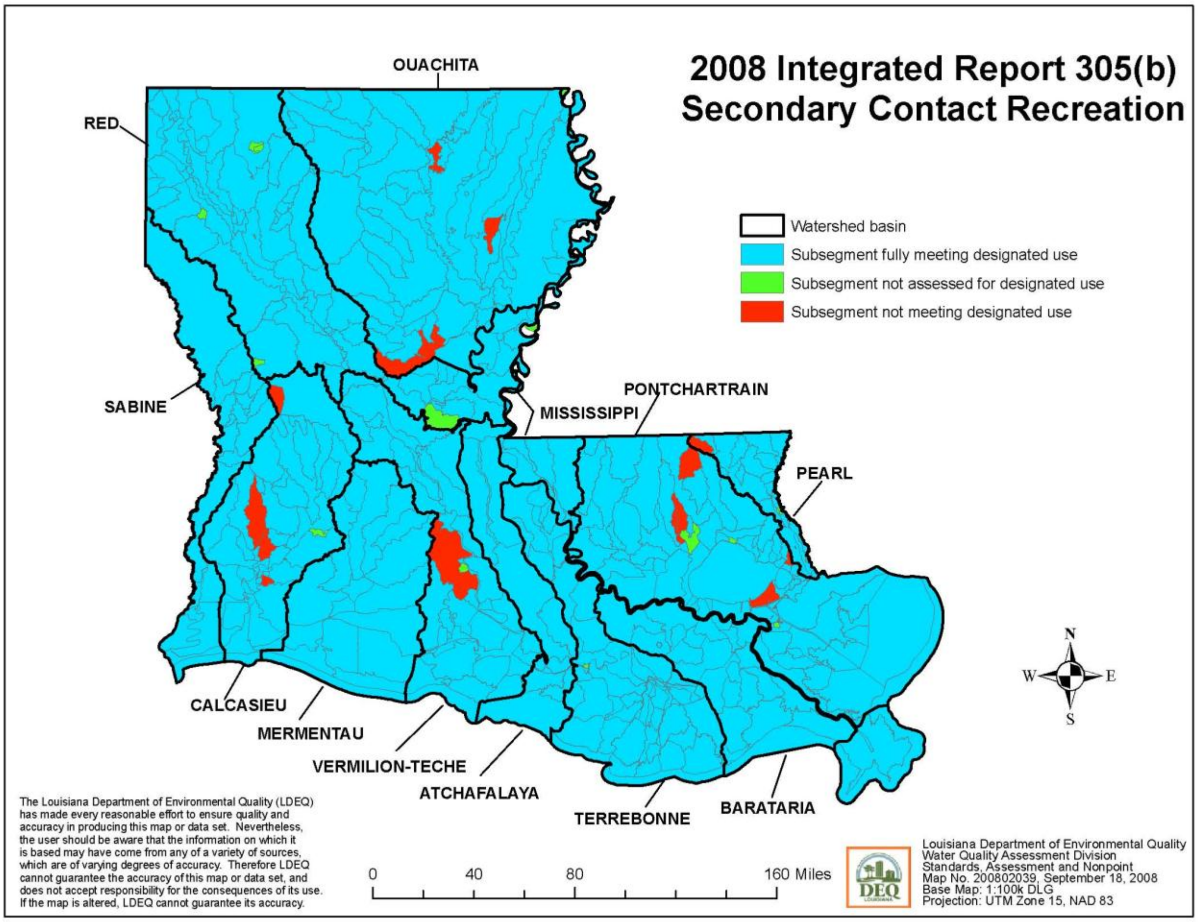
S
0
40
80
160 Miles
The Louisiana Department of Environmental Quality (LDEQ) has made every reasonable effort to ensure quality and accuracy in producing this map or data set. Nevertheless, the user should be aware that the information on which it is based may have come from any of a variety of sources, which are of varying degrees of accuracy. Therefore LDEQ cannot guarantee the accuracy of this map or data set, and does not accept responsibility for the consequences of its use. If the map is altered, LDEQ cannot guarantee its accuracy.
Louisiana Department of Environmental Quality
Water Quality Assessment Division
Standards, Assessment and Nonpoint
Map No. 200802038, September 18, 2008
Base Map: 1:100k DLG
Projection: UTM Zone 15, NAD 83


2008 Integrated Report 305(b)
Secondary Contact Recreation
Watershed basin
Subsegment fully meeting designated use
Subsegment not assessed for designated use
Subsegment not meeting designated use
OUACHITA
RED
SABINE
PONTCHARTRAIN
MISSISSIPPI
PEARL
CALCASIEU
MERMENTAU
VERMILION-TECHE
ATCHAFALAYA
TERREBONNE
BARATARIA
N
W
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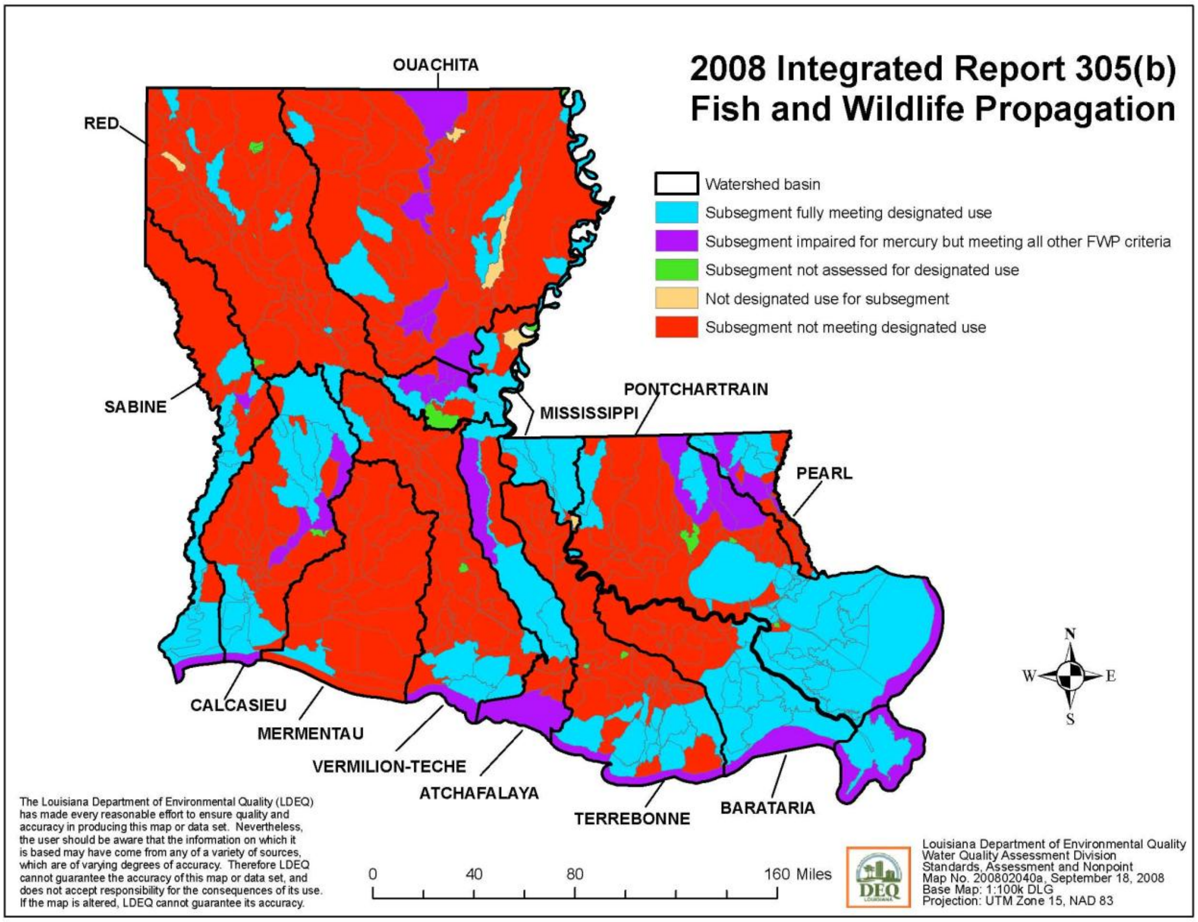
S
The Louisiana Department of Environmental Quality (LDEQ) has made every reasonable effort to ensure quality and accuracy in producing this map or data set. Nevertheless, the user should be aware that the information on which it is based may have come from any of a variety of sources, which are of varying degrees of accuracy. Therefore LDEQ cannot guarantee the accuracy of this map or data set, and does not accept responsibility for the consequences of its use. If the map is altered, LDEQ cannot guarantee its accuracy.
0 40 80 160 Miles
Louisiana Department of Environmental Quality
Water Quality Assessment Division
Standards, Assessment and Nonpoint
Map No. 200802039, September 18, 2008
Base Map: 1:100k DLG
Projection: UTM Zone 15, NAD 83


2008 Integrated Report 305(b)
Fish and Wildlife Propagation
Watershed basin
Subsegment fully meeting designated use
Subsegment impaired for mercury but meeting all other FWP criteria
Subsegment not assessed for designated use
Not designated use for subsegment
Subsegment not meeting designated use
OUACHITA
RED
SABINE
PONTCHARTRAIN
MISSISSIPPI
PEARL
CALCASIEU
MERMENTAU
VERMILION-TECHE
ATCHAFALAYA
TERREBONNE
BARATARIA
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The Louisiana Department of Environmental Quality (LDEQ) has made every reasonable effort to ensure quality and accuracy in producing this map or data set. Nevertheless, the user should be aware that the information on which it is based may have come from any of a variety of sources, which are of varying degrees of accuracy. Therefore LDEQ cannot guarantee the accuracy of this map or data set, and does not accept responsibility for the consequences of its use. If the map is altered, LDEQ cannot guarantee its accuracy.
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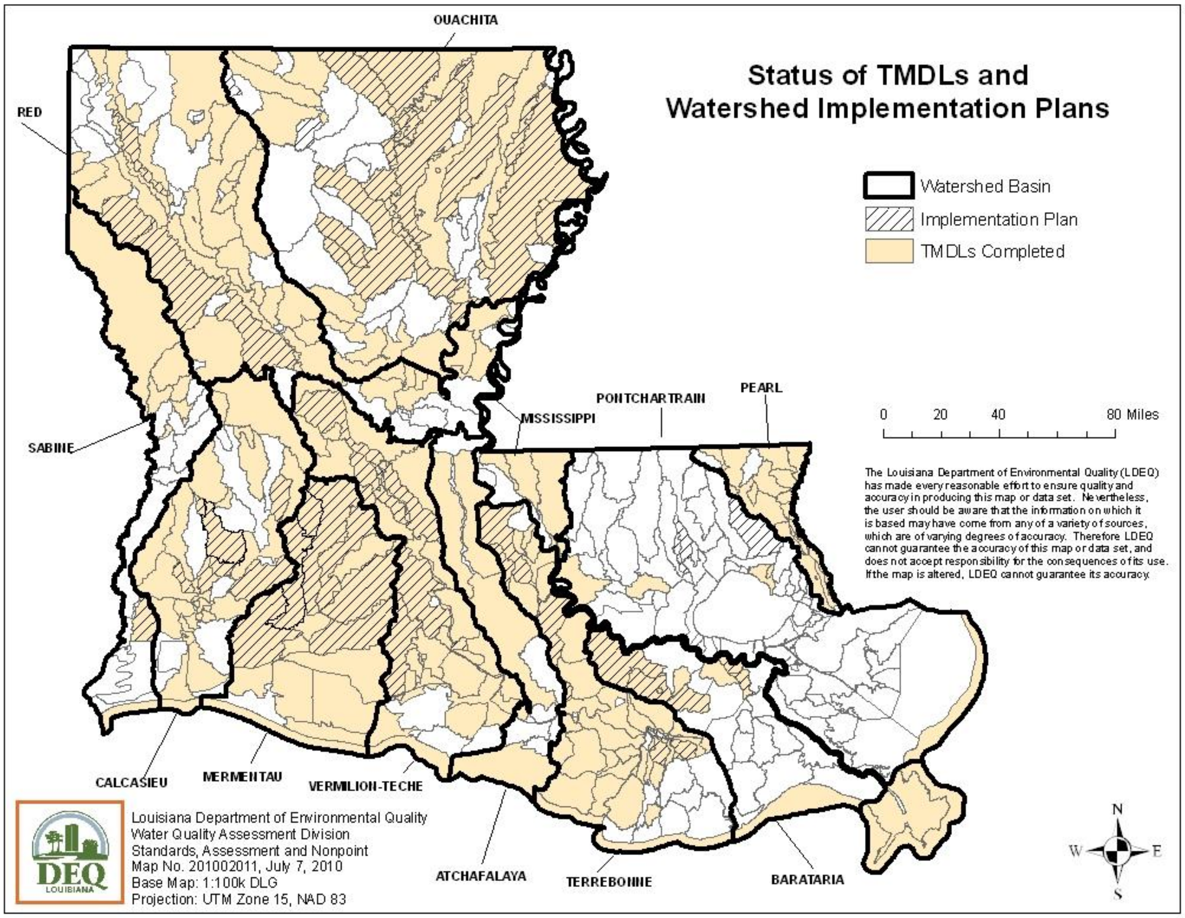
160 Miles
DEQ
Louisiana Department of Environmental Quality
Water Quality Assessment Division
Standards, Assessment and Nonpoint
Map No. 200802040a, September 18, 2008
Base Map: 1:100k DLG
Projection: UTM Zone 15, NAD 83


Status of TMDLs and
Watershed Implementation Plans
Watershed Basin
Implementation Plan
TMDLs Completed
OUACHITA
RED
SABINE
MISSISSIPPI
PONTCHARTRAIN
PEARL
CALCASIEU
MERMENTAU
VERMILION-TECHE
ATCHAFALAYA
TERREBONNE
BARATARIA
0 20 40 80 Miles
The Louisiana Department of Environmental Quality (LDEQ) has made every reasonable effort to ensure quality and accuracy in producing this map or data set. Nevertheless, the user should be aware that the information on which it is based may have come from any of a variety of sources, which are of varying degrees of accuracy. Therefore LDEQ cannot guarantee the accuracy of this map or data set, and does not accept responsibility for the consequences of its use. If the map is altered, LDEQ cannot guarantee its accuracy.
DEQ
LOUISIANA
Louisiana Department of Environmental Quality
Water Quality Assessment Division
Standards, Assessment and Nonpoint
Map No. 201002011, July 7, 2010
Base Map: 1:100k DLG
Projection: UTM Zone 15, NAD 83
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