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Louisiana Department of Environmental Quality NPS

BAYOU QUEUE DE TORTUE WATERSHED IMPLEMENTATION PLAN

For Dissolved Oxygen, Nitrogen, Total Suspended Solids, Total Dissolved Solids and Turbidity

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1. Introduction

The Bayou Queue de Tortue (050501) watershed is a 305 square mile area located in South Louisiana. Historically, the watershed encompassed a prairie region with small clusters of hardwood forests. The bayou is comprised of the main stem and several tributaries. These include Indian Bayou, Prime Gully, Coulee des Iles/Bayou Grand Marais, Lyons Point Gully, Lazy Point Canal and many unnamed canals. The bayou is approximately 56 miles in length, including a diffuse network of headwaters, and flows through Acadia, Lafayette, and Vermillion Parishes. The main channel flows approximately 44 miles (71 km) from the City of Duson to the Mermentau River. Average precipitation in the watershed is 56.9 inches. The highest elevations are 25 feet mean sea level (msl) and the bayou's width generally increases as it progresses downstream. The bayou has been heavily hydromodified for approximately 30 miles through the middle reaches, while the upper and lower reaches are highly meandering, with largely undisturbed swamps. Dredging has created square cross-sections and homogenized the streambed gradient, reducing overall flow velocity and increasing hydraulic retention time in the subsegment, especially upstream of Louisiana (LA) Highway 13. These channelized portions have low reaeration potential and are depositional in nature. The eroding, unstable spoil banks have caused a large amount of clay fines to be suspended in the water column, resulting in increased turbidity in the bayou. Downstream of LA Highway 13, the stream is less disturbed. The banks are swampy and rooted macrophytes extend well into the waterway in some areas. The area acts as a large settling basin. The water here is less turbid and reddish brown in color due to humic acid input from adjacent swamps.

Louisiana's 2010 Integrated Report (IR) indicated Bayou Queue de Tortue (subsegment 050501) is fully meeting primary contact recreation (PCR) and secondary contact recreation (SCR) uses, but is impaired for fish and wildlife propagation (FWP) because of high concentrations of nutrients (i.e. nitrate-nitrite (NO_3/NO_2) and total phosphorus (TP), total suspended solids (TSS), total dissolved solids (TDS), fipronil, low dissolved oxygen (DO), turbidity, sedimentation/siltation, and mercury in fish. Suspected sources of these impairments included irrigated crop production, non-irrigated crop production, atmospheric deposition – toxics, natural conditions, and flow alterations from water diversions (See 2010 IR, Appendix A).

In 2005, Louisiana's Clean Waters Program (CWP) established a water quality goal to restore twenty five 25 percent of the state's impaired water bodies by 2012. The draft 2012 IR that was scheduled to be submitted to United States Environmental Protection Agency (USEPA) in February 2013 will be utilized as the basis to determine whether these goals have been met. The 2010 IR indicated the water quality goal to restore twenty five (25) percent of water bodies impaired for contact recreational uses was met, but additional effort will be necessary to restore water bodies impaired for FWP.

Louisiana's 2012 Nonpoint Source (NPS) Management Plan included a water quality goal to restore or partially restore 40 Nonpoint Source (NPS) impaired water bodies by October 2016. Bayou Queue de Tortue is included in these priority water bodies (Figure 1).

Louisiana Department of Environmental Quality (LDEQ) and USEPA developed total maximum daily loads (TMDLs) for each source of impairment in Bayou Queue de Tortue. In February 2000, LDEQ completed a TMDL for organic enrichment/low DO. USEPA Region 6 completed TMDLs for turbidity in April 2000, siltation and TSS in January 2001, Fipronil in September 2001, and TDS in April 2003.

A watershed implementation plan (WIP) provides additional data and information to assist watershed stakeholders with reducing NPS pollution and improving water quality. WIPs form the basis for implementing Louisiana's NPS Management Plan at the watershed scale. In agricultural watersheds, such as Queue de Tortue, implementation of conservation tillage and precision farming are recommended best management practices (BMPs) for reducing NPS pollutants from row crops, rice and pastures. Innovations in rice BMPs could result in reducing NPS pollution in the watershed by sixty percent (60%). Preservation and/ restoration of riparian zones along the bayou is also recommended as a practice to improve water quality in Bayou Queue de Tortue.

In previous years, LDEQ partnered with Louisiana State University (LSU) AgCenter at the Rice Research Station in Crowley to evaluate the effectiveness of rice and soybean BMPs to reduce NPS pollutants. The results of the projects did indicate that significant reductions in sediment and nutrients could be achieved by retaining flood waters for rice on the field for at least 15 days prior to releasing them into the bayou. Rice famers were provided small sample cups to test water clarity of rice field floodwaters prior to their release to the bayou. Similarly, conservation tillage in soybeans reduced sediment and nutrient levels when compared with conventional tillage operations.

U.S. Department of Agriculture (USDA) has implemented agricultural BMPs in Bayou Queue de Tortue through Farm Bill Programs (see Table 2) and LDEQ has monitored water quality at the base of the subsegment to determine if water quality has improved as a result of BMP implementation. These ambient data do indicate improvements in annual averages of turbidity, TSS and TDS. LDEQ's ambient water quality data also indicates in-stream water quality improvements in nutrients ($N0_3/N0_2$) and lower average annual values of TP during 2003 and 2007/2008.

USDA is implementing additional BMPs in two (2) 12-digit hydrologic units (HUCs) of Bayou Queue de Tortue through the National Water Quality Initiative (NWQI) and Gulf of Mexico Initiative (GOMI). These initiatives will provide technical and financial assistance to landowners and produces to implement BMPs in Indian Bayou and Grand Marais HUCs.

Louisiana Department of Agriculture and Forestry (LDAF) will also implement BMPs in two (2) 12-digit HUCs of Bayou Queue de Tortue, including Lazy Point and Lyon's Point Gully.

LDEQ applied for federal fiscal year (FFY) 2012 Section 319 funds to monitor water quality in these 12-digit HUCs to determine if the BMPs result in water quality improvements in Bayou Queue de Tortue. The results of the projects will be shared with the farmers and other watershed stakeholders involved in watershed restoration.

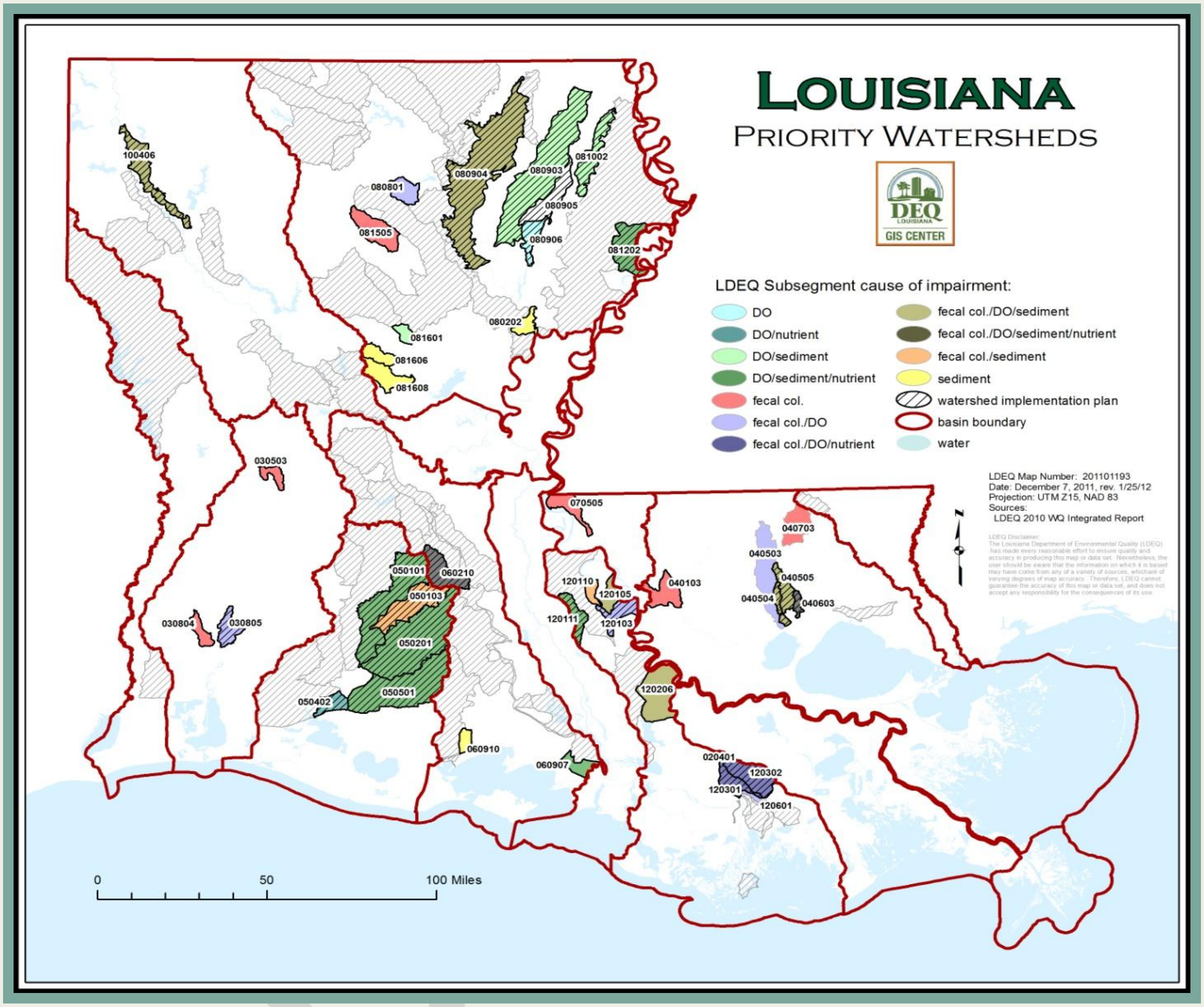
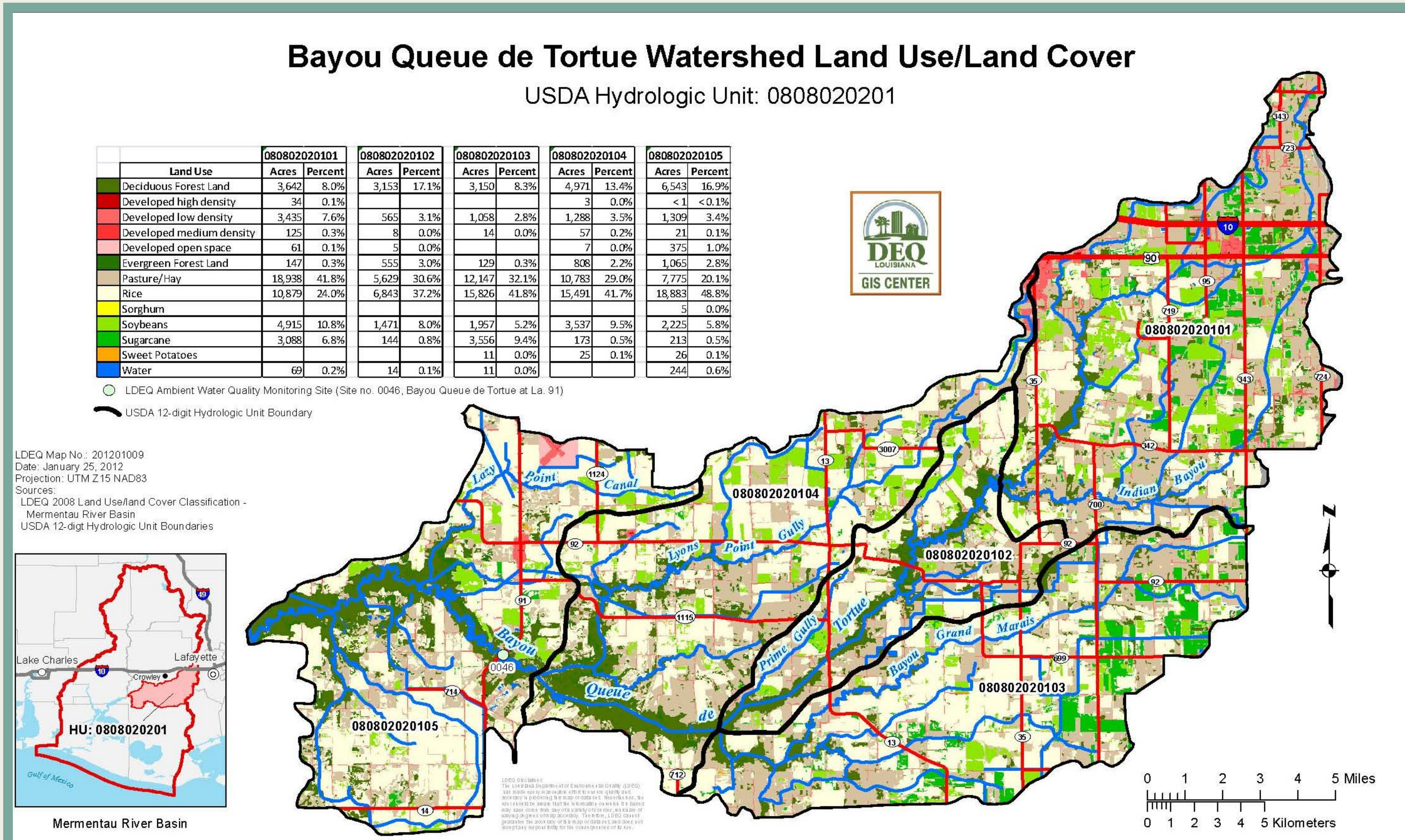


Figure 1- Map of 40 Priority NPS Impaired Water Bodies



Land Use	080802020101 Acres	080802020101 Percent	080802020102 Acres	080802020102 Percent	080802020103 Acres	080802020103 Percent	080802020104 Acres	080802020104 Percent	080802020105 Acres	080802020105 Percent
Deciduous Forest Land	3,642	8.0%	3,153	17.1%	3,150	8.3%	4,971	13.4%	6,543	16.9%
Developed high density	34	0.1%					3	0.0%	< 1	< 0.1%
Developed low density	3,435	7.6%	565	3.1%	1,058	2.8%	1,288	3.5%	1,309	3.4%
Developed medium density	125	0.3%	8	0.0%	14	0.0%	57	0.2%	21	0.1%
Developed open space	61	0.1%	5	0.0%			7	0.0%	375	1.0%
Evergreen Forest Land	147	0.3%	555	3.0%	129	0.3%	808	2.2%	1,065	2.8%
Pasture/Hay	18,938	41.8%	5,629	30.6%	12,147	32.1%	10,783	29.0%	7,775	20.1%
Rice	10,879	24.0%	6,843	37.2%	15,826	41.8%	15,491	41.7%	18,883	48.8%
Sorghum									5	0.0%
Soybeans	4,915	10.8%	1,471	8.0%	1,957	5.2%	3,537	9.5%	2,225	5.8%
Sugarcane	3,088	6.8%	144	0.8%	3,556	9.4%	173	0.5%	213	0.5%
Sweet Potatoes					11	0.0%	25	0.1%	26	0.1%
Water	69	0.2%	14	0.1%	11	0.0%			244	0.6%

Figure 2 - Bayou Queue de Tortue Watershed Land Use/Land Cover Map

1 USEPA's Nine Key Elements

In October 2003, USEPA published NPS Program and Grants Guidelines for States and Territories, which included nine (9) key elements of acceptable WIPs. USEPA requires states to implement incremental funds in watersheds where TMDLs and WIPs have been developed.

USEPA'S NINEKEY ELEMENTS

a. Identification of sources and causes or groups of similar sources that will need to be controlled to achieve load reductions estimated in the WIP;
b. An estimate of load reductions expected for management measures described in paragraph (c);
c. A description of NPS management measures that will need to be implemented to achieve estimated load reductions in paragraph (b); and an identification of critical areas where those measures need to be implemented;
d. An estimate of technical and financial assistance, and/or associated costs and authorities necessary to implement the WIP;
e. An information/education component used to enhance public understanding of the project and encourage early and continued participation in selecting, designing and implementing NPS management measures;
f. A schedule for implementing management measures identified in the WIP that is reasonably expeditious;
g. A description of interim, measurable milestones or other control actions being implemented;
h. A set of criteria to determine whether load reductions are being achieved over time and whether substantial progress is being made toward meeting water quality standards;
i. A monitoring component to evaluate effectiveness of implementation efforts over time, measured against criteria established in paragraph (h).

A. Causes and sources to be controlled to achieve NPS load reduction

Bayou Queue de Tortue fully meets water quality criteria for PCR and SCR, but does not meet criteria for FWP because of low DO and high concentrations of TDS, TSS, and turbidity. Appendix A of the state's 2010 and draft 2012 IR identified sources and causes of impairment of FWP, including irrigated crop production, non-irrigated crop production, atmospheric deposition – toxics, natural conditions, and flow alterations from water diversions. Through detailed analysis of land-use in Bayou Queue de Tortue watershed, pasture/hay and rice are predominant crops (Figure 2). LDEQ partnered with LSU Ag Center and University of Louisiana at Lafayette

(UL) on edge-of-field and in-stream monitoring for rice fields and pastures to determine effectiveness of BMPs in reducing NPS pollutants. The Annualized Agricultural Nonpoint Source (AnnAGNPS) and Soil and Water Assessment Tool (SWAT) watershed models were applied to Bayou Plaquemine Brule watershed to identify critical areas of NPS loads. Bayou Plaquemine Brule is the subsegment north of Bayou Queue de Tortue and has similar land-use patterns and soils.

DO AND NUTRIENT TMDL

The DO TMDL developed by LDEQ estimated ~89 percent of the pollutant load in Bayou Queue de Tortue was from anthropogenic NPS and ~1 percent was from point sources, with the remainder from natural background sources. The TMDL estimated that a 60 percent reduction of man-made NPS pollution would be necessary to meet the state's DO criteria of 5 mg/L (winter) and 3 mg/L (summer). Since agricultural activities represent 86.7 percent of the watershed, agricultural BMPs will be the primary management strategy to reduce NPS loads and meet water quality standards for DO. The TMDL also issued stricter effluent limitations for the City of Dawson waste water treatment plant (WWTP).

TSS TMDL

The TSS TMDL developed by USEPA calculated ambient concentrations for TSS of ~107 mg/L and established an in-stream target of 50 mg/L for Bayou Queue de Tortue. Based on historical water quality data, the TMDL estimated that a 53 percent reduction in TSS would be necessary to meet this in-stream target.

TURBIDITY TMDL

The turbidity TMDL developed by USEPA examined ambient water quality data for turbidity and determined that on average, the state's turbidity guideline for Mermentau Basin of 150 NTU is being maintained during the months of June-January. During the months of February, March, and May, mean turbidity levels were 250 NTU and during the month of April the mean turbidity level rose to 600 NTU. These spikes in turbidity coincide with the spring release of rice field discharges in the watershed. Therefore, USEPA required two (2) restrictions for turbidity loads during the rice-planting season. The months of February, March, and May will require a turbidity reduction of 40 percent and the month of April may require a 75 percent reduction in NPS loads. There are no turbidity restrictions during the months of June-January.

TDS TMDL

The TDS TMDL developed by USEPA calculated ambient concentrations for TDS of 358 mg/L. Similar to TSS, highest TDS concentrations coincide with rice seeding and leveling during spring planting. USEPA did not segregate guidelines for the spring planting season, but recommended a 27 percent reduction in TDS throughout the year. The TMDL indicated that rice field discharges were the major contributor to NPS TDS loads.

CONSISTENCY OF TMDLS

NPS pollutants identified in the Bayou Queue de Tortue WIP are potentially related in that TDS, TSS, and turbidity often deplete oxygen in the water column and contribute to sediment oxygen demand (SOD), once deposited as a benthic layer in the bayou. Since, the DO TMDL required oxygen demanding substances to be reduced by 60 percent, by reducing these pollutants (i.e. TDS, TSS and turbidity), in-stream concentrations of DO should also improve.

The Natural Resources Conservation Service (NRCS) suggests two (2) general strategies to implement in order to address these impairments.

1. Cropping System
2. Water Management

As a part of the cropping system, nutrient and pest management, residue management, conservation crop rotation, and dry seeding should be implemented. The water management strategy includes irrigation land leveling, using a grade stabilization structure, irrigation water management, and a shallow water area for wildlife. When implementing these practices as part of a system, each of them has an additive effect on the improvement of water quality.

As these agricultural BMPs are implemented on the local rice, soybean fields and pastures, the concentration of TSS, TDS and turbidity should decline and DO levels should improve significantly. Figures 3 and 4 below illustrate estimated reductions in DO and turbidity from 2013 to 2016.

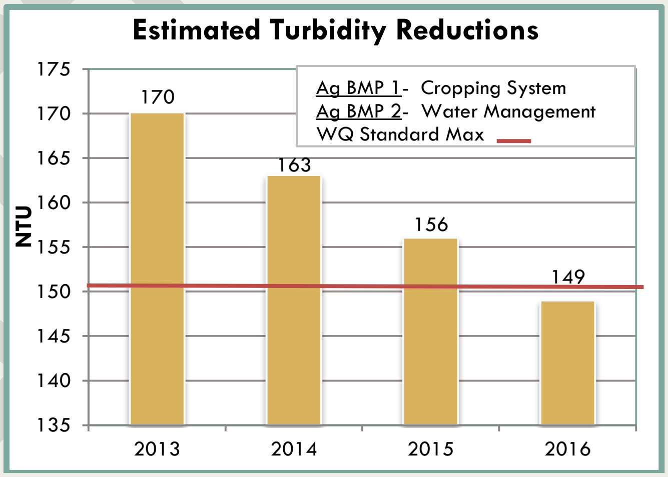


Figure 3- Estimated Turbidity Reductions from 2013-2016

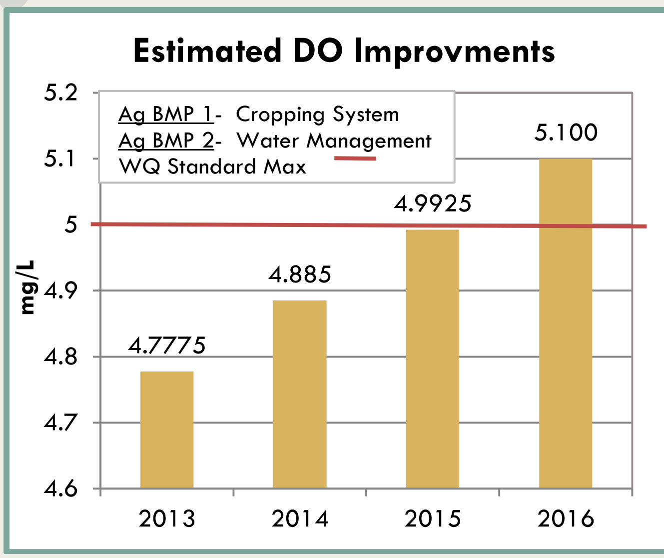


Figure 4- Estimated DO Improvements from 2013-2016

LDEQ'S AMBIENT WATER QUALITY DATA

Since 1978, LDEQ has collected ambient water quality data in Bayou Queue de Tortue. LDEQ has included four (4) years of ambient data from 1998, 2003, 2004, and 2007/2008 in the Bayou Queue de Tortue WIP. Beginning in 2007, ambient data was collected between the months of October 2007 and September 2008. A fifth year of sampling began in October 2011 and will continue through September 2012. The data was collected 3.3 miles north of Gueydan, Louisiana where LA Highway 91 crosses Queue de Tortue. These data will also be utilized to compare water quality results of data collected at the 12-digit HUC scale in Bayou Marais, Lazy Point Canal and Lyons Point Gully.

Constituent	LDEQ/USEPA Standard	Percent Reduction	NPS of Pollutant
DO and Nutrients	5.0 mg/l Dec – Feb 3.0 mg/l March - Nov	60% 60%	Agriculture, Urban Runoff, Home Sewerage, Hydro-modification
TSS	50 mg/l	53%	Same as above
Turbidity	150 NTU	75% April 40% Feb, Mar, May	Same as above
TDS	260 mg/l	27%	Same as above

Table 1 - The Water Quality Standards and TMDL Reductions for each Water Quality Impairment

The following graphs illustrate LDEQ's ambient data from 1998-2008. Data collected from October 2011 through May 2012 is not a complete year so those values have not been included in the graphs, but statements about their annual average values and peak concentrations have been included, since these values indicate water quality improvements for some of the parameters of concern in the bayou.

DO concentrations continue to be a problem in Bayou Queue de Tortue with average annual values of 2.66mg/L in 2003 and 2.02 mg/L in 2007/2008. DO values fell below 1.0 mg/L four (4) times in 1998, remained above 1.0 mg/L in 2003, fell below 1.0 mg/L three (3) times in 2004 and five (5) times in 2007/2008. Data collected from November 2011 through May 2012 indicates average annual DO concentrations of 3.20 mg/L. Minimum DO concentrations typically occur between April and June.

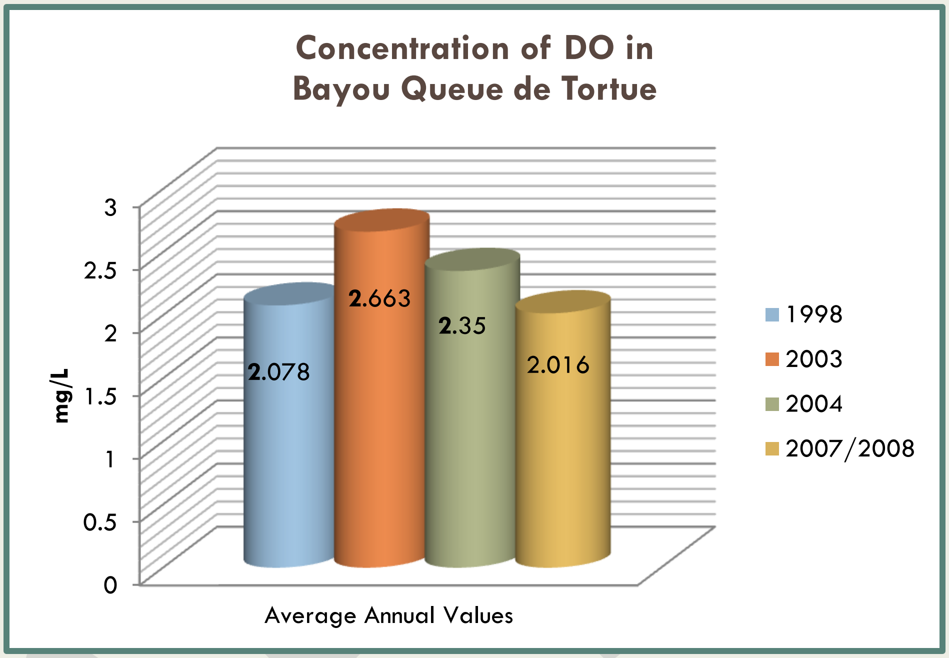


Figure 5- Average Annual Values of DO in Bayou Qyeue de Tortue

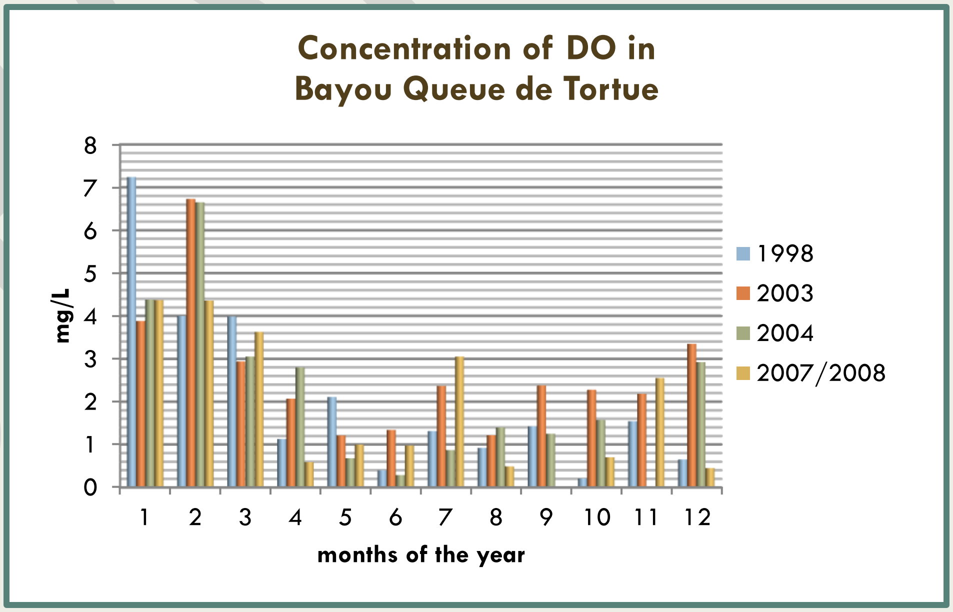


Figure 6 - DO Concentration in Bayou Queue de Tortue

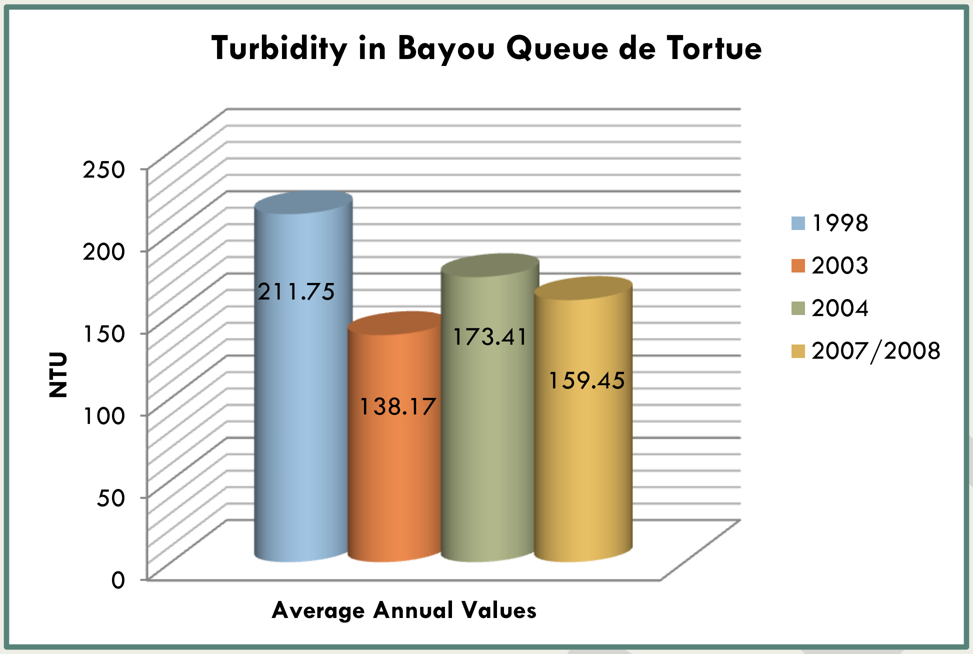


Figure 7- Average Annual Values of Turbidity in Bayou Queue de Tortue

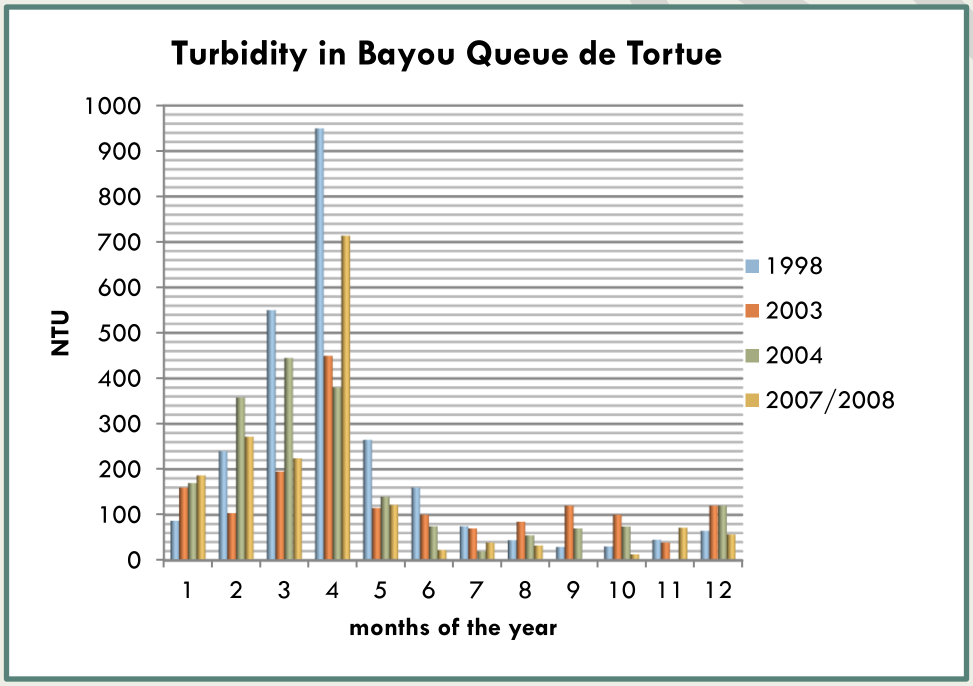


Figure 8- Turbidity in Bayou Queue de Tortue

Turbidity values in Bayou Queue de Tortue declined from 1998-2004, but increased again in 2007/2008. Average annual turbidity values were 211.75 in 1998 with five (5) months above the turbidity guideline of 150 NTU. Average annual turbidity values were 138.17 NTU in 2003, with three (3) months above the turbidity guideline. Average annual NTU values were 173.41 in 2004 and 159.4 in 2007/2008, with four (4) months above the NTU guideline during these two years of data collection. The average annual value of NTU from October 2011 through May 2012 was 87.20. Peak NTU concentrations typically occur in April, with 950 in 1998 and 714 in 2008. The peak concentration in April 2012 was 256 NTU indicating improvements since 2008.

Average annual values of TSS have remained relatively constant from 1998- 2007/2008, with a maximum value of 39.95 mg/L in 2003 and 30.92 mg/L in 2004. Average annual values of TSS from October 2011 through May 2012 was 30.86 mg/L. Peak concentrations declined from 130 mg/L in March 1998 to 59 mg/L in 2008. USEPA established an in-stream target of 50 mg/L in the TMDL and TSS values remained between 50 and 59 mg/L from January-March, 2008.

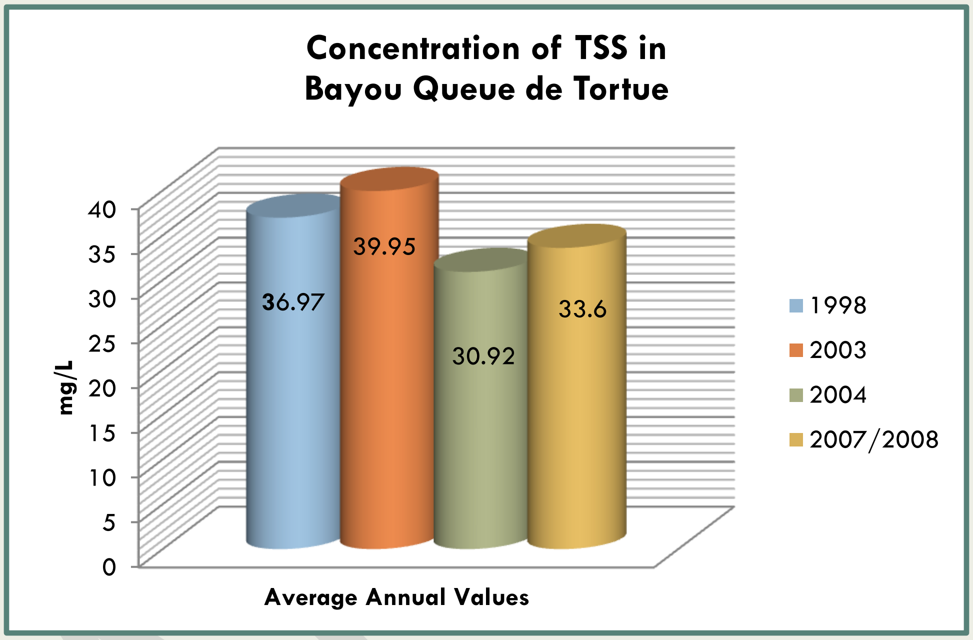


Figure 9- Average Annual Values of TSS in Bayou Queue de Tortue

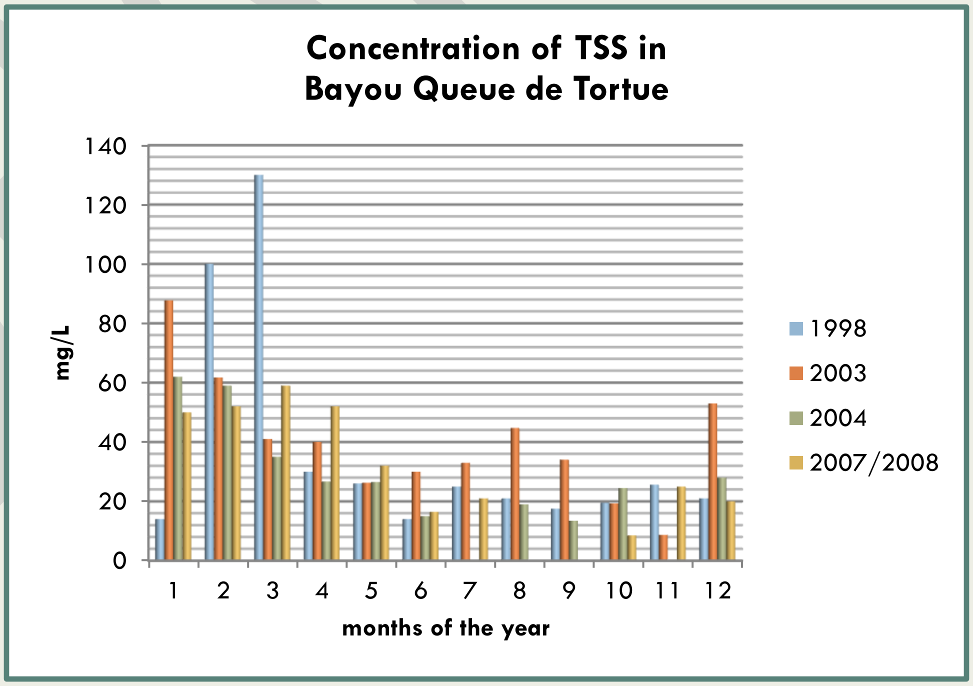


Figure 10- Monthly Concentration of TSS in Bayou Queue de Tortue

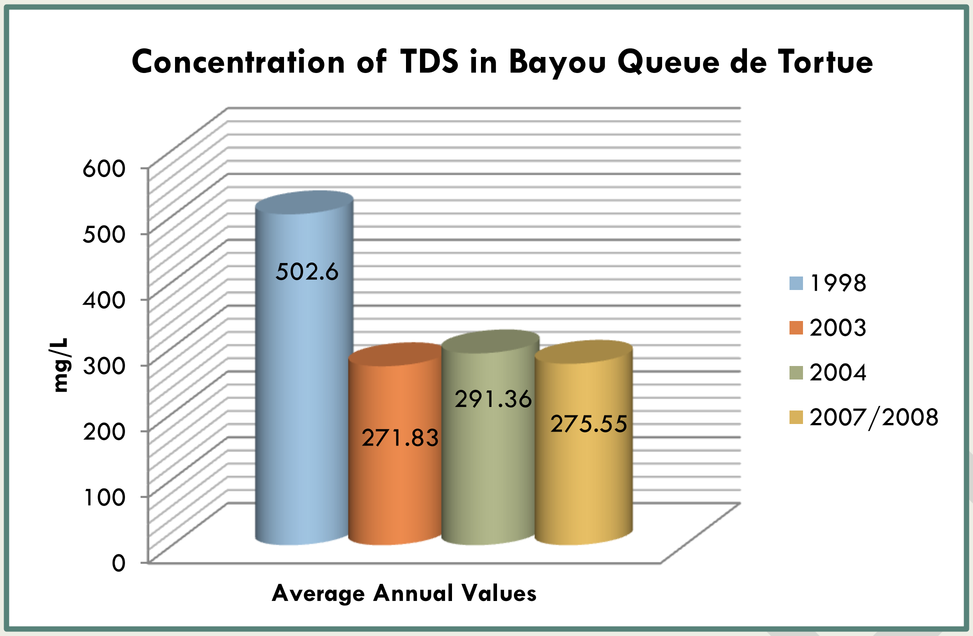


Figure 11-Average Annual Values of TDS in Bayou Queue de Tortue

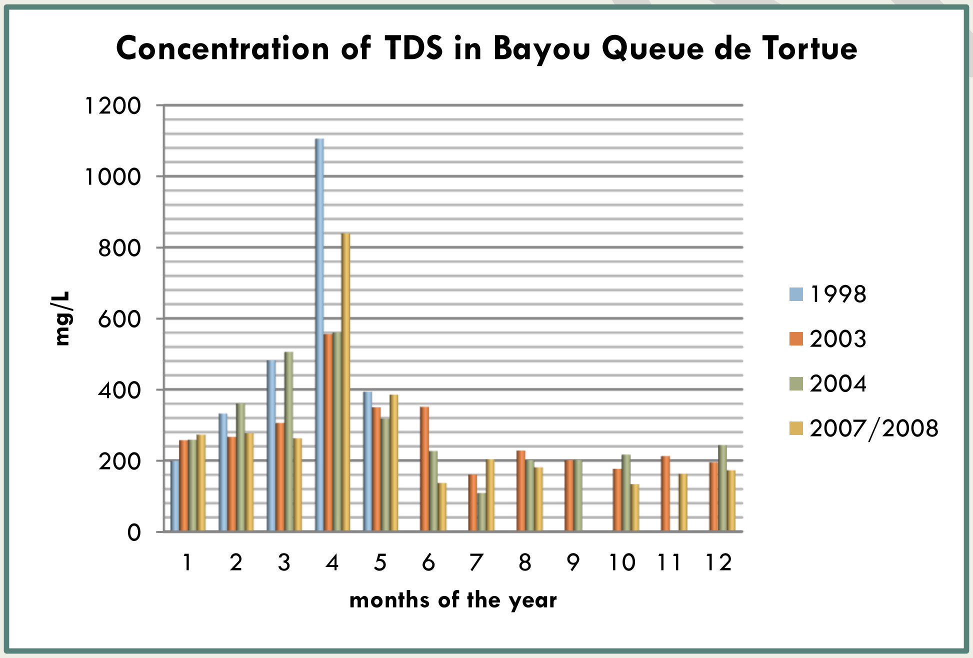


Figure 12- Concentration of TDS in Bayou Queue de Tortue

Average annual values of TDS have declined from 1998-2007/2008, with an average value of 502.6 mg/L in 1998 and 275.55 mg/L in 2007/2008. The average annual value of TDS from October 2011 through May 2012 was 218.29 mg/L. TDS water quality standards of 260 mg/L were exceeded four (4) times in 1998, five (5) times in 2004 and five (5) times in 2007/2008.

Peak TDS concentrations typically occur in March or April, with 1106 mg/L in 1998 and 840 mg/L in 2008. In February 2012, the peak TDS concentration was 240 mg/L. Peak concentrations were lower in 2003 and 2004, with 566 mg/L and 561 mg/L, respectively, with the lowest peak concentration in February 2012.

Average annual values of TP fluctuated from 1998 to 2007/2008 with highest annual values of 0.332 mg/L in 1998 and 0.349 mg/L in 2004. Average annual values were 0.298 mg/L in 2003 and 0.307 mg/L in 2008. The average annual value from October 2011 through May 2012 was 0.309 mg/L.

Peak concentrations of TP typically occurred in April with 0.79 mg/L in 1998, 0.545 mg/L in 2003, 0.46 mg/L in 2004, 0.67 mg/L in 2008 and 0.70 mg/L in 2012.

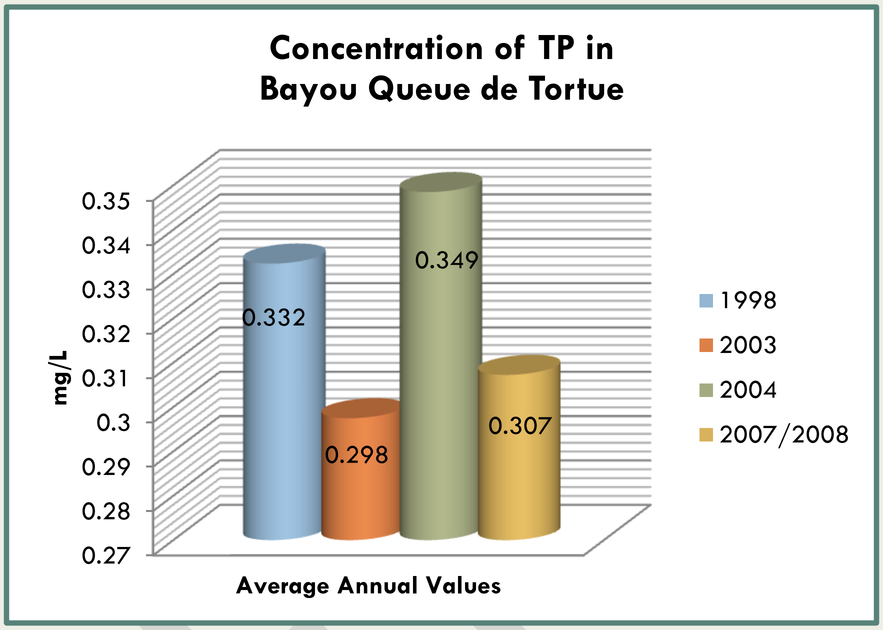


Figure 13- Average Annual Values of TP in Bayou Queue de Tortue

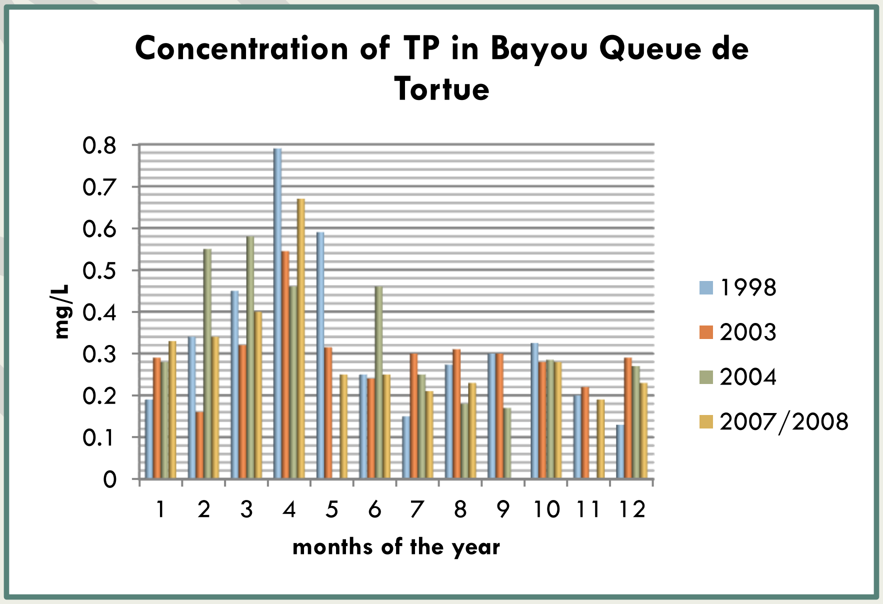


Figure 14- Concentration of TP in Bayou Queue de Tortue

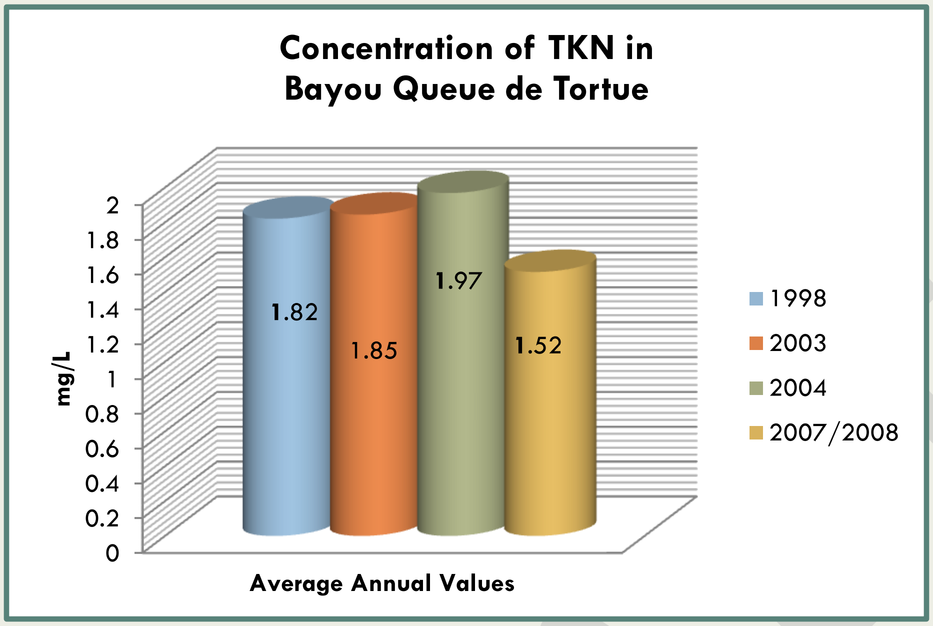


Figure 15- Average Annual Values of TKN in Bayou Queue de Tortue

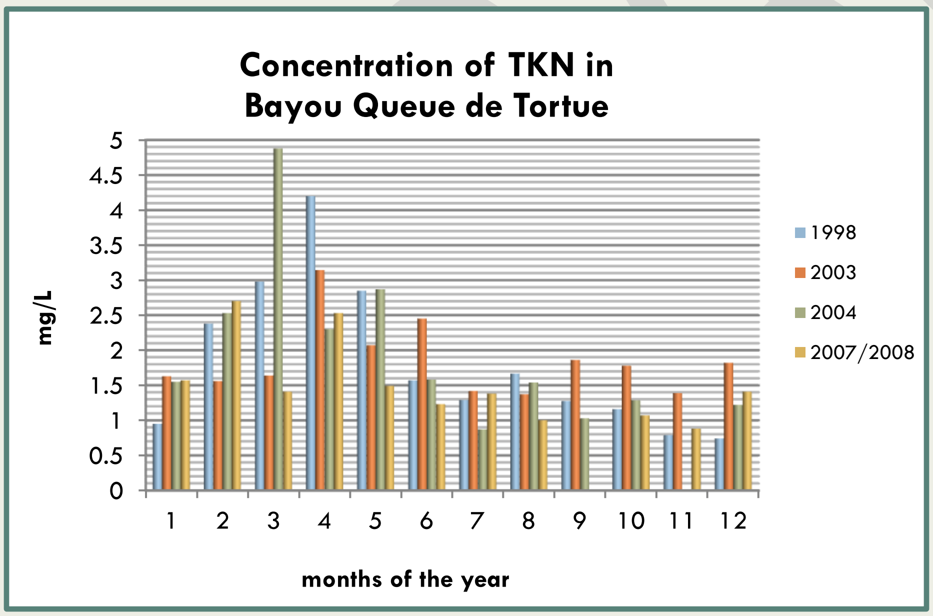


Figure 15- Monthly Concentration of TKN in Bayou Queue de Tortue

Average annual values of TKN fluctuated from 1998 to 2007/2008, with slightly lower values in 2007/2008. Average TKN values were 1.62-1.97 mg/L from 1998 to 2004, but were 1.52 mg/L in 2007/2008. The average annual value of TKN from October 2011 through May 2012 was 1.25 mg/L. Peak concentrations of TKN typically occur in March and April, with maximum values of 4.2 mg/L in April 1998, 3.145 mg/L in April 2003 and 4.88 mg/L in March 2004. Maximum values typically occur from February to May each year.

Average annual values of NO_3/NO_2 have declined from 1998 to 2007/2008. Average NO_3/NO_2 values were 0.223 in 1998 and declined to 0.115 mg/L in 2007/2008. The average annual value of $N0_3/N0_2$ from October 2011 through May 2012 was 0.098 mg/L. Peak concentrations of NO_3/NO_2/ occurred in April and June of 1998, with values of 0.96 mg/L and 0.72 mg/L, respectively. Peak concentrations of NO_3/NO_2 in May 2008 were 0.28 mg/L.

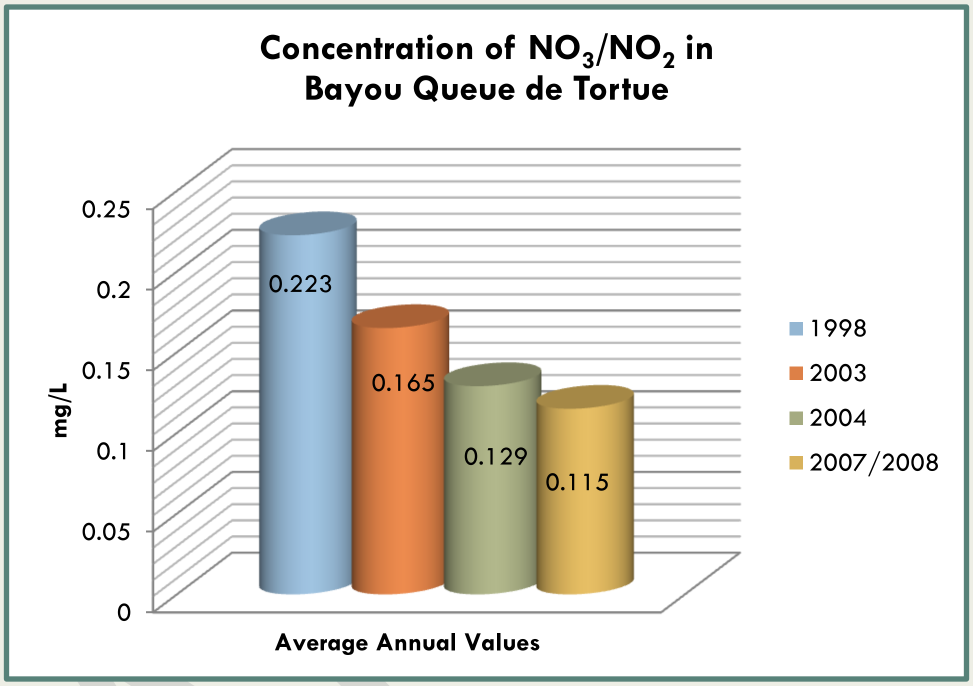


Figure 16- Average Annual Values of NO_3/NO_2 in Bayou Queue de Tortue

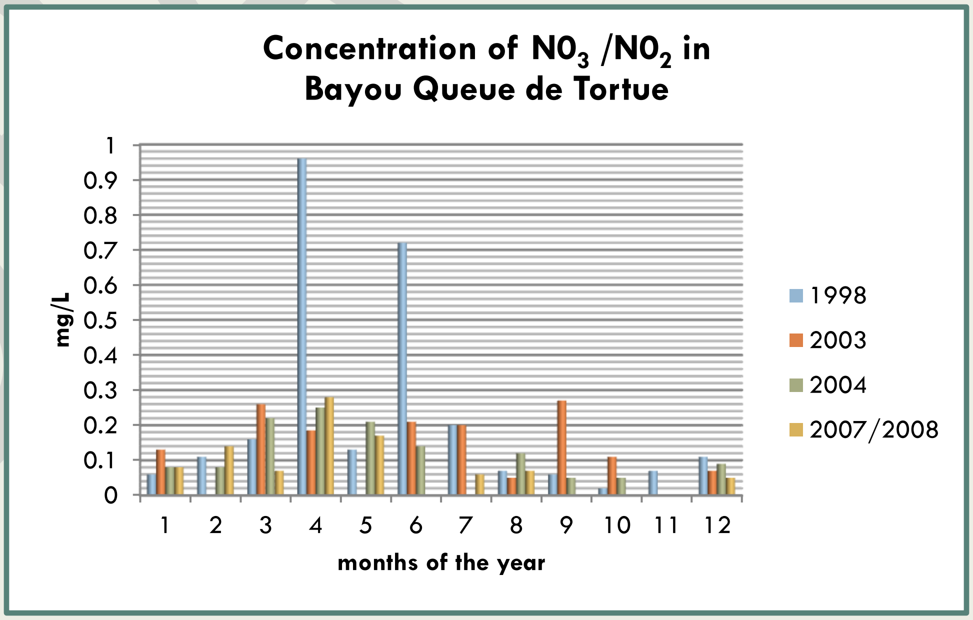


Figure 17- Concentration of NO_3/NO_2 in Bayou Queue de Tortue

These water quality data indicate that peak concentrations of sediment (turbidity, TSS and TDS) and nutrients (TP and TKN) occur during March and April. Therefore, the water quality goal is to reduce these peak concentrations and improve DO, thereby restoring or partially restoring FWP in Bayou Queue de Tortue. Recent data from 2011 through 2012 indicates that peak concentrations have declined since 1998 and water quality is beginning to improve in Bayou Queue de Tortue

Temperature is strongly inversely proportional to in-stream DO concentrations. In Louisiana, July and August are typically the hottest months, while October and November are the months with lowest stream flow.

The two (2) clearest trends in LDEQ's historical data are the presence of pollutants in the bayou from spring discharges from rice fields and the inverse relationship between temperature and DO. As previously mentioned, low DO conditions occur in Bayou de Queue Tortue between April and December, when temperatures are high and in-stream flows are typically lower. Pollutants that entered the bayou in March-April and settled to benthic layers may exert SOD in the bayou. The majority of these NPS pollutants enter the bayou during spring planting seasons of rice and remain in the bayou until they move downstream following a storm event.

In addition to analyzing water quality data, LDEQ also utilized watershed models to identify areas of high NPS loads in Bayou Queue de Tortue.

MODELING BAYOU QUEUE DE TORTUE

As Bayou Queue de Tortue approaches the Gulf of Mexico, land elevations begin to level out for several miles and stream currents slow down and sometimes reverse due to strong tides and winds. Watershed models are driven by slope and weather; however, there is no slope in the southern regions of the Queue de Tortue. Much of the water is directed through dredged channels and cut ditches. The standard Digital Elevation Model (DEM) with 1m vertical resolutions is not useful to generate any sensible stream network in the area.

SIMILARITIES BETWEEN QUEUE DE TORTUE AND PLAQUEMINE BRULE

The watershed just north of Bayou Queue de Tortue, Bayou Plaquemine Brule, is very similar in land-use and soils and was modeled successfully. The Plaquemine Brule watershed is a suitable candidate for a surrogate watershed. The results just to the north suggest that discharges from rice fields during spring planting contribute >60 percent of the sediment load in the watershed.

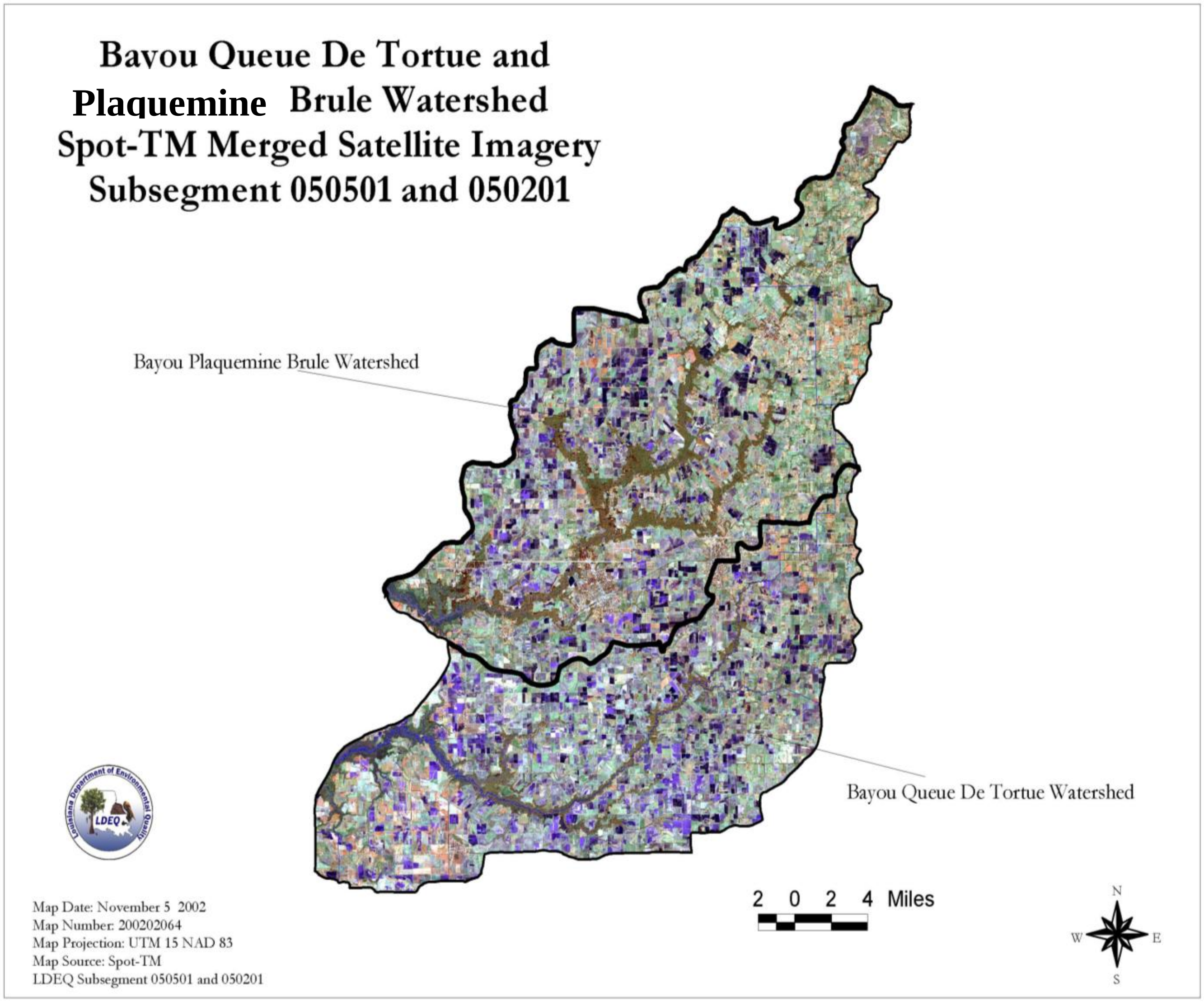


Figure 19 - Bayou Plaquemine Brule and Queue de Tortue have Similar Land-Use, Soils, Rainfall, and Farming Practices

FORESTED AREAS/RIPARIAN AREAS

Riparian or forest cell areas along the bayou had the lowest loading rates. The light color cells running up through the center of the watershed are forested areas. These forested cells also have the greatest slopes and would have greater sediment yields if they were not colonized with hardwood wetland forest. This evidence supports previous findings that riparian areas are effective management measures for reducing agricultural NPS pollutant loads. Forested areas constitute over ten (10) percent of the land mass yet the sediment yield coming off these areas is less than one (1) percent of NPS pollutant loads.

PASTURE

The northeast section of the watershed has lower pollutant load rates. This is largely due to the fact that pasture is grown in this area and the soil is not tilled and exposed to rain events. The presence of dense root matter and foliage coverage prevents the soils from moving off the field and into the stream reaches. Pastures only represent four (4) percent of the pollutant load yet it represents 27 percent of the land area in the watershed.

URBAN AREAS

Urban areas are a moderate source of NPS pollution. Urbanized areas constitute four (4) percent of the pollutant load and seven (7) percent of the area in the watershed. Its actual loading of oxygen demanding materials may be greater than what the model predicts. The AnnAGNPS model is primarily for describing soil losses in agricultural areas. The results are provided in sediment yields. Urban areas use default settings and pollutants such as oil and grease, lawn fertilizer, and pet waste are not considered in the model. Therefore, urban areas may comprise a greater pollutant load than what is depicted in the model.

RICE AND SOYBEANS

Soybean and rice field rotations almost exclusively dominate the agricultural land use in southwestern sections of the Bayou Queue de Tortue watershed. They represent about 91 percent of the pollutant load to the watershed. Of the two (2), rice produces the greatest annual sediment load to the bayou. An estimated 85 percent of NPS pollutant loads from rice fields originate from spring discharges after land leveling (mudding in) and seeding. Historical water quality collected over the last 20 years validates the predicted pollutant loads modeled by AnnAGNPS. Mudding in a rice field involves flooding the field and running disks through the mud and water. Presumably, the disk leveling evens out the high spots and the suspended solids fill in the low spots. Discharges of suspended solids are magnitudes greater during this spring discharge then discharges that occur during the summer and fall seasons. Root matter anchors sediment in the rice fields, and foliage rising through the impounded water provides a surface area for microbial decomposition of organic materials and nitrogenous compounds. The summer and fall discharges are relatively clean outflows with very low concentrations of sediment leaving the fields. These summer and fall rice field discharges may actually transport pollutants downstream to Mermentau River and improve water quality in the bayou.

Excessive soil erosion is currently occurring on crop lands as a result of extensive use of irrigation on rice acreage and high average annual rainfall which is in excess of 57 inches. Implementation of agricultural BMPs through USDA Farm Bill programs and LDAF Section 319 programs appear to be reducing sediment and nutrient levels in Bayou Queue de Tortue.

Implementation of site specific BMPs to control runoff and reduce sediment loads are key actions recommended to reduce TSS, TDS and turbidity in the bayou. Similarly, implementation of pest and nutrient management BMPs is expected to reduce the impact of agricultural chemicals on water quality in Bayou Queue de Tortue and Mermentau River. BMP implementation through USDA programs and LDAF FFY 2012 Section 319 funds should result in measurable in-stream water quality improvements.

B. Estimated Load Reductions Achieved with NPS BMPs

Since water quality data indicates NPS pollutants (sediment and nutrients) need to be reduced during March and April and land-use data indicates pastures/hay, soybeans and rice fields are predominant land-uses in the watershed, then management measures or BMPs that reduce sediment and nutrients from these land-uses are being prioritized for watershed implementation.

Peak concentrations of sediment and nutrients appear to coincide with spring rice field discharges, as indicated in the TMDLs. Some rice farmers flood their fields in late winter and early spring to level the field by "mudding in" prior to planting. When the field is leveled and planted, impounded water is released. After a couple of weeks, the field is refilled with water.

The application of rice BMPs should allow farmers to reduce high sediment and nutrient loads during the spring rice planting season. Instead of "mudding in," rice farmers can utilize precision leveling techniques. Instead of aerial seeding into flooded fields, farmers can knife in rice seeds into a dry seedbed. "Clear field" planting also allows farmers to plant into a dry seedbed. These practices should reduce or eliminate spring discharges that prevent turbid waters entering the bayou.

Similarly, soybean conservation tillage practices help retain soils during the years of soybean rotation. Farmers in the watershed typically tilled their fields four (4) times, twice during the spring and twice again during the fall, after harvest. By simply eliminating fall tillage operations and leaving crop residues on the field, a significant amount of soil is retained over winter months when the region experiences heavy and frequent rain events.

LDEQ utilized a model called AnnAGNPS, a NRCS sponsored model, to evaluate agricultural practices and compare them to various BMPs. The model produced results on sediment, phosphorus, nitrogen, pesticides, and organics as primary NPS pollutants that move overland, through stream reaches to the watershed outlet. AnnAGNPS was an extremely robust model having over 900 input parameters. Cells (land area representations) of a watershed were utilized to provide landscape spatial variability. Each cell homogeneously represented the landscape within its respective land area boundary. The physical or chemical constituents are routed from their origin within the land area and are either deposited within the stream channel system or transported out of the watershed. Pollutant loadings can then be identified at their source and tracked as they move through the watershed system.

Operational practices are a key variable. LDEQ utilized information recommended by LSU AgCenter and conservation practices in the publications listed in the bibliography, and recommendations from local farmers for input parameters. The model enabled LDEQ to evaluate BMPs and select a combination of practices to reach the 60 percent NPS pollutant load reduction required in the TMDL to meet DO water quality standards. The model also helped to identify areas of high NPS loads in the watershed where BMPs would have the greatest potential to reduce NPS loads.

Local Soil and Water Conservation District (SWCD) representatives from Acadia and St. Landry Parish were consulted to describe typical operational practices. The model was run utilizing BMPs for rice and soybeans and a 62 percent reduction was achieved with BMPs for rice and soybeans. This indicates that a 60 percent reduction is achievable. As previously discussed, BMPs recommended were precision leveling and dry seed bedding for rice fields and conservation tillage practices during soybean rotations. LDEQ is recommending that farmers in the watershed seek government cost-share assistance to purchase precision leveling equipment. Tables 2 and 3 include the types of practices, their costs and acreage scheduled for implementation in the watershed.

C. BMPs FOR IMPLEMENTATION IN BAYOU QUEUE DE TORTUE WATERSHED

USDA has implemented agricultural BMPs in Bayou Queue de Tortue during the past five (5) years (2007-2012).

Table 2 includes acreages and numbers of each practice that was implemented from 2007-2012 in each 12-digit HUC of Bayou Queue de Tortue watershed.

Watershed (12-Digit HUC)	Practice Name & Practice Code	Practice Unit	Years Implemented
Bayou Grand Marais	Conservation Completion Incentive First Year (CCIA)	122.80 no	2007
	Conservation Crop Rotation (328)	4028.80 ac	2007-2011
	Forage and Biomass Planting (512)	140.30 ac	2008
	Forage Harvest Management (511)	21.50 ac	2010
	Grade Stabilization Structure (410)	890.30 no	2007-2011
	Integrated Pest Management (IPM) (595)	1453.90 ac	2007-2009
	Irrigation Land Leveling (464)	2659.30 ac	2007-2012
	Irrigation Pipeline (430)	170.2 ft	2011-2012
	Irrigation Water Conveyance, Pipeline, Low-Pressure, Underground, Plastic (430EE)	605.30 ft	2007-2011
	Irrigation Water Management (449)	2299.50 ac	2007-208, 2010-2012
	Nutrient Management (590)	1934.90 ac	2007-2009
	Prescribed Grazing (528A)	327.9 ac	2009
	Record Keeping (748)	1277.50 no	2007-2009, 2012
	Residue Management, Seasonal (344)	2961.20 ac	2007-2010
	Shallow Water Development and Management (646)	4442.80 ac	2011-2012
	Watering Facility (614)	17.50 no	2009
	Wetland Wildlife Habitat Management (644)	1364.10 ac	2007-2010, 2012
Lazy Point Canal	Brush Management (314)	36.90 ac	2008
	Conservation Crop Rotation (328)	520.40 ac	2008, 2011
	Grade Stabilization Structure (410)	355.5 no	200-2009, 2011
	Integrated Pest Management (IPM) (595)	448.4 ac	2008
	Irrigation Land Leveling (464)	1687.80 ac	2007-2012
	Irrigation Water Conveyance, Pipeline, Low-Pressure, Underground, Plastic (430EE)	482.50 ft	2008-2010
	Irrigation Water Management (449)	1751.10 ac	2008-2010
	Nutrient Management (590)	535.90 ac	2008
	Residue Management, Seasonal (344)	448.40 ac	2008
	Shallow Water Development and Management (646)	458.00 ac	2008, 2011
	Structure for Water Control (587)	24.70 no	2008
	Upland Wildlife Habitat Management (645)	23.20 ac	2008

Watershed (12-Digit HUC)	Practice Name & Practice Code	Practice Unit	Years Implemented
Lyons Point Gully	Conservation Completion Incentive First Year (CCIA)	392.60 no	2008
	Conservation Crop Rotation (328)	524.50 ac	2007
	Forage and Biomass Planting (512)	264.10 ac	2007, 2010
	Forage Harvest Management (511)	116.40 ac	2009
	Grade Stabilization Structure (410)	994.20 ac	2008-2010
	Integrated Pest Management (IPM) (595)	701.20 ac	2007
	Irrigation Land Leveling (464)	935.80 ac	2007-2012
	Irrigation Water Conveyance, Pipeline, Low-Pressure, Underground, Plastic (430EE)	445.00 ft	2008-2009, 2011
	Irrigation Water Management (449)	1654.20 ac	2007-2010
	Nutrient Management (590)	798.00 ac	2007-2008
	Prescribed Grazing (528A)	350.00 ac	2007, 2009
	Residue Management, Seasonal (344)	760.50 ac	2007, 2010
	Shallow Water Development and Management (646)	1533.90 ac	2011
	Water Well Decommissioning (351)	9.00 no	2007
	Wetland Wildlife Habitat Management (644)	366.10 ac	2007
Indian Bayou	Conservation Cover (327)	29.30 ac	2007-2010
	Conservation Crop Rotation (328)	4555.20 ac	2007-2010
	Fence (382)	210.80 ft	2007, 2009
	Field Border (386)	353.20 ac	2009
	Forage Harvest Management (511)	32.00 ac	2008, 2010
	Grade Stabilization Structure (410)	594.70 no	2007-2012
	Heavy Use Area Protection (561)	7.40 ac	2008
	Integrated Pest Management (IPM) (595)	43.00 ac	2007
	Irrigation Land Leveling (464)	1432.60 ac	2007-2012
	Irrigation Water Conveyance, Pipeline, Low-Pressure, Underground, Plastic (430EE)	41.50 ft	2007, 2009-2010
	Irrigation Water Management (449)	3738.60 ac	2007-2011
	Nutrient Management (590)	274.60 ac	2007-2008
	Pipeline (516)	7.40 ft	2007
	Prescribed Grazing (528)	212.40 ac	2007, 2009
	Record Keeping (748)	229.50 no	2008
	Residue Management, Seasonal (344)	3291.70 ac	2007-2010
	Shallow Water Development and Management (646)	508.20 ac	2011
	Upland Wildlife Habitat Management (645)	80.00 ac	2008
	Water Well (642)	100.70 no	2007, 2010

Watershed (12-Digit HUC)	Practice Name & Practice Code	Practice Unit	Years Implemented
	Water Well Decommissioning (351)	75.30 no	2007, 2009
	Watering Facility (614)	7.40 no	2008
	Wetland Wildlife Habitat Management (644)	2786.7 ac	2007-2009, 2011
Prime Gully	**Access Control (472)**	**340.40 ac**	**2007**
	Brush Management (314)	24.40 ac	2007
	Conservation Crop Rotation (328)	1118.90 ac	2007-2010
	Forage Harvest Management (511)	11.90 ac	2010
	Grade Stabilization Structure (410)	455.50 no	2007
	Integrated Pest Management (IPM) (595)	742.10 ac	2007-2009
	Irrigation Land Leveling (464)	1197.50 ac	2007-2012
	Irrigation Water Conveyance, Pipeline, Low-Pressure, Underground, Plastic (430EE)	226.00 ft	2008-2010
	Irrigation Water Management (449)	1013.80 ac	2007-2010, 2012
	Nutrient Management (590)	864.40 ac	2007-2009, 2012
	Record Keeping (748)	730.00 no	2007-2009, 2012
	Residue Management, Seasonal (344)	1047.40 ac	2007-2010
	Shallow Water Development and Management (646)	952.60 ac	2011-2012
	Wetland Creation (658)	340.40 ac	2007
	Wetland Wildlife Habitat Management (644)	1024.50 ac	2007-2009, 2012

Table 2 - BMPs Implemented in the Past Five (5) Years

The USDA/NRCS Conservation Effects Assessment Project (CEAP) shows that conservation practices are effective in reducing NPS pollution. Comprehensive planning is needed because suites of practices, in most situations, work more effectively than applying a single practice. The assessment also indicates that targeting acres with high NPS loads significantly improves effectiveness, and the most critical conservation issue is reducing the loss of nutrients, especially nitrogen and phosphorus. The CEAP also found that compared to no application of conservation practices:

- Sediment loss was reduced by 69 percent;
- TP loss was reduced by 49 percent;
- Total nitrogen loss was reduced by 18 percent; and
- Pesticide risks to human health were reduced by 48 percent.

LDAF will be focusing its watershed implementation in Lyons Point Gully and Lazy Point Canal. They foresee a reduction of NPS pollutants can be accomplished by implementing BMPs such as grade stabilization structures, irrigation land leveling, and dry seeding of rice, seasonal residue management, nutrient management, pest management, and other practices to protect water quality in these two (2) 12-digit HUCs.

Table 3 includes BMPs that LDAF has proposed to implement over the duration of their project.

BMPs	Practice Code	Total Cost per Acre/Structure	Total Needed
Conservation Crop Rotation	328	$15/acre($5/year)	10,000 ac
Dry Seeding	449	$10/acre/year	8000 ac
Grade Stabilization Structure	410	$1,500/structure	22 no
Irrigation Land Leveling	464	$350/acre	5,000 ac
Irrigation Water Management	449	$5/acre/year	3,000 ac
Nutrient Management	590	$15/acre($5/year)	10,000 ac
Pest Management	595	$15/acre($5/year)	10,000 ac
Record Keeping	748	$1.50/acre($.50/year)	10,000 ac
Residue Management, Seasonal	344	$15/acre($7.50/year)	8,000 ac
Shallow Water Area for Wildlife	646	$5/acre	5,000 ac

Table 3 - BMPs LDAF Proposes to Implement in Lyons Point Gully and Lazy Point Canal

The NRCS in the States of Alabama, Florida, Louisiana, Mississippi, and Texas, in conjunction with conservation partners, proposed the establishment of a landscape-based, coordinated effort to improve ecosystem health in the Gulf of Mexico and its associated watersheds called the Gulf of Mexico Initiative (GoMI) Project. The NRCS will be focusing a portion of their GoMI dollars on BMP implementation in the Bayou Grand Marais 12-Digit HUC in Bayou Queue de Tortue watershed.

Table 4 includes BMPs that USDA has proposed to implement over the duration of their project. Table 5 includes load reduction estimates expected in the three (3) 12-digit HUCs targeted through LDAF and USDA projects.

LDAF utilizes a ranking criterion to prioritize farms adjacent to the bayou for BMP implementation.

BMPs	Practice Code	Total Needed
Conservation Crop Rotation	328	4,540 ac
Prescribed Grazing	528	800 ac
Nutrient Management	590	2,000 ac
Wetland Wildlife Habitat	644	3,000 ac
Drainage Water Management	554	3,000 ac
Residue Management, Ridge-Till	346	200 ac
Grassed Waterway	412	7,500 cy
Cover Crop	340	100 ac
Filter Strip	393	
Fence	382	4,000 ft
Pipeline	516	5,200 ft
Heavy Use Area Protection	561	0.75 ac
Watering Facilities	614	30 no
Grade Stabilization Structures	410	175 no
Pest Management	595	1,000 ac
Irrigation Water Conveyance Pipeline	430	20,000 ft
Irrigation Water Management	449	2,000 ac
Irrigation Land Leveling	464	800 ac
Water & Sediment Control Basin	638	100,000 cy
Structure for Water Control	587	2 no
Pumping Plant	533	4 no
Precision Land Farming	462	200 ac

Table 4 – USDA Proposed BMPs for Grand Marais

Watershed	Landuse	Acres	NRI Factor (tons/acre/year)	Sediment Delivery Ratio	Load (tons/year)	60% Reduction (tons/year)
Bayou Grand Marais (080802020103)	Cropland	21350	3.2	0.12	8198.4	3279.36
	Forest	3279	0.6	0.12	236.088	94.4352
	Pasture	12147	0.2	0.12	291.528	116.6112
	Total (Sq. Mile)	57.4625		0.12	8726.016	3490.4064
Lyons Point Gully (080802020104)	Cropland	19226	3.2	0.12	7382.784	2953.1136
	Forest	5779	0.6	0.12	416.088	166.4352
	Pasture	10783	0.2	0.12	258.792	103.5168
	Total (Sq. Mile)	55.91875		0.12	8057.664	3223.0656
Lazy Point Canal (080802020105)	Cropland	21352	3.2	0.12	8199.168	3279.6672
	Forest	7608	0.6	0.12	547.776	219.1104
	Pasture	7775	0.2	0.12	186.6	74.64
	Total (Sq. Mile)	57.3984375		0.12	8933.544	3573.4176

Table 5 – Load Reduction Estimates for Bayou Grand Marais, Lyons Point Gully and Lazy Point Canal

D. An estimate of technical and financial assistance, and/or associated costs and authorities necessary to implement the WIP

USDA/NRCS will offer landowners financial, technical and educational assistance to implement conservation practices on privately owned land to reduce soil erosion, improve water quality, and enhance crop land, forest land, wetlands, grazing lands and wildlife habitat.

LDAF/Office of Soil an dWater Conservation (OSWC) will provide technical assistance to program participants with the OSWC field staff and local Soil and Water Conservation District technicians.

The Vermilion SWCD and the Louisiana Cooperative Extension Service will promote, through producer meetings, wider adoption of precision agriculture, field borders, and alternative methods to handling sugarcane crop residue.

The Environmental Quality Incentives Program (EQIP) was established in the 1996 Farm Bill to provide a voluntary conservation program for farmers and ranchers who face serious threats to soil, water, and related natural resources. Nationally, it provides educational assistance primarily in designated priority areas. About half of the program is targeted towards livestock related natural resource concerns and the remainder goes to other significant conservation concerns.

EQIP offers 5 to 10-year contracts that provide incentive payments and cost-sharing for conservation practices called for in the site-specific conservation plan. All EQIP activities must be carried out according to a conservation plan that is site specific for each farm or ranch. Producers can develop these plans with help from the NRCS or other service providers.

Cost-sharing may pay up to 75 percent of the costs of certain conservation practices such as grassed waterways, filter strips, manure management facilities, capping abandoned wells, and other practices important to improving and maintaining the health of natural resources in the area. Incentive payments may be made to encourage a producer to perform land management practices such as nutrient management, manure management, integrated pest management, irrigation water management, and wildlife habitat management.

Technical assistance will be provided to landowners and operators in the implementation of BMP plans. Follow-up assistance for the duration of the projects will come on an as needed basis. Federal cost-share assistance will be provided to farmers that implement BMPs on their individual farms. The landowner or operator will provide matching funds for federal funds that are provided for implementing project BMPs.

For the two (2) 12-digit HUCs associated with the LDAF project (Lyons Point Gully and Lazy Point Canal), an estimated total cost of the proposed project will be $2,326,667. Of this total, $1,326,667 will be Federal dollars.

USDA GoMI dollars will be applied to the Grand Marias 12-digit HUC. The requested Federal assistance needed for this project will be $1,175,000.

E. An educational-outreach component

Stakeholder participation is a necessary component of any successful WIP, and watershed stakeholders will be encouraged to get involved in the effort to reduce NPS pollutant loads in the watershed. Field days are scheduled through LDAF's Section 319 FFY 2012 Work Plan.

Educational outreach will also include educational materials such as flyers and brochures. An educational program will be conducted to increase awareness of NPS pollution problems and issues associated with agricultural activities within Bayou Queue de Tortue watershed.

A BMP field day will be held within the watershed to discuss the TMDL process and to demonstrate the potential for reducing NPS loads from agricultural activities through implementation of BMPs. LDAF, NRCS and SWCD staff will meet with potential program participants to discuss various BMPs to reduce the potential of agriculture related NPS pollutants. A special effort will be made to encourage landowners and operators to participate in environmental education events and to attend field days, and become Certified Master Farmers.

In addition to field days and educational flyers/materials, LDEQ will partner with USDA and LDAF to host one to two (2) meetings each year in the watershed to discuss progress made in BMP implementation and water quality data collection. A summary of water quality data will be presented at these meetings to allow landowners and producers an opportunity to see how their participation in the programs is effecting water quality in each of the respective 12-digt HUCs being monitored through the project.

F. A schedule for implementing BMPs

LDEQ included Bayou Queue de Tortue in the list of 40 NPS impaired priority water bodies to restore or partially restore by October 2016.

LDAF included a project to implement BMPs in two (2) 12-digit HUCs of Bayou Queue de Tortue between October 2012 and September 2017. LDAF will work directly with the

landowners or operators to prepare a Resource Management System (RMS) BMP plan that will meet the desired level of pollution abatement on each tract of cropland selected for project implementation. Each plan will be developed under a three-year agreement and tracked accordingly.
USDA included a GoMI project to implement BMPs in the Grand Marais 12-digit HUC of Bayou Queue de Tortue. The project will implement BMPs, with EQIP dollars, for a total of five consecutive years.

G. A DESCRIPTION OF INTERIM, MEASURABLE MILESTONES OR OTHER CONTROL ACTIONS BEING IMPLEMENTED

Annual progress made in implementing BMPs and activities associated with projects by LDAF and USDA will be utilized as interim indicators of success toward restoring water quality in the watershed.

The short-term goal of this implementation plan is to implement BMPs and related conservation practices in three (3) 12-digit HUCs of the Bayou Queue de Tortue watershed and monitor water quality to determine their effectiveness in reducing sediment, nutrients, pesticides and organic material entering the bayou on an annual basis. The ultimate goal of the WIP and NPS projects is to improve water quality, meet the state's water quality standards and/or restore beneficial uses in Bayou Queue de Tortue.

H. A SET OF CRITERIA TO DETERMINE WHETHER LOAD REDUCTIONS ARE BEING ACHIEVED OVER TIME AND WHETHER SUBSTANTIAL PROGRESS IS BEING MADE TOWARD MEETING WATER QUALITY STANDARDS

Criteria utilized to determine whether NPS loads are being achieved over time and progress is being made toward meeting water quality standards will include data from water quality monitoring measured against the state's water quality standards. Table 6 includes water quality standards and designated uses for Bayou Queue de Tortue.

Use Attainability and Designated uses of Bayou Queue de Tortue				
Waterbody	**NPS related parameters for which numerical standards have been developed**	**Standard (From LDEQ Environmental Regulatory Code)**	**Does waterbody meet standard? (From 2010 305(b) Report)**	**Constituents for which TMDLs will be developed (From 1998 Court Ordered 303(d) list) [3]**
Bayou Queue de Tortue	Primary Contact Recreation	[1]	Fully	Lead, Mercury, Phosphorus, Nitrogen, Organic Enrichment/Low D.O., Pathogen Indicators, Turbidity, Suspended Solids, Salinity/TDS/Chlorides/Sulfates, Oil and Grease, Ammonia, Siltation
	Secondary Contact Recreation	[2]	Fully	
	Dissolved Oxygen	5 mg/l- 3mg/l	Not	
	Total Dissolved Solids	500 mg/l	Not	
	Turbidity Total Suspended Solids	150 260	Not Not	

[1] Based on a minimum of not less than five samples taken over not more than a 30-day period. Fecal coliform count should be less than 200 /100ml over a 30-day period, and less than 10 % of samples during any 30-day period or 25 % of total samples collected annually can exceed 400/100ml. Applies only May 1 – Oct. 31, otherwise, criteria for secondary contact recreation applies.

[2] Based on a minimum of not less than five samples taken over not more than a 30-day period Fecal coliform count should be less than 1000 /100ml in at least 5 samples taken over a 30-day period, and less than 10 % of samples during any 30-day period or 25 % of total samples collected annually can exceed 400/100ml.

[3] It should be noted that TMDL listings were based on information dating back to 1992. A waterbody may meet standards for a particular constituent in the 2012 305(b) Report, but may require a TMDL due to failure to meet standards in a previous year. In addition, a waterbody may be listed due to its failure to meet certain narrative criteria.

Table 6 - Designated Uses and Numerical Criteria for Bayou Queue de Tortue

I. A Monitoring Component to Evaluate Effectiveness of Implementation Efforts

LDEQ's ambient water quality monitoring is one source of data to evaluate effectiveness of BMPs implemented in Bayou Queue de Tortue watershed. LDEQ applied for FFY 2012 Section 319 funds to monitor in five (5) 12-digit HUCs of Bayou Queue de Tortue, for three (3) years (October 2012-September 2015), including:

- Indian Bayou
- Prime Gully
- Bayou Grand Marias
- Lyons Point Gully
- Lazy Point Canal

The project will include field parameters and water chemistry on a bi-monthly (2X/month) basis for the duration of the project and all water quality data will be analyzed and compiled into a final report.

The short-term success for these projects will be measured through water quality monitoring conducted at the 12-digit HUC level in HUCs that have been chosen as high priorities for BMP implementation. Baseline water quality data collected prior to 2007/2008 will be compared to data from 2011/2012 through 2015 to determine if BMP implementation has been effective in reducing NPS pollutants and improving water quality.

The 12-digit HUCs where the monitoring will occur include:

- Indian Bayou (080802020101)
- Prime Gully (080802020102)
- Bayou Grand Marais (080802020103) - (NRCS funds will be focused here)
- Lyons Point Gully (080802020104) - (LDAF funds will be focused here)
- Lazy Point Canal (080802020105) - (LDAF funds will be focused here)

By conducting water quality sampling at the 12-digit HUC scale, LDEQ will be able to evaluate the water quality response to BMP implementation for these 12-digit HUCs. The figure on the following page illustrates potential locations where monitoring will occur throughout these 12-digit HUCs.

LDEQ's water quality sampling design for this project includes both short term and long term monitoring to evaluate effectiveness of BMPs implemented through the project. Short term monitoring consists of a rapid water quality assessment (RWQA) method at approximately 19 sites. The purpose of this monitoring is to identify where high priority areas are located within the watershed for BMP implementation. Short term monitoring is expected to continue for three (3) to four (4) months to help LDEQ prioritize where long term monitoring should continue. LDEQ anticipates that approximately seven (7) to ten (10) sites will be selected for long term monitoring that will continue throughout the duration of the project. Photographs of the19 RWQA sampling locations are included in Appendix A.

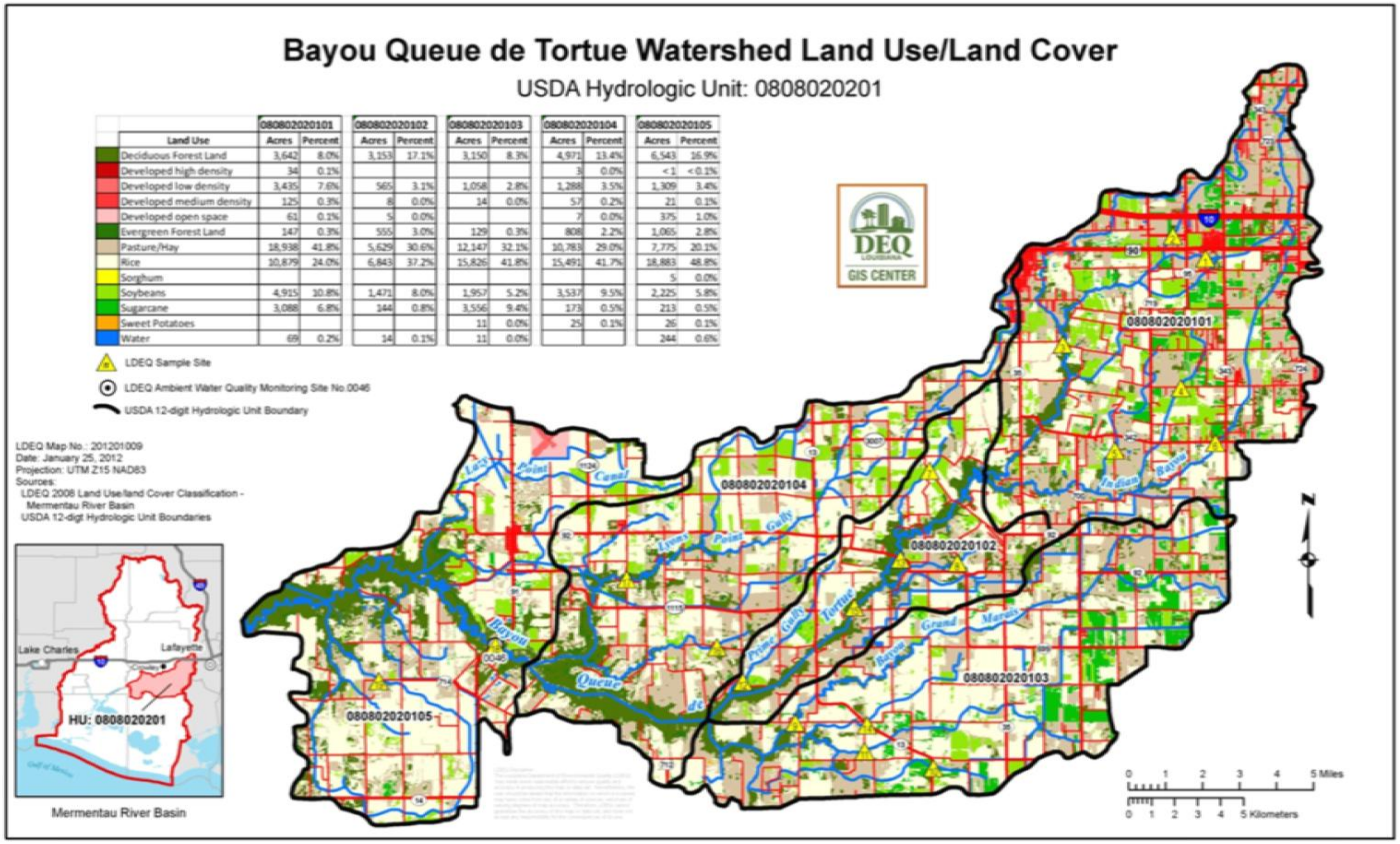


Figure 20 - Bayou Queue de Tortue Sampling Locations

MERMENTAU RIVER BASIN

The Mermentau River Basin was historically within the Mississippi and Red River drainage basins. However, today it is separated from these river systems and in the prairie region of southwestern Louisiana. Flood plains in Mermentau River Basin average only about five (5) feet above sea level, but range from one (1) to two (2) feet above mean sea level (msl) in the southern marshes to about 100 feet msl in the headwater area of Bayou Nezpique. Slopes average approximately two (2) feet per mile. The bayous of Mermentau River Basin flow through three (3) distinct physiographic regions, arranged in broad bands from north to south. The northern part of the basin is in flatwoods and an undulating landscape extends northward to Calcasieu and Red River Basins. To the south of the flatwoods region lies a broad prairie extending from Vermilion River and Bayou Teche in the east to Calcasieu Basin in the west. The prairie gives way to marshlands along the coast. The marsh is further subdivided into a freshwater marsh in the north which gradually becomes more saline as you approach the open Gulf.

In the late 1700's, predominant vegetation in the basin consisted of grasses. Forests were confined to marginal slopes of streams and the flood plains. The narrow upland forested riparian zones consisted of oak, gum, hickory, and pine trees, and lower riparian flood plains were forested in oak, tupelo gum, and cypress. This area is subject to backwater flooding along waterways as a result of low relief and flat contours of the land. As a result of this low relief, flows in the bayous of this region are very slow, and reaeration rates are low. These flat lands in Mermentau River Basin also make it ideal for rice cultivation, which is the predominant land use in the area. 92 percent of the land within Mermentau River Basin is utilized for agriculture, with rice being the predominant crop.

The geology of the region is primarily sediments accumulated in the modern Mississippi River Delta, the flanking Chenier Plain and in older Pleistocene Age fluvial and deltaic depositional systems. Sediment types range from sand to mud. Shell and organic debris including peat are lesser constituents.

DESCRIPTION OF LOUISIANA ECOREGIONS

Bayou Queue de Tortue is located within Western Gulf Coastal Plain Ecoregion (WGCPE) in Southwest Louisiana. The WGCPE is bounded to the north by the South Central Plains Ecoregion, to the south by the Intracoastal Waterway, to the west by the Sabine River, and to the east by Atchafalaya River. The ecoregion includes portions of Sabine, Calcasieu, Mermentau, and Vermilion Basins. Drainage basin boundaries and downstream estuarine waters isolate the four (4) major river systems within the ecoregion. The ecoregion lies above tidal areas, except under extreme drought conditions; therefore, tidal influences are generally excluded. Although there are several types of vegetation present in the northern area of the ecoregion, 60 – 70 percent of the WGCPE has historically been a seasonally wet prairie. The prairie was maintained as a mosaic of treeless plains and tree lined river corridors by the presence of an impermeable, calcareous clay layer that prevented downward percolation or upward capillary action of water into the shallow soils. Disjunction of this clay layer at stream margins allows trees to grow for a few hundred feet on either side of the bayou. This clay layer allows water to stand during wet seasons, supporting the dominant land use of the area, rice cultivation.

2 TRACKING PROGRESS OF WATERSHED IMPLEMENTATION

LDEQ's NPS staff will partner with LDAF and USDA through semi-annual meetings to discuss progress made in watershed implementation. These semi-annual meetings will include progress made on BMP implementation in Bayou Queue de Tortue watershed and will also include current status of water quality monitoring data collected at the 12-digit HUC scale. If water quality data indicates reductions in sediment and nutrient concentrations have occurred post BMP implementation, then LDEQ, LDAF, and USDA will continue its current approach of watershed implementation. However, if water quality data does not indicate improvements in in-stream water quality, then LDEQ, LDAF, and USDA will determine what type of corrective actions should be made to the watershed implementation approach. If water quality data indicates in-stream water quality standards have been met in Bayou Queue de Tortue, the waterbody will be delisted and a NPS success story will be developed and submitted to USEPA Region 6.

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APPENDIX A: SAMPLING SITES IN BAYOU QUEUE DE TORTUE

Site 1: S A Street at Queue de Tortue Upstream

Site 1:- S A Street at Queue de Tortue Downstream

Site 2: Hwy 1096 at Bayou Queue de Tortue Upstream

Site 2: Hwy 1096 at Bayou Queue de Tortue Downstream

Site 3: West Congress at Bayou Queue de Tortue Upstream

Site 3: West Congress at Bayou Queue de Tortue Downstream

Site 4: Ridge Road at Indian Bayou Tributary Upstream

Site 4: Ridge Road at Indian Bayou Tributary Downstream

Site 5: Hoffpauir at Unnamed Indian Bayou Tributary Upstream

Site 5: Hoffpauir at Unnamed Indian Bayou Tributary Downstream

Site 6: Hwy 342 at Indian Bayou Upstream

Site 6: Hwy 342 at Indian Bayou Downstream

Site 7: Ebenezer at Bayou Queue de Tortue Tributary Upstream

Site 7: Ebenezer at Bayou Queue de Tortue Tributary Downstream

Site 8: Unnamed Bayou Queue de Tortue Tributary Upstream

Site 8: Unnamed Bayou Queue de Tortue Tributary Downstream

Site 9: Bayou Grand Marais at Bluebonnet Rd. Upstream

Site 9: Bayou Grand Marais at Bluebonnet Rd. Downstream

Site 10: Castille Cully at Hwy 13 Upstream

Site 10: Castille Cully at Hwy 13 Downstream

Site 11: Coulee des Isles at Emery Upstream

Site 11: Coulee des Isles at Emery Downstream

Site 12: Prime Gully at Muskrat Road Upstream

Site 12: Prime Gully at Muskrat Road Downstream

Site 13: Bayou Queue de Tortue at Hwy 92 Upstream

Site 13: Bayou Queue de Tortue at Hwy 92 Downstream

Site 14: Unnamed Tributary to Coulee des Isles at Emery Upstream

Site 14: Unnamed Tributary to Coulee des Isles at Emery Downstream

Site 15: Bayou Queue de Tortue at Simon Road Upstream

Site 15: Bayou Queue de Tortue at Simon Road Downstream

Site 16: Simmons Gully at Henry Road Upstream

Site 16: Simmons Gully at Henry Road Downstream

Site 17: Lyons Point Gully at Roy Road Upstream

Site 17: Lyons Point Gully at Roy Road Downstream

Site 18: Bayou Queue de Tortue at Hwy 91 Upstream

Site 18: Bayou Queue de Tortue at Hwy 91 Downstream

Site 19: Unnamed Tributary at Hwy 714 Upstream

Site 19: Unnamed Tributary at Hwy 714 Downstream

Monitoring Location Photos taken on December 18, 2012 and December 19, 2012