Bayou Chene

2016

subsegment 050603

Watershed Implementation Plan

Water Quality Impairment, Dissolved Oxygen

DEQ
LOUISIANA

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1.0 Project Introduction

In Federal Fiscal Years (FFYs) 2010-2013, the United States Department of Agriculture (USDA) allocated approximately $80 million in federal funds to 12 states for the Mississippi River Basin Initiative (MRBI). Through the MRBI Healthy Watersheds, NRCS and partners work with producers and landowners to implement voluntary conservation practices that improve water quality, restore wetlands, enhance wildlife habitat and sustain agricultural profitability in the Mississippi River Basin. NRCS has identified the Mississippi River Basin as a top priority due to water quality concerns, primarily related to the effects of nutrient loading on the health of local waterbodies and, eventually, the Gulf of Mexico. In Louisiana, eleven 12-digit Hydrologic Unit Codes (HUCs) were chosen; Bayou Chene, subsegment 050603, was selected as an area of interest in which funds were used to implement best management practices (BMPs) in the subsegment. Water quality sampling, conducted by the Louisiana Department of Environmental Quality, (LDEQ) began in June of 2012 to gather baseline data; data collection under the MRBI project ended on June 14, 2015. In an effort to continue implementation and to gather long term water quality data, LDEQ water surveys group continued collecting data, and the Louisiana Department of Agriculture and Forestry (LDAF) continued to implement BMPs in the Bayou Chene subsegment.

Bayou Chene was originally listed by LDEQ on the Integrated Report (IR) as a result of an assessment that took place from June to December of 1998. This assessment cited the cause of the fish and wildlife propagation (FWP) impairment was organic enrichment/low dissolved oxygen (DO). Fish and wildlife propagation is the use of water for aquatic habitat, food, resting, reproduction, cover, and/or travel corridors for any indigenous wildlife and aquatic life species associated with the aquatic environment.

The IR is the current form of biennial reporting of the status of Louisiana waters. The IR is made up of what was once called the 305(b) Water Quality Inventory Report and the 303(d) List of Impaired Waterbodies. One of the primary focuses of the IR is the use of five categories and three subcategories to which waterbodies or waterbody/impairment combinations can be assigned. Categorization under IR guidance allows for a more focused approach to water quality management by clearly determining what actions are required to protect or improve individual waters of the state.

In 2002, a total maximum daily load (TMDL) for DO was developed for Bayou Chene, suggesting that a 58 percent reduction in loads may be warranted to achieve restoration of the FWP designated use. A TMDL is used to determine the pollutant loading that a waterbody 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 waterbody.

Eighteen years later, the Louisiana 2016 Draft IR continues to list Bayou Chene as impaired, for not meeting its designated use for FWP due to low dissolved oxygen concentrations from agriculture. The suspected cause of impairment is low DO concentrations stemming from agricultural practices (Table 1).

In an effort to reduce NPS pollutants, in Bayou Chene, LDEQ developed a watershed implementation plan (WIP) describing BMPs that should be implemented for water quality improvement. The objective of this WIP is to establish guidelines necessary to achieve water quality restoration for DO, using a watershed-based planning approach.

This document outlines the criterion that provides the assessment and management information for the geographically defined

watershed, including the analysis, actions, participants and resources related to the development and implementation of this WIP. This WIP will continually be revised as new data and information become available and used as a management record to document the progress made towards restoring the FWP designated use. Adaptive management strategies will be applied based on data analysis, if improvement is not shown. Data will be evaluated every quarter and the WIP updated annually, for the life of the project.

Subsegment Number	Subsegment Description	Type	Size	Designated Waterbody Uses			Impaired Use for Suspected Cause	Suspected Causes of Impairment	Suspected Source of Impairment
				PCR	SCR	FWP			
LA050603_00	Bayou Chene- From headwaters to Lacassine Bayou; includes Bayou Grand Marais	R	33	N	F	N	FWP	Oxygen, Dissolved	Agriculture

Table 1 2016 Draft Integrated Report for Bayou Chene, 050603

PCR= Primary Contact Recreation
SCR= Secondary Contact Recreation
FWP= Fish and Wildlife Propagation
N= Not Supporting Designated Use
F= Fully Supporting Designated Use
R= River
Size= Miles

2.0 Bayou Chene Description

Bayou Chene (subsegment 050603) is located in the Mermentau River basin in southern Louisiana (Figure 1). The watershed is approximately 134 mi^2 spatially with little relief. The bayou flows for 33-miles from the headwaters to Lacassine Bayou and includes Bayou Grand Marais. The lower end of Bayou Chene is affected by backwater from the Gulf of Mexico and occasionally experiences backflow.

The Bayou Chene watershed is comprised of three (3) 12-digit HUCs, 080802020201, 080802020203, and 080802020205. Average monthly precipitation in Bayou Chene varies from 3.19 to 7.36 inches per month, with the majority of the precipitation occurring in the summer (weather.com).

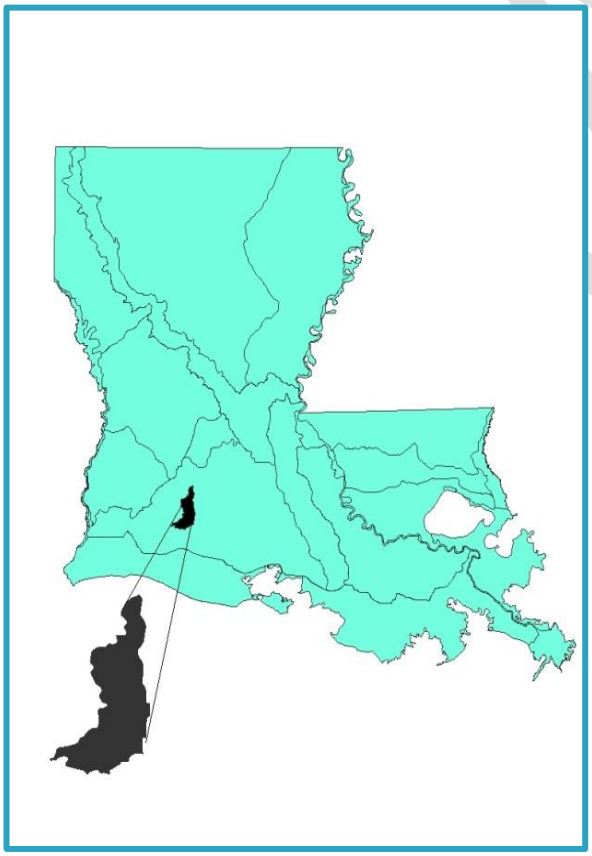


Figure 1 Location of Bayou Chene

The watershed is sparsely populated. The primary land use in Bayou Chene is agriculture, accounting for approximately 87 percent of the land use. The main agricultural uses in the watershed are fallow/idle cropland, rice, aquaculture, and soybeans. The remaining 13 percent of the land use/land cover is developed, shrubland, wetland, forest, and open water. Dominant land use data for the Bayou Chene subsegment is shown in Table 2. Any land use/land cover accounting for less than 1 percent has been omitted from the table. See Figure 2 for the land use map.

Land Use	Percent Land Use	Acres
Fallow/Idle Cropland	31.1	26673.6
Rice	29.8	25556.2
Aquaculture	12.1	10338.5
Soybeans	7.1	6075.6
Developed/Low Intensity	5.8	4945.6
Grass/Pasture	4.9	4197.9
Woody Wetlands	4.2	3614.4
Other Hay/Non Alfalfa	1.8	1548.8
Developed/Open Space	1.2	989.4

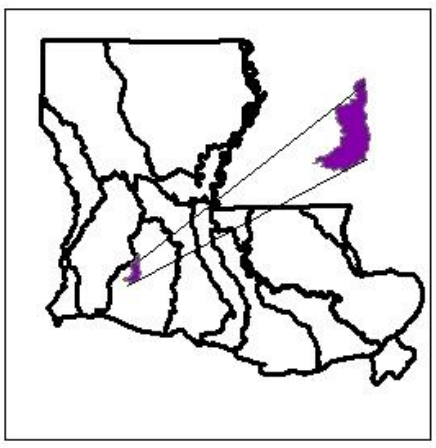
Table 2 Dominant Land Use/Land Cover in Bayou Chene

Bayou Chene
LDEQ Subsegment 050603
Land Use/Land Cover

LEGEND	LAND USE	PERCENT LAND USE	ACRES
	Fallow/Idle Cropland	31.1	26673.6
	Rice	29.8	25556.2
	Aquaculture	12.1	10338.5
	Soybeans	7.1	6075.6
	Developed/Low Intensity	5.8	4945.6
	Grass/Pasture	4.9	4197.9
	Woody Wetlands	4.2	3614.4
	Other Hay/Non Alfalfa	1.8	1548.8
	Developed/Open Space	1.2	989.4

Map date:07/21/2016
Map number: 201606112
Map sources: 2014 USDA NASS Cropland Data Layer;
2015 USGS National Hydrography Dataset;
2013 LDEQ Subsegments;
2012 USDA Waterhsed Boundary Dataset

0 1 2 4 Miles



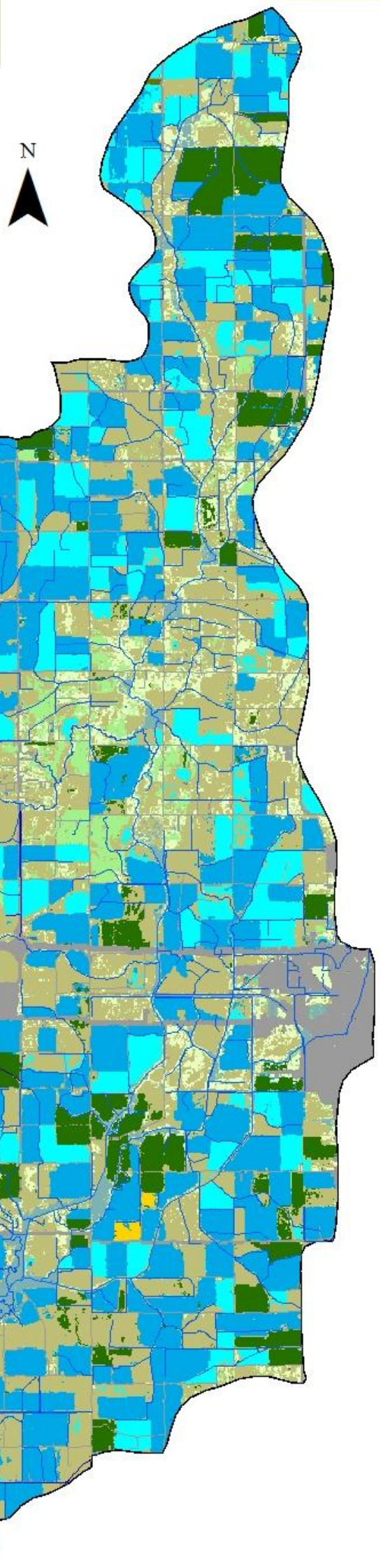


Figure 2 Land Use/Land Cover in Bayou Chene, subsegment 050603

3.0 Land Use in the Bayou Chene Subsegment

Overall, agriculture accounts for nearly 87 percent of land use for the entire subsegment. Fallow/idle cropland and rice are the dominate land uses in the subsegment, accounting for approximately 63 percent of the land use (Figure 2).

3.1 Source of Impairment

3.1.1 Agriculture

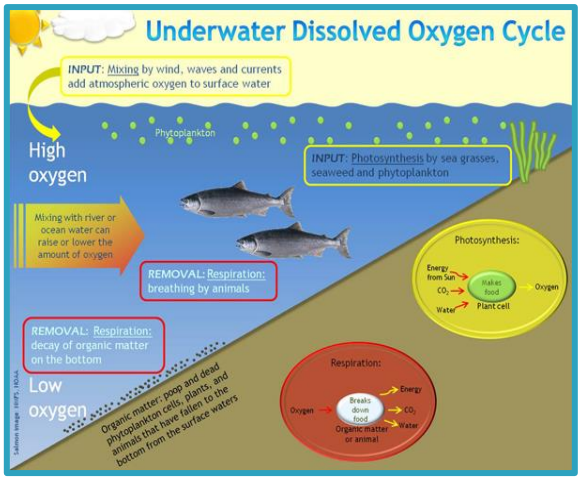
Agriculture is the predominant land use in the Bayou Chene watershed and is one of the state's largest industries. Pollutants often associated with traditional rice agricultural production include sediment, pesticides, nutrients, and oxygen demanding organic matter.

3.2 Cause and Potential Sources of Impairment

The state's 2016 Draft IR identified DO as the suspected cause of impairment in Bayou Chene. The suspected sources of impairment in Bayou Chene are agriculture, natural sources, drought-related impacts, runoff from pasture, and residential areas. Runoff from agricultural land can carry excess nutrients, such as nitrogen and phosphorus into streams, lakes, and ground-water supplies. These excess nutrients have the potential to degrade water quality.

3.2.1 Causes of Low DO

Low DO primarily results from excessive nutrient deposition. As excessive nutrients, not assimilated by vegetation in the field(s) enter the waters of Bayou Chene there is an increase in aquatic plant growth, primarily phytoplankton. As the vegetation dies and decomposes, the microbial population increases its oxygen consumption. The microbial community works in the water column all day and night, but photosynthesis only occurs during daylight; therefore oxygen is depleted faster than it can be replaced, resulting in low DO (Figure 3).



http://www.globalspec.com

Figure 3 Underwater Dissolved Oxygen Cycle

In general, the amount of DO in the water can be affected by the types of biota in the water, temperature, movement and flow of the waterbody and the amount of organic material in the water. Louisiana's DO standard is 5.0 mg/L (year round) for Bayou Chene.

4.0 Monitoring Bayou Chene

The local linkages between land use and water quality have cumulative effects within a watershed and their local receiving basins. The effects of these linkages vary as the cultural and ecological landscapes vary with population, land use changes and climatic events (Rabalais and Turner, 2003).

Statewide DO values represent the minimum criterion designed to protect indigenous wildlife and aquatic life species associated with the aquatic environment. For Bayou Chene the state's DO standard is 5.0 mg/L (year round).

Louisiana's ambient water quality monitoring and assessment program follows a four-year rotating subsegment approach through which approximately one fourth of the state's subsegments are monitored during each one-year period of the rotation. LDEQ has one (1) ambient water quality network site (WQN), located at the Highway 99 Bridge station in Bayou Chene where water quality data has been collected since 1998. LDEQ sampled the Bayou Chene subsegment in 1998, 2003, 2007, and 2010/2011. Analyzing historical water quality data is one of the first steps to understanding water quality in a watershed. Bayou Chene generally has low concentrations of DO, documented as far back as 1998. To put Bayou Chene's impairments in historical perspective, see Figure 4 for Bayou Chene's exceedance rates for 1998, 2003, 2007, and 2010/2011.

Water quality monitoring data collected by LDEQ in 1998 indicated the concentration of DO was less than the water quality standard of 5.0 mg/L (year round), which the FWP designated use is based on. Consequently, the samples collected did not adhere to the established exceedance rate, in which no more than 10 percent of the samples collected on a monthly or near monthly basis may exceed this criterion per sampling year, thus resulting in Bayou Chene being listed as impaired. Data collected from additional sampling years, indicated DO concentrations fluctuated from 1998 to 2011.

Exceedance rates are used to determine if a watershed is impaired. For Bayou Chene, the watershed has historically been listed as impaired due to the sampling year exceeding the state's criterion of 5.0 mg/L more than 10 percent of a given sampling year for DO. This means that more than 10 percent of all samples collected during a sampling year were less than the state's criterion of 5 mg/L.

BMP implementation began in 2005. Post BMP water quality monitoring has shown a continual decrease in exceedance rates (number of samples below standard for a sample year), with the exceedance rate being 86 percent in 1998, 83 percent in 2003, 80 percent in 2007, and 75 percent in 2010/2011 (Figure 4).

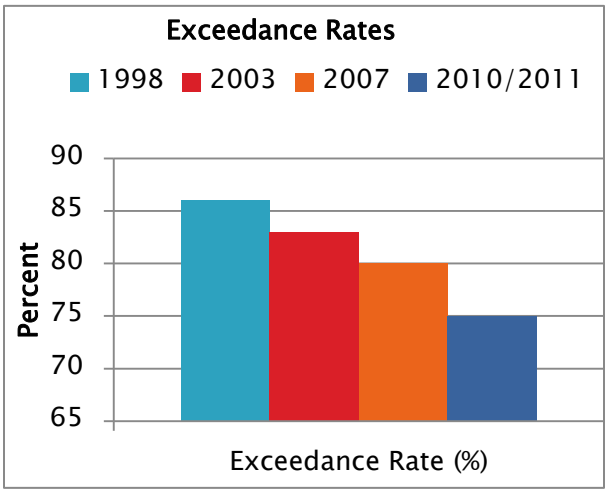


Figure 4 Annual Exceedance Rates at LDEQ's Bayou Chene's WQN Site 0658.

Due to LDEQ's cyclic ambient data collection, water quality data had not been collected on the bayou since 2011; therefore, LDEQ and ULL entered into a cooperative agreement, utilizing section 319

funds to collect water quality data in two (2) HUCS in Bayou Chene to document water quality changes following BMP implementation completed through funding from incremental Section 319 funds provided to LDAF for BMP implementation in this watershed.

LDEQ NPS FFY 2012 Section 319 funds provided support for in-stream water quality monitoring to document water quality changes from implementation of BMPs funded by LDAF incremental section 319 funds. From June 2012 to June 14, 2015, the LDEQ NPS section partnered with the University of Louisiana Lafayette to conduct weekly monitoring (Figure 5) of surface water quality at ten (10) sites in Bayou Chene under the "MRBI Watershed Water Quality Monitoring in Bayou Chene and Lacassine Bayou Project". The goal was to document water quality changes following BMP implementation completed through funding from the USDA Natural Resources Conservation Service (NRCS) to reduce nutrient loading into the Bayou Chene and Lacassine Bayou watersheds. The specific objective of this project was to collect data on field parameters and water chemistry and to collect biological data twice a year (during summer and fall of 2012 and 2013) and to analyze it for species diversity and abundance. Biological sampling collection included fish and macroinvertebrates. The LDEQ surveys team collected the flow data for select monitoring locations in Bayou Chene. Bayou Chene is impacted due to organic enrichment/low dissolved oxygen and high suspended solids; therefore, parameters monitored included temperature, DO, specific conductance, turbidity, pH, nitrate-nitrite, total phosphates, biological oxygen demand, total solids, total suspended solids, and total dissolved solids.

Figure 5 Water Quality Monitoring in Bayou Chene

Analysis of monthly median values for sites 1 thru 4 showed peak values for turbidity (611.1 NTU) and TSS (151 mg) in March and peak values for TDS (612 mg), TSS (773 mg), TP (0.63 mg), TKN (2.94 mg), and BOD_5 (5.79 mg) in April. These results indicate that the impairment of surface water quality in this watershed is correlated with agricultural activities that begin in March.

During the Bayou Chene MRBI sampling period, implementation was concentrated in one (1) of the three (3) 12-digit HUCs, 080802020205. There were two (2) practices implemented in 2012, nineteen in 2014, and twenty-one in 2015. It is unknown if the BMPs were implemented on one continuous area (larger area of the watershed), or if multiple BMPs were implemented on numerous farms (smaller areas of the watershed). Various BMPs implemented in the watershed included residue management, grade stabilization structures, irrigation water conveyance, irrigation water management, irrigation land leveling, nutrient management, integrated pest management, and shallow water area management.

The Bayou Chene MRBI project ended June 14, 2015, and it was determined that due to the BMPs implemented through NRCS-

USDA, there have been small improvements in turbidity, TSS, TDS, TS, NO_3-N, NO_2-N, FL, SO_4, SRP, and TP; however, Bayou Chene did not maintain the state's DO standard of 5 mg/L year round from 2012-2015. Bayou Chene remains listed as not supporting its designated use of fish and wildlife propagation, with the suspected cause of impairment being dissolved oxygen due to agriculture, according to LDEQ's 2016 IR. The exceedance rates for DO for site 1C/WQN 0658 for 2012, 2013, 2014, and 2015, respectively are 96 percent, 74 percent, 84 percent, and 50 percent, can be found in Figure 6.

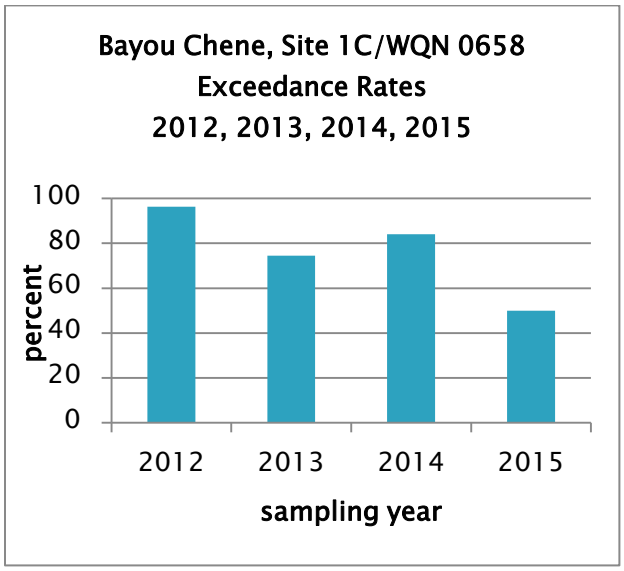


Figure 6 Bayou Chene, Project Site 1C/WQN 0658 Exceedance Rates for 2012, 2013, 2014, and 2015

LDEQ ambient water quality monitoring resumed in October 2014 and continued through September 2015. During that sampling period, twelve samples were taken, and of those, nine (9) did not meet the D.O. standard of 5.0 mg/L, which is equivalent to an exceedance rate of 75 percent. Exceedance rates for the ambient water quality monitoring and the Bayou Chene project monitoring may differ by year due to water quality sampling being conducted once a month for ambient sampling and once a week for project sampling.

Once the MRBI project came to a close, ULL personnel agreed to continue partnering with LDEQ-NPS to continue to collect weekly water quality data and to conduct analysis in Bayou Chene in an effort to pinpoint additional critical areas where BMPS could be implemented in Bayou Chene. Water quality analysis results made it evident that additional BMP implementation was needed. In consulting with LDAF, it was decided that in addition to the BMPs currently being implemented in HUC 080802020205, BMPs would also need to be implemented in 080802020203 and 080802020201, under the FFYs 2015 and 2016 grants, in hopes of furthering efforts for improving water quality in the bayou.

LDEQ staff was able to strategically begin the new project on June 15, 2015, so that there was no break in water quality sampling. The project is titled "Water Quality Sampling in Bayou Chene", and is currently being supported by 319 nonpoint source funds. Water quality data is currently being collected in two (2) of the three (3) twelve digit HUCs in Bayou Chene (080808020205 and 080808020203) where LDAF will be implementing BMPs. Water quality data collection will continue through September 2017. In the future, LDEQ will begin to collect data in the upper HUC (08080802020201), once BMP implementation commences. Flow data continues to be collected at LDEQ's WQN site 0658, with the help of LDEQ surveys group. The purpose of the water quality monitoring is to evaluate the changes in water quality, before, during, and after watershed implementation to reduce nutrient loading into the Bayou Chene subsegment. LDEQ is currently in the development of the 2018 Nutrient Management Plan (NMP). Data gathered during the Bayou Chene Project will be utilized in the development process. Results

from the NRCS-USDA BMP implementation and LDEQ/LDAF monitoring projects shared with all stakeholders implementing the WIP in Bayou Chene. The goals of this project include:

- To continue to document water quality changes following BMP implementation originally started through funding from the USDA NRCS under the MRBI and incremental Section 319 funds provided to LDAF for BMP implementation in this watershed to reduce nutrient loads in the Bayou Chene watershed in south Louisiana.
- If monitoring data supports that BMPs have been effective in reducing the targeted parameters, Bayou Chene may be delisted for DO.
- A success story may be prepared, based on water quality improvements and/or delisting of the waterbody for DO.
- The data collected during this project will be used to determine if BMPs have been effective in reducing targeted parameters for Bayou Chene. Results will be incorporated in Louisiana's Nutrient Reduction Strategy and with USDA and stakeholders implementing the WIP in Bayou Chene in Mermentau Basin.
- This data will be used to determine critical areas of high levels of NO_2/NO_3, TKN, TP, TS, TSS, TDS, BOD_5, Turbidity, Sulfate, Chloride, Phosphate, Fluoride, and low DO concentrations.
- This data will be used for water quality assessment.
- LDAF's long-term success will be measured by improved water quality that meets states standards in the watersheds and corresponding river basins. The short-term success will be measured by continuous application of existing and future BMPs and related conservation practices that reduce the amount of, organic material, sediments and other agricultural contaminants entering the water bodies on an annual basis.

Criteria for the designated uses will be used to determine whether NPS loads are being reduced and progress is being made towards meeting water quality standards for Bayou Chene. This will be determined by the WQN site.

Future recommendations for implementation in the Bayou Chene watershed include:

1) Continue implementation of BMPs and monitoring of surface water quality in Bayou Chene, focusing on high priority areas selected;
2) Integrate efforts currently being implemented by project partners;
3) Increase implementation within the critical areas in the watershed;
4) Help producers voluntarily implement conservation practices that avoid, control, and trap nutrient runoff;
5) Improve aquatic, riparian, and wildlife habitat;
6) Maintain agricultural productivity and the local economy by providing financial incentives; and
7) Develop a more aggressive outreach component for Bayou Chene, reaching all stakeholders in the watershed.

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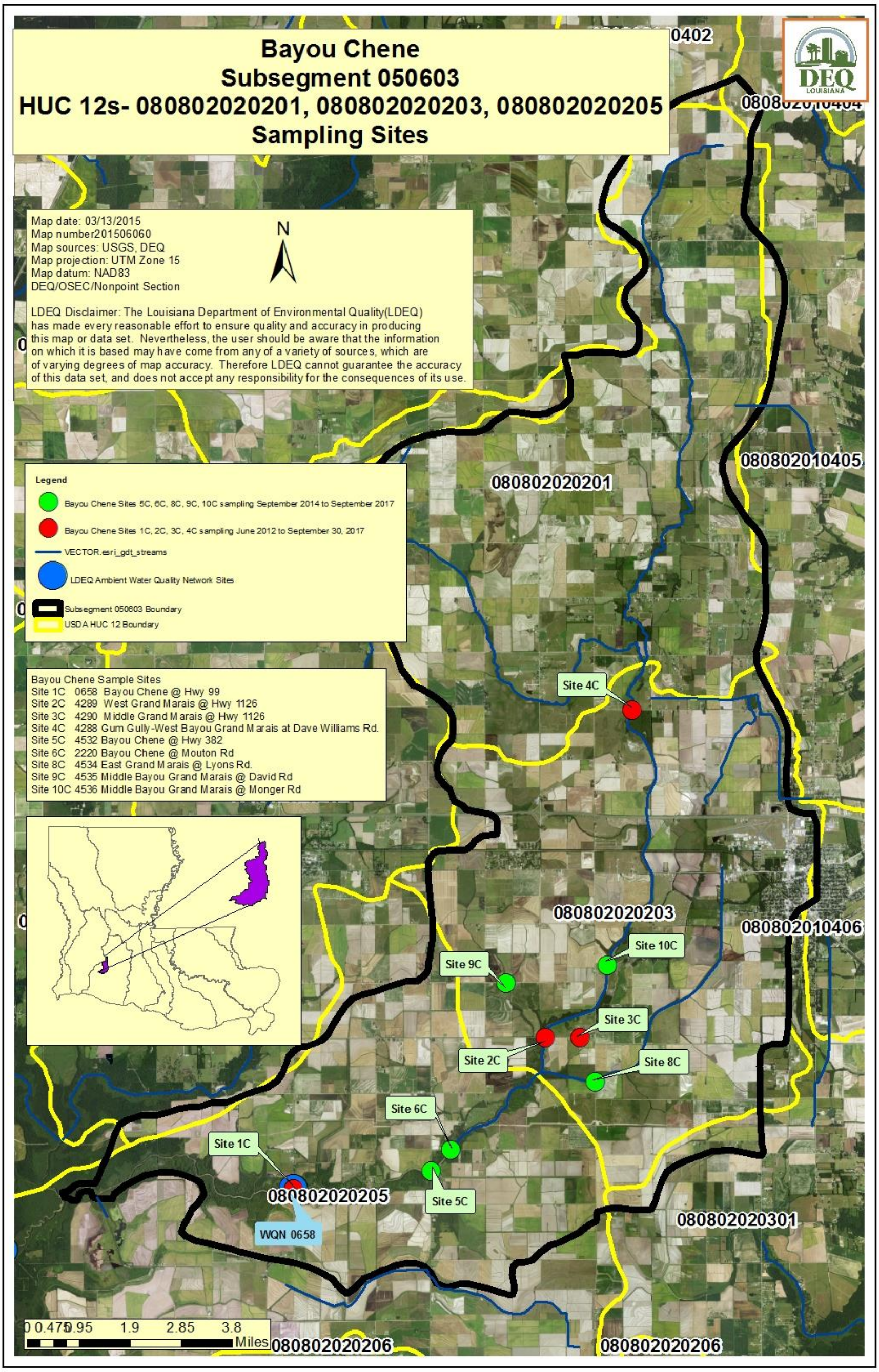

Figure 7 Bayou Chene Sampling Sites Map

5.0 Identifying High Priority Areas in The subsegment

High priority areas for BMP implementation are based on land use/land cover data, correlated with output from the Soil and Water Assessment Tool (SWAT) model (Figure 8) performed by LDEQ's NPS section. The critical areas were provided to LDAF, which were used to develop ranking criteria for choosing applications for BMP implementation. Areas in red have highest sediment yield, representing the most critical areas in the watershed, followed by sub basins highlighted in yellow, followed by those in blue. BMPs will be focused on reducing turbidity, TDS, nitrate/nitrite, TP, and increasing DO concentrations, in the bayou. This will allow LDEQ and LDAF to monitor changes in water quality as a result of watershed implementation. LDAF will place BMPs in the critical areas, and implementation will take place in two (2) of the three (3) HUCs, 080802020203 and 080802020205 at this time. The two (2) HUCs of focus were selected based on projected participation in cost share funding, in addition to output from the SWAT model. ULL staff will only conduct sampling in the two lower HUCs at this time. BMPs will be placed in HUC 080802020201 at a later date, and will be funded under LDAF's FFY 2015 work plan. LDEQ NPS section will coordinate with LDAF and LDEQ water surveys section/ULL staff to select sampling points to gauge changes in water quality during watershed implementation in the third HUC.

Bayou Chene

SWAT Model Output

Estimated Sediment Yield

Average (tons/acre/year)

- Low 0.03 - 0.87
- Med 0.87 - 1.30
- High 1.30 - 3.59
- HUC 12

SWAT Model runs are based upon available data from 1985 to 2009. All values are estimates of predicted loadings.

No TMDL data are available for this watershed.

N

0 0.5 1 2 Miles

Date: 2/9/15
Number: 201506027
Projection: UTM Zone 15, NAD 83
Map Sources: 2013 USDA NAIP Imagery; 2013 Tom-Tom Streets and Highways; 1:100K NHD Streams; 2014 LDEQ SWAT model watersheds and estimated sediment loads

SWAT Model Inputs: 2013 USDA CDL Landuse Data; 2007 USGS LIDAR DEM; 2012 USDA SSURGO Soils Data; 2014 USGS NHD Streams

Figure 8 Bayou Chene SWAT Model Output

6.0 Partnerships and Watershed Coordination

Partnerships are vital to effective watershed planning and management. Several entities worked together to coordinate water quality monitoring, critical area selection, BMP implementation, and education and outreach.

University of Louisiana at Lafayette

LDEQ established a working relationship with a professor at ULL, based on his expertise and experience in NPS pollution water quality monitoring, modeling, biological sampling and analyses. Additionally, ULL has laboratories, trucks, laboratory equipment, and staff who are capable of operating the equipment to support the monitoring.

Additional support is provided by National Aeronautics and Space Administration's (NASA) Regional Application Center at ULL, which aids in GIS analysis and mapping. ULL has a great working relationship with NRCS, Farm Service Agency (FSA), Resource Conservation District's (RC&D), Soil and Water Conservation Districts, and other governmental and non-governmental agencies and stakeholders in the region, which is important for successful completion of the project.

ULL's reputation for project fund management is proven as ULL has successfully completed the Section 319 Vermilion-Teche River Basin water quality monitoring project, Bayou Plaquemine Brule NPS pollution water quality monitoring and modeling project, and has finalized the Coulee Baton Microwatershed water quality monitoring and modeling project. In addition, ULL has successfully completed the section 319 Water Quality Monitoring Project at the Model Sustainable Agriculture Complex at Cade, the MRBI WQM project, and is currently conducting the sampling for the project "Water Quality Monitoring in Bayou Chene".

ULL also initiated the Louisiana Surface Water Quality Conference and successfully hosted two (2) water quality conferences. In addition to project reports, the faculty at ULL has published water quality monitoring results in peer-reviewed journals.

Louisiana Department of Agriculture & Forestry-Office of Soil and Water Conservation:

LDAF/OSWC will be the lead agency for BMP implementation in Bayou Chene. They will provide project management on a day-to-day basis, assist in developing conservation plans and implementing BMPs, and provide reimbursement to project participants for incentive and cost-share payments. LDAF/OSWC will track the rate and extent of BMP implementation within each project watershed.

Louisiana Department of Environmental Quality:

LDEQ staff will work closely with LDAF/ OSWC to identify high priority HUCs in the project area, project resource management problems, assess the project plan and implementation schedules, and coordinate state 319 program components with LDAF program efforts. LDEQ watershed surveys section will conduct flow measurements on Bayou Chene. LDEQ NPS staff will run the SWAT model when necessary.

Natural Resources Conservation Service: The NRCS staff will assist the LDAF and LDEQ in collecting field information, including identifying cropland in the selected watershed or sub-watersheds. The NRCS will assist the LDAF and the local SWCDs in developing project-ranking criteria. NRCS staff will assist LDAF and local SWCDs with outreach and education

activities to ensure landowners and operators are aware of program opportunities. The NRCS staff will work closely with the LDAF to ensure that resource management system (RMS) level conservation plans developed for this project meet NRCS planning standards. The field and area staff will assist in providing technical assistance for BMP plan designs, implementation, and certification. The NRCS staff will assist LDAF and the local SWCDs in collecting data and assembling semi-annual and annual reports for this project.

This locally based watershed partnership provides an avenue to communicate, share resources, partner on common goals, assist in bringing funding to the area for special projects, BMP cost-share programs, and educational outreach programs. This partnership allows for the identification of priority areas in the watershed, for the implementation of BMPs, and identification of changes in water quality as a result of watershed implementation.

Implementing BMPs and conservation measures that reduce NPS pollution in Bayou Chene relies on cooperation of watershed stakeholders and local governments. Involvement by watershed stakeholders is necessary to support watershed protection programs.

The following stakeholder meetings were held:

1. April 27, 2012 WA Callegari for Laboratory analyses – Javed Iqbal (WA Callegari), Durga Poudel (ULL) and Brian Kibbe (ULL).
2. May 4, 2012, Hamilton Hall, ULL. Scott Edwards (NRCS), Gwen Berthelot (LDEQ), Jan Boydstun (LDEQ), Durga Poudel (ULL), and Brian Kibbe (ULL). Project design.
3. July 11, 2012 – Eric Garner (LDEQ), Guy Lafleur (LDEQ), Bryan Masters (LDEQ), David Greenwood (LDEQ), Rhyshima Parms-Green (LDEQ), Gwen Berthelot (LDEQ), and Jan Boydstun (LDEQ).
4. Louisiana Nutrient Management Strategy Stakeholder Engagement Meeting, LSU – March 21, 2013.
5. Jefferson Davis Soil & Water Conservation District Locally-Led Meeting and Conservation Needs Assessment.

7.0 Mitigation Measures

7.1 Load Reduction

Section 303(d) of the Clean Water Act (CWA) requires states to identify watersheds not meeting water quality standards and develop a TMDL to allocate point and NPS pollutant loads to the waterbody.

In 2002, a TMDL was developed addressing DO for Bayou Chene. The TMDL's conclusions are summarized in Table 3, constituent load reduction estimates may not be precise; however, load reductions estimates are accurate for guiding the water quality improvements sought. Bayou Chene will be delisted upon achieving the state's standard of 5.0 mg/L (year round) for DO and having less than a 10 percent exceedance rate per sampling year.

Constituent	Standard	Average Reduction
Dissolved Oxygen	5.0 mg/L	58%

Table 3 Summary of TMDL Findings

NOTE: There were discrepancies within the model, due to limited data availability at the time of its completion. Despite the numerical load reductions not being precise for this watershed, the general conclusions of the model are consistent with reconnaissance data.

A water quality model (LA-QUAL) was set up to simulate DO, CBOD, ammonia, nitrogen, and organic nitrogen. The model was calibrated using data from FTN's synoptic survey in September 2000, LDEQ assessment data collected during June – December 1998, and other various information obtained from LDEQ and United States Geological Survey (USGS). There were no intensive survey data available for this subsegment. The projection simulation was run at critical flows and temperatures to address seasonality as required by the CWA.

Reductions of existing NPS loads were required for the projection simulation to show the current DO standard of 5 mg/L being maintained. The TMDL for this subsegment includes waste load allocations for the point sources with minor oxygen demanding discharges within the subsegment.

The TMDL for Bayou Chene concluded that NPS would need to be reduced by 58 percent to maintain the state's DO water quality standard of 5.0 mg/L. However, NPS reductions for individual reaches in the model were as high as 70 percent.

The TMDL was calculated during critical conditions, which explains why the load reduction is high. However, the TMDL does indicate that there is a seasonal peak of nonpoint source loading in the bayous each spring from rice fields. Nonpoint source pollution was estimated to be 65 percent of the total pollutant load during the summer and 75 percent of the total during the winter months. The key to reducing the critical NPS runoff in the watershed is to eliminate the spring discharge of muddy water from the rice fields. The application of BMPs will allow farmers to circumvent the muddy discharges that occur during planting season. Instead of mudding in, the rice farmers can utilize precision leveling techniques, and instead of aerial seeding into flooded fields, farmers can drill rice seed into a dry seedbed or direct seed. Regarding soybean rotation practices, simply eliminating the fall tillage operations and leaving the crop residue on the field, a significant amount of soil is retained on the fields over the winter months when the area experiences heavy and frequent rain events. Evaluation of these rice production practices has indicated that sediments and nutrients could be reduced by 50-75 percent from the traditional mudding-in practice. These are the types of steps that need to be taken by the rice farmers in the Bayou Chene watershed to reduce the nonpoint source loads entering the bayous.

Implementing additional best management practices addressing agriculture issues should bring the watershed into compliance with the TMDLs for DO.

The Bayou Chene WIP was used by LDAF as a guidance document for all watershed BMP implementation efforts. The Jefferson Davis SWCD annually conducts its public locally-led meeting to determine the natural resource concerns for their watersheds. The top natural resource priorities in the Bayou Chene watershed are: improving water quality, enhancing wildlife habitat, and reducing soil erosion. EPA Section 319 incremental funds will address a large proportion of these conservation needs. LDAF's project will:

1. Integrate efforts presently being implemented by project partners,
2. Increase the level of conservation practice implementation within the critical watershed areas, and

3. Help producers voluntarily implement conservation practices that avoid, control, and trap nutrient runoff, 4) improve wildlife habitat, 5) maintain agricultural productivity and the local economy by providing financial incentives.

TMDLs and LDEQ comments can be viewed at: http://iaspub.epa.gov/tmdl_waters10/attains_impaired_waters.tmdls?p_state=LA.

7.2 Best Management Practices (BMPs)

BMPs for agriculture are defined as "practices utilized by agricultural producers to control generation and delivery of pollutants from agricultural activities to waters of the state, thereby reducing the amount of agricultural pollutants entering surface and ground waters" (LSU Ag Center, 2000). The intent of BMPs is to provide producers with practices they can implement to reduce agricultural impacts to the environment. When properly implemented, these practices can help improve water quality without placing unreasonable burdens on the agricultural industry of Louisiana (LSU Ag Center, 2000). BMPs are one of the most important tools for controlling NPS runoff.

LDAF's semi-annual reports in USEPA grants reporting tracking system (GRTs) and LDEQ's NPS Annual Report will highlight the acreage and type of BMPs implemented and water quality improvements achieved as a result of BMP implementation.

The following practices, in Table 4, have been identified for use within the project areas to address the resource management concerns. All practices will be implemented by the project participants as identified in the RMS/BMP plans and will provide for part of the project matching costs.

NRCS Practice Code	BMP
328	Conservation Crop Rotation
329	Residue and Tillage Management – No Till/Strip Till/ Direct Seed
382	Fencing
410	Grade Stabilization Structure
561	Heavy Use Area Protection
464	Irrigation Land Leveling
449	Irrigation Water Management
590	Nutrient Management
342	Critical Area Planting
595	Pest Management
516	Pipeline
528	Prescribed Grazing
748	Record Keeping
344	Residue Management, Seasonal
646	Shallow Water Area for Wildlife
614	Watering Facility

Table 4 BMPs to Be Implemented in the Bayou Chene Subsegment

The following section describes each BMP in detail:

7.2.1 Conservation Crop Rotation (NRCS Code 328)

Conservation crop rotation refers to growing crops in a recurring sequence on the same field. As part of a conservation management system, this practice may be applied to support one or more of the following:

- Reduce sheet and rill erosion
- Reduce soil erosion from wind
- Maintain or improve soil organic matter content
- Manage the balance of plant nutrients
- Improve water use efficiency
- Manage saline seeps
- Manage plant pests

- Provide food for domestic wildlife

A conservation crop rotation may include crops planted for cover or nutrient enhancement. These crops should be adapted to the climatic region, the soil resource and the goals of the producer. Additionally, the crops selected should produce sufficient quantities of biomass at the appropriate time to reduce erosion by water or wind to within acceptable soil loss levels.

NRCS' Field Office Technical Guide describes conservation crop rotation as having a moderate to substantial effect of reducing soil erosion (sheet and rill and wind) and also in reducing the amount of nitrogen and phosphorus in soils. This practice will result in a slight to moderate improvement in reducing excessive nutrients and organics in surface water, as well as suspended sediments and turbidity. Additionally, this practice will result in a slight to moderate reduction of pesticides to surface water.

7.2.2 Residue and Tillage Management – No Till/Strip Till/ Direct Seed (NRCS Code 329)

Residue and till management refers to the amount, orientation and distribution of crop and other plant residues on the soil surface year-round, while limiting soil-disturbing activities to only those necessary to place nutrients, condition residue and plant crops. The practice may be applied to achieve one or more of the following purposes:

- Reduce sheet and rill erosion.
- Reduce wind erosion.
- Improve soil organic matter content.
- Reduce CO2 losses from the soil.
- Reduce energy use.
- Increase plant-available moisture.
- Provide food and escape cover for wildlife.

7.2.3 Critical Area Planting (NRCS Code 342)

Critical area planting refers to establishing permanent vegetation on sites that have, or are expected to have, high erosion rates, and on sites that have physical, chemical or biological conditions that prevent the establishment of vegetation with normal practices. The practice may be applied to achieve one or more of the following purposes:

- Stabilize stream and channel banks, and shorelines.
- Stabilize areas with existing or expected high rates of soil erosion by wind or water.
- Rehabilitate and revegetate degraded sites that cannot be stabilized using normal establishment techniques.
- Stabilize coastal areas, such as sand dunes and riparian areas.

7.2.4 Residue Management (NRCS Code 344)

Residue management refers to managing the amount, orientation and distribution of crop and other plant residue on the soil surface year round while limited soil-disturbing activities to only those necessary to place nutrients, condition residue and plant crops. Residue management is used to reduce soil erosion, therefore reducing the off-site transport of sediment, nutrients and pesticides. A slight to moderate improvement in soil erosion is expected from these practices, as well as a slight to moderate improvement in the amount of nutrients, organics, sediment, metals and pesticides that have an effect on water quality.

7.2.5 Fencing (NRCS Code 382)

Fencing refers to a constructed barrier to livestock, wildlife, or people. The practice may be applied to achieve one or more of the following purposes:

- To prevent, restrict, or control access by domestic animals or people into hazardous or environmentally sensitive areas;
- To protect areas such as new plantings from damage by livestock, wildlife, or people;
- To implement a prescribed grazing plan or provide better distribution of grazing animals;
- To prevent access to areas by predators;
- To minimize liability and human health concerns;
- To maintain or improve the quantity and quality of natural or visual resources.

7.2.6 Grade Stabilization Structures (NRCS Code 410)

Grade stabilization structures are used to control the grade and head cutting in natural or artificial channels. These structures are used to control erosion, prevent formation of gullies, and to enhance environmental quality and reduce pollution hazards. Grade stabilization structures may be vertical drop structures, concrete or riprap chutes, gabions, or pipe drop structures. Permanent ponds or lakes, or detention basins may be part of a grade stabilization system.

This practice is expected to provide a moderate improvement in soil erosion. Water quality impacts associated with this practice includes a slight to moderate improvement in the amount of suspended sediments and turbidity.

7.2.7 Irrigation Water Management (NRCS Code 449)

Irrigation water management refers to the process of determining and controlling the volume, frequency and application rate of irrigation water in a planned, efficient manner. This practice may be applied as part of a resource management system to achieve one or more of the following purposes:

- Manage soil moisture to promote desired crop response.
- Optimize use of available water supplies.
- Minimize irrigation induced soil erosion.
- Decrease non-point source pollution of surface and groundwater resources.
- Manage salts in the crop root zone. Manage air, soil, or plant micro-climate.
- Proper and safe chemigation or fertigation.
- Improve air quality by managing soil moisture to reduce particulate matter movement.
- Reduce energy use.

Water application shall be at rates that minimize transport of sediment, nutrients and chemicals to surface waters and that minimize transport of nutrients and chemicals to groundwater. A moderate improvement in soil erosion is expected from this practice.

7.2.8 Irrigation Land Leveling (NRCS Code 464)

Irrigation land leveling involves reshaping the surface of land to be irrigated to planned grades. All leveling work shall be planned as an integral part of an overall farm irrigation system to enhance the conservation of soil and water resources.

The boundaries, elevations, and direction of irrigation of individual field leveling jobs shall be such that the requirements of all adjacent areas in the farm unit can be met. A slight improvement in soil erosion is expected from this practice.

7.2.9 Pipeline (NRCS Code 516)

A pipeline and appurtenances are installed to convey water for livestock or wildlife.
This practice may be applied as part of a resource management system to achieve one or more of the following purposes:

- Convey water from a source of supply to points of use for livestock, wildlife, or recreation.
- Reduce energy use.
- Develop renewable energy systems (i.e., in-pipe hydropower).

7.2.10 Prescribed Grazing (NRCS Code 528A)

This practice may be applied on all lands where grazing and/or browsing animals are managed. Removal of herbage by the grazing animals is in accordance with production limitations, plant sensitivities and management goals. Frequency of defoliations and season of grazing is based on the rate of growth and physiological condition of the plants. Duration and intensity of grazing is based on desired plant health and expected productivity of the forage species to meet management objectives. In all cases enough vegetation is left to prevent accelerated soil erosion. Application of this practice will manipulate the intensity, frequency, duration, and season of grazing to:

- Improve water infiltration
- Maintain or improve riparian and upland area vegetation
- Protect stream banks from erosion
- Manage for deposition of fecal material way from water bodies
- Promote ecological and economically stable plant communities which meet landowner objectives

7.2.11 Heavy Use Area for Protection (NRCS Code 561)

The protection for heavy use areas refers to the stabilization of areas frequently and intensively used by people, animals or vehicles by establishing vegetative cover, by surfacing with suitable materials, and/or by installing needed structures. This practice may be used as a part of a conservation management system to:

- provide a stable, non-eroding surface for areas frequently used by animals, people or vehicles, and
- protect and improve water quality. In this watershed, heavy use area protection is used only in pastureland.

7.2.12 Nutrient Management (NRCS Code 590)

Nutrient management refers to balancing all sources of nutrient inputs with a crop's requirements for producing a realistic yield. Nutrients, like nitrogen and phosphorus are essential for crop production; overbalance of these nutrients can cause water quality problems.

Objectives of this BMP is 1) to budget, supply, and conserve nutrients for plant production; 2) minimize agricultural nonpoint source pollution of ground and surface water, 3) properly utilize manure of organic by-products as a plant nutrient source, and 4) maintain or improve the physical, chemical, and biological conditions of the soil. A substantial improvement to water quality is expected if this BMP is implemented.

7.2.13 Integrated Pest Management (NRCS Code 595)

Integrated pest management involves a site-specific combination of pest prevention, pest avoidance, pest monitoring, and pest suppression strategies.

- Prevent or mitigate off-site pesticide risks to water quality from leaching, solution runoff and adsorbed runoff losses.
- Prevent or mitigate off-site pesticide risks to soil, water, air, plants, animals and humans from drift and volatilization losses.
- Prevent or mitigate on-site pesticide risks to pollinators and other beneficial species through direct contact.
- Prevent or mitigate cultural, mechanical and biological pest suppression risks to soil, water, air, plants, animals and humans.

A substantial improvement is expected if this BMP is implemented.

7.2.14 Watering Facility (NRCS Code 614)

A watering facility is a permanent or portable device to provide an adequate amount and quality of drinking water for livestock and or wildlife. The purpose of the facility is to provide access to drinking water for livestock and/or wildlife in order to:

- Meet daily water requirements
- Improve animal distribution

7.2.15 Shallow Water Management for Wildlife (NRCS Code 646)

Shallow water management is used to provide habitat for fish and/or wildlife, such as shorebirds, waterfowl, wading birds, mammals, fish, reptiles, amphibians and other species that require shallow water for at least a part of their life cycle. Conditions where this practice applies: On lands where water can be impounded or regulated by diking, ditching, excavating, or flooding. On floodplain areas that provide refuge habitats for native fish during high flow periods.

7.2.16 Record Keeping (NRCS Code 748)

Record keeping is the documentation of activities and data that affects the conservation of natural resources, and environmental aspects of an operation. The purpose of record keeping is to systematically and continuously record activities and data to provide information for natural resource management decisions.

7.2.17 Dry Seeding (NRCS Code DS)

Rice will be planted into a dry seedbed to reduce irrigation water requirements and eliminate high suspended sediment loads in irrigation water runoff in lieu of using the traditional method of seedbed preparation referred to as “water-leveling” or “mudding in”. Irrigation water will be applied and managed to minimize waste and soil loss. Water levels will be adjusted throughout the growing season for the specific needs of the variety. The purpose of this practice is to reduce irrigation water requirements, reduce energy requirements and costs associated with pre-plant flood irrigation, improve surface water quality in receiving streams and other water bodies by reducing the nutrient, suspended sediment, and organic material load runoff, and reduce soil erosion.

The LDAF/OSWC in conjunction with the Jefferson Davis Soil and Water Conservation District (SWCD) will continue to focus its implementation efforts in Bayou Chene, and foresee a reduction of NPS pollutants by implementing BMPs such as conservation crop rotation, residue and tillage management – no till/strip till/ direct seed, fencing, grade stabilization structures, heavy use area protection, irrigation land leveling, irrigation water management, nutrient management, critical area planting, pest management, pipeline, prescribed grazing, record keeping, residue management, seasonal shallow water area for wildlife, and watering facility, to protect water quality in Bayou Chene's 12-digit HUCs. LDEQ-NPS along with UL staff will continue to monitor water quality. Tables 5, 6, and 7 illustrate BMPs that have been implemented between 2005 and 2015.

HUC	Practice Code	Practice Name	Measurement Unit	2005	2006	2007	2008	2009	2010	2011	2012	2014	2015
080802020201, Gum Gully-West Bayou Grand Marais	328	Conservation Crop Rotation	acre				1054.7		905.4	1763.5	793.1		
	464	Irrigation Land Leveling	acre		39.2		833.5						
	528	Prescribed Grazing	acre		12		97.2						
	561	Heavy Use Area Protection	acre			246.5							
	590	Nutrient Management	acre				552.8		166.6				

Table 5 Best Management Practices Implemented in HUC 080802020201, 2005–2015

HUC	Practice Code	Practice Name	Measurement Unit	2005	2006	2007	2008	2009	2010	2011	2012	2014	2015
080802020203, West Bayou Grand Marais-Middle Bayou Grand Marais	328	Conservation Crop Rotation	acre		1908.7	3.3	254.1		38.8	61.1	304.2		
	464	Irrigation Land Leveling	acre	62.7	267.9	111.6	575.3				89.3		
	528	Prescribed Grazing	acre		230.2	307.1	58.3				6.5		
	590	Nutrient Management	acre				617.4						

Table 6 Best Management Practices Implemented in HUC 080802020203, 2005–2015

HUC	Practice Code	Practice Name	Measurement Unit	2005	2006	2007	2008	2009	2010	2011	2012	2014	2015
080802020205, Bayou Chene	328	Conservation Crop Rotation	acre		1668.4		695.2	115.1	199.2	859.9	983.7	19399.7	9236.4
	329	Residue and Tillage Management, No-Till	acre									744.5	479
	344	Residue Management, Seasonal	acre									4930.2	1722.3
	345	Residue and Tillage Management, Reduced Till	acre										5850.7
	449	Irrigation Water Management	acre									5900.9	2360
	464	Irrigation Land Leveling	acre	685	156.9	206.1	647.9				544.1	74.7	
	528	Prescribed Grazing	acre		298.1	47.8						279.1	310.4
	561	Heavy Use Area Protection	acre									73.2	
	590	Nutrient Management	acre		740.9		422.4	225.7				7704.6	788.6
	595	Integrated Pest Management (IPM)	acre									7919.6	1339.2
	644	Wetland Wildlife Habitat Management	acre									198.4	313.9
	645	Upland Wildlife Habitat Management	acre									469.1	
	646	Shallow Water Development and Management	acre									292.4	1068.9
	666	Forest Stand Improvement	acre										69.4
	AIR04	Use drift reducing nozzles, low pressures, lower boom height and adjuvants to reduce pesticide drift	acre									6665.1	13418.7
	AIR07	GPS, targeted spray application (Smart Sprayer), or other chemical application electronic control tec	acre									6665.1	13418.7
	AIR08	Nitrification inhibitors or urease inhibitors	acre									229.1	3830.4
	ANM11	Patch-burning to enhance wildlife habitat	acre									110	
	ANM25	Stockpiling Forages to Extend the Grazing Season	acre										40
	ANM29	On-farm forage based grazing system	acre										165
	WQL03	Rotation of supplement and feeding areas	acre										165.4
	WQL05	Apply nutrients no more than 30 days prior to planned planting date	acre									1344	4945.3
	WQL06	Apply controlled release nitrogen fertilizer	acre									237.3	
	WQL07	Split nitrogen applications 50% after crop/pasture emergence/green up	acre									887.8	650.5
	WQT03	Irrigation pumping plant evaluation	no										1
	ANM38	Retrofit watering facility for wildlife escape and enhanced access for bats and bird species	no										2

Table 7 Best Management Practices Implemented in HUC 080802020205, 2005-2015

7.3 Education and Outreach

Educational-outreach activities are important components of watershed protection and water quality improvement. Educational-outreach activities are initiated prior to BMP implementation and continue throughout the life of the project. If landowners understand objectives of watershed restoration and benefits to the community, they are likely to implement and maintain BMPs.

To increase the awareness of NPS pollution problems and issues associated with agricultural activities, within the Bayou Chene watershed, LDAF will be the lead in the education and outreach program. In cooperation with the OSWC, Jefferson Davis SWCD, USDA-NRCS, LDEQ NPS, and the LSU Ag center, the goal is to work together to conduct NPS education through agricultural BMP workshops, the Soil and Water Stewardship Program, and through other related events and activities throughout communities. Project WET (Water Education for Teachers) education workshops will be conducted for formal and non-formal educators of students ages kindergarten through twelve. This NPS educational outreach program should significantly enhance watershed based efforts to correct NPS impairments by providing an opportunity to link NPS pollution reduction and other environmental benefits to all available conservation programs as necessary to achieve acceptable surface water quality standards in agricultural environments, and lead to a better community-wide understanding of the effects and remediation of off-site NPS pollution impairments. One agricultural BMP field day will be held within the Bayou Chene watershed to discuss the TMDL process and to demonstrate the potential for reducing stream loading from agriculture activities, through the implementation of BMPs. A special effort will be made to encourage landowners, operators, and educators from within the project watersheds, as well as from outside the project areas, to participate in the field day. They will also be encouraged to become certified Masters Farmers through the LSU Ag Center. The rationale is that:

- BMP Field days are essential to maintaining producers knowledge of the economics, logistics, and many environmental benefits of conservation planning, of available conservation programs, first hand observation and discussion of the proper management and protection of all natural resources on private land, and an integral component of the SWCD and OSWC's mission to encourage conservation planning.

- 319 NPS educational programs significantly enhance agricultural NPS reduction efforts by providing an opportunity to link NPS pollution reduction and other environmental benefits to all available conservation programs as necessary to achieve acceptable surface water quality standards in agricultural environments, and to an understanding of the effects of off-site NPS pollution impairments.

- Project WET (Water Education for Teachers) is an interdisciplinary water science and education program for educators of students ages K-12. It addresses a wide range of water related descriptions including the natural and social sciences. Topics covered include atmospheric, surface, ground water resources, water quality and quantity, and management and conservation. Help to provide young people with the knowledge and skills needed to make informed decisions regarding water resource management.

- Soil & Water Stewardship programs have been instrumental in creating a

community-wide awareness of everyone's responsibility to conserve and properly manage natural resources. SWCDs have been active in the delivery of the Soil and Water Stewardship Program and related events and activities throughout communities and urban areas.

- Soil and water stewardship efforts have been enhanced by incorporating this outreach program into various school and community oriented awareness events, such as water festivals to reinforce all aspects of the hydrologic cycle with special emphasis on NPS concerns. Schools, communities, and individuals, especially in rural or isolated subdivisions, may become more active in NPS prevention in their areas.

There are countless positive outcomes of organizing BMP workshops for producers, such as:

- A heightened awareness and understanding of local water quality problems and agriculture's potential to contribute to them through proper natural resource management.

- An understanding of soil stability, erosion control, and maintenance of vegetative cover in relation to agricultural processes within a given proximity to potentially affected watercourses or waterbodies.

- Increased conservation practice installation resulting in improved surface water quality.

A special effort will be made to encourage producers/landowners that have implemented BMPs under a previous section 319 project or USDA program to continue to maintain the BMPs and to work with other producers in the project and surrounding areas to implement additional BMPs with or without cost-share assistance, in hopes of having a more effective NPS pollutant abatement program.

In addition to field days and educational flyers/materials provided through the LSU Ag Center, LDEQ will partner with USDA and LDAF to host one (1) to two (2) meetings annually 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 affecting water quality in Bayou Chene.

Each SWCD will also annually host a locally led conservation meeting, inviting all landowners and interested parties within each SWCD area to publicly document all natural resource concerns within their respective work areas. These concerns will be prioritized by SWCD led local work groups, substantiating the conservation needs for each area. Each SWCD will continue to seek funding and technical assistance to address these needs, and publish annual reports on conservation accomplishments locally and to the state legislature.

8.0 Bayou Chene Project Schedules

8.1 Bayou Chene Interim Milestones and Implementation Strategies

Timeframe	Goal	Objective	Strategy	Responsible Entity
5/11/2015	Submit Sampling Plan	Create sampling plan/approval	Development of overall plan	ULL/LDEQ
06/15/ 2015	Compose Scope of Services for Project/Fully executed	Include monitoring for each of the ten sites in Bayou Chene	Development of overall plan	ULL/LDEQ
06/15/2015	Begin 25 months of water quality monitoring	Generate additional water quality data	319 Cooperative Agreement Project with ULL to continue sampling and analysis	ULL
03/02/2015-02/01/17	Selection of BMPS and participants	Meet with potential participants to discuss BMPs and technical assistance	Provide federal cost share assistance to farmers that implement BMPs	LDAF
June 2015-Spring 2017	Analyzing water quality data	Identify current condition of the bayou and identify hotspots of NPS	Review monitoring reports and data analysis reports from ULL	ULL/LDEQ
Spring 2016	Update WIP as needed	As new data becomes available, update WIP as needed	Continue to Implement BMPs	ULL/LDEQ/LDAF
Winter 2016	Obtain additional monitoring funds for one more year of monitoring	Additional monitoring will enable LDEQ to determine water quality response to BMP implementation	Apply for FFY 2015 funds	LDEQ/ULL
Winter 2016-2017	Identify critical areas	Use results of monitoring project to identify sources of pollution	End of Implementation of BMPs	ULL/LDEQ/LDAF
Fall 2017	End Project	Final data analysis and water quality assessment	Prepare data for final report	ULL/ LDEQ
Fall 2017	Revise WIP	Comply with USEPA 9 key elements	Research new water quality data, land use data and BMP data/develop task force with stakeholders	LDEQ
Fall 2017	Possibly delist Bayou Chene for DO from Impaired waters list	Improve water quality and write success story	Implement BMPs that will be effective in controlling NPS pollution from agricultural fields and improve water quality/analyze water quality data collected/outreach and education	LDEQ/LDAF

Table 8 Bayou Chene Implementation Strategies and Interim Milestones June 2015 to September 30, 2017

8.2 LDEQ Water Quality Monitoring in Bayou Chene Schedule (June 15, 2015 to September 30, 2017)

Task	Task Description	Schedule
1.1	LDEQ SP Approval	May 2015
1.2	LDEQ QAPP/SP Reviews & Revisions	Annually and As Needed
2.1	Conduct targeted water quality sampling in Bayou Chene	June 15, 2015 through July 31, 2017
3.1	Quarterly Monitoring Reports	Quarterly
3.2	Annual Reports	Annually
3.3	Final Reports	September 30, 2017

Table 9 LDEQ Water Quality Monitoring Project Tasks and Timeline

	2015								2016												2017								
Task/ Month	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Eeb	Mar	Apr	May	June	July	Aug	Sep
1.1	X																												
1.2									X												X								
2.1		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
3.1					X			X			X			X			X			X			X			X			
3.2					X												X												
3.3																													X

Table 10 LDEQ Tasks Summarized by Month and Year

The LDAF/OSWC, in conjunction with the Jefferson Davis SWCD, and the USDA-NRCS will develop ranking criteria for participation in the Bayou Chene project. Soil types, priority HUCs, drainage patterns, farming practices, and proximity to the stream along with other factors will be evaluated and used in establishing ranking criteria. The ranking criteria will provide for selection of tracts with the highest runoff potential. A 50 percent point bonus will be given for lands located on the main channel, mains and laterals with closest proximity to the stream, and to those that provide the best potential to reduce agriculture related pollutant discharges as a result of implementing BMPs. The Jefferson Davis SWCD will be responsible for providing the ranking criteria that will be used, prior to selecting agricultural lands that will be targeted for inclusion in the project. Based on the ranking criteria, agricultural producers will be selected and BMPs will be identified for use within the targeted HUCs. LDAF and the SWCD will work with NRCS in the selection of the tracts of land, and the BMPs that will be implemented. LDAF will coordinate all 319 BMP planning and implementation activities to ensure that the maximum environmental benefits will be obtained at the least cost to the government and the landowner.

Project participation signups will be announced in the USDA-Farm Service Agency newsletter and parish newspapers. The SWCD will be responsible for approving the list of potential project participants, and to ensure they were selected according to priority ranking. The SWCD will also be responsible for providing the list of BMPs that will be used in the priority area, copies of the signup announcements, and meeting with potential program participants to discuss their willingness to participate in the project. The LDAF, NRCS, and SWCD staff will discuss with participants the various BMPs they may implement to control or reduce agriculture related NPS pollutants from their farms. This process will help assess the technical assistance needed, and that ensures the landowners or producers are going to implement a combination of BMPs that will provide the greatest benefit to water quality within the Bayou Chene watershed.

The LDAF, NRCS, and SWCD staff will work directly with the landowners or operators to prepare a Resource Management System (RMS) plan that will meet the desired level of pollution abatement on each tract selected for project implementation. Each plan will be developed under a three-year agreement with the landowner or operator. The plan will include but not be limited to a detailed soil map, site-specific location of BMPs to be implemented, and BMP implementation schedules for the three-year agreement period. Also, a unit cost-share rate for each BMP and level of match for cost-share funding for each participant will be addressed. The SWCD will be in charge of approving each participant's BMP plan(s). They will also be responsible for providing a draft comprehensive BMP plan that includes all management practices, a copy of an actual BMP plan that will be implemented in the project area, and providing onsite technical assistance to project participants in implementing the BMP plans developed.

Technical assistance will include soil management, engineering, biological, agronomic, and other specialized assistance. All BMPs to be implemented will meet USDA-NRCS standards and specifications, or as determined to best suit the resource concern as needed to protect water quality. NRCS, LDAF, and SWCD staff will provide technical assistance to participants in the designing and implementation of BMPs and will assist in providing follow-up technical assistance to project participants for the duration of the Bayou Chene project. The SWCD will be responsible for maintaining all appropriate project records, and semi-annual reports will show the status of BMP plans implemented, and follow-up assistance will be provided to project participants.

Cost-share assistance will be provided to project participants upon verification of BMP implementation. SWCD employees will ensure that that all BMPs and all non-cost-share BMPs are implemented according to plan and to USDA-NRCS conservation practice standards and specifications. The SWCD will be responsible for approving all cost-share payments to program participants. The estimated cost of BMP's implemented within the Bayou Chene area is based on the most current state wide average cost list, unless otherwise documented. Documentation will include a listing of payments made by the SWCD to landowners or operators for cost-share BMPs implemented, and the SWCD employee will determine if the BMPs are being implemented on schedule. The cost of implementing non-cost share BMPs will provide the state's in-kind match for this project. See Tables 11, 12, and 13 for applicable HUC, FFY, task, and start/completion dates.

8.2 LDAF BMP Implementation Schedule for FFY 2014, FFY 2105, FFY 2016

Bayou Chene BMP Implementation in HUC 080802020205 FFY 2014	Task	Date Started & Date Completed/ To be Completed
Task 1	Develop Ranking Criteria	2/12/2015
Task 2	Selection of BMPs and Participants	3/2/2015 - 3/13/2015
Task 3	Meet with Potential Participants	3/13/2015 – 3/31/2015
Task 4	Prepare Individual Comprehensive BMP Plans	4/1/2015 – 5/19/15
Task 5	Technical Assistance	4/1/15 – 8/15/2018
Task 6	Cost Share Assistance	5/19/2015 – 8/15/2018
Task 7	Education Program	4/1/2015 – 8/1/2018
Task 8	BMP Implementation	4/1/2015 – 8/31/2018
Task 9	Semi-Annual Reports	4/1/2015 – 8/31/2018
Task 10	Annual Reports	4/1/2015 – 8/31/2018

Table 11 LDAF BMP Implementation for FFY 2014, in HUC 080802020205

Bayou Chene BMP Implementation in HUCs 080802020201 and 080802020203 FFY2015	Task	Date Started & Date Completed/To be Completed
Task 1	Develop Ranking Criteria	12/16/2015
Task 2	Selection of BMPs and Participants	3/29/2016
Task 3	Meet with Potential Participants	3/29/16 – 4/19/16
Task 4	Prepare Individual Comprehensive BMP Plans	3/29/16 – 4/19/16
Task 5	Technical Assistance	3/29/16 – 8/15/2019
Task 6	Cost Share Assistance	4/19/16 – 8/15/19
Task 7	Education Program	4/19/15 – 8/15/19
Task 8	BMP Implementation	3/29/16 – 8/31/19
Task 9	Semi-Annual Reports	3/29/16 – 8/31/19
Task 10	Annual Reports	3/29/16 – 8/31/19

Table 12 LDAF BMP Implementation for FFY 2015, in HUCS 080802020201 and 080802020203

Bayou Chene BMP Implementation in HUCs 080802020201 and 080802020203 FFY 2016	Task	Date Started & Date Completed/ To be Completed
	Work Plan Submitted and Approved	03/01/16-08/01/16
	Funding and Sign Ups	10/01/16-02/01/17
	BMP Implementation	03/01/17-04/01/21
	Education and Outreach	10/01/16-04/01/16
	Wrap Up	04/01/21-10/31/21

Table 13 LDAF BMP Implementation for FFY 2016, in HUCS 080802020201 and 08080808020203

9.0 Tracking and Evaluation: Pathway to Improvement

Louisiana's NPS Management Plan indicated program tracking will be implemented at several levels to determine if watershed activities are effective in reducing NPS pollution and improving water quality. Figure 16 shows a representation of the six (6) steps in the USEPA's Watershed Planning and Implementation Process. The following actions will be taken to determine effectiveness of this approach:

1. Tracking BMPs implemented as a result of Section 319, USDA or other sources of cost-share and technical assistance in the watershed (short term);

2. Tracking progress in reducing NPS pollutants and increasing DO concentrations from various land uses in the watershed using measurable and quantifiable methods (short and long term);

3. Tracking water quality improvement in the bayou with water quality monitoring to determine if load reductions are being achieved and water quality improvements are being made to meet the state's water quality standards (long-term);

4. LDEQ will report in the state's NPS Annual Report the number of BMPs implemented each Federal Fiscal Year (short and long-term);

5. LDEQ will report water quality results from water quality monitoring project and data will be reviewed evaluating if the current plan is achieving anticipated results or if adjustments need to be made (short and long-term);

6. Communicating results of watershed implementation to stakeholders in the watershed and to USEPA, as well as addressing any necessary adaptations to the current plan (short and long-term).

7. LDAF's long-term success will be measured by improved water quality that meets states standards in the watersheds and corresponding river basins. The short-term success will be measured by continuous application of existing and future BMPs and related conservation practices that reduce the amount of fecal coliform, organic material, sediments and other agricultural contaminants entering the water bodies on an annual basis (short and long-term).

Short-term: 0 – 5 years
Long term: 5+ years

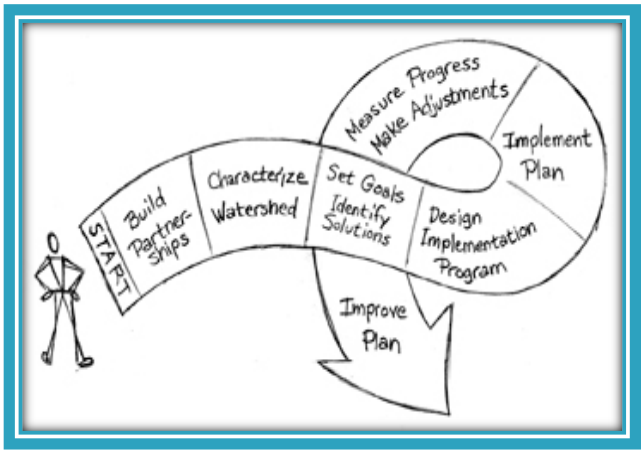

Figure 9 EPA's Six Steps in Watershed Planning

10.0 Estimate of Financial Assistance and/or Associated Costs for WIP Implementation

10.1 Technical and Financial Assistance Programs

The Louisiana Department of Agriculture and Jefferson Davis Office of Soil and Water Conservation (LDAF/OSWC) will provide technical assistance to program participants with the OSWC field staff and local Soil and Water Conservation District technicians. LDAF will only cost-share on the following BMPS: (410) Grade Stabilization Structures and (464) Irrigation Land Leveling. The remaining BMP's listed in Table 16 will be used for match.

The Louisiana Department of Environmental Quality NPS Program will provide monetary assistance from EPA's Section 319 Program, for water quality sampling and education and outreach in the Bayou Chene subsegment.

10.1.1 Budgets for Bayou Chene

LDEQs budget to complete the, "Water Quality Sampling in Bayou Chene" project is outlined in Table 14. LDAF's estimated budget for BMP implementation for 2015-2018 is outlined in Table 15.

LDEQ's Budget for "Water Quality Sampling in Bayou Chene" for June 15, 2015 to September 30, 2017

Category	Federal	Match	Total
Personnel			
Faculty salary	$69,776.00	$131,909.00	$201,685.00
Project employee	$64,969.00	$0.00	$64,969.00
Extra Comp. For Brian Kibbe	$8,021.00	$0.00	$8,021.00
Fringe benefits (35.44%)	$62,603.00	$57,842.00	$120,445.00
Supplies/Equipment	$48,000.00	$0.00	$48,000.00
Laboratory Cost			
Sample Analysis	$105,270.00	$0.00	$105,270.00
Travel for sample collection and delivery	$16,269.00	$0.00	$16,269.00
Student Aid	$12,000.00	$0.00	$12,000.00
Outreach (Meetings, Workshops and Conferences)	$16,000.00	$0.00	$16,000.00
Indirect Cost	$104,756.00	$150,087.00	$254,843.00
Total	**$507,664.00**	**$339,838.00**	**$847,502.00**

Table 14 Project Budget for June 15, 2015–September 30, 2017

LDAF's Estimated Budget for BMP Implementation in Bayou Chene for FFY 2014, 2015, and 2016

FFY Year	HUC(s)	Federal	Match	Total
2014	080802020205	$133,333.33	$166,666.67	$300,000
2015	080802020201, 080802020203	$133,333.33	$166,666.67	$300,000
2016	080802020201, 080802020203	$133,333.34	$166,666.66	$300,000
Total		**$400,000**	**$500,000**	**$900,000**

Table 15 LDAF's Estimated Budget for FFYs 2014–2016

NCRS Code	BMP Name	Targeted Pollutant	BMP Type	Unit	Unit Cost
328	Conservation Crop Rotation	Sediment	Crop rotation with high residue greases, legumes-organic, native species, seeding introduced species, sprigging introduced species	Acre	Paid for by Match
344	Residue Management	Sediment	No till	Acre	Paid for by Match
410	Grade Stabilization Structures	Sediment	Anti-vortex baffle, chute, earthfill hauled in from off farm, earthfill moisture control, earthfill soil modification, low overafall end sections, re-installation of failed structure	Per structure	$750
449	Irrigation Water Management	Sediment/Adsorbed Pesticide	determining and controlling the volume, frequency and application rate of irrigation water		Paid for by Match
464	Irrigation Land Leveling	Sediment	125 to 205 cy per ac (installed, mobilization, earthwork)	Acre	$167 or $227
528A	Prescribed Grazing	Nutrients, DO	Deferred Grazing		Paid for by Match
561	Heavy Use Area for Protection	Nutrients, DO	The stabilization of areas frequently and intensively used		Paid for by Match
590	Nutrient Management	Soluble Nutrients, DO	Precision Agriculture-with Yield Monitor		Paid for by Match
595	Integrated Pest Management	Soluble/Adsorbed Pesticide	Prevent or mitigate off-site pesticide risks to water quality		Paid for by Match
646	Shallow Water Management for Wildlife		Provide habitat for fish and/or wildlife.		Paid for by Match
DS	Dry Seeding	Nutrients	planted into a dry seedbed to reduce irrigation water requirements and eliminate high suspended sediment loads		Paid for by Match

Table 16 Bayou Chene BMPs and Cost

11.0 Summary of the WIP

Restoring designated uses and reducing loads by 58 percent in Bayou Chene will require a concerted effort from all watershed stakeholders, including government (local, state, and federal) landowners and local citizens. A person who lives in, and/or owns property in the watershed is a stakeholder and benefits from restoring and protecting water quality.

Pre BMP implementation data from 1998 shows seven (7) samples were taken, of which six (6) did not meet the standard, resulting in an exceedance rate of 86 percent. Since the onset of BMP implementation in 2005, water quality data is showing a steady decline in exceedance rates. In 2005, there were 12 water quality samples, of which, ten (10) samples did not meet the state's standard of 5 mg/L. In 2007, there were a total of ten (10) samples taken, of which eight (8) samples did not meet the standard. In the 2010/2011 sampling season, there were 12 samples taken, of which nine (9) did not meet the state's standard. The exceedance rates for 2003, 2007, and 2010/2011 were 83 percent, 80 percent, and 75 percent, respectively. The exceedance rate calculated from data collected during the MRBI project 2012, 2013, 2014, and 2015 at the WQN site 0658/site 1C was 96 percent, 74 percent, 84 percent, and 50 percent, respectively. At this time, sampling and BMP implementation are scheduled to continue with the objective of increasing DO concentrations, and reducing nutrient loads.

The primary land use in Bayou Chene is agriculture and prevention of soil erosion, sedimentation, and excess nutrients from land use activities in the watershed should improve DO concentrations in Bayou Chene. Implementing BMPs and conservation measures that reduce NPS pollution in Bayou Chene relies on cooperation of watershed stakeholders and local governments. Programs are available that provide technical assistance, cost-share and incentives. USDA offers several programs through the Farm Security and Rural Investment Act of 2008, available at local SWCDs.

Educational-outreach is an important component of watershed restoration because it is the initial step in understanding how to improve water quality in Bayou Chene. Understanding the problem often results in a greater concern and encourages the community to take actions without regulation. Awareness of watershed problems combined with educational-outreach about various BMPs for business owners, landowners and homeowners can reduce NPS pollution. More information on NPS can be found at LDEQ's NPS website at http://nonpoint.deq.louisiana.gov.

This document outlines the criterion that provides the assessment and management information for the Bayou Chene watershed, including the analysis, actions, participants and resources related to the development and implementation of this WIP. WIPs form the basis for implementing Louisiana's NPS Management Plan at the watershed scale. In a watershed, such as Bayou Chene, implementation of BMPs for conservation crop rotation, residue and tillage management, fencing, grade stabilization structures, heavy use area protection, irrigation land leveling, irrigation water management, nutrient management, critical area planting, pest management, pipeline, prescribed grazing, record keeping, residue management, shallow water area for wildlife, and watering facilities are recommended BMPs for reducing NPS pollutants

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Appendix A: EPAs Nine Key Elements

Required WIP Elements for 319 Grant	Location in Watershed Implementation Plan
a. *Identification of causes of impairment and pollutant sources or groups of similar sources that need to be controlled to achieve needed load reductions, and any other goals identified in the watershed plan*	Sections 3.1, 3.2, and 5.0
b. *An estimate of the load reductions expected from management measures*	Section 7.1
c. *A description of the nonpoint source management measures that will need to be implemented to achieve load reductions in paragraph 2, and a description of the critical areas in which those measures will be needed to implement this plan*	Section 7.2 and Figure 8
d. *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*	Section 10, Table 14, Table 15 and pages 40-41
e. *An information and education component used to enhance public understanding of the project and encourage their early and continued participation in selecting, designing, and implementing the nonpoint source management measures that will be implemented*	Section 7.3
f. *Schedule for implementing the nonpoint source management measures identified in this plan that is reasonably expeditious*	Section 8.0
g. *A description of interim measurable milestones for determining whether nonpoint source management measures or other control actions are being implemented*	Table 8
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 toward attaining water quality standards*	Section 4.0
i. *A monitoring component to evaluate the effectiveness of the implementation efforts over time, measured against the criteria established under item* h *immediately above*	Sections 4.0 and 9.0

Appendix B: Upstream and Downstream Pictures of Water Quality Sampling Locations in Bayou Chene

1C – Upstream

1C – Downstream

2C – Upstream

2C – Downstream

3C – Upstream

3C – Downstream

5C – Upstream

4C – Upstream

5C – Downstream

4C – Downstream

6C – Upstream

6C – Downstream

8C – Upstream

7C – Upstream

8C – Downstream

7C – Downstream

9C – Upstream

9C – Downstream

10C – Upstream

10C – Downstream