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Louisiana Department of Environmental Quality NPS

BAYOU MALLET (LDEQ SUBSEGMENT 050103) WATERSHED IMPLEMENTATION PLAN

For Turbidity, Total Dissolved Solids, and Fecal Coliform Bacteria

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1. INTRODUCTION

Bayou Mallet is located in the Mermentau River Basin, and lies within the LDEQ Western Gulf Coastal Plain Ecoregion (WGCPE) in Southwest Louisiana (Figure 1, page 4). 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.

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 the Mermentau River Basin average only about five feet above sea level, but range from one to two feet above mean sea level (MSL) in the southern marshes to about 100 feet MSL in the upper portions of the basin. Slopes average approximately two feet per mile.

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 addition to the hard soil clay pan that drains slowly and allows water to be held for extended periods of time in the Mermentau River Basin, also make it ideal for rice/crawfish cultivation. Ninety-two percent of the land within Mermentau River Basin is utilized for agriculture; with rice as the main crop.

The Bayou Mallet watershed is designated as Basin-subsegment 050103 and is located in the northern portion of the Mermentau Basin. The Bayou Mallet watershed includes Bayou Doza and several unnamed tributaries. The drainage area for the watershed is approximately 141 square miles. The area is sparsely populated outside its small municipalities and land use is dominated by agriculture, primarily soybeans, rice and aquaculture (crawfish) (Figure 2, page 5).

LDEQ conducts a statewide water quality assessment centered on Basin-subsegments, the results of which are reported in the Louisiana Integrated Report (IR). The 2016 IR indicated that Bayou Mallet is fully meeting its secondary contact recreation (SCR) designated use, but is impaired for primary contact recreation (PCR) because of high concentrations of

fecal coliform bacteria (FC) and is not supporting the fish and wildlife propagation (FWP) use because of high concentrations of sediments (i.e. total dissolved solids (TDS) and turbidity). Suspected sources of these impairments include agriculture, livestock (grazing or feeding operations), package plant or other permitted small flows discharges, and natural sources.

A detailed analysis of land use and land cover in Bayou Mallet watershed shows that soybeans and rice/crawfish are primary crops (Figure 2, page 5). The Lousiana Department of Agriculture (LDAF) and the United States Department of Agriculture – Natural Resources Conservation Service (USDA-NRCS) have implemented agricultural BMPs in Bayou Mallet (Table 3, page 20) and LDEQ has monitored water quality at an ambient water quality monitoring network (AWQMN) site at the outlet of the subsegment to determine if water quality has improved as a result of BMP implementation. LDEQ's ambient water quality data for Bayou Mallet shows fluctuation with respect to water quality, but success has already been achieved in the Bayou Mallet watershed.

In 2016, a USEPA Section 319 Success Story was published for Bayou Mallet when DO was removed from the 2010 IR as an impairment for FWP. Beginning in 2005, LDAF and USDA-NRCS worked with local landowners to implement agricultural BMPs, including nutrient management, irrigation land leveling, conservation crop rotation, and field borders.

Despite an improvement in DO, high levels of turbidity and TDS persist. LDEQ began a monitoring project in 2015 to identify sources of these pollutants, and BMP implementation continues. This recent monitoring project provides data on a sub-watershed scale which enables targeted BMP implementation within the watershed. Targeted implementation should reduce pollutant loads and hopefully restore the impairment for FWP.

Though Bayou Mallet remains listed as impaired for PCR due to FC, water quality data collected in previous sampling years for FC continues to be evaluated to determine if the PCR impairment should remain. This evaluation should be completed by the end of 2017. If FC remains as a suspected cause of impairment, LDEQ will add FC to the sampling plan for its project in this watershed, bacteria loadings will be targeted, and appropriate BMPs will be implemented to address load reductions in 2018.

BMPs may include fencing, water wells and watering facilities for livestock. Inspections of on-site home sewage disposal systems may also be performed to ensure that permitted facilities are functioning correctly and are not a source of pollution.

The focus of this WIP is implementation of BMPs that will reduce sediment and FC delivered to Bayou Mallet, with the goal of resulting reductions in TDS, turbidity, and FC towards restoring designated use support for FWP and PCR in the subsegment

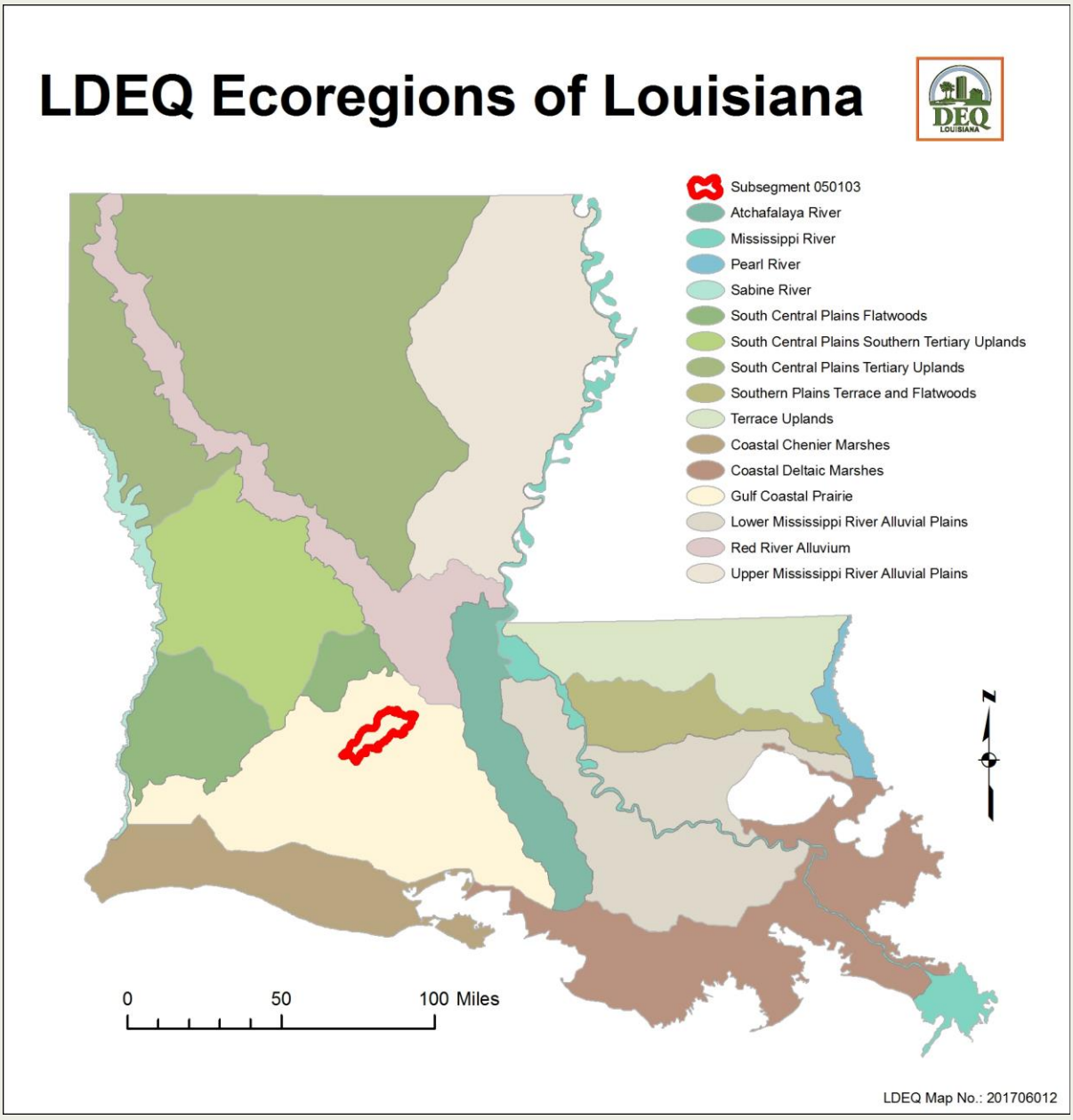

Figure 1- LDEQ Ecoregions of Louisiana with Bayou Mallet Watershed, Subsegment 050103, outlined in red

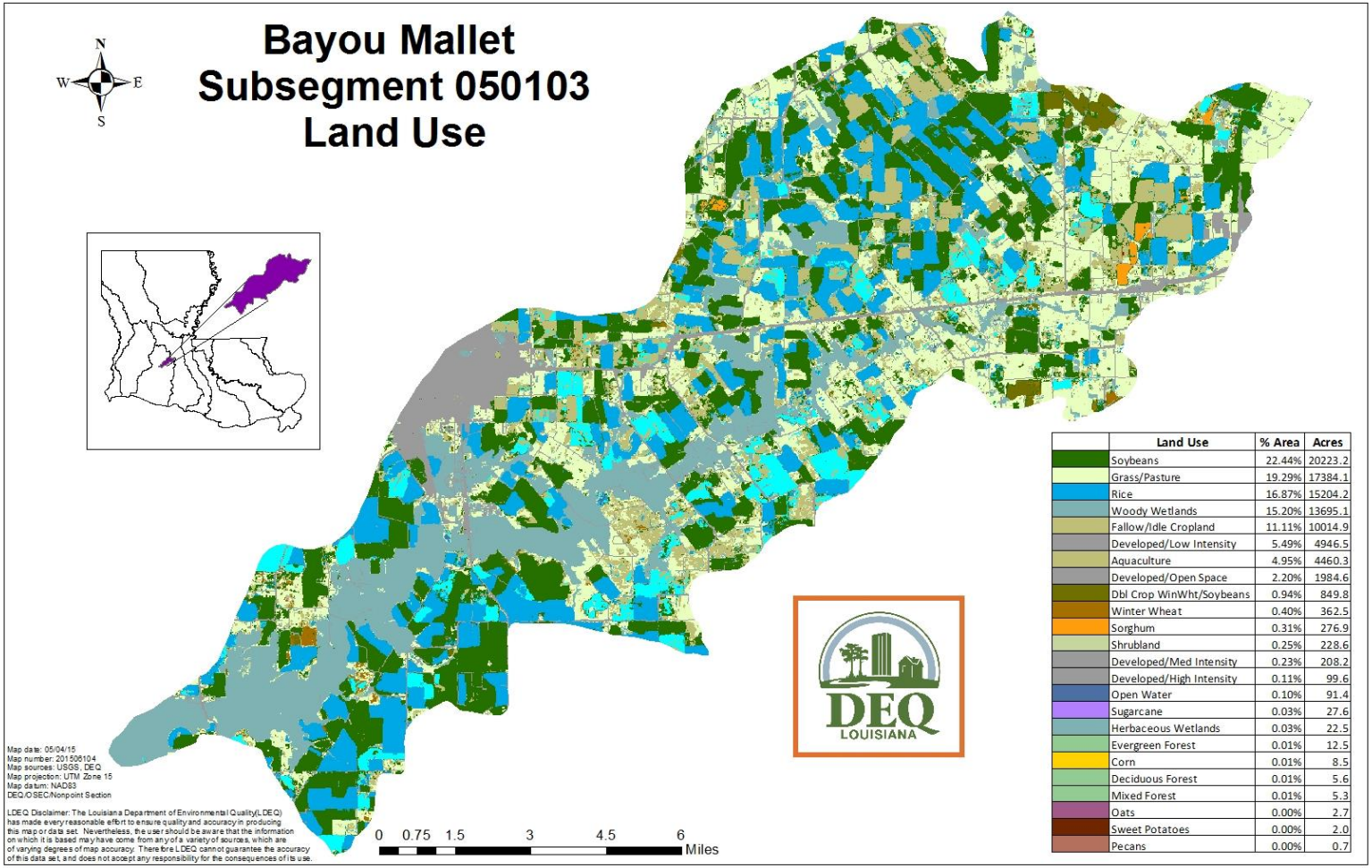

Figure 2 - Bayou Mallet Watershed Land Use/Land Cover

2. 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 WIPs have been developed.

USEPA'S NINE KEY 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 Mallet fully meets water quality criteria for SCR, but does not meet criteria for PCR and FWP because of high concentrations of FC, TDS, and turbidity. The state's 2016 IR identified suspected causes of impairment as agriculture, livestock (grazing or feeding operations), package plant or other permitted small flows discharges, and natural sources. A detailed analysis of land use and land cover in Bayou Mallet watershed shows that soybeans and rice/crawfish are primary crops (Figure 2, page 5). The Soil and Water Assessment Tool (SWAT) watershed model was applied to Bayou Mallet watershed to identify critical areas for NPS loading. Results

of this model are shown in Figure 5 (page 13).

TSS, TURBIDITY, AND SILTATION TMDL

In May 2001 a TMDL was published by USEPA Region 6 for the Mermentau River Basin ("Total Maximum Daily Load (TMDL) for TSS, Turbidity, and Siltation for the Mermentau River Basin" May 3, 2001).

The TMDL lists 17 of the 18 subsegments making up the Mermentau River Basin as impaired for TSS, Siltation, or both. This list includes LDEQ subsegment 050103, Bayou Mallet, as having TSS as the cause of impairment. The TMDL states that the subsegments listed "were included on the 1999 court-ordered Louisiana 303(d) list as not fully supporting the water quality standard with TSS, siltation and/or turbidity as the cause of the nonsupport." The TMDL goes on to state that, "Although turbidity may be influenced by other factors, effects due to TSS will be captured in a turbidity measure." The water quality criterion for turbidity in subsegment 050103 is defined in the Louisiana Water Quality Standards, §1113.B.9(a)(vi), as the appropriate background level, determined on a case by case basis, plus 10% in order for the waters to support the FWP use.

The TMDL further states that, "When such numeric values are not available, a target value must be developed for the selected indicator. Where such target values that are representative of the narrative standard are developed, the targets themselves are not water quality standards; rather, they are waterbody-specific numeric targets used by EPA to assess if a water body would be reasonably expected to be impaired based on the state's narrative standard." To this end EPA established a target vale of 150 NTU for the purposes of determining use support in the Mermentau River Basin. The TMDL then goes on to establish the relationship between TSS and turbidity, and calculates the reduction required to meet the target set. In the TMDL, a load reduction of 0% was indicated in order to meet the target of 150 NTU. LDEQ has typically used its most protective criteria of 25 NTU where the background value for turbidity has not yet been established – as is the case for the Bayou Mallet watershed. This plan will use a target value of 25 NTU while background levels are determined in order to calculate the appropriate numeric criterion for turbidity in subsegment 050103, with the expectation that the numeric criterion may be greater than the target value of 25 NTU.

For FC, the standard for PCR states that no more than 25% of samples collected on a monthly to near-monthly basis during the period of May 1 – October 31 may exceed the standard of 400 colony-forming units (cfu)/100 ml.

LDEQ'S AMBIENT WATER QUALITY DATA

LDEQ has collected ambient water quality data in Bayou Mallet since 1998; this data is included in the Bayou Mallet WIP in Figures 3 and 4. Ambient data was collected intermittently on a monthly basis in 1998, 2003, and 2005, as well as the 2008/2009 (e.g. October 2008 – September 2009), 2012/2013, and 2016/2017 sampling years. At the time of publication, only two months were available for the 2016/2017 sampling year. Ambient data for TDS was collected on a similar schedule, with the exception of not being collected in 2003. The data was collected at AWQMN site 0849, which is located at La. Hwy. 91, 4.5 miles north of Iota, 4.6 miles west of Mowata, 3.1 miles SE of Tepetate. This data will also be utilized to compare water quality results of data collected at the subwatershed scale in Bayou Mallet and Bayou Doza-Bayou Mallet.

The following graphs illustrate LDEQ's ambient data from 1998-2013. Statements about annual average values, exceedances, and peak concentrations have been included, since these values are relevant for parameters of concern in the bayou.

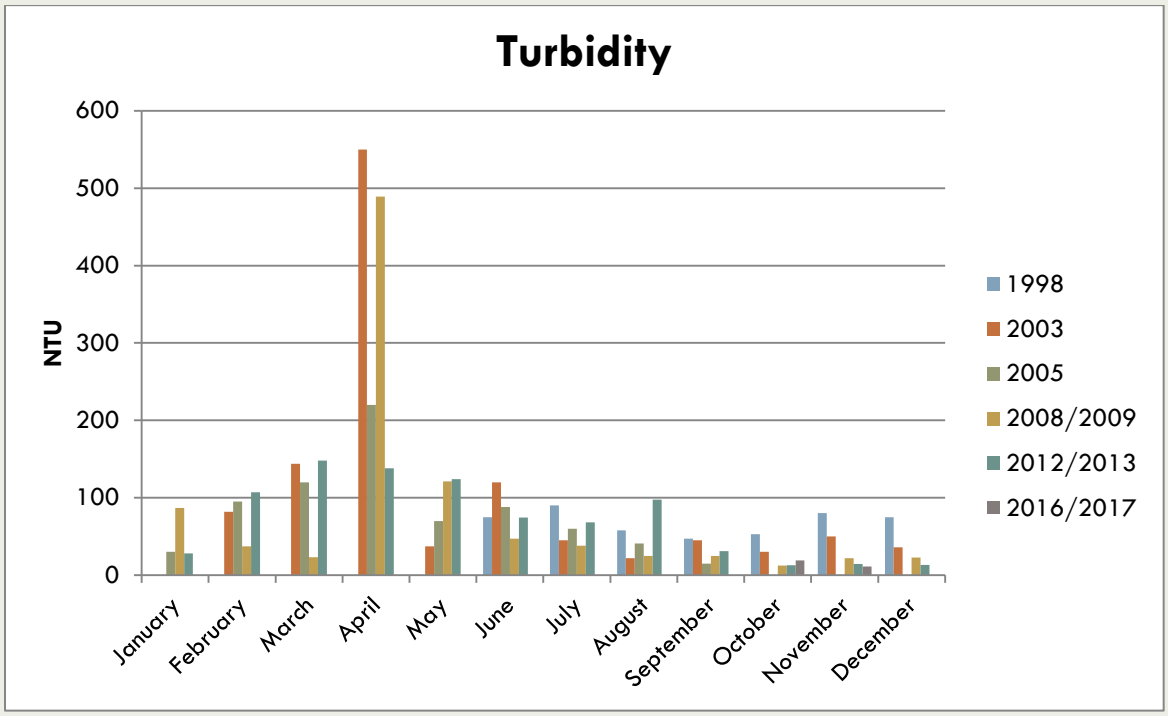

Figure 3 - Ambient Turbidity in Bayou Mallet

Ambient water quality data has been collected in the Bayou Mallet subsegment in years 1998 (June-December), 2003 (February-December), 2005 (January-September) 2008 (October-December), 2009 (January-September), 2012 (October-December), 2013 (January-September) and 2016 (October and November). The average of the values collected for years 1998 and 2003 showed an overall increase from 68.3 NTU to 105.5 NTU respectively. The trend from 2005 through 2013 declined with averages of 82.1 NTU in 2005, 79.0 NTU for the sampling year 2008-2009, and 71.4 NTU for the sampling year 2012-2013. No average was calculated for 2016/2017 since only two values were available. All 7 samples analyzed in 1998 exceeded 25 NTU, 10 of 11 samples exceeded 25 NTU for 2003, 6 of 12 for the 2008-2009 sampling year, and 9 of 12 samples exceeded 25 NTU during the 2012-2013 sampling year. The highest average concentration for a given month across all years sampled occurred during April; all 4 values for April exceeded 25 NTU (Collections during April occurred in 2003, 2005, 2009 and 2013). The two highest values occurred in April: 550 in 2003 and 489 in 2009. The lowest value occurred in November 2016: 11. The period from September to December had the lowest monthly averages. In general, samples collected during winter, spring and summer months exceed 25 NTU, while samples collected during the autumn months are generally below 25 NTU.

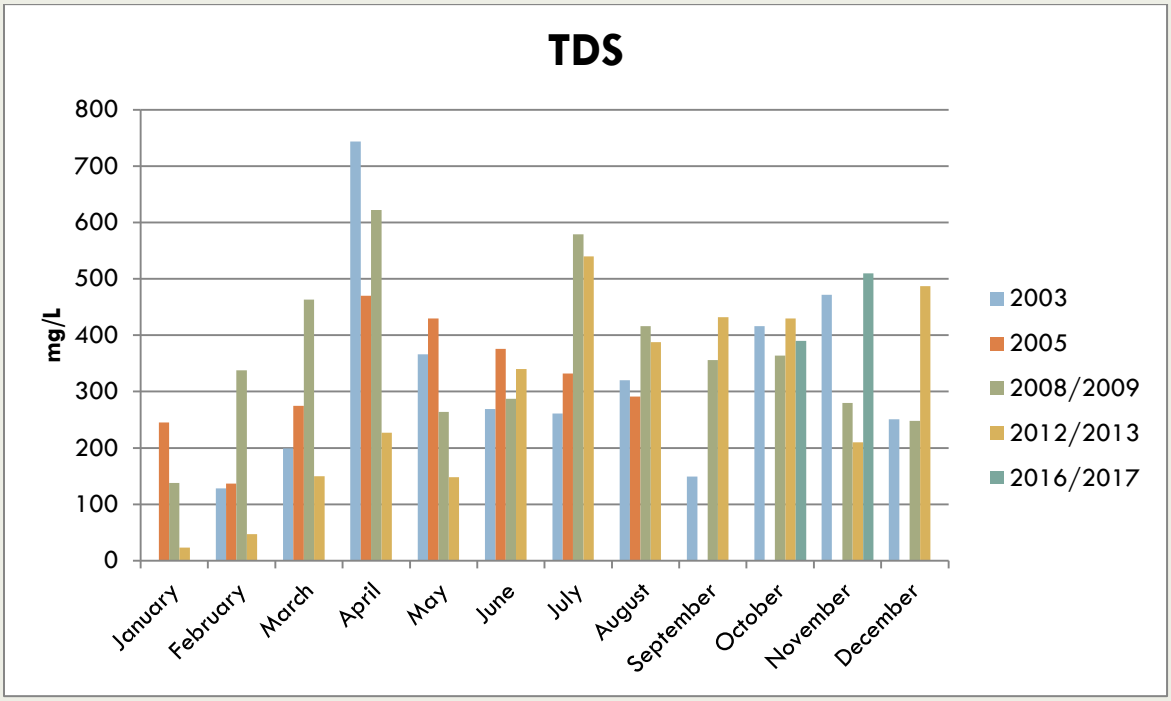

Figure 4 - Ambient TDS in Bayou Mallet

TDS data has been analyzed for water quality collected in the Bayou Mallet subsegment for years, 2003 (February-December), 2005 (January-August), 2008 (October-December), 2009 (January-September), 2012 (October-December), 2013 (January-September) and 2016 (October and November) with no discernable trend. No average was calculated for 2016/2017 since only two values were available. 7 of 11 samples exceeded the water quality criterion of 260 mg/L in Bayou mallet for 2003, 6 of 8 samples taken during 2005 exceeded the standard, 10 samples out of 12 for the 2008-2009 sampling year exceeded the standard, and 6 of 12 samples exceeded 260 mg/L during the 2012-2013 sampling year. Data collected in April of each year showed the highest concentrations on average at 515.75 mg/l (collections during April occurred in 2003, 2005, 2009 and 2013). The two highest values occurred in April: 744 mg/L in 2003 and 622 in 2009. The lowest value occurred in January 2016: 23 mg/L. The period from December to February had the lowest monthly averages. In general, samples collected during spring, summer and autumn months exceed 260 mg/L, while samples collected during the winter months are generally below 260 mg/L.

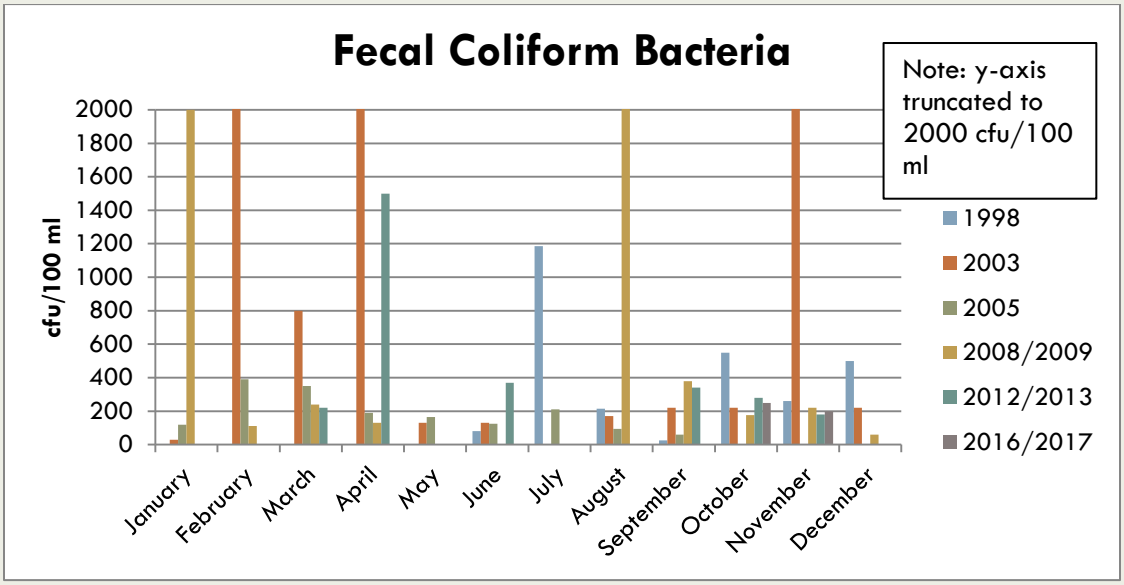

Figure 5 - Ambient FC in Bayou Mallet

FC data has been analyzed for water quality collected in the Bayou Mallet subsegment for years 1998 (June-December), 2003 (January-December, except for July), 2005 (January-September), 2008 (October-December), 2009 (January-April, and August-September), 2012 (October-November), 2013 (March, April, June, and September) and 2016 (October and November) with no discernible trend. Note: ambient FC data for Bayou Mallet is under evaluation by LDEQ. 2 of 5 samples exceeded the water quality criterion of 400 cfu/100 ml in Bayou Mallet for the PCR period during 1998, 0 of 5 samples taken during the PCR period for 2003 exceeded the standard, 1 sample out of 3 taken during the PCR period for the 2008-2009 sampling year exceeded the standard, and 0 of 3 samples exceeded the standard during the 2012-2013 sampling year. The highest value occurred in August 2009: 2600.

The ambient data for sediment parameters (Figures 3 and 4, pages 9 and 10) indicate that peak concentrations of sediment (turbidity and TDS) occur during spring, particularly April. Reducing these peak concentrations would help to restore FWP in Bayou Mallet.

The ambient data for FC (Figure 5, page 11) do not show a particular trend for the PCR period of May 1 through October 31. A focus on discharges that typically occur during the period would help to restore PCR in Bayou Mallet.

In addition to analyzing ambient water quality data, LDEQ also utilized a watershed model to identify areas of high NPS loads in Bayou Mallet.

MODELING BAYOU MALLET

LDEQ utilized the Soil and Water Assessment Tool (SWAT) model for Bayou Mallet to identify areas with high suspected sediment yield. SWAT uses land use, soil type, elevation, and climate data to model pollutant loads delivered within a watershed.

The SWAT model delineated the Bayou Mallet watershed into 91 subbasin units and calculated a value for suspected sediment yield in tons/acre/yr. for each subbasin. Values for yield for each subbasin were categorized as low, medium, or high, and mapped (Figure 6, page 14).

Areas where high yield was predicted typically have a land use classification for rice or soybeans. This map was distributed to partners to assist in the ranking process for BMP implementation. Producers in the watershed are given a score depending on the suitability of their agricultural lands to reduce pollutant loading in streams through BMPs. Those with land in the high areas (red) are given additional points and typically score higher and are therefore targeted for implementation practices.

RICE/CRAWFISH AND SOYBEANS

Excessive soil erosion is currently occurring on cropland as a result of extensive use of irrigation on rice/crawfish acreage and high average annual rainfall (more than 57 inches). While the summer and fall discharges are relatively clean outflows, with low concentrations of sediment leaving the fields, higher concentrations of pollutants enter the bayou in spring discharges from the release of water from crawfish fields and the subsequent planting of rice fields. This is due, in part, to emergent rice crops acting as a filter, incorporating excess nutrients and flocking sediments from the water as it is slowly released from the fields in summer and fall. However, higher concentrations of pollutants enter the bayou in spring discharges from the release of water from crawfish fields and the subsequent planting of rice fields as there is no emergent

vegetation at this time of year to moderate the flow and trap sediment and nutrients.

Implementation of site-specific BMPs on rice/crawfish/soybean cropping systems will help to control runoff and reduce sediment loads during the spring season, and are key actions recommended to reduce TDS and turbidity in Bayou Mallet. Similarly, implementation of pest and nutrient management BMPs is expected to reduce the impact of turbidity, TDS, and agricultural chemicals on water quality in Bayou Mallet and the Mermentau River Basin.

FECAL COLIFORM BACTERIA

Bayou Mallet is currently listed as impaired for PCR due to FC. Suspected sources of this FC are livestock (grazing or feeding operations), and package plant or other permitted small flows discharges.

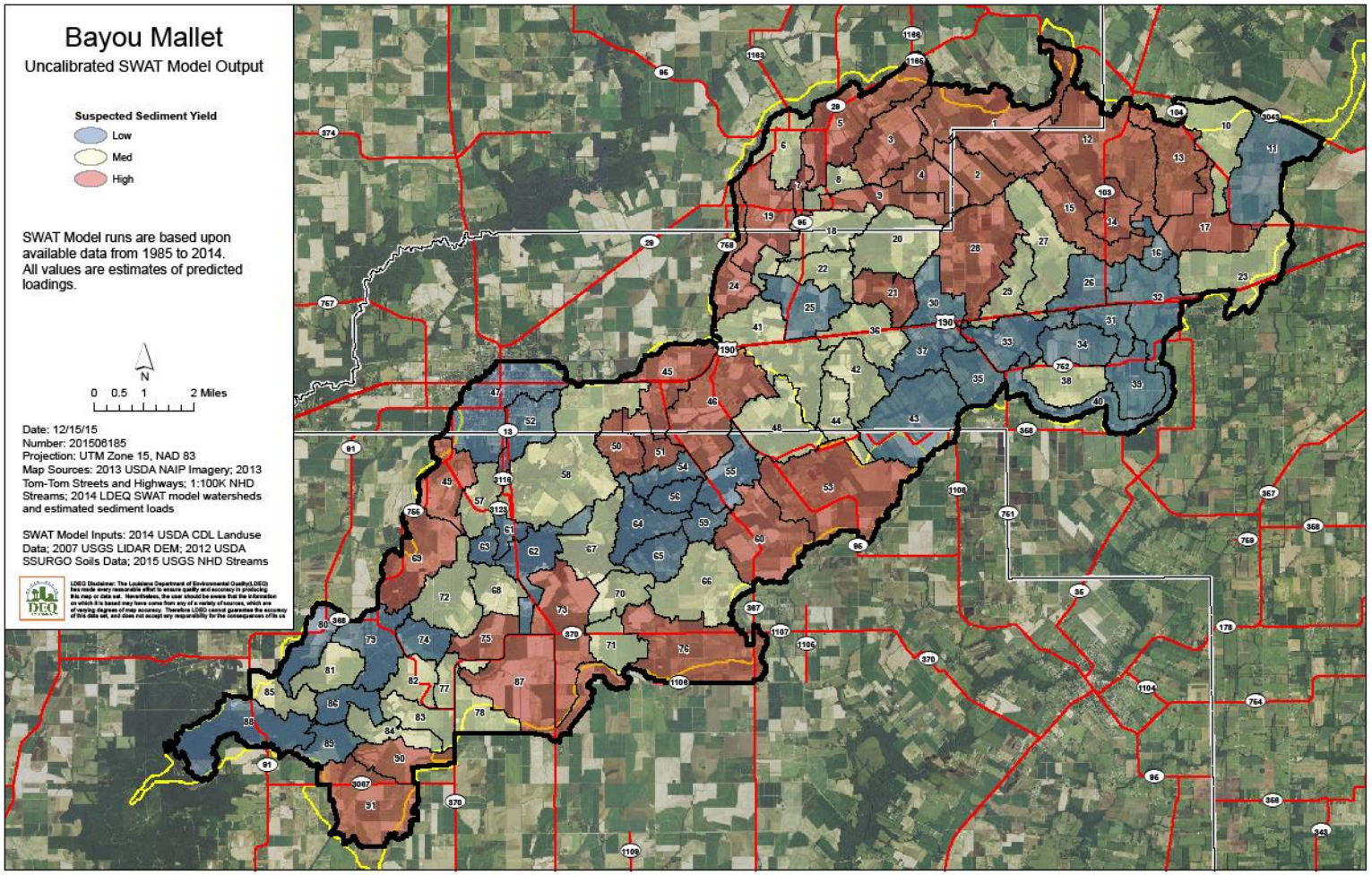

Figure 6 - Bayou Mallet SWAT Model Output

B. ESTIMATED LOAD REDUCTIONS ACHIEVED WITH NPS BMPS

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;
- Total phosphorus (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.

The Spreadsheet Tool for Estimating Pollutant Loads (STEPL) model was utilized to generate load reductions for BMPs that LDAF plans to implement in Bayou Mallet. Reductions for sediment-related BMPs ranged from 25 to 55 percent. More information is provided in Element C.

Table 1 (page 16) includes load reduction estimates expected in the two subwatersheds targeted through LDAF implementation. Load reduction estimates were calculated by taking the total cost from Table 2 (page 21) for sediment-related BMPs employed in the STEPL model, and dividing the total cost by cost per acre or number to generate the acres or number of BMPs. The acres covered by each BMP were input to the STEPL model, and sediment load and reduction data was generated. In the STEPL model, State was set to Louisiana, County was set to St. Landry, and Weather Station was set to "LA LAFAYETTE".

Estimated reductions of turbidity and TDS due to BMP implementation are shown in Figures 7 and 8 on pages 17 and 18, respectively.

Watershed (LDEQ subsegment)	BMP	Total ($)	Cost per acre or unit	Acres or number	Sediment load without BMP (tons/year)	Sediment load with BMP (tons/year)	Percent sediment reduction
Bayou Mallet 050103	Conservation Crop Rotation	30,000	$5/acre	6,000	3,440.9	1,548.4	55.0
	Grade Stabilization Structure	25,000	$2000/unit	12.5	6,901.7	4,831.2	30.0
	Irrigation Water Management	5,000	$5/acre	1,000	840.1	630.1	25.0
	Residue Management (Seasonal)	25,000	$7.50/acre	3,333.33	2,179.8	1,525.9	30.0

Table 1 - Load Reduction Estimates for Bayou Mallet

Note: a drainage area of 1,200 acres was estimated for each Grade Stabilization Structure

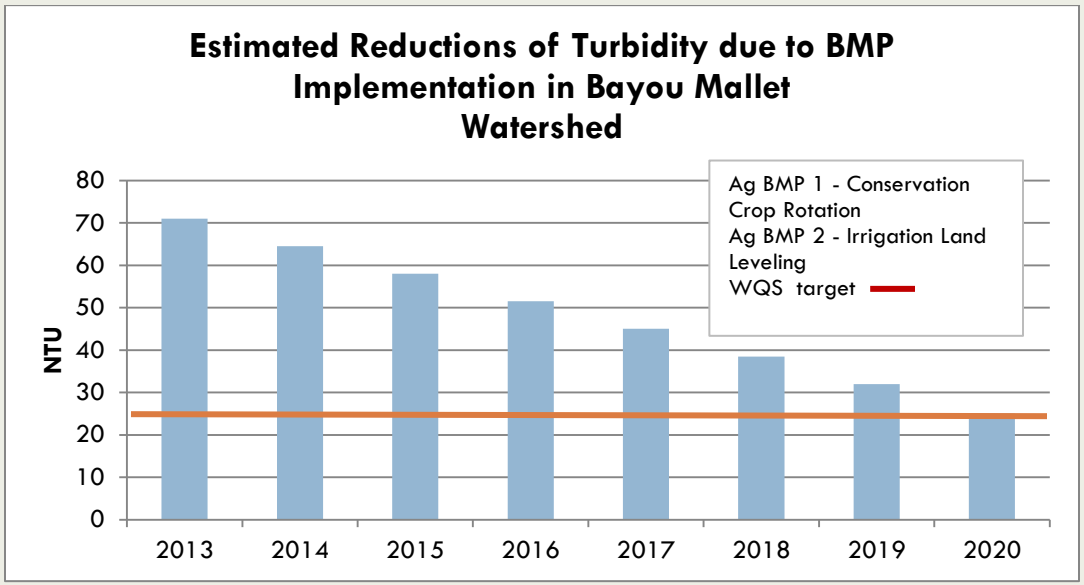

Figure 7 - Estimated Turbidity reductions in Bayou Mallet

An average value of 71 NTU was calculated for the 2012/2013 sampling year. Assuming a decrease of 6.5 NTU per year as a result of BMP implementation, including conservation crop rotation and irrigation land leveling, the target of 25 NTU can be met by 2020.

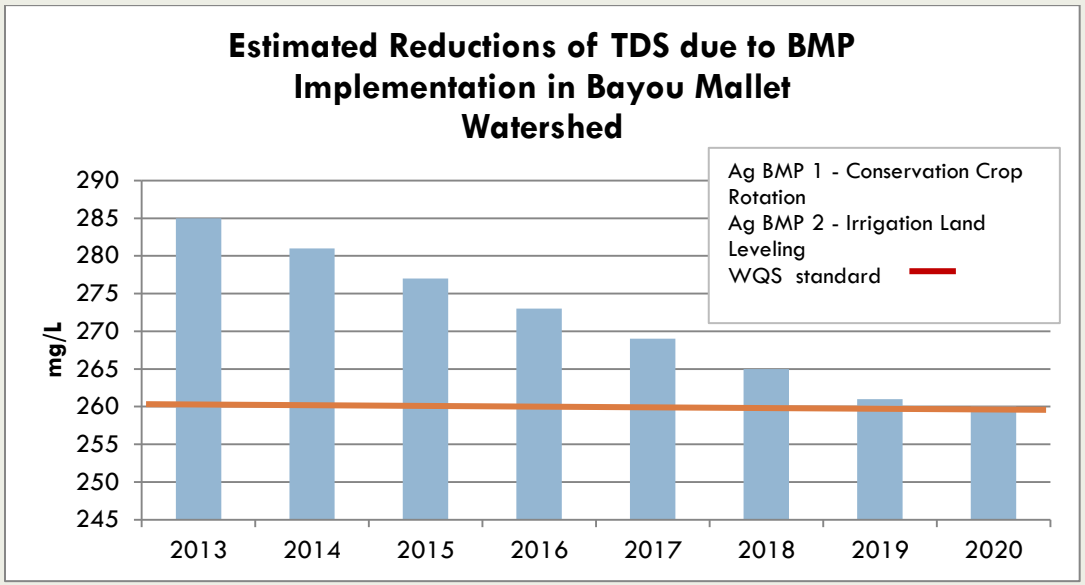

Figure 8 – Estimated TDS reductions in Bayou Mallet

An average value of 285 mg/L of TDS was calculated for the 2012/2013 sampling year. Assuming a load reduction of 4 mg/L per year as a result of BMP implementation, including conservation crop rotation and irrigation land leveling, the target of 260 mg/L can be met by 2020.

An average value of 330 cfu/100 ml was calculated for the 2012/2013 sampling year PCR season. This is below the standard of 400 cfu/100 ml, so estimated reductions were not calculated and graphed for FC as they were for turbidity and TDS. If BMP implementation occurs, possibly emphasizing BMPs such as fencing that will keep livestock from entering streams, it is expected to reduce FC concentrations in Bayou Mallet

C. BMPs FOR IMPLEMENTATION IN BAYOU MALLET WATERSHED

Since water quality data indicates that sediment needs to be reduced during the spring and land-use data indicates that a rice/crawfish/soybean rotation is the predominant cropping system in the watershed, management measures or BMPs that reduce sediment from these land uses are prioritized for watershed implementation.

Peak concentrations of sediment coincide with spring crawfish field discharges. Increased use of irrigation water management principles, such as applying and releasing water at suitable rates and intervals, will reduce sediment transport and are key to attaining target turbidity levels. The application of rice and crawfish BMPs should allow farmers to reduce high sediment loads during the spring rice planting season and release of crawfish field discharges. Rice farmers utilize precision land leveling techniques which eliminates the need for aerial seeding into flooded fields, enabling farmers to drill rice into a dry seedbed, and then, if soil moisture levels at planting time are low, may flush the fields with irrigation water to encourage sprouting, and then flood the fields once the rice seedlings become established. Planting the "Clear field" rice varieties also allows farmers to plant into a dry seedbed, as these varieties allow the use of herbicides to control red rice, rather than mudding in or water planting. These practices should reduce or eliminate spring sediment loading and prevent turbid waters entering the bayou.

Conservation tillage practices (reduced tillage) help retain soil and reduce sedimentation runoff between rice crops or during the soybean rotation. When using conventional tillage techniques, farmers in the watershed typically till their fields four times, twice in the fall, and twice during the spring immediately prior to planting.

Conservation crop rotation reduces erosion, maintains or increases soil health and organic matter content; reduces water quality degradation due to excess nutrients and improves soil moisture efficiency. In a rice cropping system, a rotation with soybeans and/or crawfish can add nutrients back into the soil and may be followed by a rice crop that will utilize those nutrients.

Grade stabilization structures stabilize the grade and control erosion to prevent the formation or advance of gullies, and enhance environmental quality and reduce pollution. A grade stabilization structure allows sediments to settle in flooded rice/crawfish fields and prevents erosion through the graded/slow release of water for harvest.

Irrigation water management manages soil moisture to promote the desired crop response, optimize the

use of available water supplies, minimizes irrigation-induced soil erosion, and decreases NPS pollution of surface and groundwater resources. This practice involves keeping records of rainfall, irrigation pump efficiency, and water depth in flooded fields to control the application of irrigation water for efficient use of surface and groundwater.

Residue management reduces erosion, maintains or increases soil quality and organic matter content, and increases plant-available moisture. This practice involves leaving crop residue on the field after harvest to protect the soil and decreases sediment loss from the field during a rainfall event, and it also increases soil organic matter by allowing plant material to degrade.

Field border reduces sheet, rill, and wind soil erosion, maintains or increases soil organic matter, decreases soil quality degradation due to compaction, reduces water quality degradation due to excess nutrients, and provides pollinator/wildlife food and cover. In any row cropping system, field borders are additional acres around the perimeter of individual fields that are planted or left alone with reduced tilling practices to allow growth of grasses. The addition of these grasses prevents soil erosion by slowing and filtering sediment/nutrient laden water due to rainfall draining from fields.

Prescribed grazing reduces soil erosion, improves or maintains riparian and watershed functions and water quality and quantity, improves or maintains diverse plant species and forage quality and quantity for grazing animals and wildlife. In pastureland, grazing animals (mostly cattle) are rotated throughout different fields where the intensity, frequency, timing, and duration of grazing is adjusted to allow recovery of forage plants. Fields are given rest for the forage to regrow which maintains adequate vegetative cover and prevents loss of forage and soil.

Nutrient management reduces agricultural nonpoint source pollution of surface and groundwater, conserves and properly utilizes nutrients for plant production, improves or maintains biological soil condition. This is a management practice that involves keeping records of rates, types, and seasonal timing of the application of fertilizer to cropland and pastureland. Soil grid sampling and precision agriculture techniques are sometimes utilized for a higher degree of nutrient utilization.

As these agricultural BMPs are implemented in Bayou Mallet's rice, crawfish, and soybean fields, concentrations of TDS and turbidity should decline with a decline in sedimentation.

Implementation of fencing is a BMP that will prevent livestock from entering waterways, thus decreasing FC concentrations. Water wells and watering facilities are other BMPs that can be used to provide water for livestock instead.

Inspections are a recommended BMP for permitted facilities. Inspections help ensure that a system is functioning correctly and is not a source of FC pollution.

Table 2, Page 21, shows BMPs needed to improve water quality that LDAF has proposed and/or currently implementating and BMP cost in Bayou Mallet.

USDA-NRCS has implemented agricultural BMPs in Bayou Mallet during the period 2005-2012 as part of their ongoing conservation technical assistance delivery. Table 3, page 20, includes approximate acreages and units for each practice that was implemented from 2005-2012 in Bayou Mallet watershed. These practices can be found in the 319 Success Story for Bayou Mallet.

Some of the BMPs in Table 3 helped remove DO as a parameter for impairment in the 2010 IR. These BMPs decrease the amount of sediment that is transported to the watershed, and should also reduce turbidity and TDS, since sediment contributes to turbidity, and TDS is a component of sediment in Bayou Mallet.

BMP	NRCS Practice Code	Federal ($)	Match ($)	Total ($)
Conservation Crop Rotation	328	0	30,000	30,000
Dry Seeding	N/A	0	30,000	30,000
Grade Stabilization Structure	410	15,000	10,000	25,000
Irrigation Land Leveling	464	450,000	450,000	900,000
Irrigation Water Management	449	0	5,000	5,000
Nutrient Management	590	0	40,000	40,000
Pest Management	595	0	40,000	40,000
Record Keeping	748	0	4,000	4,000
Residue Management (Seasonal)	344	0	25,000	25,000
Shallow Water for Wildlife	646	0	20,000	20,000

Table 2 - BMPs LDAF Proposed and/or Currently Implementing in Bayou Mallet

Watershed (LDEQ subsegment)	Practice Code - BMP	Amount Applied	Practice Unit
Bayou Mallet 080903	590 – Nutrient Management	1,911	acres
	464 – Irrigation Land Leveling	14,271	acres
	328 – Conservation Crop Rotation	5,285	acres
	410 - Grade Stabilization Structure	222	unit
	644 - Wetland Wildlife Management	15,672	acres
	386 – Field Border	142,050	feet

Table 3 - BMPs Impemented 2005-2012

BMP	NRCS Practice Code
Conservation Crop Rotation	328
Residue and Tillage Management – No Till/Strip Till/ Direct Seed	329
Grade Stabilization Structure	410
Irrigation Land Leveling	464
Irrigation Water Management	449
Nutrient Management	590
Pest Management	595
Record Keeping	748
Residue Management (Seasonal)	344
Shallow Water for Wildlife	646

Table 4 - BMPs USDA Proposed and/or Currently Implementing in Bayou Mallet

Table 4 (page 21) shows BMPs that USDA has proposed to implement in Bayou Mallet.

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.

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 five contracts that provide incentive payments and cost-sharing for conservation practices in the 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 USDA-NRCS, Soil and Water Conservation Districts (SWCD), or other service providers.

Cost-sharing may pay up to 75 percent of the costs of certain conservation 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 by USDA-NRCS to landowners and operators in the implementation of BMPs and resource management system 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, while the landowner or operator will provide matching funds.

LDAF/OFFICE OF SOIL AND WATER CONSERVATION (OSWC) will provide administrative and technical assistance to program participants with the OSWC field staff and local Soil and Water Conservation District technicians.

THE ST. LANDRY AND ACADIA SWCD AND THE LOUISIANA COOPERATIVE EXTENSION SERVICE will promote, through producer relationships and involvement, wider adoption of sediment reduction BMPs.

Ducks Unlimited (DU) has an active Regional Conservation Partnership Program project in the Bayou Doza watershed. This project will promote waterfowl habitat through technical and financial assistance on rice/crawfish/soybean land through the use of BMPs.

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.

Educational outreach should include educational materials such as flyers and brochures. An educational program should be conducted by LDAF to increase awareness of NPS pollution problems and issues associated with agricultural activities within the Bayou Mallet watershed.

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

In addition to field days and educational materials, LDEQ will partner with USDA and LDAF to host one to two meetings each year regarding 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 affecting water quality in each of the subwatersheds being monitored through the project.

F. A SCHEDULE FOR IMPLEMENTING BMPS

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

LDAF will develop a project to implement BMPs in priority subwatersheds of Bayou Mallet in concert with LDEQ, USDA-NRCS, and local SWCDs. LDAF will work directly with the producers to prepare Resource Management System (RMS) plans that address all resource concerns on the farm and 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 contract and tracked accordingly.

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 goal of this watershed implementation plan is to reduce or eliminate agricultural NPS pollution inputs into the Bayou Mallet watershed in order to delist the waterbody for known its impairments, and to prevent the likelihood of any future agriculture-related water quality impairments through implementation of BMPs and related conservation practices in priority subwatersheds of the Bayou Mallet watershed and monitor water quality to determine if changes occur in sediment entering the bayou on an annual basis.

Project milestones are listed in Table 5 (page 27). The sampling plan was approved in July 2015; long-term monitoring began that month and may continue through 2023. Data from the project will be entered into the Grants Reporting and Tracking System (GRTS) semi-annually throughout the project. LDAF began implementing BMPs for the project in 2016, and plans to continue through 2022. NRCS has been implementing BMPs since 2014 through the USDA cost share program, and could continue through 2022. With the continued cooperative effort to implement BMPs during the next 5 years, the goal is to have FWP delisted by 2020 for Bayou Mallet. See Figures 7 and 8 on pages 17 and 18, respectively.

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 load reductions are being achieved over time and whether 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, page 28, includes standards and designated uses for Bayou Mallet.

Estimated reductions of turbidity and TDS due to BMP implementation are shown in Figures 7 and 8 on pages 17 and 18, respectively.

Project Milestones	2015	2016	2017	2018	2019	2020	2021	2022	2023
SP approved									
Long-term monitoring									
GRTS reporting									
LDAF BMP implementation									
NRCS BMP implementation									
Water body possibly delisted for turbidity and/or TDS									

Table 5 - Bayou Mallet Project Milestones

Use Attainability and Designated Uses for Bayou Mallet				
Waterbody	**NPS related impaired parameters for which numerical standards have been developed**	**Standard (From LDEQ Environmental Regulatory Code)**	**Does waterbody meet standard? (From 2016 305(b) Report)**	**Constituents for which TMDLs will be developed (From 1998 Court Ordered 303(d) list) [2]**
Bayou Mallet (LDEQ subsegment 050103)	Fecal Coliform (Primary Contact Recreation)	[1]	No	Lead, Mercury, Phosphorus, Nitrogen, Organic Enrichment/Low DO, Pathogen Indicators, Turbidity, Suspended Solids, Salinity/TDS/Chlorides/Sulfates, Oil and Grease, Ammonia, Siltation
	Total Dissolved Solids	260 mg/l	No	
	Turbidity	25 NTU [3]	No	

[1] No more than 25 % of total samples collected annually can exceed 400 cfu/100ml. Applies only May 1 – Oct. 31, otherwise, criteria for secondary contact recreation apply.
[2] 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 2016 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.
[3] Targeted turbidity value while criterion is developed for the Bayou Mallet subsegment.

Table 6 - Designated Uses and Numerical Criteria for Bayou Mallet

I. A MONITORING COMPONENT TO EVALUATE EFFECTIVENESS OF IMPLEMENTATION EFFORTS

LDEQ's ambient water quality monitoring is one source of data to evaluate water quality changes as a result of BMPs implemented in Bayou Mallet watershed. LDEQ applied for and received FFY 2014 Section 319 funds to additionally monitor two subwatersheds of Bayou Mallet for three years (July 2015-September 2018), including:

- Bayou Mallet (080802010305)
- Bayou Doza-Bayou Mallet (080802010303)

The project is ongoing and includes field (dissolved oxygen, specific conductivity, pH, water temperature) and laboratory (turbidity and TDS) parameters collected on a monthly basis. All water quality data will be analyzed and compiled into a final report.

By conducting water quality sampling at the subwatershed scale, LDEQ will be able to evaluate the effect of BMP implementation for these subwatersheds. Figure 9, page 30, shows sampling sites where monitoring will occur throughout this project. Water quality data was collected at Sites 1-4 from July 2015 to the present; Sites 5-7 were added for sampling in April 2017. Turbidity was collected from July 2015 to the present; TDS was added for sampling in April 2017.

Figure 10, page 31, is a graph of turbidity data collected in this project. As of April 2017, laboratory parameter data for turbidity for 20 sampling events is available. Values for turbidity typically exceeded the target (25 NTU) that will probably be needed at AWQMN site 0849 to restore Bayou Mallet for turbidity. Figure 10 also shows that turbidity values typically increase in December and decline around July.

Table 7, page 31, shows that between 13 and 15 exceedances (highlighted in red) occurred for each site over the 20 sampling events. Values ranged from 12 to 750 NTU. Site 2 had the least number of exceedances but the greatest mean value for turbidity. This is due to a value of 750 NTU, which occurred in June 2016. The peak value of 750 NTU also was responsible for sampling event 12 (June 2016) having the highest mean value for all sampling events.

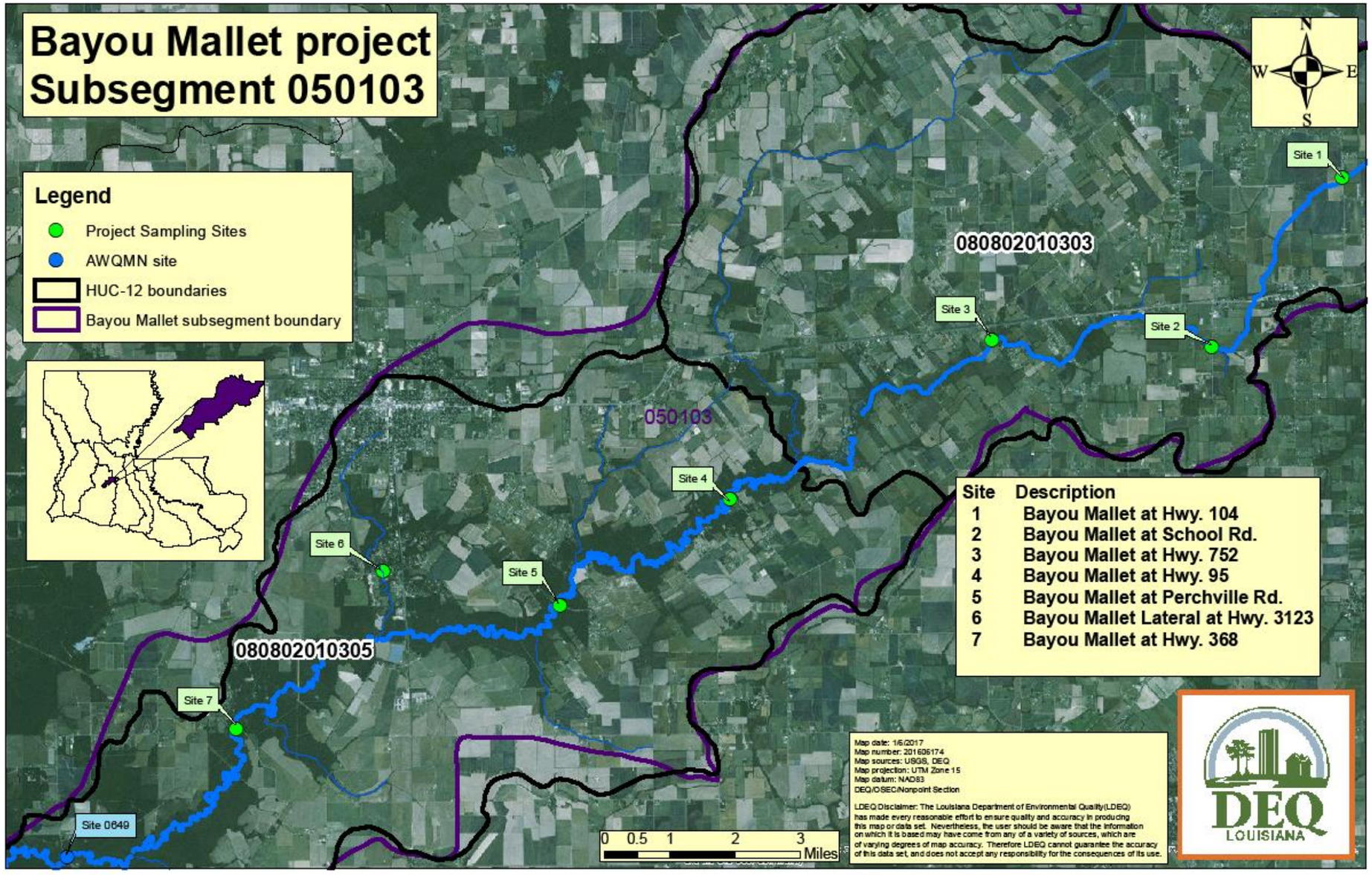

Figure 9 - Bayou Mallet Sampling Sites

	Date	*7/23/2015*	*8/27/2015*	*9/25/2015*	*10/20/2015*	*11/24/2015*	*12/22/2015*	*1/22/2016*	*2/17/2016*	*3/22/2016*	*4/19/2016*	*5/2/2016*
	Sampling event	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
Site	**1**	22	25	55	29	21	55	31	60	45	75	80
	2	40	22	16	12	21	95	33	130	60	85	85
	3	40	21	24	29	17	65	50	80	70	80	65
	4	21	22	75	30	29	70	45	60	180	160	100
Mean		31	23	43	25	22	71	40	83	89	100	83
		6/22/2016	*7/19/2016*	*8/31/2016*	*9/21/2016*	*10/20/2016*	11/23/2016	*12/21/2016*	*1/26/2017*	*3/1/2017*		
		12	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**# Exceed**	**Mean**
Site	**1**	80	260	23	19	14	26	30	29	36	**14**	**51**
	2	750	31	34	14	18	12	65	70	50	**13**	**82**
	3	40	55	45	8	6	6	60	65	80	**14**	**45**
	4	30	33	26	18	8	7	75	45	85	**15**	**56**
Mean		225	95	32	15	12	13	58	52	63		

Table 7 - Bayou Mallet Turbidity Values in NTU

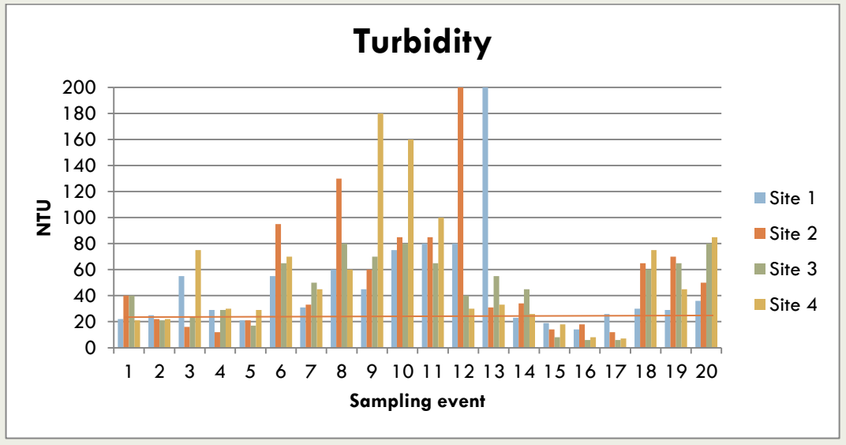

Figure 10 - Bayou Mallet Turbidity Values

Note: Y-axis truncated at 200

3. 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 the Bayou Mallet watershed as well as current status of water quality data collected at the subwatershed scale. If water quality data indicates improvement in concentrations have occurred after BMP implementation, then LDEQ, LDAF, and USDA will continue their current approach with respect to watershed implementation. If water quality data does not indicate improvement, then LDEQ, LDAF, and USDA will determine what type of corrective actions should be made to the watershed implementation approach. If water quality data indicate water quality standards have been met in Bayou Mallet, the waterbody will be delisted and a NPS success story will be developed and submitted to USEPA Region 6.

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