VERMILION RIVER WATERSHED IMPLEMENTATION PLAN

FOR DISSOLVED OXYGEN, NUTRIENTS AND FECAL COLIFORM

FEBRUARY 9, 2021

LOUISIANA DEPARTMENT OF ENVIRONMENTAL QUALITY | NONPOINT SOURCE POLLUTION DIVISION
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Introduction

The Vermilion River Watershed is located in the Western Gulf Coastal Plain Ecoregion (WGCPE). It is found between the Mississippi Alluvial Plain and the South Central Plains in Southwest portion of Louisiana. This ecoregion is characterized by its humid summers, mild winters and overall subtropical climate. The predominant natural vegetation is the longleaf pine woodland but is accompanied by sand post oak, bluejack oak, black hickory, and shortleaf pine. River systems usually drain several hundred square miles of watersheds due to lack of pronounced topographic release. (conservation gateway.org). According to the Louisiana Integrated Report (IR), the Vermilion River has a long history of low dissolved oxygen (DO) and high fecal coliform (FC) bacteria. The purpose of this plan is to address those issues through a comprehensive plan working with many local stakeholder groups and LDAF to implement pasture and cropland best management practices in the watershed.

Element A. Causes and Sources of Pollution

Vermilion River, at ambient site 0045, has been impaired for primary contact recreation (PCR) with a source of FC since the year 2000. The Nitrate Nitrite and DO impairments were first listed as impaired in the 2004 305(b) list. The table below gives a summary of the historical impairments since 2000.

Table 1: Vermilion River Impairment History

	2000	2002	2004	2006	2008	2010	2012	2014	2016	2018
Fecal Coliform Bacteria	x	x	x	x	x		x	x	x	x
DO			x	x	x	x	x	x	x	x
Nitrate/Nitrite			x	x	x	x	x	x	x	x
Turbidity		X	x	x	x					
Sedimentation/Siltation		X	x	x	x					
TSS		X	x	x	x					

The 2018 IR shows subsegment 060801 is fully supporting Secondary Contact Recreation (SCR) and Agriculture (AGR). The impairments are PCR for FC and fish and wildlife propagation (FWP) for Nitrate Nitrite and DO. The suspected sources of the nutrient impairments are Natural resources for DO and unknown for Nitrate Nitrite. The suspected sources for FC impairment are On-site Treatment Systems (Septic Systems and Similar Decentralized Systems), Package Plant or Other permitted small flow discharges. This information is detailed in Table 2.

This document will focus on the current impairments including FC, DO, and Nitrate Nitrite. There are no nutrient standards at this time, but in order for the impairment to be removed from the IR, nitrogen (N) and phosphorus (P) must maintain the natural balance that keeps the DO in its acceptable range. This acceptable range is explored in Element B. The nutrient reductions in this document are based on DO reaching the standard of 5.0 mg/L year- round to meet its FWP designated use. To meet the FC designated uses of PCR, no more than 25% of the samples collected annually should exceed 400 cfu/100 mL from May 1 through October 30 and 2000 cfu/100mL from November 1- April 30.

Table 2: 2018 Integrated Report Impairment Causes and Sources

Subsegment	Description	Type	Size	PCR	SCR	FWP	AGR	Causes	Impaired Use	Category	Sources
060801	Vermilion River-From headwaters to LA-3073 bridge	River	27.0	N	F	N	F	NITRATE/NITRITE (NITRITE + NITRATE AS N)	FWP	-	SOURCE UNKNOWN
								FECAL COLIFORM	PCR	4A	AGRICULTURE
											ON-SITE TREATMENT SYSTEMS (SEPTIC SYSTEMS AND SIMILAR DECENTRALIZED SYSTEMS)
											PACKAGE PLANT OR OTHER PERMITTED SMALL FLOWS DISCHARGES
								DISSOLVED OXYGEN	FWP		AGRICULTURE
											NATURAL SOURCES

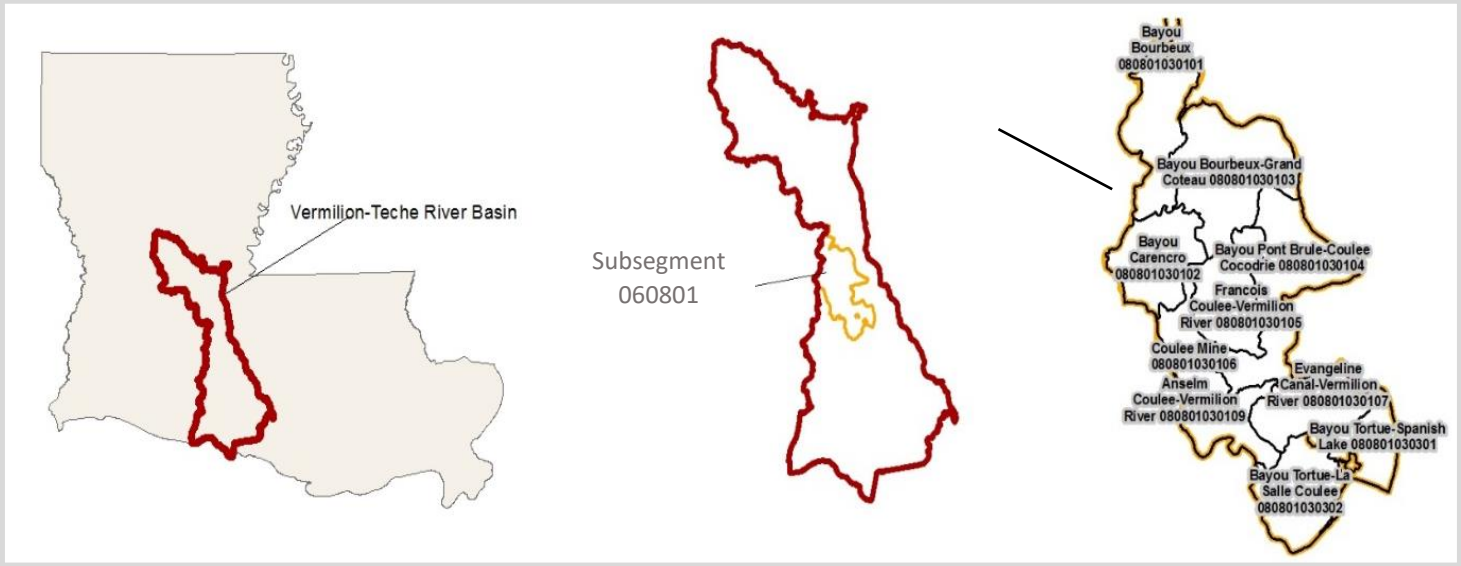


Figure 1: Relationship among Vermilion-Tech River Basin, Subsegment 060801, and HUC-12s

Land Use

The Vermilion River subsegment is roughly 32% grass/pasture, 24% woody wetlands, 23% Developed, and 13% cropland. Of the developed area, 12% is low intensity, which is mainly comprised of single-family housing units and 20-49% impervious surfaces. 7% of the developed area is open space which is comprised of less than 20% impervious surfaces and usually is made of large single- family lots, parks, recreation and golf courses. Figure 2 shows the land use of subsegment 060801 and Table 3 shows the breakdown in percent area and total acreage.

Soil Type

Southern Mississippi Valley Loess- The dominant soil orders in the MLRA are Alfisols, Entisols, Inceptisols, and Ultisols. The soils in the area are very deep or deep, medium textured, and have a thermic soil temperature regime, a udic soil moisture regime, and mixed mineralogy

Climate

As expected, max temperatures are seen from May to September with highest rainfall levels in July. High rainfall combined with high temperatures explains many of the elevated fecal coliform and lowest DO levels seen in the baseline sampling results in July. They are shown in a later section.

Table 3: Lafayette Climate Data from climatedata.org

	January	February	March	April	May	June	July	August	September	October	November	December
Avg. Temp (°F)	50.4	53.6	60.1	67.8	74.7	79.9	81.7	81.5	77.5	68.4	59.7	53.1
Min. Temp (°F)	40.6	43.7	49.8	57.7	64.9	70.5	72.7	72.1	67.8	56.7	48.7	43.0
Max. Temp (°F)	60.3	63.7	70.5	77.9	84.4	89.4	90.9	90.9	87.3	80.1	70.7	63.3
Precip/ Rainfall (mm)	130	114	108	112	131	137	163	141	121	93	102	138

Municipal Separate Storm Sewer System (MS4) Area

Lafayette City-Parish includes, the City of Carencro, the Town of Duson, the City of Scott, and the Town of Youngsville. According to the Lafayette Consolidated Government (LCG) Stormwater Management Program Plan (SWMP), Lafayette is urbanized and has a population of less than 100,000, therefore it is considered a Phase II small MS4.

LCG is covered under the Small MS4 General Permit LAR041025. As a condition of this permit, LCG must comply with the special conditions that there be no discharges causing or having the reasonable potential to cause a violation of water quality standards. There are no such discharges at this time. The primary receiving stream in the area is the Vermilion River, subsegments 060801 and 060802 but the jurisdiction also includes, Bayou Queue de Tortue (050501), and Bayou Petite Anse (060901). None of these subsegments have been assigned Waste Load Allocations (WLAs) for pollutants from MS4s. This means that LCG is not required to perform wet weather monitoring. They will continue to review the integrated report for any changes. If anything is identified, the plan will be updated within 6 months of the Total Maximum Daily Load (TMDL) approval.

One section of the program involves engaging the community through educational initiatives and community improvement programs. Our inspections, in conjunction with planned education and outreach help to supplement that portion of the permit. In meetings with Lafayette Consolidated government (LCG), we assured them that we will continue to work to ensure that the practices implemented within the scope of this project will complement those in the MS4 permit and 319 funding will not be used to complete a permit requirement but rather to go above and beyond those requirements.

The full SWMP can be found at: https://old.lafayettela.gov/EQ/SiteAssets/files/2020-Stormwater-Management-Program-Plan.pdf

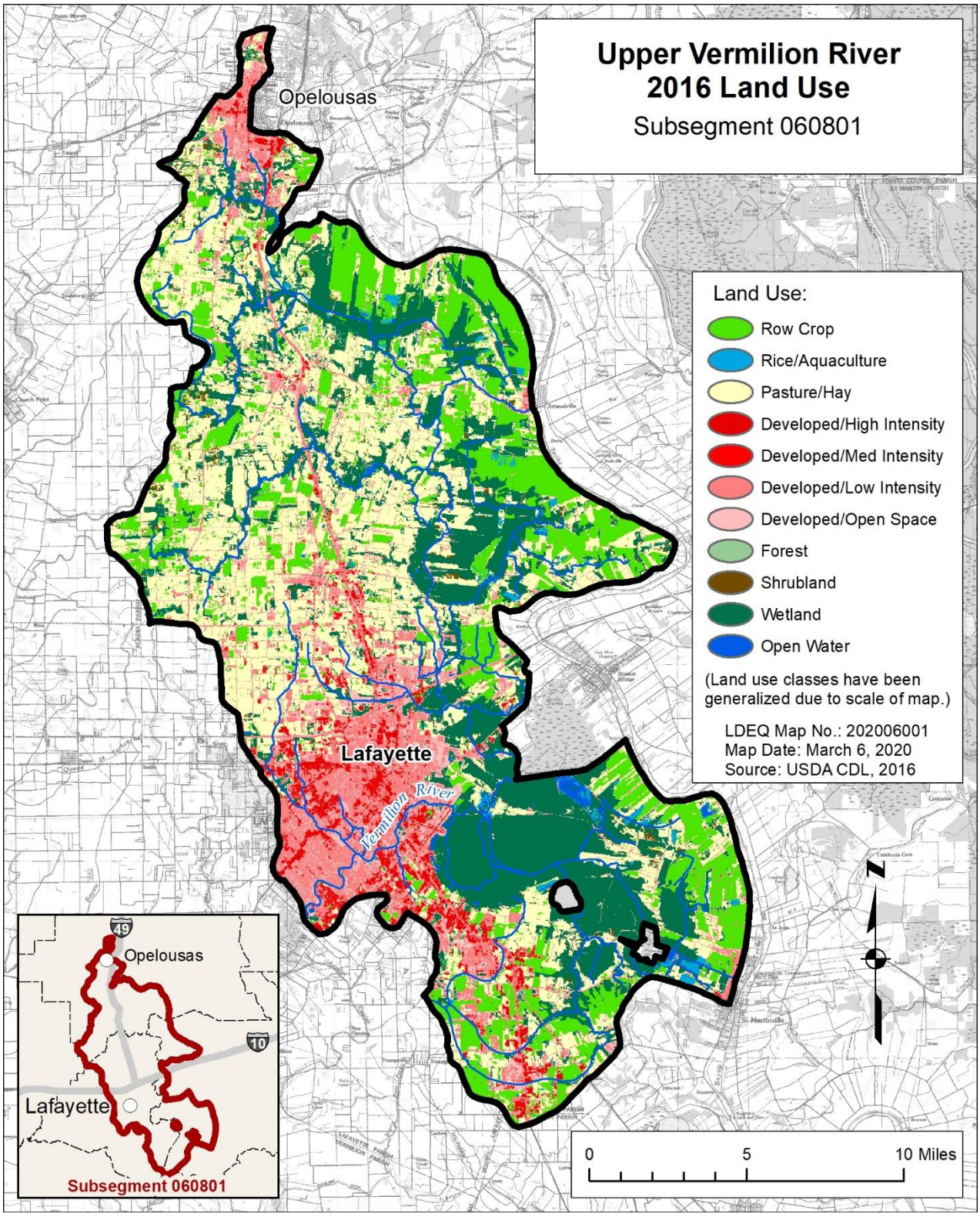


Figure 2: Land Use Map

Table 4: The chart below summarizes the breakdown of land use in Subsegment 060801.

CLASS	AREA	TOTAL %	ACRES	TOTAL ACRES
Grass/Pasture	30.78%	**31.70%**	62841.6	**64,728**
Other Hay/Non Alfalfa	0.92%		1886.4	
Woody Wetlands	24.09%	**24.26%**	49185.7	**49,537**
Herbaceous Wetlands	0.17%		350.9	
Developed/Low Intensity	11.65%	**22.92%**	23784.9	**46,807**
Developed/Med Intensity	2.40%		4906.5	
Developed/Open Space	7.45%		15216.9	
Developed/High Intensity	1.42%		2899.1	
Soybeans	7.67%	**18.09%**	15663.9	**36,940**
Corn	0.15%		306.0	
Sugarcane	4.91%		10026.9	
Sorghum	0.33%		666.7	
Rice	0.19%		396.3	
Dbl Crop WinWht/Soybeans	0.10%		194.8	
Winter Wheat	0.00%		3.1	
Pecans	0%		0.2	
Sweet Potatoes	0%		0.2	
Fallow/Idle Cropland	4.74%		9681.7	
Mixed Forest	0.06%	**1.37%**	130.8	**2,795**
Deciduous Forest	0.12%		241.3	
Evergreen Forest	0.03%		56.9	
Shrubland	1.16%		2366.3	
Aquaculture	0.87%	**1.64%**	1770.9	**3,338**
Open Water	0.77%		1561.4	
Barren	0.00%		5.3	

The six HUC-12s targeted in this project are listed below with their land use breakdowns in Tables 5 through 7. Bayou Bourbeux, Bayou Carencro, Bayou Bourbeux Grand Coteau, and Francois Coulee all have primary suspected source of agriculture with secondary source of on- site disposal systems (OSDSs). Coulee Mine and Anselm Coulee have primary suspected source of malfunctioning OSDSs with secondary source of Agriculture. These 12-digit HUCs were targeted based on the suspected sources of impairment as well as the available data from sampling conducted by Louisiana Department of Environmental Quality (LDEQ) surveys group. The data will be discussed in a later section.

Table 5: Bayou Bourbeaux HUC-12 080801030101 Land Use Breakdown.

Class Name	Percent Area	Area Acres
Grass/Pasture	36%	8999
Woody Wetlands	17%	4249
Developed/Low Intensity	10%	2603
Other Hay/Non Alfalfa	10%	2374
Developed/Open Space	8%	1979
Soybeans	5%	1440
Sugarcane	4%	1189
Shrubland	2%	466
Fallow/Idle Cropland	1%	370
Developed/Med Intensity	1%	300

Table 6: Bayou Carencro HUC-12 080801030102 Land Use Breakdown.

Class Name	Percent Area	Area Acres
Grass/Pasture	57%	11150
Woody Wetlands	12%	2356
Other Hay/Non Alfalfa	5%	1066
Sugarcane	5%	918
Developed/Low Intensity	5%	911
Developed/Open Space	4%	845
Soybeans	4%	838
Fallow/Idle Cropland	2%	491.
Corn	2%	353
Shrubland	1%	255

Table 7: Bayou Bourbeux Grand Coteau HUC-12 080801030103 Land Use Breakdown

Class Name	Percent Area	Area Acres
Grass/Pasture	36%	12517
Woody Wetlands	25%	8835
Soybeans	17%	6145
Developed/Open Space	4%	1442
Developed/Low Intensity	4%	1400
Fallow/Idle Cropland	4%	1231
Other Hay/Non Alfalfa	3%	961
Sugarcane	1%	419
Shrubland	1%	418

Table 8: Francois Coulee HUC-12 080801030105 Land Use Breakdown

Class Name	Percent Area	Area Acres
Grass/Pasture	44 %	8367
Developed/Low Intensity	15%	2957
Woody Wetlands	15%	2927
Developed/Open Space	13%	2484
Soybeans	4 %	718
Developed/Med Intensity	3%	491
Developed/High Intensity	1 %	227
Other Hay/Non Alfalfa	1 %	210

Table 9: Coulee Mine HUC-12 080801030106 Land Use Breakdown

Class Name	Percent Area	Area Acres
Grass/Pasture	33 %	4815
Developed/Low Intensity	31 %	4463
Developed/Open Space	14 %	2089
Developed/Med Intensity	8 %	1152
Developed/High Intensity	5%	752
Woody Wetlands	4 %	523
Sugarcane	1 %	175

Table 10: Anselm Coulee HUC-12 080801030109 Land Use Breakdown

Class Name	Percent Area	Area Acres
Developed/Low Intensity	30%	10519
Grass/Pasture	18%	6518
Developed/Open Space	14 %	5055
Sugarcane	10%	3547
Developed/Med Intensity	7%	2590
Woody Wetlands	6%	2171
Fallow/Idle Cropland	4%	1535
Developed/High Intensity	4.%	1458
Soybeans	1%	525
Open Water	1%	469

Using the Spreadsheet Tool for Estimating Pollutant Loads (STEPL) model, which will be detailed in a later section, nutrient and sediment loads were identified and broken down by HUC-12 as shown in Table 11. Tables 12-16 show fecal coliform calculations from 2016 through 2020 at the ambient site based on flow and FC concentration.

Table 11: Loads by HUC-12 calculated by STEP-L

HUC-12	N Load	P Load	BOD Load	Sediment Load
	lb/year	lb/year	lb/year	T/year
080801030101	215,010	23,984	683,467	2,986
080801030102	200,635	20,446	624,443	2,518
080801030103	275,835	33,308	813,165	4,483
080801030105	165,815	17,952	559,853	2,078
080801030106	138,878	21,692	514,926	1,814
080801030109	289,895	40,851	1,025,968	5,957
Total	**1,286,067**	**158,232**	**4,221,822**	**19,837**

Through planning with Louisiana Department of Agriculture and Forestry (LDAF), the implementation in Bayou Bourbeux (080801030101), Bayou Carencro (080801030102), Bayou Bourbeux Grand Coteau (080801030103), and Francois Coulee (080801030105) will consist of primarily pastureland BMPs with cropland BMPs to supplement. Coulee Mine (080801030106) and Anselm Coulee (080801030109) will focus primarily on education and outreach, focusing on OSDS inspections and lawn care with secondary BMPs focusing on agriculture.

The topographic map in Figure 3 gives a different view of the land use throughout the subsegment. The dark gray area is representative of cities and dense buildings in the city of Lafayette. Another notable

item in this map is the light green areas in the Evangeline Canal HUC-12 in the southeast portion of the map. This is representative of wetlands which dominate the area. Due to the complex nature of the hydrology for Subsegment 060801, the vast majority of the wetlands identified in the land use map do not consistently drain to the Vermilion River in this subsegment, and therefore the impacts of which are not consistently monitored by the ambient station (0045). Subsegment 060801_001, Cote Gelee Wetland-Forested wetland located in Lafayette Parish, and 060806, Cypress Island Coulee Wetland-Forested wetland located in St. Martin Parish are located entirely within and have been isolated from the surrounding subsegment for Sanitary Wastewater Permit Discharging into a Natural Wetland for Wetland Assimilation. So the wetlands are, at least in part, participating in reducing the bacterial load in the greater 060801 subsegment. These factors make it a low priority in the ranking system for BMP implementation in this watershed plan.

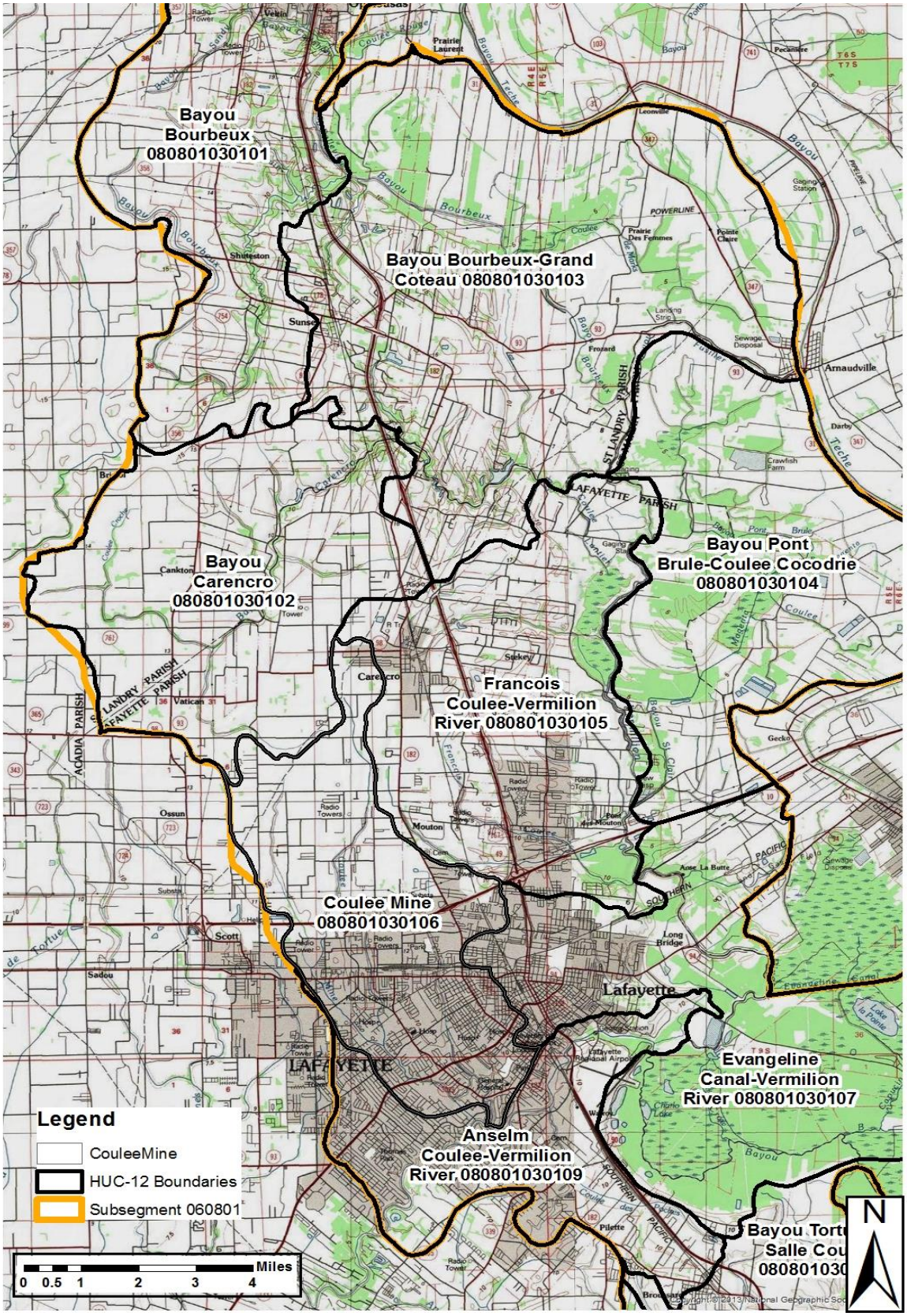


Figure 3: Topographic Map of the Vermilion River Subsegment

Data Analysis

Ambient Water Quality Monitoring Data Analysis

The data below were collected as a part of the LDEQ Ambient Water Quality Monitoring Network (AWQN) program. These data are used to establish water quality criteria, standards, TMDLs, and to determine if a water body will be listed on the IR as impaired or if it has been removed from the list. The analysis gives a visual representation of the impaired parameters, their exceedances, and trends since 1998.

Data at the current ambient site (0045) dates back to 1963. Water quality samples are collected every year through 1968 and starts again in 1978 and collected every year through 1990. There is a data gap from 1991-1998 but data begins again in June of that year through December of 1998. In 1998, the program established its four-year rotating schedule. There is another data gap from January 1999 through September 2010. From that time, sampling at the site began to rotate on a 4-year schedule. Therefore, data is collected in 2010/2011, and 2014/2015. The most recent sampling cycle was conducted from October 2018 through September 2019. Based on the amount of historical data and the current sampling, the data gaps identified will not have a significant effect on data analysis for purposes of this project.

The LDEQ Surveys section began bimonthly monitoring in Vermilion River in March of 2016 and has been sampling since that time. Since 2016, the baseline sampling has shown decreased FC concentrations and fewer exceedances. Monitoring will continue through planned BMP implementation of this project.

Fecal Coliform

The FC levels at the ambient site have fluctuated greatly throughout the seasons. Peaks over 2,000 cfu/100mL are shown on eight sampling points from 1998 through 2015. In October and November 2010 as well as June 2015, those peaks were above 11,000 colony forming units (cfu).

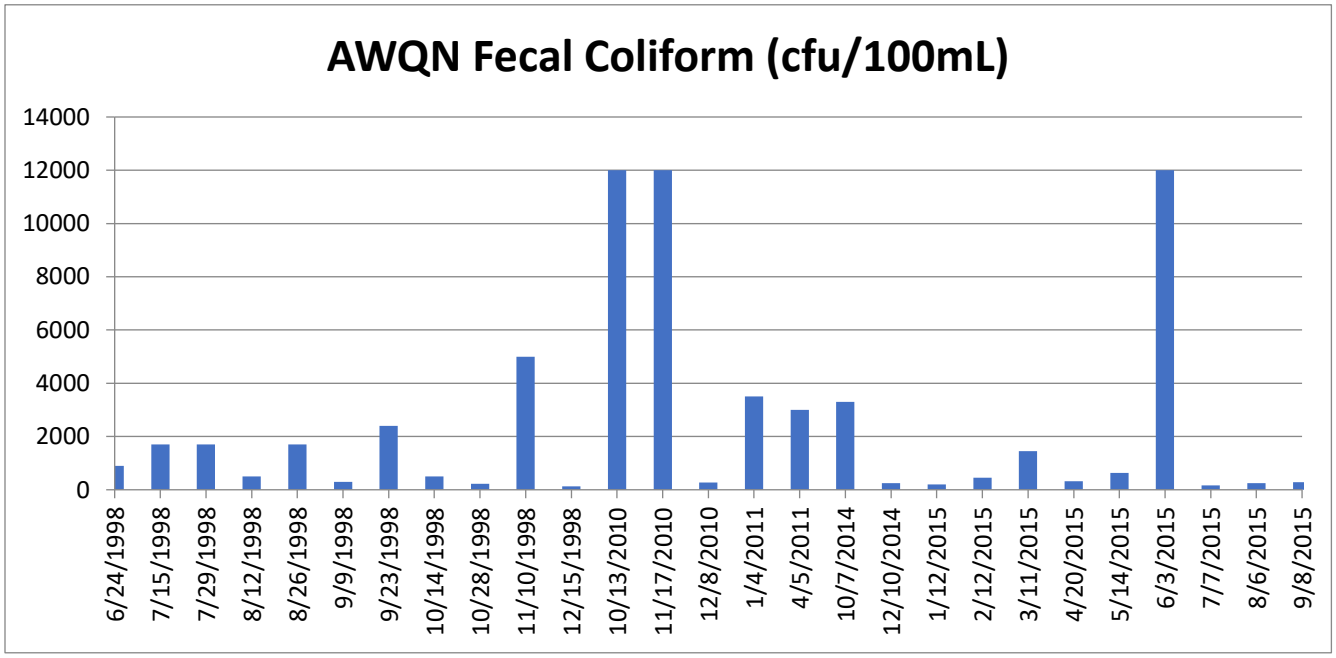


Figure 4: Fecal Coliform Ambient Data from 1998 to present

Dissolved Oxygen

During the 2014/2015 ambient cycle, the DO was below the 5.0 mg/L standard from April through August. In the 2010/ 2011 cycle, the lower values were more sporadic in October, January, May, and August. Overall, it does follow the expected pattern of elevated values in the cooler months and reduced levels during the summer months. The black line is a trend line, which shows a slight decrease in DO from 1998 to 2015. The green line in Figure 5 is the standard of 5.0 mg/L.

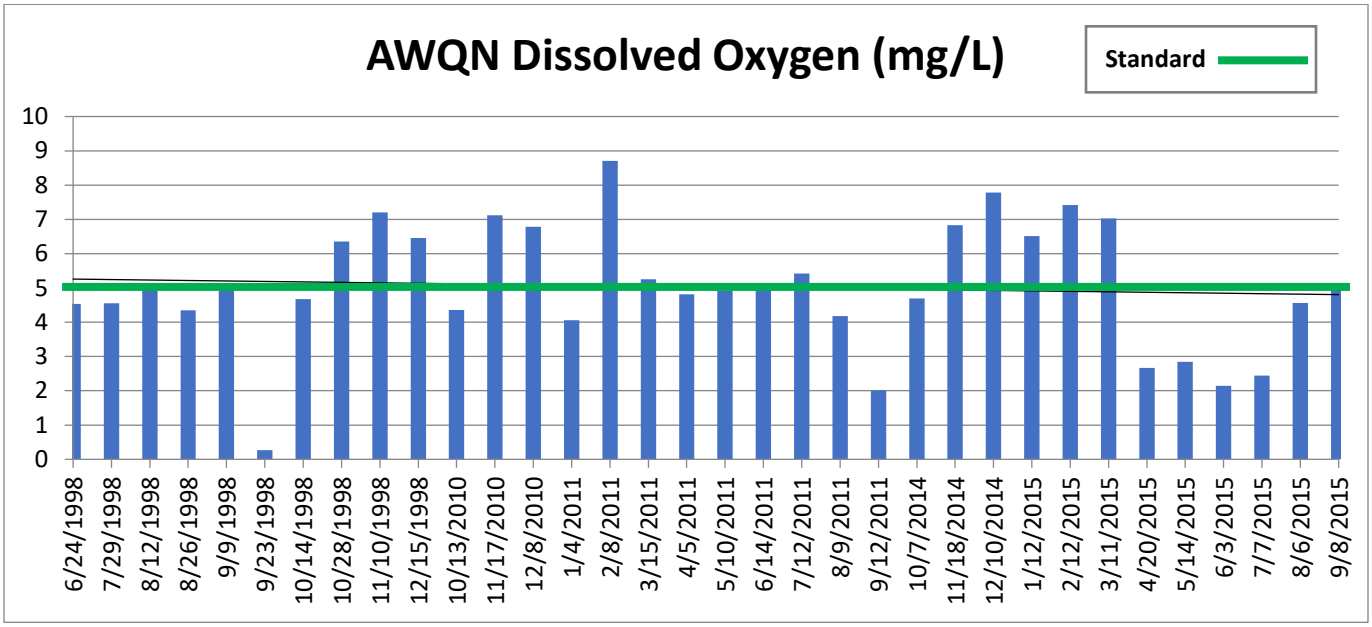


Figure 5: Dissolved Oxygen Ambient Data from 1998 to present

Nutrients

The Nitrate + Nitrite Nitrogen levels are also showing an overall decrease since 1998 based on the trendline shown in black. Elevated nutrient values in May and June may be due, in part, to sugarcane fertilization in April. The values peaked in July 1998 at 1.82 mg/L. Since 2015, the highest value is 0.83 mg/L. As the DO and Nitrate + Nitrite Nitrogen show downward trends, the Total Kjeldahl Nitrogen (TKN) and Total Phosphorus (TP) show upward trends. In the 1998 sampling run, the highest TKN value was 1.15 mg/L in October in 2015 the peak was 2.3 mg/L in August.

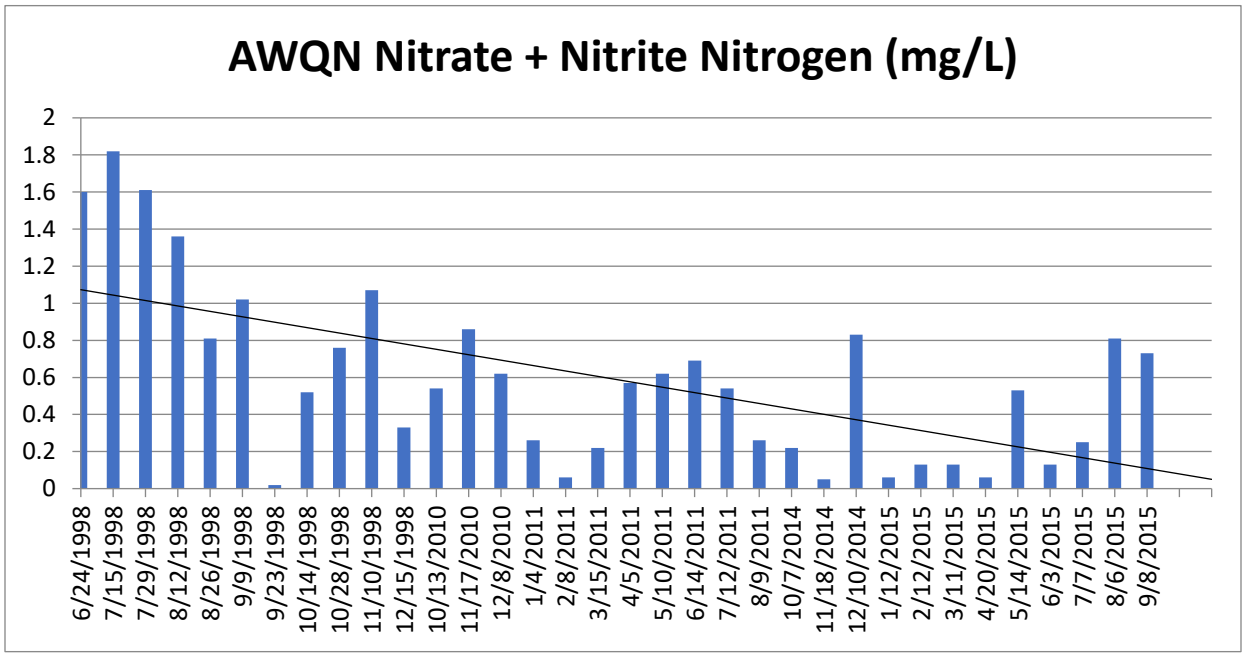


Figure 6: Nitrate + Nitrite Nitrogen Ambient Data from 1998 to present

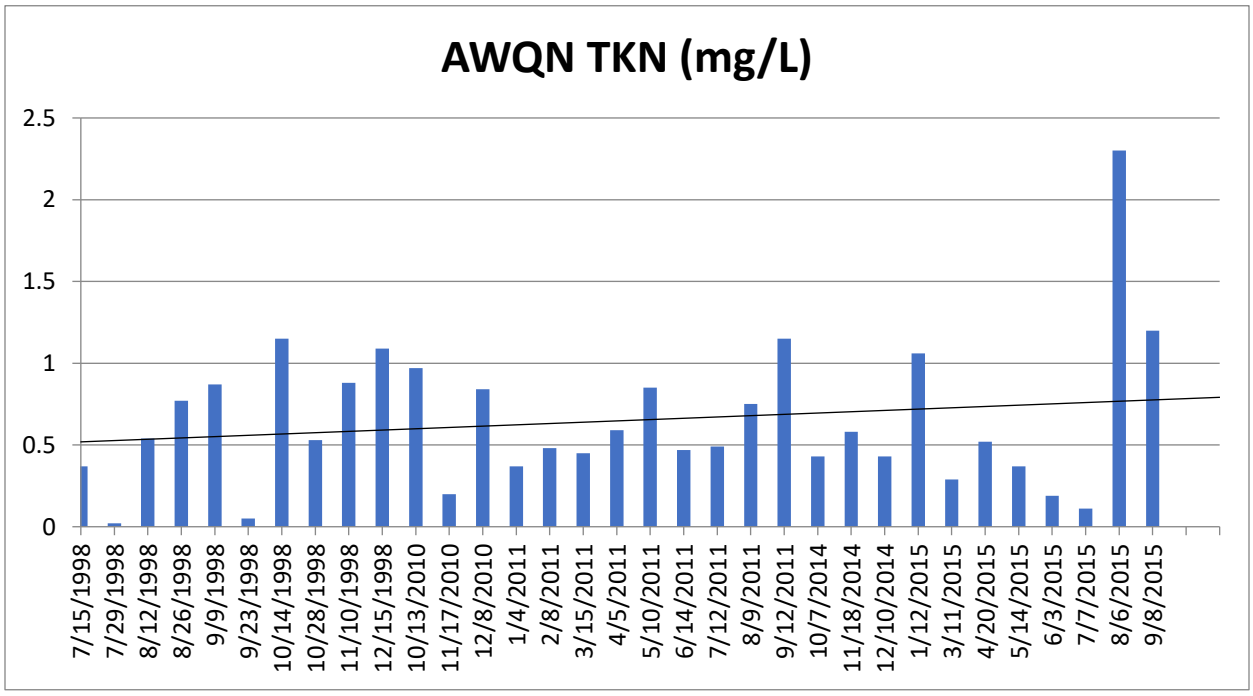


Figure 7: TKN Ambient Data from 1998 to present

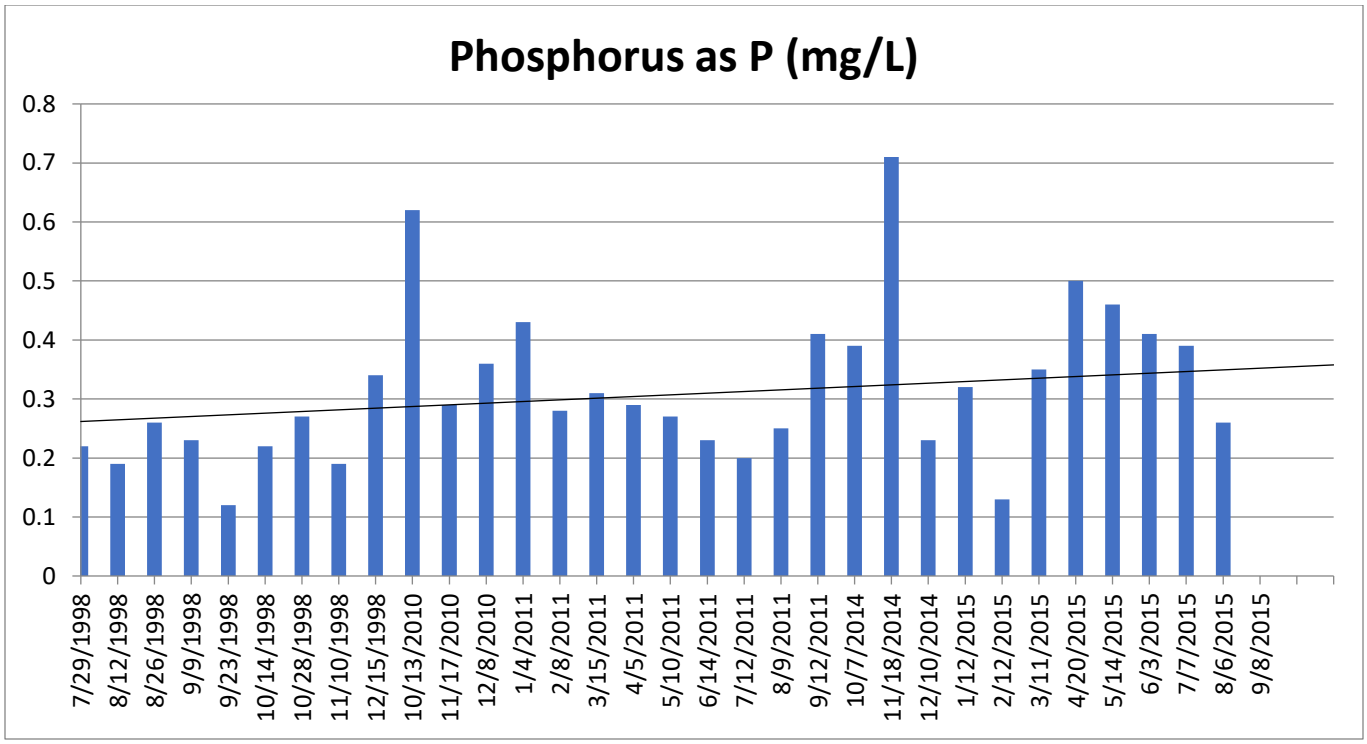


Figure 8: Phosphorus as P TKN Ambient Data from 1998 to present

Baseline Monitoring

Sites

The sampling sites are spread through the targeted HUC-12s Bayou Bourbeux (080801030101), Bayou Bourbeux Grand Coteau (080801030103), Bayou Carencro (080801030102), Coulee Mine (080801030106), Francois Coulee (080801030105) and Anselm Coulee (080801030109). The largest land use percentage in all of these HUCs other than Coulee Mine, is grass/pasture. Therefore, the strategy to reduce nutrients (Nitrogen monitored as Nitrate, Nitrite, and TKN; and Phosphorus) and FC in this document is based on tackling the agriculture issues in the pasture areas with secondary focus on OSDSs. The Coulee Mine HUC-12 is dominated by developed land. The strategy there is to focus on OSDS inspections and continuous monitoring of permitted facilities to reduce FC concentrations with secondary focus on pasture and lawn care issues.

Table 11 shows the original sampling sites, descriptions, and GPS coordinates of those sites. Figure 9 depicts the original sampling sites in the watershed with elevation. Recently, sites 4732, 4735, 4742, 4743, and 4748 have been removed. These sites are still represented by others nearby. At this time, there are 31 active sites. More information on these sites and the detailed sampling design can be found in the sampling plan ***QTRACK# 19-080.***

Table 12: Vermilion River Original Sampling Site Numbers, Descriptions, and GPS Coordinates

LEAU Site No.*	Waterbody	Description	Longitude	Latitude
4731	Coulee Mine	Coulee Mine on Prejean Rd.	-92.065661	30.309502
4732	Coulee Mine	Coulee Mine on Gloria Switch Rd.	-92.063379	30.297798
2346	Coulee Mine	Coulee Mine on Malapart Rd	-92.058598	30.290538
4733	Coulee Mine	Coulee Mine on N. Dugas Rd	-92.067078	30.283195
4734	Unnamed Trib	Unnamed Trib. on N. Dugas Rd	-92.083914	30.283244
4735	Coulee Mine	Coulee Mine on Lebesque Rd	-92.069535	30.275766
4737	Unnamed Trib	Unnamed Trib. on Emile Dr.	-92.087478	30.272300
4738	Unnamed Trib	Unnamed Trib. on Mills St.	-92.091223	30.267553
4739	Unnamed Trib	Unnamed Trib. on Heide Cr.	-92.080392	30.268400
4740	Coulee Mine	Coulee Mine on Roper Dr	-92.069374	30.264213
4741	Unnamed Trib	Unnamed Trib. on Hwy 723/Renaud Dr	-92.078196	30.253985
4742	Unnamed Trib	Unnamed Trib. on Hwy 723/Renaud Dr	-92.055610	30.254144
4743	Unnamed Trib	Unnamed Trib. on Hwy 723/Renaud Dr	-92.041825	30.254248
4744	Unnamed Trib	Unnamed Trib. On Willow St.	-92.059962	30.243596
4745	Coulee Mine	Coulee Mine on Willow St.	-92.072640	30.243024
4746	Unnamed Trib	Unnamed Trib. On Willow St.	-92.077070	30.243004
4747	Unnamed Trib	Unnamed Trib. On Eraste Landry Rd.	-92.039544	30.231788
4748	Unnamed Trib	Unnamed Trib. On Dulles St.	-92.055884	30.219691
4721	Coulee Mine	Coulee Mine on Ambassador Caffery	-92.069034	30.224837
4749	Unnamed Trib	Unnamed Trib. On UPA Rd.	-92.023659	30.208230
4719	Coulee Mine	Coulee Mine on West Bayou Parkway	-92.029314	30.194197
4750	Vermilion River	Vermilion River on Camelia Blvd	-92.048465	30.180981

LEAU Site No.*	Waterbody	Description	Longitude	Latitude
0045*	Vermilion River	Vermilion River on Ambassador Caffery	-92.055934	30.162661
4881	Bayou Bourbeux	Bayou Bourbeux at hickory Road North of Hwy 93	-91.998149	30.412004
2580	Bayou Bourbeux	Bayou Bourbeux off of Hwy 178	-92.092365	30.42742
4882	Bayou Bourbeux	Bayou Bourbeux at Jack Fox Road	-92.062343	30.441197
4883	Bayou Bourbeux	Bayou Bourbeux at Curleys road	-92.113581	30.395837
4884	Bayou Carencro	Bayou Carencro at waters street in Cankton	-92.084553	30.35279
4885	Bayou Carencro	Bayou Carencro at Service Road west side of I-49	-92.053502	30.378914
4886	Bayou Carencro	Bayou Carencro on Clarence Cormier Road	-92.08934	30.33055
4887	Bayou Carencro	Bayou Carencro South- at Meche Road	-92.008874	30.367604
4888	Bayou Fusilier	Bayou Fusilier off of Hwy 93 West of Arnaudville	-91.978361	30.407418
4889	Bayou Fusilier	Bayou Fusilier at Walnut Road	-91.9828	30.3801
4897	Vermilion River	Vermilion River at Arnaudville Road /Fusilier Road	-91.988373	30.367178
4898	Vermilion River	Vermilion River, on University Avenue at Boat Launch Dock	-92.001414	30.209395
4724	Vermilion River	Vermilion River -East Pont de Mouton	-91.984034	30.271983

*Ambient Site

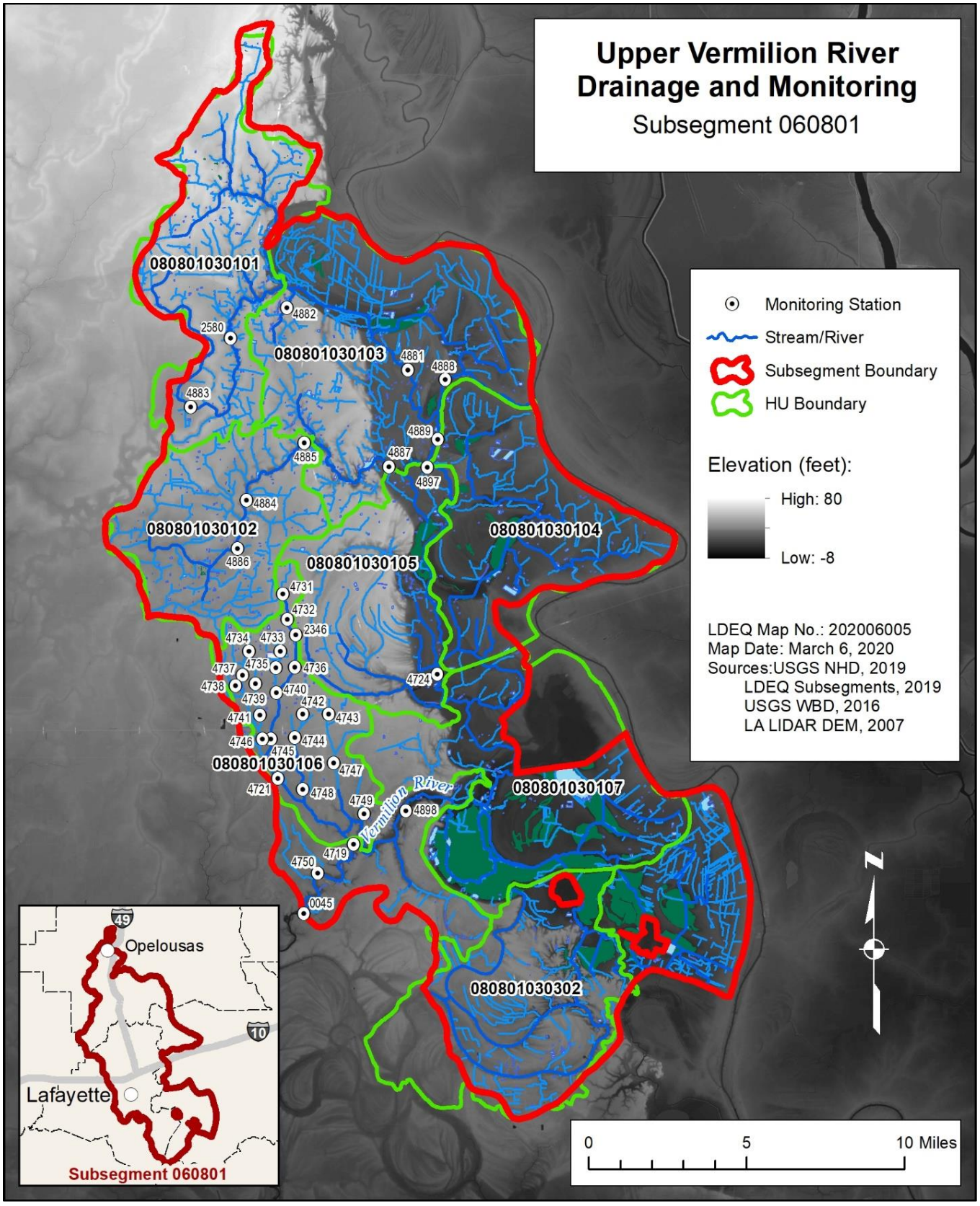


Figure 9 Vermilion River Original Site Sampling Map

Baseline Monitoring Data Analysis

In the baseline data taken by the LDEQ surveys group from 2016 to 2018, noticeably high FC levels are widespread in Coulee Mine (0808010306). The targeted source in that area is OSDSs. Inspections and education and outreach are being conducted by Bayou Vermilion District (BVD). Inspections began July 24, 2017 and they are ongoing along with outreach events throughout the area to educate local stakeholders on the importance of OSDS maintenance. Secondary BMPs in that area will focus on agriculture, with additional education and outreach materials focusing on lawn care.

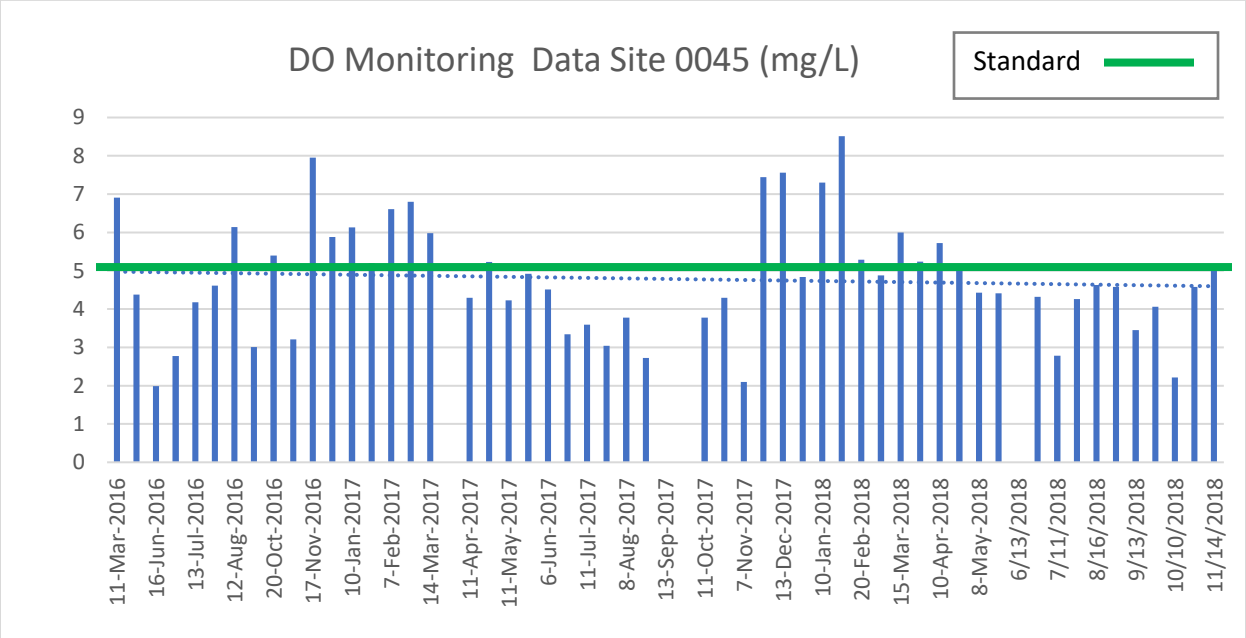


Figure 10: DO Monitoring Data from 2016 to present

Monitoring data starting in March 2016 shows a slight downward trend in DO. In 2016, 42% of values were above the 5.0 mg/L standard needed to meet its designated use. In 2017, that percentage dropped to 41% and increased to 43% in 2018. That decrease in one year is more than in the past 3 years combined. However, the average DO in 2016 was 4.70 mg/L and maintained an overall increase to 4.93 mg/L in 2018.

FC data in Vermilion River showed great improvement from 2016 to 2017 at the ambient site with a decrease of average FC from 9206 cfu/100 mL to 2578 cfu/100 mL. In 2018, the average decreased further to 1432 cfu/100 mL.

Analysis of historical weather data from Weather Underground at the Lafayette Regional Station and comparing it to the water levels at the same time. There were no significant rain events that directly affected the FC. The majority of the improvements expected in this project will come from continued education and outreach, home sewage system inspections, and agricultural BMP implementation by LDAF.

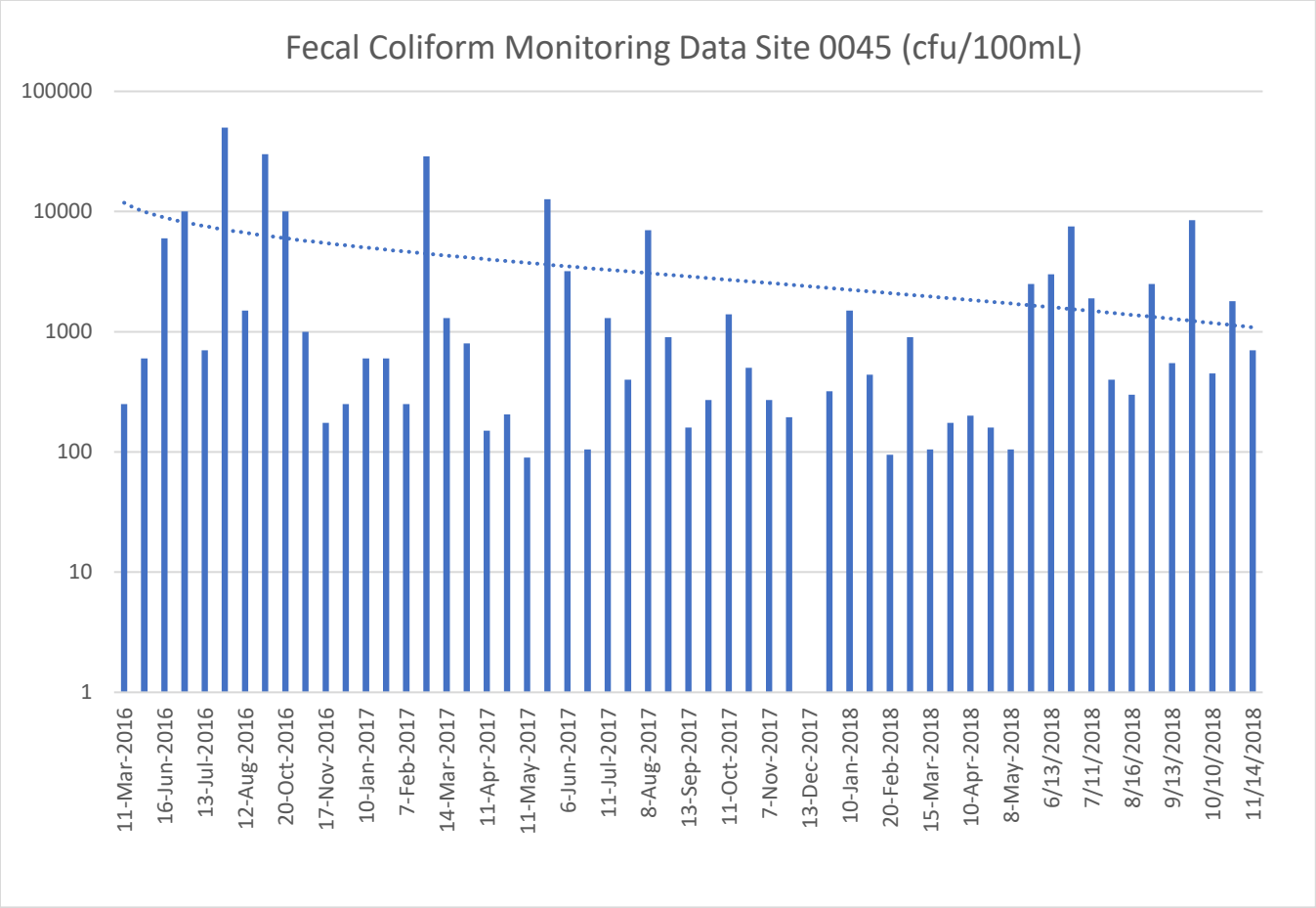


Figure 11: Fecal Coliform Monitoring Data from 2016 to present on a logarithmic scale.

Baseline nutrient analysis began in December 2018. Thus far, there has been an increasing trend of Nitrate Nitrite with an average of 0.46 mg/L. TKN was non-detect from December 2018 to April 2019, with the exception of January when it was 9.44 mg/L. The average TKN from December 2018 to November 2019 is 0.46 mg/L and it is on a decreasing trend. TP has remained between 0.287 mg/L and 0.52 mg/L with the exception of March 2019 when it was 1.42 mg/L.

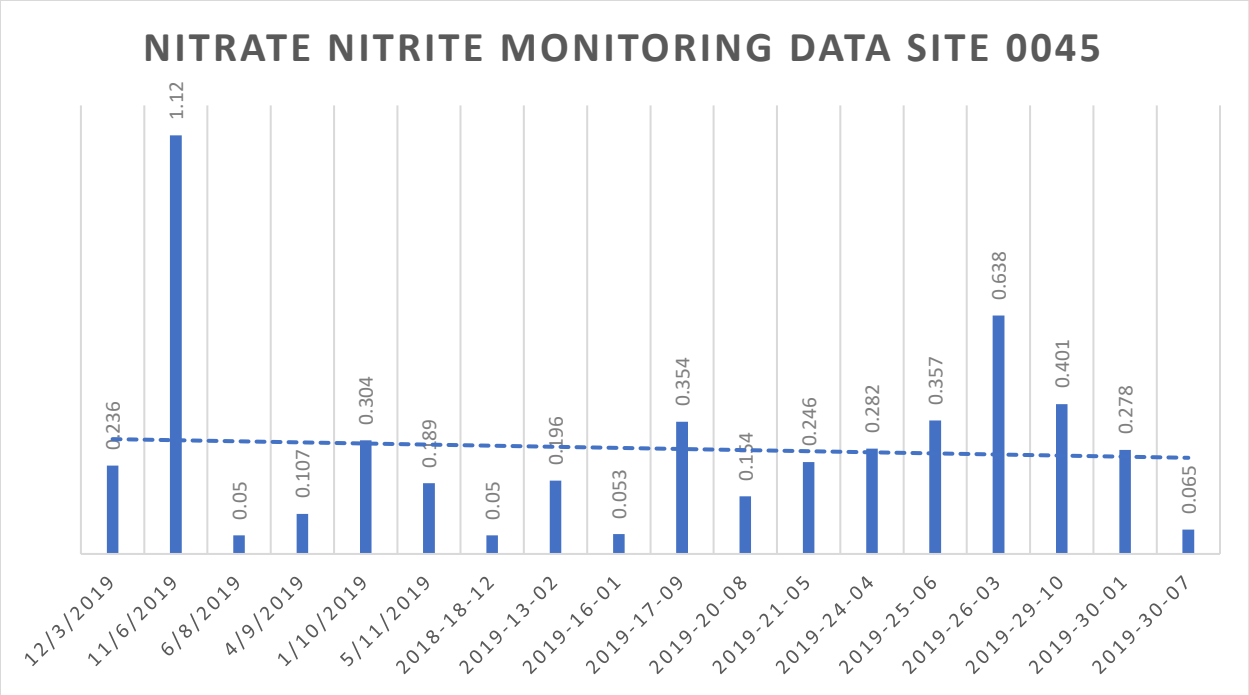


Figure 12: Nitrate Nitrite Monitoring Data from December 2019to July 2019

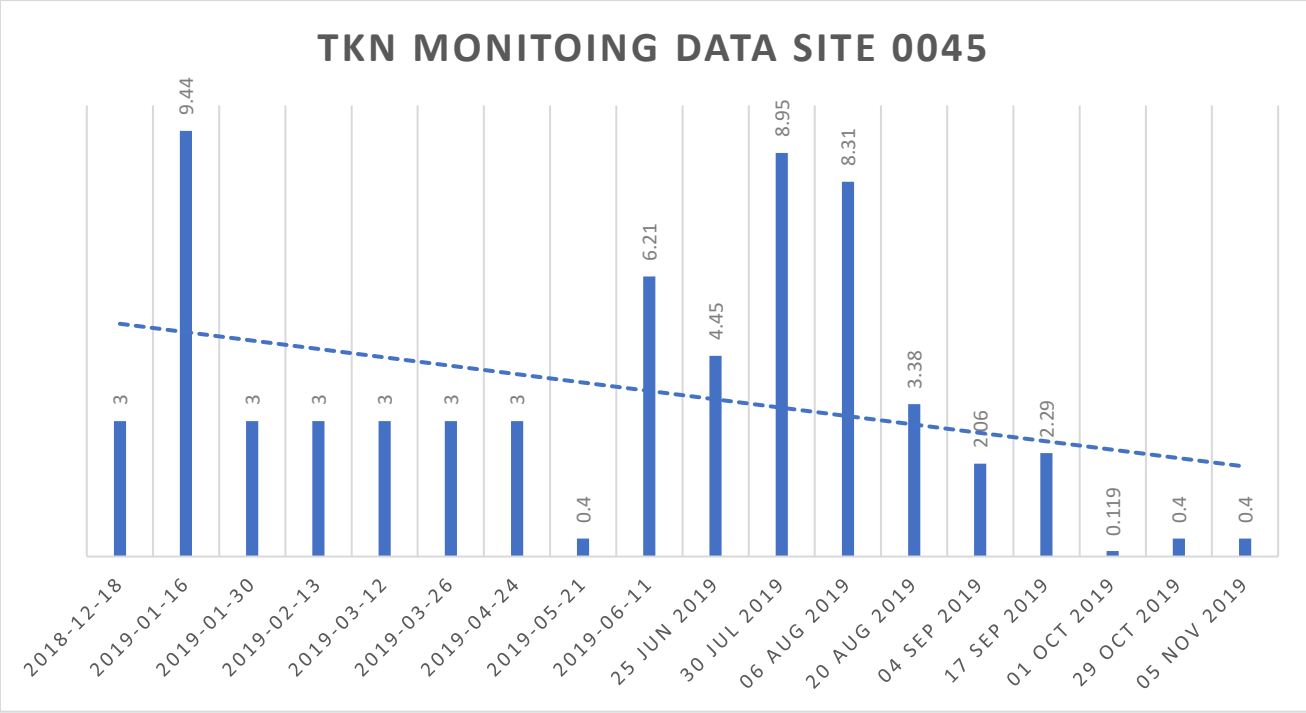


Figure 13: TKN Monitoring Data from December 2018 to November 2019

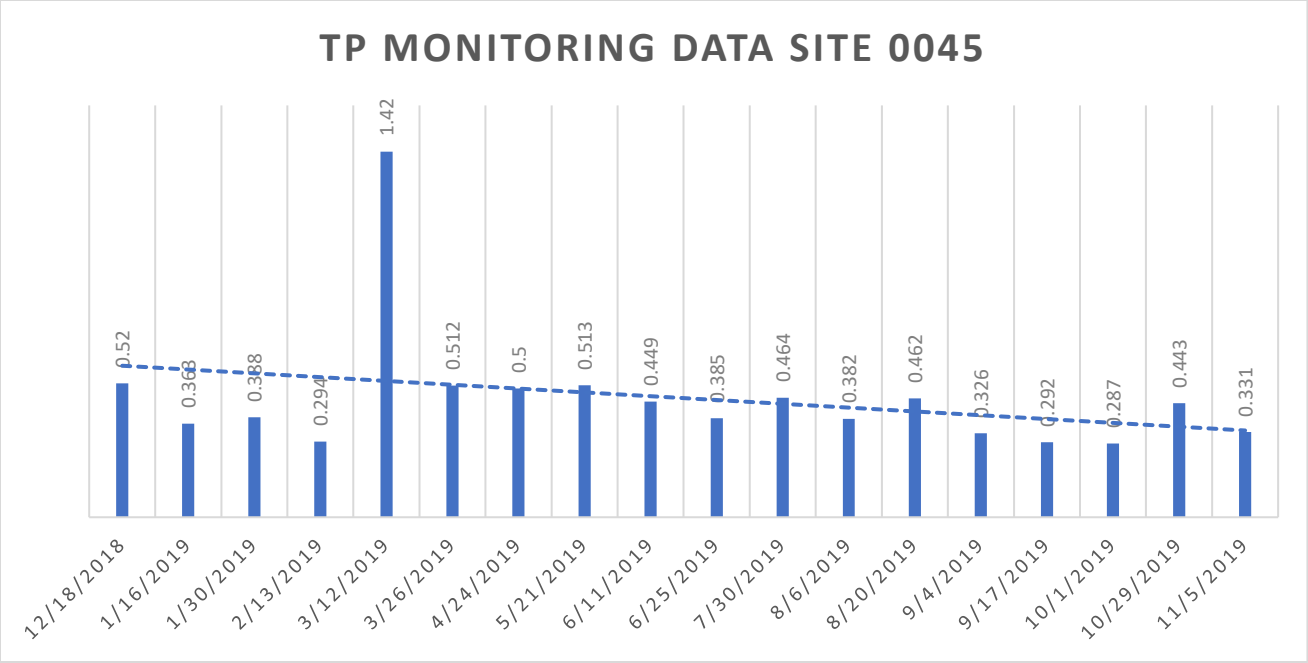


Figure 14: TP Monitoring data from December 2018 to November 2019

Although graphs are only shown for the ambient monitoring site, all available monitoring data at all sites were analyzed to determine hotspots in the watershed. Table 12 shows the site rankings from best to worst based on monitoring data. FC and nutrients are ranked from lowest to highest concentrations while DO is ranked from highest to lowest. By doing this, it ensures that there is continuity in displaying what is considered best to worst for each parameter simultaneously.

Sites highlighted in pink have been labeled as moderate risk because 3 or more of the parameters were ranked within the top 15 sites with worst concentrations of nutrients, DO, and FC. The sites highlighted in red are considered high risk because 3 or more parameters at that site were ranked in the top ten worst sites.

Moderate Risk: 4733, 4735, 4738, 4748, 4749, 4882, 2346

High Risk: 4731, 4734, 4737, 4739, 4740, 4741, 4745, 4881, and 2346

Sites 4731, 4733, 4734, 4737, 4738, 4739, 4740, 4741, 4745, and 2346 are all in areas where malfunctioning OSDSs have been a problem so the ongoing inspections program combined with pump-outs by LDAF should reduce the FC concentrations at some of these sites. Effects from DMRs exceeding their permits will be discussed in Element B.

Table 13: Vermilion River Site Rankings

ALL SITES									
6/2016-10/2019		12/2018-5/2019						6/2016-8/2019	
DO (mg/L)		TKN (mg/L)		Nitrate Nitrite (mg/L)		TP (mg/L)		Fecal Coliform (cfu/100 mL)	
4747	9.47	**4898**	2.88	**4898**	0.09	**4747**	0.345	**4888**	3100
4749	7.96	**4747**	2.94	**4747**	0.099	**4743**	0.361	**4750**	3117
4748	6.19	**4889**	3.14	**4743**	0.146	**4888**	0.366	**4724**	3277
2580	5.8	**2580**	3.16	**4748**	0.147	**2580**	0.379	**0045**	4007
4743	5.67	**4885**	3.17	**4883**	0.162	**4889**	0.403	**4746**	4173
4888	5.54	**4881**	3.23	**2580**	0.18	**4898**	0.425	**4897**	4251
4882	5.5	**4884**	3.33	**4888**	0.24	**4724**	0.445	**4887**	4697
4889	5.35	**4744**	3.35	**4742**	0.242	**4897**	0.45	**4898**	4863
4742	5.32	**4883**	3.4	**4731**	0.255	**4750**	0.462	**4881**	5349
4897	5.3	**4724**	3.42	**4889**	0.26	**0045**	0.463	**4721**	5839
4732	4.98	**4721**	3.46	**4897**	0.26	**4885**	0.485	**4886**	6101
4719	4.94	**4882**	3.46	**4750**	0.264	**4742**	0.494	**4745**	6190
4721	4.83	**4888**	3.48	**4724**	0.269	**4887**	0.545	**4737**	6277
0045	4.82	**4750**	3.49	**4887**	0.269	**4719**	0.563	**2580**	6366
4724	4.79	**4886**	3.55	**0045**	0.28	**4884**	0.633	**4732**	6652
4741	4.7	**0045**	3.58	**4744**	0.3	**4886**	0.644	**4889**	7393
4738	4.67	**4897**	3.61	**4732**	0.323	**4883**	0.647	**4882**	7521
4750	4.66	**4887**	3.66	**4719**	0.34	**4744**	0.665	**4743**	7541
4734	4.37	**4719**	3.75	**4886**	0.379	**4721**	0.761	**4731**	7768
4898	4.33	**4743**	3.75	**4885**	0.386	**4732**	0.787	**4884**	7785
4737	4.26	**4746**	3.79	4749	0.405	4749	0.849	**4883**	7793
2346	4.23	**4742**	3.87	4733	0.41	4882	0.876	2346	7887
4884	4.12	4735	4.04	4738	0.55	4745	0.969	**4885**	8561
4885	3.92	4748	4.11	**4746**	0.557	4735	0.981	**4733**	8681
4733	3.75	4749	4.29	2346	0.59	4738	1.04	**4744**	9287
4735	3.71	4739	4.39	**4884**	0.615	4733	1.05	**4742**	9759
4744	3.7	**4732**	4.52	**4739**	0.665	4748	1.05	4735	10116
4881	3.67	**4745**	4.62	4735	0.77	**4746**	1.09	4748	16195
4740	3.65	**4737**	4.68	**4721**	0.999	**4881**	1.16	4738	19283
4887	3.45	4733	4.82	**4741**	1.025	2346	1.17	**4734**	22741
4883	3.45	**4741**	4.9	**4740**	1.05	**4740**	1.2	**4719**	26517
4745	3.402	4738	5.14	**4881**	1.499	**4741**	1.24	**4739**	30179
4739	3.4	**4734**	5.34	**4745**	1.54	**4739**	1.3	**4740**	32433
4886	3.3	**4740**	5.87	**4737**	1.75	**4737**	1.456	**4747**	33567
4746	3.16	2346	7.61	4882	2.19	**4734**	2.53	4749	35163
4731	2.31	**4731**	8.29	**4734**	5.13	**4731**	2.56	**4741**	157882

avg	4.63	**avg**	4.11	**avg**	0.68	**avg**	0.86	**avg**	15230.86
max	9.47	**max**	8.29	**max**	5.13	**max**	2.56	**max**	157882
min	2.31	**min**	2.88	**min**	0.09	**min**	0.345	**min**	3100

Element B: Expected Load Reductions

TMDLs

Fecal Coliform

The FC TMDL was written in 2001 for subsegments 060801 and 060802 combined and has not been updated since that time. The sources of FC bacteria are the same as those listed in the 2001 TMDL. They are small package plants, OSDSs, point sources, agriculture, and natural sources. The main sources of agriculture in subsegment 060801 as shown in the land use chart in Table 3 are, soybeans, corn, and less than 1% sorghum and rice. The watershed is approximately 31% grass and pasture, possibly where both cattle and horses could be raised, along with urban and rural residences consisting of domesticated animals.

The TMDL states that subsegments 060801 and 060802 need an 88% reduction in FC from May-October to meet the PCR standard in the summer season. The calculations are based on FC concentrations of 200 cfu/100mL and a flow of 600 cfs (cubic feet per second). This flow is an average during the PCR season (May to October). With this information, the average loading during the PCR season can be calculated. At the time when the TMDL was done the average load was 2.44 E13 cfu/day. Using the same information, the load required to meet 200 cfu/100 mL was calculated to be 2.93 E12 cfu/day giving a required load reduction of 2.15 E13 cfu/day. This reduction will not be used in the strategy for this document because it was calculated based upon two subsegments as well as a much more stringent standard than the PCR standard for the impairment to be removed from the IR.

In the TMDL all reduction calculations are based on reaching a 200 cfu/100 mL standard. So, because we want to reach the standard at 400 cfu/100mL, the same information above can be used to calculate the load required to meet that standard. Using 400 cfu/100mL and the average flow at the time, 600 cfs, the load required to meet the standard is 5.87 E12 cfu/day. Then if we use the average load at the time, 2.4 E 13 cfu/day and subtract the load required to meet the standard, it becomes 1.85 E13 cfu/day or 76%.

The Table 12 includes data from the baseline analysis taken from 2016 through October of 2018 during the PCR season only. FC values in red exceed the PCR standard. Flows were measured at each sampling event, thus, loads were calculated based on the flow on the day samples were taken and the maximum loads to meet the standard were calculated with the flow taken that same day using 400 cfu/100ml, the PCR standard needed to meet the designated use.

Table 14: Fecal Coliform Loads and Percent Reductions Required to meet the PCR designated use

	Flow (cfs)	Fecal (CFU/100mL)	Load (cfu/day)	Criteria Load	Percent Reduction
6/29/2016	942	10000	2.30E+14	9.22E+12	96%
7/13/2016	498	700	8.53E+12	4.87E+12	43%
7/27/2016	1240	50000	1.52E+15	1.21E+13	99%
8/12/2016	710	1500	2.61E+13	6.95E+12	73%
9/27/2016	1130	30000	8.29E+14	1.11E+13	99%
10/6/2016	697	10000	1.71E+14	6.82E+12	96%

10/20/2016	636	1000	1.56E+13	6.22E+12	60%
5/11/2017	2330	90	5.13E+12	2.28E+13	0%
5/23/2017	1360	12700	4.23E+14	1.33E+13	97%
6/6/2017	1870	3200	1.46E+14	1.83E+13	88%
6/20/2017	890	105	2.29E+12	8.71E+12	0%
7/25/2017	28.9	400	2.83E+11	2.83E+11	0%
8/8/2017	999	7000	1.71E+14	9.78E+12	94%
8/22/2017	835	900	1.84E+13	8.17E+12	56%
9/13/2017	39.4	160	1.54E+11	3.86E+11	0%
9/27/2017	22.4	270	1.48E+11	2.19E+11	0%
10/25/2017	29.7	500	3.63E+11	2.91E+11	20%
6/13/2018	534	3000	3.92E+13	5.23E+12	87%
6/27/2018	523	7500	9.60E+13	5.12E+12	95%
7/24/2018	347	400	3.40E+12	3.40E+12	0%
8/16/2018	817	300	6.00E+12	8.00E+12	0%
8/29/2018	697	2500	4.26E+13	6.82E+12	84%
9/13/2018*	792	550	1.07E+13	7.75E+12	27%
9/27/2018	792	8500	1.65E+14	7.75E+12	95%
10/10/2018	704	450	7.75E+12	6.89E+12	11%
10/24/2018*	704	1800	3.10E+13	6.89E+12	78%

* used flow from sampling event in the same month/year for calculation purposes

In 2016, every sampling event from June through October exceeded the PCR criterion. By 2017, exceedances during the same months were reduced by 50% and in 2018 there were 78% exceedances. This is increased from 2017, but still has not increased past the 2016 exceedances and maintains an overall 22 % decrease. In 2016, BVD began their inspections as a part of their education and outreach. Through raising awareness and conducting OSDS inspections in Coulee Mine (080801030106), the number of exceedances per year in subsegment 060801 were decreased by 50% in 2017. Further reductions are expected as inspections continue.

DO/Nitrogen

The original TMDL for DO and Nitrogen was prepared for subsegments 060801 and 060802 in 1987. The DO criteria for subsegment 060801 is 5.0 mg/L year-round and the criteria for 060802 is 5.0 mg/L from January to April and 3.5 mg/L from May to December. It was determined in the 1996 declaratory ruling that the Nitrogen loading required to maintain the DO standards is the Nitrogen TMDL. The load allocation in this TMDL calls for a 50% reduction of nonpoint source pollution in subsegments 060801 and 060802 combined to accelerate progress toward full support of the DO standard. The margin of safety is approximately 5% and becomes greater than 10% considering the conservative inputs to the model. The summer and winter load allocation for the sum of Organic Nitrogen, NH_3N, and NO_3N is 905 lbs/day. According to the TMDL, point sources are not major contributors to the pollutants in the watershed. Most

improvement will be apparent in nonpoint source pollutant reductions. Neither the AWQN data or the baseline data provide enough information to calculate nutrient loads as the sum of the parameters given in the TMDL. However, the TMDL does specify that a 50% reduction of manmade nonpoint source pollution would be required in subsegments 060801 and 060802 combined to make progress toward full support of the DO standard. Because of this, it was decided to calculate what concentrations would be considered a 50% reduction based on the available data when the TMDL was done. From those concentrations we determined specific reductions required based on ambient and current data instead of relying on data 20 to 30 years old.

DO concentrations have been shown to be most sensitive to temperature, reaeration, depth, and background Sediment Oxygen Demand (SOD). Critical conditions occur when there is low flow and high temperature, which in Louisiana is representative of the hot, summer months. Table 15 illustrates the average nutrient values during each AWQN sampling run since 1998. The data from 1978 through August 1985 was included because the TMDL was developed with all available ambient nutrient data before the 1987 survey. These averages are used in calculating the acceptable nutrient values to support the DO standard of 5 mg/L year-round.

Table 15: Ambient Water Quality Network Sampling Nutrient Averages

AWQN sampling Nutrient Averages (mg/L)			
Time Period	**Nitrate+Nitrite Nitrogen**	**TKN**	**Total Phosphorus**
1978-1985	0.43	1.69	0.71
1998/1999	0.99	0.63	0.23
2010/2011	0.48	0.63	0.33
2014/2015	0.33	0.68	0.35

The WLA from the 1987 TMDL and the 1999 and 2001 reviews of the TMDL recommend a 50% reduction in nonpoint source pollution. The values below represent 50% of the nutrient concentrations during the time period the TMDL was developed.

Table 16: 50% Reductions needed for Nitrate+ Nitrite Nitrogen, TKN, and Total Phosphorus

(mg/L)	Nitrate+Nitrite Nitrogen	TKN	TP
1978-1985 50% Reduction	.215	.845	.355

Nitrate + Nitrite Nitrogen values during the 2014/2015 AWQN sampling need a 35% reduction. The TP value needs less than 1% reduction and the TKN value is already below the target value. Table 17 A, B, C, and D below show the nutrient decreases and DO increases at the ambient site (0045) needed to restore

FWP use support. The values in red in Table 17 are exceedances during the PCR season based on the 50% reductions.

Table 17 A, B, C, D: Nutrient Improvements needed to remove impairments from the integrated report using AWQN data.

A.

TP Ambient Reductions TMDL (0.355 mg/L May – October)		
	Result (mg/L)	Decrease Required
10/7/2014	0.39	10%
11/18/2014	0.71	100%
12/10/2014	0.23	0%
1/12/2015	0.32	0%
2/12/2015	0.13	0%
3/11/2015	0.35	0%
4/20/2015	0.5	41%
5/14/2015	0.46	30%
6/3/2015	0.41	15%
7/7/2015	0.39	10%
8/6/2015	0.26	0%

B.

DO Ambient Increases Criteria (5 mg/L May-October)		
	Result (mg/L)	% Increase Required
10/7/2014	4.69	6%
11/18/2014	6.83	0%
12/10/2014	7.78	0%
1/12/2015	6.51	0%
2/12/2015	7.42	0%
3/11/2015	7.03	0%
4/20/2015	2.67	47%
5/14/2015	2.84	43%
6/3/2015	2.14	57%
7/7/2015	2.44	51%
8/6/2015	4.56	9%
9/8/2015	5.11	0%

C.

Nitrate + Nitrite Nitrogen Ambient Reductions TMDL (0.215 mg/L May – October)		
	Result (mg/L)	% Decrease Required
10/7/2014	0.22	2%
11/18/2014	0.05	0%
12/10/2014	0.83	286%
1/12/2015	0.06	0%
2/12/2015	0.13	0%
3/11/2015	0.13	0%
4/20/2015	0.06	0%
5/14/2015	0.53	147%
6/3/2015	0.13	0%
7/7/2015	0.25	16%
8/6/2015	0.81	277%
9/8/2015	0.73	240%

D.

TKN Ambient Reductions TMDL (0.845 mg/L May – October)		
	Result (mg/L)	Decrease Required
10/7/2014	0.43	0%
11/18/2014	0.58	0%
12/10/2014	0.43	0%
1/12/2015	1.06	25%
3/11/2015	0.29	0%
4/20/2015	0.52	0%
5/14/2015	0.37	0%
6/3/2015	0.19	0%
7/7/2015	0.11	0%
8/6/2015	2.3	172%
9/8/2015	1.2	42%

In the results in Table 17, it can be seen that for each TP result that needs to be reduced, the DO needs to increase to meet the standard. The only sampling point where the TP is within the required range and DO is within the standard is on 8/6/2015. On that date, both Nitrate + Nitrite Nitrogen and TKN values are extremely high. With this analysis of ambient and baseline data, along with the TMDL reduction suggestions it is believed that if the specified reductions are made, the DO will meet the standards required to meet FWP use support.

The sampling plan for this project was updated in September 2018 to include nutrient sampling (TP, TKN, Nitrate-Nitrite). As results come in, those values will be compared to the data from the last ambient run to see if they correspond as closely as the relationships shown in Table 15.

In addition to the reductions required based on the AWQN sampling run, LDEQ scientists analyzed the current baseline data, not for exceedances, but instead for the sampling events when the DO was above the standard of 5.0 mg/L. The nutrient and FC concentrations for those same sampling events were reviewed to see if they agree with the TMDL findings. The comparison shows a clear disconnect between the average TKN in baseline data (4.11 mg/L) and the calculated 50% reduction (0.845 mg/l) as well as the 2014/2015 AWQN average (0.68 mg/L). There seems to be no correlation between the two values.

The 2016-2019 nutrient averages were calculated from all sample sites whose DO averages are greater than 5.0 mg/L as an example of what would be considered “good nutrient values”. Sites 4748, 4749, and 4882 also had DO averages above 5.0 mg/L, however, they were excluded from this calculation because its nutrient and FC values were consistently above the site averages in the subsegment. This exclusion gave a better estimate of what should be expected at sites with overall healthy DO.

The load allocation in the DO and nutrient TMDL explains that the nonpoint source pollution should be reduced 50% in subsegments 060801 and 060802 based on data taken from 1978-1987 as shown in Table 17. A 50% reduction of TKN based on data from 1978-1987 is 0.845 mg/L. Baseline data statistics calculated at sites with DO averages greater than 5.0 mg/L shows that a TKN value to achieve DO concentrations of 5.0 mg/L or greater is 3.42 mg/L. This number is 75% different from what was suggested by the TMDL. This difference is attributed to the lab analysis of TKN having a non-detect value of 3.0 mg/L for the first four years of baseline sampling. The Nitrate Nitrite value is only 8% different from the TMDL suggestion and TP is 11% different. TKN should be reevaluated when the TMDL is updated. All information above will be considered in load reduction strategies.

Table 18: Reductions based on 1978-1987 data, nutrient averages at sites with DO values greater than 5.0 mg/L, Nutrient averages at all sites

	Nitrate+Nitrite Nitrogen (mg/L)	TKN (mg/L)	TP (mg/L)
1978-1985 50% Reduction	.215	.845	.355
2014/2015 AWQN Averages	0.33	0.68	0.35
2018-2019 Baseline Data Averages All Sites	0.68	4.11	0.857
2016-2019 Averages with DO > 5.0 Excluding sites 4748, 4749, and 4882	0.20	3.42	0.3997

Spreadsheet Tool for Estimating Pollutant Loads (STEPL)

The STEPL model employs simple algorithms to calculate nutrient and sediment loads from different land uses, and the load reductions that would result from the implementation of various best management practices (BMPs). Experimentation with this model allowed LDEQ to choose which BMPs would have the most impact on the watershed. Although many BMPs will be implemented in the area in addition to these listed, STEPL has shown that the combination below will yield the most reduction in N and P. This assumes that all BMPs are applied to 50% of the applicable land use area.

To use the model, the land use acreages in tables 5-10 were input into the STEPL model. The land uses in the model are urban (43,722 ac), cropland (19,895 ac), pastureland (56,979 ac), and forest (21,062 ac). The land uses categories in the HUC 12s were more specific than those in the model so they were combined specifically to match model input. Next, STEPL calculated nutrient and sediment loads in each subwatershed. In order to complete calculations, amounts of BMPs implemented had to be estimated. Based on a list of available BMPs from LDAF for each impairment, those expected to be implemented were input into the model one by one.

Since there is no way to determine the number of sign-ups in the area, it was chosen that calculations would be done based on application to 50% of the applicable land use area. The BMPs chosen are applicable in cropland and pastureland which means the cropland BMPs should be applied to 50% of the cropland (9,948 ac) and the pastureland BMPs should be applied to 50% pastureland (28,490 ac). This assumes beginning with 0% application. If there is more, that gives us a more conservative estimation, which means higher reduction percentages are possible.

More details on BMPs and reductions expected are detailed in the next section.

Projected Reductions

From research with previous projects, it has been demonstrated that there are decreases in water quality before increases are seen because of the initial disturbances caused by some BMP implementation. After these disturbances, a lag time is observed where the waterbody must get back to its “new normal” state and then it is possible to see if water quality begins to increase. Taking this, and the BMP implementation process into account major improvements are not expected immediately following implementation but instead gradually.

Fecal Coliform

In order to Restore PCR use impairment due to elevated levels of bacteria, no more than 25% of the sampling events can exceed the 400 cfu/100mL standard for FC. Since the PCR season is from May to October, that leaves only six sampling events during the AWQN sampling. Of these six, only ONE can exceed the standard at the ambient site for the water body to be considered supporting SCR uses, which makes it only 16.7%. During the 2016 PCR season, 100% of the samples exceeded the standard. In 2017, 58% of the sampling events exceeded the standard, and in 2018, 75% of the sampling events exceeded the standard. In 2016, BVD began implementing an OSDS inspection program, which is believed to be responsible for the reduction from the previous year. The exceedance percentage did increase from 2017 to 2018, but maintained an overall 25% reduction in the number of exceedances from 2016 to 2018.

In 2018, 75% of the sampling events exceeded the standards. That leaves a 58.3% reduction required to meet the 16.7% or 1 exceedance per PCR season. It is estimated that the exceedances will be reduced by an additional 21.9% from the ongoing inspection program, based on the improvements from 2016 to

2018. This means only 36.4% reduction is required to make the standard of 16.7% of sampling event exceedances in the PCR season. The FC BMPs are expected to help achieve the remaining 36.4% reductions over the remaining life of the project. More reductions are expected from the BMPs, but this is the minimum reduction needed to meet the standard.

The chart in Figure 15 shows the expected decreases in FC bacteria throughout the term of the project.

Assumptions:

- Improvements from inspections taper off at 50% rate every 2 years (25%, 12.5%, 6.25%, 3.125 = Roughly 47%).
- At least 37% reductions from BMP implementation, considering a 1 year lag time.

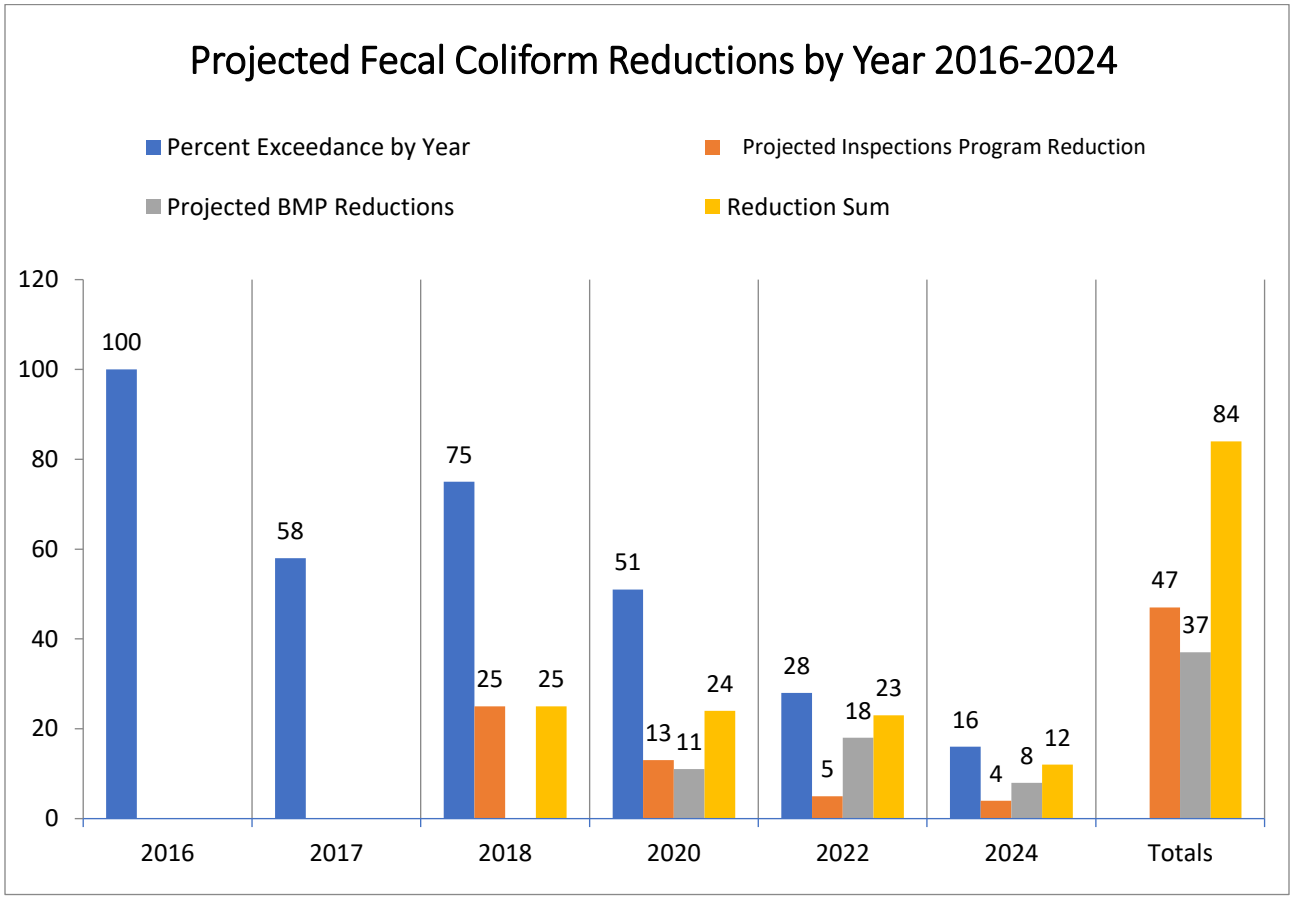


Figure 15: Expected Fecal Coliform Reductions from 2016-2024

LDEQ along with LDAF plans to incorporate OSDS pump-outs and system repair with cost share assistance to support the inspections program already in place in the Vermilion River watershed. The impact and reductions expected specifically from pump-outs varies. The exact reductions from pump-outs will be determined from data analysis after implementation of the program begins. The plan will be updated if any changes are made.

Nutrients

The TMDL requires a 50% nutrient reduction of nonpoint sources to meet the DO Standard.

STEPL estimates a 40.6 % reduction in TP and a 34.1% reduction in N using the BMPs shown in Table 22. This calculation does not include the remaining BMPs shown in Table 23. If the necessary nutrient reductions are obtained with the first set of BMPs, any additional reductions should further increase water quality and reduce the amount of time needed to meet the standard.

Based on the analysis of the nutrient values from the 2014/2015 AWQN sampling, the Nitrate + Nitrite Nitrogen and TP correspond most closely with the DO results in this watershed. Since the TP levels are within 1% of the required values and the Phase 1 BMPs will also cause a reduction, and TKN is already below the required value, Nitrate + Nitrite Nitrogen will be most important in achieving the DO reductions needed to meet the 5.0 mg/L standard. This will be the only nutrient parameter used to show hypothetical reductions in this document.

Table 19: DO AWQN Data Increases Required

DO AWQN Increases Required			
	Result (mg/L)	Criteria (mg/L)	% Increase Required
10/7/2014	4.69	5.0	6%
11/18/2014	6.83	5.0	0%
12/10/2014	7.78	5.0	0%
1/12/2015	6.51	5.0	0%
2/12/2015	7.42	5.0	0%
3/11/2015	7.03	5.0	0%
4/20/2015	2.67	5.0	47%
5/14/2015	2.84	5.0	43%
6/3/2015	2.14	5.0	57%
7/7/2015	2.44	5.0	51%
8/6/2015	4.56	5.0	9%
9/8/2015	5.11	5.0	0%

The FWP standard is 5 mg/L year round for DO, which means all sampling events throughout the year are applicable. In order to meet the standard, no more than 25% of the DO values can be below 5.0 mg/L. In this case, that means there must be three or less exceedances within a year. In the 2014/2015 ambient sampling run, there were six exceedances. Analysis of weather data from each of the exceedance dates shows no rain event around the sampling event. To meet the standard, at least 50% or three of those exceedances must meet the standard. This requires a 50% reduction in the number of exceedances within a year.

Table 20 shows the results after the expected 55% reduction from the pasture BMP application in Phase 1. As shown, it brings the number of exceedances during PCR down to four. Of the four, three of those exceedances were less than 20% above the target of 50% reduction. After the 5% reduction from Phase 2, there are only 3 exceedances, one of which is not in the PCR season. With this combination of BMPs, the standard should be met with only 2 remaining exceedances during PCR season.

Table 20: Nitrate + Nitrite Nitrogen Expected Reductions Based on Ambient Data

Projected Nitrate+Nitrite Nitrogen Ambient Reductions TMDL (0.215 mg/L May – October)				
	Result (mg/L)	**% Decrease Required**	**Result after Phase 1 BMPs 55% Reduction**	**Result after Phase 2 BMPs 5% Reduction**
10/7/2014	0.22	2%	0%	
11/18/2014	0.05	0%	0%	
12/10/2014	0.83	286%	231%	225%
1/12/2015	0.06	0%	0%	
2/12/2015	0.13	0%	0%	
3/11/2015	0.13	0%	0%	
4/20/2015	0.06	0%	0%	
5/14/2015	0.53	147%	91%	86%
6/3/2015	0.13	0%	0%	
7/7/2015	0.25	16%	16%	
8/6/2015	0.81	277%	277%	271%
9/8/2015	0.73	240%	240%	234%

Assumptions:

- Phase 1: Total of 55% N reduction based on STEPL model over the term of the project.
- Phase 2: Total of 5% reduction
- All BMPs not considered
- The TMDL Reduction Suggestion of 50% is sufficient for restoration

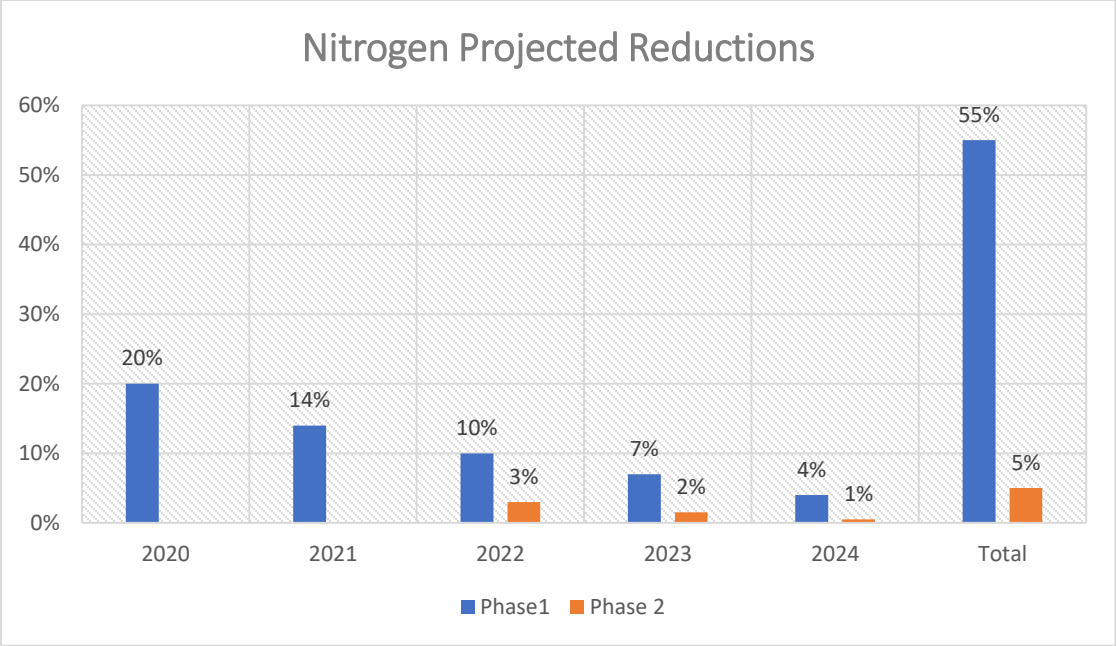


Figure 16: Projected Nitrogen Reductions from 2019-2024

Soil and Water Assessment Tool (SWAT)

The SWAT is a small watershed to river basin-scale model used to simulate the quality and quantity of surface water and predict the environmental impact of land use, and land management practices. SWAT is widely used in assessing soil erosion prevention and control, nonpoint source pollution control and regional management in watersheds. LDEQ used the SWAT model on 3 twelve-digit HUCS, Bayou Carencro, Bayou Borbeux, and Bayou Borbeux Grand Coteau to prioritize areas for BMP implementation in the Bayou Vermilion Watershed.

The maps below show the priority areas for implementation iidentified by SWAT in the HUC-12s where the primary land use is agriculture, as well as the nearby sampling sites. All sites in the SWAT model output areas below will be targeted during BMP implementation activities.

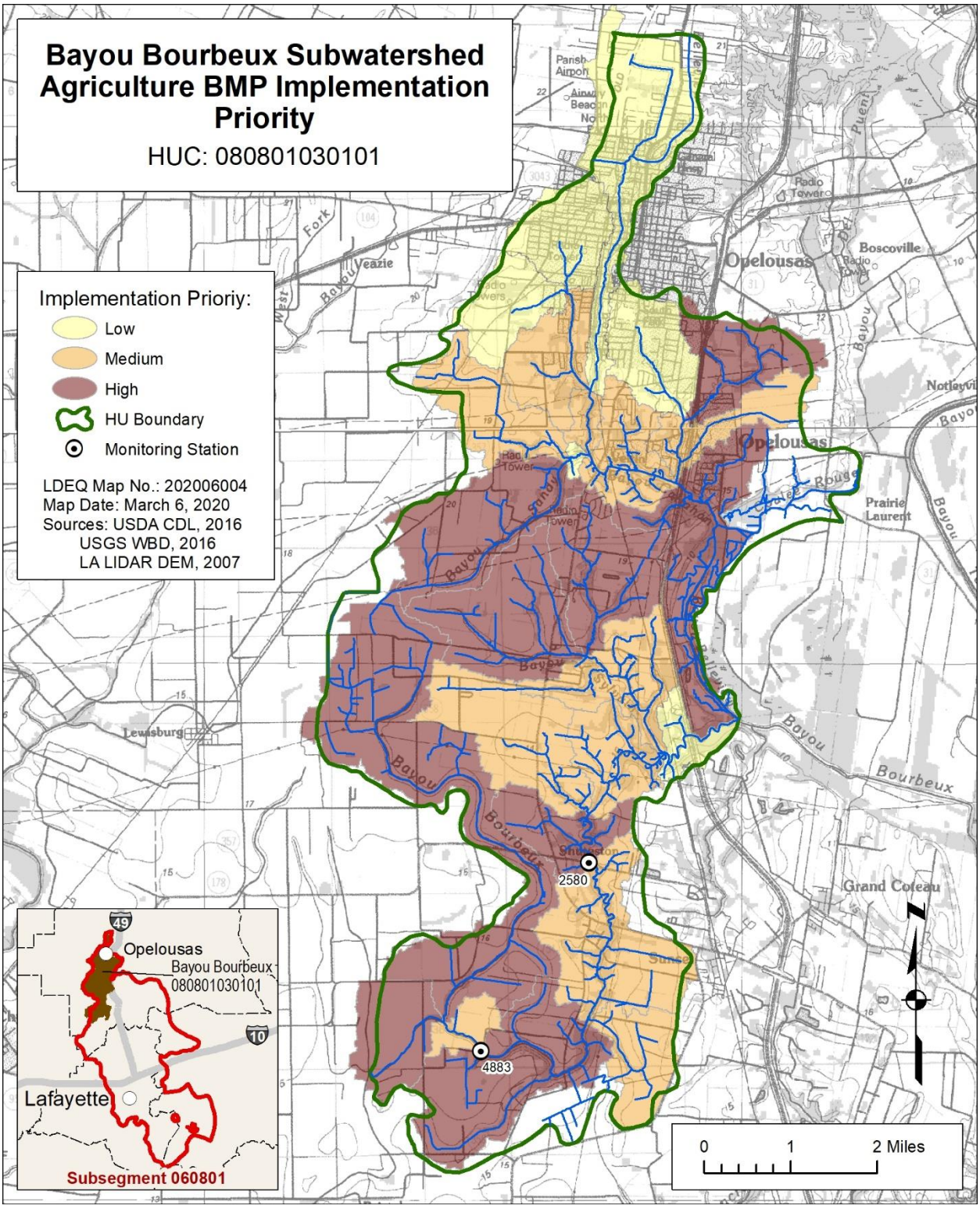


Figure 17 Bayou Borbeux Agriculture BMP Implementation Priority

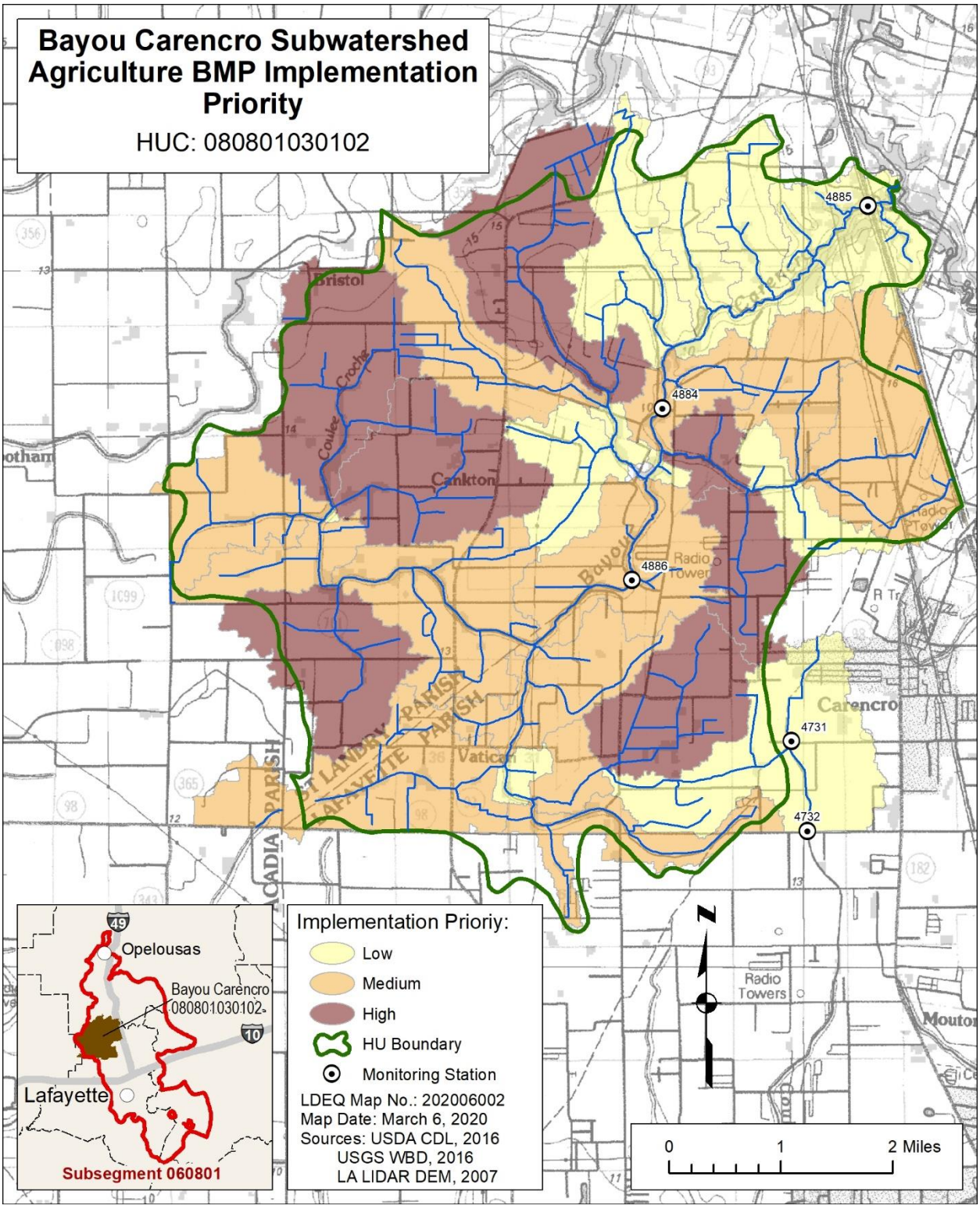


Figure 18Bayou Carencro Agriculture BMP Implementation Priority

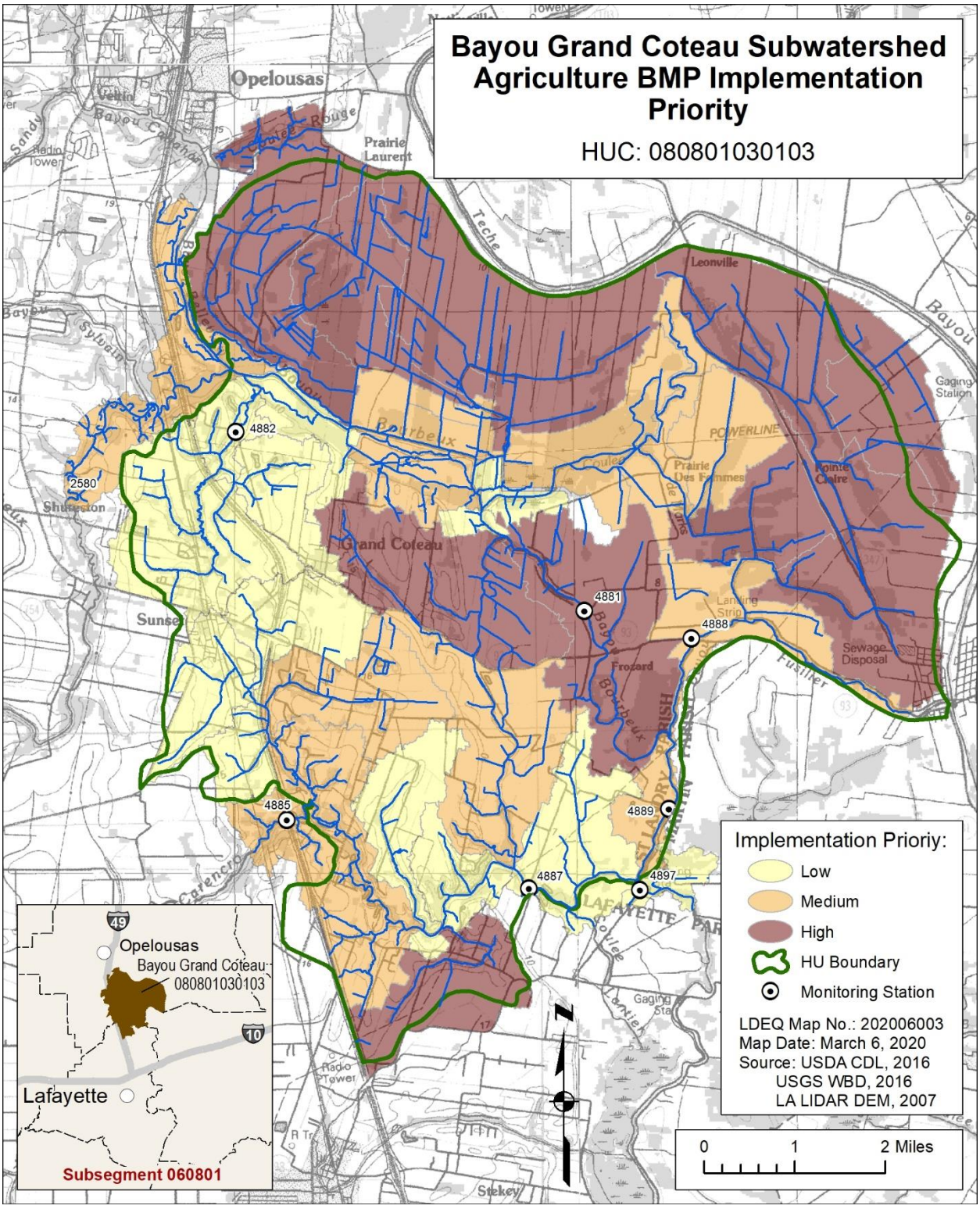


Figure 19 Bayou Grand Couteau Agriculture BMP Implementation Priority

Table 20 below is a subset of the site rankings in Table 12. Table 20 ranks the sampling sites in the in the HUC-12s where the primary use is agriculture. Although the site rankings below do not agree exactly with the model output, the purpose is to also use current data results to compare to the model output as opposed to solely relying on the model for decision-making purposes. Hydrological complexities in this watershed can cause high margins of error and low confidence values in SWAT making the model difficult to calibrate.

The DO is ranked from highest to lowest concentrations, while the nutrients and FC are ranked from lowest to highest concentrations. The sites highlighted in pink are considered moderate risk as there are less than three parameters in the top 5 with the worst concentrations. The sites highlighted in red are in the top 5 sites with worst concentrations in at least three of the parameters below.

Moderate Risk: 4732, 4885, 4887

High Risk: 4731, 4881, 4882, 4883, 4883, 4884, 4886

Table 21: Agricultural Site Rankings

DO (mg/L)		TKN (mg/L)		Nitrate Nitrite (mg/L)		TP (mg/L)		FC (cfu/100mL)	
2580	5.8	**4889**	3.14	**4883**	0.162	**4888**	0.366	**4888**	3100
4888	5.54	**2580**	3.16	**2580**	0.18	**2580**	0.379	**4897**	4251
4882	5.5	**4885**	3.17	**4888**	0.24	**4889**	0.403	**4887**	4697
4889	5.35	**4881**	3.23	**4731**	0.255	**4897**	0.45	**4881**	5349
4897	5.3	**4884**	3.33	**4889**	0.26	**4885**	0.485	**4886**	6101
4732	4.98	**4883**	3.4	**4897**	0.26	4887	0.545	**2580**	6366
4884	4.12	**4882**	3.46	**4887**	0.269	**4884**	0.633	4732	6652
4885	3.92	**4888**	3.48	4732	0.323	4886	0.644	**4889**	7393
4881	3.67	**4886**	3.55	**4886**	0.379	**4883**	0.647	**4882**	7521
4883	3.45	**4897**	3.61	4885	0.386	4732	0.787	**4731**	7768
4887	3.45	4887	3.66	**4884**	0.615	**4882**	0.876	**4884**	7785
4886	3.3	4732	4.52	**4881**	1.499	**4881**	1.16	**4883**	7793
4731	2.31	**4731**	8.29	**4882**	2.19	**4731**	2.56	4885	8561
avg	4.36	**avg**	3.85	**avg**	0.54	**avg**	0.76	**avg**	6410.5
max	5.8	**max**	8.29	**max**	2.19	**max**	2.56	**max**	8561
min	2.31	**min**	3.14	**min**	0.162	**min**	0.366	**min**	3100

DMRs

Discharge monitoring reports (DMRs) are reports that contain self-monitoring results for wastewater required by National Pollutant Discharge Elimination System (NPDES) permits and some Water Quality Management (WQM) permits. These reports are completed and submitted periodically to state agencies monthly, quarterly, semi-annually or annually. The DMRs near critical areas were reviewed to ensure that permit limits are being met and not contributing to FC concentrations in the waterbody. The map below shows all permitted facilities in the Coulee Mine HUC-12 in green, and the facilities that have exceeded their permit limits from 2016 through 2019 in red. Eight of the top 12 sites with the largest FC concentrations also have permitted dischargers exceeding their weekly and monthly discharge averages.

Of the sites listed as moderate/high risk, sites 4734, 4738, 4739, 4731, 4740, 4741, 4742, 4744 and 4748 could all be affected by sites exceeding their permit limits. These contributors are not solely responsible for high fecal coliform levels, but when these permitted facilities are issued enforcement actions to reduce their discharges, FC concentrations in the watershed may decrease further. These reductions will come in addition to the calculated reductions expected which will reduce the amount of time it will take to reach the standard. The facilities in red will be reported to the enforcement department for further action.

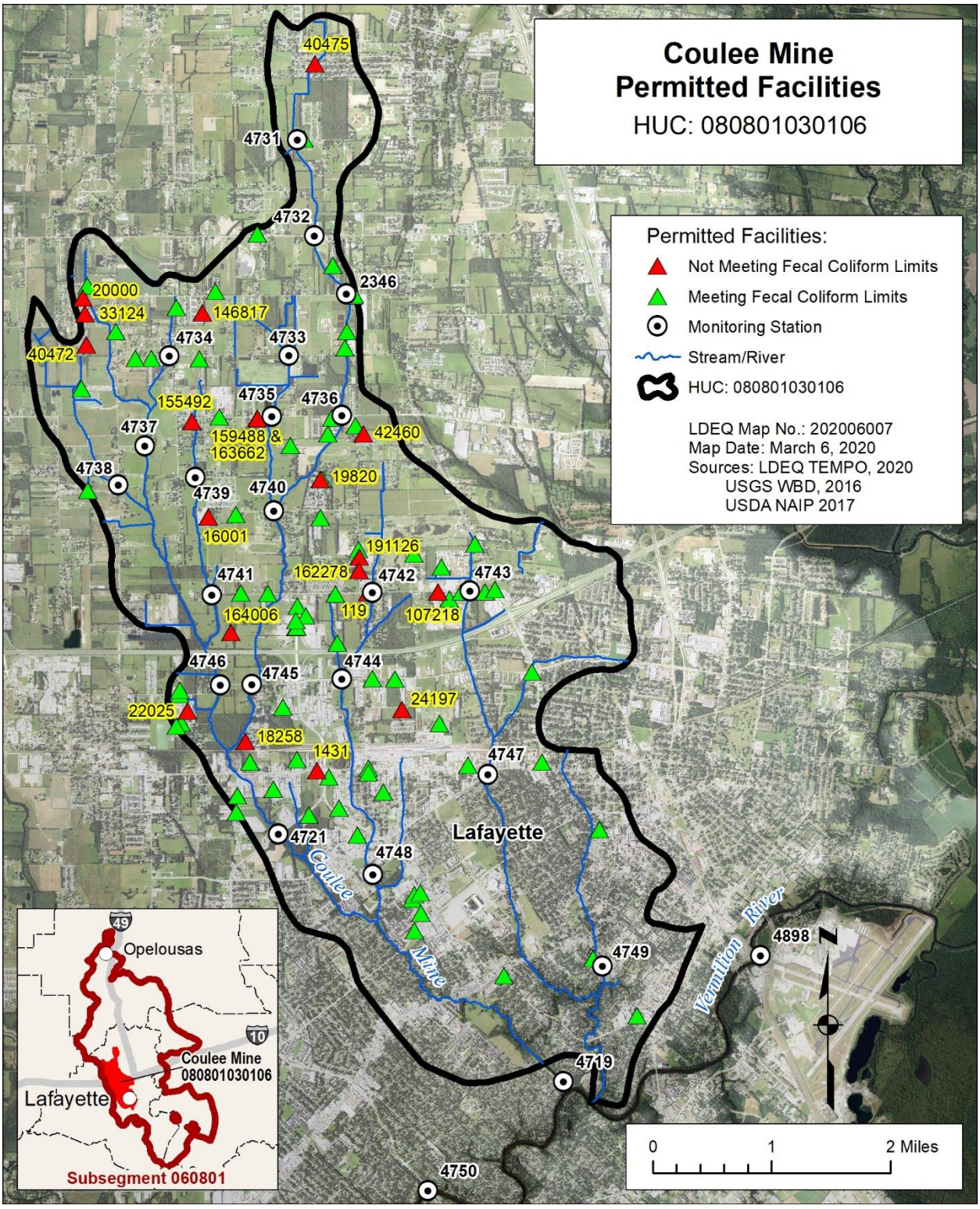


Figure 20: Coulee Mine Permitted Facilities

Element C. Best Management Practices

Several BMPs have been previously implemented by LDAF in Vermilion River to mitigate the nutrient and FC issues in Vermilion River. A complete list is found in Appendix A. The BMPs listed below are LDAF approved practices. They are listed with their respective impacts to the area and the causes and sources they will affect, along with their cost per acre. They were chosen based on the land use in the area as well as the impairments on the Draft 2018 IR. The Vermilion River Subsegment is roughly 32% grass/pasture, 24% woody wetlands, and 13% cropland. The practices below will be implemented in about 50% of the watershed in cropland and pasture targeted to have the biggest effect on the impaired area.

The BMP implementation process begins with education and outreach. LDAF will hold several stakeholder meetings in the area to educate the public on the water quality issues and to encourage landowners to sign up for the implementation program. In addition, Bayou Vermilion District (BVD) has been working in the area implementing an OSDS inspection program. Certified inspectors travel to addresses in the area where OSDSs have been indicated by the Louisiana Department of Health (LDH), and offer to inspect their systems and instruct residents on its use. Details are in Element E.

DO/Nutrient BMPs

After the initial education and outreach is conducted, the practices listed below should be implemented first on pastureland. We will refer to this as Phase 1. The watershed has a large percentage of pasture. By implementing those practices first, a large percentage of the reduction will be achieved before Phase 2 BMPs are implemented on cropland. Based on STEPL, if these BMPs are implemented on as detailed below to the applicable and use area, 50% of nutrient reductions required by the TMDL will be met within our project timeline. Most BMPs are assumed to be applied to 50% of the area other than grass buffer and field border. This is because these BMPs are typically applied per foot rather than area so the estimation is conservative.

Practice	%N Reduction	%P Reduction	
Prescribed Grazing 50% Area	10.6	4.1	30.71/ac
Heavy Use Area Protection 50% Area	4.9	3.6	2.84/sq ft
Field Border - 30 m Buffer with Optimal Grazing 25%	4.7	5.1	93.26/ac
Grass Buffer 25%	11.3	6.5	
Streambank Stabilization w/Fencing	19.6	13.0	157.24/ac
Streambank Stabilization w/o Fencing	4.1	4.4	
Totals	**55.2**	**36.7**	

Table 22: Phase 1 STEP-L Nutrient Reduction Predictions

Phase 2 involves the implementation of the cropland BMPs. Cropland is about 18% (19,895 ac) of the land use in the Vermilion River Subsegment. Of that 18%, a little over 7% is soybeans. Although it does not have a huge percentage of land use in the area, fertilizer impacts could have a significant impact on a nearby stream. Based on STEP-L, the reductions are not as evident as those from the pasture BMPs, but will still result in reductions. This is why they were indicated in phase 2. The phase 2 BMPs are listed in Table 22.

Table 23: Phase 2 STEP-L Nutrient Reduction Predictions

Practice	%N Reduction	%P Reduction	Price
Nutrient Management (50%)	0.7	2.7	$ 6.41/ac
Buffer 35 ft (50%)	1.9	3.8	$ 93.26/ac
Conservation Tillage 2 (>= 60% residue)	1.7	5.8	$14.78/ac
Cover Crop 3 Traditional Early Planting	1.1	1.3	$ 48.60/ac
Totals	**5.4**	**13.5**	

After these practices are implemented, the remaining BMPs dedicated to DO and nutrient improvements can be implemented as sign-ups, time constraints, and funding allows. This will not be considered as an additional phase of the project as these BMPs may not be implemented.

Table 24: Additional nutrient BMPs to be implemented

Practice	NRCS Code	Selected Impacts	Price
Conservation Crop Rotation	328	Reduce erosion, reduce water quality degradation due to excess nutrients, maintain or improve soil health	9.70/ac
Grade Stabilization Structure	410	Reduce runoff and erosion	$1.29/Diameter In/Ft
Irrigation Pipeline	430	Reduce energy use and erosion as part of a complete irrigation system	$14.40/ft
Irrigation Water Management	449	Minimize irrigation-induced soil erosion	$9.30/ac
Precision Land Forming	462	Erosion control	$176.10/ac
Irrigation Land Leveling	464	Reduce excess irrigation-induced runoff	$226.22/ac
Access Control	512	Reduce erosion and nutrient loading	$419.10/each
Forage and Biomass Planting	516	Reduce erosion	$199.69/ac
Livestock Pipeline	528	Reduce streambank erosion and nutrient loading by enabling reduced access	$3.57/ft
Integrated Pest Management	595	Prevent and mitigate pest suppression impacts	$13.11/ac

Fecal Coliform BMPs

This Watershed Implementation Plan (WIP) focuses on pasture, which is the largest land use percentage in 5 of the 6 subwatersheds. In Subsegment 060801, the acreage is 64,828, representing 34% of the total area. The BMPs should be implemented on at least 50% of the pastureland in the subsegments included in the STEP-L evaluation. In order to reach FC PCR standard from May-October, the plan is for LDAF to implement the BMPs listed in the table below in addition to the continued OSDS inspections.

Table 25: Fecal Coliform BMPs to be implemented in Vermilion River

Practice	Selected Impacts	Causes/Sources Mitigated	Cost
Livestock Pipeline	Reduce streambank erosion and nutrient loading by enabling reduced access	Fecal/DO/Nutrients	$3.57/ft
Watering Facility	Meet water requirements, improve animal distribution	Fecal/DO/Nutrients	$2.45/gal
Water Well	Meet water needs, enable proper use of range, pasture, and wildlife areas	Fecal/DO/Nutrients	$28.74/ft
Livestock Shelter Structure (576)	Provide protection for livestock from heat/cold. Reduce erosion and nutrient loading into surface waters	Fecal/DO/Nutrients	$3.14/sq ft
Pump-outs	Pump-out systems regularly to reduce FC loading directly into river	Fecal/Nutrients	$320 each

Element D: Technical and Financial Assistance

This WIP is a cooperative project among EPA, LDEQ, LDAF, Natural Resource Conservation Service (NRCS), and BVD. Each organization will be providing assistance in the form of education and outreach, financial assistance, sampling, data analysis and/or implementing BMPs. The Vermilion River project is included in LDAF's workplan. The amounts in the table are priced per unit or by acreage. Calculations will be completed after sign-ups. BVD has an ongoing contract with LDEQ at this time to complete inspections and education and outreach in the Vermilion River watershed

Table 26: Costs of Pastureland Best Management Practices to be Implemented in Vermilion River

Practice	NRCS Code	Selected Impacts	Cost
Conservation Crop Rotation	328	Reduce erosion, reduce water quality degradation due to excess nutrients, maintain or improve soil health	$9.70/ac
Residue and Tillage Management, No-Till/Strip Till/Direct Seed	329	Reduce erosion	$14.78/ac
Cover Crop	340	Reduce erosion, capture and recycle nutrients	$48.60/ac
Critical Area Planting	342	Stabilize streambanks and reduce erosion	$157.24/ac
streambank stabilization			
Residue and Tillage Management, Reduced Till	345	Reduce erosion, improve soil health	$11.32/ac
Fence	382	Reduce erosion and nutrient runoff, support other BMPs	$1.14/ft
Field Border	386	Reduce erosion, compaction, and excess nutrients	$93.26/ac
Grade Stabilization Structure	410	Reduce runoff and erosion	$1.29/Diameter In/Ft
Irrigation Pipeline	430	Reduce energy use and erosion as part of a complete irrigation system	$14.40/ft
Irrigation Water Management	449	Minimize irrigation-induced soil erosion	$9.30/ac
Precision Land Forming	462	Erosion control	$176.10/ac
Irrigation Land Leveling	464	Reduce excess irrigation-induced runoff	$226.22/ac
Access Control	512	Reduce erosion and nutrient loading	$419.10/each

Forage and Biomass Planting	516	Reduce erosion	$199.69/ac
Livestock Pipeline	528	Reduce streambank erosion and nutrient loading by enabling reduced access	$3.57/ft
Prescribed Grazing	528	Reduce erosion and maintain soil condition	$30.71/ac
Heavy Use Area Protection	561	Reduce erosion	$2.84/sq ft
Stream Crossing	578	Reduce sediment and nutrient loading, reduce streambank and streambed erosion	$9.65/sq ft
Nutrient Management	590	Reduce nutrient runoff, maintain or improve soil condition	$6.41/ac
Integrated Pest Management	595	Prevent and mitigate pest suppression impacts	$13.11/ac
Watering Facility	614	Meet water requirements, improve animal distribution	$2.45/gal
Water Well	642	Meet water needs, enable proper use of range, pasture, and wildlife areas	$28.74/ft
Wetland Wildlife Habitat Management	644	Maintain or develop habitat for wetland flora/fauna	$8.52/ac
Livestock Shelter Structure (576)	576	Provide protection for livestock from heat/cold. Reduce erosion and nutrient loading into surface waters	$3.14/sq ft
Pump-outs		Required every three to five years to maintain system effectiveness	$400/each
New Aerator			$700/each
Sump Pump Replacement			$400/each

Potential funding sources are listed below with actual funding amounts TBD:

LDAF
319(h)- Project Funds

NRCS
NWQI- National Water Quality Initiative
EQIP - Environmental Quality Incentive Program and
CSP - Conservation Stewardship Program

Funding amounts will be specified after this project is included in the LDAF workplan and sign-ups are complete.

LDEQ 319(h) Approximate Annual Costs (Federal and Match)
Water Surveys Monitoring: $45,300.00

NPS: $40,000.00
Analysis: $71,928.00
Bayou Vermilion District (BVD): $100,000.00

Element E: Education and Outreach

Participating Organizations

Louisiana Department of Agriculture and Forestry (LDAF) is responsible for administering many of the programs and enforcing the regulations that influence every aspect of the state's agriculture and forestry. They provide assistance to local Soil and Water Conservation District (SWCDs) and work with NRCS. During the BMP sign-up process, LDAF will explain to homeowners and stakeholders the importance of implementing BMPs and work with landowners through the implementation process. LDAF staff explain the purpose of the BMP, how it works and teaches proper maintenance to ensure that the BMP accurately serves its purpose of improving water quality in the watershed. LDEQ has regular meetings/calls with LDAF to discuss project updates, data changes, and BMP implementation status. LDAF has also been active helping LDEQ complete the WIP with BMP and financial information.

Natural Resources Conservation Service (NRCS), formerly known as the Soil Conservation Service, is an agency within the United States Department of Agriculture (USDA) that provides technical assistance to farmers and other private landowners and managers. USDA NRCS is one of LDEQ NPS' key partnerships to improve land stewardship, and thereby improve water quality

Louisiana Department of Wildlife and Fisheries (LDWF)
This department works to manage, conserve, and promote wise utilization of Louisiana's renewable fish and wildlife resources and their supporting habitats through replenishment, protection, enhancement, research, development, and education for the social and economic benefit of current and future generations. They also work to provide opportunities for knowledge of and use and enjoyment of these resources; and to promote a safe and healthy environment for the users of the resources.

U.S. Fish and Wildlife Service
The mission of the U.S. Fish and Wildlife Service (FWS) is working with others to conserve, protect and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people. They connect lands and water to sustain fish, wildlife and plants by being visionary leaders, bold innovators and trusted partners, working with and for people. The team utilizes all available resources and opportunities to multiply successes on species recovery and strategic habitat conservation. They seek out and create new opportunities to engage key partners and private landowners in strategic conservation efforts in Louisiana and in the Southeast Region. lafayette@fws.gov

Bayou Vermilion District (BVD)
BVD has implemented an inspection program in conjunction with LDEQ and EPA in Coulee Mine (HUC-12 080801030106) that is intended to explain how malfunctioning OSDSs can degrade water quality. So far, BVD has been able to reach many homeowners and teach them how to operate and maintain their OSDSs. Now that funding is available for pump-outs and total system repair or replacement, they have begun the process of working together with Lafayette Consolidated Government to establish a replacement program for qualified homeowners based on the Housing and Federal Programs Division's current financial assistance guidelines which can be found here http://www.lafayettela.gov/CommunityDevelopment/HousingServices/Pages/Sewer-Grant-Program .

In addition to inspections, BVD employees travel to many festivals and meetings in Lafayette and the surrounding areas to educate the public on their inspection program. They have done presentations at the LDH Sanitarian Conference as well as the LDEQ quarterly meeting. They have created many brochures and pamphlets including 'Maintenance of Your Home System', 'Dos and Don'ts for your System', 'Alternative Cleaning Supplies', and 'Disinfecting Your System'. They distribute community notice letters explaining why systems fail, when they may need a pump-out, and the dangers of raw sewage discharge. When a system fails, they send re-inspection notices as well as additional educational information on septic systems and Aerobic Treatment Units (ATUs).

They teach local homeowners and stakeholders general knowledge of OSDSs and how a malfunctioning system can have an effect on the local waterways. BVD explains that malfunctioning systems can cause the waters that they fish, boat and swim in to be contaminated with FC bacteria. All of this information is used and constantly shared with the general public to promote upkeep of home sewage systems. BVD continues to perform these activities and spreading information with any opportunity to do so.

As a watershed coordinator, BVD submits monthly monitoring reports detailing their inspections and outreach activities in the watershed. They also hold regular stakeholder meetings to give updates on the status of the Vermilion River. BVD also worked as an integral partner in building this document with watershed details and stakeholder contact information.

sustainability@bayouvermiliondistrict.org

Lafayette Consolidated Government
Organizes events in and around the city of Lafayette, including the Adopt-a-Road campaign, the storm drain marking program, the annual Trash Bash and more. It also does educational tours of the Recycling Foundation, Compost Facility, and the N. Dugas landfill, which is now closed and being restored to a Cajun prairie. It also provides environmental presentations to students of all ages to increase knowledge of recycling, litter reduction and local water quality and pollution prevention.

The Housing and Federal Programs Division currently offers financial assistance to qualified homeowners who apply for the assistance. BVD plans to implement a program in conjunction with the Housing department to determine which homeowners are qualified for pump-outs and system replacements and ensure those services are provided as needed. This will keep the program organized and ensure that efforts are not duplicated. On April 1, 2019 LDEQ met with LCG representatives to discuss the MS4 area and requirements in order to ensure that no NPS funds would be used to help meet MS4 requirements. The group directed us to the stormwater management plan to get more details on the MS4 area and how they are meeting the requirements. bforet@lafayettela.gov

Sierra Club, Acadian Group
The Sierra Club Acadian Group represents members on issues specific to Southwest Louisiana. The mission of the Sierra Club is to explore, enjoy and protect the wild and beautiful places of the Earth. They strive to practice and promote the responsible use of the Earth's ecosystems and resources, to educate and enlist people to protect and restore the quality of the natural and human environment, and to use all lawful means to carry out these objectives. Inspired by nature, they work together to protect the communities and the environment. The Sierra Club is America's oldest, largest and most influential grassroots environmental organization. LDEQ attended an Acadian group meeting on April 17, 2019 and was able to hear about the group's regular activities and also answer questions on areas and specific

pollutants of concern in the watershed. suzanne@cauchemarmedia.com

Bayou Vermilion Preservation Association (BVPA)
The mission of the Bayou Vermilion Preservation Association Inc. is to create awareness of our natural environment by providing education and outreach to the general community about ways to conserve, protect and enjoy the Bayou Vermilion Watershed.BVPA holds monthly meetings about outreach activities in the watershed and available participants. BVPA also holds a yearly Annual River Symposium. The most recent symposium in 2019 was to highlight how strategic development around the river can improve the quality of life while protecting natural resources in the community. LDEQ attended and presented at the April 1, 2019 stakeholder meeting explaining the purpose of the WIP, available data results, and the status. The group was eager to help facilitate the process and provide any help . BVPAconnect@gmail.com

Teche Vermilion Freshwater District (TVFWD)
TVFWD Works together with the United States Army Corps of Engineers to Improve Water Quality in Bayou Teche and the Vermilion River. Local participation in the Teche-Vermilion Basins Project was created in 1969 by passage of Act #41 to restore the historical connection between the Atchafalaya River and Bayou Courtableau, thus, creating "Teche-Vermilion Fresh Water District." The District is comprised of Lafayette, Vermilion, St. Martin and Iberia parishes. The governing body consists of Commission members from each parish. WATERDISTRICT@AOL.COM

Each of these groups is committed to improving the environmental quality in and around Vermilion River watershed and more. With this network of state and local organizations working towards the same goal, we can continue to share data and information as the project progresses through meetings and emails. This group will also serve as a forum to share information about each organization's upcoming meetings and events with the purpose promoting the improvement of water quality and spreading information about the importance of keeping the watershed clean.

Although this project does have an end date, these groups continue their efforts to spread information, create awareness of our environment, and promote responsible use of our natural resources.

Louisiana Department of Health (LDH)
LDH issues permits for newly installed home sewer systems, as well as requires point-of-sale inspections, and provides wastewater operator/installer training through University of Louisiana at Lafayette Continuing Education Department and many resources useful to homeowners in keeping their systems operating properly as well as reporting sewage complaints. Other resources include a list of certified maintenance providers and installers within the state, organized by parish. These providers offer services including installations, system repairs, and pump-outs. The site also provides a list of online retailers, which sell refurbished aerators. http://ldh.la.gov/index.cfm/newsroom/category/110

All stakeholders included were given the opportunity to provide input, review, and comment on this document. Data and project updates will be provided to stakeholders throughout the course of the project. DEQ also plans to participate in as many community outreach events and meetings in the watershed as requested for purposes of sharing/receiving information.

Element F: Implementation Schedule

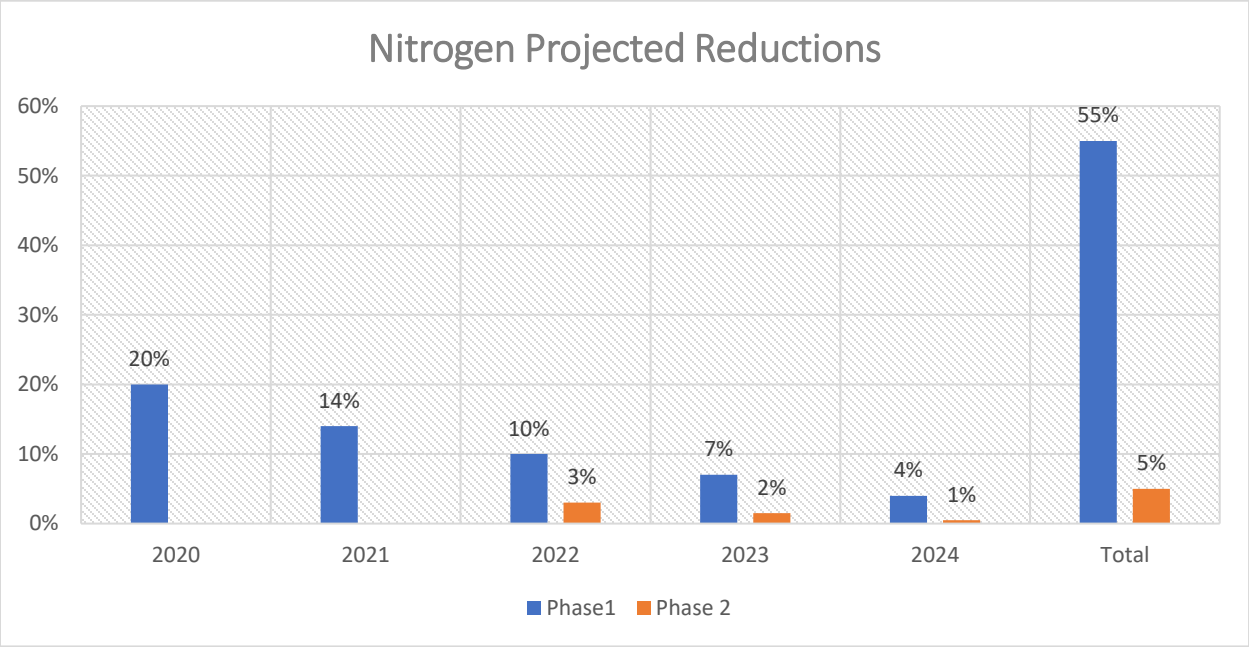
This project is scheduled to be included in LDAF's next Workplan. Baseline monitoring began in 2016 and is ongoing. Baseline monitoring for nutrients began in January 2019 and is ongoing. Once LDAF's workplan is approved, signups and implementation for this project can begin. The project will transition into long term monitoring after BMP implementation begins. Any changes with adding, replacing, or removing sampling sites will be included in the annual sampling plan update. Data will be analyzed as received and will be discussed in quarterly partner meetings and distributed through email as requested. Sampling plans will be updated yearly or as needed for changes to the sampling design. The last ambient monitoring sampling during the span of this project is scheduled for 2022-2023 and the last integrated report during this project should be released in 2024, which lines up with the original project timeline. At that time, we can determine if any of the Vermilion River impairments have been removed from the IR. The implementation schedule is described in detail below.

Table 27: Vermilion River Watershed Implementation Schedule

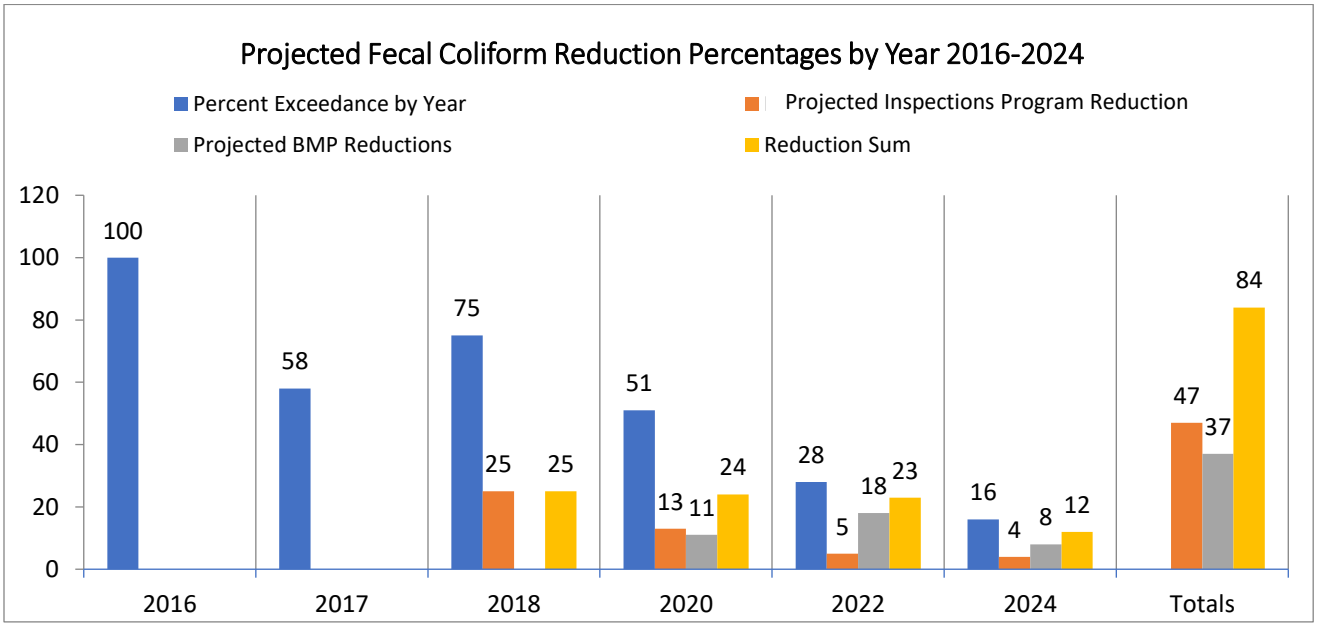
Project Tasks	2016	2017	2018	2019	2020	2021	2022	2023	2024
Baseline Monitoring-Fecal	x	x	x	x					
Baseline Monitoring-Nutrients			x	x			x	x	
Ambient Monitoring			x	x			x	x	
Long Term Monitoring				x	x	x	x	x	x
Integrated Reporting	x		x		x		x		x
Data Analysis		x	x	x	x	x	x	x	x
Outreach/Stakeholder Involvement	x	x	x	x	x	x	x	x	
Sampling Plan Approval/Renewals	x	x	x	x	x	x	x	x	
Interagency Meetings	x	x	x	x	x	x	x	x	x
BMP Sign-Ups						x	x		
BMP Implementation						x	x	x	
Inspections	x	x	x	x	x	x	x	x	
Color Guide		LDAF		BVD		LDEQ		All Partners	

BMP Implementation

The nutrient BMPs have been broken into Phase 1 and Phase 2 based on expected nutrient reduction percentage as detailed in the graph below. In order to meet these percentages, Phase 1 BMPs must begin in 2020 and be complete by 2024 and Phase 2 BMPs must begin by 2022 and be completed by 2024.



There are also FC BMPs that will be implemented along with ongoing inspections and outreach. From July 2017 to September 2019, BVD completed 797 inspections and 742 reinspections, attended 21 outreach events and did 18 presentations. These numbers will be considered when measuring milestones. The pandemic has impacted the number of outreach events and inspections that could be performed but the original estimates considered reduced reductions each year as a natural progression.



Element G: Milestones Identified

The ultimate goal of this project is to improve water quality in Vermilion River such that all designated use support if fully restored through the education and outreach, OSDS inspections, BMP implementation and monitoring. In order to reach the ultimate goal, there are many small stepping stones to get there which are listed below. Phase 1 is general preparation to get the project off the ground. Phase 2 involves everything involved in getting implementation started and the implementation of BMPs. Phase 3 is to go back, look at our predictions and determine if we are on track or need to make changes in how we reach our goals and time needed to do so. In Phase 4 we will use all data we have gathered and share our findings hopefully in the form of a success stories as each use support is restored. We can also use this information to show what worked and didn't work in this project to help us make better predictions in future projects. Table 28 illustrates the timeline involved.

Phase 1: Project Preparation

1. Watershed Characterization
2. Establish Fecal Coliform/Nutrient Baseline
3. Modeling (STEP-L/SWAT)
4. Identify Hotspots
5. Begin Education & Outreach
6. Watershed Implementation Plan

Phase 2: Implementation

1. Conduct OSDS Inspections
2. Education & Outreach continues (LDAF/BVD)
3. Secure Funding
4. Sign-Ups
5. BMP Implementation

Phase 3: Post Implementation Analysis

1. Data Analysis (Ambient/Project)
2. Fecal/Nutrient Reductions (Predictions vs Actual)
3. STEP-L Reductions (Predictions vs Actual)

Phase 4: Success

1. Water Quality Improvements
2. Use Support Restored
3. Success Story

As BMPs are implemented it has been documented that water quality parameters sometimes worsen before they improve. This would make accurately predicting a consistent decrease from year to year difficult. The strategy for this watershed is to monitor progress towards milestones with the understanding that there will be fluctuations along the way, but still overall improvement in water quality in the watershed. In order to achieve the reductions shown in Element C, the percentages of BMP implementation and data reduction percentages have been included and broken down by year. Data will be compared with predictions made in this document to ensure that the project stays on

track and specified reductions are being reached. If reductions slow, or BMP amounts change as sign-ups are completed, this document will be updated and changes will be made.

Table 28: Explanation of Project Phases and Timeline

	2016	2017	2018	2019	2020	2021	2022	2023	2024
Phase 1: Project Preparation									
Watershed Characterization									
Establish Fecal Coliform/Nutrient Baseline									
Modeling (STEP-L)									
Identify Hotspots									
Begin Education & Outreach									
Watershed Implementation Plan									
Phase 2: Implementation									
Conduct OSDS Inspections									
Inspections Data Reductions			25%	5%	4%	4%	5%	4%	
Education & Outreach Continues (LDAF/BVD)									
Secure Funding									
Sign-Ups									
BMP Implementation									
Pastureland/Cropland BMPs					33%	23%	22%	15%	8%
Fecal Coliform BMPs					30%	25%	24%	11%	11%
Phase 3: Post Implementation Analysis									
Data Analysis (Ambient/Project/)									
Fecal/Nutrient Reductions (Predictions vs Actual)									
STEP-L Reductions (Predictions vs Actual)									
Phase 4: Success									
Water Quality Improvements									
Impairment Removal From 303(d) List									
Success Story									

Element H: Load Reduction Evaluation Criteria

Using information given in the TMDLs and data analysis from most recent sampling runs, load reductions for Nutrients include a 35% reduction in Nitrate +Nitrite Nitrogen and an 88% reduction in bacteria. In order for use support in the subsegment to be restored, DO must remain above 5 mg/L year-round and the FC must remain below 400 CFU/100mL from May through October and below 2000 CFU/100 mL year-round. There are no numerical criteria for nutrients at this time. The understanding is that when the DO reaches the standard, the nutrients will be removed as a suspected cause of impairment from the IR.

Progress towards these goals will be measured by:

1. Percent BMP Implementation Completion
2. Number of OSDS Inspections Complete
3. Data Improvements (Ambient/Project)
4. Reduction Predictions Graphs vs. Actual Reductions (STEP-L)
5. Assessments from the Integrated Reports issued every two years.

Monitoring data will be collected through the life of the project and at least one year post-implementation.

Effective planning can be an iterative process where lessons learned over the course of implementing the plan can be used to modify the plan, therefore it is expected that changes will be made throughout the life of the project. In doing so, changes will also be made to this document to support those changes.

Changes that could warrant updates to this document include but are not limited to:

1. Significant Land Use Changes
2. New impairments identified by the assessment in the IR.
3. Additional BMPs become necessary
4. Funding sources change or are reduced
5. Responding to input from partners and stakeholders needed to meet goals

Data from this project will be shared with partners as available in order to ensure the project continues towards the goal of water quality improvement in Vermilion River.

Element I: Monitoring

Ambient monitoring at site 0045 has been conducted in 1963-1968, 1978-1990, June 1998- December 1998, 2010/2011, and 2014/2015 and continues on a four- year rotation. The ambient data is used to show the historical trends in Vermilion River. Sampling parameters for this project include DO, TKN, Nitrate + Nitrite Nitrogen, TP, and FC.

In 2016, LDEQ chose 22 sites to begin the process of determining hotspots for BMP implementation. The sampling parameters included in situ parameters and FC to be sampled twice per month. In November 2018, LDEQ added 13 sites to the current sites and began including TKN, TP, and Nitrate Nitrite to the current sampling design. The sampling began in January 2019. This data will serve as a baseline to show nutrient data trends throughout the year and support LDAF's BMP implementation efforts. Details on the sampling design can be found in the sampling plan for Vermilion River Q-Track#: 19-080.

The monitoring data collected by LDEQ surveys group will be used to show water quality changes starting in 2016, during, and after BMP implementation. The data from the 22 sites in Coulee Mine will be particularly useful in determining the success of the education and outreach/inspections program by our partners at Bayou Vermilion District. The sampling locations added in Bayou Bourbeux, Bayou Carencro, Bayou Bourbeux-Grand Coteau, Francois Coulee-Vermilion River, Coulee Mine, and Anselm Coulee-Vermilion River will be most useful after BMPs have been implemented. They will help us understand where the BMPs were most needed and also show where the most notable improvements are made.

When the project moves to long term sampling, after BMP implementation has begun, we will use this data to help determine if there have been any water quality improvements and compare the results to the predictions made by our models as described in Elements G and H. The percent BMP implementation will be determined by the number of sign-ups LDAF gets versus the time left in the project to complete them.

LDEQ has quarterly meetings with its partners to discuss water quality changes and any setbacks or problems encountered with BMP implementation. This time is also used to make decisions about changing the course of the project if it is not on track to reach its desired goals within the projected timeline. In addition to our internal meetings, the local stakeholder groups will continue to hold their regular meetings. As the data is analyzed and decisions are made about the project and its direction, these groups will be notified in order to keep our stakeholders involved and informed.

Appendix A: Previous BMPs by HUC

State, HUC, Practice Name	Certified - Practice Status	Certified or Planned Amount	Financial Assistance Obligation	Planned - Practice Status	Certified or Planned Amount	Financial Assistance Obligation	Total Number of Occurrences	Total Certified or Planned Amount	Total Financial Assistance Obligation
	Number of Occurrences			Number of Occurrences					
80801030101	**17**	**$ 3,538**	**$69,233**	**36**	**5,403**	**$113,446**	**53**	**$ 8,941.40**	**$ 182679.26**
Critical Area Planting	2	$ 1.00	$74	6	2	$391	8	$ 2.10	$ 464.60
Early Successional Habitat Development and Management	1	$ 602.00	$15,614	2	1,205	$31,230	3	$ 1,807.20	$ 46,844.21
Early Successional Habitat Development/Management				3	682	$20,985	3	$ 681.90	$ 20,985.00
Fence				1	1,050	$2,940	1	$ 1,050.00	$ 2,940.00
FORAGE AND BIOMASS PLANTING	1	$ 3.00	$769	2	5	$1,508	3	$ 7.70	$ 2,276.51
Grade Stabilization Structure	9	$ 40.00	$39,634	6	16	$15,989	15	$ 56.00	$ 55,623.24
Heavy Use Area Protection				1	0	$2,213	1	$ 0.30	$ 2,213.00
High Tunnel System				2	2	$16,632	2	$ 2.00	$ 16,632.00
Livestock Pipeline				1	450	$842	1	$ 450.00	$ 842.00
Mulching	2	$ 1.00	$74	6	2	$776	8	$ 2.10	$ 850.40
Seasonal High Tunnel for Crops	1	$ 2,240.00	$7,686				1	$ 2,240.00	$ 7,686.00
Watering Facility				1	3	$1,959	1	$ 3.00	$ 1,959.00
WETLAND WILDLIFE HABITAT MANAGEMENT				3	682	$7,215	3	$ 681.90	$ 7,215.00

Wetland Wildlife Management	1	$ 652.00	$5,382	2	1,305	$10,766	3	$ 1,957.20	$ 16,148.30
80801030102	**60**	**$ 5,907.00**	**$203,942**	**14**	**5,774**	**$21,010**	**74**	**$ 11,680.40**	**$ 224,952.32**
Critical Area Planting	3	$ 1.00	$114				3	$ 0.50	$ 114.30
Fence				2	3,367	$4,445	2	$ 3,367.00	$ 4,445.00
Grade Stabilization Structure	16	$ 57.00	$82,720				16	$ 57.00	$ 82,719.81
Heavy Use Area Protection				1	676	$798	1	$ 676.00	$ 798.00
Irrigation Land Leveling	4	$ 265.00	$52,467				4	$ 264.70	$ 52,466.70
Irrigation Water Conveyance Pipeline	1	$ 850.00	$7,057				1	$ 850.00	$ 7,056.72
Livestock Pipeline				1	1,252	$2,442	1	$ 1,252.00	$ 2,442.00
Mulching	3	$ 1.00	$97				3	$ 0.50	$ 97.43
Nutrient Management	21	$ 1,004.00	$31,992	9	478	$12,169	30	$ 1,482.00	$ 44,161.12
Pasture and Hayland Planting	2	$ 34.00	$3,118				2	$ 34.10	$ 3,118.26
Seasonal High Tunnel for Crops	1	$ 2,100.00	$7,245				1	$ 2,100.00	$ 7,245.00
Shallow Water Development and Management	6	$ 1,591.00	$13,590				6	$ 1,590.60	$ 13,589.94
Structure for Water Control	3	$ 5.00	$5,542				3	$ 5.00	$ 5,542.04
Watering Facility				1	1	$1,156	1	$ 1.00	$ 1,156.00
80801030103	**50**	**$ 17,836.00**	**$174,773**	**25**	**13,970**	**$55,696**	**75**	**$ 31,805.80**	**$ 230,469.27**
Critical Area Planting	8	$ 4.00	$1,299	3	1	$203	11	$ 5.10	$ 1,501.62

Fence	2	$ 8,740.00	$21,555	4	11,967	$19,219	6	$ 20,707.00	$ 40,773.54
FORAGE AND BIOMASS PLANTING				4	84	$12,172	4	$ 83.80	$ 12,172.00
Grade Stabilization Structure	14	$ 74.00	$81,133	3	6	$6,381	17	$ 80.00	$ 87,513.69
Heavy Use Area Protection	3	$ -	$2,213	3	2	$5,584	6	$ 2.10	$ 7,796.50
Irrigation Land Leveling	1	$ 146.00	$23,669				1	$ 145.90	$ 23,668.63
Livestock Pipeline	3	$ 4,777.00	$8,141	1	1,832	$2,968	4	$ 6,609.00	$ 11,109.49
Mulching	7	$ 3.00	$797	3	1	$404	10	$ 3.60	$ 1,201.11
Nutrient Management	2	$ 146.00	$3,458	1	73	$1,862	3	$ 219.30	$ 5,320.38
Pipeline	1	$ 1,760.00	$3,562				1	$ 1,760.00	$ 3,562.12
Pond	3	$ 3.00	$16,795				3	$ 3.00	$ 16,795.24
Pumping Plant	1	$ 1.00	$2,457	1	1	$1,327	2	$ 2.00	$ 3,783.72
Seasonal High Tunnel for Crops	1	$ 2,178.00	$5,092				1	$ 2,178.00	$ 5,092.33
Water Well	1	$ 1.00	$2,838	1	1	$3,076	2	$ 2.00	$ 5,914.00
Watering Facility	3	$ 3.00	$1,765	1	2	$2,500	4	$ 5.00	$ 4,264.90
80801030104	**16**	**$ 3,570.00**	**$232,398**				**16**	**$ 3,569.80**	**$ 232,398.20**
Cover Crop	1	$ 488.00	$3,200				1	$ 488.10	$ 3,200.00
Grade Stabilization Structure	9	$ 113.00	$150,103				9	$ 113.00	$ 150,103.25
Heavy Use Area Protection	1	$ -	$2,267				1	$ 0.10	$ 2,267.08
Nutrient Management	3	$ 1,777.00	$41,320				3	$ 1,777.20	$ 41,319.90
Residue and Tillage Management - Ridge Till	1	$ 991.00	$34,818				1	$ 991.40	$ 34,817.97
Seasonal High Tunnel for Crops	1	$ 200.00	$690				1	$ 200.00	$ 690.00
80801030105	**7**	**$ 8,459.00**	**$46,879**	**3**	**2,536**	**$9,431**	**10**	**$ 10,995.30**	**$ 56,309.76**
Fence	1	$ 6,258.00	$8,740				1	$ 6,258.00	$ 8,739.82

FORAGE AND BIOMASS PLANTING				1	9	$1,333	1	$ 9.30	$ 1,333.00
Grade Stabilization Structure	5	$ 23.00	$31,377	1	3	$4,009	6	$ 26.00	$ 35,385.94
Livestock Pipeline				1	2,524	$4,089	1	$ 2,524.00	$ 4,089.00
Seasonal High Tunnel System for Crops	1	$ 2,178.00	$6,762				1	$ 2,178.00	$ 6,762.00
80801030106	**9**	**$ 56.00**	**$21,941**	**4**	**3,083**	**$22,569**	**13**	**$ 3,138.10**	**$ 44,510.12**
Fence				1	1,870	$5,124	1	$ 1,870.00	$ 5,124.00
Grade Stabilization Structure	4	$ 12.00	$14,423				4	$ 12.00	$ 14,423.13
Heavy Use Area Protection				1	8	$12,744	1	$ 7.50	$ 12,744.00
Nutrient Management	2	$ 21.00	$3,685				2	$ 21.30	$ 3,684.54
Pasture and Hayland Planting	2	$ 21.00	$1,155				2	$ 21.30	$ 1,155.05
Pipeline				1	1,200	$3,000	1	$ 1,200.00	$ 3,000.00
Water Well	1	$ 1.00	$2,678				1	$ 1.00	$ 2,678.40
Watering Facility				1	5	$1,701	1	$ 5.00	$ 1,701.00
80801030107	**5**	**$ 8,102.00**	**$21,428**	**1**	**3**	**$1,616**	**6**	**$ 8,105.20**	**$ 23,043.62**
Fence	1	$ 5,465.00	$9,923				1	$ 5,465.00	$ 9,923.20
FORAGE AND BIOMASS PLANTING	3	$ 27.00	$5,737				3	$ 27.20	$ 5,737.34
Grade Stabilization Structure				1	3	$1,616	1	$ 3.00	$ 1,616.00

Livestock Pipeline	1	$ 2,610.00	$5,767				1	$ 2,610.00	$ 5,767.08
80801030108	**7**	**$ 2,859.00**	**$23,683**	**2**	**2,852**	**$12,299**	**9**	**$ 5,711.00**	**$ 35,981.79**
Grade Stabilization Structure	4	$ 7.00	$10,609	1	2	$2,295	5	$ 9.00	$ 12,903.89
High Tunnel System				1	2,850	$10,004	1	$ 2,850.00	$ 10,004.00
Seasonal High Tunnel for Crops	1	$ 2,850.00	$9,833				1	$ 2,850.00	$ 9,833.00
Water Well	1	$ 1.00	$1,934				1	$ 1.00	$ 1,934.40
Water Well Decommissioning	1	$ 1.00	$1,307				1	$ 1.00	$ 1,306.50
80801030109	**3**	**$ 7.00**	**$6,284**	**2**	**144**	**$13,764**	**5**	**$ 150.50**	**$ 20,048.20**
Grade Stabilization Structure	3	$ 7.00	$6,284	1	5	$9,338	4	$ 12.00	$ 15,622.20
Residue and Tillage Management, Reduced Till				1	139	$4,426	1	$ 138.50	$ 4,426.00

References

In general these are the major color categories used on USGS topo maps. (https://www.topozone.com/topographic-map-legend-symbols/)

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