Bayou Des Cannes

Watershed Implementation Plan

Impairments: Dissolved Oxygen, Nitrate-Nitrite, Phosphorous, Total Dissolved Solids and Turbidity

Louisiana Department of Environmental Quality

Nonpoint Source Pollution Program

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INTRODUCTION

Bayou des Cannes, Subsegment 050101, is a perennial stream located in southwestern Louisiana in the Mermentau River Basin. This 54-mile segment originates in Evangeline Parish, south of Miller's Lake, and flows in a southwesterly direction through Acadia Parish to its termination at the confluence of the bayou with the Mermentau River. The bayou is tidal in nature with frequent flow reverses. The Bayou is very deep, wide and sluggish, especially at low flow. The landscape of the watershed is the low relief prairie common to southwest Louisiana, interspersed with wetlands and riparian trees along the streambanks.

The Louisiana DEQ 2016 Integrated Report (IR) indicates Bayou des Cannes' fish and wildlife propagation (FWP) use is impaired due to low dissolved oxygen (DO) and high levels of turbidity, nitrate-nitrite (NO_3-NO_2), phosphorous (as P), and total dissolved solids (TDS) in the bayou. This use is also impaired due to mercury levels present in fish tissue, but this plan will not address the mercury impairments, as they are ultimately tied to point source emissions of an indeterminate origin. Suspected sources of impairments are agriculture (nutrients and sediment, low DO); natural sources (dissolved solids); and atmospheric deposition and additional unknown sources (mercury). Table 1, below, shows the recent history of impairment status looking back 20 years for continual impairment present day backward.

Table 1 20-year history of current impairments in Bayou des Cannes

Use Impaired	Cause of Impairment	Year Impairment Identified
FWP	DO	1996
FWP	Mercury	1998
FWP	Sediment (TSS, sediment/siltation, turbidity)	2000
FWP	Nutrients (NO3-NO2, TP)	2004
FWP	TDS	2008

Impairment is defined by the water quality standards codified in Louisiana law. The turbidity criterion is background + 10%. Until background is quantified, LDEQ uses a target of 25 NTU, the most protective Louisiana turbidity criterion. The water quality TDS standard is 260 mg/L for this bayou. For DO, Bayou des Cannes is considered a naturally dystrophic water segment, and thus has a seasonal criteria of 5 mg/L December-February, and 3 mg/L March-November. Nutrients are listed as a cause of impairment because they impact dissolved oxygen. Louisiana has no numeric criteria for nutrients at this time. Table 2 shows the state water quality criteria for Bayou des Cannes.

Table 2 Bayou des Cannes water quality standards

Constituent	Standard / Target
Dissolved Oxygen	5 mg/L December through February and 3 mg/L March through November
TDS	260 ppm
Turbidity	25 NTU target

The subsegment land use is primarily agricultural. The northern portion is characterized by rice, pasture, and soybeans. The southern portion features more rice and aquaculture and less soybeans and pasture. The central region is transitional between the two regimes, and contains a mix of those land uses. The Louisiana Department of Agriculture and Forestry (LDAF) will implement Best Management Practices (BMPs) through 2022 focusing initially on the central and northern areas of the subsegment, where intensity of the contributing uses is greatest. In addition to LDAF's focused implementation, the USDA Natural Resources Conservation Service (NRCS) works with area ranchers and other farmers to implement conservation practices on grazing land and cropland in the watershed through the voluntary Environmental Quality Incentives Program (EQIP) . The expectation is that prevention of soil erosion, sedimentation, and nutrient runoff from land use activities will reduce NPS pollution in Bayou des Cannes.

The goal of this plan is to restore use support, specifically fish and wildlife propagation, in Bayou des Cannes by improving water quality such that the state's water quality standards are being met. In order to meet the goal, we plan to implement agricultural BMPs and related conservation practices. To ensure progress is being made towards the goal, we plan to conduct sampling to monitor water quality changes in the watershed.

ELEMENT A Sources and Causes

Louisiana's 2016 IR identified DO, turbidity, NO_3-NO_2, phosphorous, and TDS as the suspected causes of FWP impairment in Bayou des Cannes. The suspected sources are of impairment are agriculture and natural sources (see Table 3).

Table 3 2016 Integrated Report

Subsegment Number	Subsegment Description	Waterbody Type	Size	PCR	SCR	FWP	Impaired Use for Suspected Cause	Suspected Causes of Impairment	Suspected Sources of Impairment	State Water Quality Standard
LA050101_00	Bayou Des Cannes-From headwaters to Mermentau River	R	54	F	F	N	FWP	Nitrate/ Nitrite (Nitrite + Nitrate as N)	Agriculture	No standard
LA050101_00	Bayou Des Cannes-From headwaters to Mermentau River	R	54	F	F	N	FWP	Oxygen, Dissolved	Agriculture	Seasonal DO Criteria: 5 mg/L December-February, 3 mg/L March- November
LA050101_00	Bayou Des Cannes-From headwaters to Mermentau River	R	54	F	F	N	FWP	Phosphorus (Total)	Agriculture	No standard
LA050101_00	Bayou Des Cannes-From headwaters to Mermentau River	R	54	F	F	N	FWP	Total Dissolved Solids	Agriculture	260 ppm
LA050101_00	Bayou Des Cannes-From headwaters to Mermentau River	R	54	F	F	N	FWP	Total Dissolved Solids	Natural Sources	260 ppm
LA050101_00	Bayou Des Cannes-From headwaters to Mermentau River	R	54	F	F	N	FWP	Turbidity	Agriculture	25 NTU (target)
LA050101_00	Bayou Des Cannes-From headwaters to Mermentau River	R	54	F	F	N	FWP	Mercury in Fish Tissue	Atmospheric Deposition - Toxics	
LA050101_00	Bayou Des Cannes-From headwaters to Mermentau River	R	54	F	F	N	FWP	Mercury in Fish Tissue	Source Unkown	

Potential long-term effects of agricultural pollutants include high concentrations of nitrogen, phosphorus, sediments, turbidity, and pesticides entering the watershed. These excess nutrients have the potential to degrade water quality. Low DO commonly results from excessive nutrient deposition. Causes of impairment are presented in the next section, followed by sources of NPS runoff pollution.

Dissolved Oxygen Ambient Data

Bayou des Cannes ambient DO concentrations were collected from WQN site 0308 from 1991 through 2015/2016. Table 4 shows sampled concentrations. Concentrations in red did not meet the DO standard of 5 mg/L December through February. Concentrations in green did not meet the DO standard of 3 mg/L March through November. The exceedance rate for each year is shown at the bottom of the table.

Table 4 Ambient dissolved oxygen water quality data for Bayou des Cannes, 1991-2016.

Month/Year	1991	1992	1993	1994	1995	1996	1997	1998	2003	2004	2007/ 2008	2011/ 2012	2015/ 2016
JAN	8.1	7.5	7.8	9.7	8.0	8.5	6.7	7.4	6.3	7.1	5.7	5.3	5.0
FEB	ND	ND	ND	ND	ND	ND	ND	ND	9.3	9.5	6.1	6.0	6.1
MAR	3.4	6.1	5.6	6.2	7.7	6.1	3.6	5.5	5.0	4.9	4.3	4.0	4.9
APR	ND	ND	ND	ND	ND	ND	ND	ND	4.1	2.9	3.6	2.5	4.6
MAY	4.9	2.7	3.3	3.7	2.6	1.1	1.8	0.9	1.0	4.0	1.7	1.3	5.0
JUN	ND	ND	ND	ND	ND	ND	ND	0.7	2.8	1.3	0.6	0.9	1.8
JUL	2.7	1.9	2.6	3.2	3.3	0.6	2.5	1.8/2.0	2.96	3.8	1.1	2.6	1.5
AUG	ND	ND	ND	ND	ND	ND	ND	1.4/1.1	1.4	3.0	1.0	1.1	ND
SEP	7.1	1.6	2.5	3.0	1.6	1.0	2.5	0.9/0.4	3.8	2.3	ND	2.1	ND
OCT	ND	ND	ND	ND	ND	ND	ND	2.3/1.3	2.7	1.6	1.2	ND	1.8
NOV	4.2	5.6	6.2	3.8	4.6	5.7	6.7	2.7/2.9	2.6	ND	5.0	3.9	3.1
DEC	ND	ND	ND	ND	ND	ND	ND	7.6	4.8	5.8	1.9	3.3	2.3
Exceedance Rate	17%	50%	33%	0%	0%	50%	50%	80%	58%	33%	55%	64%	40%

Green values indicate Mar-Nov exceedances and red values indicate Dec-Feb exceedances.

The graphs below illustrate the DO concentrations and exceedance rates at the ambient site (0308) from 1991 through 2016. The trend line in Figure 1 indicates the concentration is declining and Figure 2 shows exceedances are rising. More work is required in this watershed to restore dissolved oxygen concentrations and the FWP use support.

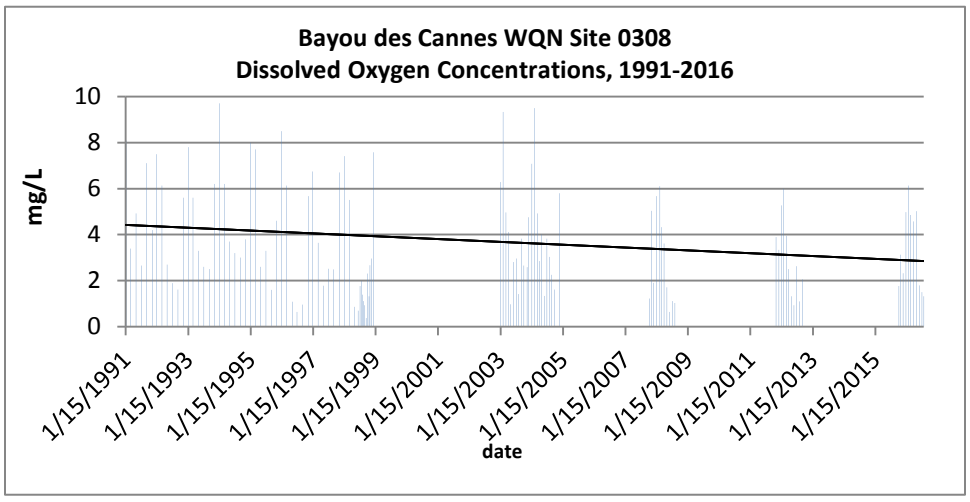

Figure 1 DO concentrations 1991-2016, Site 0308

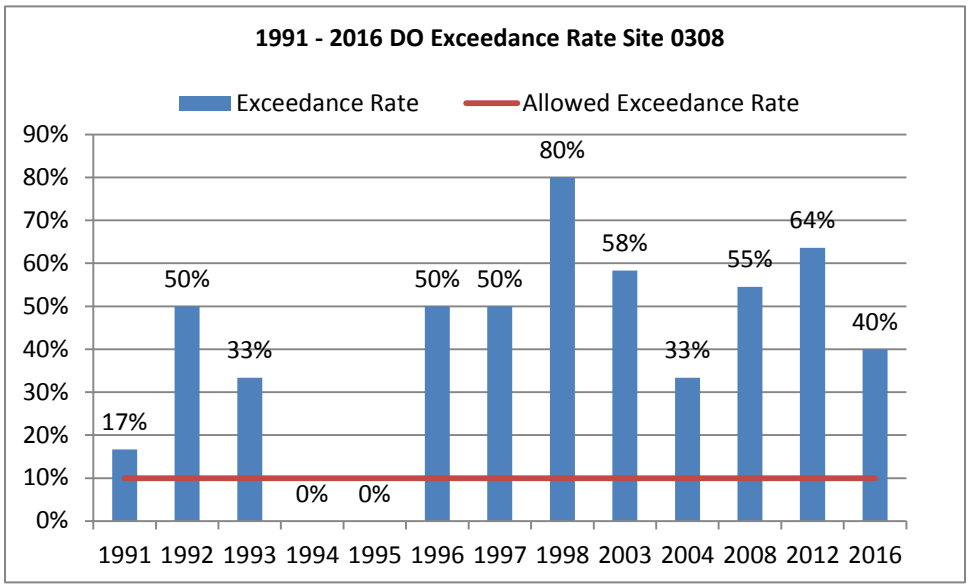

Figure 2 DO exceedance rates 1991-2016, Site 0308

TDS Ambient Data

Table 5 shows the TDS concentrations measured at the ambient site, 0308, since 1991. Exceedances of the 260 mg/L criterion are shown in red.

Table 5 Ambient TDS data for Bayou des Cannes 1991-2016

Month/ Year	1991	1992	1993	1994	1995	1996	1997	1998	2003	2004	2007/ 2008	2011/ 2012	2015/ 2016
JAN	58	262	112	278	256	318	172	174	176	140	230	119	160
FEB	ND	ND	ND	ND	ND	ND	ND	ND	130	109	162	non detect	200
MAR	226	106	164	188	202	530	262	216	185	261	239	140	210
APR	ND	ND	ND	ND	ND	ND	ND	ND	397	664	562	645	270
MAY	190	225	216	252	372	332	458	318	356	154	267	244	150
JUN	ND	ND	ND	ND	ND	ND	ND	ND	177	203	207	188	170
JUL	140	202	245	218	158	108	180	ND	183	132	245	393	150
AUG	ND	ND	ND	ND	ND	ND	ND	ND	229	192	270	100	180
SEP	240	170	266	180	172	188	204	ND	149	268	ND	120	ND
OCT	ND	ND	ND	ND	ND	ND	ND	ND	137	241/ 192	174	264	400
NOV	202	226	196	240	194	88	251	ND	175	ND	276	281	92
DEC	ND	ND	ND	ND	ND	ND	ND	ND	184	146	160	92	150
Exceedance Rate	0%	17%	17%	17%	17%	50%	33%	0%	17%	25%	36%	33%	18%

Red values indicate exceedances. ND = no data.

The graphs below depict TDS concentrations and exceedances for the ambient network site. No distinctive temporal trend is seen in TDS concentrations. However, an increasing trend in exceedance rates for TDS is evident in Figure 4.

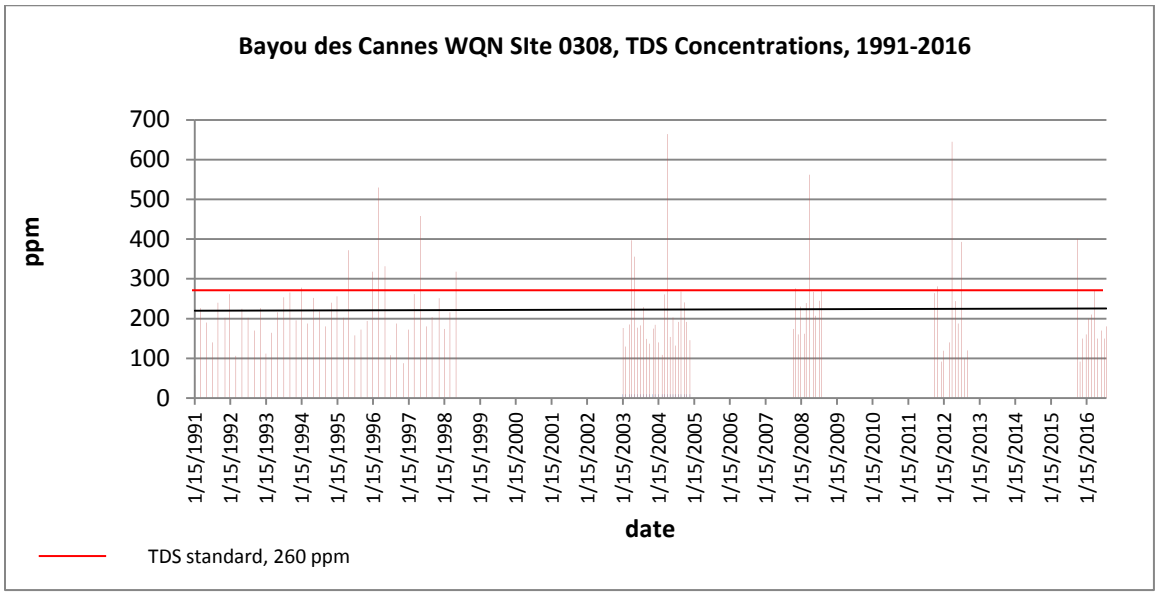

Figure 3 TDS concentrations 1991-2016, Site 0308

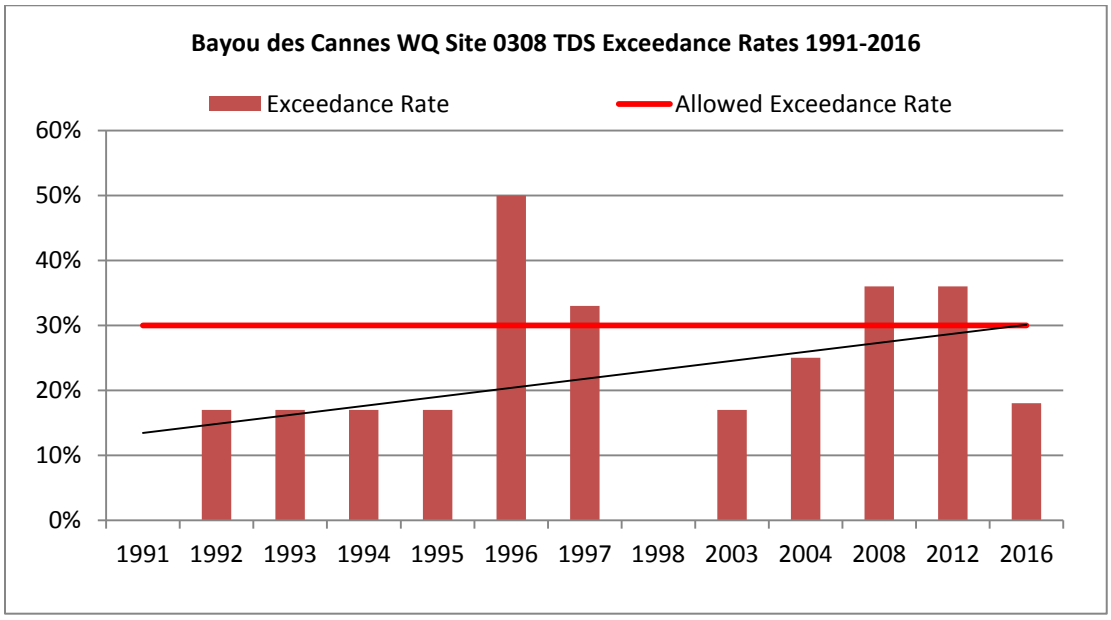

Figure 4 TDS exceedance rates 1991-2016, Site 0308

Turbidity Ambient Data

Table 6 shows the ambient turbidity data collected since 1991. Note that data was collected for both 2007 and 2008 rather than just Water Year 2007-8. Values that exceed 25 NTUs are shown in red. Exceedance rates are shown on the last line of the table. These rates are based on a protective target rather than a numeric criterion. Once background turbidity value has been quantified, the water body

will be reassessed to determine impairment status. Figure 5 shows no discernible trend in values over time, but the last three sampling cycles have shown exceedance rates greater than 60% consistently (Figure 6).

Table 6 Ambient turbidity data for Bayou des Cannes 1991-2016. Red values indicate > 25 NTU target.

Month/ Year	1991	1992	1993	1994	1995	1996	1997	1998	2003	2004	2007	2008	2011/ 2012	2015/ 2016
JAN	64	62	76	120	200	105	60	57	70	55	ND	106	65	53
FEB	ND	ND	ND	ND	ND	ND	ND	ND	80	68	ND	103	59	65
MAR	95	54	75	100	110	70	88	190	128	129	ND	115	110	90
APR	ND	ND	ND	ND	ND	ND	ND	ND	270	370	ND	590	386	180
MAY	70	195	80	160	180	132	245	110	27	45	ND	148	88	97
JUN	ND	ND	ND	ND	ND	ND	ND	25	45	39	ND	59	15	81
JUL	38	38	60	54	47	40	60	32/ 65	27	27	ND	61	32	54
AUG	ND	ND	ND	ND	ND	ND	ND	55/ 34	20	15	ND	24	13	44
SEP	28	26	18	50	18	15	50	19/ 5.5	39	35/31	ND	ND	11	ND
OCT	ND	ND	ND	ND	ND	ND	ND	28/ 26	31	ND	11	15	ND	10
NOV	5	64	56	40	40	43	50	35/ 50	18	ND	12	11	ND	18
DEC	ND	ND	ND	ND	ND	ND	ND	85	60	75	48	26	26	34
Exceedance Rate	17%	100%	17%	100%	17%	17%	100%	80%	83%	91%	33%	73%	70%	82%

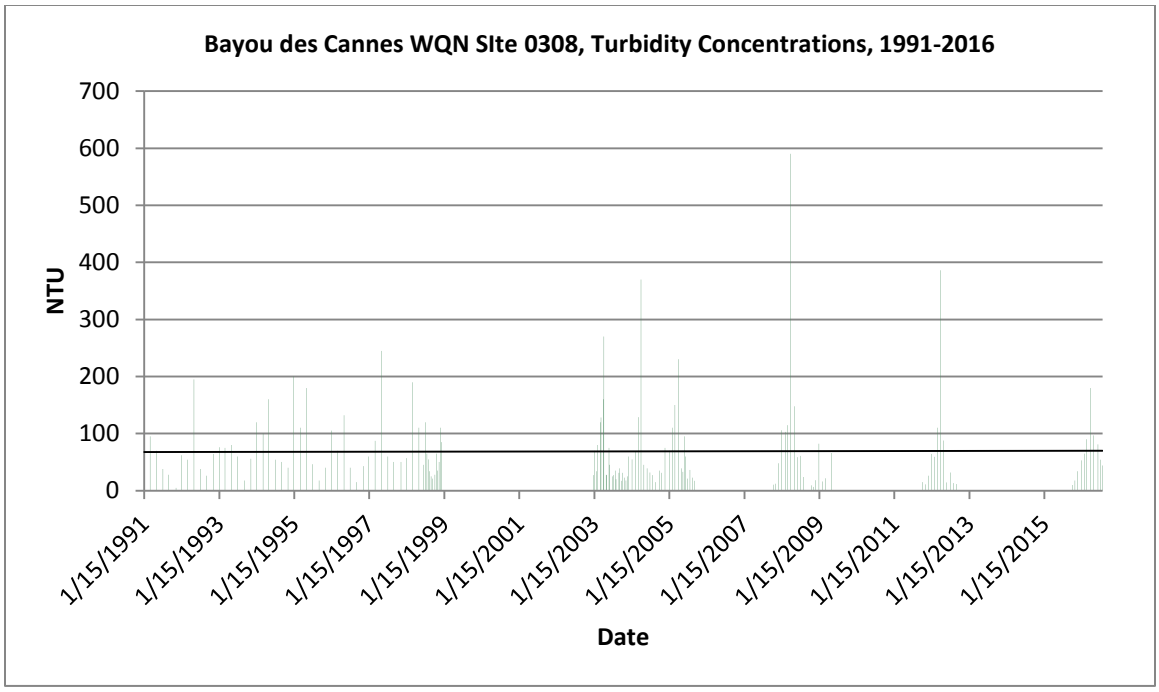

Figure 5 Turbidity concentrations 1991-2016, Site 0308

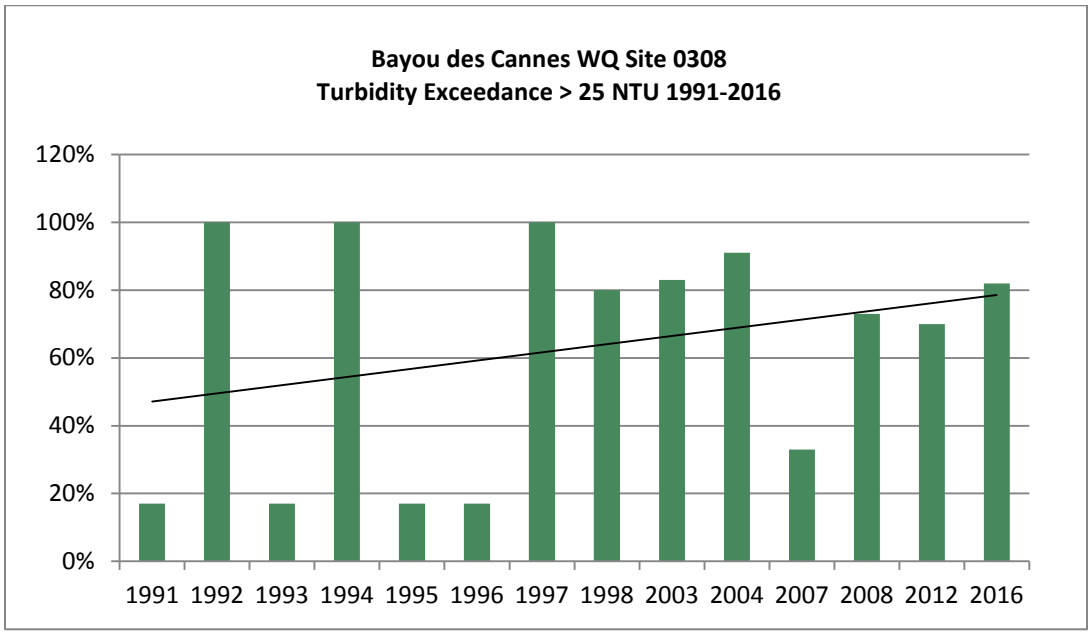

Figure 6 Turbidity exceedances 1991-2016, Site 0308

Nutrients Ambient Data – Nitrate-Nitrite

The overall trend in nitrate-nitrite concentrations shows a decline from 1991 to present. The most recent data shows concentrations have remained below 0.6 mg/L. While Louisiana has no numeric standard for nitrogen, it is often considered a limiting nutrient to algae and other oxygen-demanding substances. BMPs targeting nitrogen runoff are expected to have a positive impact on DO concentrations.

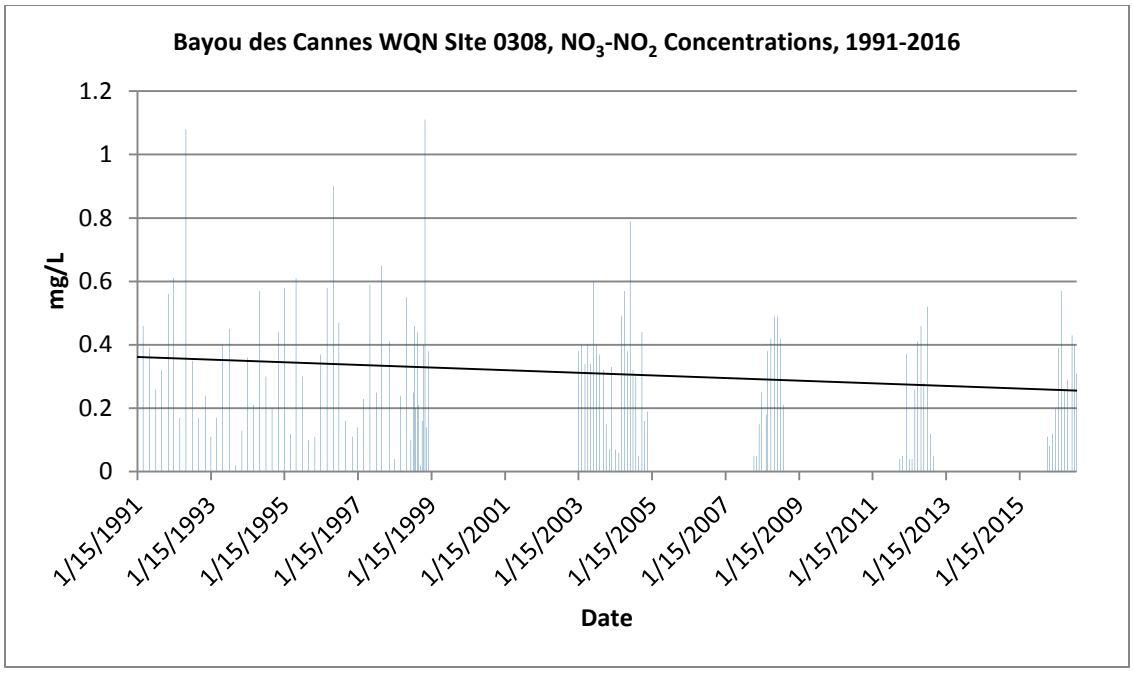

Figure 7 Nitrate-nitrite concentrations 1991-2016, Site 0308

Nutrients Ambient Data – Phosphorous

Louisiana has no numeric standard for phosphorous. However phosphorous contributes to the proliferation of oxygen-demanding organisms and thus impacts DO. Figure 8 shows that despite the trend line shown on the graph, phosphorous concentrations from 1999 forward are decreasing in Bayou des Cannes. The most recent data shows fewer spikes, and the concentrations display less variability, hovering consistently around the 0.3 mg/L mark.

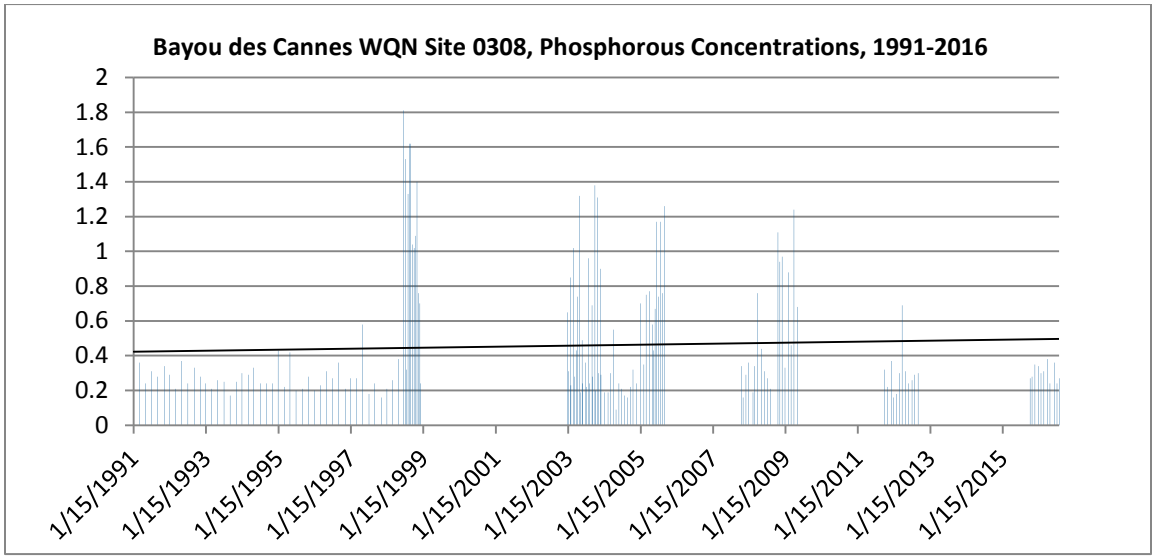

Figure 8 Phosphorous (as P) concentrations 1991-2016, Site 0308

Sources

The Bayou des Cannes subsegment is approximately 170,000 acres in area, and the dominant land use is agriculture, which accounts for about 68 percent of the land use in the watershed. Only a small percentage of the land (10%) has been urbanized. Dominant agricultural uses are rice and crawfish (40%), soybeans (17%), and grass/pasture (9%) (Sources: 2016 USDA Cropland Data Layer; 2015 USDA aerial photography, 2008 LDEQ land cover). The subsegment is also approximately 18% wetland, 10% developed land, and the remaining is a mixture of open water, forest, barren, and shrub land. Common agricultural practices such as fertilizer application and soil tillage may increase sediments and nutrients in runoff. Table 7 shows the number of acres devoted to each type of land use/land cover within the Bayou des Cannes watershed. Land use is dynamic and therefore these numbers may vary each year.

Table 7 Land use in Bayou des Cannes

Land Use/Land Cover	% Use/Cover	Acres
Rice / Crawfish	40.1%	50,730
Wetlands	18.4%	31,192
Soybeans	17.3%	25,207
Developed	10.4%	17,710
Grass/Pasture	9.4%	24,798
Other cropland	1.8%	15,819
Other (Shrub, Barren, Water)	1.4%	2,437
Upland forest	1.1%	1,908

The Bayou des Cannes subsegment is comprised of five 12-digit hydrologic unit code (HUC) areas:

- 080802010301: Bayou Joe Marcel-Bayou des Cannes
- 080802010302: Bayou Marron-Bayou des Cannes
- 080802010304: Tiger Point Gully-Bayou des Cannes
- 080802010306: Richards Gully-Bayou des Cannes
- 080802010307: Bayou Pointe Aux Loups-Bayou Des Cannes

The land use map (Figure 9) shows soybeans and pasture land are concentrated in the upper HUCs, whereas aquaculture and rice are prevalent in the southern HUCs, along with a large area of forested wetland lining the bayou.

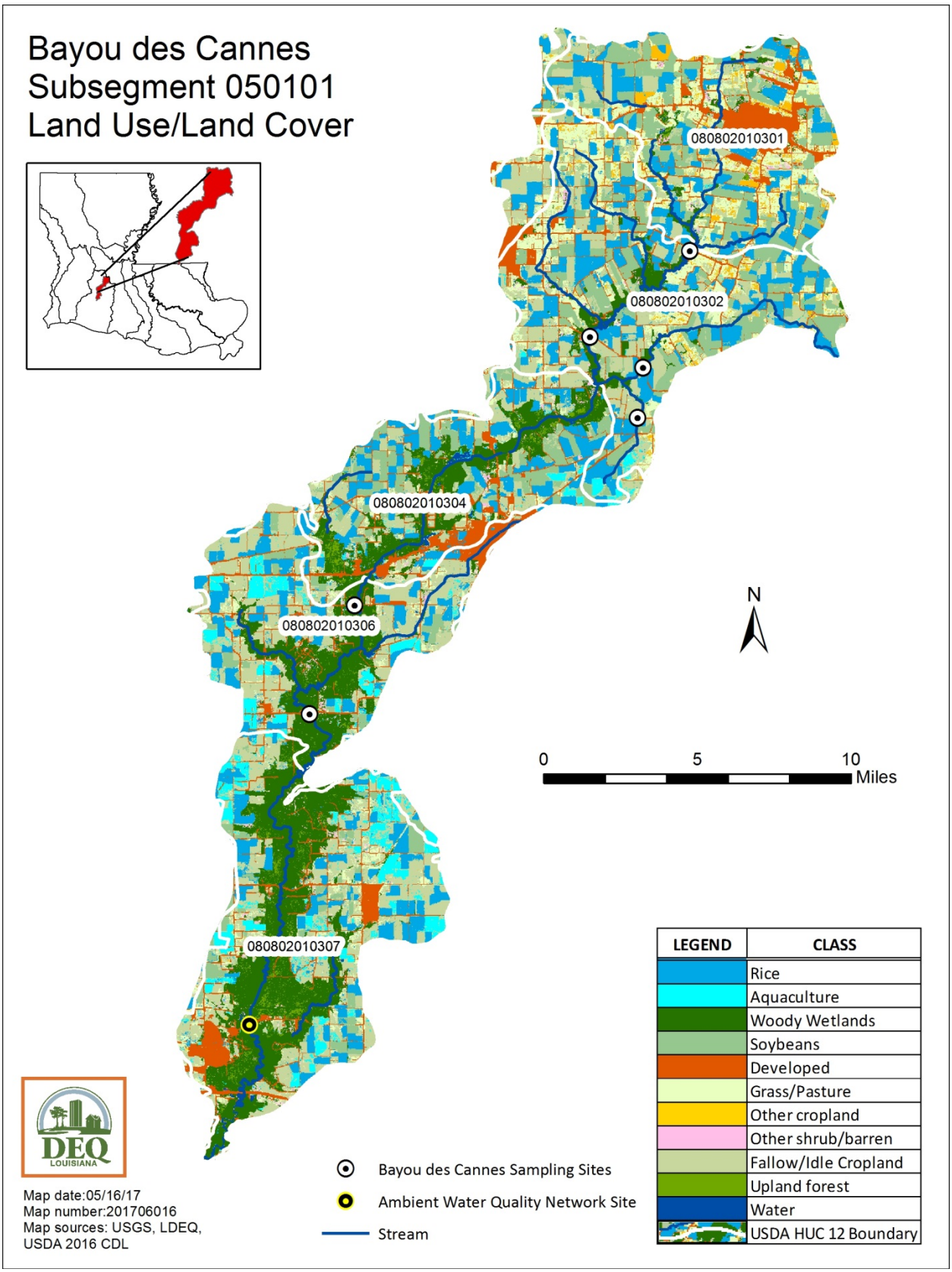

Figure 9 Land use in Subsegment 050101

High priority areas for BMP implementation in Bayou des Cannes are based on land use/land cover data, output from the Soil and Water Assessment Tool (SWAT) model performed by LDEQ's NPS section, and baseline water quality sampling. The three northernmost HUCs were identified by LDAF as having significantly larger coverage and total acreage of intense agricultural land uses known to cause the identified impairments than in other areas within the subsegment. LDEQ's NPS Section ran the Soil and Water Assessment Tool (SWAT) model on the subsegment. Output from the SWAT model was used to identify critical areas within the HUCs prioritized by LDAF to help develop ranking criteria for choosing applications for BMP implementation. LDAF is placing BMPs in the critical areas in: HUC 080802010301, HUC 080802010302, and HUC 080802010304. Locally led Soil and Water Conservation District (SWCD) outreach noted encouraging levels of prospective participation in these areas. The SWAT output map showing model results on the three HUCs of interest is seen in Figure 10, below. Critical areas identified with the SWAT model depict where the various sources of pollutants may originate. Areas in red are the most critical, followed by yellow, then blue. Baseline data has indicated additional HUCs in the lower part of the watershed warrant BMPs as high pollutant concentrations are seen at some sites in that area as well. In addition to LDAF's targeted cropland BMP efforts, NRCS implements non-targeted grazing land and other agricultural conservation practices in all HUCs within this subsegment through EQIP.

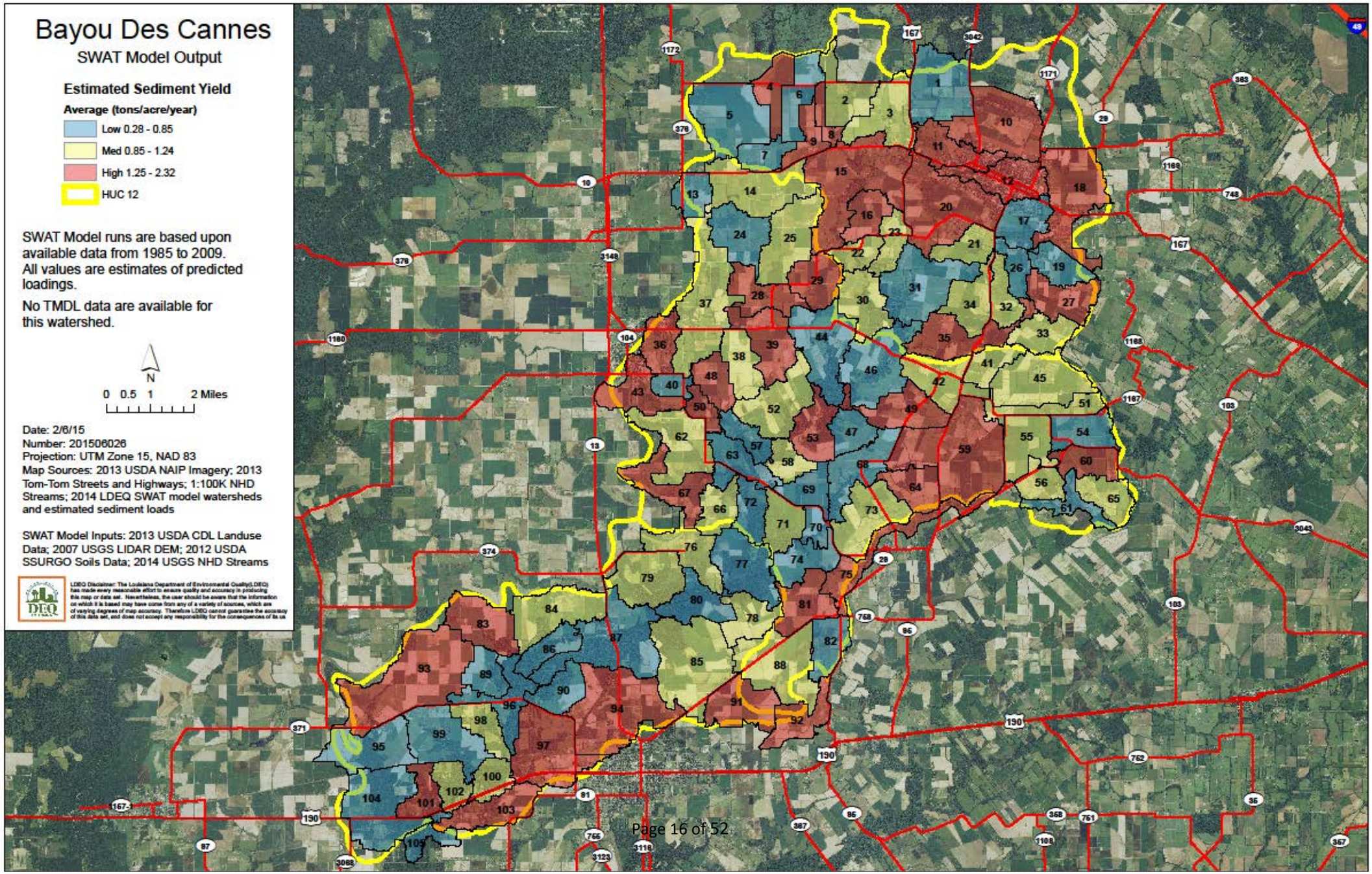

Figure 10 SWAT model output for upper HUCs

ELEMENT B Load Reductions Needed

In 1999, a TMDL was developed addressing DO and nutrients for Bayou des Cannes. The TMDL concluded that a 50-75% reduction in nonpoint source pollution was required to meet the state DO criteria (5 mg/L December – February; 3 mg/L March – November). Although the TMDL was generated in 1999, the land use has not significantly changed. Over the period from 2001 to 2016, watershed acreage of pasture decreased only 7% and acreage cropland has increased by just 1%. The TMDL was based on a model of the lower two HUCs in the watershed. This plan addresses the entire watershed. Therefore, LDEQ used the more conservative 75% NPS reduction prescription from the TMDL and distributed that across the watershed, including headland areas. Using ratio and proportion of agricultural land in the lower HUCs and in the upper HUCs, the equivalent load reduction was calculated to be 30% watershed-wide.

To provide load reduction estimates for nitrogen, phosphorus, BOD, and sediment based on the BMP's that LDAF will implement, a Spreadsheet Tool for Estimating Pollutant Loads (STEPL) model was run for the Bayou des Cannes subsegment. The tables below show the total loading estimates for Bayou des Cannes in each HUC and from each land use with no BMPs implemented.

Table 8 STEPL load estimates for each HUC-12 in Bayou des Cannes without BMPs

Watershed (HUC12)	N Load lb/yr (no BMP)	P Load lb/yr (no BMP)	BOD Load lb/yr (no BMP)	Sediment Load t/yr (no BMP)
080802010301	335,174	50,362	934,979	6,528
080802010302	513,238	75,363	1,364,663	8,557
080802010304	278,911	48,194	713,172	5,718
080802010306	283,475	48,950	720,769	5,748
080802010307	394,809	67,979	1,009,279	7,736
Total	1,805,607	290,847	4,742,862	34,287

Table 9 STEPL load estimates by land use in Bayou des Cannes without BMPs

Sources	N Load lb/yr (no BMP)	P Load lb/yr (no BMP)	BOD Load lb/yr (no BMP)	Sediment Load t/yr (no BMP)
Urban	233,643	37,157	916,478	5,510
Cropland	1,116,051	196,087	2,340,372	27,339
Pastureland	394,766	30,886	1,277,837	1,288
Forest	26,063	12,977	64,919	149
Septic	35,083	13,741	143,256	0
Total	1,805,607	290,847	4,742,862	34,287

Table 10 shows load reductions associated with each practice as determined by the STEPL model based on a 50% BMP application rate. STEP-L was used to determine the necessary application rate to achieve 30% NPS load reduction. Applying BMPs on 50% cropland is expected to generate 37 % N load reduction, 56% reduction in phosphorus, and 72% reduction in sediment. While the TMDL did not address TDS and turbidity impairments, the sediment reduction from implementing conservation practices estimated using STEPL is illustrated in the table below.

Table 10 STEPL-estimated load reductions from BMP implementation for N, P, and sediment

Expected NPS reductions from BMP implementation			
Conservation Practice	50 % Implementation		
	Nitrogen Reduction (%)	Phosphorous Reduction (%)	Sediment Reduction (%)
Residue Management	3.0	7.9	12
Grade Stabilization Structures	6.4	4.5	12
Irrigation Water Management	2.9	5.6	10
Irrigation Land Leveling	2.9	5.6	10
Shallow Water Management	12.6	9.8	6
Nutrient Management	5.4	7.8	0
Conservation Crop Rotation	3.3	14.4	21.9
Total	**36.5**	**55.7**	**71.8**

Hypothetical annual reductions in loading from 2017 to 2022 are illustrated in the graphs below. The assumption is LDAF implementation in the watershed reduces NPS pollution by 6% of current loading each year. This annual reduction would account for a 30% reduction in annual loading achieved by 2022. Reductions based on education and outreach efforts cannot be measured. These reduction charts are for the primary nutrient and sediment pollutants in the watershed and do not represent actual reductions, as many BMP impacts aren't seen within the same year as implementation. The 2017 load was estimated using the EPA STEPL model.

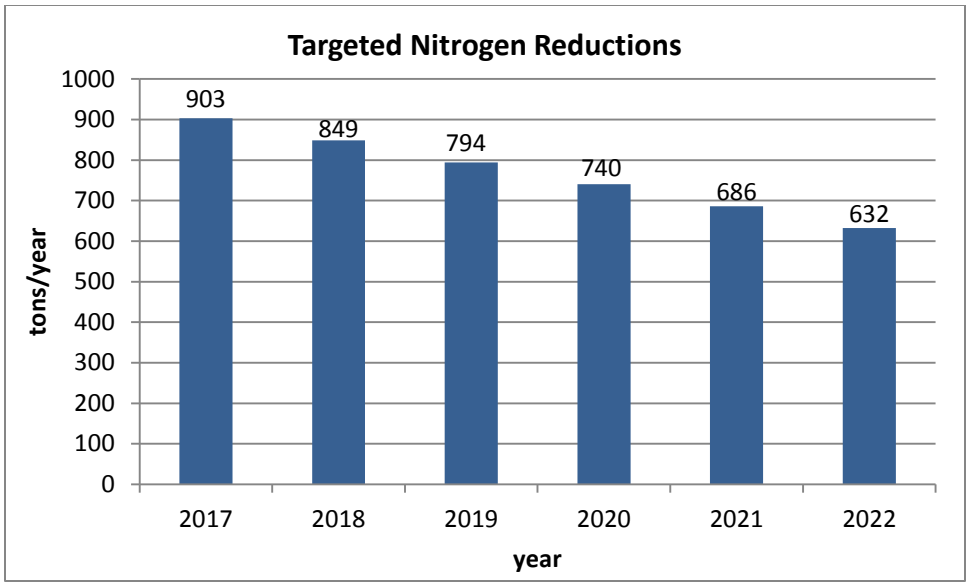

Figure 11 Targeted yearly nitrogen reductions in Bayou des Cannes

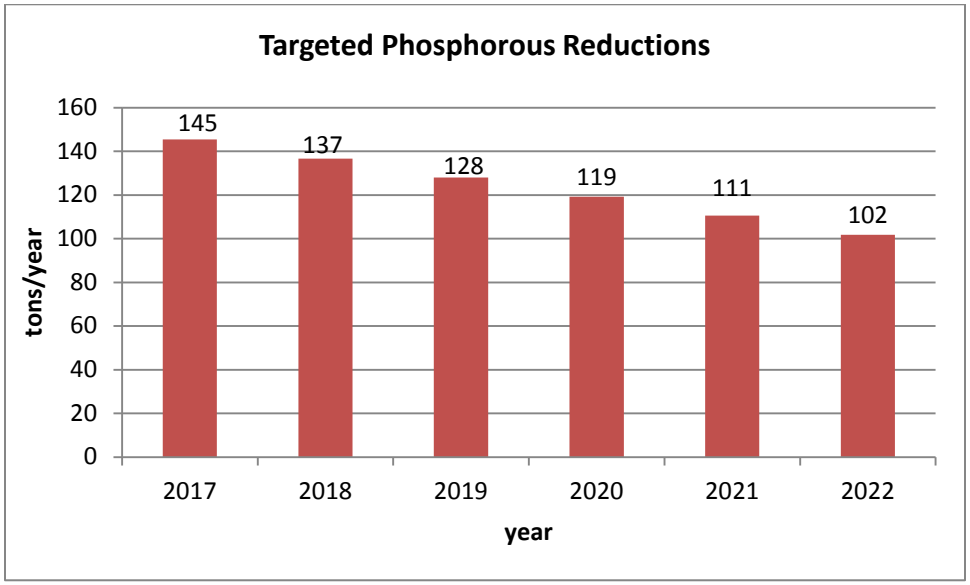

Figure 12 Targeted yearly phosphorous reductions in Bayou des Cannes

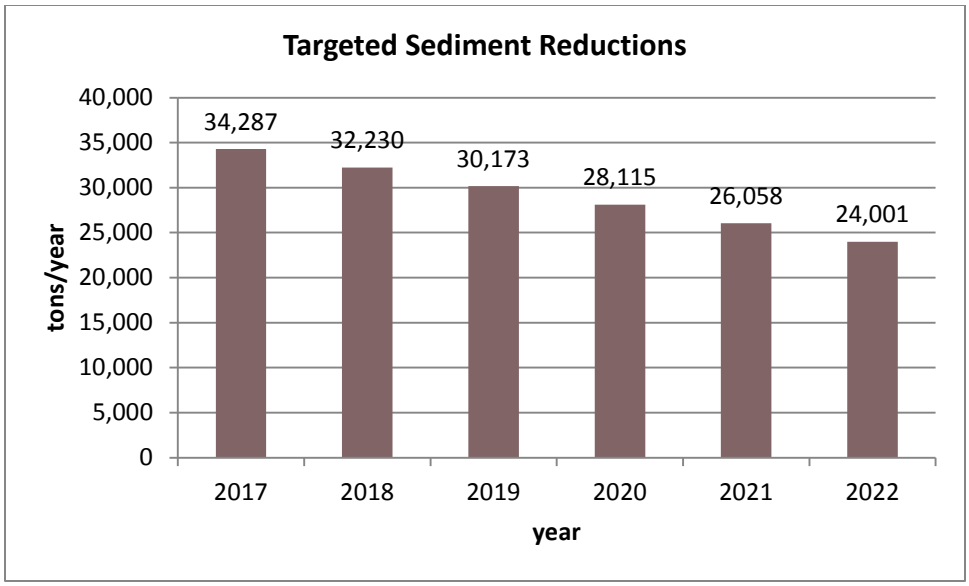

Figure 13 Targeted yearly sediment reductions in Bayou des Cannes

ELEMENT C NPS Management Measures

Although initial BMP implementation was based on SWAT model results to best target areas for conservation practices, project data can now help inform a revision of targeted areas. Applications to the program that were previously ranked according to areas targeted using SWAT can be re-ranked based on monitoring data to date, and prioritized according to areas showing highest concentrations. The upper HUCs were targeted initially for their concentration of agricultural land use and less vegetated acreage directly abutting the water body. The lower HUCs feature large tracts of wetland forest directly adjacent to the water body, which may be expected to act as a filter or sink for sediment and nutrients. However, baseline data in 2016 shows high pollutant concentrations at several sites in the lower two HUCs that should be addressed with BMPs.

Table 11 displays priorities for future implementation based on DO exceedances derived from the NPS water quality monitoring project. DO exceedance rates were calculated using 2015, 2016, and 2017 data collected. Priorities were assigned based on data collected from 2016 due to the high number of sampling events in that year. To further prioritize, we narrowed the focus to data specifically sampled from March through November, when the lower DO standard of 3.0 mg/L applies.

Priority was determined by the DO exceedance rates at each monitoring site. Site 2747 had the highest exceedance rate (65%) and therefore areas draining to that site are given the highest priority for implementation. Site 1969 had the lowest exceedance rate (0%) so areas draining to that site are given the lowest priority for future implementation. The prioritization map (Figure 11) shows sampling site rankings of March-November DO exceedances based on 2016 NPS water quality monitoring. Areas draining to those priority sites will be used to re-rank applications in the upper HUCs. Should analysis of long-term data continue to indicate high loading, implementation may move into the lower HUCs according to priorities shown in Table 11. Refer to Element I for further information concerning the

water quality monitoring project for Bayou des Cannes. Refer to Appendix A for project data graphs showing sampling results from December 2015 – February 2017.

Table 11 DO exceedances > 3 mg/L March-November 2016

Bayou des Cannes Project Water Quality Data Percent Exceedance, Year and Priority													
Site	2015				2016				2017				Priority
	Dec-Feb		Mar-Nov		Dec-Feb		Mar-Nov		Dec-Feb		Mar- Nov		
	Exceedance %	#sampling events	Exceedance %	#sampling events	Exceedance %	#sampling events	Exceedance %	#sampling events	Exceedance %	#sampling events	Exceedance %	#sampling events	
WQN 0308	100	2	ND	ND	0	3	64	11	50	2	0	2	2
1969	0	2	ND	ND	60	5	0	17	67	3	0	2	7
1970	0	2	ND	ND	0	5	53	17	50	2	0	2	3
2747	50	2	ND	ND	17	6	65	17	0	3	0	2	1
4650	0	2	ND	ND	0	6	24	17	0	3	0	2	5
4653	0	2	ND	ND	0	6	50	16	0	3	0	2	4
4654	0	2	ND	ND	0	6	18	17	0	3	ND	ND	6

Bayou des Cannes Sampling Sites Prioritized Based on DO Exceedances March-November 2016

Site	2016 Mar-Nov DO Exceedance Rates (%)	Priority
2747	65	1
WQN 0308	64	2
1970	53	3
4653	50	4
4650	24	5
4654	18	6
1969	0	7

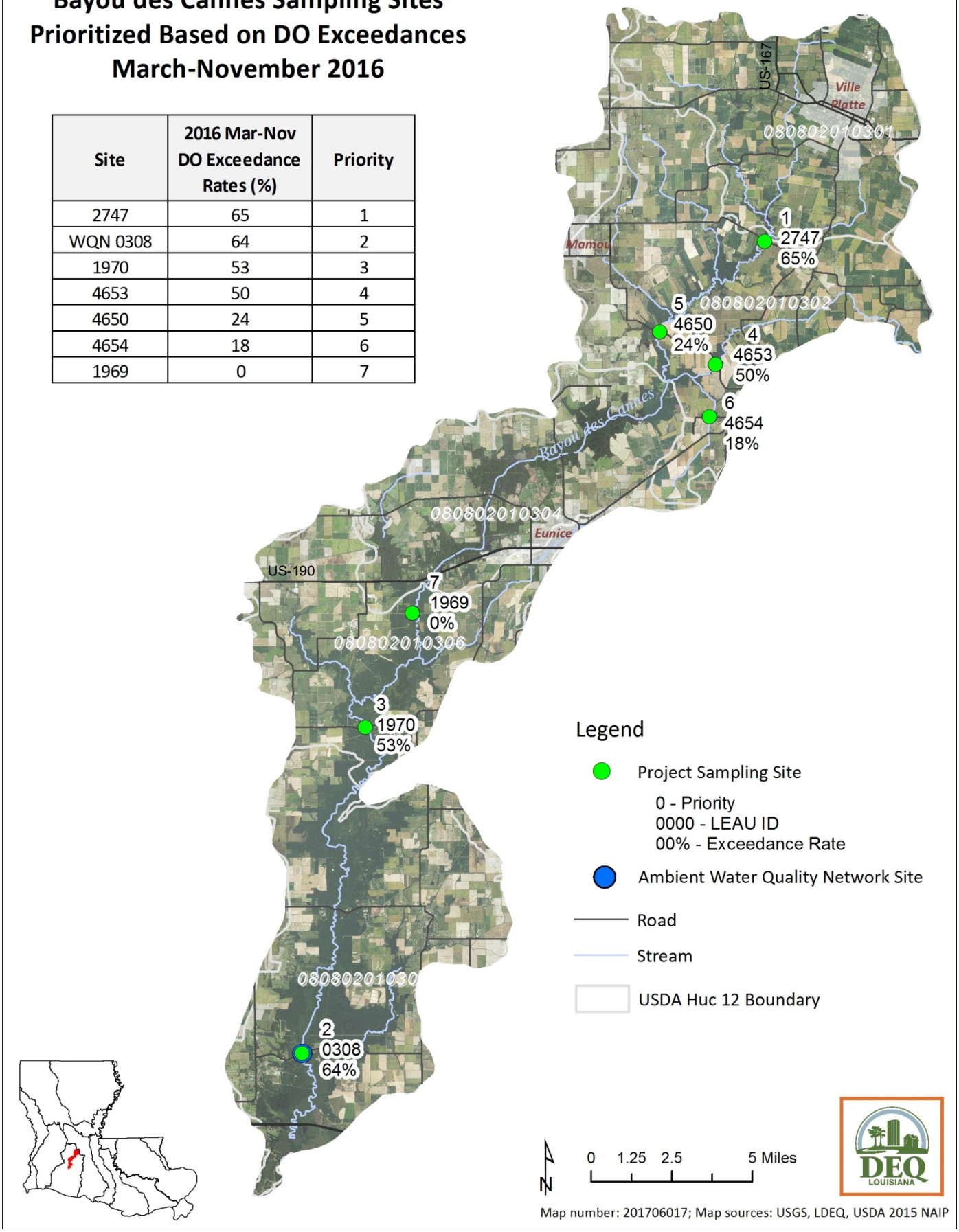

Figure 14 2016 DO exceedances and rankings for future implementation

Agricultural BMPs are one of the most important tools for controlling NPS runoff. Management practices focused on agriculture are defined as practices utilized by producers to control the timing and delivery of fertilizer, pesticides, herbicides, etc., as well as controlling the timing and amount of irrigation water thereby reducing the amount of pollutant runoff entering surface and ground waters. The intent of BMPs is to provide producers with conservation practices not only to reduce or eliminate agricultural impacts to the environment, but to occasionally induce other seasonal or sustained ecological benefits that may otherwise be nonexistent for the area. When properly implemented and maintained, these practices can help improve soil and water quality without placing unreasonable burdens on the agricultural industry of Louisiana.

BMP implementation is scheduled for July 2014 through September 2022. The practices in Table 12 have been identified for use within the project areas to address the resource management concerns.

Table 12 BMPs selected for Bayou des Cannes

NCRS Code	BMP Name	Targeted Pollutant
328	Conservation Crop Rotation	Sediment/Nutrients/DO
329/345	Residue Management	Sediment/Nutrients/DO
410	Grade Stabilization Structures	Sediment
449	Irrigation Water Management	Sediment/Nutrients/DO
464	Irrigation Land Leveling	Sediment/Nutrients
590	Nutrient Management	Nutrients/DO
646	Shallow Water Development and Management	Sediment/Nutrients/DO

All practices will be implemented by the project participants as identified in the BMP plans and will provide for part of the project matching costs. LDAF's semi-annual reports in USEPA grants reporting tracking system (GRTS) and LDEQ's NPS annual report will highlight the acreage and type of BMPs implemented and water quality changes as a result of BMP implementation.

The following section describes each BMP in more detail:

Conservation Crop Rotation (NRCS Code 328)
Conservation crop rotation refers to growing crops in a recurring sequence on the same field. A conservation crop rotation may include crops planted for cover or nutrient enhancement. The crops selected should produce sufficient quantities of biomass at the appropriate time to reduce erosion by water or wind to within acceptable soil loss levels.

Residue Management (NRCS Code 344)
Residue management refers to managing the amount, orientation, and distribution of crop and other plant residue on the soil surface year-round with limited soil-disturbing activities to only areas necessary to place nutrients. Residue management reduces soil erosion and increases soil organic matter, therefore reducing the off-site transport of sediment, nutrients, and pesticides. A slight to moderate improvement in soil erosion is expected from these practices, as well as a slight to moderate improvement in the amount of nutrients, organics, sediment, metals and pesticides that have an effect on water quality.

Grade Stabilization Structures (NRCS Code 410)
Grade stabilization structures are used to control the graded release of irrigation water to prevent the formation of edge of field gullies, scouring, and head-cuts which contribute to siltation, sedimentation, and turbidity by allowing sediments to settle out in flooded rice/crawfish fields. These structures are used to control soil erosion and to enhance environmental quality and reduce pollution hazards. This practice is expected to provide a moderate improvement in soil erosion. Water quality impacts associated with this practice includes a slight to moderate improvement in the amount of suspended sediments and turbidity.

Irrigation Water Management (NRCS Code 449)
Irrigation water management refers to the process of determining and controlling the volume, frequency, and application rate of irrigation water in a planned, efficient manner. It addresses these resource concerns:

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

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

Irrigation Land Leveling (NRCS Code 464)
Irrigation land leveling involves resloping the surface of irrigated land to planned grades of as little as 0.05% slope, so that field drainage and rainfall runoff do not induce erosion. It is meant to aid in the efficient use of water resources by capturing rainfall for crop use, allowing the producer to be less reliant on ground water. All leveling work is planned as an integral part of an overall farm irrigation system to enhance the conservation of soil and water resources. The boundaries, elevations, and direction of irrigation of individual field leveling jobs shall be such that the requirements of all adjacent

areas in the farm unit can be met. A decrease in soil erosion is expected from this practice and an improvement in water quality as a result.

Nutrient Management (NRCS Code 590)
Nutrient management reduces agricultural nonpoint source pollution of surface and groundwater, conserves and properly utilizes nutrients for plant production, and improves or maintains biological soil condition. This is a management practice that involves keeping records of rates, types, and seasonal timing of the application of fertilizer to cropland and pastureland. Soil grid sampling and precision agriculture techniques are sometimes utilized for a higher degree of nutrient utilization.

Shallow Water Development and Management (NRCS Code 646)
Shallow water development and management involves the inundation of lands to provide habitat for wildlife, increases beneficial utilization of crop and plant residue, reduces soil erosion, and improves water quality. This practice is typically applied where water can be impounded or regulated by using existing rice field levee and pumping systems. It can also be used to provide refuge habitats for native fish or crustaceans during high-flow periods. Site selection is important for the success of this practice. Soils must have a low permeability or seasonal high water table. The site must be free of hazardous materials, and the water supply must be adequate to maintain water levels between 1 to 18 inches in depth over the majority of the area during the inundation period. Management and maintenance is very important to ensure that this practice functions as intended throughout its expected life and includes monitoring and management of structural components, including irrigation land leveling and grade stabilization structures, and habitat quality.

The LDAF Office of Soil and Water Conservation (OSWC) in conjunction with the Evangeline SWCD will focus its implementation efforts on priority areas in Bayou des Cannes, and foresee a reduction of NPS pollutants by implementing these BMPs to protect water quality in the bayou's 12-digit HUCs. LDEQ will continue to monitor water quality.

ELEMENT D Technical and Financial Assistance

Onsite technical assistance in implementing BMP plans developed will be provided to project participants. Technical assistance includes, but is not limited to, soil management, engineering, biological, agronomic, and other specialized assistance. All BMPs implemented will meet USDA-NRCS standards and specifications. USDA-NRCS, LDAF, and SWCD staff will provide technical assistance to participants in designing and implementing BMPs, and assisting with follow-up technical assistance for project participants for the project duration. The SWCD will maintain all appropriate project records.

Upon NRCS' technical verification following BMP implementation, cost-share assistance will be provided to project participants. BMPs are implemented according to a prescribed resource management system (RMS) conservation plan, and according to USDA-NRCS conservation practice standards and specifications. The SWCD is responsible for verifying/approving all cost-share payments to program participants.

Louisiana Department of Agriculture & Forestry is the lead agency for BMP implementation and will provide project management on a day-to-day basis, assist in developing and implementing BMPs, and provide reimbursement to project participants for cost-share. LDAF-OSWC tracks the rate and extent of BMP implementation within each project watershed and is also responsible for producer outreach, establishing application ranking criteria, BMP selection, assisting in watershed project sign-ups, and creating conservation plans and contracts. The LDAF project manager also assesses the progress of the project through inspections and maintenance of records at the conservation district office, and by visiting the farm site, in which the program specialists provides technical assistance. The program specialist will ensure reimbursement is issued in a timely manner to project participants, and maintains photocopies of receipts used to purchase supplies and equipment that will consequently be billed to the project. Upon request, LDAF will provide evidence of all costs incurred within the grant period to USEPA. Table 13 displays the BMP's to be implemented, the targeted pollutant, BMP type, and unit cost.

Table 13 BMPs, targeted pollutants, and unit cost

NCRS Code	BMP Name	Targeted Pollutant	BMP Type	Unit	Unit Cost
329/345	Residue Management	Sediment/Nutrients /DO	No till/Reduced till	Acre	Paid for by Match
410	Grade Stabilization Structures	Sediment	Anti-vortex baffle, chute, earthfill hauled in from off farm, earthfill moisture control, earthfill soil modification, low overfall end sections, re-installation of failed structure	Per structure	750
449	Irrigation Water Management	Sediment/Nutrients /DO	Determining and controlling the volume, frequency, and application rate of irrigation water	Acre	Paid for by Match
464	Irrigation Land Leveling	Sediment/Nutrients /DO	125 to 205 cy per ac (installed, mobilization, earthwork)	Acre	$167 or $227
646	Nutrient Management	Shallow Water Development and Management	Provide habitat for wildlife, mainly waterfowl.	Acre	Paid for by Match
590	Nutrient Management	Nutrients/DO	Basic: Control rates, types, and seasonal application of fertilizer	Acre	Paid for by Match
328	Conservation Crop Rotation	Sediment/Nutrients /DO	Rotation of crops on agricultural land	Acre	Paid for by Match

The Louisiana Department of Environmental Quality NPS Program works closely with LDAF-OSWC to identify the priority areas identified using the SWAT model. In addition, all project partners collaborate to identify additional areas of interest in the project area, to address resource management problems, to assess the project plan, and implementation schedules, and to coordinate state Section 319 program components with LDAF. LDEQ-NPS also provides monetary assistance from EPA's Section 319 Program for water quality sampling in the Bayou des Cannes subsegment. The Louisiana Department of

Environmental Quality Water Surveys Section is collecting water quality samples and in-situ readings at seven locations for field parameters and nutrients in Bayou des Cannes from December 2015 through 2023.

The NRCS staff assists LDAF and LDEQ in collecting field information, meeting with local commodity groups, and identifying cropland in the Bayou des Cannes watershed. NRCS helps develop the ranking criteria and assists LDAF and local SWCDs with outreach and education activities to ensure landowners and operators are aware of program opportunities. NRCS helps ensure that RMS level conservation plans developed for this project meet NRCS standards and specifications. The field technicians help provide technical assistance for BMP plan surveys, designs, implementation, and certification.

The Evangeline Soil & Water Conservation District contacts and works with project participants at the local level. The SWCD is responsible for contacting potential applicants, conducting sign-ups, and working with project participants to ensure all BMPs are installed according to schedule. They also conduct extensive outreach to the youth schools, communities and diverse landowners of the parish. Louisiana SWCDs operate under the administrative authority of the LDAF OSWC.

ELEMENT E Education Component

Educational-outreach activities are important components of watershed protection and water quality improvement and are initiated prior to BMP implementation and continue throughout the life of the project. The educational-outreach program enhances watershed based efforts to correct NPS impairments by establishing a community-wide awareness of and relevance to local natural resource needs and concerns, and providing an opportunity to link NPS pollution reduction and other environmental benefits to all available conservation programs as necessary to achieve acceptable surface water quality standards in agricultural environments. Outreach leads to a better community-wide understanding of the effects and remediation of off-site NPS pollution impairments. The Bayou des Cannes educational program will be focused on increasing the awareness of NPS pollution issues associated with agricultural activities within the watershed. When landowners/producers understand the objectives of watershed restoration and benefits to the community, they are more likely to implement and maintain BMPs.

To increase the awareness of NPS pollution problems and issues associated with agricultural activities within the Bayou des Cannes watershed, LDAF will be the lead in the education and outreach program. LDAF, Evangeline SWCD, USDA-NRCS, LSU Ag Center and the LDEQ NPS section will work cooperatively to conduct NPS education through agricultural BMP workshops, field days within the watershed, the Soil and Water Stewardship Program, and through other related events and activities throughout communities.

Project WET (Water Education for Teachers) education workshops will be conducted for formal and non-formal educators of students ages kindergarten through twelve. One agricultural BMP field day will be held within the Bayou des Cannes watershed to demonstrate the potential for reducing stream loading

from agriculture activities, through the implementation of BMPs. Education and outreach will be conducted by the SWCD and NRCS in conjunction with a farm tour or rice field day. A special effort will be made to encourage landowners, operators, and educators from within the watershed to participate in the field day. Citizens will also be encouraged to become certified Master Farmers through the LSU Ag Center. USDA-NRCS and SWCD staff will make every effort to address local commodity groups at their annual meetings.

Additionally, to engage producers in the project areas, project fliers are distributed locally to notify landowners of CWA Section 319 funds being available for conservation assistance to correct surface water impairments. These impairments are made known to the community during the SWCD's locally-led conservation meetings, whereby all community stakeholders present are encouraged to voice, and prioritize their natural resource concerns. Project ranking procedures, including farmland in close proximity to affected waterbodies, is included. Beyond the locally led meeting is the project specific SWCD-led BMP workshop and project orientation. These workshops often include presentations by technical specialists from all agencies involved in the watershed effort, and include presentations on the extent of impairments, environmental/agricultural impacts resulting from these impairments and methods of remediation. Maximizing public outreach and education is one of the annual goals of the SWCD.

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

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

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

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

Positive outcomes of organizing BMP workshops for producers include:

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

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

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

The Evangeline SWCD has achieved their goal of visiting 11 schools and providing learning material during the 2014-2015 school year. They have also presented hands on demonstrations in four of the parish libraries as part of the summer reading program. The Evangeline SWCD hosts the annual Future Farmers of America (FFA) forestry contest each year, which attracts approximately 100 students from several different parishes.

In addition to field days and educational flyers/materials provided through the LSU Ag Center, LDEQ will partner with USDA and LDAF to host one to two meetings annually to discuss progress made in BMP implementation and water quality data collection. A summary of water quality data will be presented at these meetings to allow landowners and producers an opportunity to see how their participation in the programs is affecting water quality in Bayou des Cannes.

A special effort will be made to encourage producers/landowners that have implemented BMPs under a previous section 319 project or USDA program to continue to maintain the BMP's and to work with other producers in the project and surrounding areas to implement additional BMP's with or without cost-share assistance.

ELEMENT F Implementation Schedule

BMP implementation in Bayou des Cannes is scheduled for July 2014 through September 2022. Implementation in Bayou des Cannes will take place initially in three of the five HUCs, 080802010301, 080802010302, 080802010304, and LDEQ will sample in all five HUCS, to track water quality changes and to aid in the placement of future BMPs.

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

Cannes watershed. Note that as water quality sampling continues throughout the watershed for the duration of the project, analytical results may help refine priority areas for future signups.

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

Table 14 on the following page displays goals and the timeline for LDEQ and LDAF activities.

Table 14 Schedule of Activities

Bayou Des Cannes Timeline												
			2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
GOALS	1	Project Term										
	2	Ambient Monitoring										
	3	IR Assessment										
	4	Final Report										
	5	Use Restored										
Tasks / Milestones												
LDEQ	1	SWAT Model										
	2	Assessment, Recon, Site Selection										
	3	QAPP/SP Drafting & Approval										
	4	Baseline Assessment										
	5	Draft WIP										
	6	Longterm Monitoring										
	7	Longterm Data Analysis										
	8	Plan Revision (if required)										
Tasks / Milestones												
LDAF	1	Ranking Criteria/Select BMPs										
	2	Meet with Participants/Sign-Ups										
	3	Prepare Individual BMP Plans										
	4	BMP Implementation										
	5	Technical Assistance										
	6	Cost Share Assistance										
	7	Education & Outreach										
	8	Annual Reports										
	9	Final Report										

ELEMENT G Interim Measureable Milestones

The short-term goals of this plan are to implement BMPs and related conservation practices in three 12-digit HUCs and to monitor water quality to evaluate changes in the watershed, potentially expanding implementation into lower HUCs as data indicate. The ultimate goal of the WIP is to improve water quality, meet the state's water quality standards and restore beneficial uses in Bayou des Cannes.

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

Table 15 Annual Milestones

Bayou Des Cannes Restoration Milestones						
	2017	**2018**	**2019**	**2020**	**2021**	**2022**
Implementation-Based Milestones						
Acres in BMPs*	9,611	16,865	24,119	31,372	38,626	45,880
N Load (lbs/yr)**	1,805,607	1,697,271	1,588,934	1,480,598	1,372,261	1,263,925
P Load (lbs/yr)**	290,847	273,396	255,945	238,495	221,044	203,593
Water Quality-Based Milestones						
DO monthly exceedances	40%	34%	28%	22%	16%	<10%
Turbidity monthly exceedances	82%	72%	61%	51%	40%	<30%
TDS monthly exceedances***	18%	<30%	<30%	<30%	<30%	<30%
*Starting with cropland BMPs implemented by LDAF 2015-16, based on STEPL targets						
**Load to be determined using ambient site concentrations and flow at USGS gage 08080201						
***Last ambient cycle (2015-16) showed 18%, below 30% criteria.						

ELEMENT H Criteria to Determine Reductions/Progress

To achieve restoration of the FWP designated use, the Louisiana water quality criteria will be used to assess use support and determine success. The seasonal DO criteria is 5 mg/L December through February and 3 mg/L March through November. The standard for TDS is 260 ppm. The standard for turbidity is background plus 10%, but since background is not yet quantified, the most protective criterion the state uses – 25 mg/L – will be used unless and until background is quantified.

Data collected from water quality monitoring measured against Louisiana's water quality standards will be used to determine whether NPS loads are improving over time and progress is being made toward meeting water quality standards. Ultimate success will be determined using water quality data sampled at the ambient monitoring location to assess the watershed's use support restoration. LDEQ formally assesses use support every two years and publishes this assessment in its Integrated Report.

ELEMENT I Monitoring Component

The first goal of monitoring in Bayou des Cannes is to determine where NPS loading occurs. The second goal is to evaluate water quality changes resulting from implementation of reduction strategies in the watershed. The third goal is water quality assessment to determine support for designated uses in Bayou des Cannes.

LDEQ's ambient water quality monitoring is one source of data used to evaluate water quality changes due to the implementation of BMPs in Bayou des Cannes. In addition to regularly scheduled ambient monitoring, Federal Fiscal Year (FFY) 2014 and FFY 2015 provide support for in-stream water quality monitoring throughout the watershed through LDEQ's Section 319 program funds and LDAF's Section 319 project funds.

LDEQ Water Surveys staff began collecting water quality samples and in-situ readings at seven locations for field parameters and nutrients in December, 2015. Sampling sites are mapped in Figure 12. The seven sites were selected based on watershed drainage and hydrology, critical areas determined by the SWAT model, land use data, LDAF BMP implementation areas, accessibility, and safety of the sampling locations. The purpose of this sampling effort was to monitor critical areas identified by the SWAT model and to evaluate water quality improvement in the watershed, within those critical areas and throughout the watershed. LDEQ staff continues long-term sampling twice a month to monitor the change in water quality during and after BMP implementation.

Table 15 lists NPS sampling site information for the bayou. In-stream baseline concentration data was collected for DO and nutrients for twelve months. DO exceedance rates were calculated for December 2015, 2016, and the January through March 2017 quarter. Geographic priorities that can guide future implementation were derived from DO exceedances seen from March through Novmember 2016 (critical DO season) using analyzed project data. Long-term monitoring began in January 2017, and data continues to be collected and analyzed throughout the implementation period (expected to end in 2022). Post-BMP water quality monitoring will be performed for approximately one year after implementation, through 2023.

All water quality data will be collected and analyzed according to approved QA/QC procedures. All data for the project will be stored in LDEQ's database and up-loaded to EPA's database STOrage and RETrieval (STORET)/Water Quality Exchange (WQX). All water quality data will be shared with partners, and with other watershed stakeholders as requested.

A long-term goal for this data is water quality assessment. LDEQ Water Surveys staff will sample all seven sites (including the ambient site) twice a month, in which the first sample will be a regularly scheduled sampling event. The second monthly sampling event is an attempt to collect a rain event; however, in case of no rain event, the second sample will still be collected. The ambient site (0308) will also be sampled by LDEQ Surveys staff once a month during LDEQ's four-year rotating cycle. Data collected during the NPS water quality project will be considered in assessing use support in the subsegment and use restoration status.

The table on the following page lists sampling sites and sampling plan information.

Table 16 Sampling site locations and sampling plan information

LEAU Site No.	Field Site No.	Water-body	Descrip-tion	Lat	Long	Water Quality		Flow Severity	Watershed Characterization Seasonal and as needed	Comments/Sample Frequency
				X	Y	Lab[1]	InSitu[2,3]			
2747	1	Bayou des Cannes	Bayou des Cannes at Hwy 104	-92.317900	30.632420	X	X	X	X	Twice a month. The first sampling event will occur during the same week each month. An attempt will be made to collect a rain event for the second sample of the month; however, in case of no rain event, the second sample will still be collected.
4653	2	Bayou des Cannes	Bayou Marron at Hwy 95	-92.343800	30.577300	X	X	X	X	Twice a month. The first sampling event will occur during the same week each month. An attempt will be made to collect a rain event for the second sample of the month; however, in case of no rain event, the second sample will still be collected.
4650	3	Bayou des Cannes	Bayou des Cannes at Hwy 95	-92.372700	30.592010	X	X	X	X	Twice a month. The first sampling event will occur during the same week each month. An attempt will be made to collect a rain event for the second sample of the month; however, in case of no rain event, the second sample will still be collected.
4654	4	Bayou des Cannes	Bayou Choupique at Hwy 1162	-92.347100	30.553	X	X	X	X	Twice a month. The first sampling event will occur during the same week each month. An attempt will be made to collect a rain event for the second sample of the month; however, in case of no rain event, the second sample will still be collected.
1969	5	Bayou des Cannes	Bayou des Cannes at Fournerat Rd.	-92.502000	30.465900	X	X	X	X	Twice a month. The first sampling event will occur during the same week each month. An attempt will be made to collect a rain event for the second sample of the month; however, in case of no rain event, the second sample will still be collected.
1970	6	Bayou des Cannes	Bayou des Cannes at Hwy 368	-92.526700	30.414690	X	X	X	X	Twice a month. The first sampling event will occur during the same week each month. An attempt will be made to collect a rain event for the second sample of the month; however, in case of no rain event, the second sample will still be collected.
0308	7	Bayou des Cannes	Bayou des Cannes at Hwy 100	-92.560200	30.268210	X	X	X	X	Twice a month. The first sampling event will occur during the same week each month. An attempt will be made to collect a rain event for the second sample of the month; however, in case of no rain event, the second sample will still be collected.

1) The water quality parameters to be collected are NO2/NO3, TKN, TP, TDS, and turbidity.
2) All in situ, water quality, flows, and watershed characterizations should be conducted seasonally and as needed.
3) The in situ parameters to be collected are pH, temperature, DO/percent saturation, and conductivity/salinity.

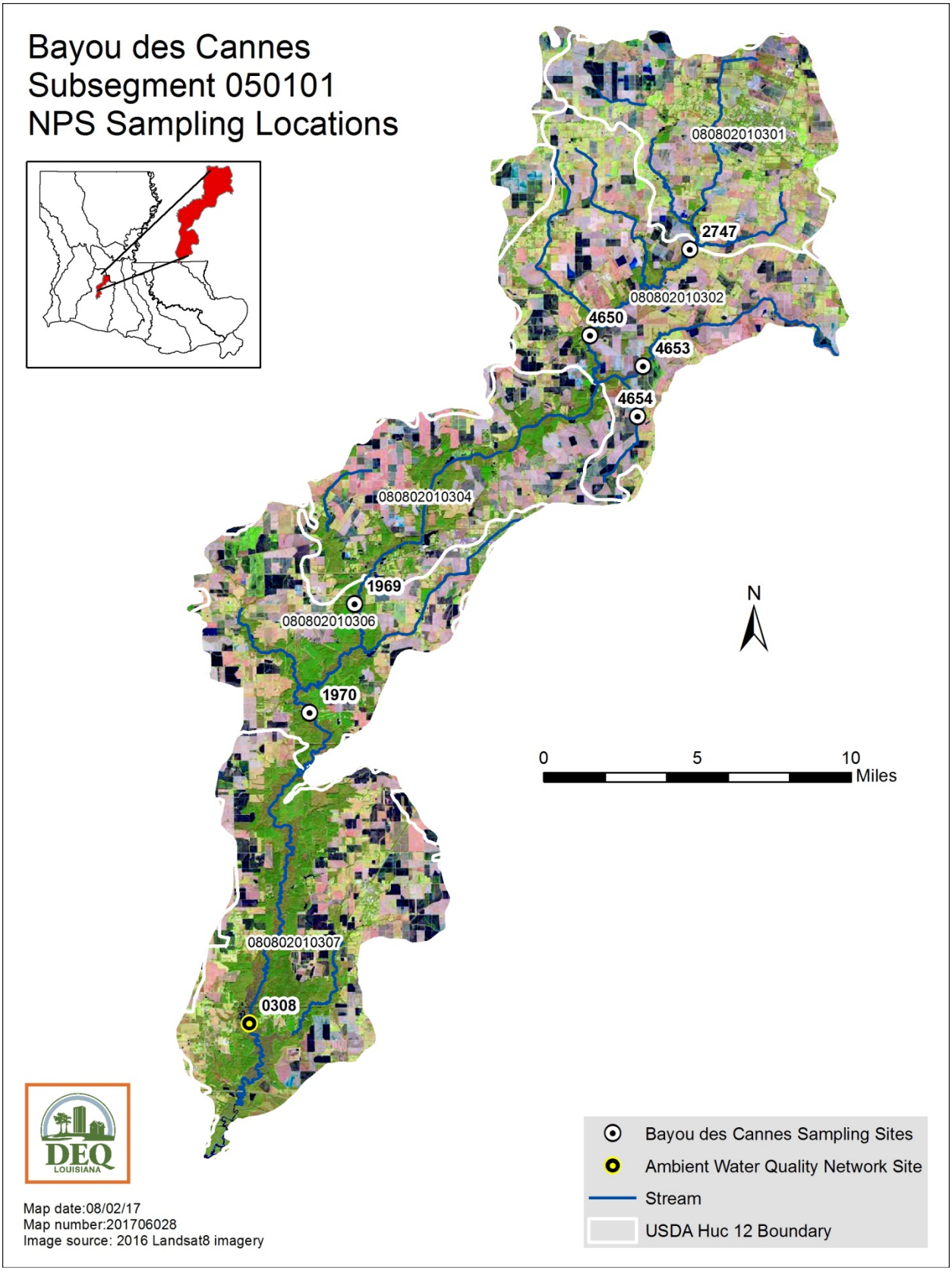

Figure 15 Bayou des Cannes sampling locations

APPENDIX A – NPS Monitoring data December 2015-February 2017

Project data from December, 2015, through February, 2017, was analyzed and compared to water quality standards. This analysis was done to identify sites showing high loading and any potential trends.

Dissolved Oxygen

Results from sampling events during the critical DO period – May through November – were analyzed to determine if any refinements are required for prioritizing areas for future implementation. The standard for that period is 3mg/L. Site 2747 had the highest DO exceedance rate for that period – 65%. Thus, the area draining to that site should be considered as a priority when ranking locations for future implementation. Site 1969 had an exceedance rate of 0% and areas draining to that location should not be prioritized.

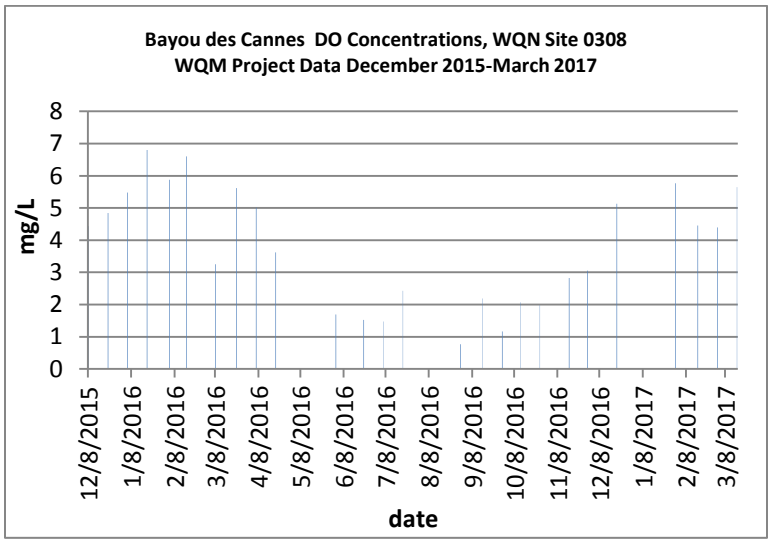

Figure 16 DO concentrations at site 0308, 2015-2017

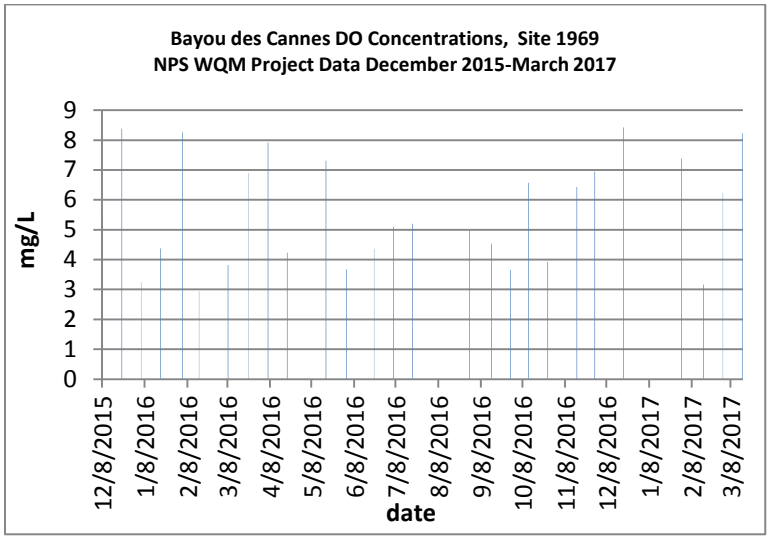

Figure 17 DO concentrations at site 1969, 2015-2017

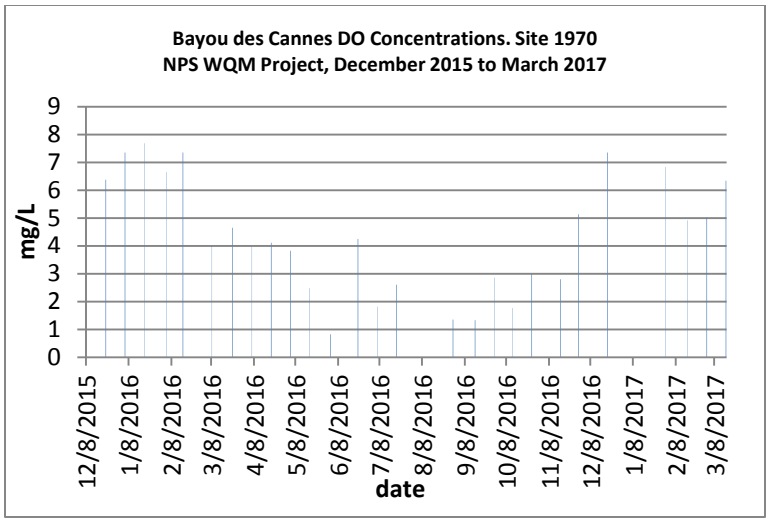

Figure 18 DO concentrations at site 1970, 2015-2017

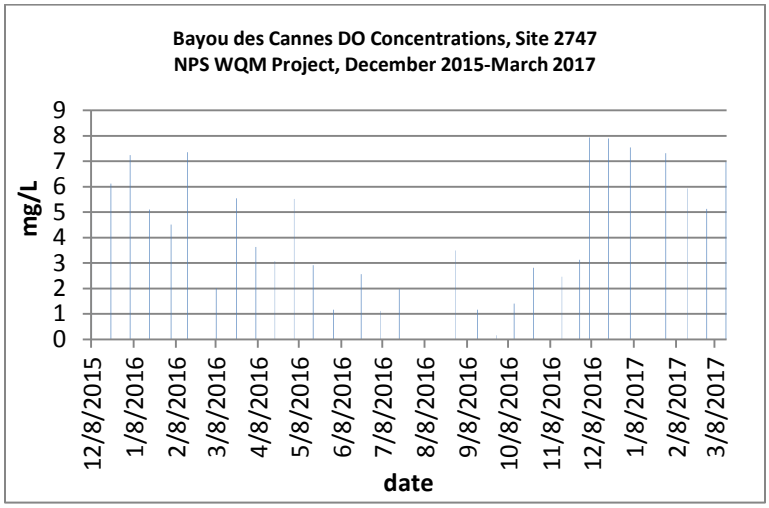

Figure 19 DO concentrations at site 2747, 2015-2017

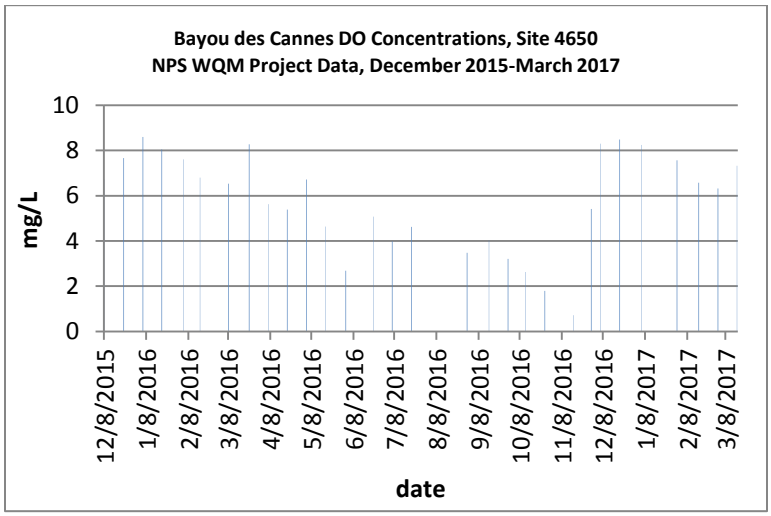

Figure 20 DO concentrations at site 4650, 2015-2017

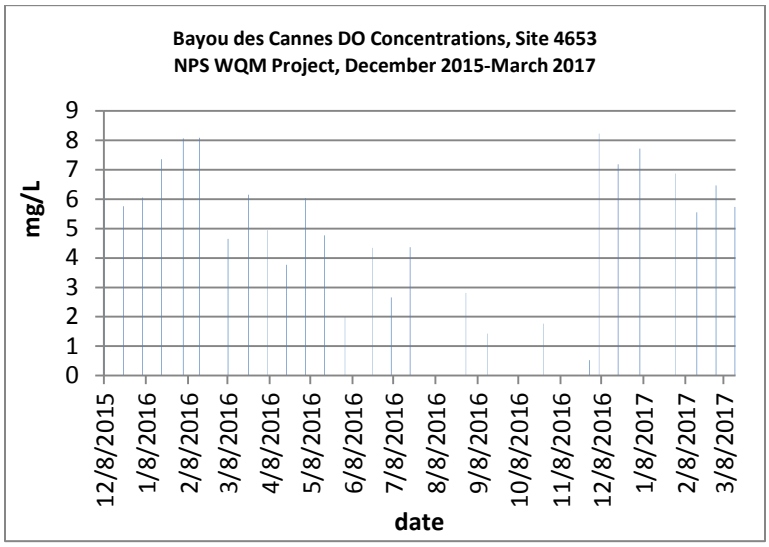

Figure 21 DO concentrations at site 4653, 2015-2017

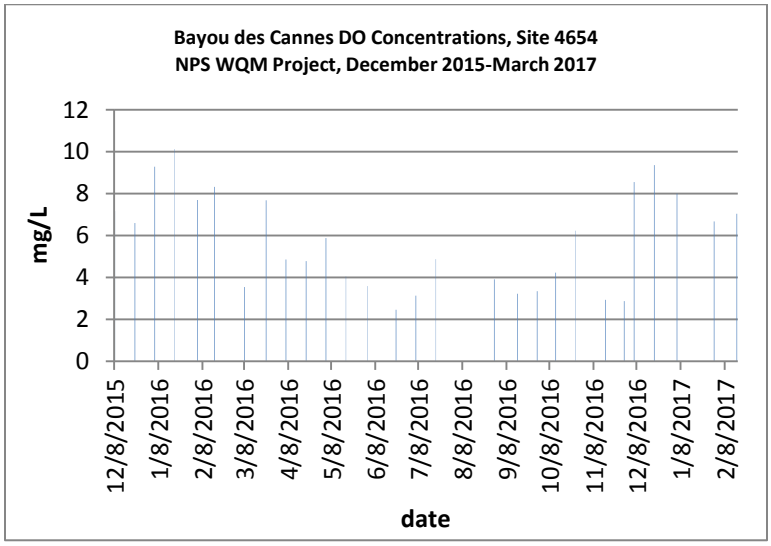

Figure 22 DO concentrations at site 4654, 2015-2017

Nutrients – Phosphorous (as P)

Graphs below illustrate phosphorous concentrations from 2015-2017. There currently is no state standard for this nutrient. At almost all of the sites, there is an increasing trend in concentrations around April, followed by a decline, as with turbidity. Peak concentrations among the sites were 1.39 ppm at site 4653 in June 2016, and 1.09 ppm at site 2747 in April 2016.

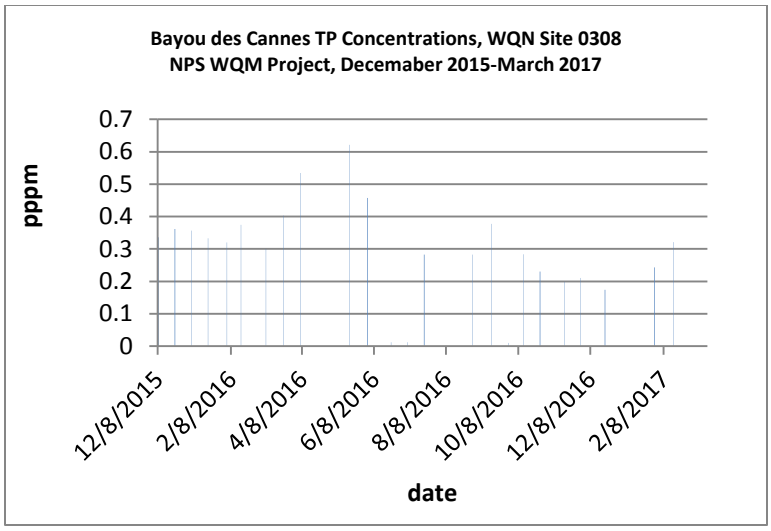

Figure 23 TP concentrations at site WQN 0308, 2015-2017

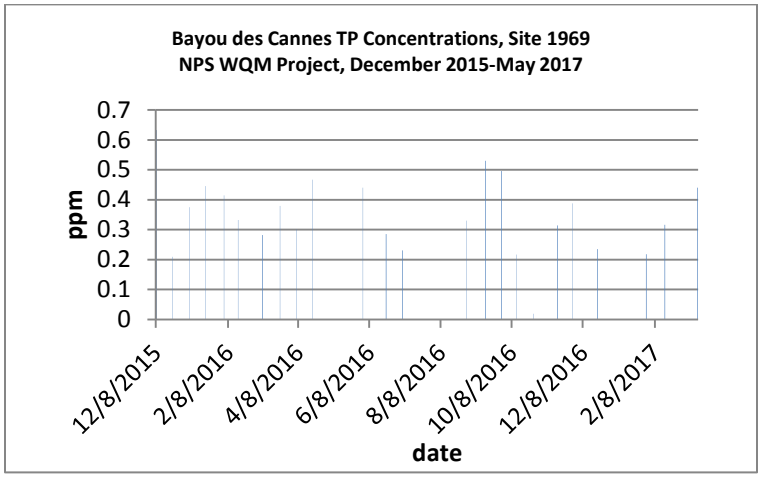

Figure 24 TP concentrations at site 1969, 2015-2017

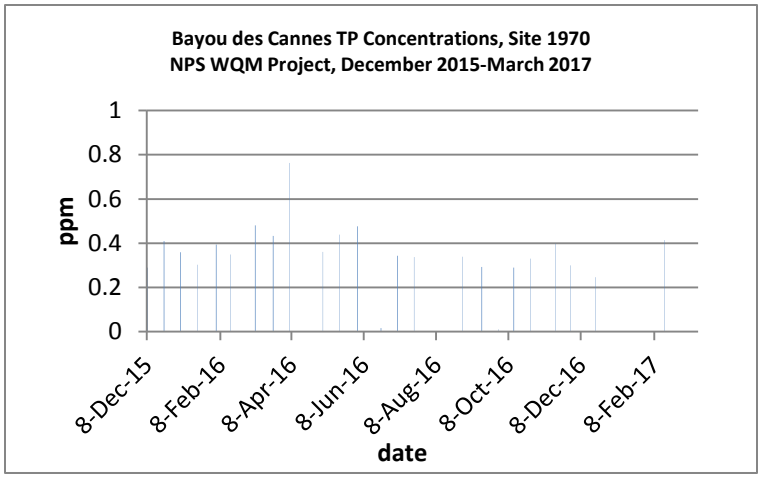

Figure 25 TP concentrations at site 1970, 2015-2017

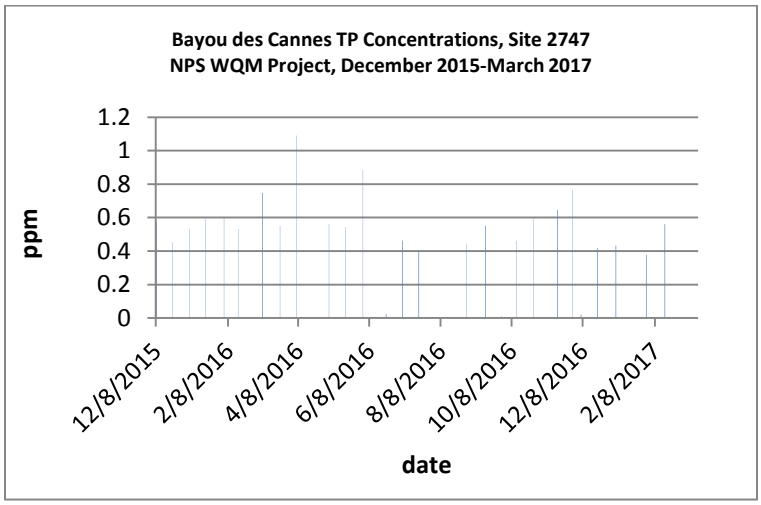

Figure 26 TP concentrations at site 2747, 2015-2017

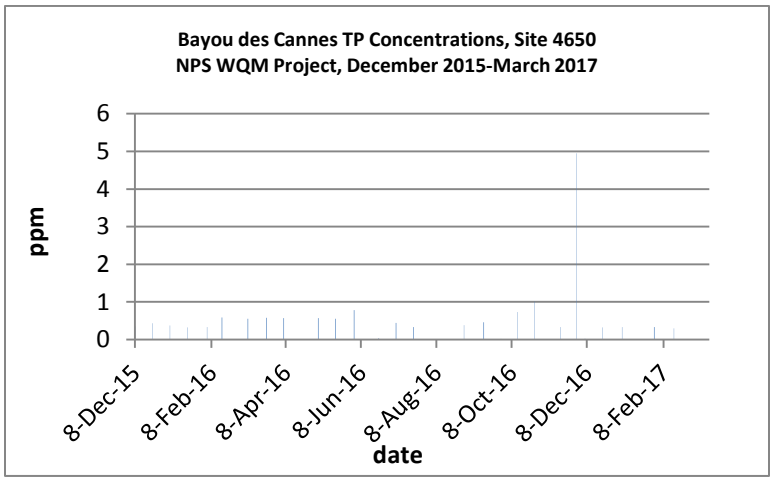

Figure 27 TP concentrations at site 4650, 2015-2017

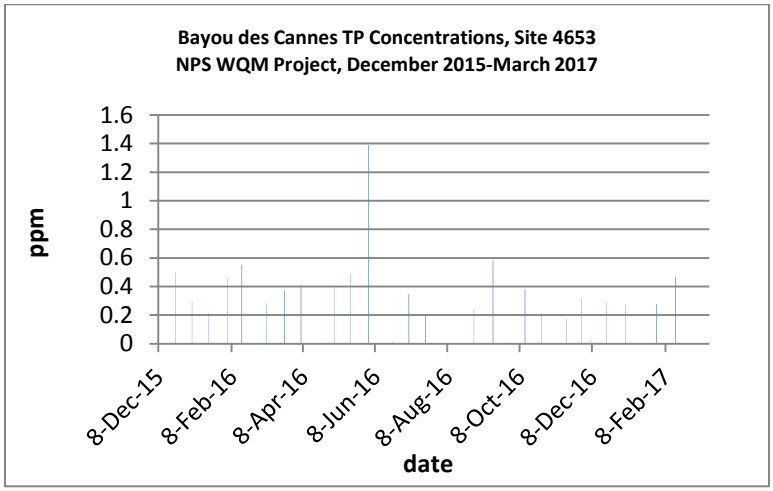

Figure 28 TP concentrations at site 4653, 2015-2017

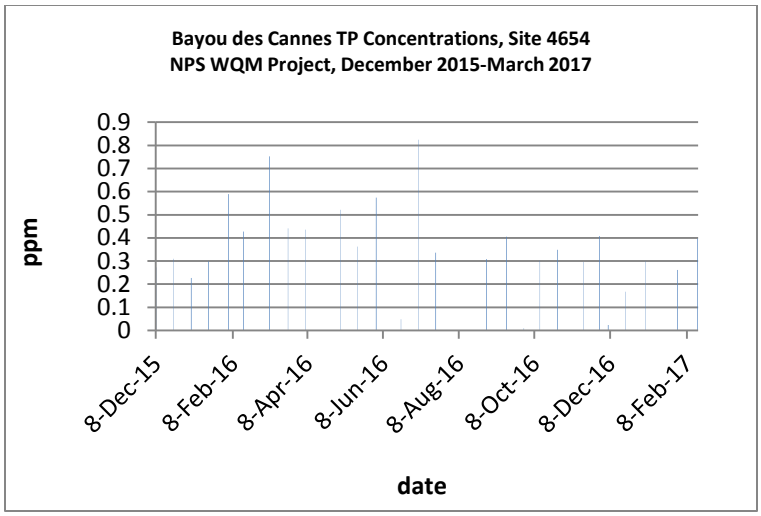

Figure 29 TP concentrations at site 4654, 2015-2017

Nutrients – NO_3

Graphs below illustrate nitrate concentrations from 2015-2017. There currently is no state standard for nitrate. At almost all of the sites, there is an increasing trend in concentrations from December to April, followed by a decline, then a smaller increase in concentration around October to December. Peak concentrations among the sites were 2.42 mg/L at site 2747 in October 2016, and 1.29 mg/L at site 1969 in May 2016. BMP's for nitrate should be implemented year round to keep concentrations of nitrate low.

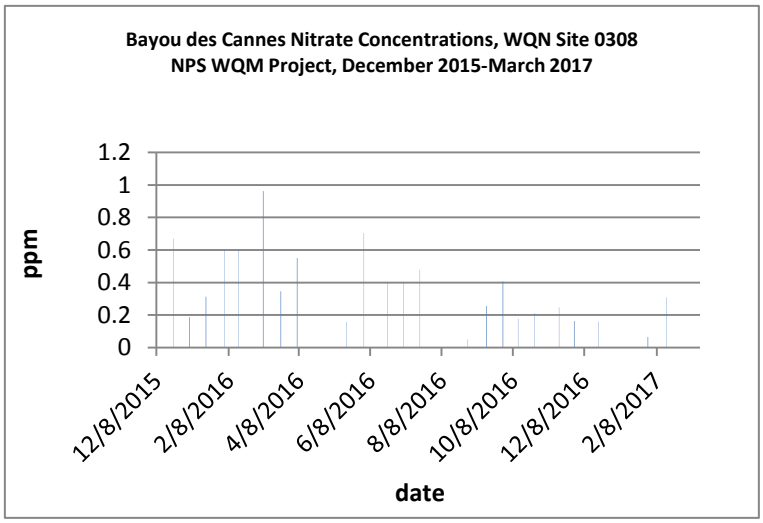

Figure 30 Nitrate concentrations at WQN site 0308, 2015-2017

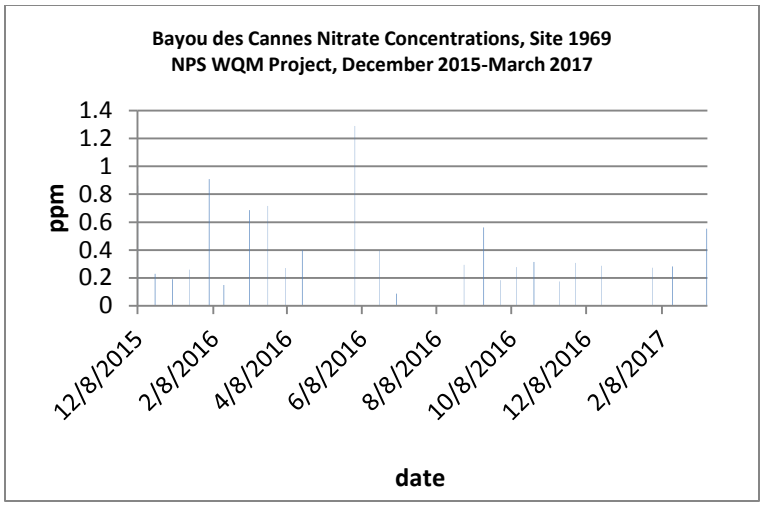

Figure 31 Nitrate concentrations at site 1969, 2015-2017

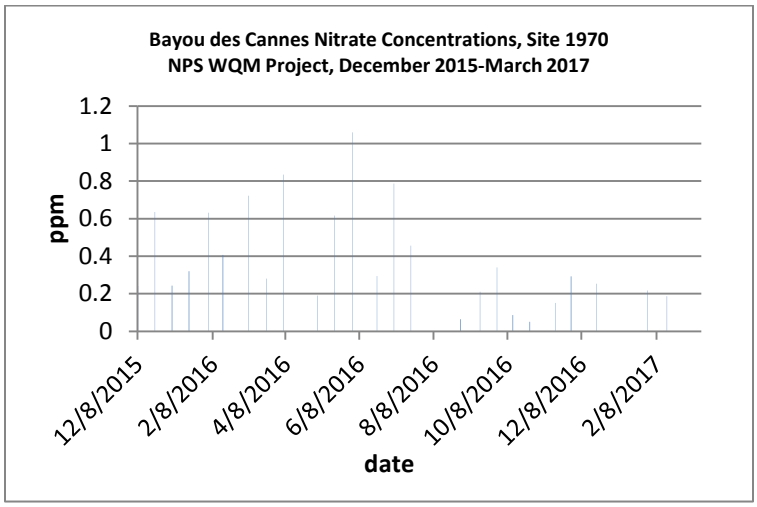

Figure 32 Nitrate concentrations at site 1970, 2015-2017

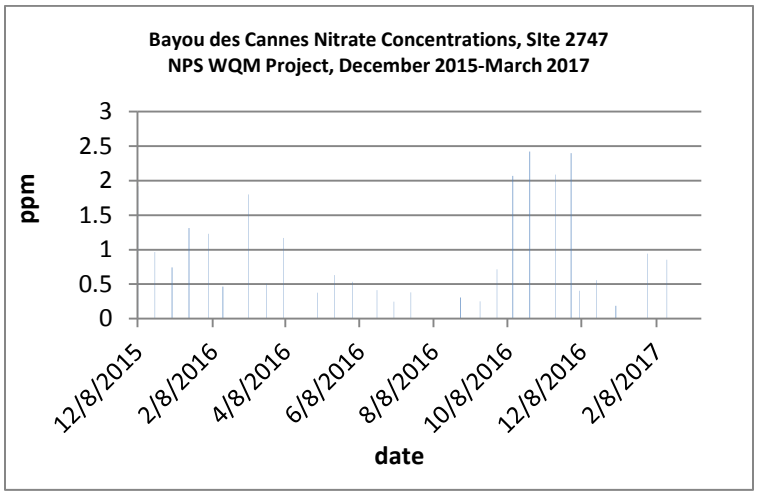

Figure 33 Nitrate concentrations at site 2747, 2015-2017

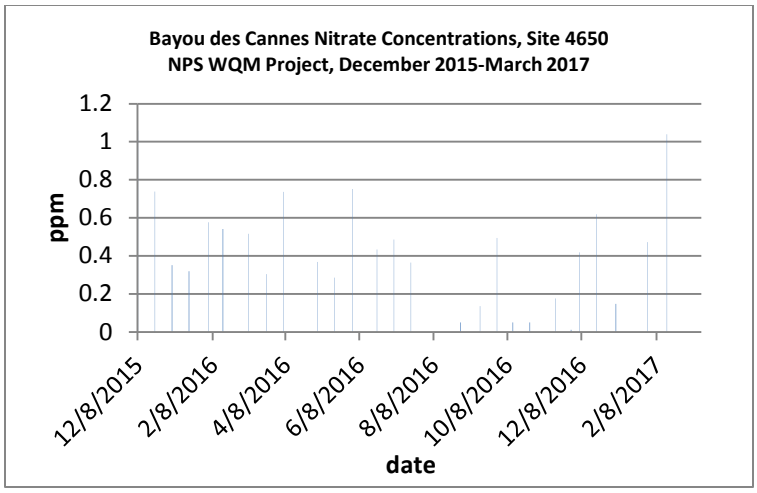

Figure 34 Nitrate concentrations at site 4650, 2015-2017

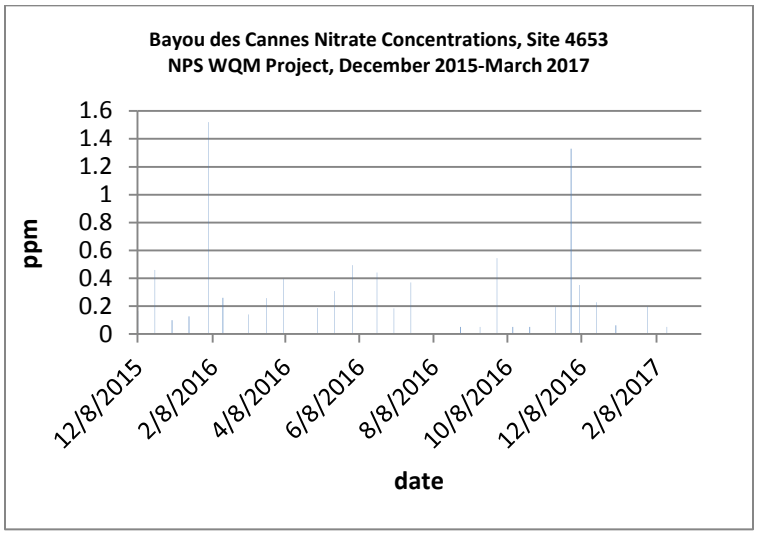

Figure 35 Nitrate concentrations at site 4653, 2015-2017

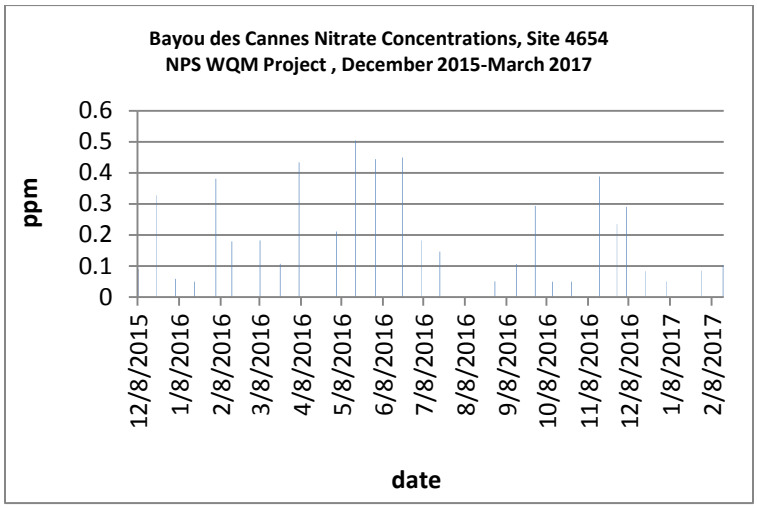

Figure 36 Nitrate concentrations at site 4654, 2015-2017

Nutrients - NO_2

Graphs below illustrate nitrite concentrations from 2015-2017. There currently is no state standard for nitrite. At almost all of the sites, there is a spike in early summer, followed by a decline, then an increase in concentration around October to December. Peak concentrations among the sites were 0.76 mg/L at site 4650 in June 2016, and 0.95 mg/L at site 4654 in December 2016. BMP's for nitrite should be implemented year round to keep concentrations of nitrate low.

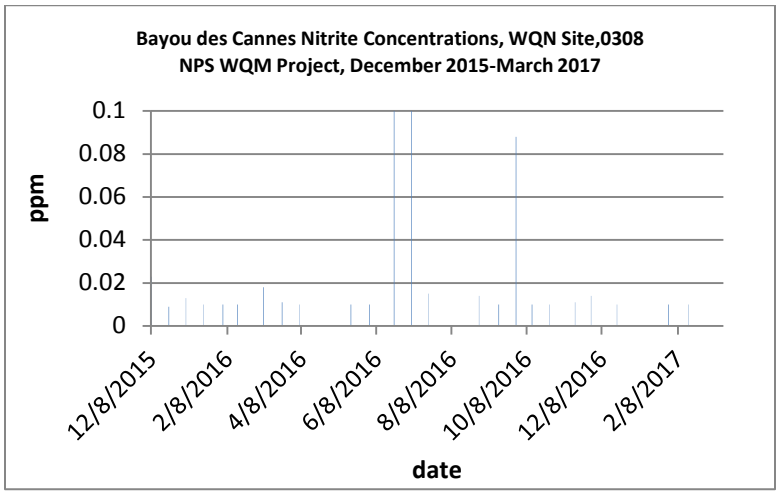

Figure 37 Nitrite concentrations at WQN site 0308, 2015-2017

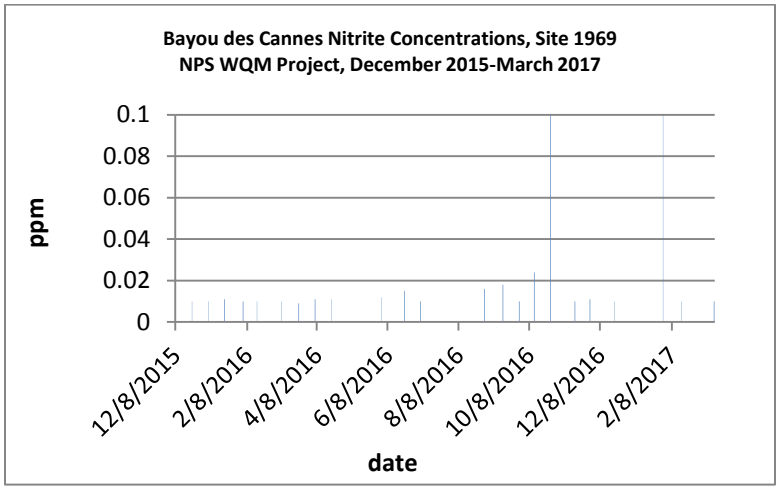

Figure 38 Nitrite concentrations at site 1969, 2015-2017

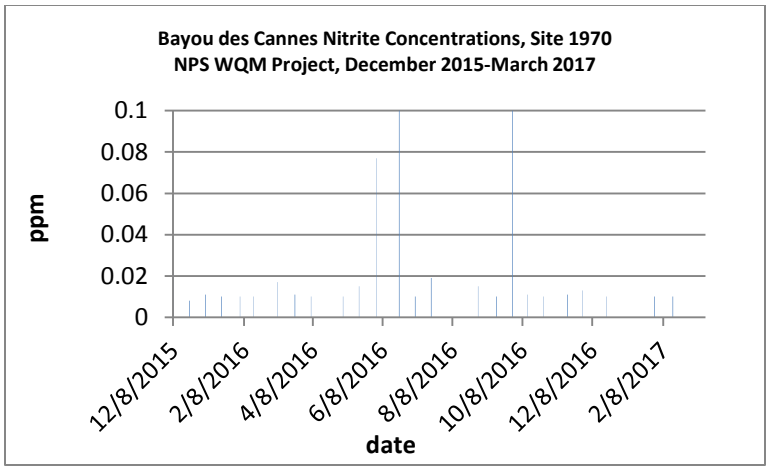

Figure 39 Nitrite concentrations at site 1970, 2015-2017

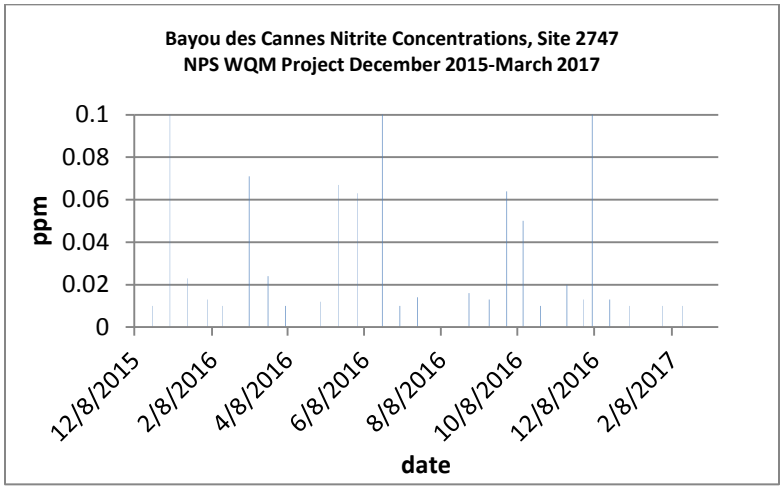

Figure 40 Nitrite concentrations at site 2747, 2015-2017

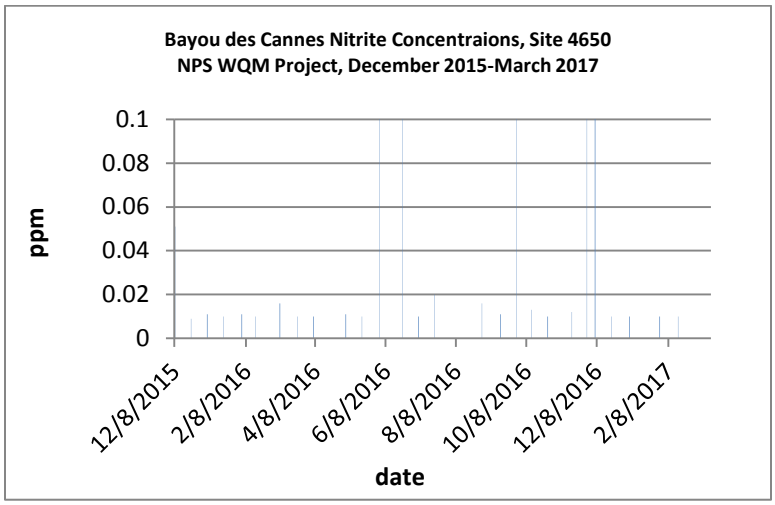

Figure 41 Nitrite concentrations at site 4650, 2015-2017

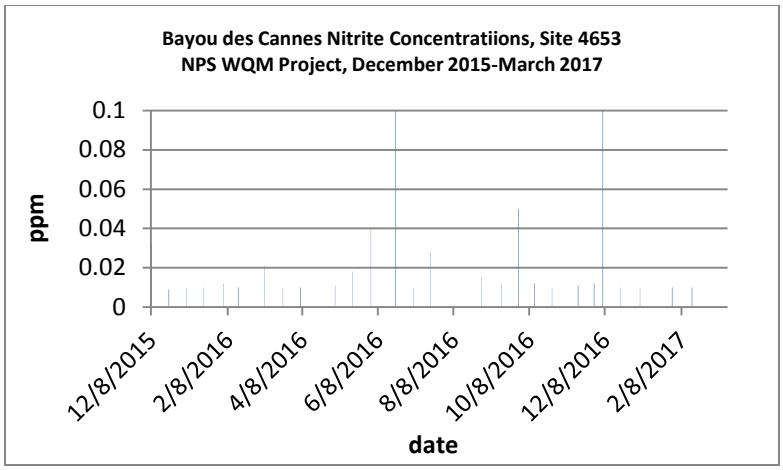

Figure 42 Nitrite concentrations at site 4653, 2015-2017

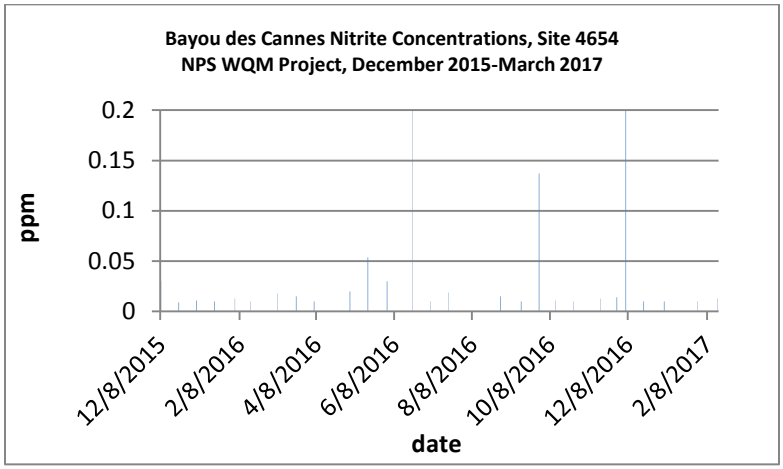

Figure 43 Nitrite concentrations at site 4654, 2015-2017

TDS

TDS results were analyzed for all sites for December, 2015, through February, 2017. In the graphs below, the red line indicates the TDS standard of 260 ppm. 7 of 20 samples exceeded the standard at the ambient water quality network site, 0308, during 2016, resulting in a 35 percent exceedance. At almost all of the sites, concentrations remained below 300 ppm, but were above the standard. There were a few high spikes, which were 886 ppm at site 2747 and 759 ppm at site 1970, both in April 2016. BMPs should be focused on reducing TDS concentrations year round, at each site.

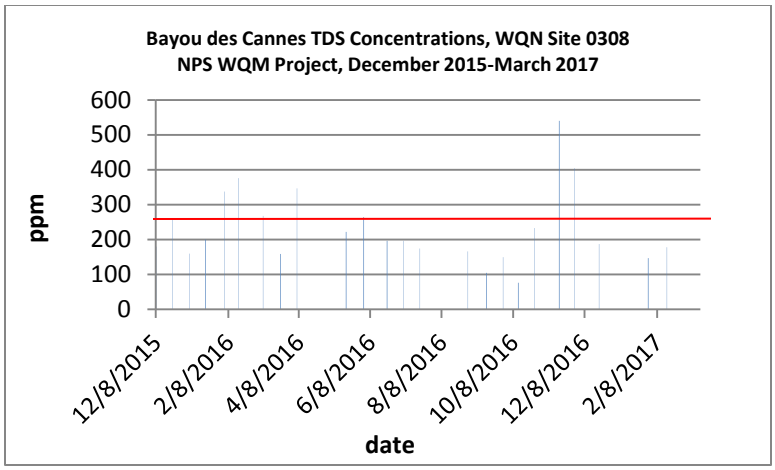

Figure 44 TDS Concentrations at WQN site 0308, 2015-2017

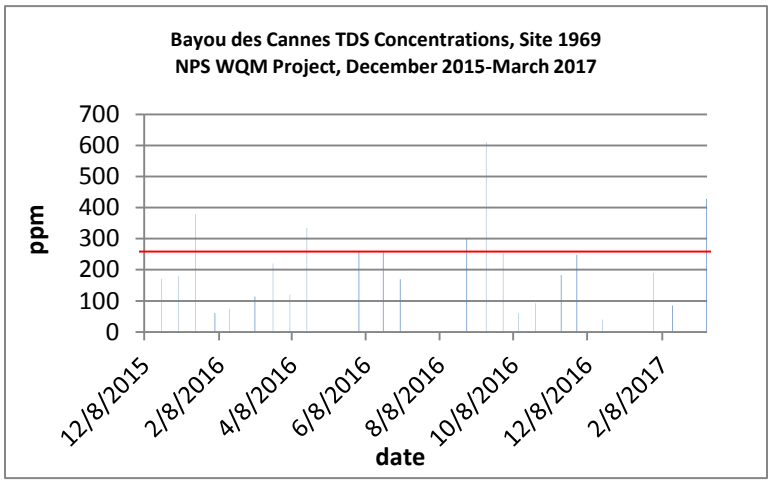

Figure 45 TDS concentrations at site 1969 from 2015-2017

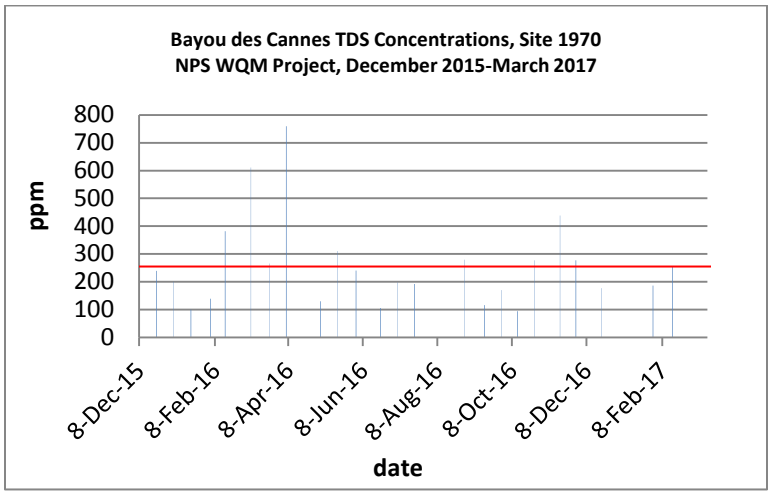

Figure 46 TDS concentrations at site 1970 from 2015-2017

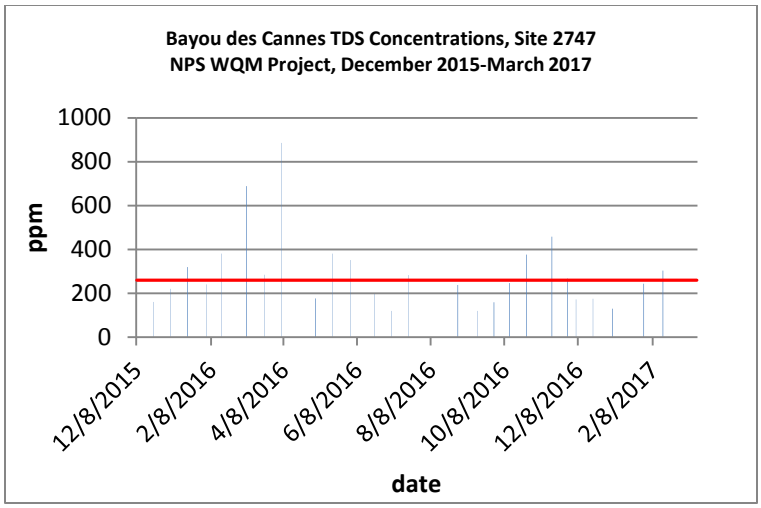

Figure 47 TDS concentrations at site 2747 from 2015-2017

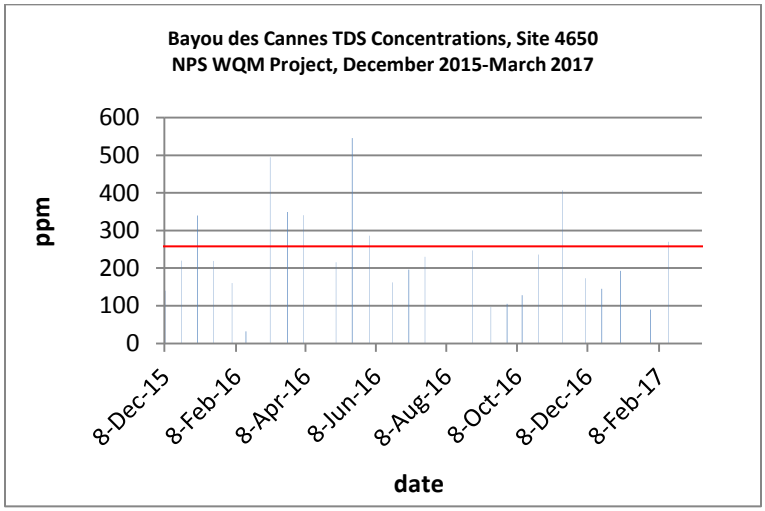

Figure 48 TDS concentrations at site 4650 from 2015-2017

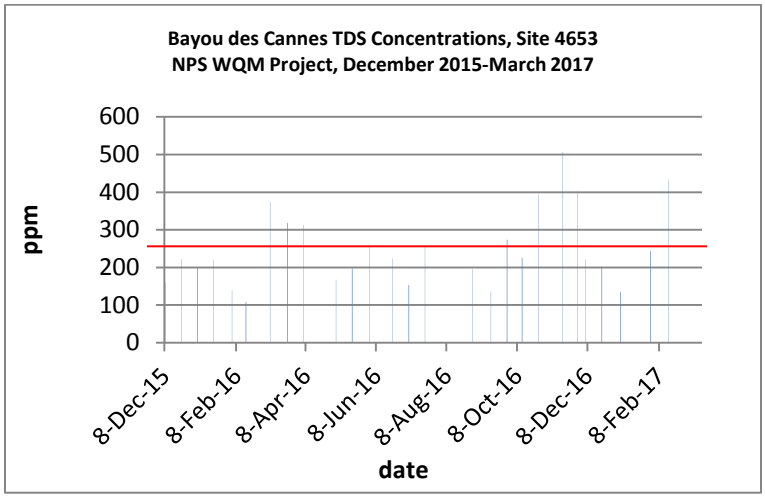

Figure 49 TDS concentrations at site 4653 from 2015-2017

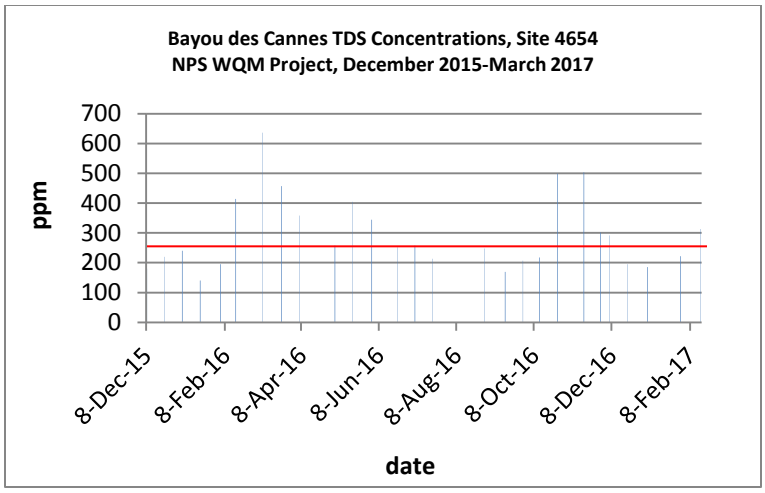

Figure 50 TDS concentrations at site 4654 from 2015-2017

Turbidity

The graphs below illustrate turbidity concentrations from the project samples. The red line indicates the turbidity goal of 25 NTU. The goal was exceeded multiple times at each site sampled between 2015 and 2017. The lowest ranges occurred between August and November of 2016. 14 of 21 samples exceeded the goal at the ambient water quality network site, 0308, during 2016, resulting in a 67 percent exceedance. At almost all of the sites, there is a peak concentration in spring followed by a sharp decline. BMPs should be focused on reducing turbidity concentrations in spring at each site.

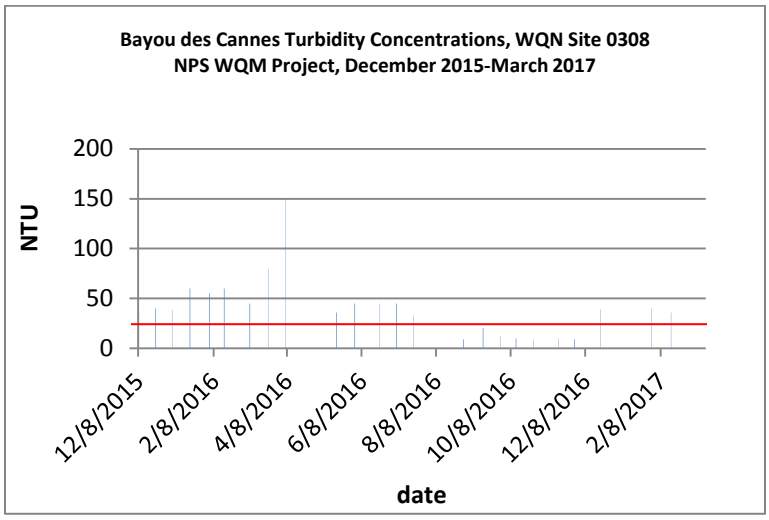

Figure 51 Turbidity concentrations at WQN site 0308, 2015-2017

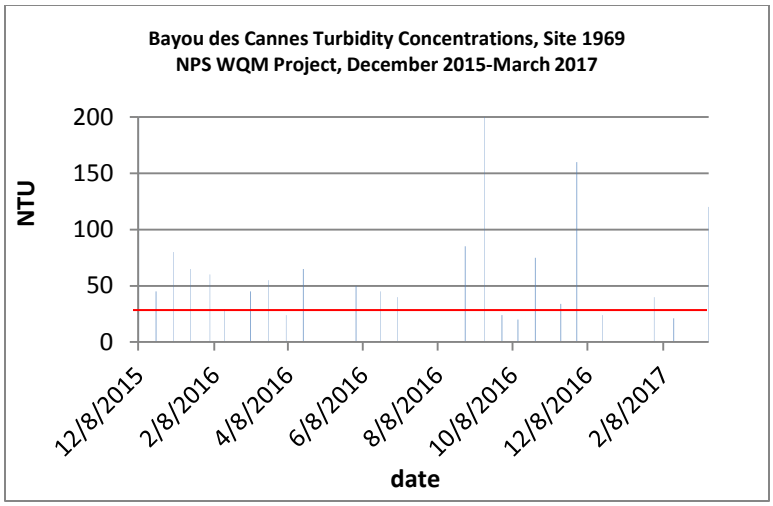

Figure 52 Turbidity concentrations at site 1969, 2015-2017

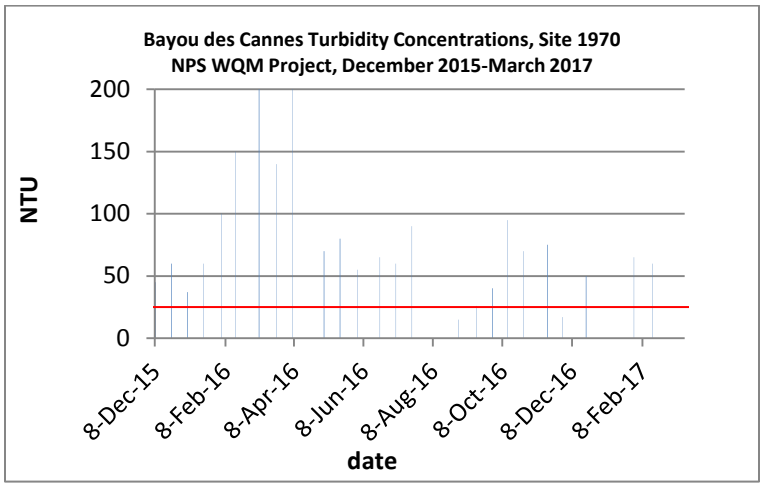

Figure 53 Turbidity concentrations at site 1970, from 2015-2017

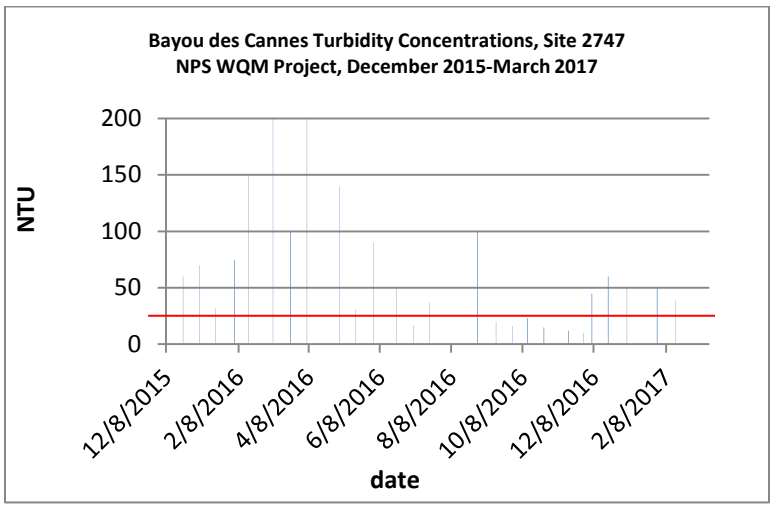

Figure 54 Turbidity concentrations at site 2747, 2015-2017

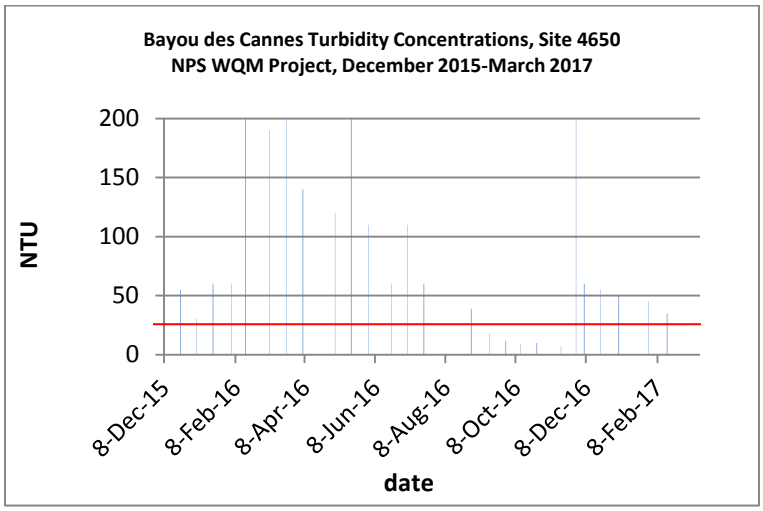

Figure 55 Turbidity concentrations at site 4650, 2015-2017

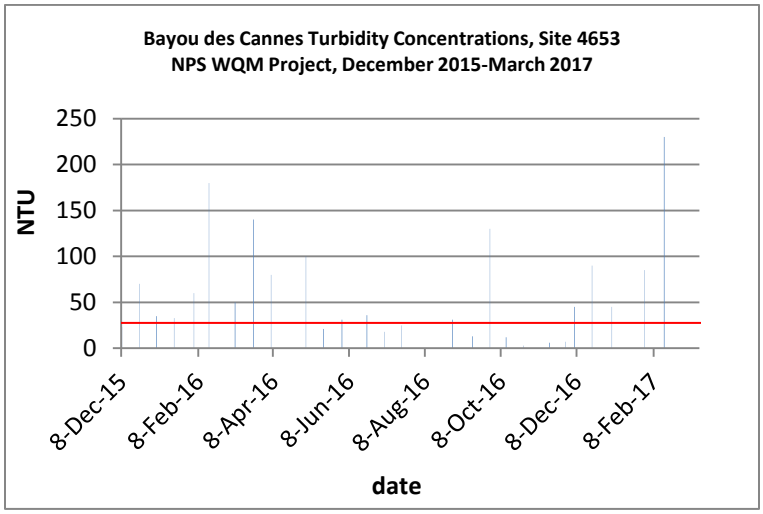

Figure 56 Turbidity concentrations at site 4653, 2015-2017

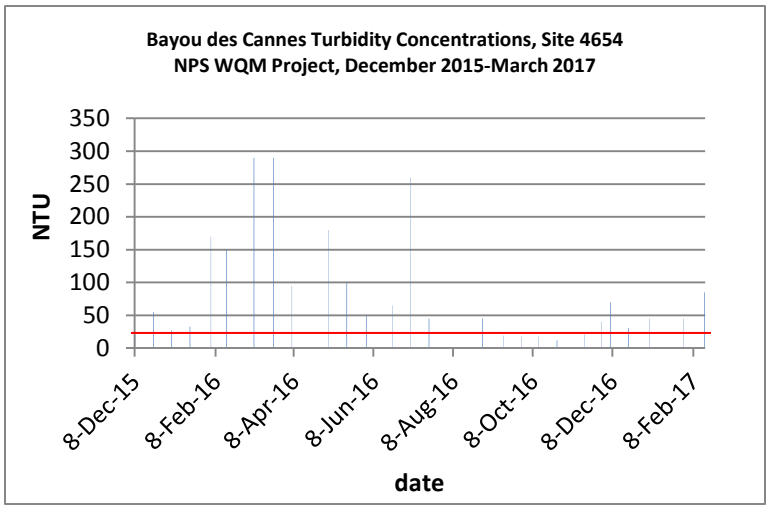

Figure 57 Turbidity concentrations at site 4654, 2015-2017

APPENDIX B – Acronyms

BMP	best management practice
DO	dissolved oxygen
FWP	fish and wildlife propagation
HUC	hydrologic unit code
IR	integrated report
LDAF	Louisiana Department of Agriculture & Forestry
LDEQ	Louisiana Department of Environmental Quality
mg/L	milligrams per liter
NO2	nitrite
NO3	nitrate
NPS	nonpoint source
NRCS	Natural Resources Conservation Service (USDA)
NTU	nephelometric turbidity unit
OSWC	Office of Soil & Water Conservation (LDAF)
P	phosphorous
ppm	parts per million
RMS	resource management system
STEPL	Spreadsheet Tool for Estimating Pollutant Loads
SWCD	Soil and Water Conservation District (LDAF local units)
TDS	total dissolved solids
TMDL	total maximum daily load
USDA	United States Department of Agriculture
WQN	Water Quality Network