Louisiana Department of Environmental Quality

Big Creek (Headwaters to Tangipahoa River)

Subsegment 040703

2012

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Introduction

The Watershed Implementation Plan (WIP) for Big Creek has been developed to reduce nonpoint sources (NPS) of pollution and improve water quality. Louisiana's 2010 Integrated Report (IR) indicated Big Creek (subsegment 040703) was fully meeting fish and wildlife propagation (FWP), but was impaired for primary (PCR) and secondary contact recreation (SCR) because of high concentrations of fecal coliform bacteria. Suspected sources of these water quality impairments include dairies outside the milk parlor area (Appendix A., 2010 IR). Appendix C of the state's IR included delistings for dissolved oxygen (DO), total phosphorus (TP), Nitrate/Nitrite ($N0_3/N0_2$) and ammonia (NH_4) in 2004. Since fecal coliform bacteria impair water quality in Big Creek, watershed restoration will focus on solving this problem. During several reconnaissance surveys through the watershed, turbidity and runoff from dairies were also observed. LDEQ's ambient water quality data indicates elevated levels of turbidity and total suspended solids (TSS) during certain times of the year and nutrients may also cause problems in the watershed. Louisiana Department of Environmental Quality (LDEQ) currently has narrative water quality standards for nutrients, but is collecting chemical and biological data to assist in development of numerical criteria for nitrogen and phosphorus. The State of

Louisiana is developing a Nutrient Management Strategy that includes management practices to reduce water quality problems associated with nitrogen and phosphorus in rivers, lakes and estuaries. The Big Creek WIP describes best management practices (BMPs) to reduce NPS pollutants in Big Creek.

In October 2011, LDEQ prioritized 40 water bodies to restore or partially restore by October 2016 (Figure 1) through partnerships with federal, state and local agencies and watershed stakeholders. In LDEQ's federal fiscal year (FFY) 2012 Section 319 Work Plan, Big Creek has been funded to monitor water quality to evaluate BMP effectiveness at the 12-digit hydrologic unit code (HUC) scale. United States Department of Agriculture-Natural Resource Conservation Service (USDA-NRCS) prioritized Big Creek watershed through the National Water Quality Initiative (NWQI) and Louisiana Department of Agriculture and Forestry's (LDAF) prioritized the watershed through FFY 2012 Section 319 incremental funds. This WIP was developed in coordination with USDA-NRCS and LDAF's Office of Soil and Water Conservation (OSWC).

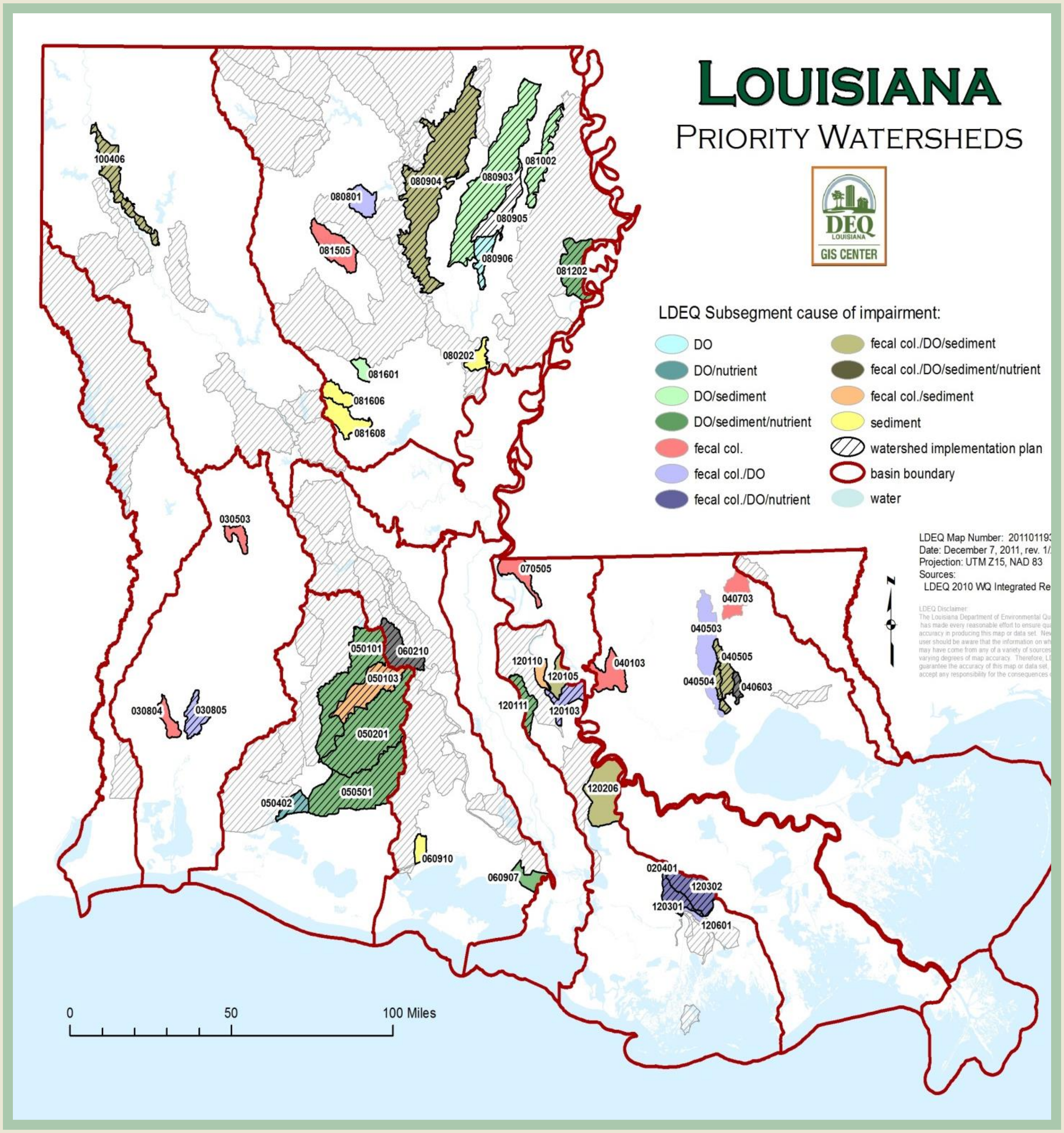


Figure 1: Louisiana's 40 Priority Watersheds

Figure 2: Louisiana's 40 Priority Watersheds with Big Creek Watershed Highlighted in Red

This watershed plan is written to comply with the nine (9) key elements included in EPA's 2004 National NPS Program Guidelines for Section 319 of the Clean Water Act (CWA).

USEPA'S 9 KEY ELEMENTS

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

EPA's 2004 National NPS Program Guidelines requires the states to address these elements prior to use of Section 319 incremental funds for project implementation. Louisiana's Clean Waters Program (CWP) established a water quality goal to restore 25 percent of the state's impaired water bodies by 2012. The draft 2012 IR was submitted to United States Environmental Protection Agency (USEPA) in April 2012 and will be utilized as the basis to determine whether these goals have been met. The 2010 IR indicated that the water quality goal to restore 25 percent of water bodies impaired for contact recreational uses was met, but additional efforts will be necessary to restore water bodies impaired for FWP. Section 303(d) of the CWA and USEPA's Water Quality Planning and Management Regulations (Title 40 of the *Code of Federal Regulations* Part 130) require states to identify water bodies that are not meeting water quality standards and develop total maximum daily loads (TMDLs) of pollutants for those water bodies. A TMDL establishes the amount of a pollutant that a water body can assimilate without exceeding its water quality standard for that pollutant. TMDLs provide the scientific basis for a state to establish water quality-based controls to reduce pollution from both point and NPS to restore and maintain the quality of the state's water resources (USEPA 1991).

A TMDL for fecal coliform bacteria in Big Creek was required through USEPA's Consent Decree for Lake Pontchartrain Basin. The TMDL was finalized in March 2012 and indicated an 88 percent reduction in fecal coliform bacteria was necessary to meet in-stream water quality standards for PCR.

The fecal coliform criterion for Big Creek is as follows: *For PCR, no more than 25 percent of the total samples collected on a monthly basis shall exceed a fecal coliform density of 400/ 100 mL. This PCR criterion shall apply only during the defined recreational period of May 1 through October 31. During the non-recreational period of November 1 through April 30, the SCR shall apply. The SCR criterion applies year round and is included here: No more than 25 percent of the total samples collected on a monthly basis shall exceed a fecal coliform density of 2000 cells/ 100 mL* (Environmental Regulatory Code-LDEQ 2010 Edition).

2.0. Causes and Sources

Fecal coliform bacteria are present in large numbers in feces and intestinal tracts of humans and other warm-blooded animals and can enter water bodies via human and animal waste. If a large number of fecal coliform bacteria (over 400 colonies/100 milliliters of water sample) are present in water, it is possible that pathogenic (disease- or illness- causing) organisms are also present in the water. Fecal coliform bacteria are indicator organisms, which mean they may indicate the presence of other pathogenic bacteria. Pathogens are typically present in such small amounts that it is impractical to monitor them directly.

Swimming in waters with high levels of fecal coliform bacteria increases the chance of developing an illness (fever, nausea or stomach cramps) from pathogens entering the body through the mouth, nose, ears, or cuts in the skin. Diseases and illnesses that can be contracted in water with high fecal coliform counts include typhoid fever, hepatitis, gastroenteritis, dysentery and ear infections. Fecal coliform, like other bacteria, can usually be killed by boiling water or by treating it with chlorine. Washing thoroughly with soap after contact with contaminated water can also help prevent infections.

There are many sources and factors that affect the concentration of fecal coliform bacteria. Community wastewater and septic system effluents are sources of bacteria from human waste. The bacteria travel with waste water through drains in our buildings and enter streams from illegal or leaky sanitary sewer connections, and poorly functioning septic systems effluent from malfunctioning waste water treatment plants. Fecal coliform is also in wastes produced by domestic animals and wildlife. This can be a serious problem for waters near cattle feedlots, hog farms, dairies and barnyards if waste is not properly contained. In urban areas, fecal coliform can be transported to surface water by animals when their feces are carried to storm drains, creeks and lakes during storms.

Bacterial concentrations can increase with higher temperatures, while growth and reproduction can decline with lower temperatures. Fecal coliform bacteria were cited as a cause for impairment of PCR in Big Creek (2010 IR).

Water quality data collected by LDEQ and Lake Pontchartrain Basin Foundation (LPBF) exceeded the state's fecal coliform bacteria standards for PCR. LDEQ's water quality data indicated PCR standards were exceeded between May and October of 2001 and 2007. PCR exceedances also occurred in October 2010 and September-October 2011. LPBF's water quality data also indicated PCR exceedances between May and October of 2008 and 2009. LDEQ's data indicated peak concentrations of 16,000 cells/100mL sample in June 2001 and February 2010, while LPBF's data indicated a peak concentration of 16,000 cells/100mL in January 2007. LDEQ's water quality data also indicated SCR standards were exceeded from May to October of 2001 and in May and October of 2007. SCR standards were also exceeded from February through April and July through August of 2011, with a peak concentration of 16,000 cells/100mL in February.

LDEQ's water quality data indicated that turbidity values in Big Creek did not exceed the state's guidelines of 50 Nephelometric Turbidity Unit (NTU) with the highest turbidity value of 29.8 NTU occurring in February 2011. LPBF's water quality data indicated turbidity values remained below 50 NTU except in January and April of 2009, with values of 55 and 69.19 NTU, respectively. During reconnaissance surveys, erosion problems were observed at several locations, potentially causing turbidity in Big Creek.

LDEQ's water quality data indicated total dissolved solids (TDS) remained below the state's water quality standard of 140 mg/L. A peak concentration of 40.5 mg/L TSS occurred in March 2007, while lowest TSS concentrations occurred in February 2007, November 2010 and January 2011.

LDEQ's water quality data indicated the highest concentration (0.75 mg/L) of NO_3/NO_2 occurred in January 2007, while the lowest concentration (0.12 mg/L) occurred in July 2001. The highest concentration (1.74 mg/L) of total kjeldahl nitrogen (TKN) occurred in August 2001, while the lowest concentrations occurred from October through December of 2010, January through April and in September of 2011. The highest concentrations (0.42 mg/L) of TP occurred during February 2001, while lowest concentrations occurred in November 2010 and March 2011.

Turbidity and bacteria problems in Big Creek watershed appear to be associated with dairies, pastures and potentially individual home sewage systems. These types of pollutant sources often contribute nutrients and sediment to the water body, so LDEQ is including these parameters in the monitoring design for Big Creek/East Fork Big Creek.

LDEQ's ambient data were analyzed and charts depicting annual averages and monthly values of NPS pollutants are included in the Big Creek WIP. These data indicate the types of BMPs that may be necessary to reduce NPS pollutants in the watershed. Although Louisiana does not currently have numerical criteria for nitrogen and phosphorus; reviewing these data allows LDEQ and watershed stakeholders to see whether nutrient concentrations are a problem in the watershed. Since LDEQ's ambient water quality data is only collected at one location, the sampling design for targeted watershed monitoring includes multiple sites to characterize Big Creek watershed and evaluate effectiveness of BMP implementation.

2.1. Water Quality Analysis

LDEQ collected and analyzed water quality samples during 2001, 2007 and 2010/2011 from their ambient site on Big Creek near Roseland, Louisiana. Figures 2-9 include graphs of these data collected between 2001 and 2010/2011. Graphs from LPBF's water quality data collected in Big Creek during 2008, 2009 and 2011 are included in Figures 10-12. These water quality data indicate when fecal coliform bacterial problems occur in Big Creek and also indicate when high turbidity values occurred. Based on information from these data, CWA Section 319 Base Funds were received for additional monitoring in Big Creek.

LDEQ's staff conducted a second reconnaissance survey of Big Creek and East Fork of Big Creek and selected 25 sampling sites, based on location of dairies, pastures and forests in the watershed (See Figure 2). The sampling design and monitoring sites are included in the quality assurance project plan (QAPP) for Big Creek. The water quality sampling design includes a rapid water quality assessment (RWQA) method to determine problem areas of high NPS pollutants in the watershed. The results from RWQA will be utilized to select seven (7) or eight (8) sample sites for long-term monitoring (three years or for the duration of the project).

A water quality standard is a numerical criterion value or general criterion statement to enhance or maintain water quality and provide for and fully protect the designated uses of a water body (LDEQ, 2003). The water quality standards for Big Creek are included in Table 1.

Water Quality Standards	
Water Quality Parameter	Numerical Criteria
Chlorides	20 mg/L
Sulfates	20 mg/L
DO	5.0 mg/L
pH	6.0-8.5
Bacteria	1*
Temperature	30
Total Dissolved Solids (TDS)	140

Table 1: Water Quality Standards in Big Creek

**Note 1 – 400 colonies/100mL and no more than 25 percent of samples exceeding 400 colonies/100mL for the period May 1 through October 31; 2,000 colonies/ 100 mL no more than 25 percent of samples exceeding 2,000 colonies/100mL shall apply all year.*

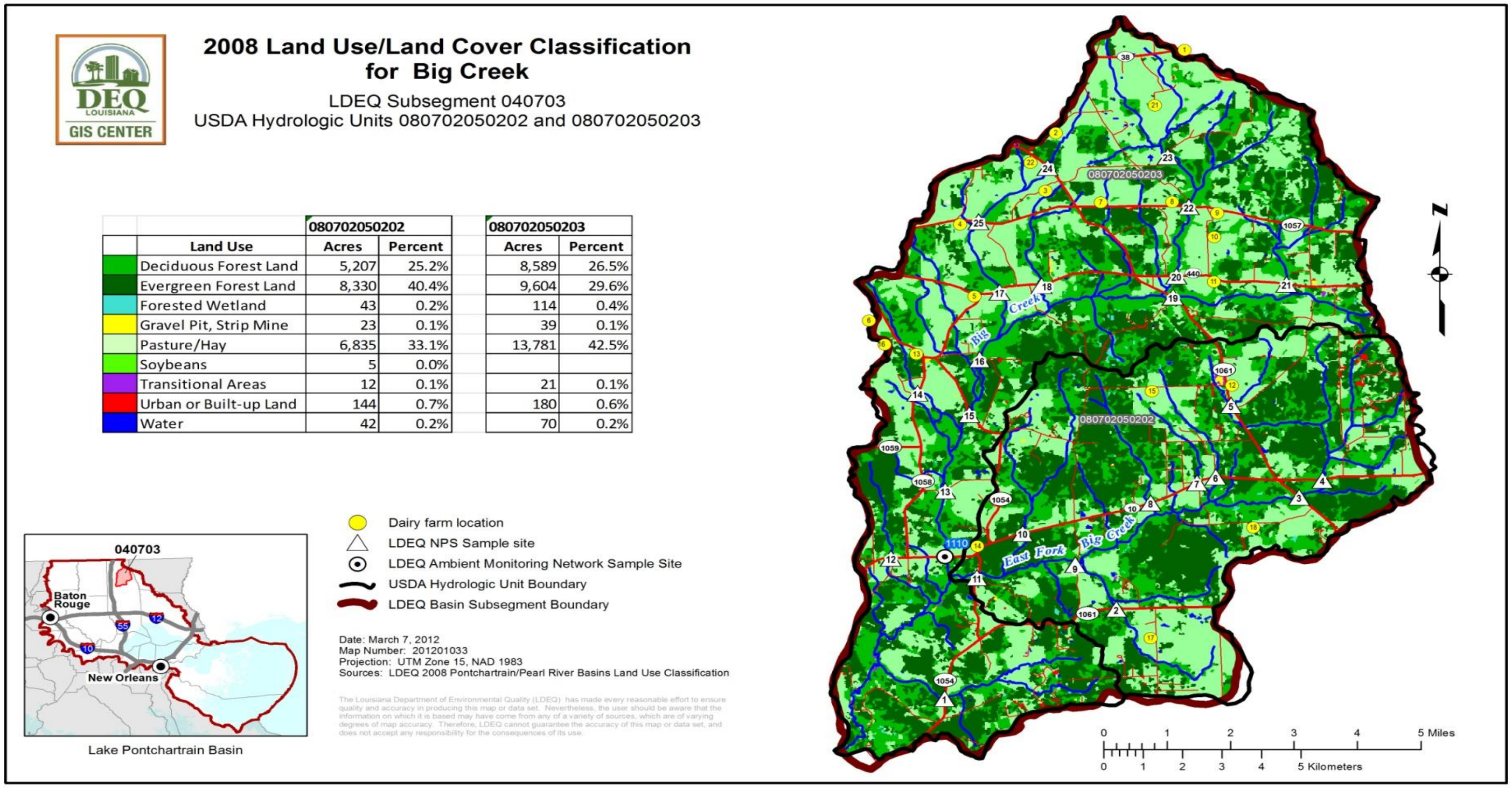


Figure 3: Sampling Locations in Big Creek

LDEQ collected ambient water quality data in Big Creek at the base of the subsegment for four (4) years between 2001 and 2010/2011. These data indicated that during 2001, fecal coliform concentrations exceeded the state's water quality standard for PCR between May and October. The water quality standard for SCR was exceeded for four (4) of these six (6) months, with a spike of 16,000 cells/100 mL in June 2001.

Similarly, water quality data collected in 2007 also indicated the state's water quality standards for PCR were exceeded between May and October. Water quality standards for SCR were exceeded in May and October. Similarly, water quality data collected between October 2010 and September 2011 indicated water quality standards for PCR were exceeded from May through August of 2011 and in October of 2010. Water quality standards for SCR were exceeded during February, March, April, July and August, with a spike of 16,000 cells/100 mL in February.

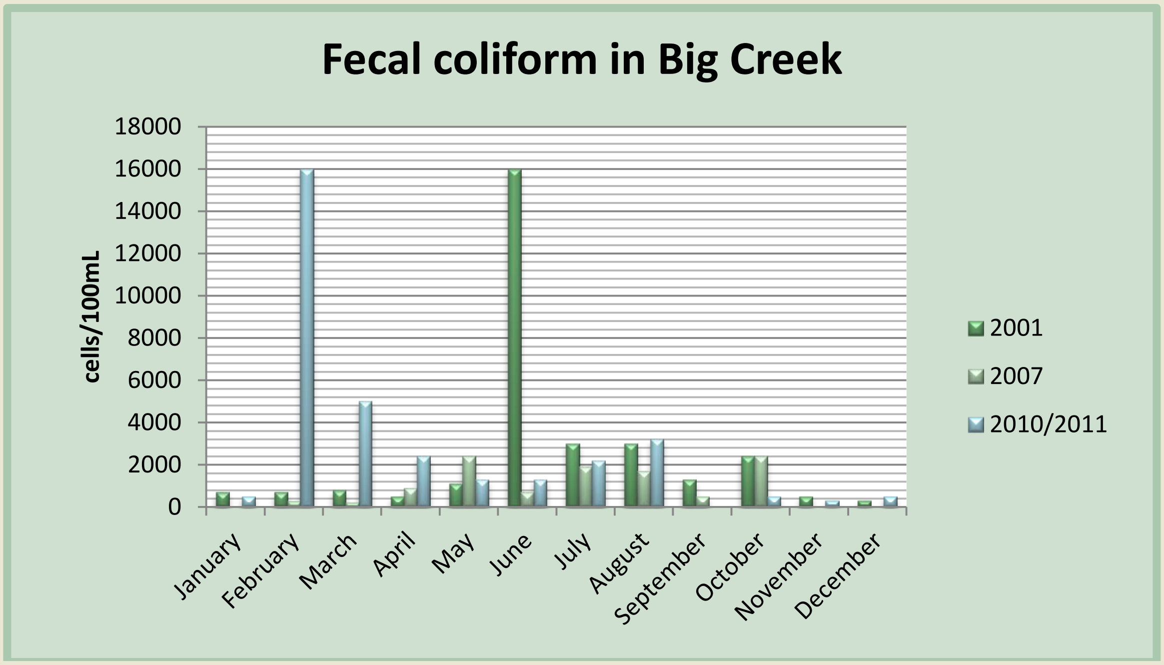


Figure 4: Fecal Coliform in Big Creek 2001, 2007 and 2010/2011

LDEQ's ambient water quality data for Big Creek indicated DO concentrations were maintained and did not exceed the state's 5.0 mg/L water quality standard for DO in Big Creek.

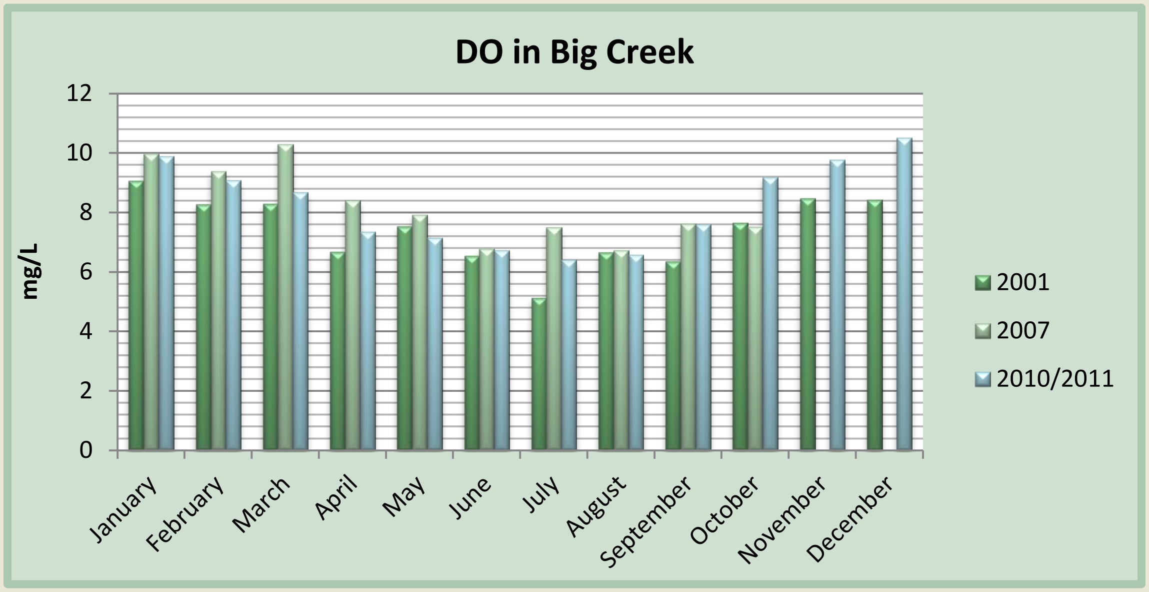


Figure 5: DO in Big Creek 2001, 2007 and 2010/2011

The water quality data for Big Creek indicated that the state's guidelines for turbidity were maintained at or below 50 NTU, but a recent spike in February 2011, indicated potential problems with turbidity. Several sites in the watershed had signs of erosion problems, therefore addressing this issue is one goal of the project.

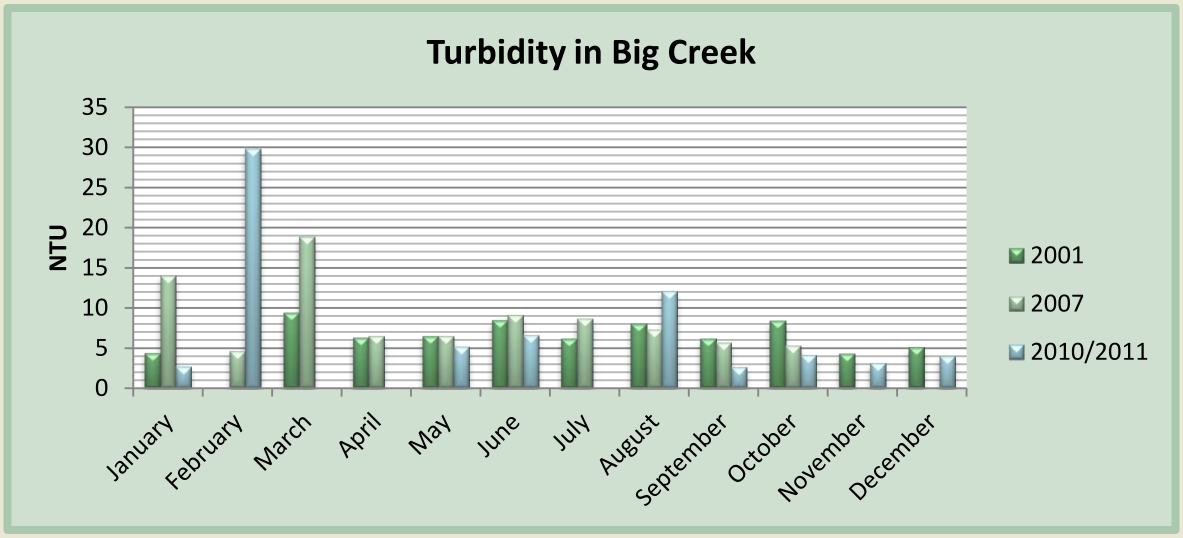


Figure 6: Turbidity in Big Creek 2001, 2007 and 2010/2011

The water quality data for Big Creek indicated TDS remained below the state's water quality standard of 140 mg/L.

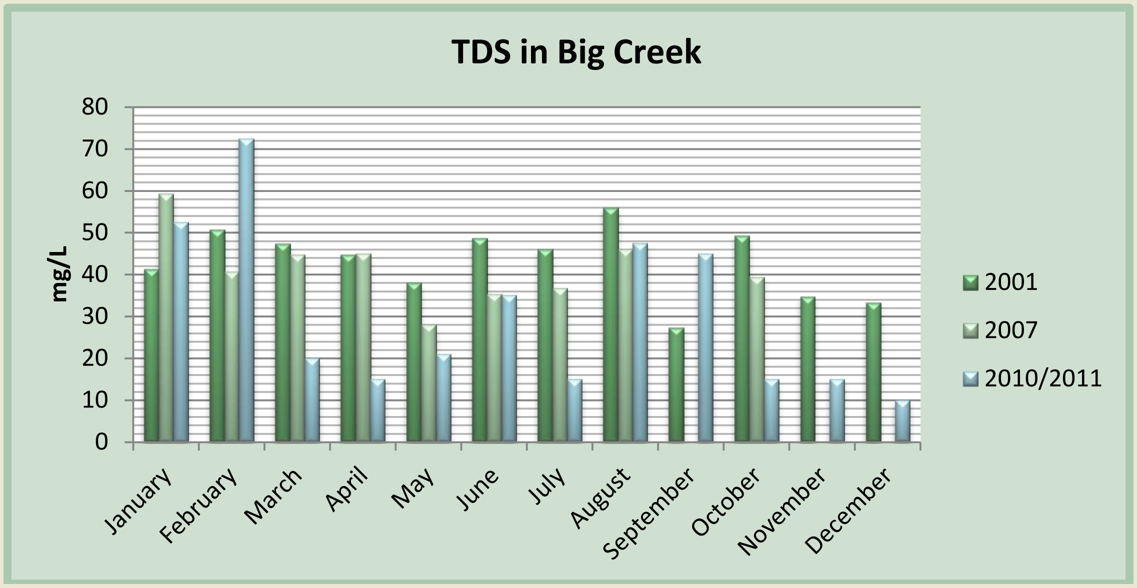


Figure 7: TDS in Big Creek 2001, 2007 and 2010/2011

The highest concentrations of TSS occurred in Big Creek during March 2007 with a value of 40.5 mg/L. The lowest values or non-detects occurred in February 2007, November 2010 and January 2011.

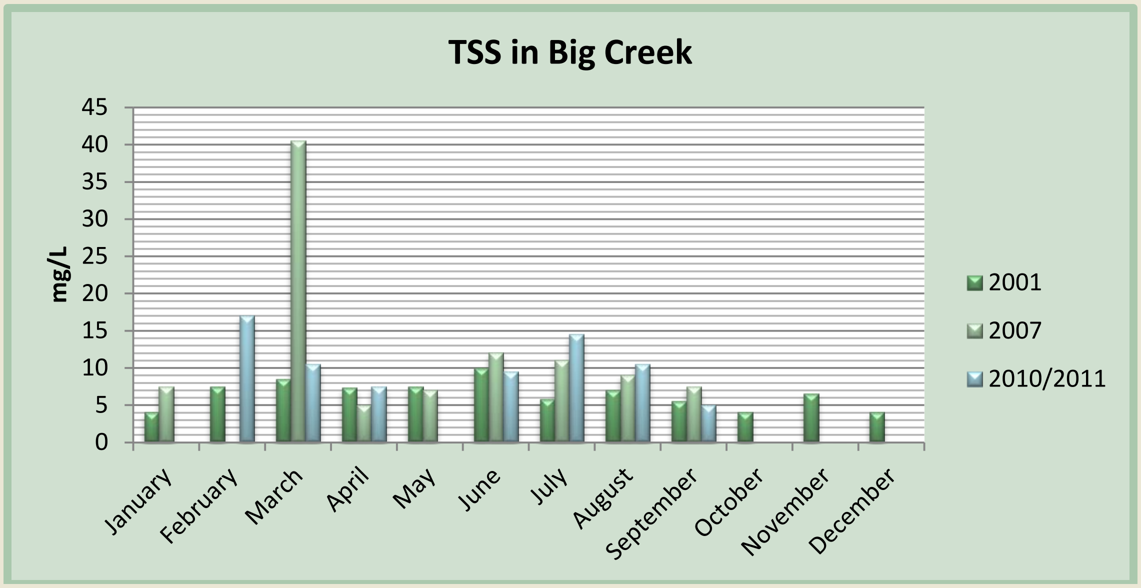


Figure 8: TSS in Big Creek 2001, 2007 and 2010/2011

The highest value of $N0_3/N0_2$ in Big Creek occurred in January 2007 (0.75 mg/L), while the lowest value occurred in July 2001 (0.12 mg/L). The highest value of TKN occurred in August of 2011 with a value of 1.74 mg/L. The lowest values or non-detects occurred during October, November, and December of 2010 and January, March, September, and April of 2011.

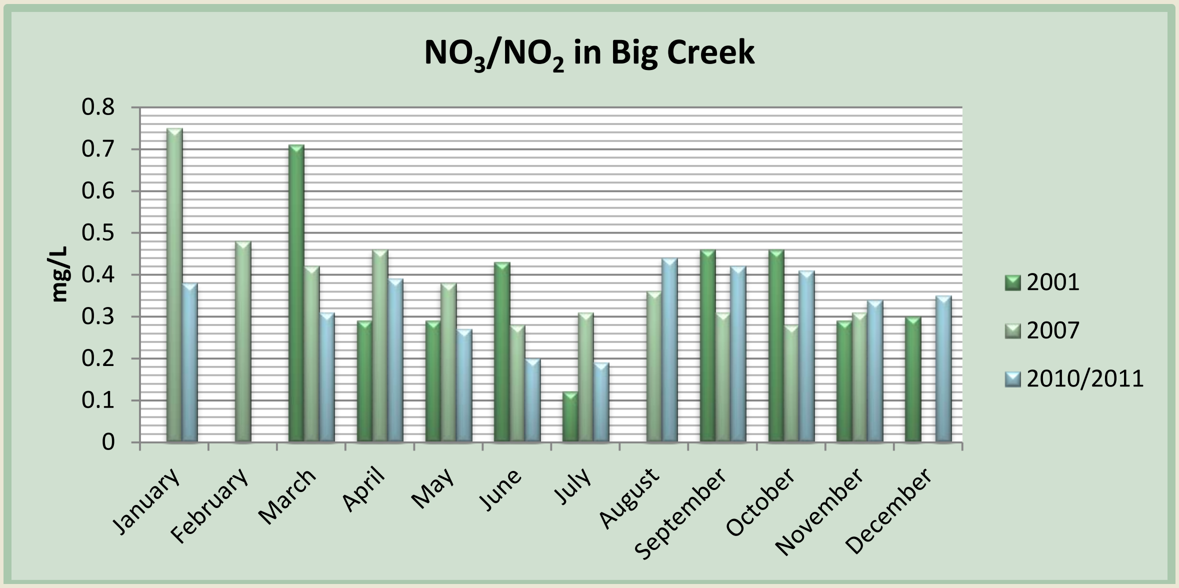


Figure 9: NO_3/NO_2 in Big Creek 2001, 2007 and 2010/2011

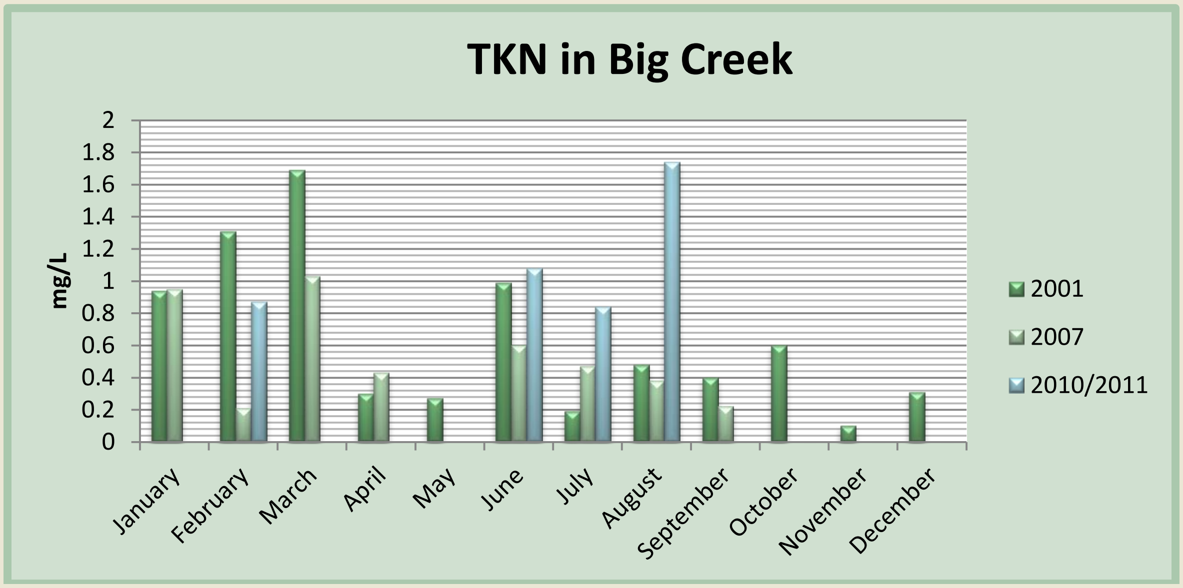


Figure 10: TKN in Big Creek 2001, 2007 and 2010/2011

The highest TP value occurred in Big Creek during Feb 2001 (0.42 mg/L) and the lowest values occurred in November 2010 and March 2011.

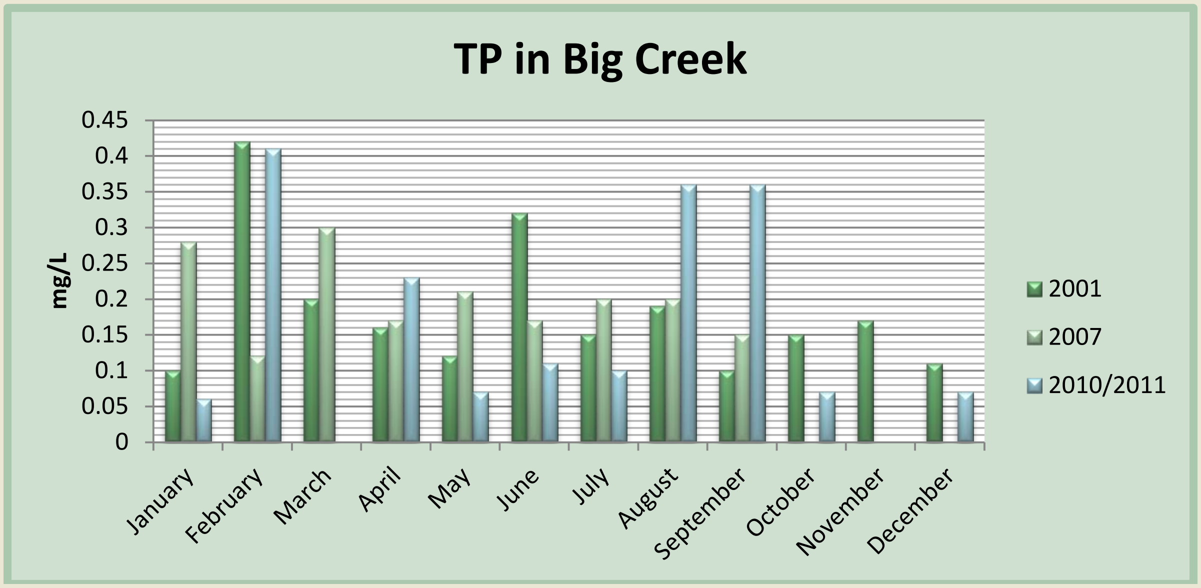


Figure 11: TP in Big Creek 2001, 2007 and 2010/2011

The LPBF collected water quality data in Big Creek during 2008, 2009 and 2011, which indicated the state's water quality standard for PCR was exceeded from May to October 2008, four (4) times from May to October 2009 and three (3) times from May to October 2011.

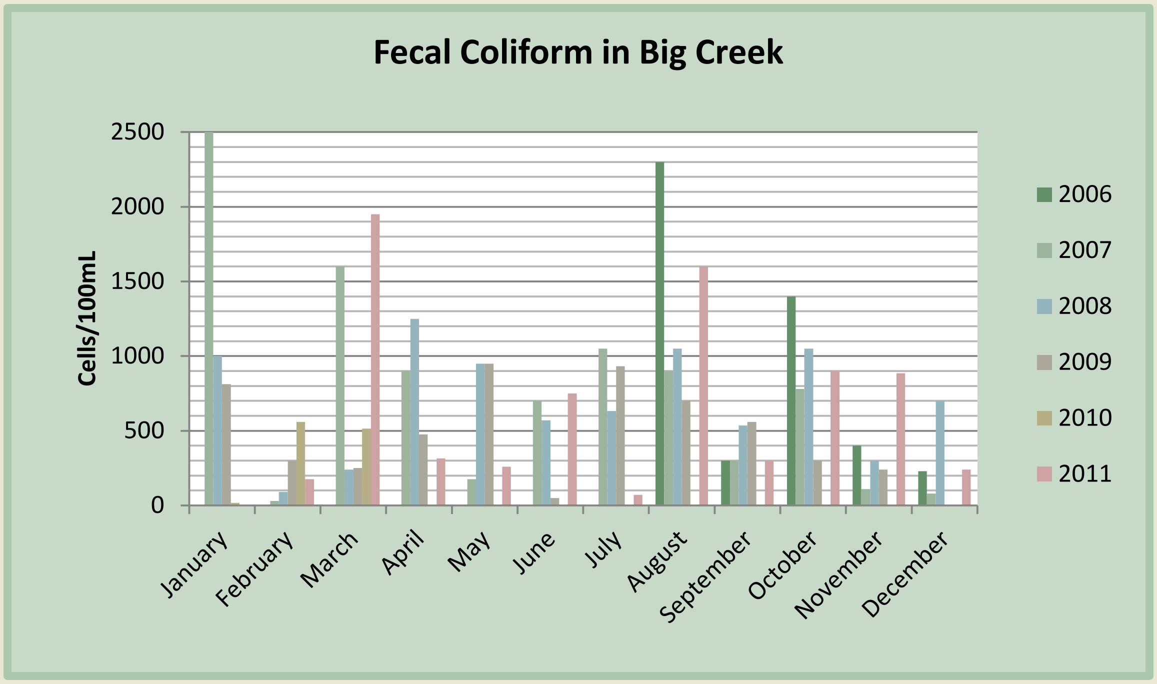


Figure 12: Fecal Coliform Bacteria in Big Creek collected by LPBF from 2006 to 2011

LPBF's water quality data for Big Creek also indicated DO concentrations were maintained and did not exceed the state's water quality standard of 5.0 mg/L for DO.

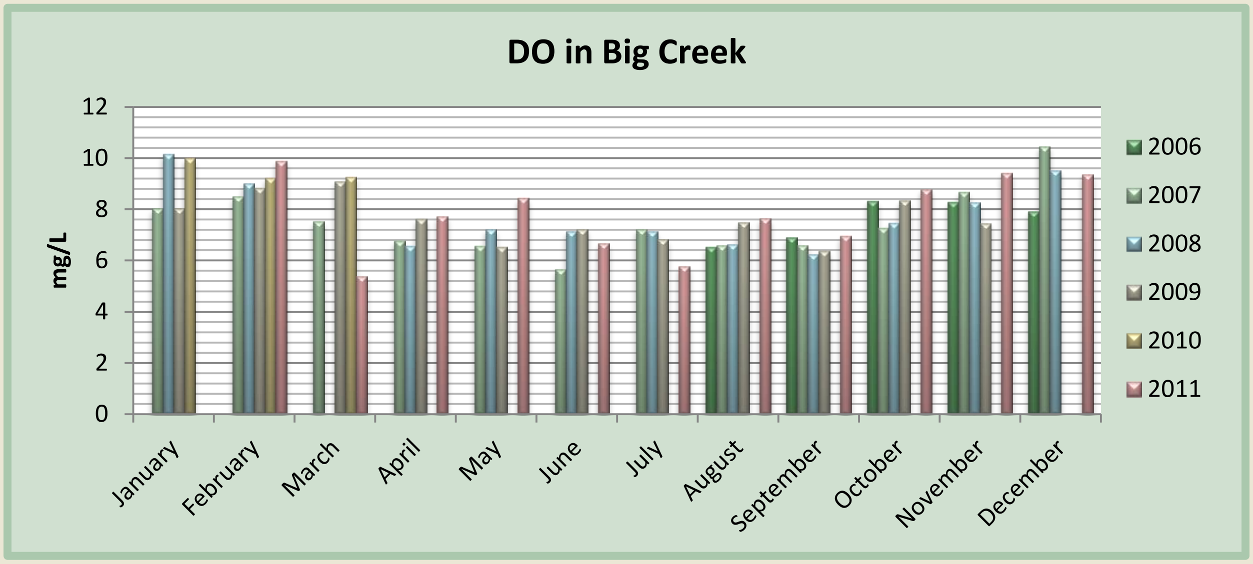


Figure 13: DO Data Collected by LPBF in Big Creek from 2006 to 2011

LPBF's water quality data for Big Creek indicated that turbidity levels were maintained at or below the state's guideline of 50 NTU except during January of 2009 (55 NTU) and April of 2011 (69.19 NTU).

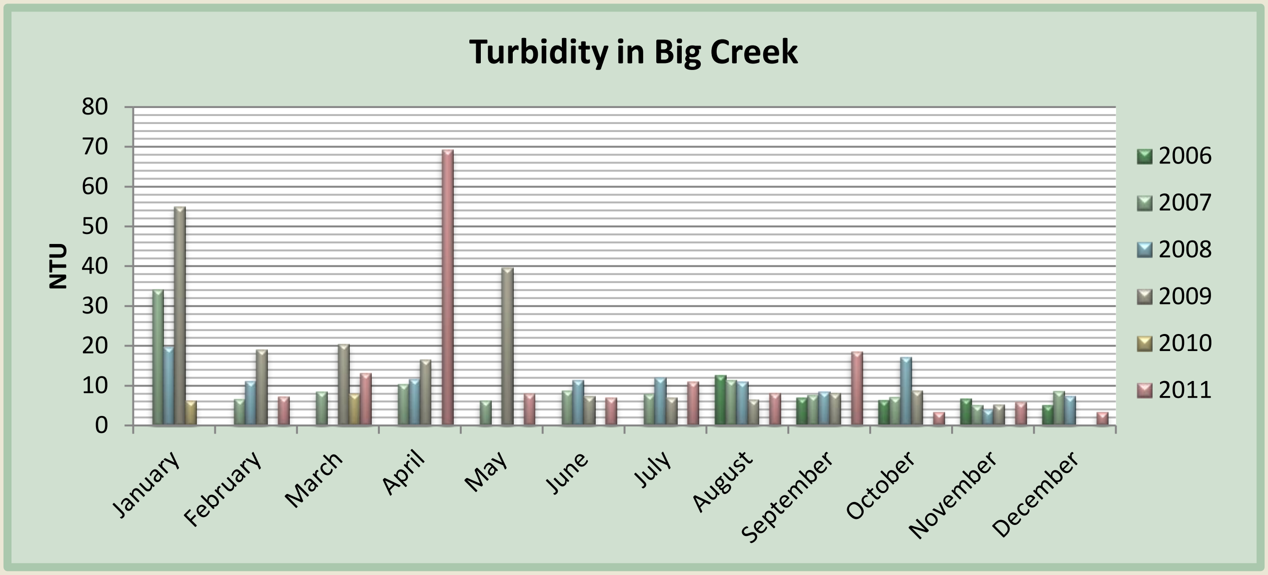
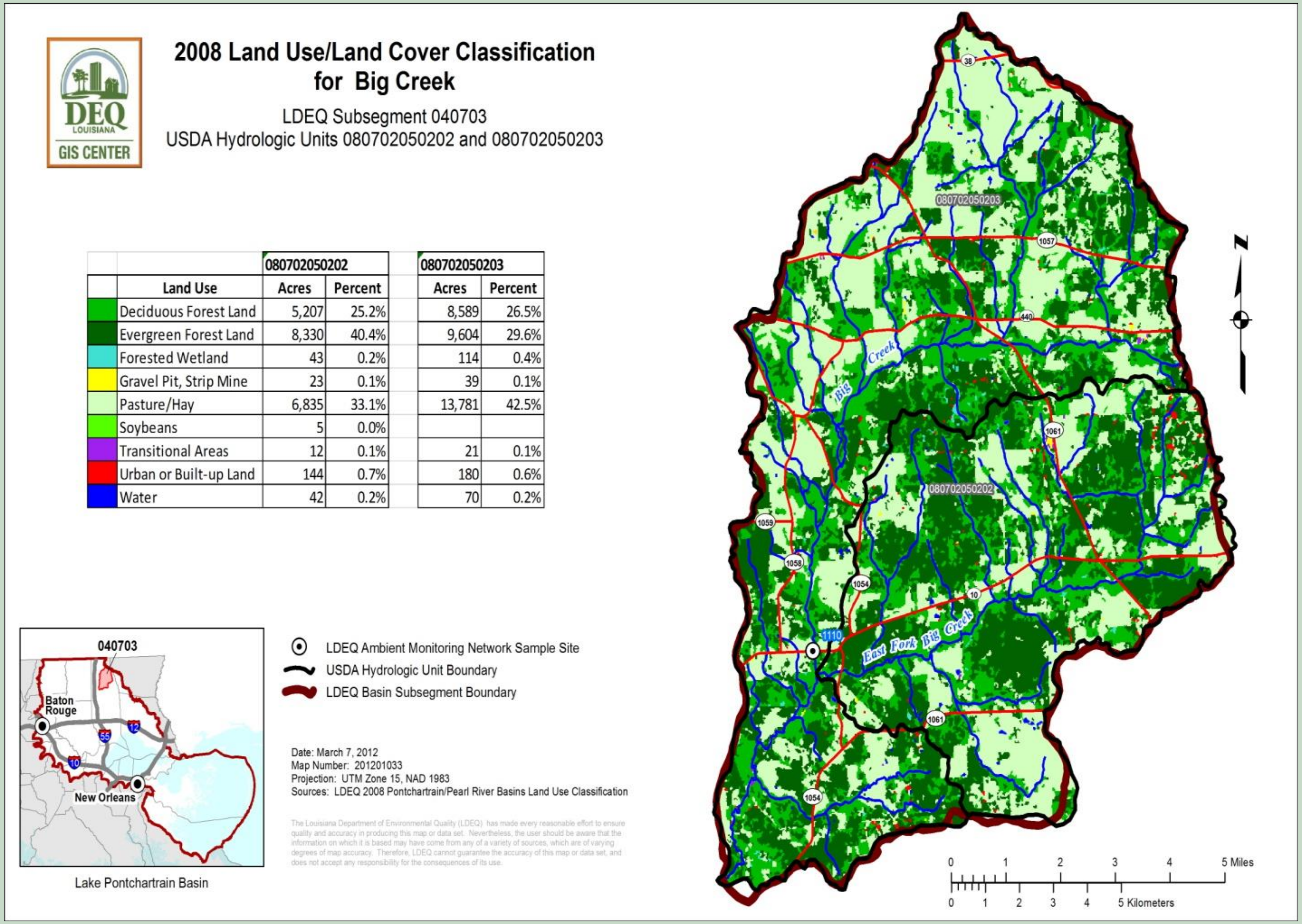


Figure 14: Turbidity Data Collected by LPBF in Big Creek from 2006 to 2011



Land Use	080702050202 Acres	Percent	080702050203 Acres	Percent
Deciduous Forest Land	5,207	25.2%	8,589	26.5%
Evergreen Forest Land	8,330	40.4%	9,604	29.6%
Forested Wetland	43	0.2%	114	0.4%
Gravel Pit, Strip Mine	23	0.1%	39	0.1%
Pasture/Hay	6,835	33.1%	13,781	42.5%
Soybeans	5	0.0%		
Transitional Areas	12	0.1%	21	0.1%
Urban or Built-up Land	144	0.7%	180	0.6%
Water	42	0.2%	70	0.2%

Figure 15: Big Creek Land-Use Map

2.2. Watershed Characteristics

Deciduous and evergreen forests and pasture/hay fields are predominant land-uses in Big Creek watershed. In East Fork Big Creek, approximately 65.6 percent of the land-use is either deciduous or evergreen forests, while 33.1 percent of the land-use is pasture/hay. The percentages for these land-uses in East Fork Big Creek are very similar to those in Big Creek watershed. In Big Creek, deciduous or evergreen forests comprise approximately 56.1 percent of the land-use. Pasture/hay comprises approximately 42.5 percent of the watershed. Other land uses in these HUCs include: forested wetlands, gravel pit or strip mines, soybeans, urban or built-up land, transitional areas and of course water, comprising less than 3.0 percent of East Fork Big Creek and Big Creek HUCs.

LDEQ's NPS staff joined USDA district staff on an initial reconnaissance of Big Creek and East Fork Big Creek watersheds on February 13, 2012. Through this field survey, LDEQ staff gained a clearer understanding of land-use types and how they potentially contribute to water quality problems identified by LDEQ's and LPBF's water quality data. Erosion problems were observed in several parts of the watershed, especially near a few dairy farms. Because soils in Big Creek Watershed are highly erodible, erosion can lead to turbidity and potentially to nutrient problems in Big Creek. The soils in the Big Creek watershed are discussed in more detail in the Appendix.

LDEQ's staff conducted a second reconnaissance of Big Creek/East Fork of Big Creek watershed on September 12, 2012, to verify additional sampling locations for targeted watershed monitoring approved through FFY 2012 CWA Section 319 Base Funds.

	East Fork Big Creek		Big Creek	
Land Use	**Acres**	**Percent**	**Acres**	**Percent**
Deciduous Forest Land	5,207	25.2%	8,589	26.5%
Evergreen Forest Land	8,330	40.4%	9,604	29.6%
Forested Wetland	43	0.2%	114	0.4%
Gravel Pit, Strip Mine	23	0.1%	39	0.1%
Pasture/Hay	6,835	33.1%	13,781	42.5%
Soybeans	5	0.0%		
Transitional Areas	12	0.1%	21	0.1%
Urban or Built-up Land	144	0.7%	180	0.6%
Water	42	0.2%	70	0.2%

Table 2: Land-Use for Big Creek Watershed

2.3 Sources and Types of Impairments

There are numerous small beef herds and non-industrial forest landowners in the Big Creek Watershed. Water quality degradation is a concern within the watershed. Gully erosion from concentrated feeding areas and unmanaged pastures were observed by LDEQ’s NPS staff during a reconnaissance of the watershed. These areas may also contribute excess nutrients to Big Creek.

Figure 16: Heavy Use Hay Feeding Area

Figures 16 and 17 represent potential problem areas in Big Creek Watershed. These areas have numerous beef cattle which potentially caused erosion of the hillside. They are heavy use areas utilized for hay feeding primarily during the winter months.

Figure 17: Dairy Farm in Big Creek Watershed

Figure 18: Erosion on the Hillside

Figure 19 is a photo taken on a beef cattle ranch in the Big Creek Watershed. It was once a dairy operation that has been converted to a beef cattle operation. This lagoon has a problem, because its walls breached, discharging waste waters to the drainage ditch. As indicated in Figure 19, the types of problems that exist in the watershed include a lagoon with waste flowing out of the spillway. Other lagoons may have similar problems, which should be identified through the RWQA phase of monitoring at 25 locations in Big Creek Watershed.

Figure 19: Waste Waters flowing from the Lagoon's Spillway

Another site visit was made to Big Creek Watershed during February 2012, to conduct a field survey and general assessment of the watershed. Satellite maps were utilized to identify land-use types, their specific locations and percentage of the watershed. Topographical maps and a global positioning system (GPS) were utilized for navigating, while verifying land use types.

There are 22 dairies in Big Creek/East Fork Big Creek watersheds. Approximately six (6) of the 22 are no longer functional and need proper closure. Beef and dairy farms are prevalent throughout the watershed and will be targeted for BMPs through NWQI. One farm that was visited had fencing too close to the creek (see Figure 20), without a buffer between the fence and the stream. Surface runoff from this area would cause high fecal coliform concentrations.

Figure 20: Beef Cows in Area with Fencing too Close to the Stream

Figure 21 illustrates an area with beef cows and is another potential site for BMP implementation, such as fencing. There were stream crossings without measures to prevent cows from entering the water way.

Figure 21: Stream Crossing for Cows without Fencing or BMPs

Another interesting issue was an animal facility with numerous dogs. The waste from these animals is being washed into the ditch in front of this shelter and there are signs of erosion along the ditch. The bacteria from waste in the ditch contribute to high concentrations of fecal coliform bacteria.

Figure 21: An Animal Shelter in the Watershed

Figure 23 is a ditch located just outside of an animal shelter. The condition of the water in the ditch is indicative of the waste load from an animal shelter.

Figure 22: Ditch outside the Animal Shelter

2.4. Priority Areas

Priority areas in this watershed appear to be dairies and small beef farms. Areas visited during the watershed tour consisted of concentrated animals in hay feeding areas as well as farms that had no fencing or improper location of fencing. According to NRCS, there are approximately 22 dairies in Big Creek watershed. Approximately six (6) of the 22 dairies are no longer active and need proper closure.

LDEQ's FFY 2012 CWA Section 319 Base Funds will evaluate effectiveness of BMPs implemented through USDA's NWQI and LDAF's Section 319 Incremental Funds in Big Creek and East Fork Big Creek. LDEQ held meetings with USDA-NRCS and LDAF to select sample locations for targeted watershed monitoring. The two-phased watershed monitoring design allows LDEQ and stakeholders to characterize the watershed and understand where NPS pollutants (i.e. fecal coliform, sediment and nutrients) originate and whether BMPs are effective in reducing them.

The RWQA method allows LDEQ to determine if there are areas in the watershed that contribute higher concentrations of fecal coliform bacteria, sediment (i.e. turbidity and total solids) and nutrients (i.e. TP and total nitrogen). Based on results of RWQA, a subset of water quality monitoring sites will be selected for long- term monitoring that evaluates effectiveness of BMPs implemented in Big Creek and East Fork Big Creek.

Rapid Water Quality Assessment
For each of the 25 sites (see photos of sites in Appendix) selected for RWQA, LDEQ will collect in-situ readings, grab samples and habitat assessment data:

In-situ readings: pH, water temperature, water clarity, DO/percent saturation, TDS and conductivity/salinity along with visual observations of oil and grease.

Grab samples: ammonia-nitrogen (NH_4-N), nitrate-nitrogen (NO_3-N), fecal coliform bacteria, phosphate and turbidity.

Habitat assessment: A habitat assessment will be conducted at each sampling site and will include other site parameters in addition to those obtained by in-situ readings and grab samples.

Flow data will be collected for each of the 25 sampling sites with assistance of LDEQ's Hydrologist and/or LDEQ's surveys group during the project.

Figure 23: Dairy Farm in Big Creek

3.0. Load Reductions

A TMDL for fecal coliform in Big Creek has been finalized and was required through USEPA's consent decree. All TMDLs that were required through the consent decree for Lake Pontchartrain Basin were finalized in March 2012.

3.1 TMDL Load Reductions

A TMDL is a calculation of the maximum amount of a pollutant that a water body can assimilate while still meeting the water quality standard for that pollutant. TMDLs provide the scientific basis for a state to establish water quality-based controls to reduce pollution from both point and NPSs to restore and maintain the quality of the state's water resources (USEPA 1991).

A TMDL for a given pollutant and water body consists of the sum of individual waste load allocations (WLAs) for point sources and load allocations (LAs) for NPS and natural background levels. In addition, the TMDL must include an implicit or explicit margin of safety (MOS) to account for any uncertainty in the relationship between pollutant loads and the quality of the receiving water body and it may include a future growth (FG) component. The components of the TMDL calculation are illustrated using the following equation:

TMDL = Σ WLAs + Σ LAs + MOS + FG

The fecal coliform bacteria TMDL for Big Creek (Subsegment 040703) was calculated using the load duration curve method. The load duration curve methodology illustrates allowable loading over a wide range of stream flow conditions. The steps for applying this methodology included:

- developing a flow duration curve;
- converting the flow duration curve to load duration curves;
- plotting observed loads with load duration curves;
- calculating the TMDL, MOS, FG, WLA and LA; and
- Calculating percent reductions.

Most fecal coliform bacteria TMDLs are developed on a seasonal basis (i.e., calculating allowable loads and percent reductions for both summer and winter) because of seasonal water quality criteria.

In TMDL development, allowable loadings from all pollutant sources that cumulatively amount to no more than the TMDL must be established and thereby provide the basis for establishing water quality-based controls. WLAs were specified for permitted point source dischargers, including municipal separate storm sewer systems (MS4). A year-round WLA was calculated for point source dischargers using their permit limits.

Seasonal WLAs were calculated for MS4s because MS4s are permitted dischargers but function similarly to NPS (through storm-driven processes). The LAs include background loadings and human-induced NPS loads. An explicit MOS of 10 percent was included in the TMDL. A future growth (FG) component of 10 percent was also included in this TMDL.

According to TMDL results for Big Creek, the percent reduction needed at LDEQ's monitoring site for fecal coliform bacteria is 88 percent during winter and summer months to meet PCR water quality standards.

Figure 25 provides a hypothetical level of fecal coliform reductions necessary to meet water quality standards for PCR by October 2016. The three (3) AgBMPs prioritized by USDA-NRCS that have the highest potential for achieving this reduction in fecal coliform concentrations include:

AgBMP 1: Comprehensive Nutrient Management Plans

AgBMP 2: Prescribed Grazing

AgBMP 3: Waste Utilization

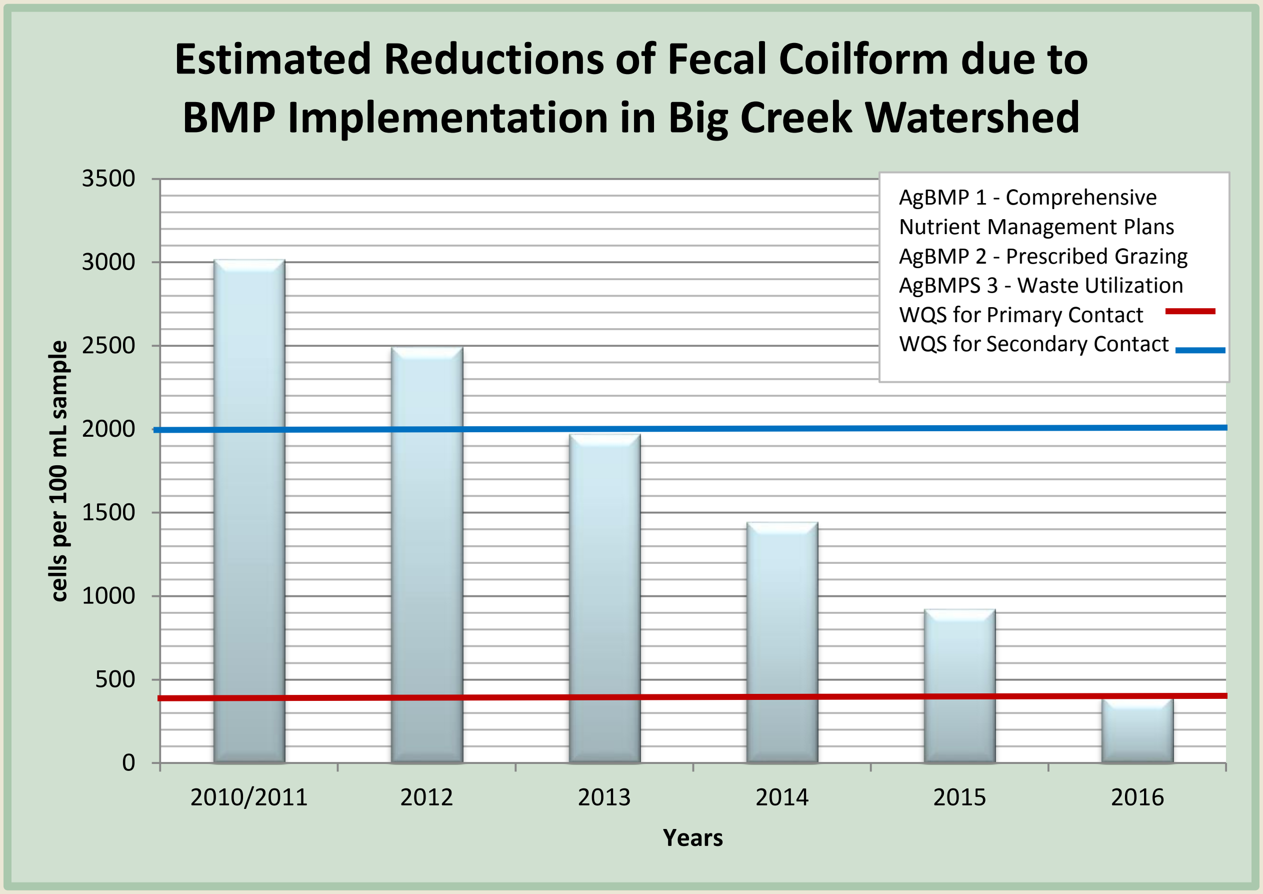


Figure 24: Estimated Reductions of Fecal Coliform in Big Creek

3.2. Load Reductions by HUC 12 sub-watersheds

By implementing BMPs included in Table 4, load reductions should occur and water quality improve in both HUC-12 sub-watersheds. BMPs expected to achieve a reduction in fecal coliform include: Waste Treatment Lagoon (359), Closure of Waste Impoundment (360), Lagoon Pump out (359) Pond (378), Fence (382), Prescribed Grazing (528), Stream Crossing (578), Watering Facility (614), Waste Recycling (633), Water Well (642), Livestock Shade Structure (717), Closure of Waste Impoundment (360) and Lagoon Pump out (359). BMPs expected to achieve a reduction in sediment and turbidity include: Conservation Cover (327), Residue and Tillage Management, No-till/Strip Till/Direct Seed (329), Contour Farming (330), Critical Area Planting (342), Residue Management (344), Residue and Tillage Management, Mulch Till (345), Conservation Crop Rotation (328) and Prescribed Burning (338). BMPs expected to achieve a reduction in sediments and nutrients include: Riparian Forest Buffer (391), Prescribed Forestry (409), Access Control (472), Tree/Shrub Preparation (490), Forage Harvest Management (511), Forage and Biomass Planting (512), Heavy Use Area Protection (561) and Tree/Shrub Establishment (612). Erosion control BMPs also include: Mulching (484), Hydrologic Unit Area (HUA)- Concreted Trough or HUA – rock gates (516), Forage & Biomass Planting (Intro Species) (512), Tree Planting (612) and Forest Trails and Landing (water bar) (655).

LDAF, USDA, NRCS and SWCD staff will implement these BMPs in both Big Creek and East Fork Big Creek HUCs. LDEQ will monitor water quality in these two (2) sub-watersheds to determine if water quality improved and bacterial concentrations declined. When water quality standards are met and designated uses for PCR are restored, Big Creek can be delisted and a NPS Success Story can be written.

4.0. NPS Management Measures

Implementation of BMPs in the watershed constitutes the building blocks of watershed protection and improving water quality. Because rivers and streams encompass a broad range of land uses, the description of BMPs for Big Creek Watershed is divided into categories such as agriculture (pasture/hay) and forestry. Each different category contains "site-specific" BMPs that minimize a particular source of NPS pollution. BMPs can include structural controls and/or non-structural controls. Structural BMPs or controls are those, whether natural or man-made, that filters, detain, or re-route contaminants carried in surface runoff. Non-structural BMPs utilize techniques such as land-use planning, land-use regulations and land ownership to eliminate or minimize sources generating a NPS load. One of the most important aspects of successfully implementing BMPs and/or making changes in the watershed that should result in reduced NPS loads to the river is public awareness, education and participation. Reduction and prevention of NPS pollution in Big Creek will involve a concerted effort from all the watershed stakeholders.

4.1. BMPs to Restore Water Quality

Pastureland BMPs

Since pastureland grazing occupies a major portion of agricultural land-use in the watershed, pastureland grazing BMPs should focus on measures to control the amount of sediment, nutrients and fecal coliform in surface waters draining from the fields/pastures. BMP implementation and edge-of-field monitoring in other watersheds of south Louisiana has indicated sediment and nutrients can be reduced from 35-65 percent with rotational grazing and fecal coliform can be reduced by 50 percent. Knowledge of the field site's delineation and drainage pattern can be helpful when identifying pathways and potential sources of NPS pollutants. During or shortly after a rainfall event is the best time to determine if BMPs have been effective in reducing NPS pollutants from pastures and dairies. With this information, the operator can strategically implement BMPs that prevent NPS pollutants from leaving their operations.

Fields with a high population density of grazing animals should consider field-rotations to allow re-establishment of vegetative cover. Sites with healthy vegetative cover have less runoff and lower NPS loads. If a field's size is not adequate for "field-rotations", ponds could be constructed to capture excess surface runoff from the site. Surface Runoff could be routed through a vegetated field ditch, in conjunction with the pond to reduce NPS loads from the field. Big Creek Watershed has a network of drainages and tributaries that drain to Big Creek. The land in and along field ditches wetlands and stream banks is very important for preventing sediment, nutrients and organic matter from entering receiving streams. This area of land between wet and upland landscapes is referred to as the "riparian buffer zone".

Riparian Buffer Zone Protection

Protecting riparian zones along Big Creek, as well as ditches that drain to the bayou, is necessary to prevent sediment, nutrients and organic matter from entering the creek. Livestock frequently access these areas to obtain water, shade and lush vegetation. The hoof traffic along the stream banks can cause serious sediment and fecal coliform loads to the creek. Fencing protects the riparian zone from damage caused by livestock. When livestock are restricted from riparian buffer zones, the landowner should provide an alternative source of water, shade and food. Water troughs should be placed on top of a concrete pad to prevent further erosion problems from occurring.

Forestry BMPs

Forestry BMPs are designed primarily to reduce the amount of sediment from forestry operations to local water bodies. To minimize impacts of potential NPS pollutant loads to Big Creek and to sustain future timber harvests, operators should employ management practices that restrict timber harvests from wet areas and utilize select-cut timber harvesting practices. This approach will help maintain important functions of the forest within the watershed, while sustaining future timber harvests.

Home Sewage BMPs

Failing home septic systems have the potential to cause significant problems in the watershed by contributing nutrients, organic matter and fecal coliform bacteria to the water body. Pollution prevention practices such as proper installation, location, size and operating maintenance are the best way to eliminate NPS loads from home systems. Repairing leaking faucets and/or toilets can help avoid septic tank failure. Many of the problems that result from home septic systems occur because of lack of knowledge about the system. A way to prevent system failure is to provide information for the homeowner about the importance of sewage system maintenance. If a home sewage educational program existed, then homeowners could make better decisions during installation and operation. Once the public has been provided educational opportunities concerning their home septic systems, they may want to implement an inspection and maintenance program.

Agricultural BMPs

Agricultural BMPs are generally associated with management of soil, nutrients and pesticides that contribute NPS pollutants to receiving streams. If fertilizers, herbicides and pesticides are utilized efficiently and/or degrade in the field, NPS loads delivered to the water body could be minimized. Reducing NPS loads from agricultural fields relies on partnerships of federal, state and local agencies with watershed stakeholders. Agriculture programs should be designed to foster a sense of conservation stewardship for each type of agricultural producer. Examples of these programs are the Louisiana Master Logger Program and Louisiana Master Farmer Program.

4.2. NPS BMPs Implemented

Conservation practices have been implemented in Big Creek Watershed during the past five (5) years. Table 3 includes a list of practices associated with reducing fecal coliform concentrations in the watershed. USDA’s Farm Bill Programs such as Environmental Quality Incentive Program (EQIP), Wildlife Habitat Incentives Program (WHIP), Conservation Reserve Program (CRP), Conservation Security Program (CSP) and Conservation Technical Assistance (CTA) funded these BMPs.

Table 3 includes a list of conservation practices that have previously been implemented in Big Creek and East Fork Big Creek watersheds from 2007 to 2012. While there has been considerable conservation work being applied in the area there has been limited adoption of the core practices; Comprehensive Nutrient Management Planning, Prescribed Grazing and Waste Utilization applied during this five (5) year period. This could explain the increase in fecal coliform numbers in the 2010/2011 monitoring. Since LDEQ's and LPBF's water quality data indicate fecal coliform concentrations did not meet PCR and SCR in 2010/2011, additional BMPs are necessary. Future implementation efforts should focus on implementing these core practices on the remaining dairies in the watershed. Through combined efforts of USDA and LDAF in implementing BMPs and LDEQ's targeted watershed monitoring design, in-stream water quality should improve.

HUC 12	Practice Name	Applied Amount	Applied Year
Big Creek	Comprehensive Nutrient Management Plan - Written (102)	1.00 no	2009
	Comprehensive Nutrient Management Plan - Applied (103)	1.00 no	2009
	Conservation Cover (327)	158.00 ac	2007
	Conservation Crop Rotation (328)	145.4 ac	2009-2010
	Residue and Tillage Management, No-Till/Strip Till/Direct Seed (329)	105.50 ac	2010
	Contour Farming (330)	39.90 ac	2010
	Prescribed Burning (338)	543.9 ac	2007-2010
	Critical Area Planting (342)	3.50 ac	2010-2011
	Residue Management, Seasonal (344)	98.20 ac	2012
	Residue and Tillage Management, Mulch Till (345)	145.40 ac	2010
	Waste Treatment Lagoon (359)	1.00 no	2011
	Pond (378)	3.00 no	2010-2011
	Fence (382)	63631.4 ft	2007-2012
	Riparian Forest Buffer (391)	26.2 ac	2011-2012
	Firebreak (394)	37502.00 ft	2008, 2010, 2012
	Prescribed Forestry (409)	21.00 ac	2010
	Access Control (472)	237.3 ac	2008, 2009, 2010
	Tree/Shrub Site Preparation (490)	777.4 ac	2007, 2011, 2012
	Forage Harvest Management (511)	249.9 ac	2008, 2009, 2010
	Forage and Biomass Planting (512)	73.60 ac	2007
	Pipeline (516)	12317.6 ft	2007, 2008, 2009, 2011
	Pond Sealing or Lining, Bentonite Sealant (521C)	1.00 no	2010
	Prescribed Grazing (528)	1331.3 ac	2007, 2008, 2010, 2011
	Heavy Use Area Protection (561)	12825.1 ac	2007, 2012
	Nutrient Management (590)	399.10 ac	2007-2012
	Integrated Pest Management (595)	240.2 ac	2007, 2010, 2011
	Tree/Shrub Establishment (612)	464.00 ac	2007, 2012
	Watering Facility (614)	3.00 no	2007, 2008, 2009, 2010, 2012
	Waste Recycling (633)	255.5 ac	2007, 2008, 2009, 2010, 2012
	Water Well (642)	1.00 no	2007
	Upland Wildlife Habitat Management (645)	1537.3 ac	2007-2012
	Early Successional Habitat Development/Management (647)	44.90 ac	2012
	Forest Stand Improvement (666)	1040.7 ac	2007-2012
	Livestock Shade Structure (717)	4.00 no	2009
East Fork Big Creek	Comprehensive Nutrient Management Plan (100)	1.00 no	2007
	Conservation Cover (327)	458.7 ac	2009, 2011, 2012
	Conservation Crop Rotation (328)	30.90 ac	2010

HUC 12	Practice Name	Applied Amount	Applied Year
East Fork Big Creek	Residue and Tillage Management, No-Till/Strip Till/Direct Seed (329)	80.80 ac	2010
	Contour Farming (330)	95.4 ac	2010
	Prescribed Burning (338)	917 ac	2009
	Critical Area Planting (342)	10.5 ac	2007, 2008, 2010
	Residue and Tillage Management, Mulch Till (345)	80.80 ac	2010
	Waste Treatment Lagoon (359)	1.00 no	2010
	Pond (378)	1.00 no	2008
	Fence (382)	13419 ft	2007, 2008, 2010
	Firebreak (394)	106,579.00 ft	2010
	Fishpond Management (399)	3.00 no	2010
	Grassed Waterway (412)	10.00 ac	2007, 2008
	Irrigation System, Microirrigation (441)	73.3 ac	2007, 2009, 2010, 2011
	Access Control (472)	82.90 ac	2009, 2012
	Tree/Shrub Site Preparation (490)	128.7 ac	2007, 2008, 2009, 2012
	Forage Harvest Management (511)	18.90 ac	2008
	Forage and Biomass Planting (512)	93.6 ac	2007, 2008
	Pipeline (516)	4651 ft	2007, 2008, 2011
	Prescribed Grazing (528)	697.8 ac	2007, 2008, 2011
	Row Arrangement (557)	13.10 ac	2012
	Heavy Use Area Protection (561)	497.6 ac	2007, 2008, 2011
	Structure for Water Control (587)	3.00 no	2007, 2011
	Nutrient Management (590)	240.00 ac	2007, 2008, 2010
	Integrated Pest Management (595)	445.7 ac	2007-2012
	Tree/Shrub Establishment (612)	279.10 ac	2007-2010
	Watering Facility (614)	11.00 no	2007, 2008, 2011
	Waste Recycling (633)	135.00 ac	2007, 2010
	Water Well (642)	3.00 no	2007, 2011
	Upland Wildlife Habitat Management (645)	1011.5 ac	2007, 2008, 2009, 2012
	Forest Stand Improvement (666)	642.7 ac	2007-2010
	Livestock Shade Structure (717)	1.00 no	2009

Table 3: BMP Implementation in Big Creek and East Fork Big Creek

4.3. BMPs for Cost-Share Assistance and Success in Big Creek Watershed

Additional water quality monitoring is necessary to determine whether BMPs implemented through USDA Farm Bill Programs have been effective in reducing NPS pollutants and to determine if additional BMPs implemented by USDA and LDAF reduce NPS pollutants in Big Creek. The water quality goal is to restore Big Creek to fully meeting PCR and SCR by October 2016. Table 4 includes BMPs that USDA/LDAF has determined should be implemented to reduce fecal coliform concentrations and improve water quality in Big Creek.

Conservation implementation efforts should focus on using a systems approach of conservation delivery. Through proper nutrient management dairy operations can make a full assessment of the current nutrient levels on farms and properly manage additional manure applications following a specific plan. Prescribed grazing plans will help utilize the existing forage base and maintain proper stocking rates and animal distribution. Waste Utilization will assist the dairies in maintaining their manure storage ponds and properly distributing the waste on or off site. A combination of all three (3) core practices will provide the best opportunity for reducing fecal coliform loads within the watershed. To further strengthen the conservation implementation in the watershed the additional supporting practices listed in table 4 will be needed to fully implement a holistic conservation plan.

USDA stated that the timeline for this project of implementing BMPs is from May 2012 through September 30, 2014. LDAF applied for Section 319 incremental funds to implement BMPs included in Table 4. The approximate timeline for BMP installation given by LDAF if funds are approved is from October 2012 through October 2015.

By partnering with Louisiana Department of Health and Hospitals (LDHH), LDEQ will acquire information on individual home systems, including dates of installation and maintenance. The information allows watershed stakeholders to determine if bacteria and/or nutrient problems are associated with home sewage systems in Big Creek watershed.

Practice Code	Practice Name	Unit	Est. Needs to Address Resource Concerns	Cost-share Available	Total Cost - share Dollars Needed	Notes:
382	Fencing	lf	10000	$ 2.13	$ 21,300.00	10,000 ft. of fencing/yr.
516	Pipeline	lf	12000	$ 2.09	$ 25,080.00	2,000 ft. per farm@ 6 farms/yr.
614	Water Troughs	gal	12000	$ 0.76	$ 9,120.00	assume 500 gal. trough with 2 troughs per farm w/ 12 farms/yr.
516	HUA - Concrete	Cu. Yd.	288	$ 97.19	$ 27,990.72	Trough HUA:12 yd3/trough - 24 troughs
516	HUA - Rock	Cu. Yd.	168	$ 35.94	$ 6,037.92	Gate HUA - 20' x 40' ; 3 gates/farm w/ 4 farms/yr.
578	Stream Crossing	lf	360	$ 79.61	$ 28,659.60	Average 120 ft./crossing: 3 crossings/yr.
512	Forage & Biomass Planting (Intro Species)	Ac.	360	$140.47	$ 50,569.20	Est. 30 acres/farm @ 12 farms/yr.
512	Forage & Biomass Planting(Legumes)	Ac.	750	$ 95.47	$ 71,602.50	Est. 50 acres/farm@15 farms/yr.
548	Grazing Land Mech. Treatment	Ac.	800	$ 9.00	$ 7,200.00	Est. 40 acres/farm@20 farms/yr.
378	Pond	Cu. Yd.	36000	$ 2.15	$ 77,400.00	Est. 3,000 yd3/pond @ 12 farms/yr.
342	Critical Area Treatment	Ac.	24	$ 423.60	$ 10,166.40	Est. 1 acre/pond, plus 2 acres/6 farms/yr.
342	Critical Area Treatment (Shaping)	Ac.	12	$ 829.28	$ 9,951.36	Est. 2 acres/6 farms/yr.
642	Well	ea	5	$ 1,934.00	$ 9,670.00	Est. 1 well@5 farms/yr.
528	Prescribed Grazing (1-4)	Ac.	200	$ 121.95	$ 24,390.00	Est. 50 acres/farm@4 farms/yr.
528	Prescribed Grazing (2-4)	Ac.	600	$ 104.50	$ 62,700.00	Est. 60 acres/farm@10 farms/yr.
528	Prescribed Grazing (3-4)	Ac.	1200	$ 60.09	$ 72,108.00	Est. 80 acres/farm@15 farms/yr.
717	Portable Livestock Shade	sf	19200	$ 2.50	$ 48,000.00	Est. 3 - 20'x40' structure@ 8 farms/yr.
612	Tree Planting	Ac.	240	$ 81.80	$ 19,632.00	Est. 80 acres/farm @ 3 farms.yr.
490	Forest Site Prep.	Ac.	240	$ 234.75	$ 56,340.00	Est. 80 acres/farm @ 3 farms.yr.

338	Prescribed Burning	Ac.	400	$ 23.08	$ 9,232.00	Est. 40 acres/farm@10 farms/yr.
484	Mulching	sy	2001	$ 2.44	$ 4,882.44	In association w/342: Est. 667sy/treatment area@3 farms/yr.
655	Forest Trails and Landing (Water Bar)	ea	40	$ 50.18	$ 2,007.20	Est. 10 water bars/farm@ 4 farms/year
655	Forest Trails and Landing (Wing Ditch)	ea	40	$ 52.75	$ 2,110.00	Est. 10 wing ditch/farm@ 4 farms/year
666	Forest Stand Improv. Chem.	Ac.	240	$ 48.01	$ 11,522.40	Est. 80 acres/farm @ 3 farms.yr.
558	Roof Runoff Struc. (6" Gutters)	lf	400	$ 4.43	$ 1,772.00	Est. 80 lf/farm@ 5 farms/yr.
360	Closure of Waste Impoundment	cf	360,000	$ 0.14	$ 50,400.00	Est. 6 Closures @ 60,000 ft3/impoundment
359	Lagoon Pumpout	gal	3,200,000	$ 0.02	$ 64,000.00	Est. 8 pumpouts @400,000 gal/
430	3 or 4 inch Pipe	lf	8000	$ 4.80	$ 38,400.00	Est. 2000 ft./farm@4 farm/yr.
430	6 or 8 inch pipe	lf	2000	$ 6.15	$ 12,300.00	Est. 2000 ft./farm@1 farm/yr.
430	Big Gun System <300 GPM	ea	4	$ 4,666.74	$ 18,666.96	Est. 4 systems/yr.
430	Self Propelled Big Gun System	ea	1	$23,659.10	$ 23,659.10	Est. 1 system/yr.
430	Pump to Pipeline Conn.	ea	5	$ 1,794.75	$ 8,973.75	Est. 5/yr.
441	Micro Irrigation	lf	50000	$ 0.26	$ 13,000.00	Est. 10 acres/year@5000 ft
			Total Cost Share:		**$898,843.55**	

Table 4: USDA List of Proposed BMPs

4.4. BMP Load Reductions

LDAF-OSWC will be the lead agency for BMP implementation. LDEQ will monitor water quality to evaluate effectiveness of BMPs in improving water quality. Through implementation of these BMPs, it is anticipated that the 88 percent reduction of fecal coliform bacteria will be reduced and water quality can be restored in Big Creek.

4.5. Stakeholder Involvement

Stakeholders involve LDAF, NRCS and SWCD staff. Other stakeholders include local participants and farmers willing to take part in the project. The project involves implementing BMPs to control or reduce agriculture related NPS pollutants to Big Creek.

5.0. Technical and Financial Assistance

The technical and financial assistance to implement BMPs plays a major role in restoring water quality in Big Creek watershed. Technical assistance will be provided by LDAF, NRCS and SWCD staff. Federal cost-share assistance will be provided to farmers that implement BMPs on their individual farms. The landowner or operator will provide matching funds for federal funds that are provided for implementing BMPs.

5.1. Technical Assistance to Achieve BMP Implementation

Technical assistance will include, but not be limited to soil management, engineering designs for BMPs, biological, agronomic and other specialist assistance. All BMPs implemented will meet USDA and NRCS standards and specifications.

A representative in the NRCS Field Office will work with staff from LDAF and SWCD to provide technical assistance to participants in designing and implementing BMPs. Follow-up technical assistance to project participants will be provided for the duration of the project.

Coordination with USDA on Farm Bill Programs is another important component of restoring water quality in Big Creek and in other watersheds in Lake Pontchartrain Basin. LDAF-OSWC has initiated their work with USDA in the Tangipahoa-St. Helena SWCD to coordinate efforts to restore water quality in Big Creek. LDEQ is also participating in this coordination by partnering with LDAF and USDA on the type of water quality sampling that needs to be done at the 12-digit HUC level to evaluate the water quality response to BMP implementation.

5.2. Cost Share Assistance to achieve BMP Implementation

The project will focus on approximately 15 to 20 active dairies in Big Creek and East Fork Big Creek watersheds. Typically, these dairies are currently managing the waste component of their respective operations through waste treatment systems that were constructed in the early 1990's. The effluent waste application systems of these dairies are obsolete or marginal at best. USDA's NWQI Farm Bill Funds of $300,000 combined with $250,000 of LDAF's Section 319 incremental funds will be utilized as cost-share to upgrade these waste systems to utilize organic wastes and nutrients and implement other conservation practices to reduce water quality impairments in these watersheds. Through implementation of these BMPs, it is anticipated that an 88 percent load reduction of fecal coliform bacteria will be achieved and Big Creek can be restored to meet its designated uses.

Environmental Quality Incentives Program

EQIP was re-authorized in the 2002 Farm Bill and again in the Food, Conservation and Energy Act of 2008 to provide a voluntary conservation program for farmers and ranchers who promote agricultural production and environmental quality as compatible goals. This program offers financial and technical assistance to eligible participants to develop management practices on their agricultural land.

Conservation Reserve Program

The CRP provides technical and financial assistance on a voluntary basis to eligible farmers and ranchers in addressing soil, water and related natural resource concerns to protect highly erodible and environmentally sensitive lands. It encourages farmers to convert these lands to vegetative cover, such as native grasses, wildlife plantings, trees, filter strips or riparian buffers.

Wildlife Habitat Incentives Program

WHIP is a voluntary program for landowners interested in developing and improving wildlife habitats. Technical assistance and up to 75 percent cost-share assistance is provided to establish and improve habitats for fish and wildlife. A WHIP agreement between NRCS and the participant generally lasts from one year after the last conservation practice is implemented, but no more than ten (10) years from the date the agreement is signed.

The Conservation Stewardship Program

The CSP is a voluntary conservation program that encourages producers to address resource concerns in a comprehensive manner by: undertaking additional conservation activities and improving, maintaining and managing existing conservation activities. CSP is available on tribal and private agricultural lands in all 50 states and the Caribbean and Pacific Island Areas. The program provides equitable access to all producers, regardless of operation size, crops produced, or geographic location.

The Wetlands Reserve Program

The WRP is a voluntary program that provides technical and financial assistance to private landowners and tribes to restore, protect and enhance wetlands in exchange for retiring eligible land from agriculture. Over 1.9 million acres are currently enrolled in WRP. Wetlands provide habitat for fish and wildlife, including threatened and endangered species; improve water quality by filtering sediments and chemicals; reduce flooding; recharge groundwater; protect biological diversity; and provide opportunities for educational, scientific and limited recreational activities.

6.0. Education and Outreach

Education and outreach activities are critical elements for accomplishing goals and objectives of the watershed project. It is necessary for citizens and stakeholders to understand and support efforts to implement BMPs. Successful outcomes are more likely, when citizens understand what is occurring and why. When stakeholders volunteer to demonstrate conservation practices on their land, they should receive positive recognition and other incentives.

6.1. Education and Outreach to achieve BMP Implementation

According to LDAF, educational outreach programs will include the use of educational materials such as flyers and brochures. A BMP field day will be held within the project watershed to discuss the TMDL process and to demonstrate the potential for reducing stream loading from agricultural activities through implementation of BMPs. A special effort will be made to encourage landowners and operators to participate in environmental education, attend the field day and to become a Certified Master Farmer.

7.0. Implementation Strategies and Interim Milestones

The implementation schedule included in Table 5 was provided by LDAF and NRCS. They will coordinate BMP implementation in the watershed. LDEQ will monitor water quality in Big Creek Watershed from 2012 through 2015. A series of semi-annual or annual meetings will be held in the watershed to provide information to watershed stakeholders on progress made in BMP implementation and improving water quality. Information on BMP implementation from FFY 2012 Section 319 incremental funds will be included in Grants Reporting and Tracking System (GRTS) on a semi-annual basis. LDEQ will compile information from USDA and LDAF and include it in the NPS Annual Report in January of each year. Interim milestones include reductions in fecal coliform, nutrients and sediment concentrations in Big Creek. Success will be measured by in-stream water quality improvement, attainment of water quality standards and restoration of contact recreational uses. A NPS Success Story will be developed if Big Creek is partially or fully restored and delisted from the state's 303(d) list.

7.1. Implementation Schedule

A schedule for implementing the necessary BMPs has been provided by LDAF-OSWC. Table 5 provides an estimate of the timeline and tasks for the implementation schedule.

IMPLEMENTATION SCHEDULE	
October 2012 – December 2012	LDAF, local SWCDs and USDA-NRCS will develop ranking criteria for participation in the project. Soil types, priority HUCs, drainage patterns, farming practices and proximity to the stream along with other factors will be evaluated and utilized in establishing ranking criteria. Based on the ranking criteria, pasturelands will be selected and BMPs identified for use within targeted areas of the project. LDAF and the SWCD will partner with NRCS in selection of pastureland tracts and BMP alternatives that will be implemented on sites selected within the watersheds. LDAF will coordinate all BMP planning and implementation activities with implementation of EQIP and other NRCS programs to ensure that maximum environmental benefits will be obtained and at the least cost to the government and the landowner.
October 2012 – December 2012	A meeting will be held with potential program participants to discuss their willingness to participate in the project. LDAF, NRCS and SWCD staff will discuss with them the various BMPs they may implement to control or reduce the potential of agriculture related NPS pollutants to move offsite.
January 2013 – October 2013	LDAF, NRCS and SWCD staff will work directly with landowners or operators to prepare a Resource Management System (RMS) BMP plan that will meet the desired level of pollution abatement on each tract of cropland selected for project implementation. Each plan will be developed under a three-year agreement with the landowner or operator. A representative within the NRCS Field Office, LDAF and SWCD staff will provide technical assistance to participants in designing and implementing BMPs. Follow-up technical assistance will be provided to project participants for the duration of the project. The SWCD will maintain all appropriate project records.
January 2013 – September 2017	Cost share assistance will be provided to project participants upon verification of BMP implementation. Provide participant's cost-share assistance for completed BMPs. Verify that non cost-share BMPs have been implemented according to the BMP plan and to USDA-NRCS conservation practice standards and the implementation schedule. It is anticipated that of the 22 dairy farms in the project area, approximately 80percent of the farms will actively participate in the project. These farms will be strategically selected based on ranking criteria for water quality improvement. The SWCD will approve all cost-share payments to program participants.

March 2013 – September 2017	Conduct an educational program to increase the awareness of NPS pollution problems and issues associated with agricultural activities within the project watershed. One agricultural BMP field day will be held within the project watershed to discuss the TMDL process and to demonstrate the potential for reducing stream loading from agriculture activities through implementation of BMPs. A special effort will be made to encourage landowners, operators and educators from within the watershed, as well as from outside the project area, to participate in the field day. They will also be encouraged to become Certified Master Farmers. The SWCD will approve the education program and conduct the field day with LDAF.
July 2013 – June 2017	In addition to and in conjunction with educational efforts conducted under previous tasks mentioned above, a special effort will be made to encourage producers/landowners that have implemented BMPs under a 319 project to continue to maintain the BMPs and work with other producers in the project and surrounding areas to implement additional BMPs.
July 2013 – September 2017	Semi-annual Reports will be prepared documenting all project activities and results, including deliverables as required by individual tasks or upon their completion. Invoices will be prepared and will accompany the semi-annual reports. The SWCD will approve all semi-annual reports.
January 2013 – September 2017	Annual Reports will be prepared which include all project activities for the previous project year. These reports will include a current summary of all project activities, progress and findings since the project start date. Previously submitted deliverables will be referenced rather than included in annual reports. The SWCD will approve annual reports.

Table 5: Implementation Schedule

7.2 Interim Milestones

Interim measurable milestones for determining whether NPS management measures or other control actions are being implemented include the following: BMPs applied in Big Creek Watershed will be documented; LDEQ will monitor water quality during and after installation of BMPs; water quality data collected will be reviewed to determine if improvements in water quality resulted from BMP implementation; and the NPS Annual Report will include information on progress made in meeting milestones included in the state's NPS Management Plan.

Management Measure	Responsible Authority(ies)	Implementation Schedule	Interim Milestones	Indicators to Measure Progress
Water Monitoring	LDEQ/NPS staff	RWQA of 25 sites to begin in January-2013 through April or May 2013	Analysis of data collected during RWQA to determine where high NPS concentrations of bacteria, nutrients and sediment occur within the watershed	Noting and sharing of data to determine seven or eight samples location for long term monitoring (see next measure below)
Water Monitoring	LDEQ/NPS staff	On-going. LDEQ monitors ambient sites on a four-year cycle. LDEQ received funds to monitor additional sites bi-monthly (2x/month) through 2015.	Analysis of collected data on streams to assess progress	Noting and sharing changes in water quality on a semi-annual basis to determine if BMP implementation by USDA and LDAF is improving water quality or if additional steps need to be taken to restore water quality and meet water quality standards
Implementation of agricultural and forestry BMPs in Big Creek and East Fork Big Creek watersheds	USDA, LDEQ NPS staff	2007-2012	Monitor to see if load reductions in the stream has occurred	Compare ambient data pre and post BMP implementation timeframe
Implementation of agricultural BMPs for dairies and pastures in Big Creek and East Fork Big Creek watersheds	USDA's NWQI, LDEQ NPS staff	May 2012 through September 30, 2014	Monitor to see if load reductions in the stream has occurred	Analyze data to determine if water quality is improving and if water body is meeting water quality standards
Implementation of agricultural BMPs for dairies and pastures in Big Creek and East Fork Big Creek watersheds	LDAF, LDEQ NPS staff	October 2012 through October 2015	Monitor to see if load reductions in the stream has occurred	Analyze data to determine effectiveness of BMPS in reducing NPS runoff and pollutants from pastures and dairies in Big Creek and East Fork Big Creek watersheds

Table 6: Management Strategies and Implementation

7.3. Criteria for Achieving Milestones

Criteria utilized to determine whether NPS loads are being achieved and progress is being made toward meeting water quality standards will include data from water quality monitoring measured against the state's water quality standards. Table 1 includes water quality standards and designated uses for Big Creek.

Tasks	Current 2012	Within 1 Year 2013	Within 2 Years 2014	Within 3 Years 2015	Within 5 Years+ 2017
QAPP Developed					
RWQA					
Long-Term Monitoring					
GRTS Reporting					
LDAF BMP Implementation					
USDA NWQI BMP Implementation					
USDA and LDEQ Internal Meetings					
Water Body possibly delisted for fecal coliform					

Table 7: Timeline of Management Measures

7.4. Tracking Implementation Process

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

8.0. Monitoring

LDEQ's ambient water quality monitoring is one source of data to evaluate effectiveness of BMPs implemented in Big Creek watershed. LDEQ applied for FFY 2012 Section 319 funds to monitor water quality in two (2) 12-digit HUCs of Big Creek, for three (3) years, including: Big Creek and East Fork Big Creek.

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

The short-term success will be measured through the water quality monitoring component of the project that will be conducted at the 12-digit HUC level in HUCs selected for BMP implementation. The evaluation of ambient water quality data collected prior to BMP implementation and data collected post BMP implementation will determine effectiveness of watershed implementation. By conducting water quality sampling at the 12-digit HUC level, LDEQ will be able to evaluate the water quality response to BMP implementation for these 12-digit HUCs.

References

Nutrient Criteria Technical Guidance Manual Rivers and Streams, EPA 822-B-00-002, July 2000

1990 United States Department. of Agriculture Soil Conservation Service, Soil Survey of Tangipahoa, Louisiana

2006 DEVELOPING NUTRIENT CRITERIA FOR LOUISIANA Prepared by Water Quality Assessment Division LDEQ

2010 Environmental Regulatory Code Title 33, Part IX, Water Quality, LDEQ

2004 USEPA's Grant Guidelines for Section 319 of the CWA

2000 LDEQ NPS Management Plan

2009 LAKE PONTCHARTRAIN BASIN /ALL RIGHTS RESERVED/ SITE DESIGNED BY MAGNOLIA DEVELOPMENT GROUP

Appendix

Soil types in the watershed can determine potential priority areas for BMP implementation to protect water quality. Some soils tend to erode more than others depending on sand, silt and clay content. Sensitive areas are typically those areas with highly erosive soils that are also near waterways and tributaries. These erosive soils may contribute NPS sediment loads to receiving streams. The majority of the soils in Big Creek Watershed are considered highly erosive and consist of: Toula-Tangi, Tangi-Ruston-Smithdale and the Ouachita-Ochlockonee.

The Tangi and Toula soils are primarily in woodlands, pasture and cropland. These soils have a loamy surface layer and a loamy and clayey subsoil. The Tangi soils are located on terrace uplands and their slopes range from one (1) to eight (8) percent. The Tangi series consist of moderately well drained soils that have a fragipan. Permeability is moderate in the upper part of the subsoil and very slow in the fragipan. The Tangi soils are gently and moderately sloping and are on narrow and broad ridge tops and on side slopes along drainage ways.

The Toula soils are gently sloping and are on broad ridge tops as well. The slopes range from one (1) to three (3) percent. The Tangi-Ruston-Smithdale series are used mainly for woodland and pasture. They consist of moderately well drained and well drained soils that have a loamy surface layer and a loamy and clayey subsoil. The slopes range from one (1) to eight (8) percent on the ridge tops and from three (3) to 20 percent on the side slopes. The Ruston soils are very gently sloping and rolling. The Ruston and Smithdale soils are well drained and are on narrow ridge tops and side slopes. The Smithdale soils are rolling and moderately steep. These soils are poorly suited for crops. Low fertility and high erosion rates are its main limitations.

The Ouachita-Ochlockonee series are primarily in woodlands. Some of the soils in this series are well drained and some are poorly drained. The soils have a loamy surface as well as a loamy or loamy and sandy subsoil. The slopes range from 0 to three (3) percent. Both the Ouachita and Ochlockonee soils are gently undulating and well drained. They are on convex ridges. These soils are not suited for cultivated crops, urban uses, or intensive recreational uses. Low fertility, wetness and flooding are its main limitations.

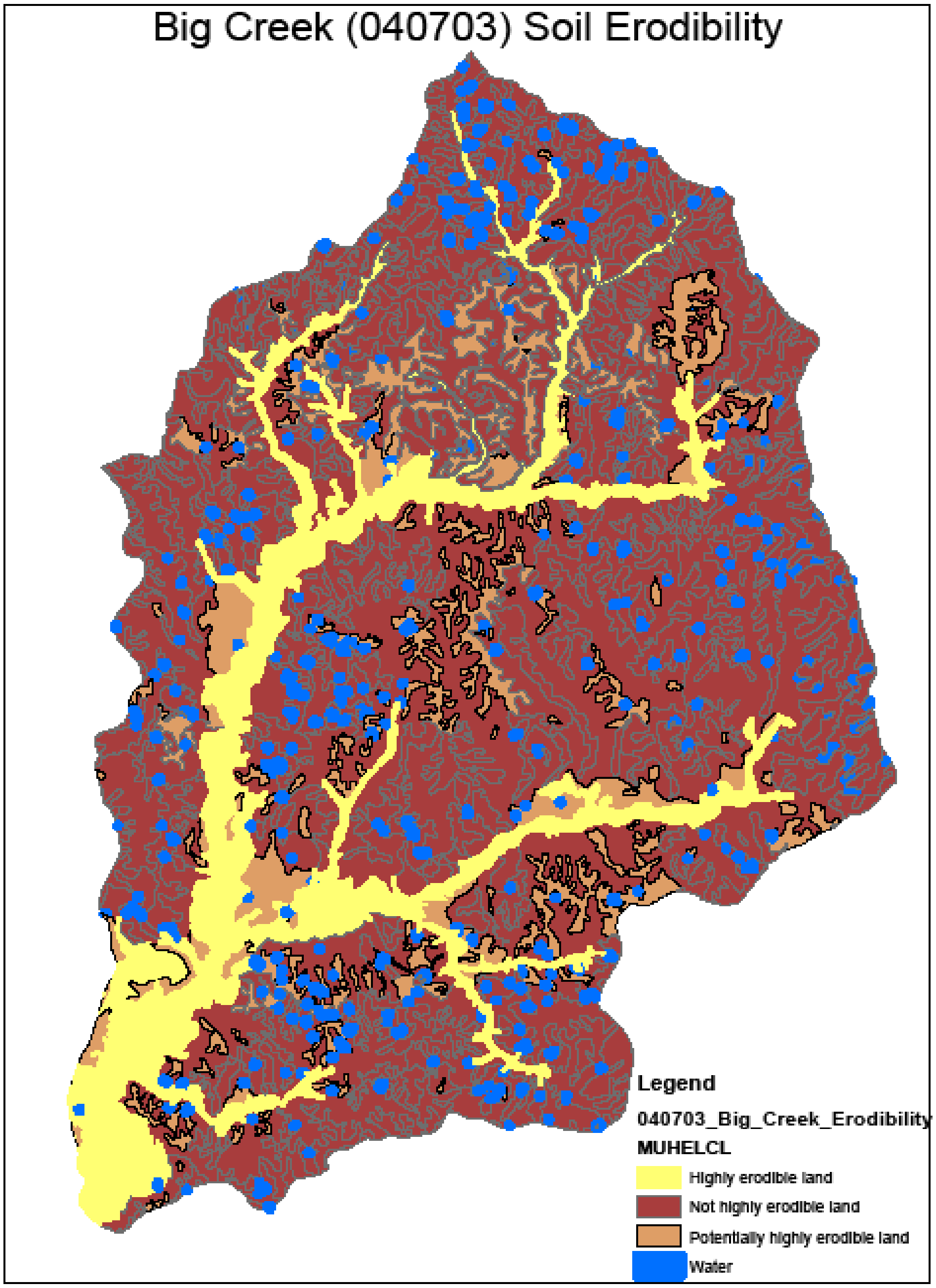


Figure 25: Soil Erodibility in Big Creek

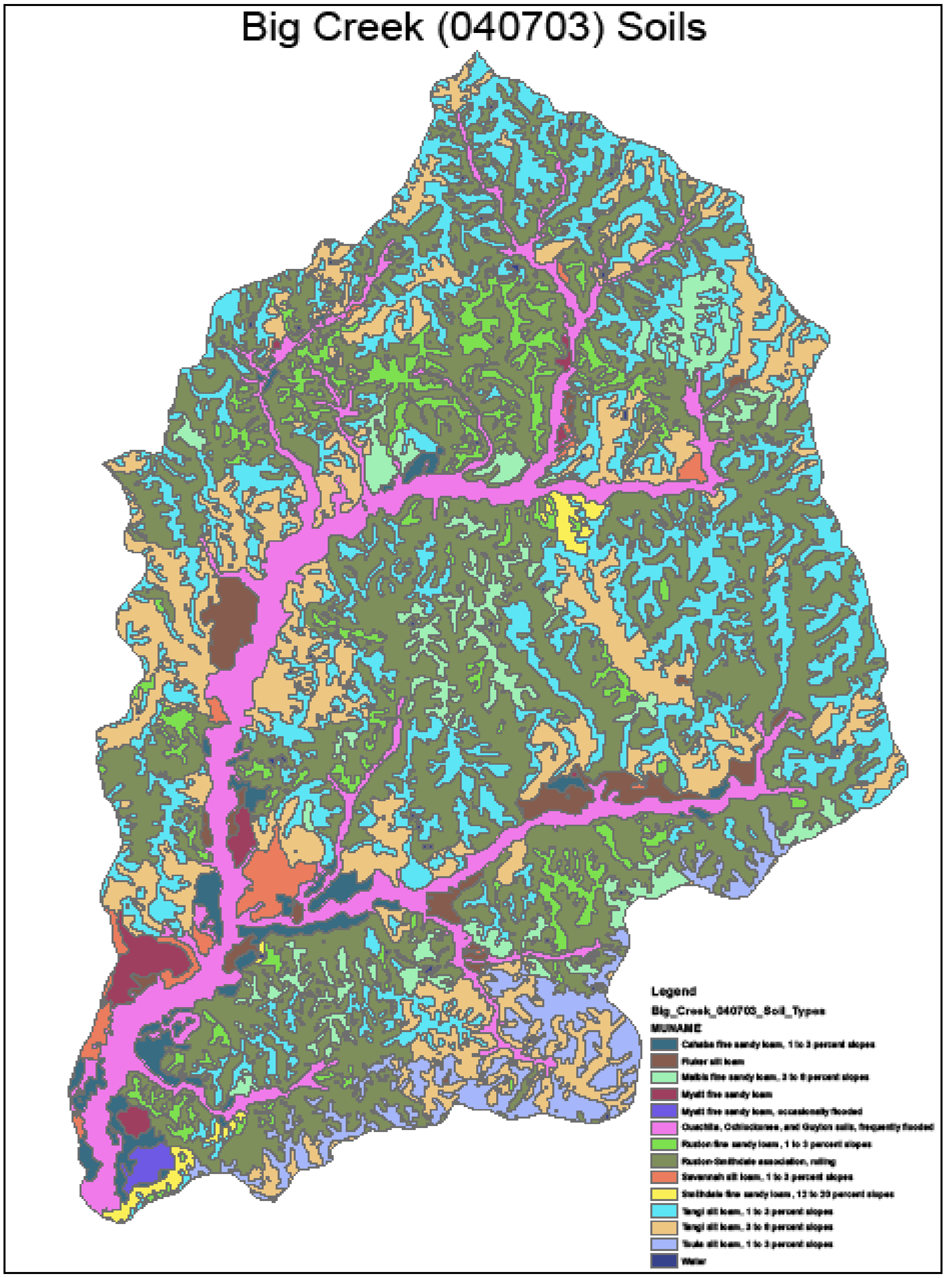
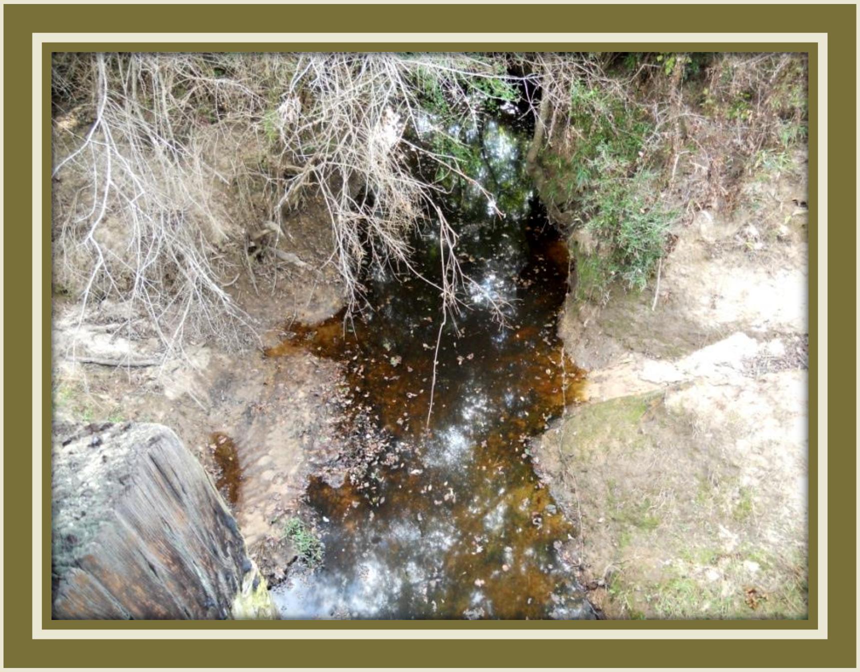


Figure 26: Soil Types in Big Creek

Sampling sites in Big Creek and East Fork Big Creek:



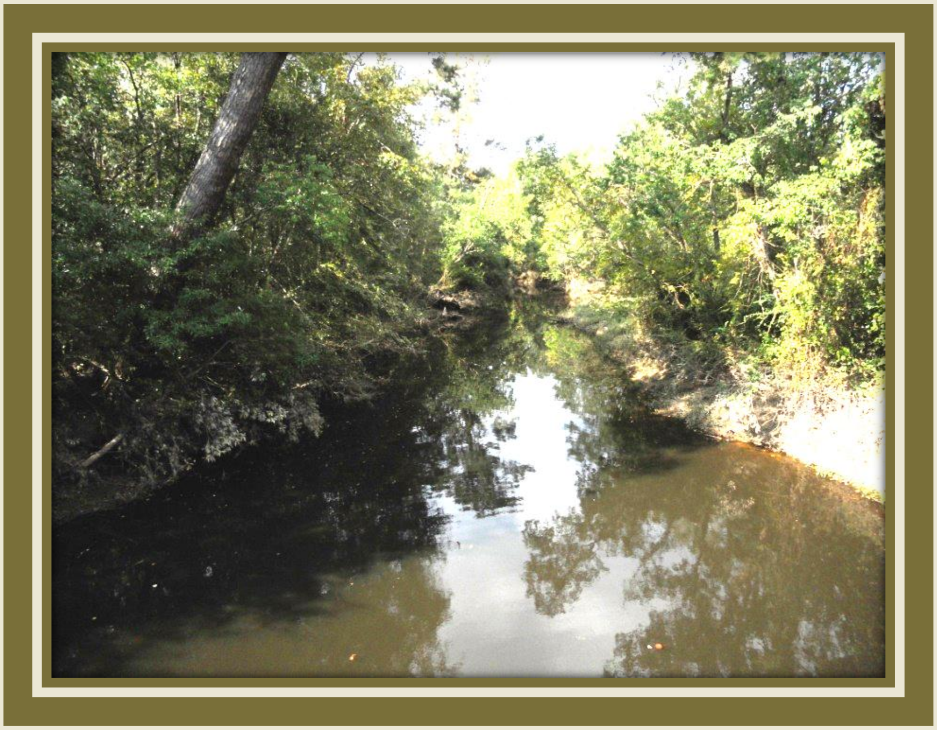
Site 1 Upstream

Site 1 Downstream

East Fork Site 2 Upstream

East Fork Site 2 Downstream

East Fork Site 3 Upstream



East Fork Site 3 Downstream

East Fork Site 4 Upstream

East Fork Site 4 Downstream

East Fork Site 5 Upstream

East Fork Site 5 Downstream

East Fork Site 6 Upstream

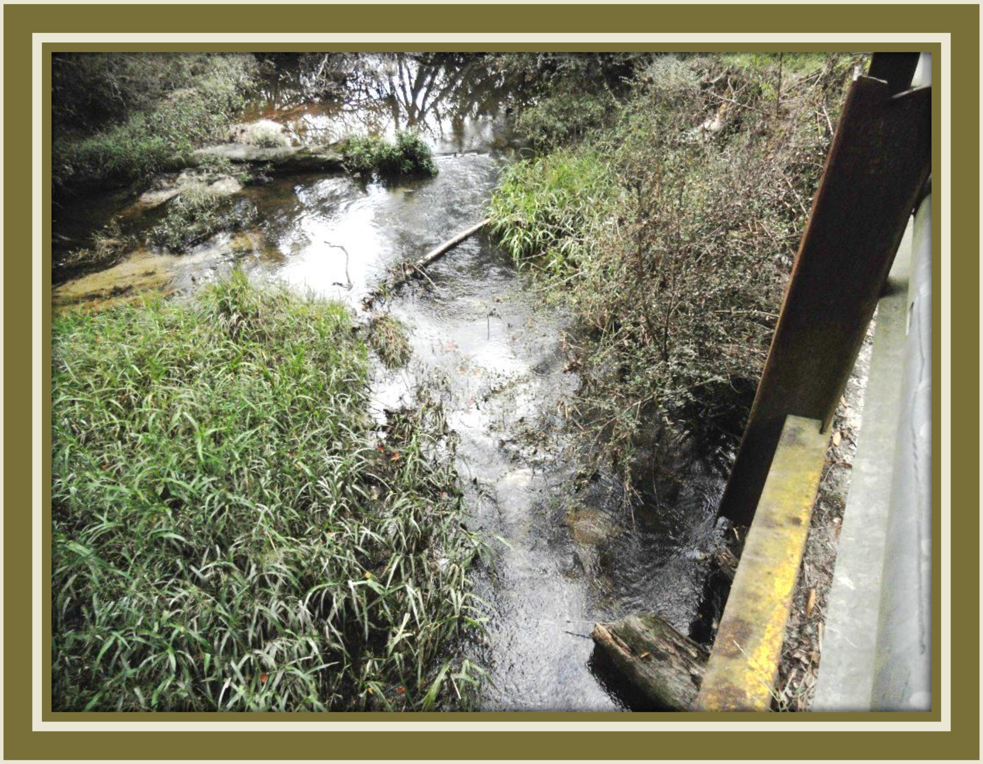
East Fork Site 6 Downstream

East Fork Site 7 Upstream

East Fork Site 7 Downstream

East Fork Site 8 Upstream

East Fork Site 8 Downstream



East Fork Site 9 Upstream

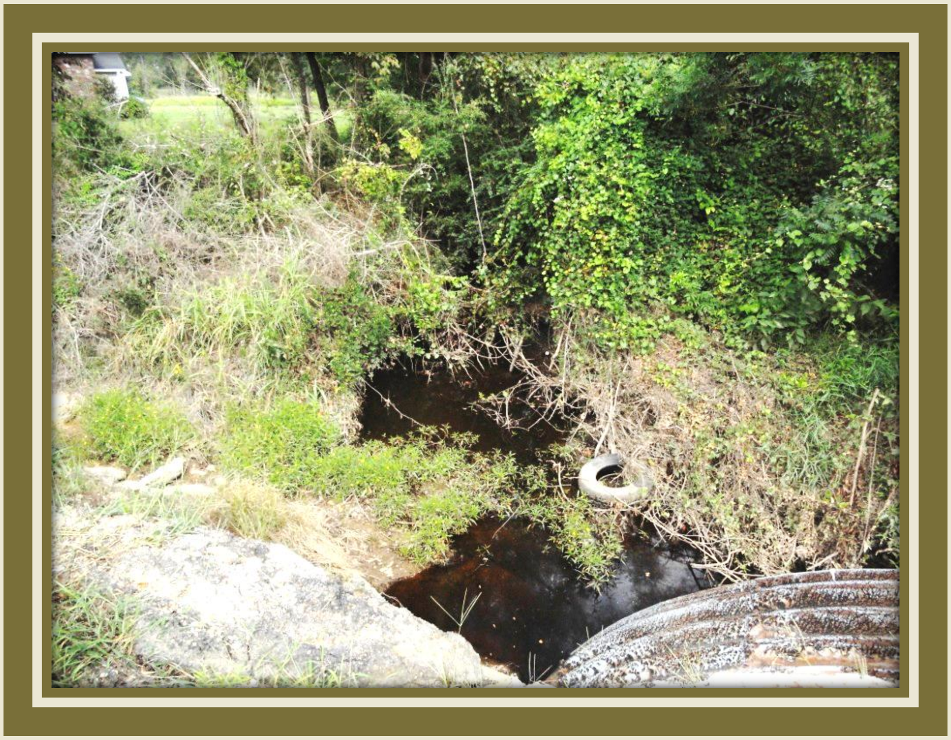
East Fork Site 9 Downstream

East Fork Site 10 Upstream

East Fork Site 10 Downstream

East Fork Site 11 Upstream

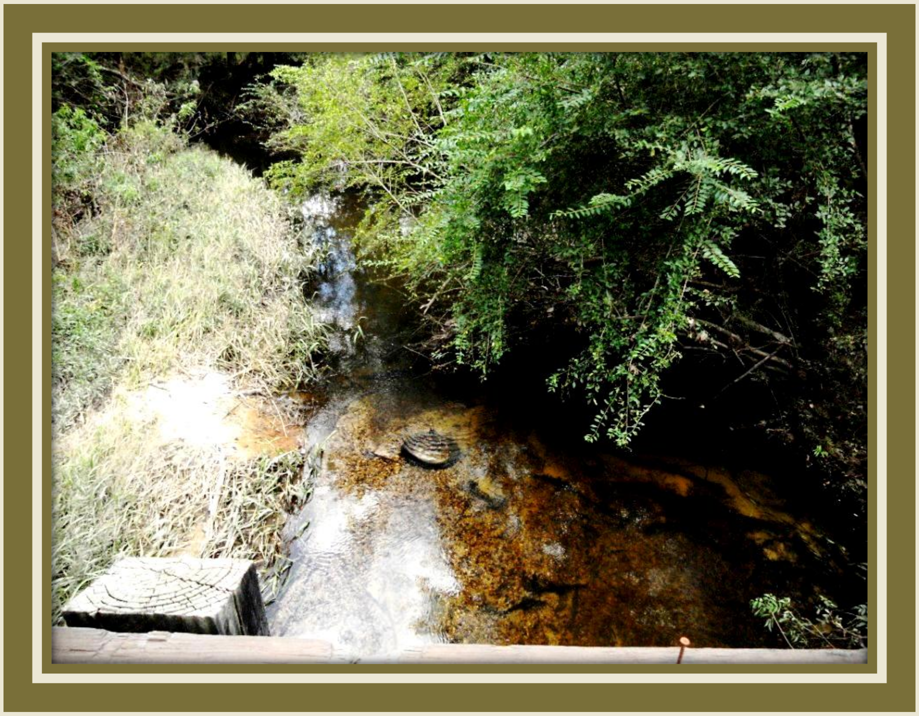
East Fork Site 11 Downstream



Big Creek Site 12 Upstream

Big Creek Site 12 Downstream

Big Creek Site 13 Upstream



Big Creek Site 13 Downstream

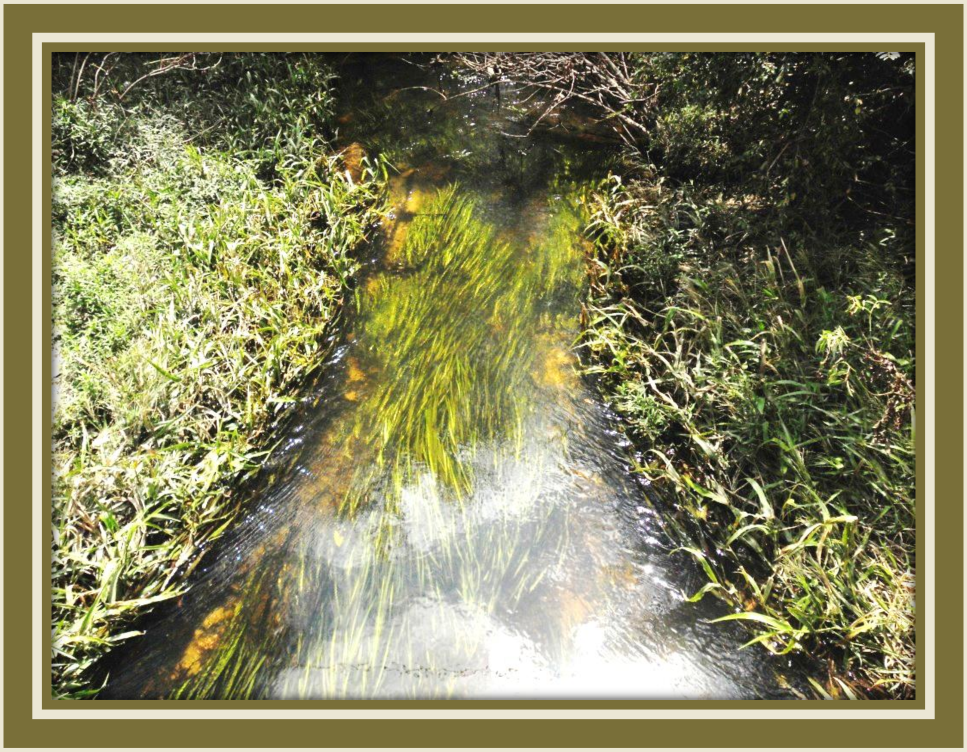
Big Creek Site 14 Upstream

Big Creek Site 14 Downstream

Big Creek Site 15 Upstream

Big Creek Site 15 Downstream

Big Creek Site 16 Upstream



Big Creek Site 16 Downstream

Big Creek Site 17 Upstream

Big Creek Site 17 Downstream

Big Creek Site 18 Upstream

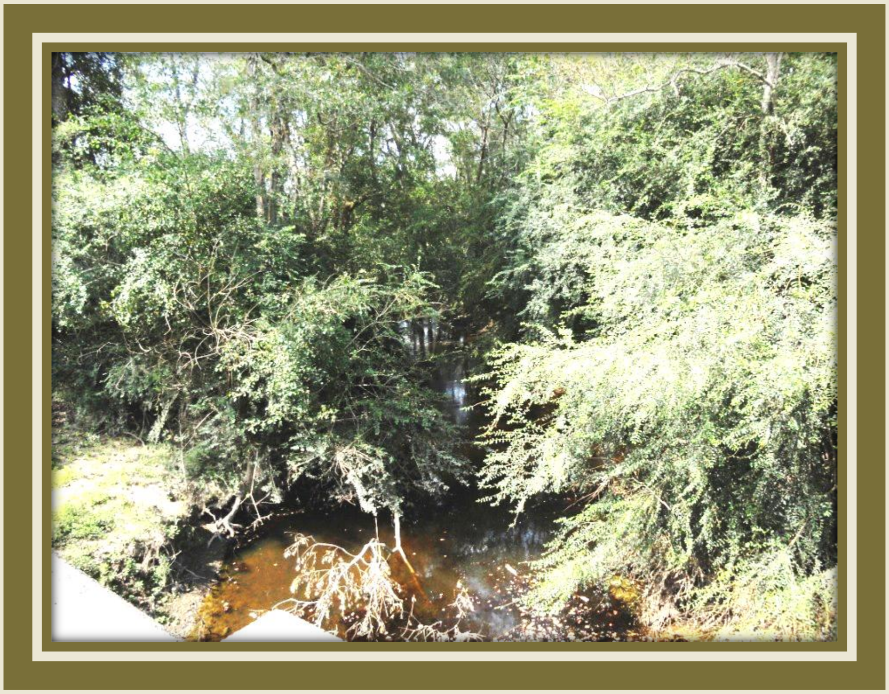
Big Creek Site 18 Downstream

Big Creek Site 19 Upstream

Big Creek Site 19 Downstream

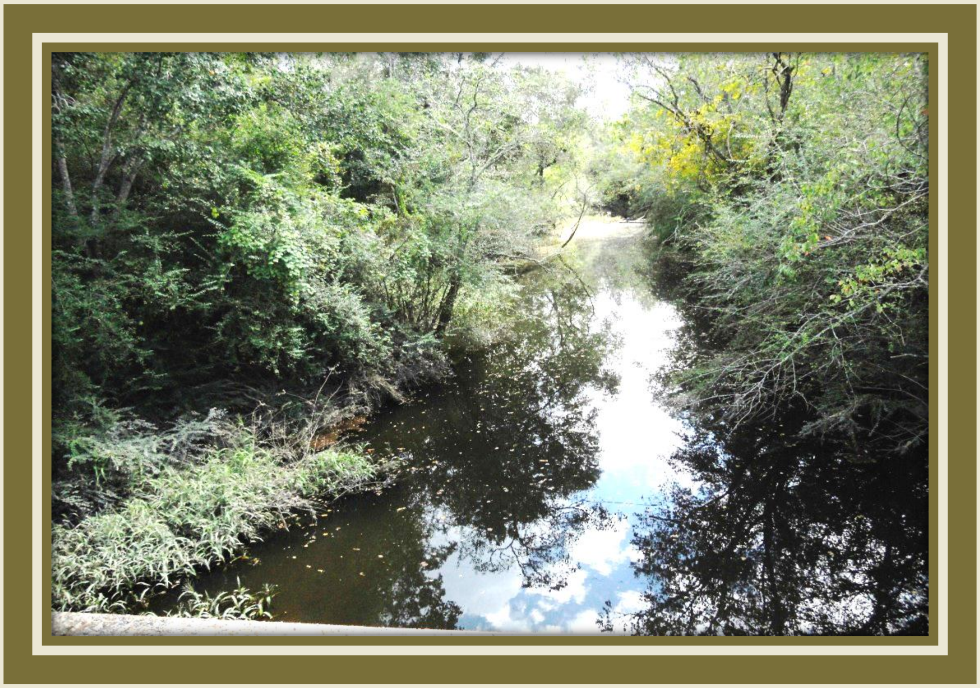
Big Creek Site 20 Upstream

Big Creek Site 20 Downstream



Big Creek Site 21 Upstream

Big Creek Site 21 Downstream



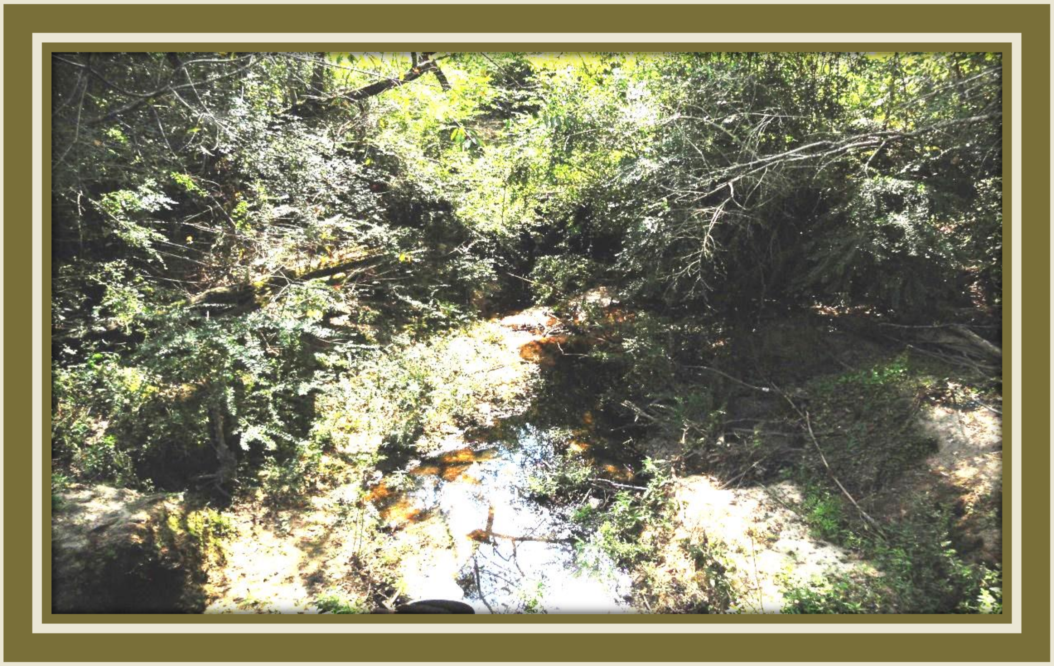
Big Creek Site 22 Upstream

Big Creek Site 22 Downstream

Big Creek Site 23 Upstream

Big Creek Site 23 Downstream

Big Creek Site 24 Upstream



Big Creek Site 24 Downstream

Big Creek Site 25 Upstream

Big Creek Site 25 Downstream

Photos of Monitoring Locations (from September 12, 2012 Reconnaissance Survey)