2017 Hemphill Creek Watershed Implementation Plan

Subsegment 081609

November 8, 2017

Louisiana Department of Environmental Quality – Nonpoint Source Pollution Group

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PREFACE

Watershed Implementation plans (WIPs) represent an effective and efficient approach to addressing water quality impairments in the states' waterbodies. By applying the nine-elements of the Environment Protection Agency's (EPA) NPS Program Guidelines, for watershed-based plan development, states can more effectively target resources into areas of the watershed that contribute the most significant pollutant loadings and runoff affecting water quality standards. This WIP will address water quality impairments in the Hemphill Creek watershed, specifically fecal coliform bacteria, in part by implementing Best Management Practices (BMP) designed to reduce bacteria loading in streams as well as inspecting On-site Sewage Disposal Systems (OSDS) for proper operation which should reduce bacteria from those sources as well. This will be accomplished through cooperation with our partners, such as Louisiana Department of Agriculture and Forestry (LDAF), as well as stakeholders in and around the watershed.

The Louisiana Department of Environmental Quality (LDEQ) has laid the groundwork for this plan by reviewing its biennial water quality Integrated Reports (IR) to identify those waters where use support is impaired by nonpoint sources of pollution; analyzing water quality data collected by LDEQ through its Ambient Water Quality Monitoring Network (AWQN), as well as baseline data collected throughout the watershed for one year prior to implementation; and modelling various types of spatial data such as land use, slope and soils. These analyses have identified sources of bacteria in the watershed, and facilitate targeting areas for implementation of BMPs.

LDAF will help coordinate the implementation of this plan in the field through meeting with local partners, stakeholders and landowners to discuss the importance of BMP implementation to water quality in the area. LDAF will identify those landowners in the areas targeted by this plan and encourage them to volunteer to participate in implementing BMPs, such as restricting cattle access to the water body through fencing and providing cattle alternate sources of water, in such a way that the targeted pollutants will be reduced, and in turn, land owners become better stewards of the land.

The ultimate factor in determining the success of the restoration efforts come in the form of restoring use support to waters of the State as reported in the IR which is based on results of AWQN data.

This WIP provides additional information to stakeholders to aid in forming strategies to reduce Nonpoint Source (NPS) pollution, specifically fecal coliform bacteria, in Hemphill Creek. This plan expands on each of the nine-elements and provides a comprehensive document to share with stakeholders, landowners, and the general public. This plan describes our process for restoring water quality in the Hemphill Creek watershed.

1.0 INTRODUCTION

Louisiana's 2012 Nonpoint Source (NPS) Management Plan included a water quality goal to prioritize restoration in 40 NPS impaired water bodies. Hemphill Creek (Subsegment 081609) was chosen as one of the priority watersheds to be restored for its fecal coliform impairment. Hemphill Creek is located in north-central Louisiana in LaSalle Parish. It is a part of the much larger Ouachita River Basin. The basin encompasses 18 parishes and an area of 7,393 square miles (DOTD 2009). In Louisiana alone, the drainage area is 10,000 square miles (LDEQ 1993). It is characterized by its principal economic activities which are Forestry related industries such as paper mills and secondary wood product production.

Historically, the Ouachita Basin's major problems have been caused by manmade changes such as diversion of water to and from the streams, dredging of channels, and construction of levees (Speer). Each year, the IR describes trends in TKN, Nitrate + Nitrite, and Phosphorus concentrations by river basin. The 2016 IR shows that the nutrient concentrations in the Ouachita River Basin are fairly low. This result is consistent in predominantly forested areas such as Hemphill Creek watershed.

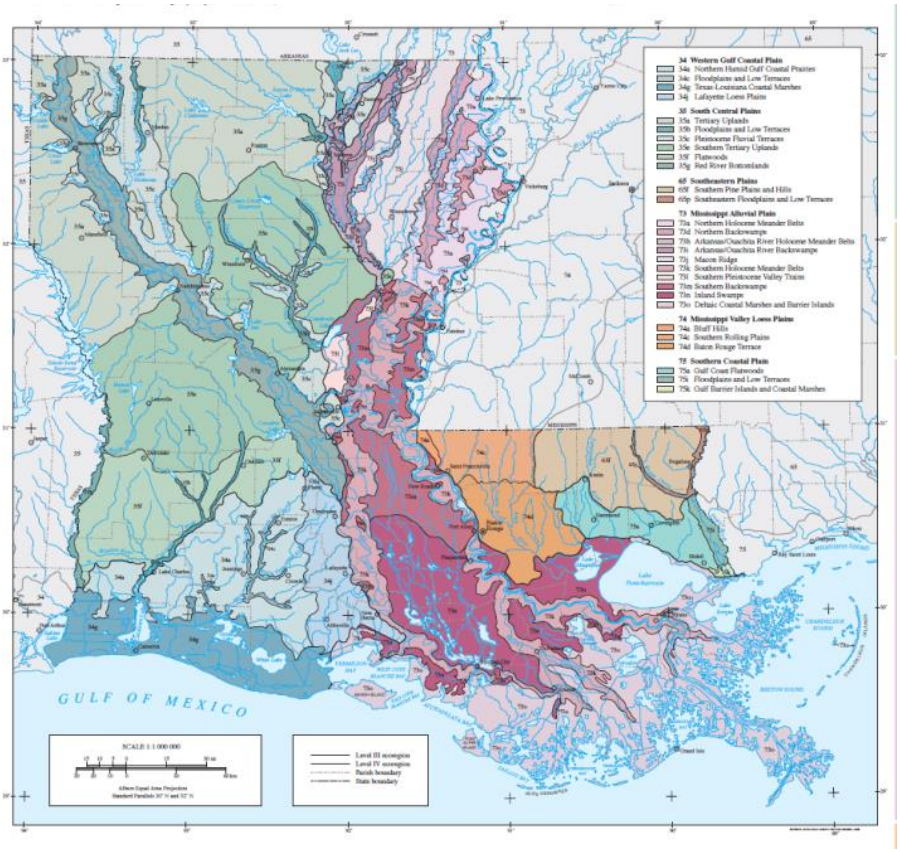

Figure 1 Louisiana Ecoregion Map

Hemphill Creek is located in the Southern Tertiary Uplands of the South Central Plains Ecoregion. The South Central Plain Ecoregion consists of rolling plains and acidic soils consisting of sandy loams, silt loams, sands, and sandy clay loams. Specifically, Southern Tertiary Uplands are hilly and soils are better drained and more permeable with silt loam to loamy sand textures (Daigle et.al).

The Hemphill Creek Watershed is 27,704 acres. The waterbody begins north of the city of Jena and flows for 11 miles to its end in Catahoula Lake. Hair Creek is a major tributary to the water body which joins Hemphill creek in the City of Jena at the headwaters. The water body flows south as Ezell Branch and Mill Creek join the main stem of Hemphill creek. Further south, Little Jordan Branch joins Mason Branch before it flows into Catahoula Lake in Catahoula National Wildlife Refuge.

The map in Figure 2 on page 4 describes the land use of the subsegment. It is comprised of approximately 80% forested, grassy and undeveloped areas. There is slightly less than 13% developed areas, which include the small city of Jena and the surrounding area. The map shows the relationship between the monitoring locations and the two main sources of bacteria which are pastured and developed areas. This map combined with the water quality data help indicate sources of bacteria loading. The city has not experienced significant growth within the last seven years. Census data shows that the population of Jena was 3,403 people in 2010. By 2016, the population had only increased by 32 people.

In 2006, Hemphill Creek was listed on the Integrated Report (IR) as impaired for Primary Contact Recreation (PCR) caused by fecal coliform with suspected sources of Livestock (Grazing or Feeding Operations) and Sewage Discharges in Unsewered Areas. A waterbody being impaired for PCR means that prolonged full-body contact in which ingestion of considerable amounts of water is possible is a risk to human health. As of the 2016 Integrated Report, Hemphill Creek is still impaired for Fecal Coliform and Mercury in Fish Tissue. The suspected source of the mercury causing the impairment is atmospheric deposition. Since the source of mercury impacting the use support in Hemphill Creek originates from outside of the watershed, the impairment due to mercury will not be addressed in this document. The focus of this document is to develop a plan to address the fecal coliform impairment.

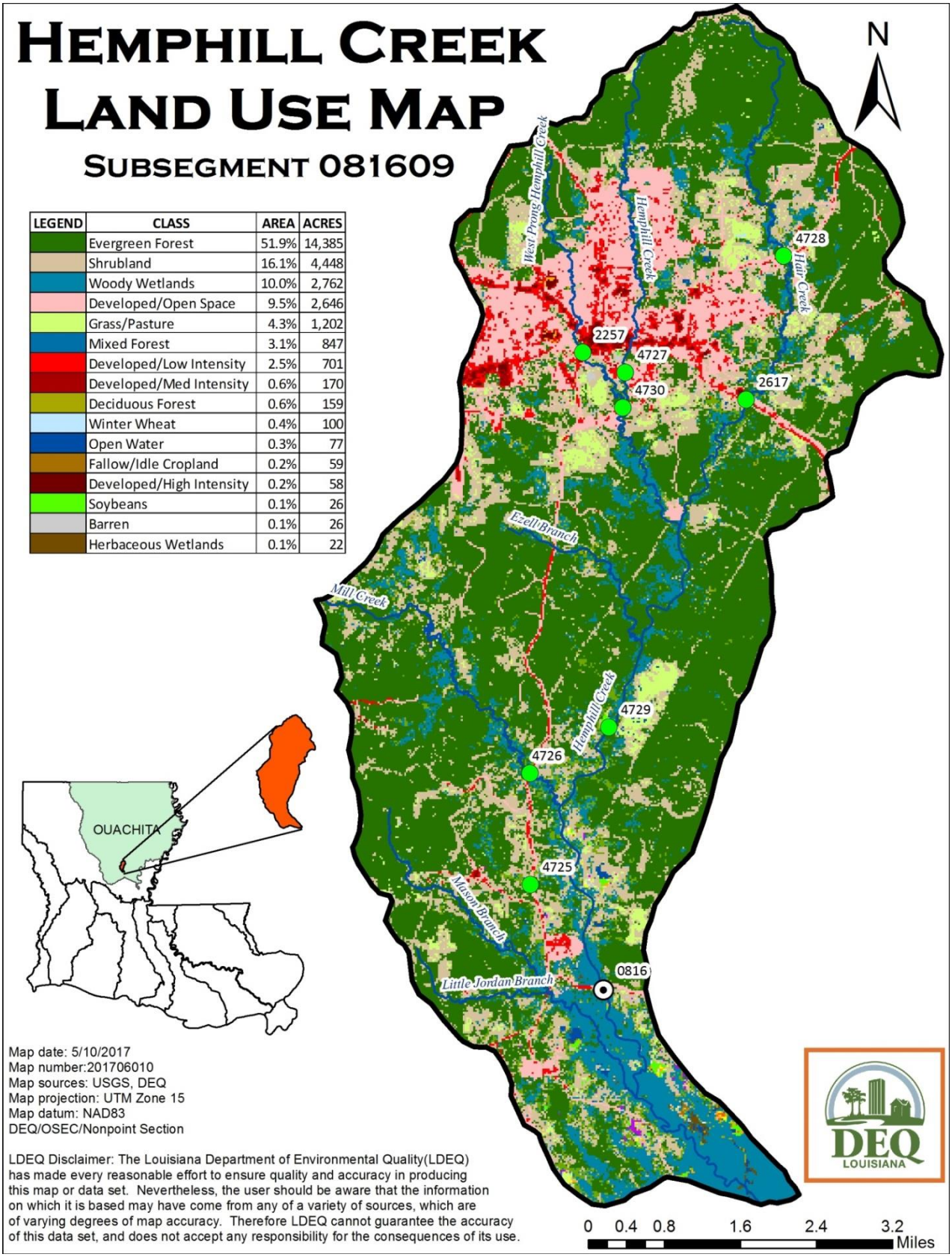

Figure 2 Hemphill Creek Land Use Map

2.0 USEPA'S NINE KEY ELEMENTS

In 2014, USEPA published NPS Program and Grants Guidelines for States and Territories, which included nine key elements of acceptable WIPs. USEPA requires states to implement incremental funds in watersheds where WIPs have been developed.

USEPA's Nine Key Elements

Element A: Identification of causes of impairment and pollutant sources or groups of similar sources that need to be controlled to achieve needed load reductions, and any other goals identified in the watershed plans.

Element B: An estimate of the load reductions expected from management measures.

Element C: A description of the NPS management measures that will need to be implemented to achieve load reductions in Element (b); and a description of the critical areas in which those measures will be needed to implement this plan.

Element D: An estimate of technical and financial assistance, and/or associated costs and authorities necessary to implement the WIP;

Element E: An information/education component used to enhance public understanding of the project and encourage early and continued participation in selecting, designing and implementing the NPS management measures that will be implemented.

Element F: Schedule for implementing the NPS management measures identified in this plan that is reasonably expeditious.

Element G: A description of interim measurable milestones for determining whether NPS management measures or other control actions are being implemented;

Element H: A set of criteria that can be used to determine whether loading reductions are being achieved over time and substantial progress is being made toward attaining water quality standards.

Element I: A monitoring component to evaluate effectiveness of the implementation efforts over time, measured against the criteria established under Element H.

A. CAUSES AND SOURCES TO BE CONTROLLED TO ACHIEVE NPS LOAD REDUCTION

Hemphill Creek was listed on the 2008 IR as impaired for PCR caused by fecal coliform with suspected sources of Livestock (Grazing or Feeding Operations) and Sewage Discharges in Unsewered Areas. In 2010, ambient water quality data showed the waterbody was supporting PCR and SCR uses, but by 2014, the data showed that concentrations of fecal coliform bacteria were again impairing PCR use. Hemphill Creek fully meets the criteria for SCR, but is still impaired for PCR from fecal coliform according to the 2016 IR. In order to meet the criteria to restore PCR use support, no more than 25% of the samples collected at the ambient site shall exceed 400 colonies/100 mL from May 1 through October 31 and no more than 25% of the samples shall exceed 2000 colonies/100 mL from November 1 through April 30 to fully support SCR uses.

The LDEQ surveys group collected baseline data from June 2016 through November 2016. Elevated fecal levels have been detected at the monitoring sites in the northern and southern portions of the watershed. LDAF identified probable sources of the problem as cattle farms in the upper reaches of the watershed on Hair Creek as well as malfunctioning septic systems outside of the city of Jena. Research was done on the point source discharges from that area by reviewing the discharge monitoring reports (DMRs) for Permit LA0033260 held by the Town of Jena Wastewater Treatment plant. The wastewater permit discharge limitations are 200 colonies/100mL for the weekly average and 400 colonies/100mL for the maximum monthly average. There were no exceedances in the DMRs while baseline monitoring was being conducted. Elevated fecal levels have also been detected in the southern portion of the watershed near the ambient site. Therefore, pastures in the southern portion of the watershed will also be targeted for implementation. Implementation is scheduled to begin in October 2017.

The Ambient Water Quality Network Data Analysis

Hemphill Creek has one monitoring station in LDEQ's AWQN (Site 0816) which is used to assess overall use support. The site is located at the bottom edge of the watershed on Hwy 460. The ambient monitoring cycles analyzed for this project were run in 2007/2008, 2011/2012, and 2015/2016 as shown in Figure 3 on page 8. The waterbody was not listed as impaired on 2010 or 2012 IRs. The increased fecal levels shown in the 2012 ambient sampling data caused it to become listed as impaired on the 2014 IR. For this watershed plan, we are most concerned with overall reduction of fecal coliform levels.

Nutrients

Nitrogen and Phosphorus are essential nutrients for growth of plants and animals but too much of either of these nutrients can cause reductions in the DO levels in the watershed. The state has no nutrient criteria, so the goal is to ensure that the balance between these nutrients and DO is maintained to protect aquatic life in the stream. The 2016 IR states that the suspected sources of impairment in Hemphill Creek are Livestock (Grazing or Feeding Operations) and Sewage Discharges in Unsewered Areas. Nitrogen contained in animal waste and malfunctioning septic

systems has been shown to cause elevations in Nitrate and Nitrite concentrations in the waterbody.

An acceptable range of Total Nitrogen, as defined by EPA, is between 2 mg/L and 6 mg/L (EPA-TN). TKN is a measure of the total concentration of ammonia and ammonium. TKN plus Nitrate-Nitrite gives Total Nitrogen values. Nitrate-Nitrite and TKN, are monitored in our AWQN data. To achieve a comparison between LDEQ's ambient data (TKN and Nitrate Nitrite) and EPA's criteria (Total Nitrogen), TKN and Nitrate-Nitrite were combined to serve as a measurement of Total Nitrogen. At this time, Total Nitrogen values are not in danger of exceeding the low or high range of this criterion.

Dissolved Oxygen

Hemphill Creek has maintained an average DO of 8.83 mg/L since 1999. It fluctuates with the seasons, showing decreased levels in the summer months and increased levels in the winter months as expected. The waterbody meets its 5mg/L standard year-round and has not been listed for DO in the past 10 years.

Fecal Coliform

The following graph illustrates the fecal levels in Hemphill Creek from 2008 to 2016. Examination of the data shows that the fecal levels peak in the late summer months. This is especially evident July through September 2012. PCR exceedances are shown in July of 2008, 2012, and 2016 as well as September 2012 and 2016.

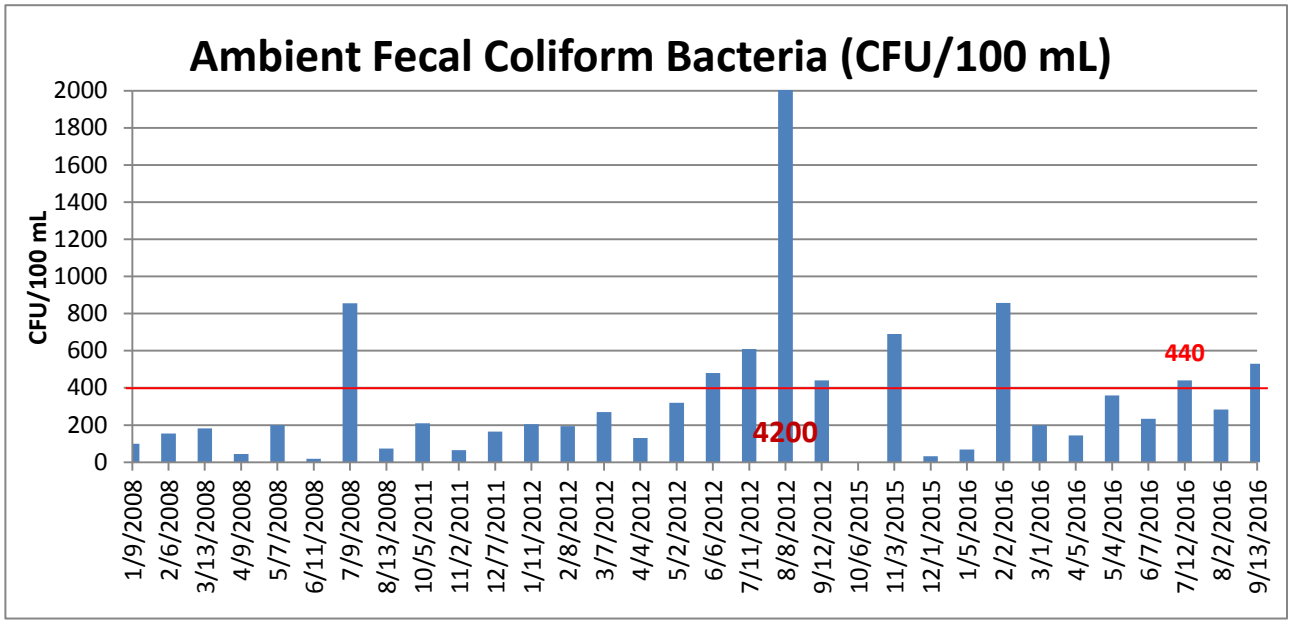

Figure 3 Ambient Fecal Coliform Data from 2008 to 2016. The red line marks the PCR standard of 400 CFU/100mL

Nine samples exceeded the criteria for PCR and only 1 sample exceeded the criteria for SCR in the last three IR cycles as shown above in Figure 3 which indicates PCR use impairment and SCR as being fully supported. The 4200 cfu value shown on August 8, 2012 is the most extreme value seen during the ambient sampling rotations from 2008-2016, however the water quality standard for SCR is still met because less than 25% of the samples exceeded the numeric criterion for fecal coliform. After reviewing historical weather data for Alexandria, Louisiana from August 7, 2012 it was noted that there was .64 inch of rain that day. Other prominent peaks are shown July 2008 and February 2016. There are no significant rain events associated with either of these peaks.

Weather data from October 31st to November 2nd show 6.29 inches of rain, which could have influenced elevated fecal concentrations on the November 3rd sampling event. Further analysis shows that there is a steadily-increasing trend from April 2012 to August 2012. Looking closely, a similar trend can be seen from April 2016 to August of 2016 but the peak value is decreased by a factor of 10. It is also noteworthy that every sampling event in July has exceeded the PCR requirement. Through research of historical data in similar land use areas and conversations with LDAF, it is understood that as the temperatures increase, the likelihood of cattle trying to get into the waterways increases as well.

Baseline Monitoring Site Selection

LDEQ has chosen nine monitoring sites to collect baseline and long-term, post-implementation data. These sites were spread throughout the watershed to help us get an overall picture of exceedances, where they are happening, if they are focused in a specific area, and their possible sources. These sites may be modified based on results of data analysis.

Table 1 Rationale for choosing baseline sample sites

Site #	Rationale for Choosing Baseline Sites
0816	Ambient Water Quality Network Site
2257	Chosen to capture load coming from Known Unsewered Areas Near Jena (NW)
2617	Site Before Hair Creek Joins the main stem of Hemphill Creek (NE)
4725	Last site before ambient site on unnamed tributary (S)
4726	Mill Creek before merge to Hemphill Main Stem (S)
4727	Above Wastewater Treatment Plant (NE)
4728	Site near known cattle farms (NE)
4729	Chosen to See if there is correlation between northern sites and southern sites (S)
4730	Catches possible unsewered area and area above WWTP before Hair Creek merges to Hemphill Creek(NE)

Data were collected by the LDEQ Surveys group from June 2016 through November 2016. Once baseline data sampling was completed, LDEQ decided to continue sampling all nine of the original sites for long term monitoring.

Soil and Water Assessment Tool (SWAT) Analysis

SWAT is the Soil and Water Assessment Tool developed to predict impacts of land management practices on watersheds with varying land use and management conditions over long periods of time. In this project, SWAT was used to generate subbasins in the watershed and give a better view of where our problem areas might be. The monitoring data is illustrated in Table 2 on page 11. It is organized by sample date and site number. The cells highlighted in pink show PCR exceedances while the cells highlighted in orange show SCR exceedances. The column labeled "Exceed %" is calculated by dividing the total number of exceedances by the total number of samples.

The SWAT model divided the watershed into 9 subbasins upstream from each sample site as shown in Figures 4 and 5 on pages 13 and 14. The colors are used to highlight the sites with the most exceedances. As you can see in the PCR Priority Area map in Figure 4 on page 13, the majority of the exceedances are seen in the northern area of the watershed at site 2257 and south of Jena at site 4730. Sites 4725 and 0816 located in the southern portion of the watershed have significant numbers of exceedances.

Baseline Monitoring Data Analysis

Sites 0816, 2257, 4728 and 4730 have exceedance rates greater than 35%. Site 4730 has an 82% exceedance rate. Figure 5 on page 14, SCR Priority Areas, tells a similar story. The majority of the exceedances are at sites 2257 and 4730 around the city of Jena. The Town of Jena Water Permit allows for a weekly maximum of 400 colonies/100mL in the effluent year-round. After reviewing the Discharge Monitoring Reports (DMRs) and the 2016 annual report, it was found that there were no exceedances or enforcement actions in regards to fecal coliform in 2016.

The 2016 IR lists one of the suspected sources as Sewage Discharges in Unsewered areas. This is probably the cause of the exceedances at sites 2257 and 4730, near Jena. Residents in this area do have individual home septic systems which may be malfunctioning or just need to be upgraded. Education and outreach programs will be initiated in the area to explain the importance of having healthy and functioning on-site home sewage disposal systems (OSDS). The other suspected source is Livestock (Grazing or Feeding Operations). The area around site 4728 is forested with no population. It is also an area where cattle have access to the waterway.

On November 29, 2016, four of the nine sample locations were above the 2,000 cfu/100 mL SCR limit. Historical weather data show that there was a rain event on November 28, 2016 with 1.31 inches of rain which may have contributed to those elevated results. There is also particularly high flow as compared to all other sampling events. The flow was 193.8 cfs, which was the highest flow recorded through the 2016 monitoring. There are peculiar exceedances around site 4725 and 0816 in the southern area of the watershed. The source of these exceedances has not been determined, but will be further investigated and considered greatly in BMP implementation strategies.

Baseline monitoring has indicated high levels of fecal coliform at the ambient site that do not seem to be well correlated with upstream sources. In analyzing the land use near the ambient site for fecal coliform sources, it was noted that approximately 200 acres of pasture land appear adjacent to the main stem of Hemphill Creek extending upstream to the next monitoring station (Site No. 4729), a distance of about 3.5 miles. While the land use in the watershed near the ambient station is dominated by silviculture, the data provided by LDH on OSDSs indicate that there are several systems in the vicinity of the ambient station. However, after analyzing the drainage of the area, any potential discharges from these systems appear to be entering Hemphill Creek downstream from the ambient station. Therefore, having only observed pasture as a potential source of fecal coliform between Site No. 4729 and the ambient station, it will be recommending that LDAF canvass the area and identify any of this pasture land as potential sources of fecal coliform bacteria, and thus potential targets for pasture management BMPs.

It is very important to ensure that the BMPs are strategically placed throughout the watershed targeting farms in the northeastern area of the subsegment. Through data analysis it has been determined that one of the main sources of exceedances from the northwestern portion of the watershed is malfunctioning septic systems. The goal is to initiate an education and outreach program for landowners in and around the city of Jena to explain the importance of keeping septic systems properly functioning and the effects it has on the water quality around them.

Table 2 Monitoring Data from June 2016 through November 2016 measuring Fecal Coliform at the nine sample sites in the Hemphill Creek Watershed. Pink highlighted cells show PCR exceedances and orange highlighted cells show SCR exceedances.

		6/14/2016	6/29/2016	7/14/2016	7/26/2016	8/9/2016	9/13/2016	9/27/2016	10/11/2016	10/25/2016	11/9/2016	11/29/2016
PCR (cfu/100mL)		400	400	400	400	400	400	400	400	400		
SCR (cfu/100mL)		2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Flow (cfs) 0816			18.5115	15.2048		18.57	18.4994	13.9055	14.4494	14.7569	13.8968	19.7631
Percent Exceedance	**Site ID**	**Results**										
45%	**816**	0	280	**410**	13	**842**	**530**	**470**	207	155	220	**2800**
36%	2257	358	100	**648**		120	13	**2800**	**3600**	94	574	**3300**
18%	2617	48	280	243		**3600**		260	165	140	820	**2400**
36%	4725		270	**470**	10	140	240	360	**584**	**445**	220	**2100**
18%	4726	155	100	220	48		290	**661**	**460**	45	410	360
9%	4727	173	210	267	13	110	65	313	210	**450**	275	287
64%	4728	65	**2400**	**600**		360	**416**	**510**	**639**	**540**	**4700**	458
9%	4729	35	145	**784**		32	300	310	240	223	245	697
82%	4730	**2600**	**480**	**661**	100	**687**	**748**	**2500**	**2800**	**5500**	**3000**	284

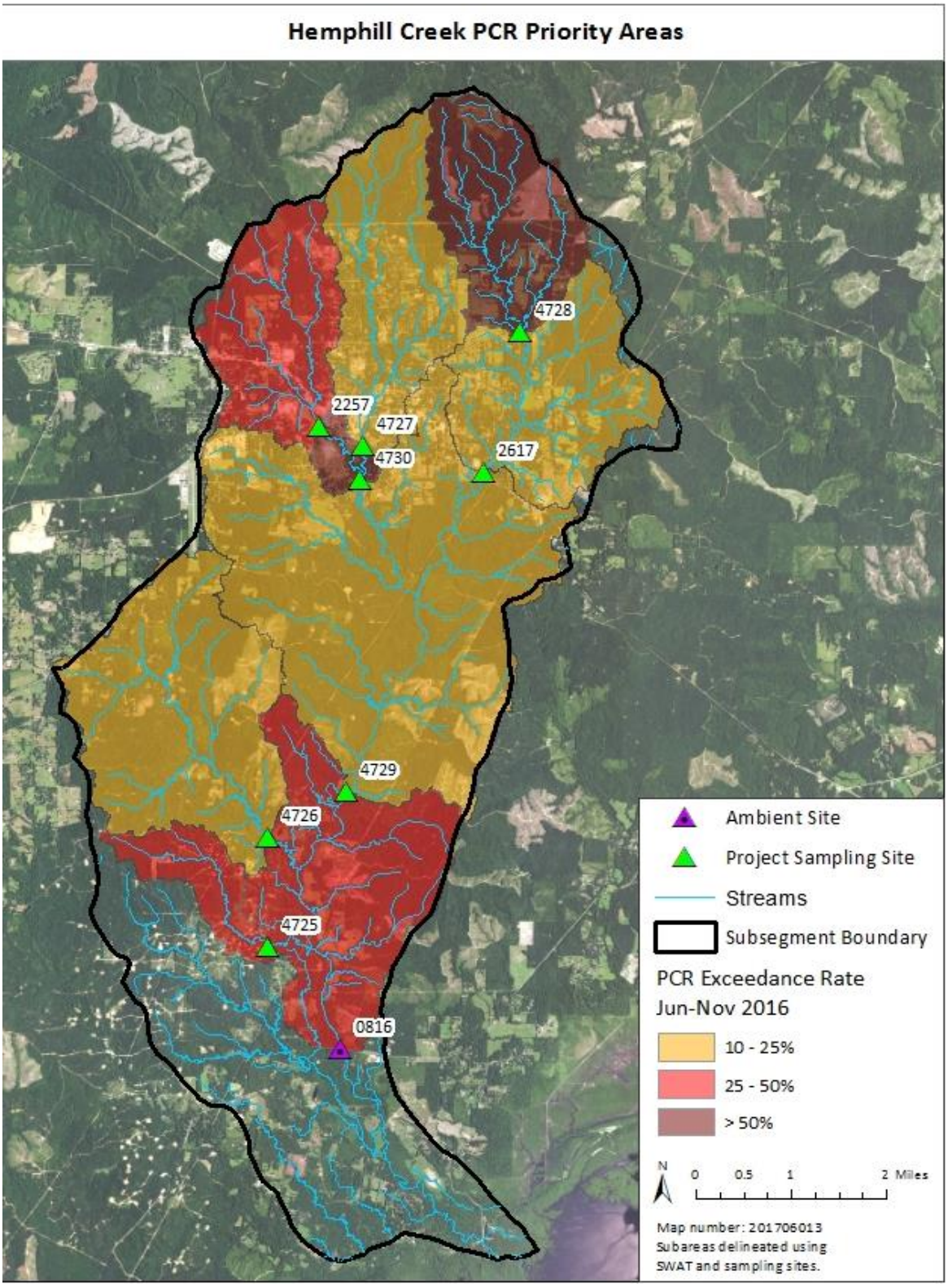

Figure 4 SWAT Map showing PCR exceedances in the Hemphill Creek Watershed

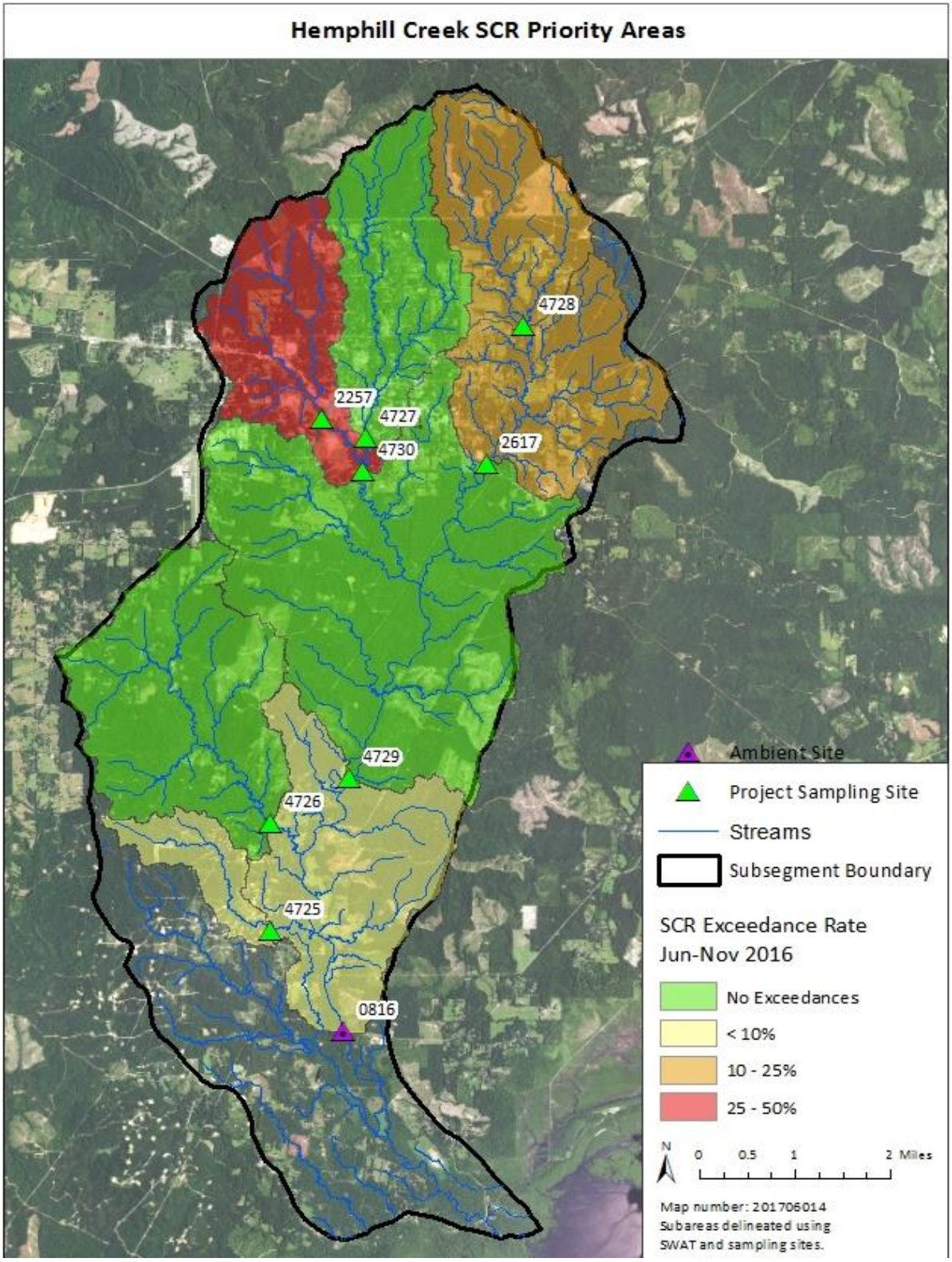

Figure 5 SWAT Map showing SCR exceedances in the Hemphill Creek Watershed.

B. ESTIMATED LOAD REDUCTIONS ACHIEVED WITH NPS BMPs

There is no Total Maximum Daily Load for this subsegment to aid in establishing the reductions needed to achieve State standards.

In 2015, load reduction estimations were developed using flow and load duration curves for Hemphill Creek to estimate the total reduction in fecal coliform loading required to meet the established PCR criteria. The LDEQ assessment method specifies that for PCR no more than 25 percent of the total samples collected on a monthly or near-monthly basis may exceed a fecal coliform density of 400 cfu/100 mL. The total number of observed concentrations from 1999 to 2012 available for this analysis of Hemphill Creek was 22. A 35% reduction in fecal coliform loads at the ambient monitoring site is required to restore the PCR use to the Hemphill Creek Watershed.

According the 2012 AWQN data, the subsegment needs a 42 percent exceedance rate reduction to be considered restored for its PCR designated use. A preliminary analysis of the monitoring data shows the following load reductions required to meet the PCR and SCR criteria at those stations:

Table 3 PCR and SCR Load Reductions required to meet water quality standards in Hemphill Creek

Monitoring Site:	**0816**	2257	2617	4725	4726	4727	4728	4729	4730
PCR Load Reduction required:	**55%**	88%	0%	20%	15%	0%	40%	0%	86%
SCR Load Reduction required:	**35%**	40%	35%	0%	0%	0%	20%	0%	35%

When all baseline data becomes available, the results will be used to determine final load reduction targets for the ambient monitoring station.

According to the LDAF FFY15 work plan, it is expected that there will be less than an 80 percent reduction in fecal coliform bacterial concentrations with the implementation of BMPs. Through previous research and project review, we know that BMPs have been successful in reducing loads in watersheds and improving the overall health of the waterbody. When BMPs are implemented strategically based on site visits, data analysis, and knowledge of local stakeholders and landowners, results are significantly more effective. By using the SWAT modeling techniques discussed above as well as load reduction calculations/estimations, we are confident that significant load reductions are possible.

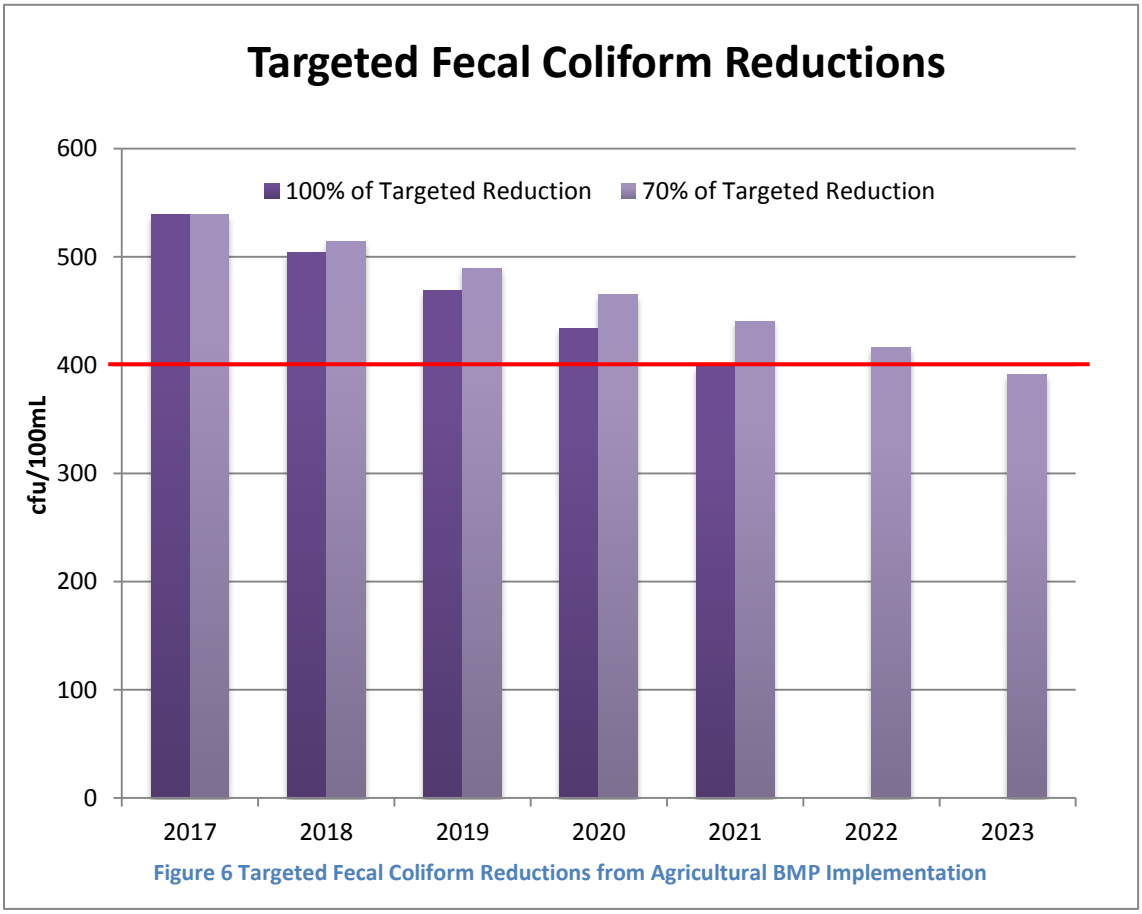

Figure 6 Targeted Fecal Coliform Reductions from Agricultural BMP Implementation

In addition to agricultural BMP implementation, LDEQ also plans to conduct a home sewage inspection program in LaSalle parish to educate homeowners on the importance of keeping their systems up as well as offering free inspections to let them know if their systems are functioning properly.

To calculate possible load reductions in the area, LDEQ researched results from similar projects and used demographics of Hemphill Creek for more accurate calculations. There are 106 OSDS sites in the Hemphill Creek Subsegment. Based on other sewage inspection programs with similar demographics, we assume all fecal coliform bacteria from that area reaches the ambient site, we assume a conservative 20% failure rate and that all 20% of the malfunctioning systems are repaired. The EPA bacterial indicator tool estimates 10,000 CFU/100mL reduction. Using that information, there is a potential load reduction of 1.5 billion CFU/Day. This is in addition to the reductions included in the table above.

$$\frac{10{,}000\ \text{CFU}}{100\ \text{mL}} * \frac{3{,}785.4\ \text{ml}}{\text{Gallon}} * \frac{70\ \text{Gallon}}{\text{person}} * \frac{2.7\ \text{person}}{\text{system}} * 21.2\ \text{systems} = \frac{1.5*10^{11}\ \text{Gallons}}{\text{day}}$$

Targeted Reductions

The targeted load reduction is set by the largest load reduction needed to achieve the water quality PCR criterion of 400cfu/100mL from May through October in the watershed, or 88% at Site 2257. Given that, at best, it can be anticipated no greater than 80% load reduction efficiencies for the recommended agricultural BMPs, with additional effort through education and outreach, specifically OSDS inspections; the target of 88% is reasonable to achieve at Site 2257 which is heavily influenced by OSDS in the area upstream from that site.

According to LDAF, there will be less than an 80% reduction through BMP implementation. The reduction strategies are based on BMPs as well as education and outreach for which success cannot be measured. The targeted reduction chart was created based on 70% reduction. 70% was chosen rather than 80% to account for less than 100% performance of the BMPs.

The predictions indicate that this reduction could be completed by 2021 as shown in Figure 6. Because LDAF has stated that there will be less than 80% reduction, the amount of reduction was decreased by an additional 10% to account for any delays or manmade errors. This changed the yearly average reduction amount from 35 cfu/100mL per year to 24.5 cfu/100 mL per year which in turn increases the amount of time it will take to achieve the goal. Again, this is calculated based on reaching 400 cfu/100 mL or PCR year-round. This is not required for complete restoration or impairment but this will be a huge step in improving the overall health of the waterbody.

C. BMPs FOR IMPLEMENTATION IN HEMPHILL CREEK

There are 15 proposed BMPs for implementation in the Hemphill Creek Watershed as shown in Table 4 on page 17. They were chosen because of their applications to overall watershed improvement. This comprehensive list includes management practices that directly and indirectly reduce fecal coliform loading in the watershed. For example, while fencing directly reduces loading by restricting cattle access to the stream, other practices such as pest management and pollinator habitat enhancement maintain the health of the vegetative cover thereby reducing runoff.

Table 4 Proposed BMPs in the Hemphill Creek Watershed.

NRCS Code	BMP	Cost/ Unit
146	Pollinator Habitat Enhancement	$390.91/Acre
327	Conservation Cover: Native Grass	157.78/Acre
329	Residue and Tillage Management	17.89/Acre
342	Critical Area Planting	1051.12/AC
382	Fencing	2.55/FT
512	Forage and Biomass Planting	191.00/Acre
516	Pipeline (Livestock)	2.67/ft
528	Prescribed Grazing	56.63/Acre
561	Heavy Use Area Protection	1.55/Sq ft
578	Stream Crossing	6.74/Sq ft
590	Nutrient Management	36.55/Acre
595	Pest Management	17.58/Acre
614	Water Facility	3.30/Gallon
642	Water Well	26.52/Ft
717	Livestock Shade Structure	3.14/Sqft
748	Record Keeping	1.00/Acre

The majority of these BMPs will be focused in the upper area of the watershed around cattle farms and in the southern portion of the watershed just above the ambient site. Applications are currently being collected and LDAF will work with landowners to choose the most effective BMPs for that particular problem in order to achieve maximum reduction in that area. At this time specific acreage is not available as LDAF is still taking applications in the area.

Fencing, Prescribed Grazing, water facility, and Livestock Shade Structures are specifically used to gain control of the livestock in the area. They should make a tremendous difference in bacteria contaminated runoff and overall water quality very quickly especially in the northeast portion of the watershed around site 4728. Improvements in the water quality will be used to help determine if BMPs have made a difference in the area. Improvements from BMPs will not be seen initially as they do take time to show improvements in data. USDA/Natural Resources Conservation Service (NRCS) descriptions of the proposed BMPs are given below.

Pollinator Habitat Enhancement Plan (146)

A site-specific conservation plan developed for a client that addresses the improvement, restoration, enhancement, or expansion of flower-rich habitat that supports native and/or managed pollinators. This plan will meet NRCS criteria for soil erosion control, water quality, soil quality, plant condition, fish and wildlife, rangeland/pasture/grazed woodland

health and productivity, and other identified resource concerns as well as meeting the client's objectives while complying with federal, state, and local requirements.

Conservation Cover: Native Grass (327)

Establishing and maintaining permanent vegetative cover to reduce soil erosion and sedimentation, improve water quality, improve air quality, enhance wildlife habitat, improve soil quality, or to manage plant pests.

Residue and Tillage Management (329)

This is used to manage the amount, orientation and distribution of crop and other plant residue on the soil surface throughout the year. It includes all soil disturbing activities like tillage, nutrient applications and harvesting of residue. This practice is used on all cropland fields especially where excess wind, sheet and rill erosion are a problem to reduce water/wind erosion, maintain or increase, soil organic matter, increase moisture for plant use, reduce fuel usage, and provide food and escape cover for wildlife.

Critical Area Planting (342)

This establishes permanent vegetation on sites that have, or are expected to have high erosion rates, and on sites that have physical, chemical or biological conditions that prevent the establishment of vegetation with normal practices. This practice is used to stabilize stream and channel banks with high rates of soil erosion.

Fencing (382)

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

Forage and Biomass Planting (512)

This establishes adapted and compatible species, varieties, or cultivars of herbaceous species suitable for pasture, hay, or biomass production to improve or maintain livestock nutrition and health, provide/ increase forage supply during periods of low production, reduce soil erosion, improve soil and water quality and to produce feedstock for biofuel or energy production.

Pipeline- Livestock (516)

A pipeline and appurtenances are installed to convey water for livestock or wildlife. This practice may be applied as part of a resource management system to achieve water to points of use for livestock or wildlife, reduce energy use, and develop renewable energy systems.

Prescribed Grazing (528)

This practice manages the harvest of vegetation with grazing and/or browsing animals. It is used to improve or maintain desired species composition and vigor of plant communities, improve or maintain quality and quantity of forage for grazing and browsing animals' health and productivity, improve or maintain surface and/or subsurface water quality and quantity, improve or maintain riparian watershed function, reduce accelerated soil erosion and maintain or improve soil condition, improve or maintain the quantity and quality of food and/or cover available for wildlife, and manage fine fuel loads to achieve desired conditions.

Heavy Use Area Protection (561)

The stabilization of areas frequently and intensively used by people, animals or vehicles can be done by establishing vegetative cover, surfacing with suitable materials, and/or installing needed structures. This practice is used to provide a stable, non-eroding surface for areas frequently used by animals, people or vehicles and to protect and improve water quality.

Stream Crossing (578)

This practice entails a stabilized area or structure constructed across a stream to provide a travel way for people, livestock, equipment, or vehicles. This practice provides access to another land unit, improves water quality by reducing sediment, nutrient, organic, and inorganic loading of the stream, and reducing streambank and streambed erosion.

Nutrient Management (590)

This practice manages the amount (rate), source, placement (method of application), and timing of plant nutrients and soil amendments. This practice aids in minimizing agricultural nonpoint source pollution of surface and groundwater resources, properly utilizing manure, municipal and industrial biosolids, and other organic byproducts as plant nutrient sources. It protects air quality by reducing odors, nitrogen emissions (ammonia, oxides of nitrogen), and the formation of atmospheric particulates and maintaining or improving the physical, chemical and biological condition of soil.

Pest Management (595)

This is a site-specific combination of pest prevention, pest avoidance, pest monitoring, and pest suppression strategies. This practice is used to prevent or mitigate off-site pesticide risks to water quality from leaching, solution runoff and adsorbed runoff losses, prevent or mitigate off-site pesticide risks to soil, water, air, plants, animals and humans from drift and volatilization losses, prevent or mitigate on-site pesticide risks to pollinators and other beneficial species through direct contact, prevent or mitigate cultural, mechanical and biological pest suppression risks to soil, water, air, plants, animals and humans.

Water Facility (613)

Water facilities are permanent or portable devices which provide an adequate amount and quality of water. It is used to provide access to drinking water for livestock and/or wildlife in order to meet daily water requirements and to improve animal distribution.

Water Well (642)

A hole drilled, dug, driven, bored, jetted or otherwise constructed to an aquifer for water supply is a water well. This practice provides water for livestock, wildlife, irrigation, and other agricultural uses and facilitates proper use of vegetation, such as keeping animals on rangeland and pastures and away from streams, and providing water for wildlife.

Livestock Shade Structure (717)

It is a permanent or portable framed structure to provide shade for livestock that are adversely affected by heat from the sun or are excluded from natural shade.

Record Keeping (748)

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

Using the information gathered from our monitoring and data analysis, a list of proposed BMPs near each problem site have been compiled and shown in Table 5 below. Through previous research, these particular BMPs have been shown to be effective in reducing fecal levels. The table below gives suggested BMPs at each of the sites identified as hotspots through LDEQ monitoring data.

Table 5 Proposed BMPs near each site

Site #	Possible Cause of Fecal	Proposed BMPs Near Each Site
0816	Cattle Farm	Stream Crossing, Livestock Shade Structure, Water Well, Water Facility, Prescribed Grazing, Pipeline Livestock, Fencing, Forage and Biomass Planting
2257	Known Unsewered Areas Near Jena (NW)	Education Outreach, Home Sewer System Inspections
4728	Site near known cattle farms (NE)	Stream Crossing, Livestock Shade Structure, Water Well, Water Facility, Prescribed Grazing, Pipeline Livestock, Fencing, Forage and Biomass Planting
4730	Unswered Areas Near Jena	Education and Outreach, Home Sewer System Inspections

With guidance from LDAF, landowners will choose BMPs that they would like to implement on their land. LDAF is still taking applications for sign-ups in the area. The table below lists the BMPs there are applications for at this time along with the acreage and the cost per unit. The total amount listed is calculated based on the current applications in the area.

Table 6 List of current targeted BMP implementation, costs per unit and projected total costs

Practice Code	Practice Name	Extent	Unit Cost	Total Amount
512	Forage and Biomass Planting	551 acres	98.33	$54,179.00
590	Nutrient Management	744.04acres	1.81	$1,346.71
561	Heavy Use Area Protection	13,143 sq ft	1.45	$19,057.00
614	Watering Facility	1800 gal	3.4	$6,120.00
516	Pipeline (Livestock)	2800 ft	2.2	$6,160.00
382	Fence	5200 ft	2.49	$12,948.00

D. AN ESTIMATE OF TECHNICAL AND FINANCIAL ASSISTANCE AND/OR ASSOCIATED COSTS AND AUTHORITIES NECESSARY TO IMPLEMENT THE WIP

Partnerships are vital to effective watershed planning and management. There are several different groups with responsibilities in this project and they are as follows:

Louisiana Department of Environmental Quality: LDEQ staff will work closely with LDAF/ Office of Soil and Water Conservation (OSWC) to identify high priority HUCs in the project area, project resource management problems, assess the project plan and implementation schedules, and coordinate state 319 program components with LDAF program efforts. LDAF along with LDEQ will conduct water quality monitoring and data analysis. This project will be completely funded by 319 funds.

Louisiana Department of Agriculture & Forestry-Office of Soil and Water Conservation: LDAF/OSWC will be the lead agency in BMP implementation throughout the watershed. They 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 will track the rate and extent of BMP implementation within each project watershed and identify where BMPs have been implemented. The LaSalle, Northeast, Jefferson Davis, and St. Landry Soil and Water Conservation Districts (SWCDs) will contact and work with project participants at the local level. Louisiana SWCDs operate under the administrative authority of the LDAF/OSWC.

Natural Resources Conservation Service: The NRCS staff will assist LDAF and LDEQ in collecting field information, including identifying cropland in the selected watershed or sub-watersheds. NRCS will assist LDAF and the local SWCDs in developing project-ranking criteria. NRCS staff will assist LDAF and local SWCDs with outreach and education activities to ensure landowners and operators are aware of program opportunities. NRCS staff will work closely with LDAF to ensure that RMS level conservation plans developed for this project meet NRCS planning standards. The field and area staffs will assist in providing technical assistance for BMP plan designs, implementation, and certification. NRCS staff will assist LDAF and the local SWCDs in collecting data and assembling semi-annual and annual reports for this project.

E. AN EDUCATION AND OUTREACH COMPONENT

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

To engage stakeholders and support implementation of this watershed plan, a number of outreach strategies are used to attract and inform participants. Ongoing outreach and education efforts will maintain public involvement in the process and increase awareness of the plan and its goals throughout the watershed. Stakeholder participation is a necessary component to any successful WIP, and watershed stakeholders are encouraged to get involved in the effort to reduce NPS pollutant loads in the waterbody.

The OSWC and the participating SWCD, through partnership with the USDA-NRCS, the LDEQ NPS Program staff, and the LSU Ag center, plan to conduct NPS education through Agricultural Best Management Practice Workshops for farm operators and other land-users, Soil and Water Stewardship Program, and 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 K-12. This NPS education and outreach program should significantly enhance watershed based efforts to correct NPS impairments by providing an opportunity to link NPS pollution reduction and other environmental benefits to all available conservation programs as necessary to achieve acceptable surface water quality standards in agricultural environments, and lead to a better community-wide understanding of the effects and remediation of off-site NPS pollution impairments. At least one 6-hour Project WET educator workshop should be offered at least once every 3 years for all educators of students within LaSalle Parish's three middle schools. Costs per workshop range from $1,200 without teacher stipends and as much as $10,000 with teacher stipends included. Stipends are funded by state or local education agencies.

One agricultural BMP field day will be held within Hemphill Creek watershed to discuss the TMDL process and to demonstrate the potential for reducing stream loading from agriculture activities through the implementation of BMPs. Additional semi-annual or annual field days may be offered to highlight any changes in conservation programs, practices, or in commodity markets and subsequent land –use trend forecasts. A special effort will be made to encourage landowners, operators, and educators from within the project watersheds, as well as from outside the project areas, to participate in each field day. They will also be encouraged to become certified Master Farmers through the LSU Ag center.

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

In addition to field days and educational materials, LDEQ will partner with LDAF to host one or 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 program is affecting water quality in Hemphill Creek. The information gathered for this project and thereafter will be shared with cooperating agencies, stakeholders and landowners involved in restoring Hemphill Creek.

Soil & Water Stewardship programs have been instrumental in creating a community-wide awareness of everyone's responsibility to conserve and properly manage natural resources. SWCDs have been active in the delivery of the Soil and Water Stewardship Program and related events and activities throughout communities and urban areas. Schools, communities, and individuals, especially in rural or isolated subdivisions, may become more active in NPS prevention in their areas. Soil and water stewardship efforts have been enhanced by incorporating this outreach program into various school and community oriented awareness events, such as water festivals to reinforce all aspects of the hydrologic cycle with special emphasis on NPS concerns. A BMP field day will be held within the watershed to demonstrate the potential for reducing NPS loads from agricultural activities through implementation of BMPs. A special effort will be made to encourage landowners and operators to participate in environmental education events and attend field days and become Certified Master Farmers.

Producer BMP workshops will provide a heightened awareness and understanding of local water quality problems and agriculture's potential to contribute to them through proper

natural resource management. They will also provide an understanding of soil stability, erosion control, and maintenance of vegetative cover in relation to agricultural processes within a given proximity to potentially affected water bodies. These workshops will also provide an increased conservation practice installation resulting in improved surface water quality.

Through the BMP Field Days, BMP workshops, Soil and Water Stewardship programs, and constant information sharing and guidance from LDAF, USDA, and LDEQ, the plan is to keep the stakeholders involved throughout the project and ensure they understand what they are doing is indeed making a difference in their communities. It is important to convey the idea that results are not usually evident right away but in time will make a huge difference in the health of the water body and improving water quality. We anticipate implementation of an OSDS inspection program in the area which, in addition to on-site inspections of OSDSs, will also include flyers with information about maintaining septic systems, operating tips, and websites with more information. Programs like this help to educate the general public on how upkeep of these systems or lack thereof can have a direct effect on their local water sources, and are dependent on close cooperation with parish and local government officials.

F. A SCHEDULE FOR IMPLEMENTING BMPS

The schedule below in Table 7 on page 26 will be used as a guideline for the project which includes implementation in the Hemphill Creek Watershed. It lists timeframes, goals, objectives, strategies and responsible entities for each goal and the scheduled time period for completion.

Each section of this schedule is important to the overall success of BMP implementation. LDEQ plans to work closely with USDA, LDAF and local stakeholders to ensure that each of these objectives is completed in a timely manner. By doing this, all participants in this project stay informed about activities. The will also have a better understanding of the timeline for the project and know who is involved in each portion.

The implementation schedule for the home sewage system inspection and education and outreach program that LDEQ plans to implement is not listed in the schedule below. Before this department can schedule tentative start dates for the program, there must be an agreement between parish officials and the inspectors to get permission to perform inspections in that parish. However, LDEQ is in the process of working with the watershed coordinator for Capital RC&D who has successfully completed inspection programs in other parishes to get training started for inspectors in LaSalle parish.

Table 7 BMP Schedule of Implementation for Hemphill Creek Watershed

Timeframe	Goal	Objective	Strategy	Responsible Entity
Oct 2015 – Sep 2020	Education and Outreach	Educate on NPS pollution and BMPs	Inform the public of NPS pollution problems in their area and the BMPs that could be used to reduce or eliminate them	LDAF, SWCD
Spring 2016	Submit Sampling Plan	Create sample plan	Development of overall plan	LDEQ
Spring 2016	Select Participants for the project	Develop Ranking Criteria and select BMPs and participants for project	Development of ranking criteria, selection of participants and corresponding BMPs for implementation	LDAF, SWCD
Spring – Summer 2016	Meet with potential participants and develop comprehensive BMP plans	Sign up participants and develop implantation plans with participants	Explain the process and BMPs to the participant	LDAF, SWCD
May 2016– Oct 2017	Conduct Baseline Sampling	Generate recent water quality data for targeting BMPs	Sample nine sites twice a month for fecal coliform	LDEQ
April 2017- November 2017	Analyze baseline water quality data	Identify current condition of the bayous and identify NPS loadings	Complete data analysis	LDEQ
May – August 2017	Develop a WIP	Develop a plan for restoration	Identify the EPA nine key elements required for a WIP and the implementation strategy for restoration	LDEQ/LDAF
May - August 2017	Identify critical areas	Use results of monitoring project to identify sources of pollution	Choose evaluate monitoring sites and establish long term sites	LDEQ/LDAF
October 2017 – Sept 2020	BMP Implementation	Reduce fecal coliform loading from agricultural land	Reduce fecal coliform loadings into the waterbody through the implementation of BMPs	LDAF, SWCD
Sept 2020	LDAF End Project	Final BMP analysis	Prepare data for final report	LDAF
October 2017 – September 2021	Long Term Sampling	Final data analysis and water quality assessment	Aid LDAF in preparing their final report by supplying water quality data results	LDEQ

G. A DESCRIPTION OF INTERIM, MEASURABLE MILESTONES OR OTHER CONTROL ACTIONS BEING IMPLEMENTED

Annual progress made in implementing BMPs and activities associated with projects by LDAF will be utilized as interim indicators of success toward restoring water quality in the watershed. We will use the BMP information from LDAF and NCRS to have an estimate of the total amount (acreage, length, number of structures) of each BMP that is expected to be implemented throughout the life of the project. From that number, we will track progress each year to determine if we are on schedule to reach these goals.

The short-term goal of this plan is to begin implementation of BMPs in the Hemphill Creek watershed and to monitor water quality changes and improvements in the waterbody. The short-term success will be measured by continuous application of existing and future BMPs and related conservation practices that reduce the amount of fecal coliform, organic material, sediments and other agricultural contaminants entering the water bodies on an annual basis.

The long-term success will be measured by improved water quality that meets Louisiana's criteria in the watersheds and corresponding river basins. LDEQ will continue to sample in the watershed, analyze the data, and compare results to historical data to see if improvements have been made. The chart in Figure 6 on page 16 illustrates targeted fecal coliform reductions in Hemphill Creek at 70% and 100% targeted reduction of 400 cfu/100mL. The long term sampling data will be used to compare changes occurring in water quality to the projections for load reductions expected in this plan (see Figure 6 on page 16).

The ultimate goal of this WIP is to improve water quality, mainly through the reduction of fecal coliform bacteria, meet the state's water quality standards and/or restore the impaired designated use of the water body.

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

Hemphill Creek is impaired for PCR caused by Fecal Coliform. To meet the water quality standards, no more than 25% of the samples collected at the ambient site shall exceed 400 colonies/100 mL from May 1 through October 31 and no more than 25% of the samples shall exceed 2000 colonies/100 mL year-round. Since there are not applicable TMDLs for Hemphill Creek, the above fecal coliform criteria will be used to evaluate if the designated uses are being supported.

LDEQ is analyzing monitoring data and using GIS methods to determine how the water quality is changing at the ambient site and in problem areas identified through our baseline sampling. Any decreases in fecal coliform at these sites are signs of improvement and

another step towards it being fully restored. The results we get from the monitoring data will be compared to the graph in Figure 6 on page 16 to see how close we have come to the estimated targeted reductions.

The purpose of BMP implementation is to introduce proven effective strategies into the watershed to improve water quality and mitigate problems in the watershed. The BMP implementation process includes education and outreach as well as physical installation and implementation of BMPs. To ensure that progress is being made, LDEQ and LDAF will

1. Work to ensure that we adhere as closely as we can to the schedule of BMP implementation in this document so that we reach full restoration of this waterbody.
2. Continuously monitor the data as it is received to check for improvements at our sampling sites, especially the ambient site.
3. Look for trends in previous data and compare them to current data before and after implementation took place.
4. Continue to monitor the IR to see if it begins to meet standards.
5. Track implementation progress and compare to WQ monitoring data to refine load reduction estimates.

I. A MONITORING COMPONENT TO EVALUATE EFFECTIVENESS OF IMPLEMENTATION EFFORTS

Baseline sampling consisted of nine sites in which LDEQ will use to monitor water quality for the PCR months (Table 2, Page 12). Samples will be taken twice a month May through October until the year 2020.

The sampling sites were identified according to the transportation pathway of the water off the land, particularly from observed land uses likely contributing bacteria loadings, such as cattle grazing trails leading to the waterbody, septic tank pipes in the streambanks, or small waterways that course through overgrazed areas.

Long-term monitoring will commence on the next sampling cycle (October 2017) and will continue annually for the PCR season until October 2020.

***In-Situ* Parameters will consist of:**

- Dissolved Oxygen
- Salinity
- Electrical Conductivity

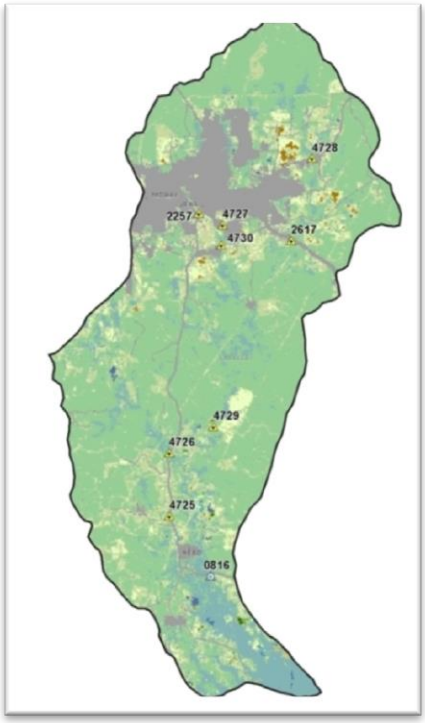

Figure 8 Hemphill Creek Sample Site Map

- Temperature (Water and Air)
- pH
- Sample depth, water depth, and Secchi depth

Laboratory Analysis will consist of:

- Fecal Coliform

Through these analyses, the current health of the waterbody can be determined and compared to previous sampling runs during the same months. This allows for a direct method of comparing data before and after BMP implementation to determine changes in water quality.

If these efforts are successful in improving fecal coliform levels at that sample site as well as at the ambient site, sampling and monitoring of the data will be continued to ensure that the improvement is steady and not just a one-time improvement. This is the most efficient way to determine if the results are accurate.

3.0 TRACKING PROGRESS OF WATERSHED IMPLEMENTATION

Louisiana's NPS Management Plan indicated program tracking will be implemented at several levels to determine if watershed activities are effective in reducing NPS pollution and improving water quality. Figure 8 shows a representation of the six steps in the US Environmental Protection Agency's (EPA) watershed planning and implementation process.

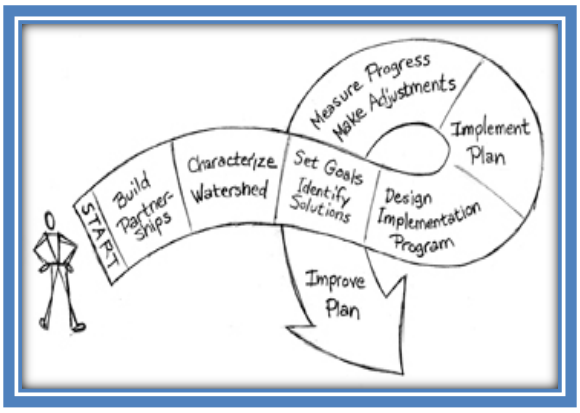

Figure 9 EPA's Watershed Planning and Implementation Process

As sampling and BMP implementation continues, LDEQ will continue to work to have the waterbody completely restored. To do this, we will

1. Analyze data through SWAT and monitor the status of the watershed on the IR to learn the effects of the BMPs on the watershed
2. Look for trends in the new data and compare them to previous data at the ambient site and the other known problem sites.
3. Use the targeted reductions chart to see how our predictions compare to what happens in real-time in the watershed.
4. Track the time schedule of BMP implementation and improvements and use what we learn to compare similar watersheds and get more accurate time estimates for restoration.
5. Work closely with LDAF to keep record of BMP implementation dates and acreages to compare with data improvements and make sure that we stay on track to implement the projected number of BMPs.

The following actions will be taken to determine effectiveness of this approach:

1. Tracking BMPs implemented as a result of section 319 or other sources of cost-share and technical assistance in the watershed (Short Term);
2. Tracking progress in reducing NPS pollutants from various land uses in the watershed using measurable and quantifiable methods (short and long term);
3. Tracking water quality improvement in the watershed with water quality monitoring to determine if reductions are being achieved and water quality improvements are being made to meet the state's water quality standards (long term);
4. LDEQ will report in the state's NPS annual report the number of BMPs implemented each federal fiscal year (short and long term);

5. LDEQ will report water quality results from water quality monitoring project and data will be reviewed evaluating if the current plan is achieving anticipated results or if adjustments need to be made (short and long term)
6. Communicating results of watershed implementation to stakeholders in the watershed and to USEPA as well as addressing any necessary adaptations to the current plan -short and long term (Short Term = 0 -5 years, Long Term = 5+ years).

The purpose of these actions is to ensure that we have as much information as possible to keep our efforts moving towards restoration of Hemphill Creek as stated in the introduction of this document. We will constantly be working to improve our process based on results. The overall goal of this project is water quality restoration in Hemphill Creek and there can be no improvement without evaluation of processes. Timelines will change, adjustments will be made, new goals will be set but we will keep moving forward.

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