Upper Little-Bayou Pierre Watershed Plan
9 Key Elements
HUC 080602030702
MWS 6031
GY18 Proposed Project Area
November 9, 2018

Element a: Identification of Causes and Sources of Impairment

The Upper Little Bayou Pierre Watershed (080602030702) is located primarily in Claiborne County, MS, and includes the upper portion of Little Bayou Pierre which is a tributary of the Bayou Pierre located in the South Independent Streams River Basin. According to the 2011 National Land Cover Database (NLCD), this watershed is approximately 22,120 acres and contains many different land use types, including forest (75%), pasture/grassland (8%), scrub/barren (10%), wetland (4%), cropland (1%) and urban (3%) as is depicted in Figure 1.

The area is predominantly forest land and is a very popular location for hunting and other recreational activities such as four-wheeling and picnicking on the pretty white sandbars of the creek. Little Bayou Pierre has its headwaters southeast of the town of Pattison and flows northwest to the confluence with Bayou Pierre near the city of Port Gibson crossing Claiborne, Jefferson and Copiah Counties. Little Bayou Pierre is the major water body in the Upper Little Bayou Pierre watershed with smaller tributaries, like Brandywine Creek and other smaller unnamed streams, flowing into Little Bayou Pierre.

The water use classification for Little Bayou Pierre and all waters in the Upper Little Bayou Pierre Watershed, as established by the *State of Mississippi Water Quality Criteria for Intrastate, Interstate, and Coastal Waters* (MDEQ 2015) regulation, is predominantly Fish and Wildlife Support. Waters with this classification are intended for fishing and propagation of fish, aquatic life, and wildlife. Waters that fall within the Fish and Wildlife classification should also be suitable for secondary contact recreation, which is defined as incidental contact with water including wading and occasional swimming. However, the Little Bayou Pierre main stem is classified for Recreation Use. Waters in this classification should be suitable for primary contact recreational purposes, including such water contact activities as swimming and wading.

The Little Bayou Pierre (MS450E) has a long history with MS's Section 303(d) List of Impaired Water Bodies and represents the entire length of the stream from its headwaters in the Upper Little Bayou Pierre Watershed to the mouth at Bayou Pierre. This water body segment was initially listed as evaluated on the 1996 List due to pesticides, nutrients, siltation, and organic enrichment/low dissolved oxygen (DO) based primarily on review of anecdotal information and not monitoring data. The water body remained on the 1998 §303 (d) List for the same causes. Also in 1998, the segment was included on the evaluated list as impaired for the Recreation Use due to pathogens. The portion of MS450E that falls within the Upper Little Bayou Pierre Watershed is shown in Figure 1.

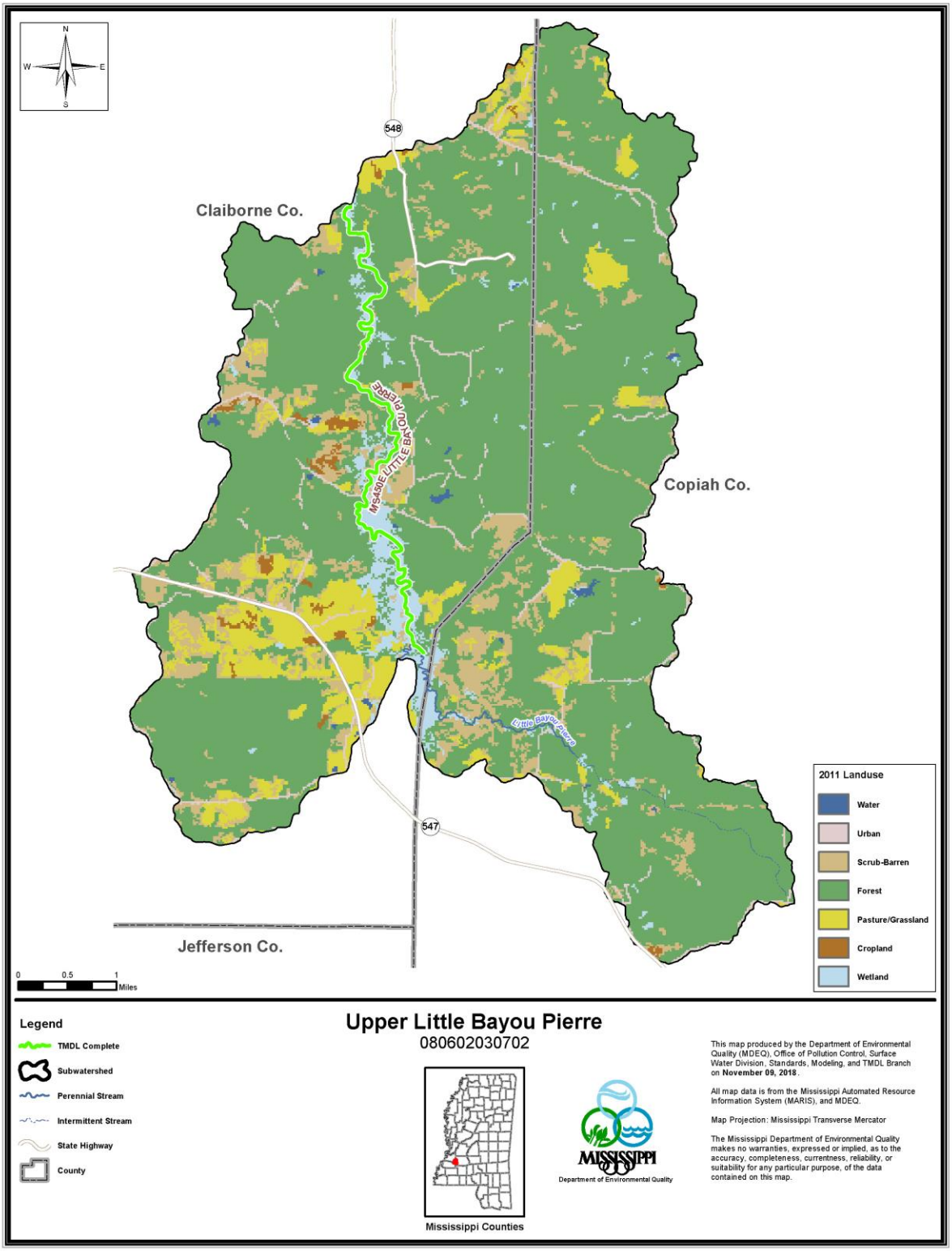

Figure 1: Upper Little Bayou Pierre Watershed Landuse, 2011 NLCD

In order to make water quality assessments on wadeable streams outside of the Mississippi Alluvial Plain, MDEQ uses a calibrated and verified index of biological integrity (IBI) referred to as the Mississippi Benthic Index of Stream Quality (M-BISQ). Using biological community data and comparing it to the attainment thresholds from the M-BISQ, Upper Little Bayou Pierre was assessed as impaired (segment MS450E) for Aquatic Life Use Support due to biological impairment in 2002. Due to this determination, the evaluated causes of pesticides, nutrients, siltation, and organic enrichment/low dissolved oxygen (DO) based primarily on review of evaluated anecdotal information and not monitoring data from the 1996 and 1998 §303(d) lists were removed and MS450E was included on the 2002 §303(d) List of Impaired Water Bodies for biological impairment.

MDEQ has a strong team of scientists and engineers focused on evaluating water quality data and identifying stressors in water bodies that have been listed as being biologically impaired using benthic macroinvertebrate community data. When biological community data indicate that a water body segment is impaired, an investigative, stressor identification analysis using strength-of-evidence approach is conducted to determine the cause(s) of the impairment. Such causes may range from specific pollutants (e.g. Total Nitrogen) to other causes of pollution such as sedimentation, habitat loss or hydrologic alteration. In most cases, nonpoint sources contribute, or are the primary causes of impairment. MDEQ relies upon all available monitoring and assessment data and conducts additional monitoring to gather the necessary data and information to help determine both the causes and sources of impaired waters. The *U.S. Environmental Protection Agency (EPA) Stressor Identification Process and Stressor Identification Guidance Document* (USEPA, 2000), is used to identify most probable stressors causing biological impairment to provide the information necessary to develop required TMDLs that will guide restoration activities. A stressor identification study was conducted on Little Bayou Pierre in 2009. As a result of the analysis, sediment was identified as the primary probable pollutant causing the aquatic life use impairment to the stream. This information was then used to develop a Total Maximum Daily Load (TMDL) for sediment in Upper Little Bayou Pierre. Total Maximum Daily Loads, TMDLs, are pollution budgets. A TMDL determines how much of a pollutant can be present in a stream, river, or lake without negatively affecting aquatic life or public health.

There are two TMDLs for the Little Bayou Pierre segment MS450E; one is for sediment and the other for pathogens. The *Fecal Coliform TMDL for Bayou Pierre* (MDEQ, 1999), which includes Little Bayou Pierre (MS450E), was developed for the waterbodies within the larger Bayou Pierre Watershed; however, none of the NPDES permitted facilities included in the TMDL are located within the Upper Little Bayou Pierre Watershed boundaries. This TMDL requires all NPDES permitted discharges of fecal coliform to meet water standards for disinfection and recommends reducing fecal coliform contributions from cattle access to streams and failing septic systems in the watershed.

In 2009, MDEQ developed the *Total Maximum Daily Load Designated in the South Independent Streams Basin for Impairment Due to Sediment* (MDEQ, 2009), which includes the Little Bayou Pierre waterbody segment MS450E. There are no facilities in the Upper Little Bayou Pierre Watershed with NPDES permits that include limits for Total Suspended Solids (TSS) which is used as an indicator of sediment contributions from permitted activities. The pollutant of concern

for the Little Bayou Pierre TMDL is sediment from land-use runoff. Certain contaminants may be associated with sediment such as pesticides and nutrients. These contaminants were not addressed directly within the sediment TMDL. However, these contaminants would also be controlled by the same best management practices (BMPs) that control the sediment from nonpoint sources of pollution.

Nonpoint loading of sediment in a water body results from the transport of material into receiving waters by the processes of mass wasting, head cutting, gullying, and sheet and rill erosion. Sources of sediment include: agriculture, silviculture, rangeland, construction sites, roads, urban areas, mass wasting areas, gullies, surface mining, in-channel and instream sources, and historical land use activities and channel alterations.

Element b: Expected Load Reduction

The *Fecal Coliform TMDL for Bayou Pierre* (MDEQ, 1999) was developed for the streams and creeks within the larger Bayou Pierre Watershed including the Little Bayou Pierre (MS450). This TMDL requires all NPDES permitted discharges of fecal coliform, the water quality indicator for pathogens, to meet water standards for disinfection and recommends reducing 85% of the cattle access to streams and 80% reduction in fecal coliform contributions from failing septic systems in the watershed.

The *State of Mississippi Water Quality Criteria for Intrastate, Interstate, and Coastal Waters* (MDEQ, 2015) regulation does not include a numeric water quality standard for aquatic life protection due to sediment. The narrative standard for the protection of aquatic life is sufficient for justification of TMDL development, but does not provide a quantifiable TMDL target. The target for the sediment TMDL is based on reference sediment yields developed by the USDA Agricultural Research Service's Channel and Watershed Processes Research Unit (CWPRU) at the National Sedimentation Laboratory (NSL). Based on the ranges of stable and unstable yield values, a reduction in sediment of 95 - 98% is recommended for Upper Little Bayou.

The MDEQ will work with agency resource partners to identify and implement BMPs to address pathogen and sediment concerns identified in the Upper Little Bayou Pierre Watershed. The Natural Resource Conservation Service (NRCS) has a list of approved BMPs that address pathogen and sediment issues and this list will be used to identify BMPs that are candidates to be used in the Upper Little Bayou Pierre Watershed. Figure 2 shows recent imagery taken of the Upper Little Bayou Pierre watershed along with the listed segment MS450E.

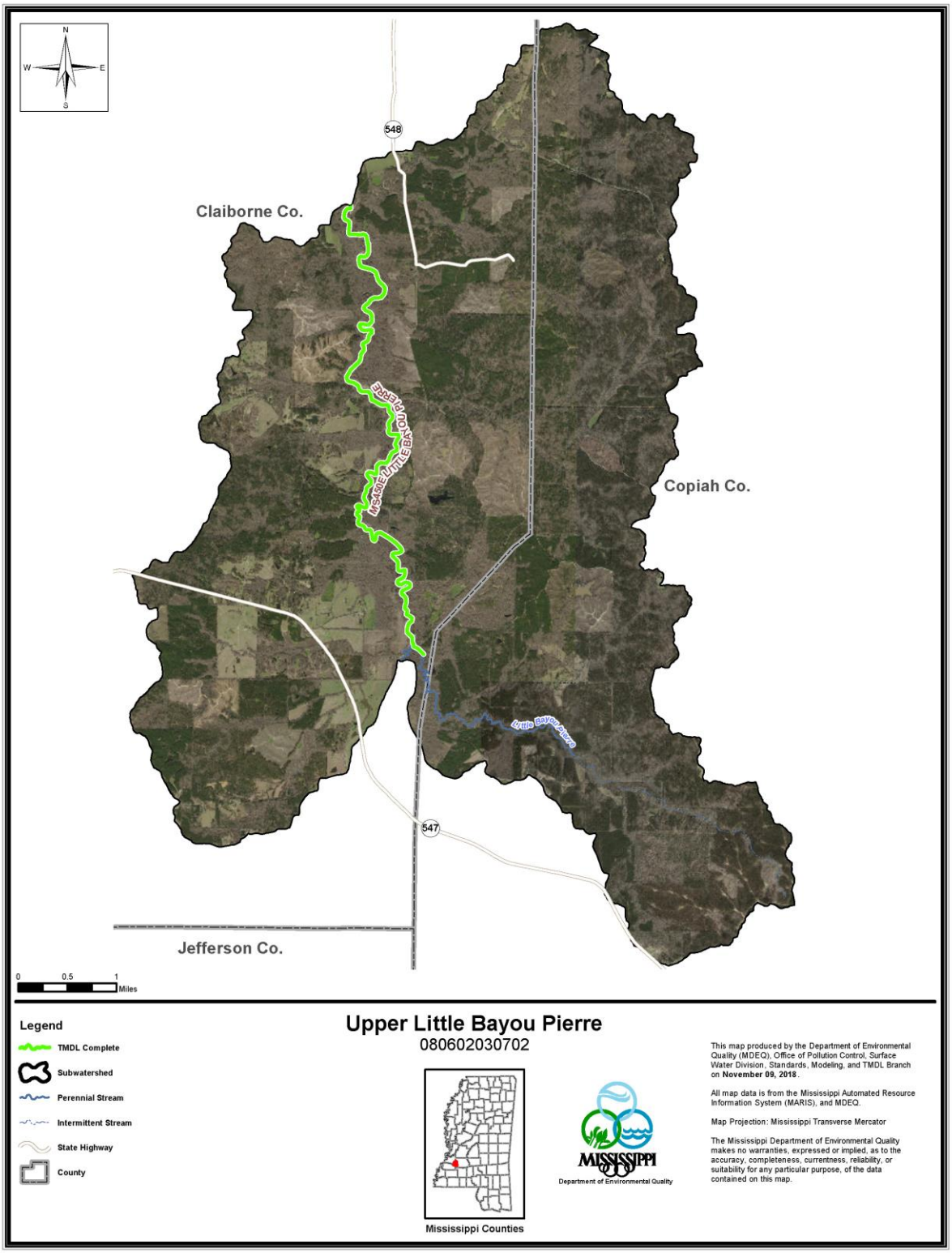

Figure 2: Upper Little Bayou Pierre Watershed Aerial Imagery.

Element c: Proposed Management Measures

Coordinating partners with MDEQ include the Mississippi Soil and Water Conservation Commission (MSWCC) the local Soil and Water Conservation Districts (SWCDs), and the Natural Resource Conservation Service (NRCS). These partners have been coordinating with local stakeholders to gauge landowner interest and, based on their expertise, have identified a suite of BMPs that should be effective in addressing nonpoint source pollution sources in the Upper Little Bayou Pierre Watershed.

Staff from MSWCC and the SWCD depend upon assistance from their NRCS partners in determining landowner interest in the watershed because they are present on the farms and in the fields with local landowners. These staff members also understand the conservation needs at the local level, and have knowledge of the amount of unfunded applications for federal program assistance which meet Section 319 eligibility requirements. At present, the Upper Little Bayou Pierre Watershed has TMDLs for sediment and pathogens. Based on previous experience in watersheds with similar impairments, our partners recommend installation of the following BMPs to help mitigate sediment and pathogen issues in the Upper Little Bayou Pierre Watershed: critical area planting, fencing, grade stabilization, streambank and shoreline protection, grassed waterways, water and sediment control basins, instillation of tank and troughs, and heavy use protection area practices. Through a collaborative effort to identify water quality concerns and needs within this watershed, these agencies feel the following management measures will help ensure success and mitigate pollution sources. Those measures are as follows:

1. Likely water quality benefit;
2. Willing landowners;
3. Implementation of the recommendations of the TMDL(s);
4. Ease of showing effectiveness of the BMP(s) through monitoring;
5. Shorter length of time for anticipated results (i.e., within the Initiative period);

Upon receipt of funding, MDEQ will coordinate with the field staff from MSWCC in Claiborne County to target implementation in priority areas, and then move to other areas as funds allow. A map depicting the landuse can be found in Figure 1 and recent imagery in Figure 2. Additional considerations for prioritization of BMPs included the positioning of BMPs with willing landowners; the increased likelihood for leveraging of in-kind services; and proximity to pollutant sources to Upper Little Bayou Pierre.

Element d: Technical and Financial Assistance

As part of any Section 319 funded project, MDEQ requires a 40% match in project areas. This match may be in the form of actual dollars or may be provided as "in-kind" to project activities. Partners in this project who may contribute match include MSWCC, NRCS, USGS (monitoring), and/or local landowners. Generally, project planning and administration (planning, coordination and watershed plan revision) consumes 10-15% of the total budget, however. Provided below is a summary of estimated project costs for a full-scale watershed restoration. The MSWCC provided the following estimates for BMP instillation below:

Activity	Size/Amount	Estimated Cost
BMPs		
Critical Area Planting	43ac @ $178	7,654
Fencing	19,930 ft. @$2.05	40,857
Grade Stabilization Structure	28 ea. @ $5,000	140,000
Streambank and Shoreline Protection	630ft @ $111	69,930
Grassed Waterway	12ac @ $1,755	21,060
Water and Sediment Control Basin	5ea @ $5,000	25,000
Tank or Trough	7 ea. @ $3,000	21,000
Heavy Use Area Protection	4,500 ft. @$1.00	4,500
Monitoring		10,000
Education/Outreach		11,500
Technical Assistance		25,000
Project Management, Implementation, Coordination, Plan Revision		40,000

Total Estimated Project Cost **$416,501**

To maximize education and outreach activities and monitoring efforts, MDEQ plans to leverage with existing programs already allocated for funding where possible.

Element e: Information and Education`

The MDEQ, in cooperation with numerous federal, state, and local stakeholders has developed diversified information/education programs, best management practices manuals, literature, books, videos, and public service announcements that address pollutants from the seven (7) major land use categories of Nonpoint Source Pollution, namely; agriculture, construction, forestry, on-site waste water disposal, surface mining, urban storm water runoff, and hydrologic modification. Audiences from pre-school to adults throughout the state are reached with a variety of mature, well-designed programs each year. These programs, events, manuals and

literature can be used in the Upper Little Bayou Pierre Watershed project by tailoring them to address the pollutants of concern. A positive approach is used to reach the full diversity of people in the community with projects that foster a "sense of place", a "sense of pride in community", and a sense of the native plants, animals, and general ecology of their region, as well as, the history of the community and a sense of economics. Stakeholders and coordinators join together to participate in problem-solving, brainstorming, plan development, training workshops, festival event planning, soil and water conservation field days, tree boards, poster, art and writing projects and other activities that promote collaboration and ownership of the watershed, as well as, solutions to its problems. The ultimate goal is to bring about behavior changes and the use of "best management practices" that will improve water quality and the overall quality of life in the watershed. Evaluation forms, pre-test/ post-test, surveys, and reporting of the number of people who attend workshops, trainings and events are among the methods used to measure the success of education/information programs. A partial list of MDEQ's programs that could be used in the Upper Little Bayou Pierre watershed is listed below:

- **Water Model Presentations** - Enviroscapes and groundwater aquifer models distributed statewide with training and related interactive lesson plans.
- **Teacher Workshops –** train educators in proximity to the watershed about NPS pollution and provide materials and information that can be used in their classrooms.
- **Adopt A Stream -** workshops and training venues for citizens, teachers, and students in the Upper Little Bayou Pierre Watershed.
- ***Watershed Harmony Mobile Classroom*** - for age's kindergarten – adults with state and federal public education objectives tailored for 4th and 5th grade students.
- **"Train the Trainer" -** workshops and materials for Soil and Water districts, Extension Service, etc.

As part of the education outreach efforts, the stakeholder group forming the Upper Little Bayou Pierre Watershed Implementation Team (WIT) will participate in a minimum of 3 face-to-face meetings. The purpose of these meetings is to provide updates on implementation activities, education events and review and modify the watershed plan. In concert with these WIT meetings, and to incentivize stakeholder participation, project funding will be used to purchase food and other refreshments for the WIT along with providing support for renting facilities in which to host those events. In accordance with 41 CFR § 301-74.11, light refreshments, meals, and/or beverages are an allowable expense under CWA Section 319, provided a description of the agenda, purpose, location, costs, etc., are outlined in an approved 319 grant work plan. The purpose of the meetings will be for updating the watershed plan, and hosting field days to showcase the implemented BMPs for the public. At this time the exact number of participants and locations are not known therefore costs have been estimated for the purposes of this plan and will be updated.

Element f: Implementation Schedule

The following work plan describes the approaches and tasks that the grantee shall collaboratively perform with project partners to advance and implement this watershed-based plan. During this effort, the grantee will work with the MDEQ Basin Team and will put forth its best effort to perform the tasks identified below within the given timetable.

1. Work to develop, execute, and implement a Subgrant Agreement that specifies the roles, tasks, requirements, and milestones for project implementation. (Month 1)

2. Facilitate, in coordination with MDEQ and other partners, meetings, media and social media promotion of the project, and coordinate activities to fully implement this plan. (Months 1 – 36)

3. Work with the Claiborne County SWCD, MSWCC, NRCS, and MDEQ to inform landowners and operators within the watershed about the project and work to secure commitments from priority area landowners and operators who are willing to participate in the project. (Months 1 – 6)

4. Work with the local SWCD, MSWCC, NRCS, and MDEQ to determine through GIS applications and intensive site surveys the priority areas within the sub-watershed that are contributing significant pollutant loads. All BMPs shall be installed in accordance with the guidelines developed in the latest edition of the NRCS Technical Field Manual, or other approved guidelines. (Months 1-36)

5. Facilitate, in cooperation with MDEQ and other monitoring partners, the completion and implementation of an effective and efficient plan to monitor baseline water quality conditions in the watershed and track changes in water quality over time resulting from the BMPs implemented through this project. (Plan Completion: Months 1-2); Implementation: Months 3-36).

6. Submit blank copies of standard maintenance agreements to MDEQ. (Months 13-36)

7. Conduct inspections of BMPs during construction (Months 3-36)

8. Coordinate with and support the local SWCD, MSWCC and NRCS in the collection of relevant GPS coordinates of all installed BMPs and incorporate this information into a GIS format. All geospatial data shall be collected in a manner consistent with the Federal Geographic Data committee-endorsed standards. (Months 3-36)

9. Collect adequate photo documentation before, during, and after installation of the approved BMPs (Months 3-36)

10. Report measured, or estimated, nonpoint source pollutant load reduction, acreage affected, pre-and post- site conditions, and GIS data (1-36)

Element g: Milestones and Outcomes

Milestone	Outcome	Probable Completion Date
Coordinate with the MDEQ, NRCS, USGS, MSWCC, and the Copiah and Claiborne Counties Soil and Water District to determine priority areas that are contributing significant pollutant loads to Upper Little Bayou Pierre	Target priority areas for BMPs	Month 1-2
Establish Watershed Implementation Team to begin refinement of Watershed Based Plan for Upper Little Bayou Pierre watershed	Establish WIT	Month 1-2
Initiate watershed monitoring	Baseline condition monitoring	Month 3-12
Meet with landowners and cooperators to secure commitments to install BMPs in priority areas	Landowner Commitment	Months 1-6
Establish routine meeting schedule for WIT to support WBP revision	WIT meetings	Months 1-36
Implement BMPs	BMP instillation	Months 6-36
Coordinate with Landowners to inspect BMPs that were installed using Section 319 funds	BMP Inspection	Months 6-36
Begin monitoring to collect data on post-BMP water quality	Post-BMP Monitoring	Months 42-48
Finalize education and outreach plan	Education/Outreach events scheduled	Months 8-36
Finalize revised WBP	Final Revised WBP	Months 30-36

Goal: Reduce the pathogen and sediment loads entering waters in the Upper Little Bayou Pierre Watershed.

Element h: Load Reduction Evaluation

According to the *State of Mississippi Water Quality Criteria for Intrastate, Interstate, and Coastal Waters* (MDEQ, 2015), most waters in the Upper Little Bayou Pierre watershed, are classified for Fish and Wildlife Use. As such waters in this classification must meet the aquatic life designated use and the secondary contact recreation designated use. The Little Bayou Pierre main stem is classified for Recreation Use and thus should be protective of the Primary Contact Recreation designated use in addition to supporting the Fish and Wildlife classification. Although the TMDL was developed using fecal coliform as the indicator for pathogens, in 2015, MDEQ updated the water quality criteria for recreational waters. With this update, the pathogen indicator was switched from fecal coliform to *e. coli*. In compliance with current water quality criteria, e coli will be used as the pathogen indicator for all bacteriological monitoring.

Mississippi's water quality criteria do not include a water quality standard applicable to aquatic life protection due to sediment. However, a narrative standard for the protection of aquatic life was interpreted to determine an applicable target for the sediment TMDL. The narrative standard for aquatic life use states that waters shall be free from materials attributable to municipal, industrial, agricultural, or other dischargers producing color, odor, taste, total suspended solids, or other conditions in such degree as to create a nuisance, render the waters injurious to public health, recreation, or to aquatic life and wildlife, or adversely affect the palatability of fish, aesthetic quality, or impair the waters for any designated uses. In lieu of numeric criteria for sediment, monitoring will be conducted to collect data on parameters that are considered surrogates for sediment (Total Suspended Solids, Total Suspended Sediment, turbidity) and nutrients (chlorophyll-a) along with conventional in-situ parameters generally measured to determine aquatic health (e.g. Dissolved Oxygen, pH, Temperature, Conductivity, Dissolved Solids) will also be obtained. In addition, *e. coli* monitoring will be conducted in the Little Bayou Pierre. The following thresholds will be used to measure compliance applicable with water quality criteria and/or target thresholds:

Parameter	**Threshold**
Dissolved Oxygen	Daily Average of 5.0 mg/L; Instantaneous threshold of 4.0 mg/L
Dissolved Oxygen % Sat	≥ 70% - ≤ 125%
pH	6.0-9.0
Temperature	Not to exceed 90°F
Specific Conductance	Less Than 1000 micromhos/cm
Dissolved Solids	Monthly average less than 750 mg/L; instantaneous threshold less than 1500 mg/L
Chemical Oxygen Demand	35 mg/L
Total Suspended Solids	65 mg/L
Turbidity	75 NTU
E. coli	30-day geometric mean of 126 per 100 ml; samples during 30-day period should not exceed 410 per 100 ml more than 10% of the time
M-BISQ West Bioregion	43.7 Calibration 3

In addition to chemical data, biological community data, in stream habitat surveys will be collected over the course of the project to determine attainment of the Aquatic Life Designated Use. These data are extremely helpful in identifying positive trends in water quality and should provide information to help determine if the implementation activities are resulting in water quality improvements. For freshwater wadeable streams, not including the Mississippi Alluvial Plain (i.e. Delta), Mississippi uses a calibrated and verified index of biotic integrity to make water quality assessment decisions. This index, the Mississippi Benthic Index of Stream Quality (M-BISQ) was originally developed in 2000 and has undergone three recalibration efforts to refine the sensitivity of the index. As part of the index development process, the state was divided into unique bioregions. Within each bioregion, the index has a defined attainment threshold that is used to determine if the biological community measures collected at a site are representative of good water quality that can support a balanced benthic macroinvertebrate community. If the score is above the attainment threshold for the bioregion, the site is assessed as attaining the aquatic life use designation. Along with overall MBISQ scores, the in-stream habitat surveys will also be used to determine change over time.

It should be noted that recovery time of a stream is variable and may extend beyond the timeframe identified in the work plan. At the end of the project, data will be analyzed to determine if the data indicate improvements to water quality in Upper Little Bayou Pierre Watershed. In the event data indicate little or no positive change, a Stressor Analysis will be conducted to determine if any new or additional stressors are preventing improvements to water quality. If any new stressors are identified, the Watershed Implementation Team will identify future actions/activities to address those stressors.

Element i: Monitoring

Prior to BMP installation, pre-implementation water quality chemical and biological monitoring have been compiled from 2001 – 2018 to serve as baseline data for the project on streams in the Upper Little Bayou Pierre watershed and on Brandywine Creek. Brandywine Creek flows into the Little Bayou Pierre from the south and represents the major drainage flowing into the watershed. This varied water quality monitoring included water chemistry data (nutrients, suspended solids, oxygen demand, chlorides, etc.), in-situ field measurements for such parameters as dissolved oxygen, pH, temperature, specific conductance, and turbidity, as well as biological community monitoring for benthic macroinvertebrates in wadeable streams. A list of this historical water quality monitoring in the Upper Little Bayou Pierre Watershed is provided in the table below and their sample locations are shown in Figure 3.

Station ID	Water Body	Sampling Year/Agency		Project Type	Water Chem	In-Situ	Bacteria	Benthics and/or Algal
111F16	Little Bayou Pierre	2018	MDEQ	MBISQ	X	X		X
111D57	Brandywine Creek	2015	MDEQ	MBISQ	X	X		X
112G95	Brandywine Creek	2017	MDEQ	MBISQ	X	X		X

Post-BMP monitoring locations will be selected using best professional judgment and will be targeted to reflect water quality downstream of BMP activity. Once BMP installation is complete, and there has been sufficient time for the stream to stabilize, post BMP monitoring will be initiated. Post BMP monitoring will be conducted in a way that allows for comparison with the pre-implementation data. Because recovery periods of streams can be dependent on type and amount of BMPs installed, more than 1 year of post BMP data may be needed to observe a change in water quality. In some cases, it may take 5 or more years to see full benefits of BMPs. All data collection efforts will be conducted using trained personnel following established Standard Operating Procedures and adhering to agency Quality Assurance protocols.

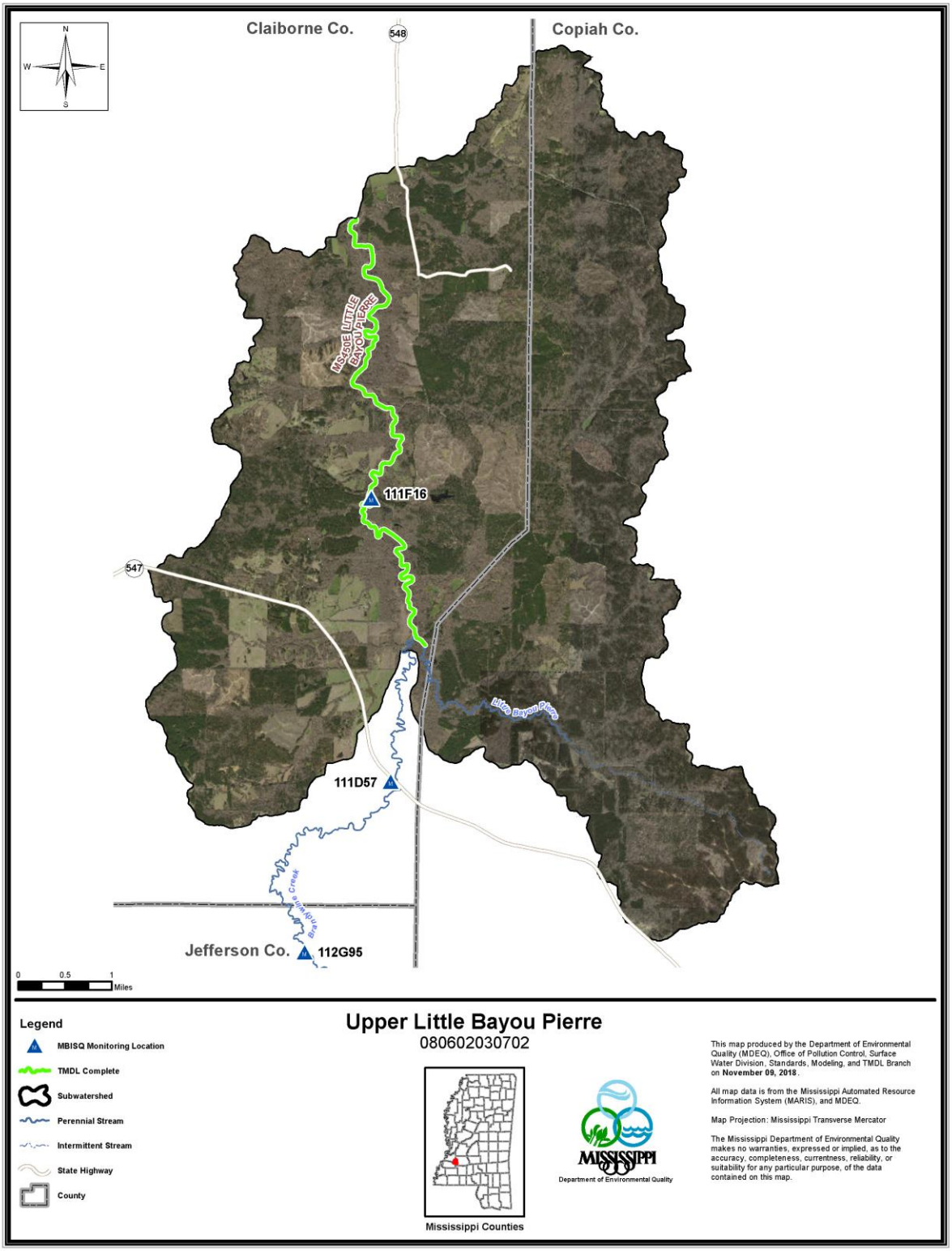

Figure 3: Upper Little Bayou Pierre and Brandywine Creek Historical Monitoring Stations.