

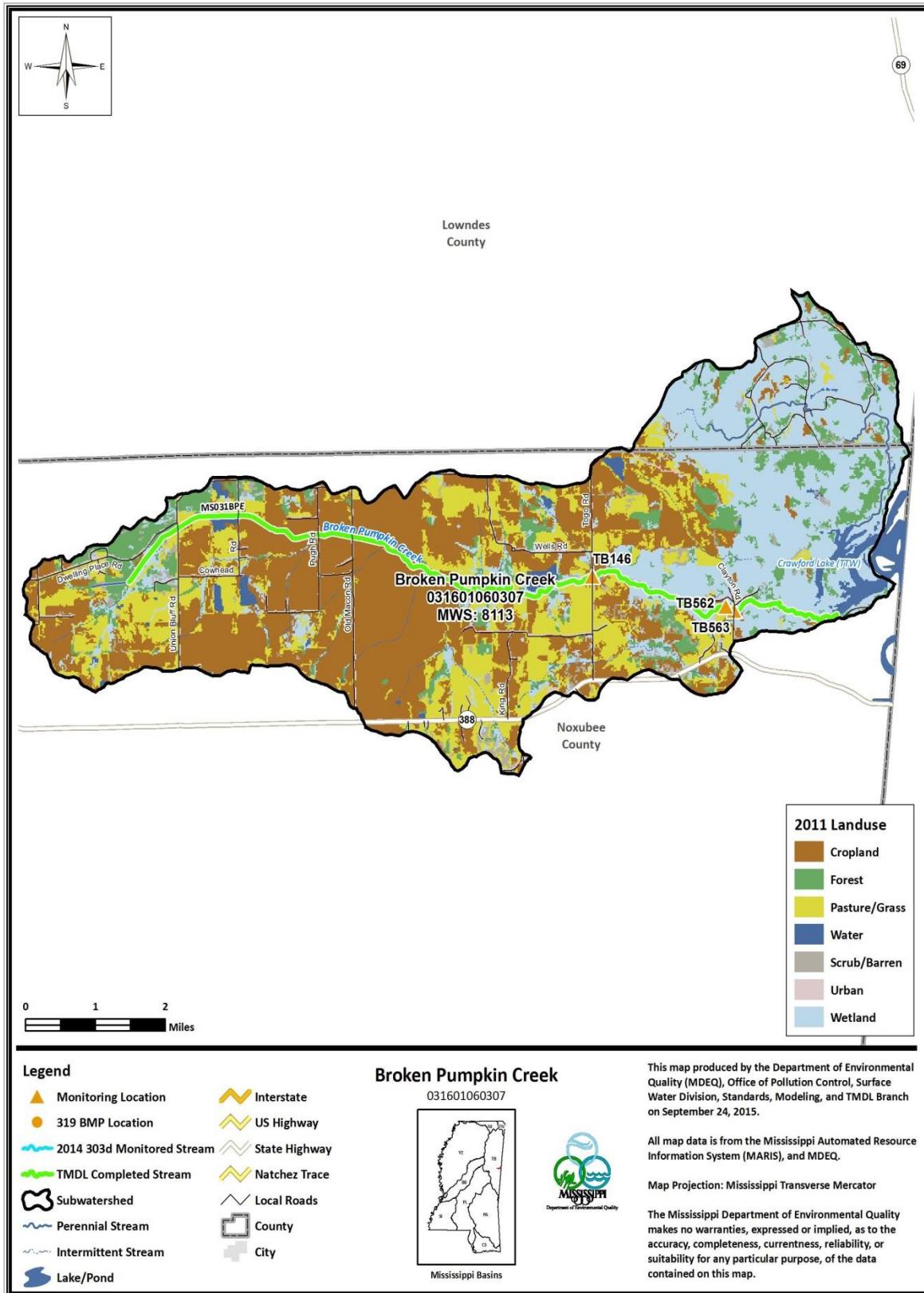
Broken Pumpkin Watershed Plan**9 Key Element Plan****HUC 031601060307****MWS 8113****GY19 Watershed Implementation Project****March 8, 2019****Element a: Identification of Causes and Sources of Impairment**

The Broken Pumpkin Creek watershed is located in Noxubee and Lowndes counties in east central Mississippi covering 24,573 acres. According to the 2011 National Land Cover Database (NLCD), the landuse within this watershed is comprised of approximately 37% cropland, 20% pastureland, 27% wetlands, 10% forestland, and 6% other (water, scrub/barren, and urban) (Figure 1).

The water-use classification for Broken Pumpkin Creek, as established by [Regulations for Water Quality Criteria for Intrastate, Interstate, and Coastal Waters](#) (11 Miss. Admin. Code Pt. 6, Ch. 2), is *Fish and Wildlife*. Waters with this classification are intended for fishing and propagation of fish, aquatic life, and wildlife. Waters included in the *Fish and Wildlife Classification* should also be suitable for secondary contact, which is defined as incidental contact with water including wading and occasional swimming.

MDEQ has conducted statewide biological monitoring using benthic macroinvertebrates as the indicator to develop a regionally-calibrated *Index of Biological Integrity (IBI)* for wadeable streams. This index, known as the *Mississippi Benthic Index of Stream Quality (M-BISQ)*, was used in the biological assessment of the State's wadeable streams and rivers including Broken Pumpkin Creek. Based on the *M-BISQ* scores, this water body was determined to be impaired. Therefore, Broken Pumpkin Creek (MS031BPE) was placed on the *Mississippi 2002 Section 303(d) List of Impaired Water Bodies* (MDEQ, 2002a) for Biological Impairment. A stressor identification study was then completed for the Broken Pumpkin Creek watershed to determine the most likely cause(s) of the impairment. This analysis identified sediment as the primary probable stressor of the water body and a TMDL was developed in 2007. This TMDL was updated in 2010 to include Kincaide Creek (MS033K); however, this segment is not part of the Broken Pumpkin Creek Watershed and therefore is not considered in this watershed plan.

There are no facilities in the Broken Pumpkin Creek 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 [Updated Total Maximum Daily Load Tombigbee River Basin Designated Streams in HUCs 03106105 \(Luxapallila Creek\) and 03160106 \(Middle Tombigbee River\)](#) (MDEQ, 2006) TMDL, which includes Broken Pumpkin Creek, is sediment from land-use runoff and in-channel processes. This TMDL was developed for clean sediment. Certain contaminants may be associated with sediment such as pesticides and nutrients. These contaminants were not addressed directly within this TMDL; however, these contaminants would also be controlled by some of the same best management practices (BMPs) that control the sediment from nonpoint sources of pollution. The target for the TMDL was based on reference sediment yields developed by the 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 77% to 97% is recommended in the Broken Pumpkin Creek watershed.

**Figure 1: Broken Pumpkin Creek Watershed Landuse**

Nonpoint loading of sediment in a water body results from the transport of the material into receiving waters by several processes including mass wasting, head cutting, gullying, and sheet and rill erosion. Sources of sediment come from improper agricultural and silviculture practices as well as from a plethora of other improper land-use activities, e.g. construction, mining, channel alterations.

Element b: Expected Load Reduction

The sediment TMDL for *Updated Total Maximum Daily Load Tombigbee River Basin Designated Streams in HUCs 03106105 (Luxapallila Creek) and 03160106 (Middle Tombigbee River)* concluded that yields would need to be reduced by 77-97% within the watersheds in order to reflect stable conditions. The USDA NRCS has a list of approved BMPs to address sedimentation and this list will be used to identify candidate BMPs in Broken Pumpkin Creek watershed.

The Natural Resources Conservation Service has a list of approved BMPs to address sedimentation. This list will be used to identify candidate BMPs to be installed in the Broken Pumpkin Creek Watershed.

Element c: Proposed Management Measures

Coordinating partners with MDEQ include the Mississippi Soil and Water Conservation Commission (MSWCC), the Natural Resource Conservation Service (NRCS), and the local Soil and Water Conservation Districts (SWCDs) throughout the state. These SWCDs are typically housed within USDA Service Centers co-located with NRCS offices. These USDA Service Centers handle federal assistance programs offered through the Farm Bill. As part of these services, SWCD staff communicate regularly with the local landowners and operators within the watershed as they work to support sign-ups for Farm Bill initiatives. Staff from MSWCC and the SWCD depend upon assistance from their NRCS partners in determining landowner interest in the watershed because they are on the farms and in the fields with the landowners, understand the needs at the local level, and have knowledge of the amount of unfunded applications for federal program assistance which meet Section 319 eligibility requirements. Based on their analysis, installation of the following BMPs would help to mitigate sediment issues in Broken Pumpkin Creek watershed: brush management; weed management; prescribed burning; cover crops; critical area planting; sediment basins; diversions; ponds; fencing; filter strips and field borders; firebreaks; grade stabilization structures; grassed waterways; irrigation pipeline; irrigation reservoirs; land clearing; forage and biomass planting; livestock management practices; streambank and shoreline protection; water control structures; terraces; underground outlets; habitat development and management; and forest stand improvements. Factors considered for determining specific locations for the placement of BMPs included the following attributes based upon best professional judgement:

1. Likely water quality benefit;
2. Willing landowners;
3. Implementation of the recommendations of the TMDLs (i.e., "It is recommended that water bodies within [the watershed] be considered a priority for streambank and

- riparian buffer zone restoration and any sediment reduction BMPs, especially for road crossings, agricultural activities, and construction activities);
4. Ease of showing effectiveness of the BMP(s) through monitoring; and
 5. Shorter length of time for anticipated results (i.e., within the grant period).

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 that may contribute match include MSWCC, Noxubee County Soil and Water Conservation District and Lowndes County Soil and Water Conservation District, NRCS, USGS (monitoring), and/or local landowners. For project implementation, administration, management, and watershed plan revision, as well as hosting and facilitating team meetings, MDEQ plans to work under a memorandum of agreement (MOA) with the MSWCC to implement this project. Project partners provided the funding amounts used to estimate costs for BMP installation. Provided below is a summary of estimated costs for potential BMPs and overall project implementation:

Cost Estimate: Full Project Implementation

Practice Name	Unit	No of Units	Unit Cost	Estimated Cost
Brush Management	ac	5	\$44.43	\$222.15
Herbaceous Weed Management	ac	325	\$64.80	\$21,060.00
Prescribed Burning	ac	350	\$42.63	\$14,920.50
Cover Crop	ac	2500	\$55.86	\$139,650.00
Critical Area Planting	ac	55	\$483.84	\$26,611.20
Sediment Basin	cu yd	5000	\$3.34	\$16,700.00
Diversion	cu yd	2500	\$2.40	\$6,000.00
Pond	cu yd	8000	\$3.93	\$31,440.00
Fence	ft	20000	\$2.22	\$44,400.00
Field Border	ac	54	\$631.20	\$34,084.80
Filter Strip	ac	50	\$146.35	\$7,317.50
Firebreak	ft	11000	\$0.24	\$2,640.00
Grade Stabilization Structure	ea	18	\$10,000.00	\$180,000.00
Grassed Waterway	ac	10	\$1,753.81	\$17,538.10
Irrigation Pipeline	ft	20000	\$21.85	\$437,000.00
Irrigation Reservoir	cu yd	40000	\$8.21	\$328,400.00
Land Clearing	ac	20	\$530.65	\$10,613.00
Tree/Shrub Preparation	ac	350	\$255.05	\$89,267.50
Forage and Biomass Planting	ac	60	\$109.48	\$6,568.80
Livestock Pipeline	ft	8000	\$1.91	\$15,280.00

Prescribed Grazing	ac	500	\$57.13	\$28,565.00
Heavy Use Area Protection	ft	15000	\$1.04	\$15,600.00
Livestock Shelter Structure	ft	2000	\$3.38	\$6,760.00
Stream Crossing	ft	3000	\$4.82	\$14,460.00
Streambank and Shoreline Protection	ft	275	\$183.56	\$50,479.00
Structure for Water Control	ft	4400	\$2.06	\$9,064.00
Terrace	ft	9000	\$1.59	\$14,310.00
Tree/Shrub Establishment	ea	66700	\$0.42	\$28,014.00
Watering Facility	gal	2400	\$2.81	\$6,744.00
Underground Outlet	ft	2500	\$5.39	\$13,475.00
Early Successional Habitat Development/Management	ac	25	\$24.03	\$600.75
Forest Stand Improvement	ac	500	\$210.59	\$105,295.00
*Monitoring				\$140,328.00
*Technical Assistance				\$45,000.00
*Education/Outreach				\$41,700.00
*Project Management, Implementation, Coordination, Plan Revision				\$180,978.03

Total Estimated Project Cost **\$2,131,086.33**

* -Denotes fields that are estimated upon five incremental funding cycles of the project

Due to the magnitude of this project, it will need to be incrementally funded. In order to fully address all suggested conservation needs in the watershed, this plan recommends funding be provided in 3 increments. To maximize education and outreach activities and monitoring efforts, MDEQ plans to leverage with existing programs already allocated for funding where possible

Below is the estimated budget for the first incremental funding (Phase 1) of this project:

Cost Estimate: Phase 1 Implementation

Practice Name	Unit	No of Units	Unit Cost	Estimated Cost
Cover Crops	ac	500	\$55.86	\$27,930.00
Diversion	cu yd	8000	\$2.40	\$19,200.00
Fencing	ft	5509	\$2.22	\$12,229.98
Grade Stabilization Structure	ea	8	\$10,000.00	\$80,000.00
Forage and Biomass Planting	ac	100	\$109.48	\$10,948.00
Terraces	ft	25200	\$1.59	\$40,068.00

Tank/Trough	ea	6	\$2,500.00	\$15,000.00
Underground Outlet	ft	1600	\$5.39	\$8,624.00
*Monitoring				\$74,328.00
*Technical Assistance				\$15,000.00
*Education/Outreach				\$13,900.00
*Project Management, Implementation, Coordination, Plan Revision				\$24,290.00

Phase 1 Estimated Project Cost **\$341,517.98**

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 landuse 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 Broken Pumpkin Creek watershed project by tailoring them to address the sedimentation. 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 Broken Pumpkin Creek watershed are 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 Dry Creek Watershed.
- **Watershed Harmony Mobile Classroom** - for ages 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 Broken Pumpkin Creek 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 workplan. 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

In the event of a Section 319 NPS funding award from MDEQ to support implementation of this watershed-based plan for this HUC 12 sub-watershed, MDEQ, along with support from the Watershed Implementation Team and Project Manager (where applicable), will:

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 Tallahatchie 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, MSWCC, USGS, and the Noxubee and Lowndes Co. Soil and Water Districts to determine priority areas that are contributing significant pollutant loads to Broken Pumpkin Creek Watershed	Target priority areas for BMPs	Months 1-2
Establish Watershed Implementation Team to begin refinement of Watershed Based Plan for Broken Pumpkin Creek Watershed	Establish WIT	
	Months 1-2	
Initiate watershed monitoring	Baseline condition monitoring	Completed using historical data
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 installation	Months 6-36
Coordinate with Landowners to inspect BMPs that were installed using Section 319 funds	BMP Inspection	Months 3-36
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

Element h: Load Reduction Evaluation

The State of Mississippi Water Quality Criteria for Intrastate, Interstate, and Coastal Waters 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 TMDL that include Broken Pumpkin Creek. The narrative standard is 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, the monitoring will be conducted to collect data on parameters that are considered surrogates for sediment concentrations and may include measurements for Total Suspended Solids, Total Suspended Sediment, and turbidity along with conventional parameters generally measured to determine aquatic health (e.g. Dissolved Oxygen, pH, Temperature, Conductivity, Dissolved Solids). The following thresholds will be used to measure compliance 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	$\geq 70\% - \leq 125\%$
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
Total Suspended Solids	65 mg/L
Turbidity	75 NTU
Dissolved Solids	Monthly average less than 750 mg/L; instantaneous threshold less than 1500 mg/L
Chemical Oxygen Demand	35 mg/L
M-BISQ East Bioregion	71.6 Calibration 3 (Applicable to waters outside the Mississippi Alluvial Plain)

In addition to chemical data, biological community data and 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. Broken Pumpkin Creek is located in the East bioregion and was determined to be impaired in 2002 compared to the bioregional reference conditions. 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 workplan. At the end of the project, data will be analyzed to determine if the data indicate improvements to water quality in Broken Pumpkin Creek. 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, water quality chemical and biological monitoring was conducted and will serve as baseline data for the project along with any historical data available on Broken Pumpkin Creek. 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. Historical monitoring stations and already scheduled monitoring sites outside of this workplan effort are shown in Figure 2 with the types of monitoring data that have and/or will be collected provided in the table below.

Station ID	Water Body	Sample Year(s)	Collecting Agency	Project	Water Chem	In-Situ	Benthics and/or Algal
TB146	Broken Pumpkin Creek	2019	MDEQ	MBISQ	X	X	X
TB562	Broken Pumpkin Creek	2002	MDEQ	MBISQ	X	X	X

Post-BMP monitoring locations will be selected using best professional judgement 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.

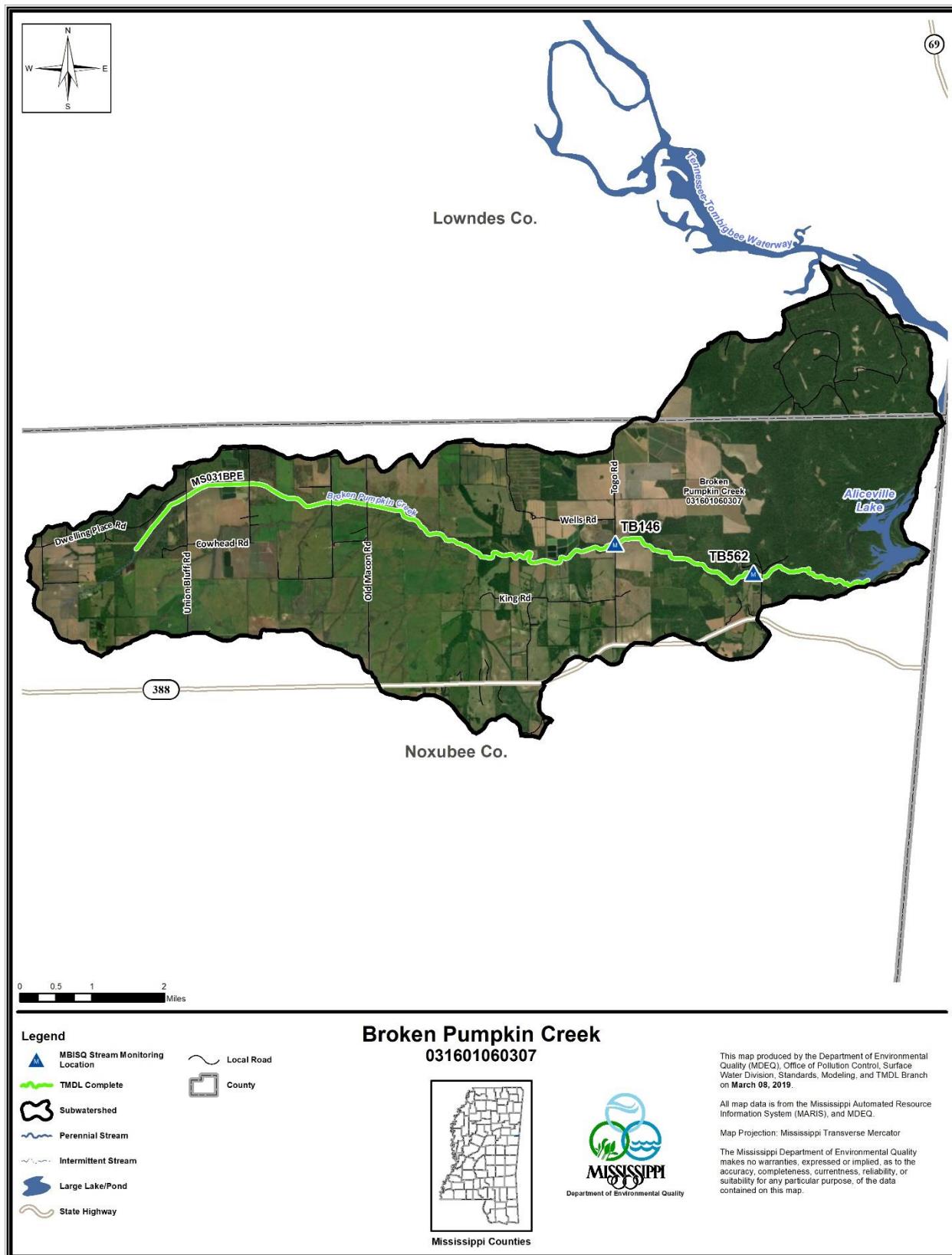


Figure 2: Monitoring Stations Broken Pumpkin Creek Watershed