

Mississippi's Nonpoint Source Management Program

Tennessee River Watershed (MS)
Photo by: Janet Chapman, MDEQ



2015 Annual Report



MISSISSIPPI DEPARTMENT OF
ENVIRONMENTAL QUALITY

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Mississippi's 2015 Nonpoint Source Program Annual Report

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Mississippi River
Photo by: Marty Kittrell



Executive Summary

Nonpoint Source (NPS) Pollution has an adverse impact on the State's water resources. Unlike pollutants from point sources that enter the environment from well-defined discharge points, pollutants from nonpoint sources find their way to surface and ground waters via rainwater runoff or percolation. The polluted runoff can contain sediment, nutrients, bacteria, or toxic materials. Nonpoint Source runoff from the seven major land-use categories listed below potentially impacts the State's water bodies. These categories consist of agriculture, forestry, mining, construction activities, urban runoff, hydrologic modifications, and land-disposal activities. Polluted runoff is a significant cause of water-quality problems in Mississippi. The NPS Pollution Control Program seeks to reduce or eliminate polluted runoff that degrades water bodies in Mississippi.

The State's NPS Management Plan incorporates a strategy for the management and abatement of NPS pollution and relies on statewide and targeted watershed approaches. These approaches are implemented through both regulatory and non-regulatory programs on the federal, state, and local levels. Some of the activities regulated by the State include: construction, stormwater, mining, and hydrologic modifications. The strategies for the management of these activities are to continue developing and implementing educational programs and to continue issuing permits and maintaining compliance and enforcement activities. The implementation of program activities for land-use categories that are not regulated will rely primarily on the voluntary cooperation of stakeholders and will be supported financially through federal assistance programs such as Section 319 and other state resources. The strategies for addressing NPS pollution on a statewide level include education/outreach, assessment and monitoring, use of Best Management Practice (BMP) and nutrient reduction demonstrations, BMP compliance, technology transfer, consensus building, and partnering.

The NPS Management Program also implements a strategy that targets priority watersheds. Prioritization of these watersheds is done by multi-agency teams in the Basin Management Approach (BMA). Within priority watersheds, activities will be implemented to address parameters of concern that appear on the State's 303(d) list. The State's NPS Program also incorporates [Mississippi's Strategies to Reduce Nutrients and Associated Pollutants](#), and the State's strategy for the development and implementation of NPS Total Maximum Daily Loads (TMDLs).

The NPS Program continues to be implemented in cooperation with several agencies, organizations, and groups at all levels of government and in the private sector. A great focus is given to activities that promote consensus building and partnering to increase the overall effectiveness of the State's NPS Program. One key partnership to increase this overall effectiveness is with the USDA Natural Resources Conservation Service (NRCS). In one example of this partnership, Section 319 funds are used for assessment and monitoring of National Water Quality Initiative (NWQI) sites where the NRCS has or will implement various conservation practices such as cover crops, filter strips, and terraces.

MDEQ's program strategy will be implemented to meet the long-term goals of the program. The long-term goals will, in turn, be achieved by implementing five-year action plans. These plans will be modified as more data and new issues are identified under the BMA.

This report relates several accomplishments during calendar year 2015 that directly relate to and support the long-term and short-term action strategies identified in the State's NPS Management Program. These accomplishments include characterization, assessment/monitoring, and protection/restoration of impeded

water bodies. Of course, education and outreach activities are inherent to each protection/restoration project so as to gain local stakeholder support and involvement.

Characterization/Assessment/Monitoring. Major assessment and monitoring accomplishments during 2015 include: the further development, refinement, and use of the *Mississippi Benthic Index of Stream Quality (M-BISQ)*; continued tiered monitoring in support of NRCS's National Water Quality Initiative (NWQI), and NPS BMP implementation monitoring in conjunction with watershed projects.

Protection/Restoration. In addition to the above activities, there continues to be much progress in the protection and restoration efforts of specific watershed projects. Four projects are showcased in this report: 1) Bell Creek-West Prong Muddy Creek; 2) Tarebreeches Creek-Tuscumbia River Canal; 3) Porter Bayou; (4) Rotten Bayou.

Bell Creek-West Prong Muddy Creek is a 19,277 acre sub-watershed of the 63,682 acre Muddy Creek Watershed. Current land uses in the Muddy Creek Watershed include 32% agricultural, 39.2% forestry, 6.2% urban, and 22.6% other. This project targeted an area of about 3,940 acres in which selected Best Management Practices (BMPs) were implemented. Primary focuses of the project were to improve and protect water quality, to reduce nutrient and sediment loading, and to provide outreach to the public. Through the joint efforts of federal, state, and local partners, a total of 81 BMPs were installed, affecting 255.1 acres and saving approximately 2,125 tons of soil per year.

Tarebreeches Creek-Tuscumbia River Canal is a 16,721 acre sub-watershed of the 204,311 acre Tuscumbia River Canal Watershed. Current land uses in the Tuscumbia River Canal Watershed include 32% agricultural, 35.3% forestry, 9% urban, and 23.7% other. This project targeted an area of about 9,240 acres in which selected Best Management Practices (BMPs) were implemented. Primary focuses of the project were to improve and protect water quality, to reduce nutrient and sediment loading, and to provide outreach to the public. Through the joint efforts of federal, state, and local partners, a total of 45 BMPs were installed, affecting 579.4 acres and saving approximately 3,191 tons of soil per year.

Porter Bayou is a watershed in the Mississippi Delta comprised mainly of productive agricultural land, having about 80 % of its watershed consisting of these types of lands. Naturally, there are nutrient-laden sediments that need to be reduced and prevented from reaching waters further downstream. The main objective of this project is to determine what reductions are achievable using Best Management Practices (BMPs) and the cost to implement these practices as defined in the state's nutrient reduction strategy. This project serves as a noteworthy example of leveraging resources in a collaborative effort. Nutrient-load reductions for BMPs implemented during 2015 are showing reductions of over 206 lbs/yr of phosphorous, 405 lbs/yr of nitrogen, and 206 tons/yr of sediment in Mississippi waters.

Rotten Bayou is a coastal watershed containing 22,246 acres and is a tributary to St. Louis Bay. Mississippi's [*Coastal Nutrient Reduction Strategy*](#) is currently being implemented in the Rotten Bayou Watershed. Tributaries of St. Louis Bay, including Rotten Bayou, have a TMDL for organic enrichment, low dissolved oxygen (DO), and nutrients. MDEQ is leveraging with nine different federal, state, local government, and non-profit organizations to address livestock, forestry, urban stormwater, and atmospheric deposition. A Watershed Implementation Plan has been developed for the Rotten Bayou Watershed.

Education and Outreach. Education and outreach activities are inherent to each of MDEQ's protection and restoration projects. These activities become a part of the watershed implementation plan for that project. For example, *Adopt-A-Stream* is a program that includes water-education workshops on streams themselves. Streams having protection/restoration projects are given priority for locating and conducting these workshops. Similarly, other education/outreach activities are treated in the same way as much as

possible. There are some activities that are generic and have statewide applicability. Activities in addition to *Adopt-A-Stream* described in this report include: 1) *Envirothon Competition*; 2) *Environmental Teacher Workshops*; 3) *WaterFest Event on the Ross Barnett Reservoir*; 4) *Student Environmental Day Camps*; 5) *Enviroscape and Groundwater Models* 6) *Make-A-Splash* and; 7) the *Storm Drain Marking Program*.

What is Nonpoint Source Pollution?

Nonpoint source (NPS) pollution has an adverse impact on the State's water resources. Unlike pollutants from point sources that enter the environment from well-defined discharge points, pollutants from nonpoint sources find their way to surface and ground waters via rainwater runoff or percolation. Nonpoint Source runoff can contain sediment, nutrients, bacteria, or toxic materials. This runoff comes from seven major land-use categories and can potentially impact the State's water bodies. These seven categories are: agriculture, forestry, mining, construction activities, urban runoff, hydrologic modifications, and land-disposal activities. Polluted runoff is a significant cause of water-quality problems in Mississippi. The Nonpoint Source Pollution Control Program seeks to reduce or eliminate polluted runoff that degrades water bodies in Mississippi.

Mississippians enjoy a rich heritage of natural resources. From headwater streams to the Gulf of Mexico, Mississippi's land has been blessed. The charge given to the MDEQ is to conserve the environment while allowing economic development to occur in concert with good environmental practices.

The Mission of the NPS Pollution Control Program in Mississippi is to conserve and improve state waters for man's use and the sustainment and propagation of wildlife and aquatic life, through focused research, responsible regulation, widespread education, and cooperation with other agencies and the public."



Agricultural BMP



Urban BMP



Construction BMP

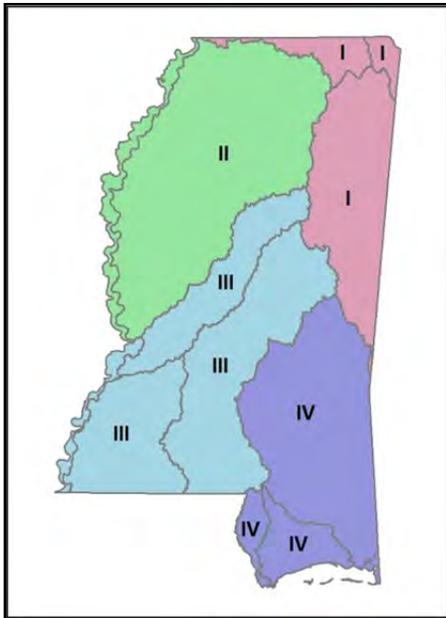
History

The 1987 Amendments to the Clean Water Act (CWA) established a national policy that programs be developed to control nonpoint sources of pollution. Congress inserted Section (§) 319 in order to establish a national program to address nonpoint source pollution. It authorized the EPA to issue grants to states and, in order for the states to receive these grants, required the states to assess NPS pollution problems and causes within the State, and to implement a management program to control NPS pollution. Every few years, the states must document their efforts and results in assessing pollution problems and implementing their management programs.

The NPS Program was originally established to provide education and outreach regarding the seven categories of NPS pollution, demonstrate the effectiveness of Best Management Practices (BMPs), investigate the ability of new practices and technologies to reduce NPS pollution, and to assess NPS sources and impacts to waters of the State. In 1999, the NPS Program began to change its focus as the Total Maximum Daily Load (TMDL) issue gained national attention. Questions were raised at both the state and the federal level as to how to address any NPS pollution reductions that might be required in a TMDL. MDEQ addressed the question by developing the Basin Management Approach (BMA) which has been used from the year 2004 to present.

The *Mississippi Nonpoint Source Management Program 2014 Update*, noted above, still emphasizes the BMA, builds upon the lessons learned since the *2000 Update*, and presents management strategies that can be used by a broad audience to decrease NPS pollution in the State.

Moving into the future...



The mission of the BMA is to foster stewardship of Mississippi's water resources through collaborative watershed planning, education, protection, and restoration initiatives. To accomplish this, ten of Mississippi's major river basins have been organized into four basin groups (see map inset). Each basin group has a basin team comprised of state and federal agencies and local organizations. This team provides the opportunity for multiple levels of government and local stakeholders to coordinate their efforts. Together, basin team members help assess water quality, determine causes and sources of problems, and prioritize watersheds for water-quality restoration and protection activities. The BMA also encourages and provides the opportunity for basin-team members to pool both technical and financial resources to address priority watersheds. More information on Mississippi's BMA and the NPS Program can be found on MDEQ's website: <http://www.deq.state.ms.us>.

Highlights of the Year

Assessment & Monitoring/ TMDL Activities

Total Maximum Daily Load and Modeling Section

Total Maximum Daily Loads (TMDLs) are a requirement of the Clean Water Act (CWA) to provide direction for restoring the nation's waters. TMDL reports provide an analysis of the ability of a water body to assimilate pollutants from point sources, such as industry and communities, and nonpoint sources, such as storm water runoff from urban areas or agriculture.

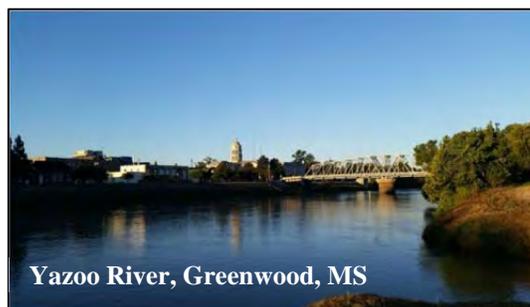
Water bodies that do not meet water-quality standards are identified as "impaired" for the particular pollutants of concern. Under [Section 303\(d\) of the Clean Water Act](#) states are required to develop a list of waters that are not in compliance with water quality standards and establish a total maximum daily load (TMDL) for each pollutant causing the impairment. Biennially, MDEQ creates a list of these impaired waters called the Section 303(d) List of Impaired Waters. MDEQ's 2014 list was adopted by the Mississippi Commission on Environmental Quality on June 26, 2014. This list will be updated in 2016 in compliance with schedules defined in the CWA. MDEQ had 4 TMDLS approved between June 2014 and July 2015 and is also currently working on 6 stressor identification (SI) reports on water bodies that are identified as biologically impaired. These SI reports span across the Tombigbee River, Yazoo River, and Pearl River Basins and are the process by which primary probable pollutants are identified for waters that are assessed as biologically impaired.

MS Prioritization Framework

The Mississippi Department of Environmental Quality (MDEQ) is complying with a national initiative by the U.S. Environmental Protection Agency (EPA) to develop a new collaborative framework for implementing Section 303(d) of the CWA. EPA's new framework— [A Long-Term Vision for Assessment, Restoration, and Protection under the CWA Section 303\(d\) Program \(PDF\)](#) — is referred to as the *Vision*. According to EPA, the Vision is designed to help coordinate and focus EPA and State efforts to advance the effectiveness of the CWA Section 303(d) Program direction in the coming decade, based on lessons learned from the past two decades in assessing and reporting on water quality.

Yazoo River Nutrient Model Calibration Study Project

A water quality study on the Yazoo River located in northwest Mississippi was initiated in the summer of 2015. The project was a joint collaboration with the Environmental Protection Agency (EPA) to evaluate physical and chemical parameters of the river and its segments. The primary objective of this study was to collect water quality samples for the evaluation and development of water quality model inputs to characterize the current conditions of the Yazoo River. Study efforts



included water quality sampling for an array of analytes including long-term biological oxygen demand (BOD), nutrients, solids, and algal analyses. The study area included five locations that were selected to provide representative data on waters receiving pollutants from a wide range of agricultural and industrial sources.

This study helps generate data to estimate the total nutrient load allowable in the river and the nutrient input from the point source dischargers.

Turkey Creek Fecal Coliform Revised TMDL

In 2015, Turkey Creek, located in Harrison County and within the Coastal Basin, was selected by EPA as 1 of 51 projects for restoration on a national level. This water body was included in EPA's "Making A Difference in Communities Task Initiative." In an effort to join with EPA on this task, MDEQ voluntarily revised the TMDL report for Fecal Coliform for this water body that was previously completed in 2003. MDEQ collected more water quality data since the issuance of the 2003 TMDL and believed a revision in the report was necessary based upon the data. Additionally, MDEQ held several meetings with the community and local officials to further address concerns of the community. From these meetings, MDEQ is partnering with EPA and other agencies to do more frequent monitoring of the creek. This additional monitoring will be used to set a foundation for helping to restore water quality to this water body and to notify the community of possible violations.

Modeling for NPDES Permit Limits

Another sector of MDEQ's TMDL Program is Waste Load Allocations (WLAs). In addition to the TMDLs and stressor identification efforts, TMDL staff members are actively involved in the ongoing issuance/reissuance of WLAs. This includes the development of new and/or review of current NPDES permit limits. As a part of this process, the Modeling and TMDL Branch uses water quality models to replicate conditions of a stream and determine the appropriate loads that are allowed from dischargers as a result of those conditions. The Modeling and TMDL Branch completed approximately 73 WLAs from October 2014 to September 2015 to assist the permitting branch in meeting their permitting goals.

Numeric Nutrient Criteria Development

In 2015, MDEQ continued efforts to develop numeric nutrient criteria for Mississippi's various water body types. MDEQ's goal is to develop scientifically defensible criteria that are appropriate and protective of Mississippi's waters. The criteria for each water body type will be coordinated with other water body types to ensure consistency across the State and protection from downstream impacts. Highlights of MDEQ's numeric nutrient criteria development efforts include:

- MDEQ established the Mississippi Nutrient Technical Advisory Group (TAG) in 2010. The mission of the TAG is to provide technical expertise and regional knowledge to MDEQ for the development of scientifically defensible numeric nutrient criteria. The TAG consists of over 30 members representing multiple state and federal agencies and four Mississippi universities. In 2015, the Mississippi Nutrient Technical Advisory Group focused on providing continued technical input on developing nutrient criteria for Mississippi's wadeable and non-wadeable streams, lakes and reservoirs, coastal and estuarine waters, and Mississippi Delta waters. MDEQ continues data analyses efforts based on recommendations from the TAG.
- In 2015, MDEQ continued to provide Nutrient Criteria Update Sessions for Mississippi stakeholders. MDEQ held two stakeholder update sessions providing stakeholders with an update

regarding the work MDEQ is performing to develop the criteria. These update sessions also promote open communication between MDEQ staff and stakeholders. MDEQ plans to hold update sessions regularly with this group throughout the numeric nutrient criteria derivation process. MDEQ's goal is to promote transparency of the process and provide stakeholders an opportunity to ask questions and provide feedback to MDEQ and the Mississippi TAG.

- In 2015, MDEQ continued to plan for numeric nutrient criteria implementation. While developing the criteria values themselves, MDEQ also focused significant efforts on exploring concerns and questions raised both internally by MDEQ staff and stakeholders. The details pertaining to how numeric nutrient criteria will be implemented must also be developed and understood by both MDEQ staff and Mississippi stakeholders. MDEQ will continue to work concurrently on both criteria development and implementation planning for Mississippi.
- MDEQ continues to collect data and conduct studies to fill data gaps in support of nutrient criteria development.

Mississippi Benthic Index of Stream Quality (M-BISQ)

In 2001, MDEQ developed the *Mississippi Benthic Index of Stream Quality, Development and Application of the Mississippi Benthic Index of Stream Quality (M-BISQ)* (MDEQ 2003b). This *Index of Biotic Integrity (IBI)* is used to determine the status or overall health of all wadeable, non-tidal streams in Mississippi with the exception of those located in the Mississippi Alluvial Plain. The monitoring locations for the biological sampling have been targeted to ensure that, where possible, all 12-digit watersheds have biological samples for the main-stem drainage of that watershed. The data collected and resulting water quality assessments are critical in measuring success for MDEQ water programs. Monitoring efforts completed with the support of this funding have greatly increased the number of biological assessments conducted on state waters. The M-BISQ sampling program and the established sampling and analytical methodology contained therein now serves as the foundation for routine biological monitoring in MDEQ's statewide *Status and Trends Ambient Monitoring Network*. The M-BISQ was originally developed using biological and environmental data collected from 463 stream locations. Since 2001, approximately 1,735 biological samples have been collected from approximately 1,400 sites. As part of routine index maintenance, it is a common practice to re-calibrate IBIs every 3-5 years to ensure that the index continues to accurately reflect stream health. As such, in 2008, the M-BISQ was recalibrated using data that were collected since the original development of the index in 2003. These additional data were used to both test the performance of the original *M-BISQ* and to re-calibrate the index. Over the past several years, MDEQ has been targeting wadeable streams in blackwater systems. Using these data, MDEQ is in the process of re-calibrating the M-BISQ again to investigate the applicability of a separate site class for blackwater systems. If successful, this will increase the sensitivity of the index. The ongoing re-calibration of the M-BISQ is scheduled for completion in early 2016. As part of MDEQ's routine monitoring program, approximately 100 samples are scheduled for collection annually.

Mississippi Alluvial Plain Monitoring

In 2002, MDEQ began collecting biological community, physical, chemical and habitat data on wadeable streams in the Mississippi Alluvial Plain, commonly referred to as the Mississippi Delta. These data, along with historical monitoring in the Mississippi Alluvial Plain will be used to develop an index of biological integrity for the Mississippi Delta. The effort to develop an index of biological integrity for the Delta is an ongoing effort with the USGS. The data collected are also being used to evaluate the dissolved oxygen levels in the Delta as well as support nutrient criteria development. With each new set of data

collected annually during September to October, the index will be refined, and when finalized, biological monitoring in the Mississippi Delta will be incorporated into MDEQ's *Ambient Monitoring Program*. Since monitoring was initiated in 2002, approximately 100 sites have been monitored. In 2011, MDEQ acquired Light Detection and Ranging (LIDAR) data for the Mississippi Alluvial Plain and has used that data to establish drainage areas for each of the monitoring locations. Land use analyses have been completed, and were used to refine the preliminary index. A draft report is currently in the review process. Additional data gaps were identified and the final report should be available in 2016.

Geographic Information Systems (GIS) and Mapping of NPS Projects

GIS is used extensively by NPS staff in watershed project planning, data delivery, monitoring, and budget tracking. The NPS Management Branch uses a collection of GIS tools along with available data to accomplish its goals, with three influential applications being: 1) *The Mississippi Water Quality Data Compendium*; 2) *The Mississippi Watershed Characterization and Ranking Tool (MWCRT)*; and 3) *The NPS Watershed Resource Management System (WRMS)*. In support of these tools, the NPS program maintains a geodatabase of locational information for all current and historical Best Management Practice (BMP) installations and also stores information regarding assessment and monitoring of NPS projects by the MDEQ and its partners.

Mississippi Agricultural Chemical Groundwater Monitoring Program

The *Mississippi Agricultural Chemical Groundwater Monitoring (AgChem) Program* was initiated in March 1989, for the purpose of determining if the use of agricultural chemicals is impacting groundwater quality in Mississippi. As of June 30, 2015, the Program has sampled over 2,120 groundwater sources throughout the State. To date, results indicate that no significant impacts to groundwater quality are directly attributable to agricultural practices in the State.

During the state fiscal year 2015, 60 samples were collected for analysis. Included in this total were thirty-one drinking water samples, and twenty-nine irrigation, fish culture or wild-life management samples. The program remains committed to testing wells statewide, including those located in the highly agriculturalized Mississippi Delta. Analysis of the 60 samples performed by the AgChem program showed only two detects of organic compounds exceeding Federal Primary Drinking Water Standards and/or State of Mississippi Groundwater Standards. The sample sites will be retested in fiscal year 2016 and will be resampled as a precautionary measure in subsequent years. For inorganic testing, one sample indicated a lead concentration above Federal Drinking Water Standards and thirteen samples indicated concentrations of iron above Federal Secondary Drinking Water Standards for FY2015.

Developing and Implementing Conjunctive Water Management Strategies for the Mississippi Delta through the Delta Sustainable Water Resources Task Force

The Delta is a land of rich cultural tradition with some of the most fertile soils in the world. For more than 150 years the region has been a major supplier of cotton and more recently food to this country and the world. With its extraordinary land and water resources, and with the world's population growing exponentially, the Delta is poised to experience the greatest period of prosperity in its history, but only if it manages its water resources responsibly.

While the region is water rich with over 50 inches of rainfall annually, less than half of this falls during the growing season. Approximately two million acres in the Delta are irrigated, primarily with groundwater pumped from the Mississippi River Valley Alluvial Aquifer (MRVA). Groundwater levels in the MRVA are declining as irrigation demands have increased. Increased irrigation demand over time has resulted in declines of water levels of almost one foot per year in some parts of the MRVA.

By law, the Mississippi Department of Environmental Quality (MDEQ) is charged with “conserving, managing, developing, and protecting” the state’s water resources for current and future generations and ensuring responsible beneficial use. The Delta Sustainable Water Resources Task Force (Task Force) was originally organized in 2011 and was later formalized by an executive order of Governor Bryant in 2014. The Task Force promotes conservation measures, irrigation management practices, and implementation of alternative Delta surface and groundwater supplies; advises MDEQ on policies related to water resources; and promotes the implementation of strategies and plans developed through the Task Force to ensure the future sustainability of water resources in the Delta. MDEQ leads the Task Force which includes representatives from: Delta Council, Delta F.A.R.M., Mississippi Farm Bureau Federation, Mississippi Soil and Water Conservation Commission, Natural Resources Conservation Service, U.S. Army Corps of Engineers, and Yazoo-Mississippi Delta Joint Water Management District.

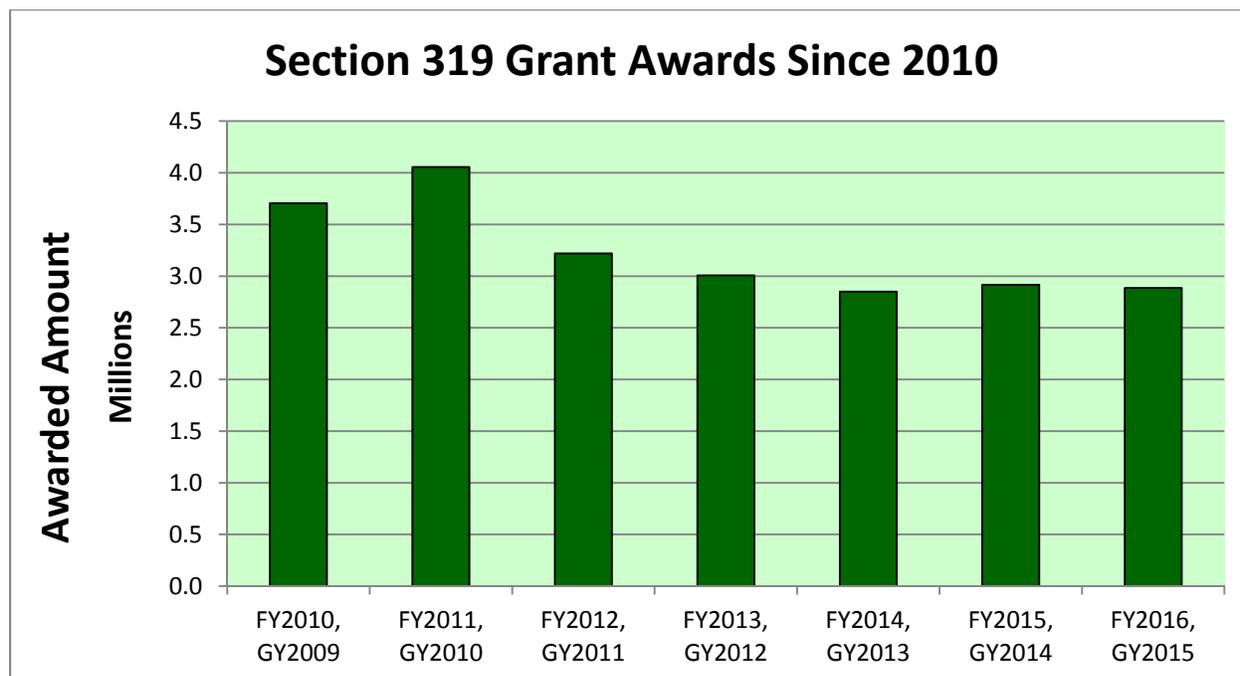
Because irrigation is the driver of water level declines in the MRVA, the initial efforts of the Task Force focused on acquiring better information on irrigation withdrawals from the MRVA. Accurate water use data was essential to improve the science that informs policy decisions and to encourage more efficient water use. Moreover, it was decided that the best way to get this information was through fixed flow meters installed on at least 10% of MRVA wells with good geographic distribution throughout the Delta. Metered water use data could be used by the Task Force in evaluating water conservation scenarios; assessing the effectiveness of different irrigation management practices; and determining the need for additional surface water supplies. The meters would also give water users a tool to help them better understand, more carefully manage, and possibly reduce their water use.

In February 2013, MDEQ implemented the Voluntary Metering Program. Task Force members supported the program with the understanding that mandatory metering will be implemented if the program’s deadlines are not met.

Voluntary Metering Program Deadlines:

- June 30, 2014- fixed meter must be installed on 5% of all MRVA wells in each county. This deadline was met.
- February 1, 2015 - metered water use for 5% of the MRVA wells in each county must be reported to MDEQ. This deadline was also met.
- December 31, 2015- fixed meter must be installed on a total of 10% of the MRVA wells in each county.
- February 1, 2016 (and annually thereafter) - metered water use for the previous calendar year must be reported to MDEQ for each meter installed under the program. MDEQ developed an online reporting tool to report water use through MDEQ’s website.

Program Funding

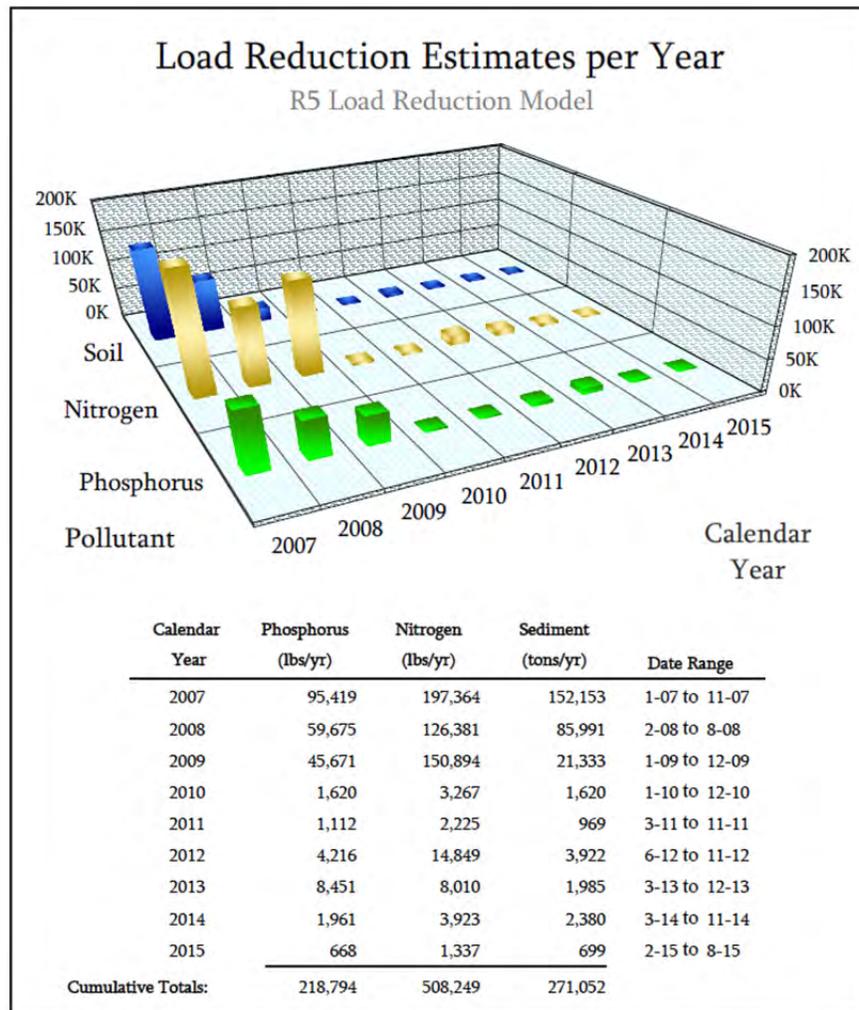


Leveraging Opportunitites

Since the inception of the §319 Nonpoint Source Program in 1990, various types of projects have been funded, including demonstrations of BMPs in watersheds; agricultural/chemical waste disposal; alternatives for converting dairy-cow wastes into electrical power and preventing possible stream pollution from those wastes; industrial-plant demonstrations that focused on preventing NPS pollution in industrialized watersheds; coastal streams ecosystem restoration; conservation easements that encouraged and assisted farmers to place lands into riparian-buffer strips; development and implementation of approaches that will restore and sustain surface and groundwater resources in perpetuity in the Mississippi Delta and; a variety of educational and outreach projects. One recent and salient development includes the planning of *Low Impact Development (LID)* features in an urban area on the Gulf Coast. In recent years, §319 NPS funding has been used more and more to support nutrient reductions in large watersheds. The strategy behind this approach is to use the committed §319 resources to attract additional leveraging opportunities, that together, create a greater potential to achieve quantifiable reductions in nutrient concentrations/loadings. A special effort is focused on the *Mississippi River Basin Initiative (MRBI)*. This initiative, in turn, focuses on reduced nutrient input from agricultural lands that drain into the Mississippi River and contribute to the Gulf of Mexico's hypoxia problem. As a part of the MRBI, NPS funds are being used to investigate problems and solutions concerning conjunctive water uses in the Delta that threaten water tables. Another important initiative is a partnership with NRCS relative to their *National Water Quality Initiative (NWQI)*. In this effort, NPS funds are being used to support monitoring efforts on NWQI sites where the NRCS has implemented BMPs. With these large-scale projects, it is anticipated that a heightened focus on pre- and post-implementation monitoring will document the improvements in resulting water quality. In 2015, during the fourth year of the NWQI, a total of \$723,311 was allocated in three priority watersheds: Porter Bayou, North Tippah Creek, and Chase Bayou-Sammy Creek. This funding treated 975.2 acres in order to reduce sediment and nutrients delivered to those impaired water bodies.

Estimated Nonpoint Source Load Reduction Achieved

The goal of many §319 funded projects is to control, reduce, and alleviate pollution loads into Mississippi’s lakes, rivers, and streams. The use of BMPs such as soil stabilization, weirs, and filter-strips is the leading strategy for reducing NPS pollution impacts. These types of BMPs are easily recognized and their effectiveness is often easily calculated using the Region 5 (R5) mathematical model. The load reductions estimated in the R5 model include phosphorous, nitrogen, and sediment. The fundamental methodology of this model is based on *Pollutants Controlled Calculation and Documentation for Section 319 Watersheds Training Manual* (Michigan DEQ, June 1999). Although the R5 model is an important tool in nutrient-reduction calculations, it is not inclusive of all BMPs. There are many other highly effective agricultural BMPs with impacts that are not as easily estimated, such as prescribed grazing, heavy-use area protection, and livestock fencing. The data calculated through the R5 model are entered into the Environmental Protection Agency’s *Grants Reporting and Tracking System* (GRTS) so that the load reductions are available within the database. The cumulative total reductions for projects from 2007 to the end of the 2015 calendar year were: phosphorous – 218,794 lbs/yr; nitrogen – 508,249 lbs/yr; and sediment – 271,052 tons/yr.



Nutrient Reduction Strategies

Mississippi's collaborative, leveraged approach to reduce excessive nutrients and their impacts focuses on the development and implementation of appropriate nutrient reduction strategies. During 2009, strategies were developed to reduce excessive nutrient loadings for the Mississippi Delta, the primary region of row-crop agriculture and aquaculture in the State. This effort was co-led by MDEQ and Delta F.A.R.M. (Farmers Advocating Resource Management).



During late 2009, MDEQ, working through the Gulf of Mexico Alliance's Nutrients Team, facilitated the development of a common template for Gulf of Mexico States to encourage a consistent, aligned approach to reduce excessive nutrients regionally. This template is now being implemented in Mississippi and Louisiana as both states use it to guide them in developing state-specific nutrient reduction strategies for their coastal watersheds. During September 2010, MDEQ, working through the Hypoxia Task Force, facilitated the development of a common framework for states within the Mississippi/Atchafalaya River Basin to reduce excessive nutrients and mitigate Gulf hypoxia. Additionally, in a similar effort, Mississippi also developed nutrient reduction strategies for the upland areas of the State.

In 2015, strategies for the Delta, the Mississippi Coast, and Mississippi Uplands continued to be implemented in watersheds in each region to establish a comprehensive, state-level approach to reduce nutrient loadings from nonpoint and point sources

Basin Management Approach

The mission of the Basin Management Approach is to foster stewardship of Mississippi's water resources through collaborative watershed planning, education, protection and restoration initiatives. To accomplish this, ten of Mississippi's major river basins have been organized into four basin groups. Each basin group has a basin team of state and federal agencies, non-governmental organizations, and other stakeholders.

Implementing Nutrient Reduction Strategies and TMDLs on the Mississippi Coast

Basin Group 4 (Pascagoula River, Coastal Streams, and Lower Pearl) has received emphasis on more protection-oriented watershed projects in contrast to restoration-oriented projects. These projects have focused on the acquisition of conservation easements and have also included the installation of BMPs at Dead Tiger/Orphan Creek, Red Creek, and Turkey Creek. A Pathogen TMDL was completed in 2003 for Turkey Creek; however, MDEQ collected more recent monitoring data and revised the TMDL report based upon this new data, in 2015. Turkey Creek is an EPA- and MDEQ-priority watershed. These projects are currently in the implementation phase. The Wolf River Conservation Society has completed a Watershed Implementation Plan (WIP) that includes both 1) Protection and Restoration Projects and; 2) Education and Outreach Projects.

The *Coastal Mississippi Nutrient Reduction Strategy* is being implemented in a coastal Mississippi watershed project in Rotten Bayou. A Final Rotten Bayou Watershed Implementation Plan was developed

by the Rotten Bayou Watershed Partnership and presented in September, 2015. See **Rotten Bayou Watershed Project** below.



Blueways, which are paddling trails on waterways, have now been developed on Old Fort Bayou, the Pascagoula River, Red Creek, Bogue Homa, and the Jourdan River. Blueways are also planned for Turkey Creek, Tchoutacabouffa River, and the Wolf River.

Celebrate the Gulf is an environmental outreach event that was established in 1991. It is held annually in Pass Christian's War Memorial Park overlooking the Pass Christian harbor. It is a fun-filled family event designed to educate and inform participants about all aspects of the Gulf of Mexico and associated

wetlands and tributaries. More than 25 exhibitors participate in the event. They include a broad range of conservation groups and governmental agencies, who provide hands-on interactive exhibits primarily geared toward children. Each year MDEQ reaches out to public and private elementary schools along the Gulf Coast to encourage attendance by students and their families. Cash prizes are awarded to the schools with the most participation. The event is held in conjunction with *Art in the Pass* which will celebrate its 18th anniversary this year.

Implementing Nutrient Reduction Strategies and TMDLs in the Mississippi Uplands

The *Upland Nutrient Reduction Strategy Implementation* in the North Independent Streams Basin has been progressing according to schedule. Two watersheds were selected for installation of BMPs to reduce nutrient pollution. These are the Bell-Muddy Creek Watershed in Tippah County and Tarebreeches Creek Watershed in Alcorn County. BMPs installed in the Bell-Muddy Watershed are: 5,277 feet of stream-bank and shoreline protection; three water and sediment-control basins; 30 grade-stabilization structures; three tank/troughs; 2,742 feet of fencing; 14.5 acres of critical-area planting; 27 acres of pasture and hay-land planting; and, 146 acres of nutrient management. The Tarebreeches Creek Watershed has the following BMPs: 381.9 acres of pasture and hay-land planting; five heavy-use area protections; two tank/trough; 550 feet of lined waterway; 16 grade-stabilization structures; 550 feet of stream-bank and shoreline protection; 170.4 acres of nutrient management; one check dam; and, one stream crossing. Additional project funds were allocated to implement all these BMPs. These two projects have now been completed.

Monitoring began in February 2012 on both watersheds and consisted of sampling for nutrients, sediment, and biological integrity. After an appropriate time interval, the post-BMP implementation monitoring will be conducted.



The Buttahatchee Forum is a bi-state initiative concerning the Buttahatchee River watershed in Alabama and Mississippi. Natural resource practitioners and scientists have met and are developing an action plan for restoration and protection of the water resource. Data will be collected and analyzed to know where restoration efforts will have the most impact.

Implementing Nutrient Reduction Strategies and TMDLs in the MS Delta

Implementation of the Delta Nutrient Reduction Strategy (DNRS) is currently ongoing in multiple priority watersheds to answer the following key questions:

- What nutrient load reductions are achievable?
- What will be the cost for these reductions?
- What will be the associated environmental and economic benefits from these reductions?

Harris Bayou watershed: Harris Bayou, a tributary of the Big Sunflower River, flows through portions of Bolivar and Coahoma counties. A §319 implementation project (3/2010 – 8/2013) was conducted to implement the Delta Strategy in two project areas: Treatment Area (1,700 acres) and Control Area (1,300 acres). Collection of Tier 1 nutrient data for the treatment/control catchments has ceased after five years and is currently under analysis.



2-stage Ditch/Low Grade Weir

The current priority sub-watershed is Overcup Slough, which is located in the headwaters of the watershed and contains both catchments that have been the focus of the DNRS implementation efforts since 2010. BMPs implemented during 2015 in the Overcup Slough sub-watershed include: water control structures (28), low grade weirs (3), and two-stage ditch (3,500 ft). Approximately 2,000 acres of cover crops were implemented during the fall/winter of 2015.

With Tier 2 monitoring in place at the pour point of the watershed, the current project will continue to incrementally implement BMPs to address prioritized resource concerns.

Porter Bayou watershed: Porter Bayou, also a tributary of the Big Sunflower River, flows through portions of Bolivar and Sunflower counties. A §319 implementation project (3/2010 – 8/2013) was conducted to implement the DNRS in north project area (1,000 acres) and the south project area (2,500 acres). Collection of Tier 1 nutrient data has ceased after five years and is currently under analysis.



Cover Crops

The current priority sub-watersheds are Upper Porter Bayou and Middle Porter Bayou, which contain the catchments that have been a focus of continued DNRS implementation efforts. The following BMPs have been implemented during 2015:

- Upper Porter Bayou: water control structures (52), low grade weirs (12), and two-stage ditch (15,000 ft)
- Middle Porter Bayou: water control structures (15), low grade weirs (4), and two-stage ditch (5,000 ft)

Approximately 1,000 acres of cover crops were implemented during the fall/winter of 2015. With Tier 2 monitoring in place at the pour point of both sub-watersheds, the current project will continue to incrementally implement BMPs to address prioritized resource concerns.

Coldwater River watershed: Coldwater River, a tributary of the Tallahatchie River, flows for about 220 miles through portions of Coahoma, Desoto, Marshall, Quitman, Tate and Tunica counties in the northwestern Mississippi. Also, collection of Tier 1 nutrient data has ceased after five years and is currently under analysis.

Lake Washington watershed: Lake Washington is another existing project retrofitted for implementation of the Delta nutrient reduction strategies. Lake Washington is a 1400-acre oxbow lake lined with cypress trees; because of its beauty and relatively abundant fish population, the lake is a popular recreation area that contributes to the local economy. The lake also serves as a water supply for agricultural irrigation. Nonpoint source (NPS) pollution contributes nutrients and sediment loads into the waters of the Lake Washington Watershed.



BMPs were installed by using EPA Section 319, NRCS (through EQIP, CSP and other programs), and other funds. Currently, USGS is analyzing the collected water quality data to determine the effects of BMP implementation in this watershed.

Steele Bayou watershed: Steele Bayou drains approximately 520,446 acres of the Yazoo River basin in portions of Issaquena, Sharkey, Warren and Washington counties in west central Mississippi. In addition to the drainage, the bayou provides a source for irrigation and recreational activities such as fishing and hunting. Approximately 2,500 acres of cover crops are planned for the fall/winter of 2015.

Wolf-Broad Lake watershed: Wolf-Broad Lake is located in Humphreys and Yazoo Counties in the southwestern portion of the MS Delta. Wolf-Broad Lake provides a source for recreation. Approximately 1,500 acres of cover crops were implemented during the fall/winter of 2015.

Mississippi Healthy Soils Initiative: The purpose of this initiative is to help growers be more profitable and sustainable by improving the health of their most valuable asset, the soil. Management systems and practices used to build healthy soils also produce many environmental benefits such as reducing sediment and nutrient loss, reducing irrigation water demand through improved infiltration and holding capacity, and sequestering more carbon from the atmosphere. One of the principle components involved is the use of cover crops. Over 5,000 acres of winter cover crops were planted and evaluated during the 2014-2015 with a similar amount planned for 2015-2016 throughout the Yazoo River Basin. Updates and reports from this Delta F.A.R.M. led initiative can be found at: www.mscovercrop.com.

Mississippi River Basin Healthy Watershed Initiative (MRBI): The purpose of the MRBI initiative is to assist landowners and producers to voluntarily implement conservation and management practices that prevent, control and trap nutrient runoff from agricultural land. The USDA Natural Resources Conservation Service (NRCS) invested \$1.9 million in 2015 to target Brook Bayou, Christmas Lake Bayou, Long Lake, Stillwater Bayou and Tommie Bayou watersheds located in portions of Bolivar, Sunflower and Washington counties.

Implementing Nutrient Reduction Strategies and TMDLs in the Big Black, Pearl River, and South Independent Streams

Since its construction in the late 1960s, the Ross Barnett Reservoir has been an extremely valuable resource to Central Mississippi. It is the largest source of drinking water in the state, supplying over 15 million gallons of water to local residents, businesses, and industries. As it has done for more than 50 years, this plentiful water resource provides outstanding recreational opportunities, supports economic growth as well as scenic beauty and vital wildlife habitats. The USEPA has designated this area as a Priority Watershed.

In a proactive effort to reduce NPS pollution within the Ross Barnett Reservoir Watershed, the MDEQ and the Pearl River Valley Water Supply District (PRVWSD) along with other local partners are working together to implement a series of best management demonstration projects as recommended in comprehensive plans developed for the Rezonate Initiative for the Reservoir.

Currently, through the ongoing Memorandum of Agreement (MOA) between PRVWSD and MDEQ, urban storm water BMP demonstration projects for water quality improvements have been identified. Sites include Old Trace Park in Ridgeland, Turtle Point Nature Area in Rankin County, Lakeshore Park in Rankin County, and Flag Island, up river of the Reservoir. Implementation of these water quality improvement projects began in the fall of 2015 and will continue until the end of the agreement in August 2016. Interpretive signage for these sites and other existing BMP demonstration sites will also be placed to increase knowledge concerning water quality and protection. In addition, educational workshops are being developed to target three key groups: 1.) Decision Makers (elected officials), 2.) Professionals (architects, engineers and planners), and 3.) Developers.

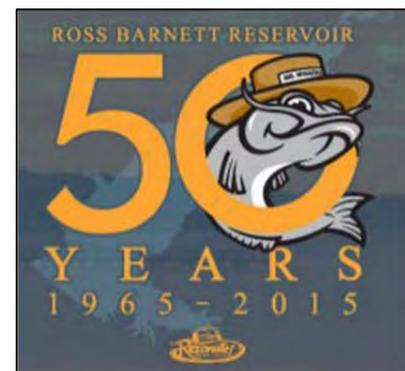
In an continuing effort to leverage resources and to promote the message of protecting and restoring the Reservoir, Rezonate, through the MDEQ, has sponsored and helped facilitate several events in and around the Ross Barnett Reservoir.



Rezonate was a major sponsor for the Project Rezway Recycle Fashion show that took place on April 23, 2015 at the Mississippi Craft Center in Ridgeland. The show featured apparel and accessories composed of at least 75 percent recycled materials. Keep the Rez Beautiful, a nonprofit in the Ross Barnett Reservoir area, hosts this event annually with the aim of raising awareness of the importance of recycling and shows how commonly discarded items can be put to use again instead of littering our environment. Other major sponsors included the MDEQ, Kathryn's Steakhouse, Waste Management, Barnett Reservoir Foundation, Mississippi Department of Transportation, Keep Mississippi Beautiful, and PRVWSD. Through partnerships with the City of Ridgeland, the Rezonate Initiative, MDEQ, and PRVWSD were promoted at various events such as the Kids Fest (April 3-4 & 11-12, 2015) and through the Ridgeland Life magazine publications.

The PRVWSD and the Barnett Reservoir Foundation hosted its fourth Annual Independence Day Celebration in conjunction with the ninth annual WaterFest event hosted by the Mississippi Department of Environmental Quality. This year's event was part of the 50th anniversary celebration on the Ross Barnett Reservoir, which was first impounded in 1965.

WaterFest is an annual event that spotlights the importance of protecting, restoring and improving the water quality. Event activities included educational exhibits, kid zones, water slides, interactive



displays, live music, food vendors, face-painting, and static military displays, balloon artists, caricature artist, and a free photo booth. An estimated 10,000 people attended the dual event.

The 5th annual Gator Bait Kayak Race, a 5.5 mile race for competitive and recreational kayakers, canoeists, and stand up paddlers (SUP) , is another event sponsored through the Rezonate Initiative. The event was held at Pelahatchie Shore Park (September 19, 2015) on the Ross Barnett Reservoir. The course runs through Pelahatchie Bay on the Ross Barnett Reservoir. This successful event raised awareness about the water quality of the Reservoir and the need to protect it through conservation education and litter control. The 2nd annual Gator Bait Hatchling Race for kids 5-17 was held at Lakeshore Park, and its goal is to introduce children to the sport of kayaking, foster a love for the outdoors, and instill a desire to protect their environment for generations to come. Both events were well attended. Other partners contributing to these events were the Pearl River Valley Water Supply District, MS Wildlife Federation, Keep the Reservoir Beautiful, Academy Sports and Outdoors, Barnett Reservoir Foundation, MS Natural Science Museum, Pearl River Kayaks, YMCA, and Service Printers.

Rezonate also partnered with the Summer Library Programs in Hinds, Madison and Rankin counties to teach students about the importance of protecting our drinking water sources especially in the Ross Barnett Reservoir watershed. Over 500 students and parents were reached through this effort.

Showcased Section 319 Projects

Bell Creek – West Prong Muddy Creek

Due to the high level of stakeholder interest and its listing on Mississippi’s 303(d) list of impaired waters, the Bell Creek-West Prong Muddy Creek Watershed was selected by MDEQ as a priority watershed for restoration activities in the Tennessee-Tombigbee/North Independent Streams Basin. Therefore, a joint effort by Mississippi Soil and Water Conservation Commission (MSWCC), MDEQ, EPA, NRCS, and the Tippah County Soil and Water Conservation District (SWCD) resulted in a proposal and subsequent implementation of a project to significantly reduce the amount of nutrients and sediment entering Bell Creek-West Prong Muddy Creek by implementing selected Best Management Practices (BMPs).

The 63,682-acre Muddy Creek Watershed is located in Tippah County, Mississippi. The current land uses in the Muddy Creek Watershed include 7,724 acres of cropland (12.1%), 12,692 acres of pasture land (19.9%), 24,982 acres of timber land (39.2%), 3,974 acres of urban land (6.2%), 10,097 acres of barren land (15.9%), 3,362 acres of wetlands (5.3%), and 851 acres of water (1.3%). This project targeted the 19,277-acre Bell Creek-West Prong Muddy Creek Sub-watershed. Within this watershed, the project was implemented on an area of approximately 3,940 acres, containing about 2,167 acres of pasture land.

The primary goals of the project were: (1) to improve water quality and protect high quality waters by demonstrating the economic benefits and effectiveness of selected BMPs in targeted areas; (2) to apply BMPs to agricultural land in the project area to reduce runoff, cattle access/nutrients to the stream, and sedimentation, and; (3) to inform and educate the public about BMPs that benefit water quality. Information/education activities carried out under this project included demonstration farms, educational field days, news articles, and over 1,000 distributed fact sheets detailing the practices installed and the soil savings from those practices.

Summary of Best Management Practices Installed

Practice Name	Number of Practices	Number of Acres Affected	Total Tons of Soil Saved
342-Critical Planting Area	1	14.5	130.5
382-Fencing	2	2,742 ft	
410-Grade Stabilization Structure	30	28.6	602.1
512-Pasture & Hayland Planting	2	27	181
580-Streambank & Shoreline Protection	35	5,277 ft	813
590-Nutrient Management	4	146	344
614-Tank/Trough	4		
638-Water & Sediment Control Basin	3	3	54
Totals	81	255.1	2,124.6

*The soil savings is on a per year basis.



Streambank & Shoreline Protection (1) - Before



Streambank & Shoreline Protection (1) - After



Streambank & Shoreline Protection (2) - Before



Streambank & Shoreline Protection (2) - After



Grade Stabilization Structure - Before



Grade Stabilization Structure - After

Tarebreeches Creek-Tuscumbia River Canal

Due to the high level of stakeholder interest and its listing on Mississippi's 303(d) list of impaired waters, the Tarebreeches Creek-Tuscumbia River Canal Watershed was selected by MDEQ as a priority watershed for restoration activities in the Tennessee-Tombigbee/North Independent Streams Basin. Therefore, a joint effort by MSWCC, MDEQ, EPA, NRCS, and the Alcorn County Soil and Water Conservation District (SWCD) resulted in a proposal and subsequent implementation of a project to significantly reduce the amount of sediment and nutrient loadings entering Tuscumbia River by demonstrating the effectiveness of selected Best Management Practices (BMPs).

The 204,311-acre Tuscumbia River Canal Watershed is located in portions of Alcorn and Prentiss County, Mississippi. The current land uses in the Tuscumbia River Canal Watershed include 31,795 acres of cropland (15.6%), 33,293 acres of pasture land (16.3%), 72,214 acres of timber land (35.3%), 18,380 acres of urban land (9%), 22,143 acres of barren land (10.8%), 23,156 acres of wetlands (11.3%), and 3,330 acres of water (1.6%). This project targeted the 16,721-acre Tarebreeches Creek-Tuscumbia River Canal Sub-watershed. Within this watershed, the project was implemented on an area of approximately 9,240 acres, containing about 2,000 acres of pasture land.

The primary goals of the project were: (1) to improve water quality and protect high quality waters by demonstrating the economic benefits and effectiveness of selected BMPs in targeted areas; (2) to apply BMPs to agricultural land in the project area to reduce runoff, cattle access/nutrients to the stream, and sedimentation, and; (3) to inform and educate the public about BMPs that benefit water quality. Information/education activities carried out under this project included demonstration farms, educational field days, news articles, and over 1,000 distributed fact sheets detailing the practices installed and the soil savings from those practices.

Summary of Best Management Practices Installed

Practice Name	Number of Practices	Number of Acres Affected	Total Tons of Soil Saved
410-Grade Stabilization Structure	16	21.1	2,312
512-Pasture & Hayland Planting	9	381.9	430.9
468-Lined Waterway	1	1	32
590-Nutrient Management	3	170.4	170.4
561-Heavy Use Area Protection	5	5	
614-Tank/Trough	2		
580-Streambank & Shoreline Protection	6	550 ft	245.3
578-Stream Crossing	1		
382-Fencing	1	1,660 ft	
WQ-7 Check Dams	1		
Totals	45	579.4	3,190.6

*The soil savings is on a per year basis.



Grade Stabilization Structure - Before



Grade Stabilization Structure - After



Heavy Use Area - Before



Heavy Use Area - After



Fencing Cattle Out of Stream - Before



Fencing Cattle Out of Stream - After

Porter Bayou

The 66,405-acre Porter Bayou Watershed is located in Bolivar and Sunflower Counties, Mississippi. The watershed is comprised predominately of productive agricultural lands making up nearly 56,000 acres (82%) and urban areas making up only 3,882 acres (5.8%) of the total watershed area. This project targets the current priority sub-watersheds of Upper Porter Bayou and Middle Porter Bayou.

The main objectives of this nutrient reduction project are to accurately determine what reductions are achievable using BMPs and the cost to implement these practices. These objectives are being accomplished by educating local farmers with the following: 1) management practices that reduce nutrient input; 2) innovative farming practices and; 3) other measures that include installing vegetative and structural BMPs such as low-grade weirs, constructed-treatment wetlands, grade-control structures and tail-water recovery systems. During 2015, the following BMPs were implemented in the Upper Porter Bayou watershed: 52 water control structures, 12 low grade weirs, and 15,000 feet of two-stage ditch. In the same year, the following BMPs have been implemented in the Middle Porter Bayou watershed: 15 water control structures, 4 low grade weirs, and 5,000 feet of two-stage ditch. Also, approximately 1,000 acres of cover crops were implemented during the fall/winter of 2015. Through education and implementation of these practices, a high benefit-to-cost ratio is achieved. The public is being equipped with the necessary tools to improve the water quality within their watershed that will last from generation to generation. The USGS has implemented several in-stream monitoring strategies to document the nutrient reduction and water quality in the streams over several years. Collection of Tier 1 nutrient data has ceased after five years and is currently under analysis. With Tier 2 monitoring in place at the pour point in both sub-watersheds, the current project will continue to incrementally implement BMPs to address prioritized resource concerns. Nutrient-load reductions for the stated BMPs are showing reductions of over 206 lbs/yr of phosphorous, 405 lbs/yr of nitrogen, and 206 tons/yr of sediment in Mississippi waters.



Tailwater Recovery & On-farm Storage System



Concrete Weir

Rotten Bayou

The Rotten Bayou Watershed Project was developed to implement the *Coastal Nutrient Reduction Strategy*. This strategy used the *Gulf of Mexico Alliance (GOMA) Coastal Template* and leveraged on work done in the Delta with the *Delta Nutrient Reduction Strategy*. The *Coastal Nutrient Reduction*



Strategy was developed through local workshops with coastal stakeholder input. Various issues relative to livestock, forestry, urban stormwater, and atmospheric deposition were included in the strategy. As part of the federal government's efforts to recover from the Deepwater Horizon oil spill, NRCS announced the start of an innovative water- and wildlife-conservation effort along the Gulf Coast, called the *Gulf of Mexico Initiative (GoMI)*. NRCS developed *GoMI* in close collaboration with local, state, and federal partners. It is a new approach to better target conservation activities in the Gulf Coast region to improve the health of the Coast's rivers, wetlands, and estuaries that are integral to jobs and the economy in the Gulf. Because MDEQ had already developed and begun implementation of the *Coastal Nutrient Reduction Strategy* in Rotten Bayou Watershed, NRCS targeted it for the their *GoMI* Project. The Mississippi Soil and Water Conservation

Commission, the Soil and Water Conservation District, and NRCS, have been working with local landowners in the Rotten Bayou Watershed to install agricultural BMPs. Some of the available BMPs to landowners in the watershed are: 1) pasture and hay planting; 2) nutrient management; 3) tank/ troughs; 4) tree and shrub establishment; 5) forest harvest trails and landings and; 6) vegetative barriers. To develop a Watershed Implementation Plan for this project, the Land Trust for the Mississippi Coastal Plain is working with local residents to form three teams: a watershed team, a technical team, and an education team. These teams will provide input to the plan. Also as part of this project, the Department of Landscape Architecture at Mississippi State University worked with the City of Diamondhead, the Property Association, and the golf course to develop Low Impact Development BMPs for reducing stormwater NPS pollution in urban areas.

Several meetings and workshops relative to the watershed were held in 2015. The Rotten Bayou Watershed Steering, Technical and Educational Committees each met during the year. A Stormwater workshop was held on March 26, 2015, at Diamondhead Country Club. This workshop was especially tailored to the Rotten Bayou Project and targeted for local leaders, planners, city officials, engineers, and developers, who work within the Rotten Bayou watershed. This workshop was conducted to share information with them about stormwater and other ordinances that could positively affect water quality in the watershed. Participants were also encouraged to attend a larger workshop on March 27, called Planning for Resiliency, sponsored by the MS-AL Sea Grant Consortium and the MS Chapter of the American Planning Association, at the Biloxi Visitor's Center.

In coordination with the development of a Watershed Implementation Plan to address water quality in the Rotten Bayou Watershed, three Best Management Practices (BMP's) were installed on Diamondhead's Cardinal Golf Course, along with educational signage. BMP's included a dry swale on hole one, a restored stream segment on hole two, and a native planting area on hole three. The BMP's installed on Diamondhead's Cardinal Golf Course are not only reducing stormwater runoff and improving water quality in a critical area in the Rotten Bayou Watershed, but are serving as a great outreach tool to educate the public. REACH (Research and Education to Advance Conservation and Habitat) has been monitoring pre- and post- construction water quality at the BMPs at holes 1 and 2.

The Steering Committee for the Rotten Bayou Watershed Partnership selected an area adjacent to the overflow of the duck pond at the front of Diamondhead as the site for a demonstration project that would highlight various best management practices for improving water quality. The existing site was highly channelled and provided little opportunity to slow and filter the water coming over the spillway during rain events.

The project included a stream naturalization, native plantings, and multiple levels of filtration that will accomplish the following:

- Improve water quality and decrease sedimentation downstream;
- Decrease stormwater velocity and erosion of the stream and around the overflow;
- Provide habitat for butterflies and songbirds, and;
- Provide a park-like atmosphere for the community to enjoy.

Educational signage at the deck overlook informs community members about the project and how they might use similar species of plants at their own homes.

Work on the project was completed between July and September 2015.



NPS Education/Public Outreach

Envirothon Competition

The *Envirothon High School Competition* tests student knowledge about water, soils, forestry, wildlife, and current environmental issues each year. The focus in 2015 was “Urban Forestry and Green Infrastructure”. The competition measures success by student-oral presentations made to a panel of judges where each team applies their knowledge and field experiences to a real-life environmental problem/situation as well as by both written and field tests. The Mississippi competition is sponsored by MDEQ’s NPS Program and the Mississippi Association of Conservation Districts and is coordinated by the Mississippi Soil and Water Conservation Commission. In 2015, 335 high-school students (67 teams) and their advisors participated in four area competitions. A total of about 110 students (22 teams) participated at the state- level competition which was held at Roosevelt State Park on May 1, 2015. The Oxford High School *Envirothon Team* won the State’s competition and traveled to Missouri State University in Springfield, Missouri to compete in the *National Conservation Foundation Envirothon* which was held August 2, 2015.

Adopt-A-Stream

Adopt-A-Stream is an environmental education training program for adults and students that focuses primarily on aquatic ecosystems and the effects of NPS pollution on water quality. During 2015, a 2-day workshop and nine 1-day workshops were conducted. These workshops were conducted in the major watershed basins of Mississippi, i.e., Yazoo River, Tombigbee River, Pascagoula River, the Big Black River, and the Coastal Streams/South Independent Streams. The coordinator for *Adopt-A-Stream*, through a subgrant that MDEQ has with the Mississippi Wildlife Federation (MWF) provided additional water-quality training in 2015.



Environmental Teacher Workshops

Teacher workshops are a major environmental education component of MDEQ’s NPS education program each year. During calendar year 2015, fifty-two (52) teacher workshops were held in all regions of Mississippi with approximately 1,000 educators participating.

The teacher workshops included interactive classroom activities and field trips with some of the best environmental/natural- resource speakers in Mississippi instructing the classroom teachers and environmental educators. About half of this work was carried out through the *Project Learning Tree* Workshop/Curriculum with the help of a program coordinator and facilitators. The work included 23 workshops for 477 educators with most of the workshops being held at seven Mississippi universities and

community colleges. Other workshops were held at various venues in counties throughout the State. These workshops included sessions on water quality, NPS pollution prevention, green infrastructure, low-impact development, water chemistry, macro-invertebrates, and hands-on, water-related activities. Educators can use all of the information provided in these workshops to teach students about natural-resource stewardship. The NPS program assists with workshop support for these curricula: *Project Learning Tree*; *Project WET*; *Project WILD*; *Project Aquatic WILD*; *Project Food, Land and People*; *Private Eye*; and others.



Train-the-Trainer Workshops and Decision-Maker Workshop

Three (3) *Train-the-Trainer* workshops that included new teaching modules were held for sixty (60) statewide- and coastal-resource people. One (1) workshop was held specifically for 25 decision-makers such as local supervisors and commissioners. These teaching modules included interactive “environmental lesson plans” for teachers and students and consisted of: written lesson plans; a video on how to conduct the lessons, as well as supplies and equipment to carry out the lessons. Project coordinators presented the teaching-modules to Soil and Water Conservation District Clerks, *Earth Team* volunteers, and others so they can use them for classroom presentations, in-service teacher training, conservation-field days and other programs and events throughout the State.

Student Environmental Day Camps

During 2015, the NPS program sponsored four (4), one-week summer-camp sessions at the *University of Mississippi Center for Water and Wetland Resources* where 50 students were trained. These camps train students on environmental topics such as water quality, land use, forestry, wildlife, and NPS pollution. A pre-test/post-test method is used to measure increased knowledge as an indicator of program success. Additionally, NPS presentations were made at eight summer camps/after-school programs including the *Mississippi Soil and Water Conservation Commission Youth Camp* for high school students, girl-scout and boy-scout camps, and the *Jackson Environmental Learning Center Camp*.

Enviroscape and Groundwater Models

Presentations of *Enviroscape and Groundwater Models* continue to enhance NPS educational activities and are widely used by organizations all over the State due to their widespread distribution by MDEQ. Hundreds of presentations are made each year by various environmental organizations, natural-resource agencies, and nonprofit organizations demonstrating these models at conservation carnivals, schools, civic clubs, workshops, summer camps, and *Earth Day* events.

Make-A-Splash Event

The *Make-A-Splash, A Water Education Event* is held each September at the Mississippi Museum of Natural Science in Jackson, Mississippi where students visit up to 20 water-related interactive booths and guided museum exhibits to learn about polluted runoff, wildlife, water use, groundwater, surface water, macro-invertebrates, etc. At the September 2015 event, eight schools attended with a total of 571 students participating and 45 teachers receiving (0.5) Continuing Education Units (CEUs) of credit.



Storm Drain Marking Program

The *Storm Drain Marking Program* is another cooperative program between MDEQ and the Mississippi Wildlife Federation (MWF). MDEQ provides MWF funding for this effort through one of its Section 319 subgrant agreements. The program promotes awareness of the water-quality impacts of polluted runoff in urbanized communities. Small plastic disks are placed by local volunteers on storm drains with the message “*No Dumping, Drains to River.*” Volunteers glue the markers to storm drains and distribute door hangers to homes. Students and scouts also talk with residents about storm- water runoff and the need to prevent pollutants from entering storm drains. A new “door-knob hanger” was developed during 2015 for neighborhoods that have drainage ditches instead of storm drains. A brochure entitled *How to Conduct a Storm Drain Marking Project* can be found at the following web site: [Storm Drain Marking](#)



Field Days

Field days have been arranged as part of the NPS Watershed Demonstration Projects conducted with the USDA Natural Resources Conservation Service, the Mississippi Soil and Water Conservation Commission and various water-management district staff. Additional field trips are included in Teacher Workshops and Adopt-A-Stream Workshops and are a part of the Storm-Drain Marking Program.

Workshops

MDEQ NPS personnel continue to conduct and assist with presentations for teachers, students, resource agencies, etc. These workshops enable instruction on and the distribution of existing educational models and materials. Some of the NPS programs with workshops inherent to their curricula are *Adopt-A-Stream* and *Community Growth Readiness* as well as some specific projects such as a *Rain Barrel Workshop* where barrels are retrofitted for use at homes to collect rainfall and prevent runoff.

Public Service Announcements/Literature Distribution

By working with the Foundation for Public Broadcasting in Mississippi, MDEQ sponsored NPS pollution messages on their radio network and on their *Mississippi Outdoors* Television Program.

NPS - Related Programs

Mississippi Coastal Cleanup

The 27th Annual Mississippi Coastal Cleanup was held on October 17th, 2015. The organizers of the event repeatedly look forward to a productive, annual cleanup day that will benefit the environment and educate the public about the importance of being good stewards of our coastal resources. MDEQ is proud to be a contributor to this event through the NPS Program.

More than 2000 volunteers combed the Coast's beaches, marsh areas, and barrier islands to clean Mississippi's beaches and waterways. The volunteers picked up marine litter at 60+ sites during the Mississippi event, part of the *International Coastal Cleanup*—the world's largest volunteer effort to clean up the marine environment. During the 2015 Mississippi event, volunteers picked up 1,188 bags of trash, including 180 bags of recyclables along 166 miles of coastal beaches and waterways in Harrison, Hancock, and Jackson Counties and barrier islands.

The cleanup is organized by the Mississippi Department of Marine Resources and the Mississippi Marine Debris Task Force. "Every year, the *Mississippi Coastal Cleanup* grows, showing that more people are dedicated to keeping the Coast free of trash," said Jamie Miller, executive director of the Mississippi Department of Marine Resources. "It's good for the environment, but it's also an opportunity to teach our young people the value of keeping our beaches, bays, and islands clean."

Healthy Watershed Initiative

The United States Department of Agriculture's NRCS is partnering with 12 states within the Mississippi River Watershed basin to improve water quality within the watershed. Through the partnership, the NRCS has created the *Mississippi River Basin Healthy Watershed Initiative* (MRBI) which will promote the implementation of voluntary conservation practices by landowners, state agencies, and federal agencies. These landowners and agencies will focus on practices that reduce nutrient influxes rather than completely controlling them. These conservation practices include systems that avoid, control, and trap nutrient runoff to improve the wildlife habitat and help maintain the agricultural productivity within the State. The initiative will significantly decrease polluted runoff in order to improve water quality within the basin and control nutrient loading which contributes to the hypoxic zone in the Gulf of Mexico. NRCS will invest \$1.9 million in 2015 to target Brook Bayou, Christmas Lake Bayou, Long Lake, Stillwater Bayou and Tommie Bayou watersheds located in portions of Bolivar, Sunflower and Washington counties.

The Mississippi 319 Waste-Pesticide Disposal Program

Mississippi farmers continue to take advantage of economical ways to address waste-pesticide disposal problems and improve water quality in their watersheds at the same time. They do this through waste-pesticide disposal events that have been held over the last several years.

These programs and prior ones funded by §319 grants have had a positive impact on reducing

environmental risks and improving water quality in rural Mississippi while providing farmers an economical way to dispose of waste-pesticide products. Since the inception of the program, more than 1.3 million pounds of waste-pesticides have been collected from more than 600 farmers in just about all of Mississippi. In addition to reducing potential environmental risks associated with these waste products, the events collectively saved farmers more than \$1.4 Million in disposal costs.

Water Pollution Control Revolving Loan Fund

The Water Pollution Control Revolving Loan Fund (WPCRLF) program provides low-interest loans to public entities in the State for construction, repair, or replacement of wastewater, stormwater, and nonpoint source pollution projects. Funding for these projects comes from federal grants, state match, repayments, and interest on deposits. Since 2010, additional subsidy funding provided through annual Congressional appropriations, has also been made available to “Green” and “Small/Low Income Community” WPCRLF projects. During 2015, MDEQ funded 12 new WPCRLF projects totaling \$76.3 million, which included approximately \$0.73 million of Green or Small/Low Income Community subsidies.

Water Pollution Control Emergency Loan Fund

The Water Pollution Control Emergency Loan Fund (WPCELF) program provides loans to communities for the emergency construction, repair, or replacement of wastewater collection and treatment facilities. The WPCELF has approximately \$3.3 million available for such emergency projects. MDEQ encourages communities throughout the State to utilize this program whenever funds for emergency wastewater projects are needed.

Source Water Assessment Program

The 1996 amendments to the Safe Drinking Water Act mandated states to develop and implement a Source Water Assessment Program (SWAP). The purpose of this program is to notify Public Water Systems (PWS) and customers regarding the relative susceptibility of their drinking-water supplies to contamination. Congress intended for these susceptibility assessments to encourage efforts that would enhance the protection of PWSs by managing identified potential contaminant sources of concern. In 1998, the Mississippi State Department of Health (MSDH) contracted with MDEQ to develop and administer the SWAP in Mississippi. Required elements of assessments include the following: 1) delineating Source Water Protection Areas around PWS wells; 2) inventorying potential contaminant sources in the protection areas; 3) assigning susceptibility rankings to wells and; 4) notifying the public regarding the availability of SWAP information.

Assessments in Mississippi use the following rankings to notify PWSs of their relative susceptibility: 1) Higher, 2) Moderate and, 3) Lower. Most of the public groundwater-system wells in the State have received a Moderate ranking (63%) while 29% have received Lower rankings and only 8% have received higher susceptibility rankings. Some of the criteria considered when assigning these rankings to public groundwater systems include aquifer confinement; MSDH minimum well-design criteria; potential contaminant sources identified within the delineated Source Water Protection Area and; abandoned wells within the protection area.

The size of a Source Water Protection Area is based on eight delineation scenarios that were developed using EPA's Wellhead Protection Area (WHPA) computer program. The different scenarios are a result of countless computer modeling runs and an extensive data review of aquifer characteristics and well data from the USGS and MDEQ's Office of Geology and Office of Land and Water Resources. The eight developed delineation scenarios incorporate differing model-input parameters, including well discharge, aquifer porosity and transmissivity, aquifer thickness, and time. The approved pumping scenarios are arranged according to well-discharge ranges with larger pump rates corresponding to larger Source Water Protection Areas.

Assessments of all public groundwater systems and the three public, surface-water systems operating in the State have been completed. After MDEQ mailed the prepared assessment reports to the systems, it became their responsibility to notify their customers that a SWAP report was available for review upon request. As another reminder, the EPA required the annual Consumer Confidence Report (CCR) prepared by systems to include a reference regarding the SWAP report and a brief summary of the assessment findings.

The SWAP reports and corresponding maps of delineated Source Water Protection Areas are available online at the MDEQ website: [SWAP Resources](#). As a result of recent MDEQ regulatory changes, all new PWS wells now require that preliminary assessments be performed by MDEQ prior to the issuance of groundwater withdrawal permits. These preliminary assessments allow the suitability of proposed well sites to be screened prior to the drilling and completion of PWS wells.

Source Water Protection Strategy

Mississippi's Source Water Protection Strategy for PWS wells using unconfined aquifers involves the integration and coordination of protection efforts with various environmental regulatory programs within MDEQ. The implementation of this strategy is initiated when the corresponding regulatory programs are provided a Source Water Assessment analysis of a PWS well from the Groundwater Planning Branch. This direct, cross-program involvement should help to ensure that contaminant plumes do not degrade shallow groundwater sources used for public water supply. The strategy will be considered complete after MDEQ meets with representatives of systems to explain pertinent protection measures.

The protection strategy for public groundwater systems using deeper confined wells focuses on the hydro-geologic confinement (vulnerability) of their production aquifers. Adequate aquifer confinement is generally assumed if an overlying confining unit of clay is at least 30 feet in thickness and/or the corresponding potentiometric surface (head) extends at least 10 feet above the screened aquifer. The implementation of this strategy is considered complete when the confinement is verified and a system is identified of any abandoned (unplugged) wells that may pose public health issues.

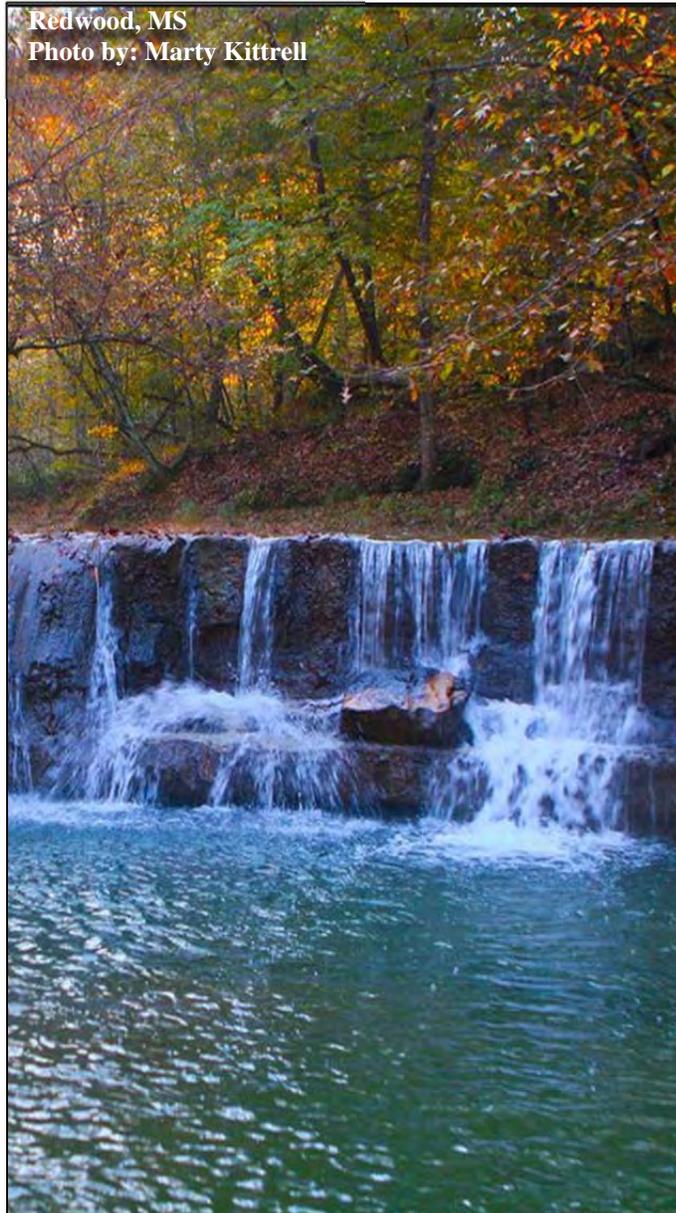
The Source Water Protection Strategy for the four surface-water intakes used in the State involves the integration of public drinking-water protection into MDEQ's Basin Management Approach that is designed to protect and restore the quality of Mississippi's surface-water resources. This integration component was well received by the two pertinent Basin Management Teams that incorporated extra protection measures into their management plans to complete the strategy. EPA Region IV and the Tennessee Valley Authority are assisting MDEQ with these projects. Meetings with these PWS entities have been held and additional meetings to discuss protection measures are intended. The State is also participating in a national pilot project to address the integration of the SDWA and the CWA.

Storm Water Regulations

Implementation of Mississippi's Storm Water General Permits and regulations continued in Fiscal Year 2015.

- The Environmental Permits Division (EPD) issued general permit coverage for 315 large construction projects (five acres or greater).
- EPD issued general permit coverage for 75 regulated industrial facilities under the Baseline Storm Water General Permit for Industrial Activities.
- EPD received and processed 70 "No Exposure Certifications" from potentially regulated industrial facilities. Facilities that certify "No Exposure" of industrial activity to storm water are not required to obtain storm water coverage under the Baseline General Permit.

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