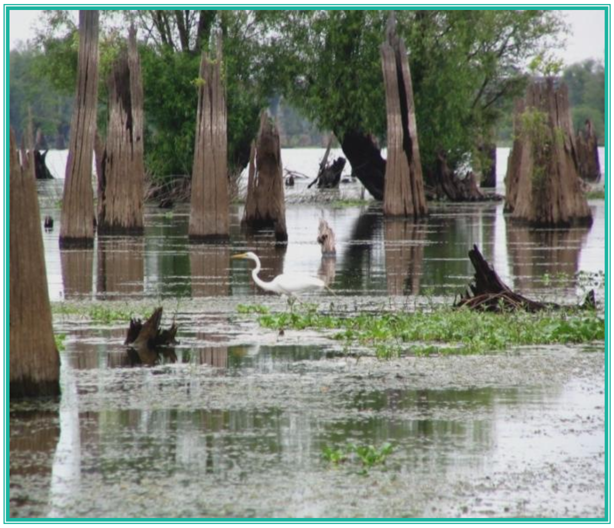

Louisiana's Nonpoint Source Management Plan

Prepared by the
Louisiana Department of
Environmental Quality

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS, TEXAS 75202 – 2733

November 21, 2012

Office of the Regional Administrator

The Honorable Bobby Jindal
Governor of Louisiana
Post Office Box 94004
Baton Rouge, Louisiana 70804-9004

Dear Governor Jindal:

Thank you for your letter of October 12, 2012, to the U.S. Environmental Protection Agency submitting Louisiana's updated 2012 Nonpoint Source Management Plan. The EPA appreciates the combined efforts of the Louisiana Department of Environmental Quality and the Louisiana Department of Agriculture and Forestry in preparing this update. As required by Clean Water Act § 319(d), our review concluded that the NPS Management Plan is consistent with CWA § 319(a) and (b), and is hereby approved. In addition, this update satisfies 40 CFR § 130.6(C)(4), as an update to the Louisiana Water Quality Management Plan.

The state proposes to use a balanced approach of targeted monitoring, watershed planning and statewide initiatives to effectively address NPS impairments. Louisiana is to be complimented on the quality of the NPS Management Plan and its prescribed approach to restore water quality in at least 40 priority watersheds by 2016, representing more than 25 percent of the state's NPS impaired water bodies. In addition, we strongly support the state's commitment to submit a minimum of three success stories per year to document water quality restoration.

The commitments and goals outlined in this plan will not be easily implemented, but I am confident the path to restoring water quality will be successful with the dedication and partnership of federal, state and local governments.

I look forward to the continued cooperation between our agencies. If you have any questions, please contact me at (214) 665-2100, or your staff may contact Mr. Brad Lamb, Nonpoint Source Program Coordinator, at (214) 665-6683.

Sincerely,

Ron Curry
Regional Administrator

cc: See page 2

cc: Ms. Peggy M. Hatch, Secretary
Louisiana Department of Environmental Quality

Dr. Alex Appeaning, Deputy Secretary
Louisiana Department of Environmental Quality

Dr. Mike Strain, Commissioner
Louisiana Department of Agriculture and Forestry

Mr. Brad Spicer, Assistant Commissioner
Louisiana Department of Agriculture and Forestry

State of Louisiana

BOBBY JINDAL
GOVERNOR

Post Office Box 94004
Baton Rouge, LA 70804-9004

OFFICE OF THE GOVERNOR

October 2, 2012

Sam Coleman
Acting Regional Administrator
United States Environmental Protection Agency
Fountain Place, Suite 1200
1445 Ross Avenue
Dallas, TX 75202-2733

RE: Approval of Louisiana's Nonpoint Source Management Plan

Dear Mr. Coleman:

The State of Louisiana submits its Nonpoint Source (NPS) Management Plan for approval with compliance of Section 319 of the Clean Water Act. The NPS Management Plan includes water quality goals and annual milestones to improve or restore designated uses for contact recreation and fish and wildlife propagation in at least forty (40) water bodies in Louisiana by October 1, 2016.

We appreciate your support of Louisiana's programs to improve water quality and protect our natural resources.

Sincerely,

Bobby Jindal
Governor of the State of Louisiana

C: Peggy M. Hatch, Secretary of Louisiana Department of Environmental Quality
Dr. Mike Strain, Commissioner of Louisiana Department of Agriculture and Forestry

(225) 342-7015 ⚜ Fax (225) 342-7099 ⚜ www.gov.state.la.us

BOBBY JINDAL
GOVERNOR

PEGGY M. HATCH
SECRETARY

State of Louisiana

DEPARTMENT OF ENVIRONMENTAL QUALITY
OFFICE OF THE SECRETARY
LEGAL DIVISION

Clean Water Act – Section 319 Certification: State Nonpoint Source Management Plan

Section 319(b)(2)(D) of the Clean Water Act requires a Certification from the Chief Attorney of the State Water Pollution Control Agency, which has independent legal counsel. This certification certifies that the laws of the State are adequate authority to implement such management program.

Therefore, this statement of certification is to certify that the Constitution and Revised Statutes of the State of Louisiana, specifically, the Louisiana Environmental Quality Act, L.A. R.S. 30:2001, et seq. provide the authority to implement the Nonpoint Source Management Plan.

Herman Robinson, CPM
Executive Counsel

Post Office Box 4302 • Baton Rouge, Louisiana 70821-4302 • Phone 225-219-3985 • Fax 225-219-4068
www.deq.louisiana.gov

Executive Summary

The State of Louisiana has over 1,684 square miles of lakes, approximately 7,656 square miles of estuaries, 8,673 square miles of wetlands and 66,294 miles of rivers. The history and culture of Louisiana are closely tied to these waters and wetlands. The State is committed to protecting and improving its water resources, including surface and ground waters, for present and future generations.

Louisiana's coastal and inland waters are utilized for recreational and commercial fisheries, oil and gas production, transportation, forestry and agriculture. The challenge of the Nonpoint Source Program (NPS) is to protect and restore water quality, while ensuring private and public lands are managed in a sustainable manner. Management of the state's natural resources relies on many partners, who benefit from Louisiana's healthy environment. Even though water is an integral component of life and valued by the people who live in Louisiana, water quality is not fully meeting goals of the Clean Water Act (CWA). This means that designated uses for fishing and swimming are not fully met. Although significant progress has been made in meeting these goals, the NPS Plan describes tasks and milestones to fully restore impaired waters and protect healthy waters. Water quality improvements that have been made between 2000 and 2010 are graphically depicted in Figure 1. Those waters designated for primary and secondary contact recreation (i.e. swimming and boating) have significantly improved since 2000. Waters designated for fish and wildlife propagation (FWP) have only slightly improved, because of a myriad of pollutants that affect this use and complexities of addressing them. Louisiana Department of Environmental Quality (LDEQ) continues to focus much of its resources on addressing water quality and wetland issues.

The 2010 NPS Annual Report indicated 264 water body impairments were removed from the 303(d) list since 2006. The state's 2008 Integrated Report (IR) identified approximately 149 water bodies with NPS impairments, representing 31 percent of the state's assessed water bodies. These NPS impaired waters are priorities for restoration through the NPS Program. Full restoration of a water body means all impairments have been removed and the water body fully meets all of its designated uses. Water quality improvement means instream concentrations of specific pollutants are reduced and progress is being made toward full restoration. Although current budgetary constraints may affect the rate of progress in meeting NPS water quality goals, LDEQ intends to continue or exceed current rates of improving water quality in 25 percent of NPS impaired waters. Therefore, LDEQ's water quality goal is to reduce NPS impairments and improve water quality in at least 40 water bodies by October 2016. When one or more pollutants have been removed from the impairment list as a result of implementation of NPS activities, LDEQ will provide USEPA with a Success Story. LDEQ has currently committed to three success stories each year for FFY 2012-2016.

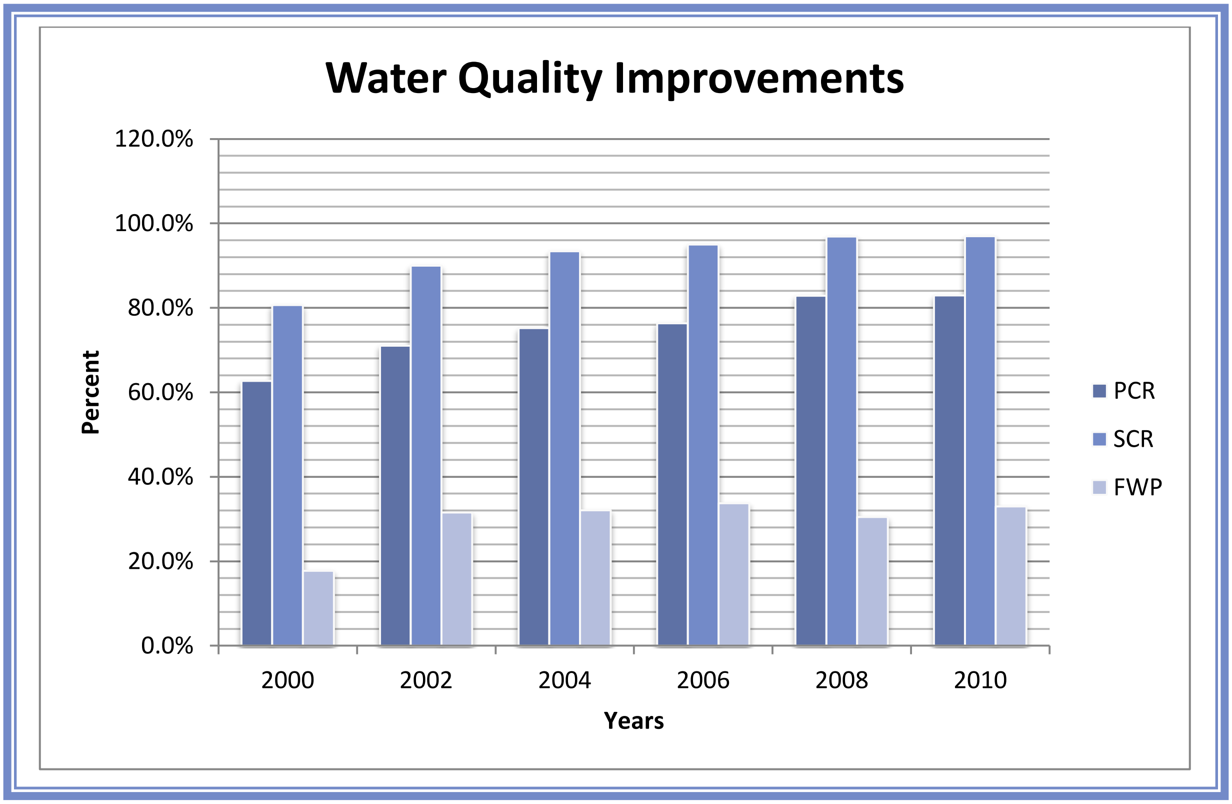

Figure 1: Percentage of the State's 476 Sub-Segments Fully Supporting Designated Uses

As Figure 1 illustrates, water quality has improved since 2000, with 97 percent of the state's assessed water bodies (441) designated for secondary contact recreation (SCR) fully meeting that use. Approximately 83 percent of the state's assessed water bodies (395) designated for primary contact recreation (PCR) fully met that use and 33 percent of the state's assessed water bodies (157) designated for FWP fully met that use. Water bodies designated for PCR and SCR typically do not meet their use because of high concentrations of fecal coliform bacteria. Water bodies designated for FWP do not meet their use because of a wide range of pollutants, including sediment, nutrients and metals.

The Clean Waters Program (CWP) was designed to integrate efforts of point source programs with NPS programs in order to form a cohesive management approach to reach these water quality goals. Through the CWP, LDEQ adopted water quality goals in 2005, to reduce the number of water bodies on the 303(d) list by 25 percent before the end of calendar year (CY) 2012, which was a baseline approved by U.S. Environmental Protection Agency (USEPA). This 25 percent goal meant that 28 of the 111 water bodies not meeting the swimming use (PCR) in 2004 would be restored by 2012. The goal for FWP was to restore 77 of the 310 impaired water bodies by 2012. These water quality goals for PCR and SCR were met in CY 2010, with more than 28 water bodies restored. These goals were consistent with national water quality goals of USEPA and Association of State and Interstate Water Pollution Control Administrators (ASIWPCA). The NPS Program was a significant component of the CWP since more than half of the state's impaired waters were associated with NPS pollutants. The 2010 IR indicated progress toward the CWP goal of restoring 77 water bodies designated for FWP, with 8 fully restored. LDEQ continues to work on this goal and has established a new water quality goal to reduce the number of NPS impairments in 40 water bodies by October 2016.

LDEQ collects water quality data in all regulatory sub-segments on a 4-year rotation to evaluate whether water bodies are meeting their designated uses. These and other appropriate data are utilized to determine if water quality goals are met and water bodies can be delisted. Whereas LDEQ's ambient data are the basis for listing and delisting sub-segments, it is often necessary to monitor smaller watersheds to evaluate NPS water quality improvement. Between 2011 and 2016, LDEQ will implement targeted watershed monitoring to identify specific areas where NPS problems exist and evaluate water quality improvements made as a result of BMP implementation.

NPS pollution has been identified as the largest remaining water quality problem that needs to be solved to meet goals of the CWA. Therefore, the purpose of this document is to describe the NPS strategy that Louisiana will implement to improve water quality and restore impaired waters and to also protect healthy waters. LDEQ is lead agency for the NPS Management Program, but relies on partnerships with agencies and local stakeholders to implement the program.

The Governor's Office of Coastal Activities (GOCA) coordinates coastal restoration activities. Through the NPS Management Plan, LDEQ maintains a strong partnership with GOCA and Louisiana Department of Natural Resources Office of Coastal Management (LDNR-OCM) to ensure program consistency in coastal watersheds. The state's Coastal Nonpoint Pollution Control Program (CNPCP) is one example of where coordination of programs has taken place. Through this program, LDEQ and LDNR have partnered on educational materials and programs, adapted permit programs to address coastal management measures and assisted in development and implementation of master farmer and logger programs. Protecting Louisiana's coastal wetlands is a 50-100 year plan, but short-term actions can be taken by cities, parishes and stakeholders as interim steps for restoring coastal waters.

The strategy for implementing Louisiana's NPS Plan is to guide actions of local governments, businesses, industries, academia and the public on a watershed-based approach to address NPS pollution. Watersheds cross boundaries, requiring collaboration at many levels to protect and enhance the environment. To promote watershed restoration and protection, LDEQ will:

- Collect information necessary to assess each of the state's sub-segments to determine if designated uses are being met;
- Use Louisiana's IR to evaluate progress made in restoring designated use support of all waters;
- Produce TMDLs and/or Watershed Implementation Plans (WIPs) for impaired waters where near-term delisting is not apparent;
- Utilize TMDLs and/or other available appropriate water quality data and information to establish NPS pollutant reduction goals;
- Utilize watershed coordinators to assist local stakeholders and resource agencies implement local environmental programs;
- Facilitate organization of local watershed groups, if necessary, to develop and/or implement WIPs;
- Promote WIPs as the basis for allocating resources to reduce NPS pollution entering the water body;
- Administer CWA Section 319 Grant Program and other applicable grants to enable actions that achieve water quality goals;
- Review existing monitoring data for priority watersheds and recommend supplemental data to measure water

quality trends associated with watershed activities;

- Report data to local stakeholders and general public;
- Report progress made in water quality improvement to USEPA and the public through the NPS Annual Report and the NPS website; and
- Produce Success Stories for water bodies that meet water quality standards because NPS activities have been implemented.

A WIP is an important part of the NPS management strategy for watershed restoration. The WIP is developed through a collaborative effort among people that live in the watershed (i.e., the "watershed community"). LDEQ has facilitated establishment of watershed coordinators to assist local stakeholders in solving their NPS water quality issues. Through the stakeholder process, WIPs emerge as living documents from which future actions are taken to protect and restore local waters.

Short and long term goals for the NPS Management Plan include:

- By October 2016, restore 40 water bodies impaired for NPS pollution; Implement NPS targeted watershed monitoring in 20 water bodies in order to develop WIPs or evaluate water quality improvement in water bodies targeted for delisting by 2016; Produce three NPS Success Stories each year as a result of reducing NPS pollutants for one or more parameters so the water body meets water quality standards;
- Track expenditure of federal and matching funds efficiently to solve NPS water quality problems; and
- By 2016, SWPP will minimize risks to public health in 281 community water systems in 15 parishes that serve a population of 644,371.

All activities described in the NPS Management Plan are designed to achieve these water quality goals. Statewide programs are designed to improve water quality generally in all parts of the state, through institutionalizing NPS water quality goals in on-going programs of state, federal and local governments. Watershed programs are designed to solve specific water quality problems identified through Louisiana's NPS Program and included in the state's IR.

Interim measures of achieving water quality goals include:

- Reduce in-stream concentrations of total suspended and dissolved solids, nitrogen, phosphorus, and fecal coliform in 40 priority watersheds (analyzed annually with results included in NPS Annual Report);
- Increase in-stream concentrations of dissolved oxygen (DO) during critical periods (sensitive aquatic life stages and hot weather/low flow conditions) in water bodies targeted for NPS Program implementation (reported annually in NPS Annual Report);
- Reduce the number of water bodies on the 303(d) list (reported annually through NPS Annual report and also through biannual IR);
- Increase the number of local watershed groups established for watershed restoration and protection to reach goal of restoring water quality in 40 water bodies (reported annually through NPS Annual Report);
- Increase the number of water bodies delisted because NPS pollution activities (reported annually through NPS Annual Report); and
- Increase the number of "Success Stories" describing water bodies that have been de-listed for one or more parameters (A minimum of three Success Stories each fiscal year).

Source Water Protection Goals

In addition to water quality goals for surface water, LDEQ also administers the Source Water Protection Program (SWPP) to protect the state's ground water aquifers and surface waters utilized as drinking water supplies. The SWPP builds upon the Source Water Assessment Program (SWAP) that was completed by LDEQ in 2003. This program determined the susceptibility of public water supplies to contamination after assessing nearby type, number and location of potential sources of contamination and hydrogeologic sensitivity factors. The assessment phase is discussed in the *State of Louisiana Source Water Assessment Program* document available on LDEQ's website at the following web address:
http://www.deq.louisiana.gov/portal/PROGRAMS/SourceWaterAssessmentProgram.aspx

The statewide SWPP concentrates on the most susceptible public water supply sources by implementing protection measures on sensitive areas around public supply wells (ground water) and surface waters that are sources of drinking water. Watersheds that drain to and recharge these drinking water sources are of special concern in that the myriad of activities that occur within them can potentially affect the health and safety of the drinking water supply.

The following Source Water Protection Measures must be completed for each targeted parish in order to achieve substantial implementation of the SWPP, as defined for Louisiana by EPA:

- Visit potential NPS of contamination identified in the assessment phase;
- Introduce the drinking water protection model ordinance for adoption by local governing bodies; and
- Work with each water system in the targeted parish to develop new or update existing contingency plans.

Discussion of key elements that further explain and refine these protection measures is found in the Source Water Protection Section in the body of this document.

A Table of Annual Milestones for Statewide and Watershed Activities has been included on pages 9-14 of the NPS Management Plan. LDEQ will report on progress made on each of these milestones through the NPS Annual Report submitted to USEPA Region 6 in January of each year.

Statewide Milestones for Water Quality Improvement	2012	2013	2014	2015	2016	2017
Number of Water Bodies identified in LA's 1998/2000 IR or subsequent years as being primarily NPS impaired that are partially or fully-restored (WQ-10) :Identify Fully Restored Water Bodies in Appendix C of State's IR Primarily Impaired by NPS Pollutants in 1999 court ordered 303(d) list or 1998/2000 IR; Review NPS Related Activities in Watershed where Water Body was Restored; Write NPS Success Story; Identify Activities to Maintain Water Quality.						
Number of Water Bodies identified in LA's 2002 IR as not attaining water quality standards where standards are now fully attained (SP12): Review 2002 IR for impaired waters; ID NPS priority parameters; Review Appendix C of IR to Identify NPS impaired waters that fully attain water quality standards; Review NPS Related Activities in Watershed where water quality standards are attained; Write NPS Success Story; Identify Activities to Maintain Water Quality.						
Estimated Annual Reductions in Million of Pounds of Nitrogen from NPS to Water Bodies (from Section 319 funded projects) (WQ-9a): Annually Review information from LDAF, USDA, Watershed Coordinators, NPS staff and Stakeholders for NPS Load Reductions of Nitrogen; Include information in NPS Annual Report (not currently reported by LDAF).						
Estimated Annual Reductions in Million of Pounds of Phosphorus from NPS to Water Bodies (from Section 319 funded projects) (WQ-9b): Annually review information from LDAF, USDA, Watershed Coordinators, NPS staff and Stakeholders for NPS Load Reductions of Phosphorus: Include information in NPS Annual Report (not currently reported by LDAF).						
Estimated Annual Reductions in Million of Pounds of Sediment from NPS to Water Bodies (from Section 319 funded projects) (WQ-9c): Annually review information from LDAF, USDA, Watershed Coordinators, NPS staff and Stakeholders for NPS Load Reductions of Sediment: include information in NPS Annual Report.						
Number of Water Bodies Where Instream Concentrations of NPS Parameters Have Been Reduced (i.e. sediment, fecal coliform bacteria, nutrients): Annually review water quality data for reductions in sediment, fecal coliform bacteria and nutrients as a result of NPS activities; Include information in NPS Annual Report (will be reported in 2012 and subsequent years).						

Number of NPS Impairments Removed from LA's IR: Annually review state IR for NPS impairments (DO, Fecal, TSS, etc.) removed as a result of NPS activities; Include information in NPS Annual Report.						
Basin/Watershed Milestones for Water Quality Improvement	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
Watershed Implementation Plans Developed - Baseline is 2012						
Identified "Priority Areas" in the Watershed for BMP Implementation						
Selected BMPs to Achieve NPS Load Reductions						
Appropriate Stakeholders Involved in Watershed Implementation						
BMPs Implemented in Watershed "Priority Areas"						
Water Quality Monitoring to Evaluate Effectiveness of BMP Implementation						
Water Quality Data Analyzed for Water Quality Improvements						
Develop Success Story or Identify Future Actions to Achieve Success						
Delist Water Body from Water Quality Impairment List						
Progress in Reducing Unliquidated Obligations (ULO)	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
Federal Funds Included with 2012 as a Baseline (in millions of dollars for 2012-2017)						

Activity Milestones to Meet Water Quality Goals	2012	2013	2014	2015	2016	2017
Statewide Agricultural Milestones						
Annually Evaluate Progress in Each of These Activities						
Partner with LDAF on Data-sharing and BMP Implementation for Pesticides						
Continue to Implement Nutrient and Sediment BMPs in Agricultural Watersheds						
Continue to Prioritize Water Bodies Impaired for Fecal Coliform Bacteria for Water Quality Improvement, Partial and Full Restoration						
Expand Statewide Educational Programs to include Electronic Media and Tools						
Continue to Partner with LDNR-OCM on implementation of CNPCP						
Reduce the Number of Agricultural Watersheds Impaired by NPS Pollution (Baseline is 85, based on 2010 IR); Cropland (Irrigated and Non-Non Irrigated Crop Production)						
Reduce the Number of Agricultural Watersheds Impaired by NPS Pollution (Baseline is 10, based on 2010 IR); Pastureland (Managed Pasture)						
Determine if Additional Steps are Necessary to Improve Water Quality in Agricultural Watersheds						
Statewide Forestry Milestones						
Annually Evaluate Progress in Each of these Activities						
Host a Series of Forestry Water Quality Workshops to Increase BMP Compliance Rate						
Continue to Implement Forestry and Streambank Protection BMPs in Forested Watersheds						
Expand Statewide Educational Programs to Include Electronic Media and Tools						
Continue to Partner with LDNR-OCM on implementation of CNPCP						
Reduce the Number of Forested Watershed Impaired by NPS Pollution (Baseline is 17, based on 2010 IR)						
Determine if Additional Steps are Necessary to Improve Water Quality in Forestry Watersheds						

Activity Milestones to Meet Water Quality Goals	2012	2013	2014	2015	2016	2017
Statewide Individual Home Sewerage Systems						
Annually Evaluate Progress in Each of these Activities						
Increase Coordination with LDHH and Parishes on Inspection Programs for Individual Home Sewage Systems						
Examine New Technologies to Determine Feasibility of Reducing Nutrient and Bacteria Loads from Individual Systems						
Coordinate with State Revolving Load Fund Program in Parishes/Watersheds where Community Systems could replace Individual Systems						
Activity Milestones to Meet Water Quality Goals	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
Partner with LDNR-OCM on implementation of CNPCP						
Reduce the Number of Water Bodies Impaired by Fecal Coliform Bacteria from Individual Home Sewerage Systems (Baseline is 61, based on 2010 IR)						
Statewide Resource Extraction Milestones						
Annually Evaluate Progress in Each of these Activities						
Coordinate with Office of Conservation on Potential Restoration Opportunities for Sand and Gravel Mines						
Reduce the Number of Water Bodies Impacted by Sand and Gravel Mining Activities (Baseline is 1, based 2010 IR)						
Statewide Construction Milestones						
Annually Evaluate Progress in Each of these Activities						
Coordinate with LDOTD on Programs to Reduce Sediment from Road and Highway Projects						

Activity Milestones to Meet Water Quality Goals	2012	2013	2014	2015	2016	2017
Coordinate with Parishes and Municipalities to Reduce Sediment from Residential Construction Projects						
Partner with LDNR-OCM on implementation of CNPCP						
Urban Storm Water Milestones						
Annually Evaluate Progress in Each of these Activities						
Continue to Host Educational Outreach Activities with Municipalities on Green Infrastructure and Storm Water BMPs/Ordinances						
Partner with Stakeholders on Nutrient Reduction Activities in Urban and Rural Communities						
Provide Materials to Municipalities on Urban NPS Pollution, BMPs and Ordinances for Reducing Pollutant Loads						

Activity Milestones to Meet Water Quality Goals	2012	2013	2014	2015	2016	2017
Hydromodification Milestones						
Annually Evaluate Progress in each of these Activities						
Continue to Make Recommendations through SOV and 401 Water Quality Certification processes to Local Parish Drainage Boards and Police Juries on Hydromodification BMPs						
Track Water Quality Improvements that Result from these Recommendations						
Reduce the Number of Water Bodies Impaired by Hydromodification Activities (Baseline is 2, based on 2010 IR)						

Activity Milestones to Meet Water Quality Goals	2012	2013	2014	2015	2016	2017
Source Water Protection						
Develop contingency plans for water systems in targeted communities in the event of an emergency or loss of the water supply						
Disseminate BMPs through visits to businesses considered potential sources of contamination to drinking water supplies						
Partner with each committee to introduce a drinking water protection model ordinance for adoption by local governments						

Activity Milestones to Meet Water Quality Goals	2012	2013	2014	2015	2016	2017
Coastal Nonpoint Pollution Control Program						
Continue to implement CPNCP management measures for each category identified as contributing to coastal NPS pollution						
Continue to partner with LPBF, BTNEP and Atchafalaya Basin Programs on coastal NPS program activities						
Continue to partner with coastal parishes to implement management measures for urban, home sewage and hydromodification						
Continue to partner with LDAF, USDA and LSU AgCenter to implement management measures for agricultural and forestry						
Continue to collect water quality data and evaluate effectiveness of management measure implementation in improving water quality						

Congressional Mandates, Federal Guidance and State Responses for Louisiana's NPS Management Plan

History

During the past 30 years since the CWA was approved by Congress, there has been significant progress made in improving the nation's water quality. A brief description of some of the actions of Congress to protect and restore the nation's drinking waters and recreational waters have been included here. In 1987, Congress amended the CWA to focus greater national efforts on managing NPS pollution. In the Water Quality Act of 1987, Congress amended section 101, "Declaration of Goals and Policy," to add the following fundamental principle:

It is the national policy that programs for the control of nonpoint sources of pollution be developed and implemented in an expeditious manner so as to enable the goals of this Act to be met through the control of both point and nonpoint source of pollution.

Section 319 of the Clean Water Act

Congress enacted Section 319 of the CWA, which established a national program to control NPS water pollution. Under Section 319, States address NPS pollution by assessing NPS source pollution problems and causes in the state, adopting management programs to control NPS pollution, and implement the management program. Section 319 authorized USEPA to issue grants to states to assist them in implementing those management programs or portions of management programs, which had been approved by USEPA (USEPA, 1993).

Safe Drinking Water Act Amendments of 1996

The Safe Drinking Water Act (SDWA) Amendments of 1996 emphasized pollution prevention to ensure safe drinking water, focusing on the protection of the water sources. In order to achieve such protection, all states were required to develop SWAP. The ultimate goal of the State of Louisiana Source Water Assessment Program has been to balance technical adequacy against cost and time, and still produce a usable product that the public can understand.

Coastal Zone Reauthorization Amendments of 1990

In addition to the CWA, Congress enacted Coastal Zone Reauthorization Amendments (CZARA) of 1990. These amendments were intended to address several concerns, a major one of which was the impact of NPS pollution on coastal waters. In section 6202 (a) of the Amendments, Congress made a set of findings, which are quoted below in pertinent part.

NPS pollution is increasingly recognized as a significant factor in coastal water quality degradation. In urban areas, storm water and combined sewer overflows are linked to major coastal problems, and in rural areas, runoff from agricultural activities may add to coastal pollution.

There is a clear link between coastal water quality and land use activities along the shore. State management programs under the Coastal Zone Management Act of 1972 (16 U.S.C. 1451 et seq.) are among the best tools for protecting coastal resources and must play a larger role, particularly in improving coastal zone water quality" (USEPA, 1993).

Wetlands play a vital role in sustaining the coastal economy and environment. Wetlands support and nourish fishery and marine resources. They also protect the nation's shores from storm and wave damage. Coastal wetlands contribute an estimated $5 billion to production of fish and shellfish in the United States' coastal waters. Yet, wetland loss has affected 50 percent of the Gulf's coastal wetlands and more are likely to decline in the future (USEPA, 2012).

Congress enacted Section 6217, "Protecting Coastal Waters" providing for each state with an approved coastal zone management program to develop a CNPCP. The purpose of CNPCP is to develop and implement a technology based program using management measures to restore and protect coastal waters. The state coastal zone and water quality agencies are to be co-equal and work in conjunction with other state and local authorities.

In addition to the CWA, SDWA and CZARA, Congress realized that national waters can not be fully restored or protected without participation of the agricultural community. Through inclusion of more conservation programs in the Farm Bill, Congress has continued to emphasize importance of reducing soil erosion, protecting water quality and restoring wetlands.

Farm Security and Rural Investment Act of 2008

In 2008, Congress authorized Farm Security and Rural Investment Act of 2008 (i.e. Farm Bill) which provided programs to assist landowners, farmers and ranchers with implementing BMPs to reduce NPS pollution, restore wetlands and improve wildlife habitat. The level of funding in the Farm Bill provides incentives to the agricultural community to participate in Environmental Quality Incentive Program (EQIP), Wetland Reserve Program (WRP), Wildlife Habitat Incentive Program (WHIP) and other programs aimed at increasing utilization of BMPs on their lands.

In the State of Louisiana, federal and state agencies partner with local governments to implement these programs, which was the intent of the CWA. Section 319 of CWA indicated the NPS Program should be multi-disciplinary and implemented through collaborative efforts of many programs and stakeholders.

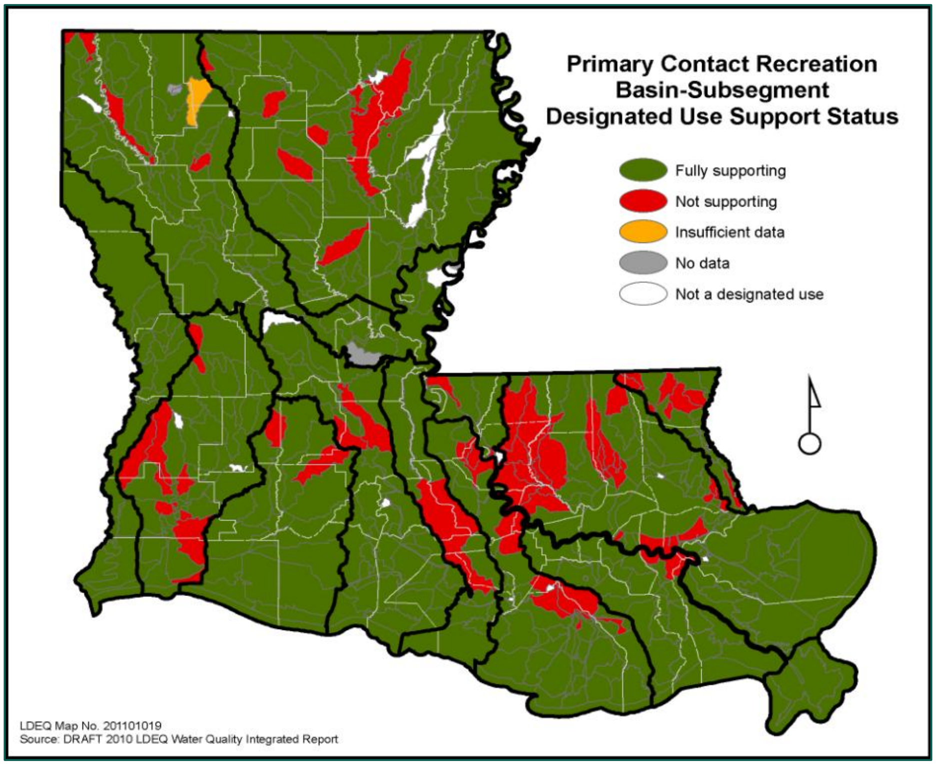

Figure 2: 2010 IR Primary Contact Recreation Use

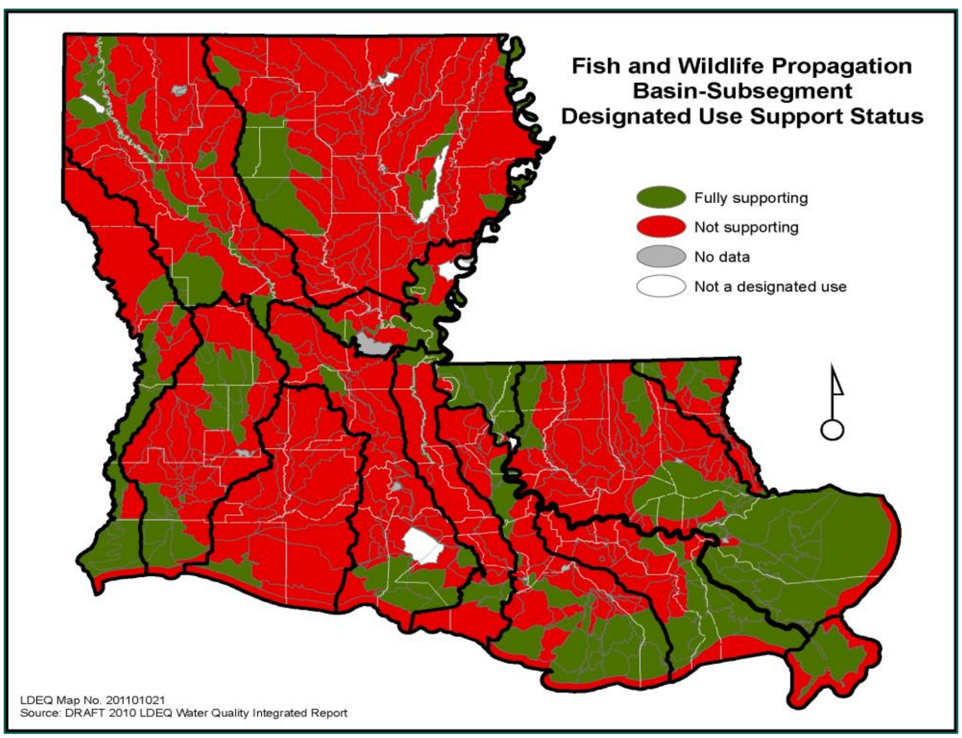

Figure 3: 2010 IR Fish and Wildlife Propagation Use

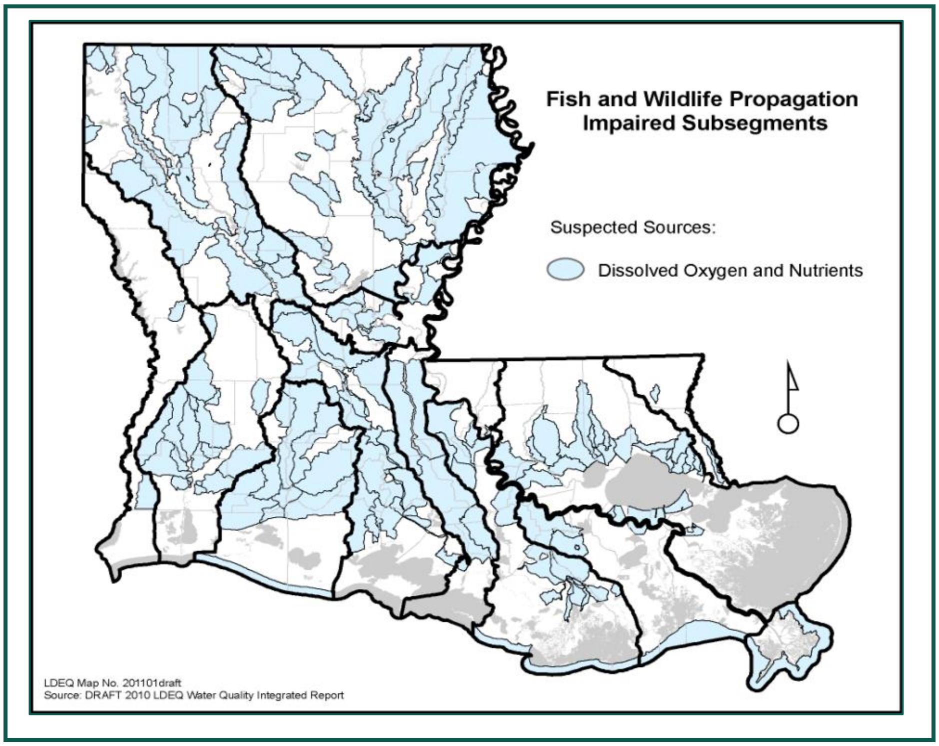

Figure 4: 2010 IR Fish and Wildlife Propagation Impairments for DO and/or Nutrients

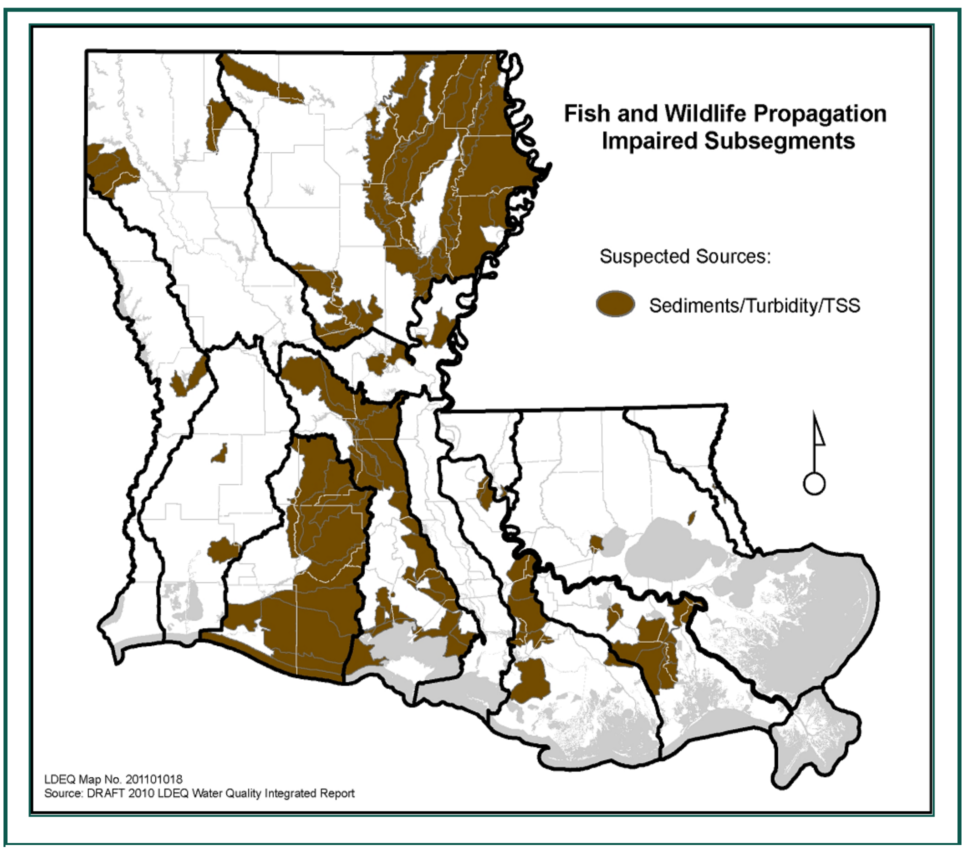

Figure 5: 2010 IR Fish and Wildlife Propagation Uses Impaired for Sediment/Turbidity or Sedimentation

Nonpoint Source Management Program Requirements

Section 319 of the CWA (PL 100-4, February 4, 1987) directed the Governor of each State to prepare and submit a NPS Management Program for reduction and control of pollution from NPS sources to navigable waters in the State. The specific requirements of Section 319 are:

A. An identification of BMPs and measures which will be undertaken to reduce pollutant loading resulting from each category, subcategory, or particular nonpoint source designated under paragraph (1)(B), taking into account the impact of the practice of ground water quality.
B. An identification of programs (including, as appropriate, non-regulatory or regulatory programs for enforcement, technical assistance, financial assistance, education, training, technology, transfer, and demonstration projects) to achieve implementation of BMPs by categories, subcategories, and particular NPS sources designated under subparagraph (A).
C. A schedule containing annual milestones for (i) utilization of the program implementation methods identified in paragraph (B), and (ii) implementation of BMPs identified in subparagraph (A) by the categories, subcategories, or particular NPS designated under paragraph (1)(B). Such schedule shall provide for utilization of BMPs at the earliest practicable date.
D. A certification of the attorney general of the State (or the chief attorney of any state water pollution control agency which has independent legal counsel) that laws of the State or States, as the case may be, provide adequate authority to implement such management programs, or if there is not adequate authority, a list of such additional authorities as will be necessary to implement such management programs. A schedule and commitment by the State or States to seek such additional authorities as expeditiously as practicable.
E. Sources of Federal and other assistance and funding (other than assistance provided under subsections (h) and (i) which will be available in each of such fiscal year for supporting implementation of such practices and measures and the purposes for which such assistance will be used in each of such fiscal years.
F. An identification of Federal financial assistance programs and Federal development projects for which the State will review individual assistance applications or development projects for their effect on water quality pursuant to the procedures set forth in Executive Order 12372 as in effect on September 17, 1983, to determine whether such assistance applications or development projects would be consistent with the program prepared under this subsection; for the purposes of this subparagraph, identification shall not be limited to the assistance programs or development projects subject to Executive Order 12372 but may include any program listed to the assistance programs subject to Executive order 12372, but may include any programs listed in the most recent Catalog of Federal Domestic Assistance which may have an effect on the purposes and objectives of the State's NPS pollution management program.

In response to the federal law, the State of Louisiana passed R.S. 30:2011, signed by the Governor in 1987 as Act 272. This law directed LDEQ, designated as Lead Agency for the NPS program, to develop and implement a NPS Management Program. The Department, as the state agency officially charged with responsibility to protect and preserve quality of waters of the State, has developed the NPS Management Program. The NPS Management Program was developed in coordination with appropriate state agencies including, but not limited to, the Department of Natural Resources, the Department of Wildlife and Fisheries, the Department of Agriculture and Forestry, and the State Soil and Water Conservation Committee in those areas pertaining to their respective jurisdictions (La.R.S. 30:20).

USEPA Guidelines on Nonpoint Source Program

USEPA provided national guidance documents to states since 1990, when Congress allocated Section 319 funds to implement NPS Programs. These guidance documents have been updated, revised, and re-issued several times. The 1996 NPS Guidance provided a set of nine key elements that all states should strive to incorporate into their upgraded NPS Programs.

USEPA's Nine Key Elements for Upgrade of State NPS Management Programs

1. The State program contains explicit short- and long-term goals, objectives, and strategies to protect surface and ground water.
2. The State strengthens its working partnerships and linkages with appropriate State, Tribal, regional, and local stakeholders (including conservation districts), private sector groups, citizen groups, and Federal agencies.
3. The State uses a balanced approach that emphasizes both statewide NPS programs and on-the ground management of individual watersheds where waters are impaired and threatened.
4. The State program (a) abates known water quality impairments from nonpoint source pollution and (b) prevents significant threats to water quality from present and future activities.
5. The State program identifies waters and watersheds impaired by NPS pollution and also identify important unimpaired waters that are threatened or otherwise at risk. Further, the State establishes a process to progressively address these identified waters by conducting more detailed watershed assessments and developing watershed implementation plans and then by implementing the plans.
6. The State reviews, upgrades, and implements all program components required by section 319(b) of the Clean Water Act, and establishes flexible, targeted, and iterative approaches to achieve and maintain beneficial uses of water as expeditiously as practicable. The programs include:
    a. A combination of water quality-based and/or technology-based programs designed to achieve and maintain beneficial uses of water; and
    b. A combination of regulatory, non-regulatory, financial and technical assistance as needed to achieve and maintain beneficial uses of water as expeditiously as practicable.
7. The State identifies Federal lands and activities, which are not managed consistently with State NPS program

objectives. Where appropriate, the State seeks USEPA assistance to help resolve issues.

8. The State manages and implements NPS program efficiently and effectively, including necessary financial management.
9. The State periodically reviews and evaluates its NPS management program using environmental and functional measures of success, and revises its NPS assessment and its management program at least every five years.

In 1999-2000, LDEQ revised the state's NPS Management Plan to address these nine key elements and to outline goals and objectives for program implementation. A vision statement was written and included in the NPS Plan and is still applicable to the state's approach to managing nonpoint source pollution and improving water quality.

Vision Statement: LDEQ will continue to work cooperatively with federal, state and local partners that assist them in implementation of statewide educational programs and watershed protection and restoration projects. Through this implementation, water bodies in the state that are presently impaired because of NPS pollution should improve and meet their designated uses for fishing, swimming and drinking water supplies.

As previously stated in this document, substantial progress has been made in meeting water quality goals since 2000 with each IR listing cycle indicating consistent improvement and delisting water bodies impaired for NPS problems.

Through implementation of NPS Management Program, Louisiana learned that land-use activities such as agricultural or urban storm water runoff are not issues that are either simple or quick to correct. The technological, financial and political nature of implementing NPS control measures or practices on private lands in rural or urban watersheds are a long-term, continuous process. Gaining cooperation of all landowners, loggers or urban developers that collectively contribute to water quality problems that exist is the goal of the NPS Program. Interim goals or steps in this long-range pollution reduction process have been identified, in order to evaluate the rate of progress in reaching water quality goals for priority water bodies.

Louisiana's Approach to USEPA's Nine Key Elements for Upgrade of their NPS Management Program

Long-term and short-term goals

The long-term goal for statewide or watershed programs is to improve water quality and restore designated uses. In order to meet these water quality goals in Louisiana, emphasis will continue to be placed on reducing fecal coliform from individual home sewerage systems to restore swimming uses. Emphasis will also be placed on reducing sediment and nutrients entering the water bodies to restore FWP. The FWP designated use is linked to many factors, including DO, mercury, turbidity/total suspended solids and sedimentation or chlorides.

The State of Louisiana has adopted numerical criteria for DO for each water body. Although this numerical criterion is typically 5 ppm, these numbers do vary, depending on natural conditions and ecosystems that exist in the state. Reference streams have been selected in each of the state's ecoregions to determine appropriate DO standards. The reference stream is basically the *best example* that can be found of a bayou, stream, river or lake in a specific ecoregion. The ecoregion is defined as a geographic area that consists of similar soil types, vegetation, and geology. A map that illustrates the state's Ecoregions has been finalized, but will continue to be refined as additional sampling is completed.

Reference streams, by definition, are relatively unimpacted by sources of pollution and can serve as a baseline for other water bodies in an ecoregion. Therefore, it may not be completely realistic to expect that all water bodies in that ecoregion can attain the same level of water quality that a reference stream would. However, reference streams do provide exactly what its name implies: a point of reference from which to compare water quality of other water bodies in that ecoregion of the state. Figure 6 depicts Louisiana's most recent version of the ecoregion map.

The long-range goal of the NPS program is to restore impaired waters and meet water quality standards. The short-term goal is to implement statewide and watershed programs that result in implementation of BMPs to reduce sediment, carbon-based compounds and/or nutrients that contribute to DO problems in state waters.

The long-term goal for waters designated for contact recreation, is to reach in-stream numerical criteria for fecal coliform bacteria. The short-term goal is to implement BMPs to reduce concentrations of fecal coliform from identified sources, such as home sewerage systems, urban communities or animal operations.

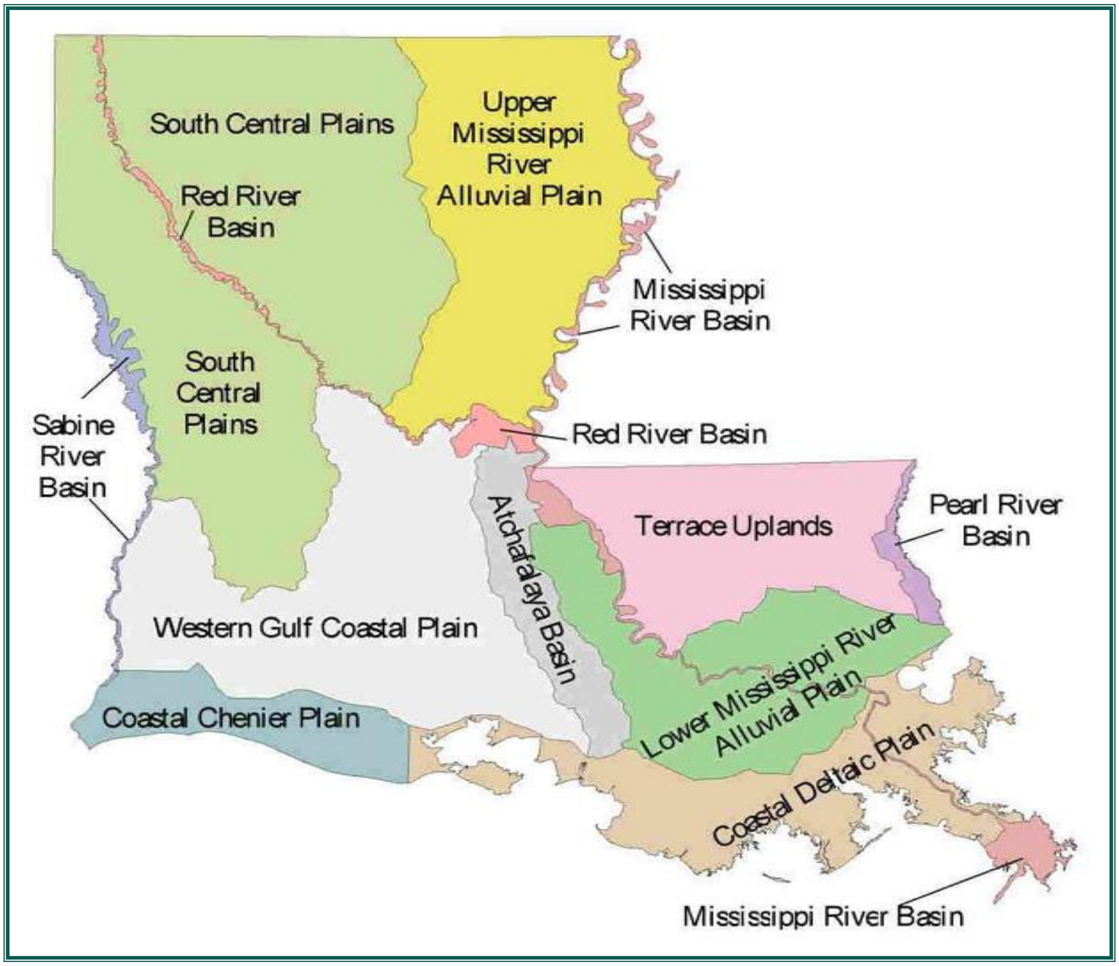

Figure 6: Louisiana's Ecoregions

Milestones and timelines have been estimated for these water quality goals with the understanding that they are the best estimates possible for gauging progress. These milestones are steps in the process to reach long-term goals of meeting in-stream standards for DO and fecal coliform bacteria. These goals also include removing water bodies from the 303(d) list and writing success stories that describe how the water body was restored.

1. **Defining Partnerships for Program Implementation**

The land-use categories that have been defined as contributing to Louisiana's NPS pollution problems cross many federal, state and local program authorities and responsibilities. Therefore, it is essential for all of the agencies to partner with the general public, landowners, urban developers, builders and environmental community to focus their programs on water quality protection and improvement. Louisiana has a good history of working together on natural resource issues that involve water quality and habitat protection.

In 1989, when Louisiana began to formalize the NPS Management Program, each of the state and federal agencies signed a Memorandum of Understanding (MOU) and agreed to partner with LDEQ on implementing the program. A NPS Interagency Committee was formed and has continued to meet. This interagency committee structure has been effective in implementing the state's NPS Management Program. Committee members have submitted projects that have been implemented as statewide educational programs and watershed implementation projects. They have supported and sponsored agricultural field days and educational workshops for loggers and landowners. They have created educational videos, brochures and pamphlets that have been distributed through local parish and district offices. They have formed committees to work on parish ordinances for urban development and wetland regulations. Interagency cooperation and coordination of programs is the strength and the basis of the success of Louisiana's NPS Management Program. In 2005 and in 2007, LDEQ partnered with University of Louisiana at Lafayette (ULL) to host watershed conferences, which were attended by approximately 200 people that have worked on water quality issues across the state. These conferences will continue to be held as a means of educating the pubic and program cooperators on progress being made in implementing the State's NPS Management Plan.

The LSU AgCenter has partnered with LDEQ to evaluate effectiveness of BMPs and gather quantifiable data to estimate pollutant load reductions that result from their implementation. The AgCenter has also developed and implemented educational programs that address a wide range of NPS issues. Natural Resource Conservation Service (NRCS) has coordinated their cost-share and technical assistance programs in areas that LDEQ targeted through the state's 303(d) list of impaired waters. Programs like EQIP, CRP, Conservation Reserve Enhancement Program (CREP), WRP and WHIP have been instrumental in supporting implementation of BMPs. These practices target reduction of sediment, nutrients, pesticides, and fecal coliform from entering water bodies in priority watersheds. The Farm Services Agency (FSA) and NRCS provided cost-share funds through USDA to assist farmers in making changes on their fields, poultry farms, and dairy operations. Section 319 funds are often utilized to host demonstrations and implement BMPs in priority watersheds, coordinated with USDA funds for implementation of recommended practices. The State will continue to expand the range of participation in the NPS Program at statewide and local watershed levels. Since the program focuses on issues that involve private lands and how people manage these lands, it is important to continue to include as many people in the decision-making process as possible.

2. Balanced Approach for Statewide and Watershed Implementation

Louisiana has implemented an approach to provide added balance to statewide and watershed-specific approaches for NPS pollution control and management. Watershed Coordinators employed regionally across the state serve to initiate and coordinate local involvement in identifying and seeking solutions for water pollution. Resources from state and federal agencies or other stakeholders can be leveraged for watershed-specific problems. As interest and involvement grows, the watershed community can seek to formalize their actions into a local environmental program with autonomy and leadership. Organized partnerships, with sound planning and implementation, can be a foundation for local environmental efforts. Such local programs are critical to sustainability of environmental projects and can be competitive in seeking resources through statewide programs or grant opportunities.

- Statewide programs provide resources for NPS practices to be implemented throughout the state to solve water quality problems. Members of the NPS

Interagency Committee have developed and implemented statewide programs for forestry, agriculture, home sewerage systems, urban runoff, and sand and gravel mining. These programs are examples of interagency cooperation with industry support. As a result of these programs, there is a better understanding of NPS pollution;

- An increased awareness of practices that can be implemented by the farmer, logger and landowner to reduce the impact of their activities on Louisiana's water bodies; and
- An increase in implementation of practices to manage NPS pollution.

Statewide Agricultural Programs

Statewide programs institutionalize goals and objectives of NPS management into agency programs. For example, LDEQ and USDA have coordinated their watershed programs and utilized water quality data to identify water bodies for implementation of federal cost-share programs. EQIP, WRP, CREP and CRP have been implemented in watersheds identified in the state's IR as impaired by agricultural NPS. Most recently, USDA and LDEQ partnered on USDA's Mississippi River Basin Healthy Watershed Initiative (MRBI) to target practices that reduce nutrients such as nitrogen and phosphorus entering the Gulf of Mexico. MRBI allowed states that border the Mississippi River with an opportunity to implement these types of NPS controls that could be expanded to adjacent watersheds to reduce the size of hypoxia in the Gulf of Mexico.

In Louisiana, LDEQ is lead agency for the NPS Program, but partners with LDAF to implement the incremental portion of Section 319 funds in agricultural watersheds that have been included on the State's 303(d) list of impaired waters. However, CWA Section 319 funding guidelines may change the way that these funds are allocated for NPS Program implementation in the future. These watersheds have had TMDLs developed, indicating significant NPS loads associated with agricultural runoff. WIPs have been developed to target where in the watershed the largest NPS loads may originate. This allows for more of a focused effort toward implementing BMPs in areas with highest sediment and nutrients loads to the water body. LDAF tracks BMP implementation and provides a summary of progress each year in the NPS Annual Report. Information on acreage of BMPs implemented through the Farm Bill Programs is also included in this report, by basin. This allows LDEQ, USEPA and the public to gain a better understanding of where efforts are being made to reduce NPS loads and also where additional work is necessary to reach in-stream water quality standards.

Through collaborative efforts with LSU AgCenter, agricultural BMPs were developed for each of the major agricultural crops in the state. A current set of agricultural BMP manuals are available on LSU AgCenter's website: http://www.lsuagcenter.com/en/environment/conservation/bmps. Many of these BMPs have had edge of field data collected to quantify their effectiveness in reducing sediment, nutrients and fecal coliform bacteria entering water bodies. The results from many of these projects are available on LDEQ's website and are also incorporated in the statewide educational program called Master Farmer Program. Farmers participate in the program to learn more about the CWA and how it relates to their daily activities on their lands. Once farmers understand what needs to be done, they can work with their local Districts on farm plans to implement the BMPs. This compliance with the BMPs provides them with a certification that they are a Master Farmer who works to help restore and protect water bodies in Louisiana.

Statewide Forestry Programs

The Louisiana Forestry Association (LFA) works with various forestry industries across the state to implement training workshops for loggers on forestry BMPs. The U.S. Forest Service has become more involved in water quality monitoring on water bodies that run through forest service lands. Both LFA and the U.S. Forest Service work closely with LDEQ on forestry educational programs that help Louisiana meet goals and objectives of Section 319 of the CWA. Several of the programs that will be implemented to address forestry NPS problems on statewide and watershed levels will be highlighted in the Forestry Section of this document. One on-going effort is for the Louisiana Office of Forestry (LOF) to track forestry BMP implementation on a parish basis and report on results of BMP compliance for forestry operations. This allows LDEQ and the forestry community to see where educational programs have been effective and where additional work may be necessary to improve water quality. The LFA has also implemented a tracking system where forestry BMPs must be utilized or loggers can not sell the trees at the mills. If complaints are received for water quality problems associated with forestry activities, then LDEQ and LFA partner to correct the problem and these actions can result in the logger losing their Master Logger certification.

Statewide Sand and Gravel Mining Programs

In the past five years, LDEQ has also partnered with the Concrete and Aggregate Industry on a BMP Manual for sand and gravel mining. This manual has been provided to sand and gravel industries that mine in Louisiana and is also provided for new permit requests that LDEQ receives for sand and gravel mining. LDEQ partnered with the Louisiana Nature Conservancy (TNC) on a project to identify where sand and gravel mines were located in Pearl River Basin and TNC met with local landowners to educate them about the BMP manual and how their activities affect water quality and the biological community in that watershed. West Pearl River-from Holmes Bayou to the Rigolets has been delisted for turbidity since 2006. A copy of the manual has also been provided to LDNR's Office of Conservation, who is in the process of identifying where abandoned mines are in Louisiana in anticipation of funds to restore selected sites.

Statewide Urban Programs

LDEQ has partnered with several landscape architects on design manuals for green infrastructure and urban BMPs that can be applied in residential, commercial and light industrial areas. A copy of the landscape ordinance final report is posted on LDEQ's NPS website at http://nonpoint.deq.louisiana.gov. This report provides information and instructions to urban communities on how they can revise their existing landscape codes to incorporate storm water BMPs. LDEQ staff has continued to participate in workshops to educate cities about the importance of implementing urban BMPs such as impervious concrete, grassed swales and wetland detention areas. They have also assisted East Baton Rouge Parish with revision of their development codes to require BMPs for all development and redevelopment projects. LDEQ has participated with Center for Planning Excellence (CPEX) in their smart growth conferences and planning efforts that encourage parishes to utilize zoning as a method to plan where urban development should occur in an attempt to reduce urban sprawl.

Statewide Onsite Individual Sewerage Programs

LDEQ continues to partner with Louisiana Department of Health and Hospitals (LDHH) on more efficient ways to coordinate their inspections and field work on home sewerage systems with impaired waters that are listed for fecal coliform bacteria. LDHH has provided information on their inspection and replacement activities for parishes to assist LDEQ in writing success stories for Bayou Plaquemine Brule, Tangipahoa and Tchefuncte Rivers. There are a higher percentage of water bodies being restored for contact recreation each year, indicating that many of the sewage issues that cause water quality problems are being addressed. LDEQ and LDHH developed educational materials and videos that were provided to all parish offices for distribution with permit requests for installation of home sewerage systems. These efforts combined with those of the SWPP are having positive effects on water quality in Louisiana. The SWPP works with local parishes and communities on educating the public on how malfunctioning home sewerage systems can have a detrimental effect on water quality. They work through local stakeholder groups to adopt ordinances that require home sewerage systems to be inspected and replaced when problems are detected. Both the NPS and SWPP have implemented several projects in the state to replace failing home sewerage systems that were identified as contributing to water quality problems. These types of projects continue to be a priority for the state until all of the water bodies that are impacted for fecal coliform as a result of home sewerage systems have been restored.

Watershed Planning

Watershed planning is the primary tool that leads to implementation of practices that solve NPS water quality problems. Watershed planning is formalized in WIPs. Watershed coordinators and LDEQ's NPS staff participate with stakeholders (i.e., the watershed community and state and federal resource agencies) in development and implementation of WIPs. The WIP describes the path(s) forward to achieve water quality goals and identification of resources necessary for watershed implementation. Through the watershed planning process, LDEQ and LDAF partner to compile information on acreage of agricultural BMPs implemented through Farm Bill Programs and Section 319 funds. This information allows local stakeholders to see progress that has been made to restore the watershed and what additional steps may be necessary to meet water quality standards. This information can also be provided to stakeholder meetings to assist local farmers and Soil and Water Conservation Districts (SWCDs) identify where in the watershed that additional BMP implementation may be necessary. LDEQ implements this watershed planning process in many watersheds across the state, with the long-term goal of restoring all of the water bodies currently not meeting their designated uses. Agricultural BMPs are not the only types of practices that are implemented through watershed restoration programs. The local focus may be on individual home sewerage systems or urban storm water, sand and gravel mines or stream bank protection. Current water quality problems are the focus for watershed planning and restoration efforts. Through this balanced approach to statewide and watershed implementation, Louisiana's water quality problems can be addressed and water bodies protected and restored.

3. **Abates Known NPS Water Quality Impairments and Prevents Significant Present and Future Threats to Water Quality**

LDEQ initially identified NPS water quality problems such as low dissolved oxygen, high turbidity and high bacterial counts as in-stream indicators to track progress in NPS implementation. LDEQ's regional office staff assisted NPS staff at LDEQ Headquarters in identifying sources of NPS pollution. Demonstration projects and educational programs were developed to address specific NPS issues in priority watersheds. Once cooperating agencies and the public were engaged in routine meetings on NPS concerns, then key practices were implemented. For example, in the Tangipahoa River Watershed, this watershed approach resulted in reduced in-stream fecal coliform bacteria from dairies and home sewerage systems and subsequent delisting of Tangipahoa River in the state's 2008 IR.

The results of these watershed activities have been highlighted in the NPS Annual Reports and other forms of documentation to USEPA. Copies of the last six years of these Annual Reports can be found at LDEQ's NPS website at http://nonpoint.deq.louisiana.gov. This process continues to be utilized and refined to target problem areas in the watershed for BMP implementation. The watershed approach has also been adopted for point source pollution control, enabling integration of point and NPS pollution management by watershed. Between 2004 and 2010, the state's IR continued to document water quality improvement and delisting as a result of NPS program implementation. More details on this management process are described in the watershed section of the NPS Management Plan.

Although impaired waters still have a higher priority for resource allocations, a new national initiative, Healthy Watershed Initiative (HWI), may provide additional resources for protection of high quality waters. The intent of the HWI is to place equal emphasis on healthy waters as is placed on impaired waters. This will prevent these high quality waters from becoming impaired and encourage protective measures to be implemented in healthy watersheds.

4. **Identifies and Addresses NPS Impaired Waters and their Watersheds and Unimpaired Waters that are Threatened**

The State identifies NPS impaired waters through the Ambient Water Quality Monitoring Network, Water Quality Assessments, and the state's IR. Within the IR is the 303(d) list, which is the basis for prioritizing watersheds where NPS implementation will occur. Procedurally, identifying NPS impaired waters and subsequent implementation of impairment-specific remedies involves the process identified on pages 6-7 of the NPS Management Plan.

5. **Upgrades and Efficiently Implements all Program Requirements of Section 319(b) of the Clean Water Act to achieve and maintain Beneficial Uses of Water.**

Each year the State reports on progress made in NPS program implementation activities through the NPS Annual Report. Examples of these reports can be found on LDEQ's website. The report provides details on the number of water bodies that has been delisted and water quality improvements that have been made as a result of program implementation. Highlights from watershed coordinators, watershed projects and statewide educational programs are summarized in LDEQ's NPS Annual Report.

6. **Federal NPS Management within the State is Consistent with State NPS Management Program**

Federal agencies participate in the NPS Interagency Committee to coordinate their programs to meet CWA water quality goals. Two examples of this federal/state partnership are NRCS and U.S. Forest Service. Both of these agencies have partnered with LDEQ on coordination of projects to reduce the concentration and/or loading of sediment, nutrients and other pollutants associated with agricultural and forestry activities, respectively.

The NRCS utilizes the state's priority list for impaired waters in their ranking to prioritize participation in their cost-share and technical assistance programs. Coordination of these programs has resulted in an efficient and effective process of implementation in watersheds that have been identified as impaired. More recently, LDEQ has partnered with Corps of Engineers in New Orleans District on sand and gravel mining BMPs and coastal wetland forestry issues to improve coordination of programs to reduce NPS pollution and improve water quality.

MOUs with each of the federal agencies that have management responsibilities for land-use issues are subject to this NPS Management Plan. These MOUs serve as the basis for ensuring federal consistency with the state's goals and objectives for managing NPS pollution.

7. **Manages and Implements NPS Program Efficiently and Effectively, Including Necessary Financial Management**

The staff in the NPS Program is responsible for both technical and financial management of projects funded through Section 319. Tracking of federal and local matching dollars is done through quarterly invoicing and extensive records that are kept on file for each of the program's projects. The Financial Services Division, Contracts and Grants Section within LDEQ's Office of Management and Finance assist with tracking financial expenditures made through the NPS Program. In order to be more consistent with other states and meet USEPA's objectives for a Grants Reporting Tracking System (GRTs), LDEQ is entering all of the project information about Section 319 projects in GRTs. Substantial progress has been made by LDEQ to reduce unliquidated obligations (ULOs) through use of federal funds for staff support, watershed coordinators and monitoring. These activities support project implementation at the 12 digit HUC scale which is a manageable size to measure success over a 4-5 year timeframe.

8. **Periodically Reviews and Evaluates NPS Management Program Using Environmental and Functional Measures of Success**

The NPS Management Program is evaluated each year when the Annual Report is compiled for USEPA Region 6. Through the quarterly reports that are provided to LDEQ on each of the projects, progress is tracked to ensure that work plan commitments are met. Routine site reconnaissance to projects and watersheds ensure that progress is being made on program and water quality goals. Frequent meetings are held with cooperating agencies to communicate progress made on the NPS program and to discuss new national directives that are applicable to Louisiana.

In 2003, USEPA published Federal Fiscal Year (FFY) 2004 NPS Program and Grants Guidelines for States and Territories. A copy of the guidelines can be obtained at USEPA's website: http://www.epa.gov/owow/nps/cwact.html.
The purpose of this guidance document was to build upon and replace the NPS Program and Grants Guidance for FFY 1997 and Future Years, as well as all of the supplemental annual NPS guidance and guidelines that have been published. The central theme of FFY 2004 NPS Program and Grants Guidelines was to place additional emphasis on watershed-based planning and restoring impaired waters through developing and implementing TMDLs. The guidelines stated that two key steps were necessary to solve NPS problems: development of a watershed-based plan that addresses a water body's problems and actual implementation of the plan.

In FFY 1999, USEPA asked Congress to increase Section 319 funds from $100 million to $200 million. The purpose of these additional funds was to implement watershed plans in high priority water bodies. The FFY 2004 Guidelines indicated that where a TMDL has been developed and approved, the WIP must be designed to achieve the NPS load reductions required in the TMDL. Therefore, FFY 2004 guidelines maintained the position that all incremental funds provided to the states would need to be utilized for development and implementation of watershed-based plans to reduce NPS pollution and achieve water quality standards.

The FFY 2004 USEPA Guidelines also outlined requirements that states need to include in watershed-based plans to restore waters impaired by NPS pollution if incremental funds from the Section 319 grant were utilized to fund implementation of the plan. These items include:

a. An identification of causes and sources or groups of similar sources that will need to be controlled to achieve load reductions estimated in this WIP (and to achieve any other watershed goals, identified in the watershed-based plans), as discussed in item (b) immediately below. Sources that need to be controlled should be identified as the significant subcategory level with estimates of the extent to which they are present in the watershed (e.g. X number of dairy cattle feedlots needing upgrading, including a rough estimate of the number of cattle per facility; Y acres of row crops needing improved nutrient management or sediment control; or Z linear miles of eroded stream bank needing remediation).
b. An estimate of load reductions expected for management measures described under paragraph (c) below (recognizing natural variability and difficulty in precisely predicting performance of management measures over time). Estimates should be provided at the same level as in item (a) above (e.g., total load reduction expected for dairy cattle feedlots; row crops; or eroded stream banks).
c. A description of the NPS management measures that will need to be implemented to achieve load reductions estimated under paragraph (b) above (as well as to achieve other watershed goals identified in these watershed-based plan), and an identification (using a map or a description) of the critical areas in which those measures will be needed to implement this plan.
d. An estimate of the level of technical and amount of financial assistance needed and/or the sources and authorities that will be relied upon, to implement this plan. As sources of funding, States should consider the use of their Section 319 programs, State Revolving Funds, USDA's EQIP, and other relevant federal, state, local and private funds that may be available to assist in implementing this plan.
e. An information/education component that will be used to enhance public understanding of the project and encourage their early and continued participation in selection, designing, and implementing NPS management measures that will be implemented.
f. A schedule for implementing NPS management measures identified in this plan that is reasonably expeditious.
g. A description of interim, measurable milestones for determining whether NPS management measures of other control actions are being implemented.
h. A set of criteria that can be used to determine whether loading reductions are being achieved over time and

substantial progress is being made towards attaining water quality standards and, if not, the criteria for determining whether this watershed-based plan needs to be revised or, if a NPS TMDL has been established, whether the NPS TMDL needs to be revised.

i. A monitoring component to evaluate the effectiveness of implementation efforts over time, measured against the criteria established under item (h) above.

LDEQ utilizes these guidelines to develop watershed plans for water bodies that have had TMDLs developed for them. LDEQ has also worked closely with LDAF on coordination of watershed plan implementation with incremental Section 319 funds. LDEQ and LDAF have developed a process for working together on watershed planning and implementation in order to restore the water bodies to their designated uses. The process works along these steps:

- LDEQ meets with LDAF to discuss the list of impaired waters that are in agricultural watersheds;
- LDAF determines which of those watersheds they can make progress in BMP implementation;
- LDEQ determines whether there has been a TMDL and WIP written to help them identify where the "hot spots" are in the watershed;
- LDEQ and LDAF develop the WIP if one does not exist, revise one if it does not meet the 9 key elements or utilize a completed plan as the basis for partnering with local stakeholders on BMP implementation;
- LDAF creates the work plan that implements the WIP, describing the area where they will focus their resources;
- LDEQ and LDAF select a 12 digit HUC or set of HUCs that are agricultural "hot spots" in the watershed where BMPs need to be implemented;
- These are their priority sites for partnering with farmers and landowners on BMP implementation;
- LDEQ partners with LDAF and local stakeholders to determine what type of water quality monitoring may be necessary to evaluate whether BMP implementation is achieving water quality goals of restoring designated uses;
- Stakeholders partner with LDEQ and LDAF to implement BMPs in critical areas of the watershed;
- LDEQ and LDAF meet routinely to determine if BMP implementation is going smoothly and discuss results of water quality data that has been collected; and
- The process of BMP implementation and education/outreach continues until water quality goals of the project are met and a success story can be written.

The purpose of USEPA's nine key elements is to provide an objective, scientific basis for watershed planning and management. All appropriate water quality, watershed, and land-use data available to LDEQ are utilized to describe watershed conditions and how improvement and/or protection can occur through a systematic approach to NPS implementation. Involvement of the local community in the watershed planning process is important since the NPS Program relies upon partnership and participation at the local level to guide implementation and provide sustainability of local water resources. LDEQ will have an annual report card which illustrates the number of water bodies that have been restored through the watershed implementation process. This report card can then become the basis for which water bodies may be eligible for NPS Success Stories.

The FFY 2004 USEPA Guidelines also stressed the importance of working with USDA through their Farm Bill Programs to *achieve common goals of improving, restoring and protecting water quality.* In Louisiana, USDA's EQIP prioritized NPS pollution as a priority to rank farms for allocation of EQIP funds. USEPA also encouraged states to partner with other federal agencies such as Bureau of Land Management, U.S. Forest Service, National Park Service, Corps of Engineers, Bureau of Reclamation, Federal Highway Administration and Federal Emergency Management Agency. They also encouraged the state to partner with other USEPA/State programs such as: the National Pollutant Discharge Elimination System (NPDES) as it relates to urban runoff, construction, inactive and abandoned mines, concentrated animal feeding operations and marinas. Coastal protection programs such as CNPCP, Wetland Protection Programs, Section 404 of CWA, SDWA, the Clean Lakes Program, Watershed Planning Programs, State Revolving Loan Fund Programs and ambient water quality monitoring programs.

USEPA's Strategic Plan for FFY 2007-2012 has continued to emphasize clean and safe waters as a national priority. The plan includes an extensive list of strategic targets aimed at improving the nation's drinking water supplies, fish and shellfish safe to eat, water safe for swimming, compliance with drinking water supplies, protecting water quality on a watershed basis and improving coastal waters and oceans. All of these strategies are consistent with the historical perspective that Congress, USEPA and the states have all been working toward since 1987 when the CWA was reauthorized. For a more detailed description of these strategies, go to USEPA's website at www.epa.gov

In order to implement these water quality goals, Congress has authorized funding through several sections of the CWA, one of which is the Section 319 grant program. States utilize these funds to further develop their programs and to implement them in priority waters of the state that have been identified as impaired or are in need of protection for recreational use or for public drinking water supplies.

Section 319 Grant Program

Section 319 (h) described the types of activities that states could fund through the NPS Management Program. For information on the grant application and reporting process, and grants for protection of ground water quality please see the CWA, Section 319 at USEPA's website:
http://www.epa.gov/lawsregs/laws/cwa.html.

Interagency Coordination

LDEQ relies on partnerships and collaboration of federal and state agencies, non-profit organizations, universities and other stakeholders to implement the NPS Management Plan. These partnerships have resulted in progress in implementation of statewide programs for forestry and agriculture through Master Logger and Master Farmer Programs. They have also resulted in watershed partnerships where stakeholders work together to collect water quality data, implement BMPs, host field days, educational events and evaluate success of their projects. In addition to the activities that LDEQ has fostered and supported, NPS issues have also been adopted by many other programs, such as USDA Farm Bill Programs, Local Soil and Water Conservation Districts (LSWCDs), the Barataria-Terrebonne National Estuary Program (BTNEP), LSU

AgCenter, Bayou Vermilion District and cities and parishes across the state.

There would not be a statewide NPS Program without this level of collaboration and cooperation from these stakeholders. If the watershed approach is going to be successful, then more partners will be necessary to achieve the water quality goals of improving water quality in 25 percent of Louisiana's NPS impaired waters by 2016.

Memorandum of Understanding [MOU]

I. Purpose

These MOUs between state and federal agencies, universities, local governments and non-profit organizations illustrate the level of cooperation and collaboration that is necessary to implement the State of Louisiana's NPS Management Plan. These MOUs identify and encourage the use of existing authorities and programs to achieve goals and objectives of this NPS plan. As a result of this collaborative approach, NPS pollution should be reduced and water quality goals of the CWA could be met.

The stakeholders that have been included in these MOUs are essential to the success of this NPS Management Plan. As the NPS Program expands to include new watersheds during 2012-2016, additional partners will be identified and MOUs may be added. The coordination and cooperation between agencies, non-profit organizations and local government should reduce unnecessary duplication of effort and accelerate implementation of BMPs. All BMPs included in the NPS Program are the types of practices that can be implemented to reduce the amount of pollutants entering water bodies of the state. Federal, state and local governments have standards and specifications for these types of practices that should be adhered to in order to ensure they function according to design standards. Long-term maintenance of BMPs is an integral part of the NPS pollution reduction strategy to restore water quality and achieve CWA goals.

II. Authorities

Section 319 of CWA instructed the Governor of each state to prepare and submit a NPS Management Plan, in order to reduce and control NPS pollution and improve water quality. The State Legislature enacted Act 272 in 1987, designating the LDEQ as the "Lead Agency" for the State's Nonpoint Source Program, which was to be prepared in cooperation with state and federal agencies who have land management authorities within the state. These MOUs do not alter existing statutory or regulatory authority of cooperating agencies. They are intended to facilitate statutory requirements through cooperative Federal, State and Local efforts.

Section 319(b)(2)(D) requires that the Attorney General or Chief Attorney of the state water pollution control agency, that has independent legal counsel, certify that sufficient legal authority exists to implement programs that restore impaired waters and protect healthy waters. In November 2003, a letter signed by the Secretaries of LDEQ, LDAF and LDNR to USEPA and National Oceanic and Atmospheric Administration (NOAA) documented the list of existing authorities to implement the state's NPS Management Plan. These authorities included the Louisiana Environmental Quality Act, La.R.S. 30:2001, et seq.

III. Background

The WQA of 1987 amended the CWA of 1972, with Section 319 directing States to develop and implement programs for control of NPS pollution. Section 319 authorized financial assistance to States for implementing State Management Programs.

States are encouraged to develop NPS programs that build upon related water quality programs such as, Estuaries (Section 320), Surface Water Toxics (Section 304 (1)), Ground Water, Wetlands, and Storm Water Permitting. This allows NPS Programs to be implemented in conjunction with other programs and Section 319 funds to be leveraged with resources from other programs.

The Food Security Act of 1985 and the 1990 Farm Bill established major new conservation provisions; primarily dealing with highly erodible croplands, which when managed properly can protect and enhance water quality. In carrying out these requirements and other on-going conservation programs, the Field Office Technical Guide (FOTG) will serve as standards and specifications for agricultural BMPs.

IV. Provisions

In accordance with these MOUs, LDEQ will continue to serve as the Lead Agency for the state's NPS Program. Currently, Louisiana Department of Agriculture and Forestry (LDAF) and LDEQ both apply directly to USEPA for CWA Section 319 Funds. This dual role of NPS program implementation allows for a targeted approach for watershed management and a more efficient utilization of Section 319 funds. LDEQ will maintain its role as the "Lead Agency" for the State's NPS Management Program, as authorized by Act 272 by the State Legislature in 1987. However in watersheds where agricultural and/or forestry are predominant land-uses that need to be addressed to restore designated uses, LDEQ and LDAF maintain a partnership to focus federal funds directly where TMDLs and WIPS have been completed. If USEPA and LDEQ decide to alter the current approach to allocation of Section 319 funds, these changes can be made through a letter to the funding agency.

State level agreements have been developed and utilized to strengthen assistance and participation in the NPS Management Program. These MOUs have expanded the level of cooperation with U.S. Forest Service in Louisiana who partner with LDEQ on water quality data collection and use of BMPs on highway projects that traverse national forest lands. The MOU has also strengthened the level of cooperation with USDA-NRCS and FSA on Farm Bill funds. LDEQ has continued to work with LDWF, LDOTD, LDNR and other state agencies to focus on water quality problems that exist in Louisiana. Since 2000, these partnerships have resulted in water quality improvements, as a result of NPS program implementation in more than 70 water bodies listed as impaired for NPS pollution. Since 2004, approximately 360 water bodies or 75 percent of those LDEQ monitors had 1425 pollutants delisted. These delisting included a number of pollutants (i.e. sedimentation/siltation, turbidity, total suspended solids (TSS), dissolved oxygen (DO), fecal coliform, metals, nutrients and pesticides).

Louisiana's MOU for the NPS Management Program is included in Appendix A.

Implementation of Statewide Programs

One of the important management strategies for reducing NPS pollution and restoring the state's water bodies is statewide programs for each of the different land-use categories. Statewide programs provide systematic efforts through policies, ordinances, educational programs, cost-share programs and regulations. These programs are administered by federal and state agencies that have authority and responsibilities to partner with private landowners or parish governments to manage agricultural lands, forestry operations, construction and maintenance of roads and highways and issuance of permits to install home sewerage systems. Statewide activities also involve organizations such as Louisiana Forestry Association, Concrete and Aggregate Association, Homebuilders Association, Municipal Association, all of which can provide training and guidance to private industries that harvest trees, conduct sand and gravel mining operations, build homes and maintain drainage systems throughout Louisiana. Interagency coordination with LDOTD, LDHH, OCM-LDNR, OSWC at LDAF and LSU AgCenter form the basis of the statewide network that exists for broad based utilization of BMPs across the state.

These statewide programs are equal in importance to watershed programs. Through statewide programs, BMPs are concurrently implemented in all parts of the state rather than only in specific basins or watersheds. In May 2009, LDEQ launched "Be the Solution" water quality campaign with a large kick-off event at LDEQ Headquarters in Baton Rouge. This event highlighted the new television commercial about NPS pollution, shown on Baton Rouge stations in June 2009 and eventually in all major cities of the state. In addition to the commercial, billboards were designed and placed on all major interstates in the state, reminding people that trash that goes down the storm drain ends up in their water bodies. Radio spots were aired on all major radio stations, reminding people not to throw trash down their storm drains. A new "Be the Solution" website was also developed, providing the public with information and a list of actions they could take to protect their watershed whether they lived in the city or in rural areas. These programs and other similar activities will continue to be implemented across the state to improve Louisiana's water quality.

The NPS Management Program is built on the concept of interagency coordination and collaboration, so a set of MOUs has been developed and signed by many stakeholders that partner with LDEQ on program implementation at the statewide and watershed level. If progress is expected to be made in reducing NPS pollution in Louisiana, then programs to manage and control these types of pollution will need to be incorporated into federal, state and parish programs that have land-use management responsibilities. The steps outlined to accomplish this programmatic goal are included in the statewide section of the NPS Plan (pages 34-184). This is a long-term goal, but activities described in this section of the NPS Management Plan outline objectives that the State has identified to implement, at least for the next 5-6 years.

Agricultural Statewide Program

Agricultural production is an important part of Louisiana's economy, and is woven into the fabric of the culture of the state. Agricultural commodities produced in Louisiana have been valued at nearly $5.3 billion (2008 LSU AgCenter). Crops such as rice, sugarcane, cotton, soybeans and corn sustain many individual families and are the economic base of many rural communities across Louisiana. Historically, agriculture has been a major part of Louisiana's heritage and remains an important component of the state's NPS Management Program.

A large percentage of land in Louisiana is utilized for crop and animal production and as pastures; therefore it is not surprising that sediment, nutrients and organic material from these operations contribute to NPS pollutant loads in Louisiana's waters. Addressing the agricultural component of the NPS problem will continue to be a high priority for the state, in order to meet water quality goals of restoring 25 percent of the state's impaired water bodies. A set of BMPs has been developed for each of the major types of crops grown in the state. A statewide program, the Master Farmer Program, has been implemented to increase the level of utilization of these BMPs for all crops grown in Louisiana. BMP manuals have recently been revised and others are in the process of being revised to include these crop specific BMPs. They are available online at LSU AgCenter's website: http://www.lsuagcenter.com/en/environment/conservation/bmps.

Federal and state agricultural agencies in Louisiana have taken leadership roles in addressing agricultural pollution problems. Through Farm Bill Programs that USDA administers each year, thousands of acres of BMPs have been implemented to reduce the amount of sediment and nutrients entering the state's water bodies. LDEQ participates in the USDA State Technical Advisory Committee (STAG) to ensure water quality improvements continue to be a top priority for their programs. Through USDA's ranking criteria that is provided to local stakeholders and field offices, water quality and habitat protection remain key factors for selecting which lands are included in Farm Bill Programs. Members of the STAG are provided an opportunity to vote on the list of resource concerns in the same manner as members of local stakeholder groups. This process keeps water quality priorities at the top of the list of issues that need to be addressed through Farm Bill Programs. LDEQ provides information, maps and advice to USDA on where water quality impairments (i.e. 303(d) listed waters) exist for use in local stakeholder group meetings. This allows each work group to see which water bodies in their areas are not meeting designated uses and what type of NPS pollutants need to be reduced.

In Louisiana, USDA's top priorities are improving water quality and reducing soil erosion. The ranking criteria for FFY 2011 included 250 points for national priorities and 500 points for state priorities. LDEQ and other resource agencies participated in establishing state priorities. Approximately 84 percent or 420 of the 500 points related to improving water quality or reducing nutrients or sediment from agricultural fields. The ranking system included points for farms located in watersheds with 303(d) listed water bodies. Additional points were given if farms utilized NPS BMPs in watersheds that drain to scenic streams. Points were also provided to farms that installed buffers to prevent pollutants from moving overland to receiving streams. Master Farmers received points for completing CWA and TMDL training and implementing NPS BMPs. The phosphorus index is linked to all nutrient management plans and includes a ranking factor for proximity to the stream.

During FFY 2009, $11.9 million was allocated for EQIP. This resulted in 554 contracts with private landowners to implement practices on 68,491 acres of land. During FFY 2007, EQIP funded 1,131 contracts ($14.5 million) on an additional 141,414 acres of land. In some areas of the state that have been intensively farmed, wetlands have been restored through programs like the Wetland Reserve Program (WRP) and the Conservation Reserve Program (CRP). As of August 2007, 185,485 acres of bottomland hardwood forests have been restored in Louisiana through the Wetland Reserve Program (WRP). The Conservation Reserve Enhancement Program (CREP) has also provided additional funds for landowners in Louisiana to convert highly erodible croplands to pastures or forests. All of these programs are combined to work toward the goals of reducing soil erosion and improving water quality in Louisiana. USDA provides LDEQ with parish summaries of what types of BMPs have been implemented on how many acres and what the costs were for this implementation. This information is utilized in the NPS Annual Report and in watershed implementation plans as a way to determine how much of the watershed has already been treated with BMPs and how many still needs to be treated with BMPs in order to meet water quality standards.

Under an agreement with LDEQ, LDAF currently utilizes the incremental portion of Section 319 grant funds to implement BMPs in priority watersheds where TMDLs have been completed and WIPs have been developed. These incremental funds have been utilized to implement BMPs in Mermentau, Vermilion-Teche, Ouachita and Calcasieu River Basins. Specific information about each of these projects has been included in the respective sections of the NPS Plan where watershed-based activities are described. LDEQ and LDAF meet on a routine basis to discuss project areas where Section 319 funds should be prioritized for BMP implementation. These meetings provide a forum for resource sharing and coordination of "on the ground" implementation with water quality monitoring to track whether agricultural BMPs are resulting in reduction of NPS pollutants and water quality improvements. Additional watershed priority areas are selected based on where TMDLs and WIPs have been developed. In these priority areas, agricultural production was identified as the major source of NPS pollutant loads. WIPs guide implementation of BMPs in these critical areas of the watershed where the highest level of nutrients or sediment originate. The LSU AgCenter has taken a leadership role in implementation of the Master Farmer Program. This program has resulted in approximately 2100 farmers participating in educational programs about NPS pollution and BMPs. LDEQ provides information for the water quality section of the training and also participates in workshops for farmers at the Master Farmer Program. LDEQ serves on the review committee for Annual Awards for the Master Farmer Program in Louisiana. Participation in this program has afforded LDEQ the opportunity to provide direction for the program and remain involved with local experts that advise farmers on their farming operations. All of these cooperative efforts comprise the agricultural component of Louisiana's NPS Program. It has been a good example of how NPS problems can be solved through consistent communication on water quality concerns that need to be addressed in agricultural watersheds of the state.

Types of Agriculture within Louisiana

Plant Based Agriculture

Plant based agriculture includes crops such as cotton, feed grains (i.e. corn, grain sorghum, oats), forestry, fruit crops, rice, soybeans, sugarcane, vegetables, nursery crops and sod. Forestry is the largest plant based commodity in Louisiana and is discussed in detail in the next chapter of the NPS Management Plan. Soybeans, cotton, rice, sugarcane and feed grains are major types of row crops grown in Louisiana.

Soybeans

Three major soybean producing areas in the state include the Mississippi and Red River Alluvial Plains and the coastal plains of southwestern Louisiana. These sections of the state have extensive soybean production, which contribute sediment and nutrient loads to water bodies. Many of these water bodies are not meeting FWP and have had TMDLs developed for them that indicate 50-80 percent load reductions will be needed for the water quality standard to be met. LDEQ has implemented projects to determine whether the types of BMPs that were being recommended for soybean production were reducing the amount of sediment, nutrients and organic matter leaving the fields. BMPs that were evaluated include stale seedbed and no-till compared to conventionally tilled soybeans. Results of the projects have indicated that both stale seedbed and no-tilled soybeans reduced the amount of sediment leaving the field by almost 80 percent and nitrate by 55-60 percent. However, total organic carbon, total nitrogen and ortho-phosphorus were higher from the fields with BMPs than the conventionally tilled field. This means additional work on BMP effectiveness is necessary to determine the combination of BMPs that are effective on all forms of nutrients and organic carbon. LDEQ is partnering with USDA on nutrient management practices and monitoring their effectiveness through the USDA MRBI.

Results of projects funded with Section 319 funds can be found on LDEQ's website for the NPS Program. Through the Master Farmer Program, LDAF's NPS Program and USDA's Farm Bill Program, BMPs are recommended and implemented. The BMP manuals provide information on the BMPs at LSU AgCenter website. Many of these BMPs have been implemented and evaluated on model farms. This provides the farmers an opportunity to learn more about how effective the practices are in reducing the types of pollutants that contribute to water quality problems in the state.

Cotton

Cotton is primarily produced along the Red and Mississippi River Alluvial Plains. LDEQ has implemented several projects to examine whether the BMPs recommended for cotton producing areas are effective in reducing NPS pollutants. The types of BMPs that were evaluated include: conventional tillage with a winter wheat crop, conservation tillage with nutrient and pesticide BMPs, conservation tillage with a cover crop and transgenic cotton. When these types of practices were compared to a conventionally tilled cotton field without BMPs, there were significant reductions in sediment and ortho-phosphorus, but not in total nitrogen or nitrate. In the two conventional tilled cotton fields, the winter wheat cover crop reduced sediment leaving the field by 20 percent. Conservation tillage reduced the amount of sediment leaving the field by 40 percent when compared to the fields that were conventionally tilled. The cover crop on the conservation tilled fields reduced sediment by 34 percent. Results of this work are provided in Final Reports on LDEQ's NPS Program's website. Through the Master Farmer and the Farm Bill Programs, conservation tillage and cover crops are recommended as BMPs for cotton. The Cotton BMP Manual includes the types of information that cotton producers need to follow and the types of practices they should implement on their lands. This manual can be accessed on the LSU AgCenter website or by contacting your local parish agent.

Rice

Rice is primarily grown in the coastal prairies of southwestern Louisiana. LDEQ has partnered with the agricultural industry for many years on BMPs for rice producing areas of the state, and has found that rice water management or controlling the discharge from the fields is the best practice to reduce the amount of sediment and other pollutants entering the water bodies. There are also new varieties of rice, called clear-field rice that will result in lower rates of pollutants entering the water bodies in southwestern Louisiana. Through the Master Farmer Program, the rice BMP manual includes a description of the types of practices that can be implemented by rice farmers in Louisiana, and model farms have been designed to help them understand what needs to be done to reduce NPS pollution from rice fields.

Sugarcane

Sugarcane is primarily grown in the lower portions of the Red River Alluvial Plain, the coastal prairies and the Barataria and Terrebonne Basins. LDEQ has partnered with the agricultural community for many years on BMPs for sugarcane crops, and have found that the highest loading of sediment comes off the field during the fallow year and the first year when cane is planted. The sediment load was reduced by 50 percent during the second stubble stage of sugarcane production. Sugarcane BMPs are more effective in reducing the nutrient and total organic carbon load than in reducing the sediment load. The Master Farmer Program has a BMP manual for sugarcane producers so they can learn more about the types of practices that they should be implementing to reduce the level of NPS pollutants from their fields. This BMP manual can be obtained from the parish extension agent or accessed online at LSU AgCenter's website. Model farms have also included demonstrations of sugarcane BMPs for the farmers to see and gain a better understanding of what needs to be done to reduce pollution from their fields. LDEQ continues to partner with the agricultural community on sugarcane BMPs to find practices that will reduce the sediment load coming off of the field.

Feed Grains

Feed grains are primarily grown in the Red River and the Mississippi River Alluvial Plain but are also grown in the coastal prairies. The Master Farmer Program has a BMP manual for agronomic crops which includes soybeans, wheat, corn and feed grains, where grain producers can learn more about how to implement BMPs on their lands. This manual can be requested from the local parish extension agent or accessed online at LSU AgCenter's website.

Animal Agriculture

Animal agriculture in Louisiana includes beef cattle, dairies, horses, poultry, swine, sheep, goats, rabbits and exotic animals. Whereas some of these operations are very small, others will fall under the definition of an animal feeding operation or a concentrated animal feeding operation. Poultry production is the largest animal agricultural industry in Louisiana and is second only to forestry in total income production for agricultural commodities (Agricultural Summary, 2008).

Poultry

Poultry production occurs in 27 of the state's 64 parishes, but is primarily located in a 12 parish area in north central and northwestern Louisiana, including: Bienville, Claiborne, Jackson, Lincoln, Livingston, Natchitoches, Ouachita, Sabine, Union, Vernon, Webster and Winn parishes. Two of the major pollutant problems associated with poultry operations are nutrients and litter disposal. For those poultry operations classified as a Concentrated Animal Feeding Operation (CAFO), a nutrient management plan is required as the tool to manage nutrients. LDEQ has partnered with the agricultural community on application of poultry litter to pastures, cotton fields and forests, as potential practices for managing these materials. The results indicate that application of poultry litter to mature forests did not reduce the amount of sediment or nutrients leaving the site, in fact, the rates of all of these pollutants increased with this practice. Information on projects that LDEQ has funded on poultry litter application can be found online at LDEQ's website. The LSU AgCenter also has a BMP Manual for poultry operations that can be accessed through the parish extension offices or online at LSU AgCenter's website.

Beef Cattle

Beef cattle operations exist in 63 of the states' 64 parishes with Natchitoches parish having the largest beef cattle production. LDEQ has partnered with the agricultural community on BMPs for pastures and has found that rotational grazing has a significant effect on the amount of sediment and nutrients leaving the field when compared with a conventionally grazed site. Total suspended solids can be reduced by more than 65 percent and total phosphorus can be reduced by 30 percent with rotational grazing compared to conventional grazing. Information about these BMPs can be accessed on LDEQ's website through the NPS Program or by contacting the local parish extension office. Copies of the online version of the BMP manual can be accessed at LSU AgCenter's website.

Dairies

Most of the dairies in Louisiana exist in 4 parishes, 3 of these parishes lie within the Florida parishes and the 4th is Desoto Parish. LDEQ requires a no-discharge system for dairies unless they are permitted through the point source program. The types of pollutants associated with dairy waste include fecal coliform bacteria, nutrients and organic material. These materials can run off of the milking areas or concrete walkways during rain events, causing pollution problems in the receiving stream. There has been a lot of work done to address the water quality problems associated with dairies and water bodies have improved and been taken off of the state's 303(d) list as a result of this work.

Aquaculture

Louisiana has a diverse and rich aquaculture industry, with crawfish being the highest producing commodity. Other industries include catfish farms, oyster production, shrimp, crabs, fresh water and saltwater fisheries.

Crawfish

During 2008, there were approximately 184,000 acres of farmed crawfish produced. LDEQ has partnered with ULL and LSU AgCenter on projects that have provided a better understanding of how crawfish ponds may impact water quality. The practice of discharging low oxygen waters to receiving streams can cause declines in DO levels in bayous and rivers of south Louisiana. Therefore, water management is an important aspect of crawfish farming. LSU AgCenter is partnering with crawfish producers to implement BMPs that will help them to reduce the impact that their operations have on the state's waters. Results of the work that LDEQ funded on crawfish ponds can be found on their website through the NPS Program. Additionally, a BMP manual for crawfish operations produced by the LSU AgCenter is on their website.

Organic Farms

In 2002, USDA adopted national standards for organic certification of farms and LDAF was accredited by USDA to certify Louisiana's organic farms. Organic certification has included a variety of crops, such as: fruits (blackberries, blueberries, & citrus); pasture and hay; pecans; vegetables and herbs. Additionally, several livestock operations that produce organic milk, beef and lamb have been organically certified.

Organic certification considers ecological soil management and does not allow use of synthetic pesticides or fertilizers. All operations must be compliant with National Organic Standards 7 CFR Part 205 and participants are allowed to utilize a marketing logo that identifies their crops as organically grown. Local farmers' markets often specialize in organically grown foods, and commercial markets also provide organically grown foods. Information on Louisiana's organic certification program is available on LDAF's website.

Nonpoint Source Pollutants Associated with Agriculture

What types of pollution problems are associated with all of these various types of agricultural crops, animal operations, pastures and aquaculture? A wide range of pollutants are generated as a result of these types of operations, however the major pollutants include: sediment, pesticides, nutrients, organic material, animal waste and fecal coliform bacteria.

Sediment

Soil erosion is the detachment and movement of soil particles from the soil surface. Soil loss is equal to the tonnage of soil being moved by erosion and re-deposited in other locations, such as in ends of field rows, drainage ditches, adjacent land road ditches, and other locations. Frequently, some of these eroded soil materials, along with the undesirable chemicals dissolved in runoff water or attached to soil particles, are transported from land surfaces by the runoff water into bodies of water. The percentage of soil that moves into bodies of water from eroding lands is quite variable. Sediment yield depends on the size of soil particles being transported, slope of the land, and distance to the nearest water body, density of the vegetation the sediment has to move through, the shape of the drainage way, and the intensity of the rain event.

The quantity of soil loss from cropland can be calculated by using the Revised Universal Soil Loss Equation (RUSLE), which was developed by the Agricultural Research Service (ARS) in cooperation with NRCS. This information along with land-use and climatological data can be used to predict potential water quality problems in a number of areas.

Sediment affects water quality by smothering benthic organisms, interfering with photosynthesis by reducing light penetration, and filling in waterways, thereby hindering navigation and increasing flooding. Sediment particles may carry nutrients and pesticides and other organic compounds into water bodies.

Pesticides

The term *pesticide* includes any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any pest or intended for use as a plant regulator, defoliant, or desiccant. The principal pesticide pollutants that may be detected in surface water and in ground water are the active and inert ingredients and any persistent degradation products. Pesticides and their degradation products may enter ground and surface water in solution, in emulsion, or bound to soil colloids. For simplicity, the term *pesticides* will be used to represent "pesticides and their degradation products" in the following sections.

Despite the documented benefits of using pesticides (insecticides, herbicides, fungicides, miticides, nematicides, etc.) to control plant pests and enhance production, these chemicals may, in some instances, cause impairments to the uses of surface water and ground water. Some types of pesticides are resistant to degradation and may persist and accumulate in aquatic ecosystems.

Pesticides may harm the environment by eliminating or reducing populations of desirable organisms, including endangered species. Sublethal effects include the behavioral and structural changes of an organism, jeopardizing its survival. For example, certain pesticides have been found to inhibit bone development in young fish or to affect reproduction by inducing abortion.

Herbicides in the aquatic environment can destroy the food source for higher organisms, which may then starve. Herbicides can also reduce the amount of vegetation available for protective cover and the laying of eggs by aquatic species. Also, the decay of plant matter exposed to herbicide-containing water can cause reductions in dissolved oxygen concentration (North Carolina State University, 1984).

Sometimes a pesticide is not toxic by itself but is lethal in the presence of other pesticides. This is referred to as a *synergistic effect*, and it may be difficult to predict or evaluate. *Bioconcentration* is a phenomenon that occurs if an organism ingests more of a pesticide than it excretes. During its lifetime, the organism will accumulate a higher concentration of that pesticide than is present in the surrounding environment. When the organism is eaten by another animal higher in the food chain, the pesticide will then be passed to that animal, and on up the food chain to even higher level animals.

A major source of contamination from pesticide use is the result of application of pesticides during or prior to a significant rainfall event. This can result in runoff of the pesticide to adjacent water bodies. Other sources of pesticide contamination are atmospheric deposition, spray drift during the application process, misuse, and spills, leaks, and discharges that may be associated with pesticide storage, handling, and waste disposal.

The primary routes of pesticide transport to aquatic systems are (Maas et al., 1984):

a. Direct application;
b. In runoff;
c. Aerial drift;
d. Volatilization and subsequent atmospheric deposition; and
e. Uptake by biota and subsequent movement in the food web.

The amount of field-applied pesticide that leaves a field in the runoff and enters a stream primarily depends on:

a. The intensity and duration of rainfall or irrigation;
b. The length of time between pesticide application and rainfall occurrence;
c. The amount of pesticide applied and its soil/water partition coefficient;
d. The length and degree of slope and soil composition;
e. The extent of exposure to bare (vs. residue or crop-covered) soil;
f. Proximity to streams;
g. The method of application; and
h. The extent to which runoff and erosion are controlled with agronomic and structural practices.

Pesticide losses are generally greatest when rainfall is intense and occurs shortly after pesticide application, a condition for which water runoff and erosion losses are also greatest.

Pesticides can be transported to receiving waters either in dissolved form or attached to sediment. Dissolved pesticides may be leached to ground-water supplies. Both the degradation and adsorption characteristics of pesticides are highly variable.

Many investigations of losses of various agricultural pesticides in runoff from treated land have been reported. Nearly all led to the same general conclusion: if they are applied properly, except when heavy rainfall occurs shortly after treatment, concentrations are low and the total amount of pesticide that runs off the land during the crop year is less than five percent of the application. Nevertheless, some chemicals are highly toxic to fish or other aquatic fauna and can persist in the aquatic environment for a long time, so that even very low levels of these pesticides in runoff may be of environmental concern. On the other hand, some of the agricultural chemicals have not been proven to be acutely toxic to animal life, do not persist from one crop season to the next, and do not accumulate in food chain organisms. However, due to the extensive acreage of the state in agriculture, the potential movement of chemical pesticides into water bodies still continues to be an environmental concern.

Nutrients

In general, runoff from watersheds under agricultural use has significantly higher nutrient concentrations than drainage waters from forested watersheds. Increased nutrient levels may result from fertilizer application and animal wastes. In a nationwide Environmental Protection Agency study, (Nonpoint Source - Stream Nutrient Level Relationships, 1977), it was determined that nutrient concentrations are generally proportional to the percentage of land in agricultural use and inversely proportional to the percentage of land in forested use. Nutrients have become a central focus for several new national initiatives that will be implemented in Louisiana. USEPA has required states to develop numerical criteria for nutrients as a mechanism to set limits on the amount of nitrogen and phosphorus that can be discharged into the nation's water bodies. Louisiana has developed a draft set of criteria for inland rivers and streams and continues to work on criteria for wetlands, lakes and estuaries. Information on nutrient criteria development in Louisiana is available on LDEQ's website in the State's Nutrient Criteria Development Plan. In addition to nutrient criteria, USEPA has published a set of NPS measures for Chesapeake Bay which focuses on reduction of nutrient and sediment levels entering the bay. As more attention is placed on the hypoxia area in the Gulf of Mexico, Louisiana may eventually see similar steps by USEPA to encourage gulf coast states to implement similar actions. USDA is implementing MRBI in Mississippi and Atchafalaya Basins to reduce the amount of nutrients entering the Mississippi River from agricultural lands. Watersheds throughout this large drainage basin will be included where nutrient management practices can be implemented. This initiative could be an impetus to utilize nutrient management plans and new technologies to reduce nitrogen and phosphorus levels in receiving streams. LDEQ has initiated a nutrient reduction strategy that will include NPS and point source management strategies to reduce nutrients entering inland and coastal waters.

Eutrophication affects water quality of inland and coastal waters. These high levels of eutrophication in some of Louisiana's lakes and streams can be attributed to nutrients derived from agricultural land, primarily nitrogen and phosphorus. Soluble nutrients may reach surface and ground water through runoff or percolation. Others may be adsorbed onto soil particles and reach surface waters with eroding soil. Nutrients are necessary to plant growth in a water body; however over-enrichment leads to excessive algae growth, an imbalance in natural nutrient cycles, changes in water quality and a decline in the number of desirable fish species. Factors influencing nutrient losses are precipitation, temperature, soil type, and kind of crop, type of conservation practices utilized, nutrient mineralization, and denitrification.

Nitrogen

In addition to eutrophication, excessive nitrogen also results in other water quality problems. Dissolved ammonia at concentrations above 0.2 mg/L may be toxic to fish, especially trout. Nitrates in drinking water are potentially dangerous, especially to newborn infants. Nitrate is converted to nitrite in the digestive tract, which reduces the oxygen-carrying capacity of the blood (methemoglobinemia), resulting in brain damage or even death. USEPA has set a limit of 10 mg/L nitrate-nitrogen in water used for human consumption (USEPA, 1989).

Nitrogen is naturally present in soils within the organic matter but must be added to increase crop production. Nitrogen is added to the soil primarily by applying commercial fertilizers and manure, but also by growing legumes (biological nitrogen fixation) and incorporating crop residues. Not all nitrogen which is present in or on the soil is available for plant use at any one time. For example, in the eastern Corn Belt, it is normally assumed that about 50 percent of applied N is assimilated by crops during the year of application (Nelson, 1985). Organic nitrogen normally constitutes the majority of the soil nitrogen. It is slowly converted (2 to 3 percent per year) to the more readily plant-available inorganic ammonium or nitrate.

The chemical form of nitrogen affects its impact on water quality. The most biologically important inorganic forms of nitrogen are ammonium (NH_4-N), nitrate (NO_3-N), and nitrite (NO_2-N). Organic nitrogen occurs as particulate matter, in living organisms, and as detritus. It occurs in dissolved form in compounds such as amino acids, amines, purines, and urea.

Nitrate-nitrogen is highly mobile and can move readily below the crop root zone, especially in sandy soils. It can also be transported with surface runoff, but not usually in large quantities. Ammonium, on the other hand, becomes adsorbed to the soil and is lost primarily with eroding sediment. Even if nitrogen is not in a readily available form as it leaves the field, it can be converted to an available form either during transport or after delivery to water bodies.

Phosphorus

Phosphorus can also contribute to the eutrophication of both freshwater and estuarine systems. While phosphorus typically plays the controlling role in freshwater systems, in some estuarine systems both nitrogen and phosphorus can limit plant growth. Algae consume dissolved inorganic phosphorus and convert it to the organic form. Phosphorus is rarely found in concentrations high enough to be toxic to higher organisms.

Although the phosphorus content of most soils in their natural condition is low, between 0.01 and 0.2 percent by weight, recent soil test results show that the phosphorus content of most cropped soils in the northeast have climbed to the high or very high range (Sims, 1992). Manure and fertilizers increase the level of available phosphorus in the soil to promote plant growth, but many soils now contain higher phosphorus levels than plants need (Killorn, 1980; Novais and Kamprath, 1978). Phosphorus can be found in the soil in dissolved, colloidal, or particulate forms. Runoff and erosion can carry some of the applied phosphorus to nearby water bodies. Dissolved inorganic phosphorus (orthophosphate phosphorus) is probably the only form directly available to algae. Particulate and organic phosphorus delivered to water bodies may later be released and made available to algae when the bottom sediment of a stream becomes anaerobic, causing water quality problems.

Organic Material

Animal waste and crop debris are the major organic pollutants which result from agricultural activities. These materials place an oxygen demand on receiving waters upon decomposition. If DO levels decrease and remain low, fish and other aquatic species may die. Often this occurs on a seasonal basis in Louisiana, with NPS pollutant loading occurring during seasons of the year with high rainfall (i.e. high flow events), but the water quality effect occurring during seasons of the year associated with low flow and high temperature. This low flow, high temperature season is often defined as the "critical condition" for the water body and for the aquatic organisms, which reside in the water body.

Animal Wastes

Disposal of animal wastes on land is a potential NPS of water degradation. Runoff and percolation could transport organic matter and nutrients to surface and ground water. Animal wastes applied to land come from wastes removed from feeding facilities, runoff from feeding areas, and waste from animals on pasture and rangeland. Proper application of animal wastes provides nutrients for crop production and also reduces surface runoff. Appropriate animal and land management practices should be followed.

Animal waste (manure) includes fecal and urinary wastes of livestock and poultry; process water (such as from a milking parlor); and the feed, bedding, litter, and soil with which they become intermixed. The following pollutants may be contained in manure and associated bedding materials and could be transported by runoff water and process wastewater from confined animal facilities:

a. Oxygen-demanding substances;
b. Nitrogen, phosphorus, and many other major and minor nutrients or other deleterious materials;
c. Organic solids;
d. Salts;
e. Bacteria, viruses, and other microorganisms; and
f. Sediments.

Fish kills may result from runoff, wastewater, or manure entering surface waters, due to ammonia or DO depletion. The decomposition of organic materials can deplete DO supplies in water, resulting in anoxic or anaerobic conditions. Methane, amines, and sulfide are produced in anaerobic waters, causing the water to acquire an unpleasant odor, taste, and appearance. Such waters can be unsuitable for drinking, fishing, and other recreational uses.

Solids deposited in water bodies can accelerate eutrophication through the release of nutrients over extended periods of time. Because of the high nutrient and salt content of manure and runoff from manure-covered areas, contamination of ground water can be a problem if storage structures are not built to minimize seepage.

Animal diseases can be transmitted to humans through contact with animal feces. Runoff from fields receiving manure may contain extremely high numbers of bacteria if manure has not been incorporated. Shellfish and beach closures can result from high fecal coliform counts. Although not the only source of bacteria, animal waste has been responsible for shellfish contamination in some coastal waters.

The method, timing, and rate of manure application are significant factors in determining likelihood of water quality contamination. Manure is generally more likely to be transported in runoff, when applied to the soil surface than when incorporated into the soil.

When application rates of manure for crop production are based on N, P and K rates normally exceed plant requirements (Westerman et al., 1985). The soil generally has capacity to adsorb phosphorus leached from manure applied on land. As previously mentioned, however, nitrates are easily leached through the soil to ground water or to return flows, and phosphorus can be transported by eroded soil.

Conditions that cause a rapid die-off of bacteria are low soil moisture, low pH, high temperatures, and direct solar radiation. Manure storage generally promotes die-off, although pathogens can remain dormant at certain temperatures. Composting the wastes can be quite effective in decreasing the number of pathogens. USEPA's new guidance documents for agricultural management measures are a good source of information for types of actions that can be taken to reduce the amount of nutrients leaving agricultural fields and animal operations. Copies of these documents can be found online at their website.

Define Water Quality/Program Goals

The NPS Program utilizes land-use maps generated by LDEQ's Geographic Information System (GIS) Center as a primary source of information to identify areas in the state primarily utilized for agricultural production. This cropping information has been layered with statewide watershed maps to identify which watersheds have agricultural activities. This watershed information is layered with the 303(d) list of priority water bodies in order to identify which of the agricultural watersheds across the state have impaired water bodies. The data is then utilized as another source of information to determine which watersheds have water quality problems from agriculturally related activities. This information was used to create maps that could be utilized in the planning process for statewide agricultural programs and watershed projects.

To improve accuracy of land-use information utilized in the program, more up-to-date satellite imagery is now available and is utilized extensively in the program for watershed planning and management. These maps provide the level of information necessary for designing monitoring programs at the watershed level and identifying the type of agricultural crops that need to be targeted in a basin for a statewide NPS educational program. LDEQ has partnered with OSWCD at LDAF on classifying satellite images according to crop types and other land-uses for each watershed. The land-use classification schedule followed the TMDL court ordered timeline in a basin-by-basin process, beginning in 1999 and continuing through 2012, to complete classification for the entire state. In addition to land-use classification to prioritize where BMPs need to be implemented in the watershed, LDAF has developed a GIS-based BMP database for their priority watersheds. This BMP database includes Global Positioning System (GPS) points for each of the farms that implemented BMPs. The BMP database included type and acreage of BMPs implemented on that farm. NPS load reductions resulting from BMP implementation has also been gathered.

The short-term water quality goals are to reduce the concentration of sediment, nutrients, pesticides and fecal coliform bacteria entering water bodies from agricultural row crops, pastures, poultry and dairy farms. These short-term goals are evaluated on an annual basis with analysis of ambient water quality data. Water quality improvements are reported in LDEQ's NPS Annual Reports to USEPA Region 6 and posted on LDEQ's website. The long-term water quality goal is to restore impaired waters and remove them from the state's 303(d) list. Water quality improvement is defined as restoring water bodies to meet their designated uses for fishing and swimming. Louisiana has historically viewed its water resources as one of its major assets. People love to fish, swim and boat all across the state. Therefore, the goals of this program are to improve water quality to the extent that these uses are maintained and restored. Progress in restoring the state's water bodies is reported in the biannual IR posted on LDEQ's website.

Explain Programmatic Activities to reach those Goals

The programmatic activities implemented to reach these short-term and long-term goals include educational activities and cost-share technical assistance programs to encourage farmers to implement BMPs on their lands. Partnerships between USDA-NRCS, LDAF, LSU AgCenter and LDEQ have resulted in effective educational outreach programs which provide farmers with the type of information needed to implement appropriate BMPs to reduce/ control NPS pollution from their farms. In CY 2010-2011, LSU AgCenter took the lead on revision of BMP manuals for each of the agricultural commodities grown in Louisiana. The revised BMP manuals are available on LSU AgCenter's website. LSU AgCenter also has research and demonstration farms in major agricultural areas of the state, where farmers obtain up-to-date techniques about production and environmental practices. LDEQ's NPS Program partnered with LSU Ag Center to utilize research and demonstration farms to evaluate effectiveness of BMPs and to educate farmers and landowners on how to reduce sediment, nutrients and organic material from their farms.

Educational workshops, field days, and field tours have been held at both private and university farms located in watersheds where agricultural production has been identified as contributing NPS pollution to water bodies included on the state's 303(d) list. These types of educational activities are typically co-hosted by state, federal and local agencies working together on NPS pollution issues. Partnering agencies typically include: NRCS, SWCDs, FSA, RC&D, Louisiana Cooperative Extension Service (LCES), the Louisiana Agricultural Experiment Stations, ULM, ULL, Southeastern Louisiana University and LDEQ. In addition to agency and university partners, LDEQ also partners with Farm Bureau and many of agricultural commodity groups on statewide agricultural and water quality issues. LDEQ also cooperates with LDNR/OCM on CZARA educational and outreach programs, workshops and field days in Louisiana's coastal zone management area.

As LDEQ continues to monitor water bodies across the state on the 4-year basin cycle, annual progress made in BMP implementation and water quality improvement will be reported to USEPA, the NPS Interagency Committee and the public through LDEQ's website. LDEQ has estimated that it may take 10-12 years for in-stream water quality improvements to be made at the watershed scale. This 10-12 year timeline can be divided into three phases. The first phase of water quality data provides necessary information to develop the TMDL and potentially the WIP. The second phase of water quality data provides a baseline from which progress can be measured on implementation of WIPs and BMPs. The third phase of water quality data provides information on whether watershed implementation has been successful for delisting the water body and restoring designated uses. The 2006, 2008 and draft 2010 IRs have indicated water quality is improving as a result of Farm Bill and CWA Section 319 programs.

Future Objectives and Milestones

Future objectives and milestones build on previous efforts to restore impaired waters and protect healthy waters. For example, NRCS utilizes the state's 303(d) list as one factor in prioritizing where Farm Bill Program funds are offered to farmers in Louisiana. Through this priority ranking process, cost-share and technical assistance programs are provided to farmers for BMP implementation in watersheds included on the State's 303(d) list. These cooperative efforts should continue to result in statewide water quality goals and objectives being met. Impaired waters have been restored and several success stories have been posted on USEPA's website.

Future objectives of the program are to continue this process of collaborating and leveraging federal and state programs in priority basins and watersheds, where water quality problems have been identified. As long as water quality improvements continue to be made and water bodies are delisted, then this collaborative process will be viewed as effective and successful for reaching water quality goals of the NPS Program. However, if NPS reductions and water quality improvements are not made, then additional steps may be necessary to ensure water bodies are restored and meet their designated uses. These additional steps will be scientifically based, including natural background conditions and NPS inputs, as indentified in TMDLs. Additional controls may include back-up authorities, if necessary, to achieve water quality goals and restore designated uses for the water bodies. Section 319(B) (2)(c) of the CWA required NPS Management Plans to contain a set of milestones for program implementation, therefore these milestones provide tasks and timelines to complete those tasks:

- Continue to evaluate on an annual basis the number of watersheds where LDEQ has partnered with NRCS and other cooperating federal, state and local agencies on statewide and watershed priorities (2011-2016);
- Continue to evaluate on an annual basis progress that has been made on coordination of federal and state agencies and local watershed groups on prioritization of statewide educational programs and watershed implementation projects in the state (2011-2016);
- Partner with LDAF to improve coordination and data sharing on their pesticide monitoring program in order to evaluate water quality improvements that have resulted from implementation of integrated pest management practices. In addition, through this partnership identify priority areas to prevent or reduce water quality problems associated with pesticides (2011-2016);
- Continue to solicit proposals through interagency partners and the public, targeted at reduction/ control of NPS pollutants in agricultural watersheds of the state (2011-2016);
- Continue to partner with other agencies on improving statewide educational and outreach activities in areas of the state with water quality problems associated with agriculture (2011-2016);
- Continue to report annually on the number of water bodies delisted because of implementation of BMPs to reduce/control agricultural NPS pollutants (2011-2016);
- Evaluate water quality improvement on an annual basis in priority watersheds [i.e. 303(d)listed] to determine if water quality is improving as a result of increased education and implementation of BMPs (2011-2016);
- Continue to expand use of the internet as an educational outreach tool for environmental communities, concerned citizens, landowners, farmers, and the public on steps that have been taken to reduce agricultural NPS pollution in the state (2011-2016);
- Utilize the basin-monitoring program combined with in-stream surveys to determine where participation in the program (i.e.

BMP implementation) has resulted in water quality improvements (2011-2016);

- Determine if additional steps are necessary to restore designated uses to water bodies on the 303(d) list and whether back-up authority is necessary to achieve BMP implementation and reduce NPS pollution in state water bodies (2011-2016); and
- Remove water bodies from the 303(d) list as a result of cooperative efforts on agricultural BMPs (2011-2016).

The primary goal of Louisiana's Statewide Agricultural NPS Program is to incorporate water quality goals and objectives of the State's NPS Management Program into all federal and state agricultural programs and LSU AgCenter's research and educational outreach programs. LDEQ would expect to achieve water quality improvement in watersheds identified as agricultural watersheds within the next 7-10 years, as a result of these statewide goals and objectives.

Timeline for Milestones: October 2011 - September 2016

Stakeholders (see the Section on MOUs and federal/state cooperating agencies)

Cooperating stakeholders include a wide range of participants, all of which are essential to a successful statewide water quality program. Key partners (i.e. NRCS, SWCD, LDAF, LCES and FSA) are the federal, state and local agencies, which provide funding through cost-share assistance, expertise through technical assistance, and education through information outreach programs to the farmers. Without these key players, there would be no organized process for implementation of BMPs to reduce erosion and manage pesticide and fertilizer use on agricultural lands. These partners reside in the watershed where farmers live and they have expertise and experience crucial to providing guidance to farmers on land management. The trust that has been built over past years between these partnerships with landowners is essential to the implementation process. They provide the day-to-day guidance on conservation tillage practices, pesticide and fertilizer management, record-keeping and animal waste management plans.

Once the statewide NPS strategy was defined as an approach to restore impaired waters, then additional partners were included. The Corps of Engineers has been included in discussions of drainage issues and riparian protection for agricultural watersheds. Commodity groups such as poultry producers, Sugarcane League or the Cattleman's Association were included for development of crop specific BMPs. The Farm Bureau has also been included to provide their support for participating in the NPS program. Schools, Future Farmers of America (FFA), advertising agencies, RC&Ds, environmental organizations and local civic organizations have also been active participants in the state's water quality issues. They have designed educational programs to raise awareness of local communities about NPS pollution issues.

Finally, the most important partner has been the farmer, poultry producer or dairyman that actually owned or farmed the land. The success of the NPS Program depends on his input into the process of what is economically feasible and achievable on his land. Otherwise, everything is simply an exercise with no real end point. Therefore, it is imperative that this partner be included in the earliest stages of the program. The most effective solutions for agricultural NPS pollution are site-specific conservation plans, which include BMPs, and are developed with the farmer. If these issues are factored into the comprehensive strategy, then it should become a workable one that can be implemented across the state. Section 319 of the CWA required milestones and timelines be included for programs and partnerships that will be utilized for implementation. These milestones include:

- Continue to partner with other agencies and organizations that are essential for statewide agricultural NPS programs (2011-2016);
- Continue to partner with commodity groups, environmental communities private landowners on statewide educational programs concerning NPS pollution issues (2011-2016);
- Continue to develop more effective statewide educational outreach programs that include television, radio and the internet as methods to reach a broader audience on NPS water quality issues (2011-2016);
- Continue to partner with the LDNR-OCM on identification of appropriate Coastal Use Permitting and Federal Consistency back-up authorities that can be implemented when activities cause NPS impacts to Louisiana's coastal waters (2011-2016);
- Continue to partner with LDNR/OCM on additional MOUs that may be necessary in regards to the Section 6217 program and coastal NPS pollution impacts (2011-2016);
- Continue to build an information network on effectiveness of these partnerships (i.e. increased participation in cost-share and technical assistance programs) (short-term); and
- Continue to report results of these partnerships to USEPA Region 6 on an annual basis (2011-2016);

Timeline for Milestones: October 2011 – September 2016

Federal Consistency

The primary area where LDEQ will focus on federal consistency for the agricultural NPS program is with NRCS on consistency of BMPs recommended to reduce NPS pollution. Consistency in implementation of Farm Bill Programs for priority watersheds, based on 303(d) listed waters, also continues to be a high priority for the state. LDEQ and NRCS have effectively partnered in this area, but continue to do so through the STAC and NPS Interagency Committee. This list of activities describes steps taken by LDEQ to ensure federal consistency with the NPS Program:

- Continue to review BMPs and determine their applicability to reducing specific NPS loads for EQIP, WRP, CRP, WHIP and other federal programs that provide recommendations to farmers;
- Continue to participate in STAC and provide technical input on existing and new programs implemented by USDA and other federal and state partners;
- Continue to review 401 Water Quality Certifications for watershed projects to ensure consistency with the state's NPS Management Program;
- Participate in NRCS watershed level planning projects and Cooperative River Basin Studies and identify NPS concerns which will be addressed; and
- Coordinate with NRCS in selection of watershed level planning areas compatible with LDEQ's priority watersheds.

Program Evaluation

Evaluating the success of a program is the only method to determine whether it has been effective in reaching short-term and long-term goals. In addition to evaluating activities and implementation of BMPs in priority watersheds, the most important measure of success is whether water quality is improving. Through the cyclic basin-monitoring program, LDEQ continues to monitor water quality improvements. As part of this activity, the initial baseline watershed monitoring will be combined with historical water quality data and information from TMDLs which exist for most of the priority watersheds. As BMP implementation occurs in agricultural watersheds, subsequent water quality sampling should indicate whether these changes resulted in reduced loading of sediment, nutrients, pesticides and fecal coliform bacteria. These water quality data will continue to be analyzed and examined to determine whether statewide programs have been successful in reaching short-term and long-term goals.

To evaluate progress on BMP implementation, records need to be kept at the local field office level. This information is compiled by parish and/or HUC and reported through USDA's annual reporting system. Summaries of this information are provided to LDEQ for their NPS Annual Report. Federal and state agencies are interested in sharing data and information to determine the water quality effectiveness of their programs. LDNR/OCM can assist in these tasks by reporting on the level of management measure implementation to NOAA. Results of program effectiveness can be provided to STAC, the NPS Interagency Committee and the public through agency websites.

Timeline for* Milestones: *October 2011 - September 2016

Agricultural Best Management Practices

Section 319(b)(2)(A) required States to identify BMPs and measures which would be implemented to reduce NPS pollutant loads resulting from each category and subcategory identified as significant contributing sources to NPS impaired waters. Agricultural BMPs included in the state's NPS Management Plan are practices currently recommended by NRCS, and if installed according to their standards and specifications, should result in reduction and control of targeted pollutants. Each of the BMPs is classified according to the type of pollutant which they were designed to mitigate and are ranked according to their effectiveness to meet their intended purpose. The BMPs have been reviewed by the NPS Interagency Committee and by a series of committees at LSU AgCenter. These committees consisted of experts with the LSU College of Agriculture familiar with agricultural commodities and various commodity groups. Recommendations from these advisory committees were provided to Louisiana's Farm Bureau Federation for their consideration. These recommendations were also reviewed by LDEQ and included in the NPS Management Program.

Section 319(b)(2)(a) of the CWA required that States include a list of BMPs that would be implemented to reduce NPS pollutant loads from each category and sub-category of land-use that contributes significant NPS loads to navigable waters not meeting water quality standards. The following list includes agricultural BMPs that reduce NPS pollutant loads to impaired waters in Louisiana.

Cropland Best Management Practices (1)- Sediment Concerns in Surface Water

Favorable BMPs (2)	Effectiveness of Favorable BMPs	Crops(3)	Practices Which May Be Unfavorable (4)
Mulch Till	slight	1, 2, 4-6	Land clearing
No Till	moderate	1, 2, 4-6	
Ridge Till	slight-moderate	1,-3, 5, 6	Access roads
Contour farming	moderate	1,2,5,6	Clearing & snagging
Grassed waterway	slight-moderate	1-6	
Residue Mgt., Seasonal	slight	1-6	
Grade stab strut.	slight-moderate	1-6	
Cons. crop. rot.	slight-moderate	1-6	
Waste utilization	na	1-6	
Irrig.Water mgt. (5)	moderate	1-6	
Tailwater rec. (5)	slight	1-6	
Irrig. system (5)	na	1-6	
Struct. water cont.	slight	1-6	
Water & sed. basin	moderate-substantial	1,2,5,6	
Sediment basin	substantial	1,2,5,6	
Irrig. leveling (5)	slight	1-6	
Field border	slight-moderate	1, 2, 5, 6(6)	
Cover crop	slight-moderate	1-6	
Deep Tillage	slight-moderate	1-6	
Filter strips/buffers	substantial	1, 2, 4-6(6)	
Diversion	medium	1,2,5,6	

PROBLEM: Sediment in a water body can smother organisms, interfere with photosynthesis by reducing light penetration, and may fill in waterways, hindering navigation and increasing flooding. Sediment particles often carry nutrients, pesticides, and other organic compounds into water bodies. Sediments can be resuspended in a water column and act as an uncontrolled source of pollution.

PROCESSES: Soil movement in water.

CAUSES: Precipitation on unprotected soil, flowing runoff water, and irrigation water applied at erosive rates.

1. There are many other practices not listed in this table which may be considered for installation for a specific purpose or as a part of a total resource management system which may increase or decrease loading or have little or no effects on water quality on a site-specific basis. An on-site analysis should be a consideration in evaluating the effect of a practice not listed.
2. This list is not ranked in an order, which would indicate preference in installation.
3. 1 = cotton, 2 = soybeans, 3 = sugarcane, 4 = rice, 5 = corn, 6 = truck crops.
4. An on-site evaluation should be conducted to determine if conditions exist which would result in unfavorable effects if the practice was installed.
5. Irrigated fields.
6. Fields not artificially drained.

CROPLAND BEST MANAGEMENT PRACTICES (1) - Pesticide Concerns in Surface Water

Favorable BMPs (2)	Favorable BMPs for: Soluble P/Adsorbed P	Crops(3)	Practices Which May Be Unfavorable (4)
Pest management	Sub Substantial	1-6	Land clearing
Irrig.Water mgt. (5)	Slight Substantial	1-6	Surface drainage(6)
Tailwater rec. (5)	slight moderate	1-6	Subsurface drain (6)
Land leveling (5)	slight moderate	1-6	
Irrig. system (5)	slight substantial	1-6	
Struct. water cont.	na na	1-6	
Field border	slight moderate	1-6(9)	
Cover crop	slight moderate	1-6	
Deep Tillage	slight substantial	1-6	
Cons. crop. rot.	slight moderate	1-6	
Mulch till	mod substantial	1, 2, 4-6	
No till	mod substantial	1, 2, 4-6	
Ridge Till	mod substantial	1-6	
Crop residue, Seasonal	slight moderate	1-6	
Grade stab. struct.	na na	1-6	
Water & sed. basin	slight moderate	1,2,5,6	
Terrace	slight substantial	1,2,5,6	
Sediment basin	slight moderate	1,2,5,6	
Filter strip/buffers	slight substantial	1-6(9)	
Contour farming	slight moderate	1,2,5,6	
Strip-cropping	slight moderate	1,2,5,6	
Diversion	slight slight	1,2,5,6	
Channel vegetation	na na	1-6 (7)	
Grassed waterway	slight moderate	1-6 (7)	

PROBLEM: Pesticides by their nature are toxic substances. Many are highly toxic to fish, other aquatic fauna, and warm-blooded animals. Some persist in the aquatic environment for long periods of time so that even at very low level concentrations, they are a serious environmental concern in runoff water.

PROCESSES: Runoff of soluble pesticides in water and movement of pesticides combined with soil and organic matter from site.

CAUSES: Excess pesticide, applied pesticides with affinity for soil and organic matter, persistent pesticides, runoff water and interflow, excess irrigation water, improper pesticide application or irrigation timing, and improper mixing and handling of pesticides and pesticide containers.

1. There are many other practices not listed in this table which may be considered for installation for a specific purpose or as a part of a total resource management system which may increase or decrease loading or have little or no effect on water quality on a site-specific basis. An on-site analysis should be a consideration in evaluating the effect of a practice not listed.
2. This list is not ranked in an order, which would indicate preference in installation.
3. 1 = cotton, 2 = soybeans, 3 = sugarcane, 4 = rice, 5 = corn, 6 = truck crops.
4. An on-site evaluation should be conducted to determine if conditions exist which would result in unfavorable effects if the practice was installed.
5. Irrigated fields.
6. Where water table control or regulating water in drainage systems is not applied.
7. Chemical maintenance of vegetation may adversely affect the quality of runoff water.
8. Where drainage practices already exist.
9. Fields not artificially drained.

CROPLAND BEST MANAGEMENT PRACTICES (1) - Nutrient Concerns in Surface Water

Favorable BMPs (2)	Favorable BMPs for: Soluble N/Adsorbed N	Crops(3)	Practices Which May Be Unfavorable (4)
Nutrient Mgt.	substantial	1-6	Land clearing
Waste utilization	slight moderate	1-6	Surface drainage(6)
Irrig.Water mgt. (5)	Slight substantial	1-6	Subsurface drain (6)
Tailwater rec. (5)	slight moderate	1-6	
Land leveling (5)	slight moderate	1-6	
Irrig. system (5)	slight substantial	1-6	
Struct. water cont.	na na	1-6	
Field border	slight moderate	1-6(8)	
Cover crop	slight moderate	1-6	
Deep tillage	slight substantial	1-6	
Cons. crop. rot.	slight moderate	1-6	
Mulch till	slight moderate	1, 2, 4-6	
No till	slight slight	1, 2, 4-6	
Ridge till	slight slight	1-6	
Crop residue, Seasonal	slight slight	1-6	
Grade stab. struct.	na na	1-6	
Water & sed. basin	slight moderate	1,2,5,6	
Terrace	slight moderate	1,2,5,6	
Sediment basin	substantial	1,2,5,6	
Filter strips/buffers	substantial	1-6(8)	
Contour farming	slight substantial	1,2,5,6	
Strip-cropping	Slight substantial	1,2,5,6	
Diversion	na na	1,2,5,6	
Channel vegetation	na na	1-6 (7)	
Grassed waterway	slight moderate	1-6 (7)	

PROBLEM: Excess nitrogen and phosphorus in a water body causes excessive plant and alga growth, an imbalance of natural nutrient cycles, and a decline in the number of desirable fish species. High nitrate levels can be hazardous to warm-blooded animals under conditions that are favorable to reduction to nitrite.

PROCESSES: Runoff of soluble nitrogen and phosphorus in water and movement of nitrogen and phosphorus combined with soil and organic matter from site.

CAUSES: Excess amounts of surface-applied nitrogen and phosphorus, runoff water and interflow, improperly managed irrigation systems, and erosion of soil and organic wastes.

1. There are many other practices not listed in this table which may be considered for installation for a specific purpose or as a part of a total resource management system which may increase or decrease loading or have little or no effects on water quality on a site-specific basis. An on-site analysis should be a consideration in evaluating the effect of a practice not listed.
2. This list is not ranked in an order, which would indicate preference in installation.
3. 1 = cotton, 2 = soybeans, 3 = sugarcane, 4 = rice, 5 = corn, 6 = truck crops.
4. An on-site evaluation should be conducted to determine if conditions exist which would result in unfavorable effects if the practice was installed.
5. Irrigated fields.
6. Where water table control or regulating water in drainage systems is not applied.
7. Chemical maintenance of vegetation may adversely affect the quality of runoff water.
8. Fields not artificially drained.
9. Where drainage practices already exist.

CROPLAND BEST MANAGEMENT PRACTICES (1) - Minerals or Salinity Concerns in Surface Water

Favorable BMPs (2)	Effectiveness of Favorable BMPs	Crops(3)	Practices Which May Be Unfavorable (4)
Irrig.Water mgt. (5)	slight-moderate	1-6	Land clearing
Tailwater rec. (5)	slight	1-6	Surface drainage(6)
Water convey. (5)	slight	1-6	Subsurface drain (6)
Land leveling (5)	neutral	1-6	
Irrig. system (5)	slight-substantial	1-6	
Deep Tillage	slight-moderate	1-6	
Cons. crop. rot.	slight-moderate	1-6	
Waste utilization	slight-moderate	1-6	

PROBLEM: Excessive concentrations of salts/minerals in surface waters can render the waters unfit for human and animal consumption and impair the growth of plants. It can also reduce or restrict the water's value for industrial use, irrigation and for propagation of fish and wildlife. The toxic effect of certain chemicals can be enhanced in saline waters, and the saturation levels of dissolved oxygen decrease with increasing salinity. Excessive salts can adversely alter the permeability of soils. The U.S. Public Health Service has established the maximum allowable concentrations of chlorides and sulfates in water for human consumption at 250 mg/l each. Excessive salt intake can produce minor to serious effects.

PROCESSES: Natural processes and movement (surface runoff and interflow) of dissolved minerals and salts from soil and organic waste by irrigation or storm water.

CAUSES: High content of minerals and salt concentration in soil and underlying geology, excess irrigation water, high content of minerals and salt concentration in irrigation water, and over-application of waste with high salt content.

1. There are many other practices not listed in this table which may be considered for installation for a specific purpose or as a part of a total resource management system which may increase or decrease loading or have little or no effects on water quality on a site-specific basis. An on-site analysis should be a consideration in evaluating the effect of a practice not listed.
2. This list is not ranked in an order, which would indicate preference in installation.
3. 1 = cotton, 2 = soybeans, 3 = sugarcane, 4 = rice, 5 = corn, 6 = truck crops.
4. An on-site evaluation should be conducted to determine if conditions exist which would result in unfavorable effects if the practice was installed.
5. Irrigated fields.
6. Where water table control or regulating water in drainage systems is not applied.
7. Where drainage practices already exist.

CROPLAND BEST MANAGEMENT PRACTICES (1) - Organic Matter & Bacteria Concerns in Surface Water

Favorable BMPs (2)	Effectiveness of Favorable BMPs for: Oxy. Demand/Bacteria	Crops(3)	Practices Which May Be Unfavorable (4)
Waste utilization	Slight neutral	1-6	Land clearing
Struct. water cont.	na na	1-6	Surface drainage(6)
Field border	mod slight	1, 2, 5, 6(7)	Subsurface drain (6)
Filter strips/buffers	sub slight	1, 2, 5, 6(7)	
Terrace	mod moderate	1,2,5,6	
Contour farming	mod slight	1,2,5,6	
Strip-cropping	mod slight	1,2,5,6	
Water & sed. basin	mod slight	1,2,5,6	
Sediment basin sub	mod	1,2,5,6	
Diversion	neutral slight	1,2,5,6	
Irrig Water mgt. (5)	slight substantial	1-6	
Irrig. system (5)	slight slight	1-6	
Deep tillage	slight slight	1-6	

PROBLEM: Animal waste and crop debris are the major organic pollutants resulting from agricultural activities. They place an oxygen demand on receiving waters during decomposition, which can result in stress or the death of fish and other aquatic species. Certain bacteria can cause disease in humans such as infectious hepatitis, typhoid fever, dysentery, and other forms of diarrhea.

PROCESSES: Movement of organic waste, bacteria, and organic matter in soil from the site and excess irrigation water.

CAUSES: Over-application of waste or irrigation water, application of waste on unsuitable sites, improper timing of waste or irrigation application, and storm runoff.

1. There are many other practices not listed in this table which may be considered for installation for a specific purpose or as a part of a total resource management system which may increase or decrease loading or have little or no effects on water quality on a site-specific basis. An on-site analysis should be a consideration in evaluating the effect of a practice not listed.
2. This list is not ranked in an order, which would indicate preference in installation.
3. 1 = cotton, 2 = soybeans, 3 = sugarcane, 4 = rice, 5 = corn, 6 = truck crops.
4. An on-site evaluation should be conducted to determine if conditions exist which would result in unfavorable effects if the practice was installed.
5. Irrigated fields.
6. Where water table control or regulating water in drainage systems is not applied.
7. Fields not artificially drained.
8. Where drainage practices already exist.

CROPLAND BEST MANAGEMENT PRACTICES (1) - Nutrient Concerns in Ground Water

Favorable BMPs (2)	Effectiveness of Favorable BMPs	Crops(3)	Practices Which May Be Unfavorable (4)
Nutrient mgt	substantial	1-6	
Waste utilization	high	1-6	Vertical drains
Cons. crop. rot.	slight-moderate	1-6	Chiseling & subsoil.
Cover crop	slight-moderate	1-6	Water & s. c. basin
		1-6	Irr. canal/lat (5) (6)
Surface drainage	slight	1-6	Irr. fld ditch (5) (6)
Subsurface drainage	slight	1-6	Mulch till
Irrig Water mgt. (5)	slight-substantial	1-6	No till
Water convey. (5)	na	1-6	Ridge till
Irrig. system (5)	slight-substantial	1-6	Residue use, Seasonal
Prec. land form. (5)	slight-moderate	1-6	
Struct. water cont.	na	1-6	
Well (5)		1-6	

PROBLEM: Soluble nutrients, mainly nitrogen, can reach ground water by percolation or through fractures, sinkholes, and solution channels. This process can cause significant problems in areas where high rates of nitrogen fertilization are used, soils are highly permeable, there is wide scale use of irrigation, and/or ground water levels are near the surface. High nitrate levels in drinking water can be hazardous to warm-blooded animals under conditions that are favorable to reduction to nitrite.

PROCESSES: Leaching of nitrogen below the root zone and water percolation below the root zone.

CAUSES: Nitrogen in excess of plant needs in the root zone, excess irrigation water application beyond the root zone capacity, faulty well or pump hardware, and improperly constructed wells.

1. There are many other practices not listed in this table which may be considered for installation for a specific purpose or as a part of a total resource management system which may increase or decrease loading or have little or no effects on water quality on a site-specific basis. An on-site analysis should be a consideration in evaluating the effect of a practice not listed.
2. This list is not ranked in an order, which would indicate preference in installation.
3. 1 = cotton, 2 = soybeans, 3 = sugarcane, 4 = rice, 5 = corn, 6 = truck crops.
4. An on-site evaluation should be conducted to determine if conditions exist which would result in unfavorable effects if the practice was installed.
5. Irrigated fields.
6. Where canal, lateral, or field ditch conveys drainage or tailwater or where fertilizer is added to the irrigation supply.

CROPLAND BEST MANAGEMENT PRACTICES (1) - Organic Matter & Bacteria in Ground Water

Favorable BMPs (2)	Effectiveness of Favorable BMPs	Crops(3)	Practices Which May Be Unfavorable (4)
Waste utilization	slight-moderate	1-6	Vertical drains
Nutrient manage.	Slight	1-6	
Irrig Water mgt. (5)	slight-moderate	1-6	
Irrig. system (5)	slight	1-6	
Mulch till	neutral	1, 2, 4-6	
No till	neutral	1, 2, 4-6	
Ridge till	neutral	1-6	
Cons. crop. rot	slight-moderate	1-6	
Filter strip/buffers	slight	1-6	
Cover crop	slight-moderate	1-6	
Well	na	1-6	
Crop residue use, Seasonal	Seasonal neutral	1-6	

PROBLEM: Animal waste and crop debris is the major organic pollutant resulting from agricultural activities. Of these, bacteria are the major pollutant concern in ground water. Certain bacteria can cause disease in humans such as infectious hepatitis, typhoid fever, dysentery, and other forms of diarrhea.

PROCESSES: Enters aquifer through fractures, sinkholes, and solution channels and enters through macropores.

CAUSES: Over-application of waste, application of waste on unsuitable sites, excess irrigation water application, and improper timing of waste application and irrigation water.

(1) There are many other practices not listed in this table which may be considered for installation for a specific purpose or as a part of a total resource management system which may increase or decrease loading or have little or no effects on water quality on a site-specific basis. An on-site analysis should be a consideration in evaluating the effect of a practice not listed.
(2) This list is not ranked in an order, which would indicate preference in installation.
(3) 1 = cotton, 2 = soybeans, 3 = sugarcane, 4 = rice, 5 = corn, 6 = truck crops.
(4) An on-site evaluation should be conducted to determine if conditions exist which would result in unfavorable effects if the practice was installed.
(5) Irrigated fields.

CROPLAND BEST MANAGEMENT PRACTICES (1) - Minerals or Salinity Concerns in Ground Water

Favorable BMPs (2)	Effectiveness of Favorable BMPs	Crops(3)	Practices Which May Be Unfavorable (4)
Salinity mgt	slight-	1-6	
Irrigation water mgt. (5)	slight-substantial	1-6	Vertical drains
Subsurface drain	slight-moderate	1-6	Deep Tillage
Irrig. water convey. (5)	slight-moderate	1-6	W/Sed Basin
Irrig. system (5)	slight-substantial	1-6	Irr .fld ditch
Waste utilization	slight-moderate	1-6	Irr. canal/lat
Cons. crop. rot	slight-moderate	1-6	

PROBLEM: Excessive concentrations of salts/minerals can render ground water unfit for human and animal consumption. It can reduce or restrict the water's value for industrial and municipal use and irrigation. The toxic effect of certain chemicals can be enhanced in saline waters. The U. S. Public Health Service has established the maximum allowable concentrations of chlorides and sulfates in water for human consumption at 250 mg/l each. Excessive salt intake can produce minor to serious effects.

PROCESSES: Natural processes and leaching of minerals or salt concentrations.

CAUSES: Naturally occurring, excess water moving downward from human activity of concentrating water or changing evapotranspiration, and irrigation water which contains high concentrations of dissolved solids.

(1) There are many other practices not listed in this table which may be considered for installation for a specific purpose or as a part of a total resource management system which may increase or decrease loading or have little or no effects on water quality on a site-specific basis. An on-site analysis should be a consideration in evaluating the effect of a practice not listed.
(2) This list is not ranked in an order, which would indicate preference in installation.
(3) 1 = cotton, 2 = soybeans, 3 = sugarcane, 4 = rice, 5 = corn, 6 = truck crops.
(4) An on-site evaluation should be conducted to determine if conditions exist which would result in unfavorable effects if the practice was installed.
(5) Irrigated fields.
(6) Where canal, lateral, or field ditch conveys drainage or tailwater, or where fertilizer is added to the irrigation supply.

CROPLAND BEST MANAGEMENT PRACTICES (1) - Pesticide Concerns in Ground Water

Favorable BMPs (2)	Effectiveness of Favorable BMPs	Crops(3)	Practices Which May Be Unfavorable (4)
Pest management	substantial	1-6	
Irrigation water mgt. (5)	slight-substantial	1-6	
Cons. crop. rot	slight-moderate	1-6	Deep Tillage
Cover crop	slight-moderate	1-6	W/Sed Basin
Precision land forming (5)	slight	1-6	Mulching
Surface drainage	slight	1-6	
Subsurface drain	slight-moderate	1-6	Irr.fld ditch
Irrig. water convey. (5)	na	1-6	Irr. canal/lat
Irrig. system (5)	slight-substantial	1-6	
Well	na	1-6	

PROBLEM: Pesticides by their nature are toxic substances. Soluble pesticides can reach ground water through percolation, fractures, sinkholes and solution channels where some can persist for long periods of time rendering the ground water unsafe for drinking and/or causing expensive cleanup. Pesticide leaching is more critical in areas where high amounts are used, soils are highly permeable, there is wide scale use of irrigation, and/or ground water levels are near the surface.

PROCESSES: Leaching of pesticides below the root zone and water percolating below the root zone.

CAUSES: Excess pesticide applied, leachable pesticides, persistent pesticides, excess irrigation water, improper pesticide or irrigation application or timing, faulty well or pumps hardware, improper mixing and handling of pesticides and pesticide containers, and improperly constructed wells.

(1) There are many other practices not listed in this table which may be considered for installation for a specific purpose or as a part of a total resource management system which may increase or decrease loading or have little or no effects on water quality on a site-specific basis. An on-site analysis should be a consideration in evaluating the effect of a practice not listed.
(2) This list is not ranked in an order, which would indicate preference in installation.
(3) 1 = cotton, 2 = soybeans, 3 = sugarcane, 4 = rice, 5 = corn, 6 = truck crops.
(4) An on-site evaluation should be conducted to determine if conditions exist which would result in unfavorable effects if the practice was installed.
(5) Irrigated fields.
(6) Where canal, lateral, or field ditch conveys drainage or tailwater or where pesticide is added to the irrigation supply.

PASTURELAND BEST MANAGEMENT PRACTICES (1) - Sediment Concerns in Surface Water

Favorable BMPs (2)	Effectiveness of Favorable BMPs	Practices Which May Be Unfavorable (3)
Pasture & hayland planting	substantial	Land clearing
Irrigation water management (4)	substantial	
Critical area planting	substantial	
Use Exclusion (5)	na	
Fencing (6)	neutral	
Prescribed Grazing	substantial	
Mechanical Forage Harvest	moderate	
Irrigation water conveyance (4)	moderate	
Appropriate irrigation system (4)	moderate	
Filter strip/buffer	moderate	
Pond (6)	slight-substantial	
Well (6)	na	
Spring development (6)	slight	
Pipeline (6)	na	
Brush management	slight	

PROBLEM: Sediment in a water body can smother benthic organisms, interfere with photosynthesis by reducing light penetration, and may fill in waterways, hindering navigation and increasing flooding. Sediment particles often carry nutrients and pesticides and other organic compounds into water bodies. Sediments can be resuspended in a water column and act as an uncontrolled source of pollution.

PROCESS: Movement of sediment from site.

CAUSES: Concentration of livestock in or near watercourses leading to instability and overuse of vegetation.

(1) There are many other practices not listed in this table which may be considered for installation for a specific purpose or as a part of a total resource management system which may increase or decrease loading or have little or no effects on water quality on a site-specific basis. An on-site analysis should be a consideration in evaluating the effect of a practice not listed.
(2) This list is not ranked in an order, which would indicate preference in installation.
(3) An on-site evaluation should be conducted to determine if conditions exist which would result in unfavorable effects if the practice was installed.
(4) Irrigated fields.
(5) To exclude livestock from streams.
(6) To distribute grazing.

PASTURELAND BEST MANAGEMENT PRACTICES (1) - Nutrient Concerns in Surface Water

Favorable BMPs (2)	Effectiveness of Favorable BMPs for: Soluble N./ Adsorbed N.	Practices Which May Be Unfavorable (3)
Nutrient management	substantial	Subsurface drain (4)
Waste Utilization	substantial	Subsurface drain (4)
Irrigation water management (5)	substantial	
Pasture & hayland planting	substantial	
Use Exclusion (6)	neutral	
Pond	slight-moderate	
Buffers	slight-substantial	
Fencing (7)	neutral	
Well (7)	na	
Pipeline (7)	na	
Prescribed Grazing	moderate	
Forage harvest mgt.	slight-moderate	
Spring development	na	

PROBLEM: Excess nitrogen and phosphorus in a water body causes excessive plant and algae growth, an imbalance of natural nutrient cycles, and a decline in the number of desirable fish species. High nitrate levels can be hazardous to warm-blooded animals under conditions that are favorable to reduction to nitrite.

PROCESSES: Runoff of soluble nitrogen and phosphorus in water and movement of nitrogen and phosphorus combined with soil and organic matter from site.

CAUSES: Excess surface applied nitrogen and phosphorus, runoff water and interflow, erosion of soil and organic waste, cattle congregating in or near streams, and excess irrigation water application beyond root zone.

(1) There are many other practices not listed in this table which may be considered for installation for a specific purpose or as a part of a total resource management system which may increase or decrease loading or have little or no effects on water quality on a site-specific basis. An on-site analysis should be a consideration in evaluating the effect of a practice not listed.
(2) This list is not ranked in an order, which would indicate preference in installation.
(3) An on-site evaluation should be conducted to determine if conditions exist which would result in unfavorable effects if the practice was installed.
(4) Where water table control or regulating water in drainage systems is not applied.
(5) Irrigated fields.
(6) To exclude livestock from streams.
(7) To distribute grazing.

PASTURELAND BEST MANAGEMENT PRACTICES (1) - Pesticide Concerns in Surface Water

Favorable BMPs (2)	Effectiveness of Favorable BMPs for: Soluble P./ Adsorbed P.	Practices Which May Be Unfavorable (3)
Pasture & hayland planting	substantial	Subsurface drain (4)
Irrigation water management (5)	substantial	Surface drainage (4)
Prescribed grazing	moderate	
Forage harvest management	slight-moderate	
Filter strips/buffers	moderate	
Pest Management	substantial	

PROBLEM: Pesticides by their nature are toxic substances. Many are highly toxic to fish, other aquatic fauna, and warm-blooded animals. Some persist in the aquatic environment for long periods of time so that even at very low concentrations, they are a serious environmental concern in runoff water.

PROCESSES: Runoff of soluble pesticides in water and movement of pesticides combined with soil and organic matter from site.

CAUSES: Excess pesticide, applied pesticides with affinity for soil and organic matter, persistent pesticides, runoff water and interflow, improper pesticide application and/or timing, improper mixing and handling of pesticides and pesticide containers, and excess irrigation water application beyond root zone.

(1) There are many other practices not listed in this table which may be considered for installation for a specific purpose or as a part of a total resource management system which may increase or decrease loading or have little or no effects on water quality on a site-specific basis. An on-site analysis should be a consideration in evaluating the effect of a practice not listed.
(2) This list is not ranked in an order, which would indicate preference in installation.
(3) An on-site evaluation should be conducted to determine if conditions exist which would result in unfavorable effects if the practice was installed.
(4) Where water table control or regulating water in drainage systems is not applied.
(5) Irrigated fields.

PASTURELAND BEST MANAGEMENT PRACTICES (1) - Organic Matter & Bacteria Concerns in Surface Water

Favorable BMPs (2)	Effectiveness of Favorable BMPs for: Oxygen Demand/ Bacteria	Practices Which May Be Unfavorable (3)
Waste utilization	mod neutral	Surface drainage (4)
Pond	slight sl. worsening	Subsurface drain (4)
Nutrient management	Sub slight	
Use Exclusion (5)	slight-moderate	
Fencing (6)	neutral	
Filter strip/buffers	sub. slight	
Prescribed grazing	slight	
Forage harvest mgt.	slight	
Pasture and hayland planting	slight	
Well (6)	na	
Pipeline (6)	na	
Spring development (6)	na slight	
Irrigation water management (7)	slight substantial	

PROBLEM: Animal waste and plant debris is the major organic pollutant from pastureland. They place an oxygen demand on receiving waters during decomposition, which can result in stress or the death of fish and other aquatic species. Certain bacteria can cause disease in humans such as infectious hepatitis, typhoid fever, dysentery, and other forms of diarrhea.

PROCESS: Movement of organic waste, bacteria, and organic matter in soil and water from the site.

CAUSES: Over application of waste, application of waste on unsuitable sites, improper timing of waste application, storm runoff, and concentration of livestock in or near watercourses.

(1) There are many other practices not listed in this table which may be considered for installation for a specific purpose or as a part of a total resource management system which may increase or decrease loading or have little or no effects on water quality on a site-specific basis. An on-site analysis should be a consideration in evaluating the effect of a practice not listed.
(2) This list is not ranked in an order, which would indicate preference in installation.
(3) An on-site evaluation should be conducted to determine if conditions exist which would result in unfavorable effects if the practice was installed.
(4) Where water table control or regulating water in drainage systems is not applied.
(5) To exclude livestock from streams.
(6) To distribute grazing.
(7) Irrigated fields.

PASTURELAND BEST MANAGEMENT PRACTICES (1) - Minerals or Salinity Concerns in Surface Water

Favorable BMPs (2)	Effectiveness of Favorable BMPs	Practices Which May Be Unfavorable (3)
Irrigation water management (4)	slight-moderate	Land clearing
Nutrient management	slight	Subsurface drain (5)
Irrigation water conveyance (4)	slight	Surface drainage (5)
Irrigation system (4)	neutral to moderate	
Forage harvest management	slight	
Prescribed grazing	slight-moderate	
Waste utilization	slight-moderate	

PROBLEM: Excessive concentrations of salts/minerals in surface waters can render the waters unfit for human and animal consumption and impair the growth of plants. It can also reduce or restrict the water's value for industrial use, irrigation and for propagation of fish and wildlife. The toxic effect of certain chemicals can be enhanced in saline waters. Excessive salts can adversely alter the permeability of soils. The U.S. Public Health Service has established the maximum allowable concentrations of chlorides and sulfates in water for human consumption at 250 mg/l each. Excessive salt intake can produce minor to serious effects.

PROCESSES: Natural processes, movement of organic waste, sheet flow from surface runoff and interflow from ground water as influenced by human activities.

CAUSES: High content of minerals and salt concentration in soil and underlying geology, over application of waste with high salinity content, movement of minerals and salinity in soil from the site by precipitation runoff and interflow (saline seeps), high content of minerals and salt concentration in irrigation water, and excess irrigation water.

(1) There are many other practices not listed in this table which may be considered for installation for a specific purpose or as a part of a total resource management system which may increase or decrease loading or have little or no effects on water quality on a site-specific basis. An on-site analysis should be a consideration in evaluating the effect of a practice not listed.
(2) This list is not ranked in an order, which would indicate preference in installation.
(3) An on-site evaluation should be conducted to determine if conditions exist which would result in unfavorable effects if the practice was installed.
(4) Irrigated fields.
(5) Where water table control or regulating water in drainage systems is not applied.

PASTURELAND BEST MANAGEMENT PRACTICES (1) - Minerals or Salinity Concerns in Ground Water

Favorable BMPs (2)	Effectiveness of Favorable BMPs	Practices Which May Be Unfavorable (3)
Irrigation water management (4)	slight-substantial	Irr. field ditch (4)
Surface drainage	slight-moderate	Irr. canal/lateral (4)
Subsurface drain	slight-moderate	Soil salinity mgt
		Toxic salt reduction
Irrigation conveyance (4)	slight	
Irrigation system (4)	slight-moderate	
Nutrient management	slight	
Waste utilization	slight-moderate	
Prescribed grazing	slight	
Forage harvest mgt.	slight	
Pasture/hayland planting	slight	
Fencing	neutral	
Pond	na	
Spring development	na	
Pipeline	na	

PROBLEM: Excessive concentrations of salts/minerals can render ground water unfit for human and animal consumption. It can reduce or restrict the water's value for industrial and municipal use and irrigation. The toxic effect of certain chemicals can be enhanced in saline waters, and the saturation levels of dissolved oxygen decreases with increasing salinity. The U. S. Public Health Service has established the maximum allowable concentrations of chlorides and sulfates in water for human consumption at 250 mg/l each. Excessive salt intake can produce minor to serious effects.

PROCESSES: Natural processes and leaching of minerals or salt concentrations.

CAUSES: Naturally occurring, excess water moving downward from human activity of concentrating water or changing evapotranspiration, and irrigation water contains high concentration of dissolved solids.

(1) There are many other practices not listed in this table which may be considered for installation for a specific purpose or as a part of a total resource management system which may increase or decrease loading or have little or no effects on water quality on a site-specific basis. An on-site analysis should be a consideration in evaluating the effect of a practice not listed.
(2) This list is not ranked in an order, which would indicate preference in installation.
(3) An on-site evaluation should be conducted to determine if conditions exist which would result in unfavorable effects if the practice was installed.
(4) Irrigated fields.

PASTURELAND BEST MANAGEMENT PRACTICES (1) - Organic Matter & Bacteria Concerns in Ground Water

Favorable BMPs (2)	Effectiveness of Favorable BMPs	Practices Which May Be Unfavorable (3)
Waste utilization	slight-moderate	
Use Exclusion (4)	slight	
Nutrient management	slight substantial	
Fencing (5)	neutral	
Irrigation water management (6)	slight-substantial	
Prescribed grazing	slight	
Water & sediment control basin	slight worsening	
Pond (5)	na	
Pipeline (5)	na	
Filter strip	slight-substantial	
Spring development (5)	na	
Forage harvest mgt.	slight-moderate	
Grassed waterway	neutral	

PROBLEM: Animal waste and plant debris are the major organic pollutants resulting from agricultural activities. Of these, bacteria are the major pollutant concern in ground water. Certain bacteria can cause disease in humans such as infectious hepatitis, typhoid fever, dysentery, and other forms of diarrhea.

PROCESSES: Enters aquifers through macropores, fractures, sinkholes, and solution channels.

CAUSES: Over application of waste, application of waste on unsuitable sites, and concentration of livestock in sinkholes and fractured limestone areas.

(1) There are many other practices not listed in this table which may be considered for installation for a specific purpose or as a part of a total resource management system which may increase or decrease loading or have little or no effects on water quality on a site-specific basis. An on-site analysis should be a consideration in evaluating the effect of a practice not listed.
(2) This list is not ranked in an order, which would indicate preference in installation.
(3) An on-site evaluation should be conducted to determine if conditions exist which would result in unfavorable effects if the practice was installed.
(4) To exclude livestock from sinkholes and fractured areas where feasible.
(5) To distribute grazing.
(6) Irrigated fields.

PASTURELAND BEST MANAGEMENT PRACTICES (1) - Nutrient Concerns in Ground Water

Favorable BMPs (2)	Effectiveness of Favorable BMPs	Practices Which May Be Unfavorable (3)
Nutrient management	substantial	Irrig. field ditch (4) (5)
Waste utilization	slight-moderate	Irrig. canal & lat. (4) (5)
Pasture & hayland planting	slight-moderate	
Forage harvest management	slight-moderate	
Irrigation water management (4)	slight-substantial	
Irrigation conveyance (4)	na	
Irrigation system (4)	slight	
Fencing (6)	neutral	
Pipeline (6)	na	
Surface drainage	slight	
Subsurface drain	slight	
Prescribed grazing	slight	
Spring development	na	
Pond	slight worsening	

PROBLEM: Soluble nutrients, mainly nitrogen, can reach ground water by percolation through fractures, sinkholes, and solution channels. This process can cause significant problems in areas where high rates of nitrogen fertilization are used, soils are highly permeable, there is wide scale use of irrigation, and/or ground water levels are near the surface. High nitrate levels in drinking water can be hazardous to warm-blooded animals under conditions that are favorable to reduction to nitrite.

PROCESS: Leaching of nitrogen.

CAUSES: Applied nitrogen in excess of plant needs in the root zone, cattle concentrating in one area for water, and excess irrigation water application beyond root zone capacity,

1. There are many other practices not listed in this table which may be considered for installation for a specific purpose or as a part of a total resource management system which may increase or decrease loading or have little or no effects on water quality on a site-specific basis. An on-site analysis should be a consideration in evaluating the effect of a practice not listed.
2. This list is not ranked in an order, which would indicate preference in installation.
3. An on-site evaluation should be conducted to determine if conditions exist which would result in unfavorable effects if the practice was installed.
4. Irrigated fields.
5. Where ditch, canal, or lateral conveys drainage or tailwater, or where fertilizer is added to the irrigation supply.
6. To distribute grazing.

PASTURELAND BEST MANAGEMENT PRACTICES (1) - Pesticide Concerns in Ground Water

Favorable BMPs (2)	Effectiveness of Favorable BMPs	Practices Which May Be Unfavorable (3)
Irrigation water management (4)	slight-substantial	Irrig. canal & lat. (4) (5)
Surface drainage	slight	Irrig. field ditch (4) (5)
Subsurface drain	slight-moderate	
Prescribed grazing	slight-moderate	
Pasture & hayland planting	slight-moderate	
Forage harvest management	slight-moderate	
Irrigation conveyance (4)	na	
Irrigation system (4) slight	moderate	
Pest Management	substantial	

PROBLEM: Pesticides by their nature are toxic substances. Soluble pesticides can reach ground water through percolation, fractures, sinkholes, and solution channels where some can persist for long periods of time rendering the ground water unsafe for drinking and/or causing expensive cleanup. Pesticide leaching is more critical in areas where high amounts are used, soils are highly permeable, there is wide scale use of irrigation, and/or ground water levels are near the surface.

PROCESS: Leaching of pesticides.

CAUSES: Excess pesticide applied leachable pesticides, persistent pesticides, improper pesticide application or timing, improper mixing and handling of pesticides and pesticide containers, and excess irrigation water application beyond root zone capacity.

1. There are many other practices not listed in this table which may be considered for installation for a specific purpose or as a part of a total resource management system which may increase or decrease loading or have little or no effects on water quality on a site-specific basis. An on-site analysis should be a consideration in evaluating the effect of a practice not listed.
2. This list is not ranked in an order, which would indicate preference in installation.
3. An on-site evaluation should be conducted to determine if conditions exist which would result in unfavorable effects if the practice was installed.
4. Irrigated fields.
5. Where ditch, canal, or lateral conveys drainage or tailwater, or where pesticide is added to the irrigation supply.

Forestry Statewide Program

Introduction

Much of the land in Louisiana is forested, either upland forests such as pines, or bottomland hardwood forests in the floodplains and cypress-tupelo forests in coastal wetlands. Actually, forests occupy more than 49 percent or 13.8 million acres of the land in Louisiana. A majority of the forest land, more than 64 percent, is in non-industrial private ownership; 26 percent is owned by the forest industry and the remaining 10 percent by public agencies. Forest land ownership patterns are similar to other southern states. The magnitude of NPS pollution from silviculture activities in Louisiana is small when compared to the pollutant loads generated by agricultural activities. Silviculture is defined as cultivation, harvest, and transport of lumber. Even so, silviculture activities can represent a significant source of pollution when poor or no management practices are followed. Forestlands cover approximately half of the land area of the state, therefore forestry BMPs are an important aspect of protecting water quality in the State of Louisiana. A portion of the forests in the state are in a transition stage of cover during, and for two years after harvesting. These disturbed areas are where most of the sediment erosion problems will exist. In addition to sediment, nutrients, toxic chemicals, metals, organic material, pathogens, herbicides, pesticides and increases in stream temperature can cause pollution problems in the water body. It is important to utilize site planning and other types of BMPs to minimize these impacts to the water body.

Forestry activities such as harvesting and road building can also affect hydrology of the watershed, therefore pre-harvest planning needs to be considered on the watershed and sub-watershed scale. Without adequate controls, forestry operations may degrade several water quality characteristics in water bodies receiving drainage from forestlands. Sediment concentrations can increase due to accelerated erosion; water temperatures can increase due to removal of over story riparian shade; slash and other organic debris can accumulate in water bodies, depleting DO; and organic and inorganic chemical concentrations can increase due to harvesting and fertilizer and pesticide applications (Brown, 1985). These potential increases in water quality contaminants are usually proportional to the severity of site disturbance (Riekerk, 1983, 1985; Riekerk et al., 1989). Silviculture NPS pollution impacts depend on site characteristics, climatic conditions, and the forest practices employed.

USEPA has indicated that five leading pollutants impairing the nation’s waters are siltation, nutrients, (from fertilizers and animal wastes) bacteria, toxic metals, and organic enrichment that lower DO (USEPA, 2000). Siltation is the leading cause of water quality impairment to rivers and streams and the third leading cause of impairment to lakes, ponds, and reservoirs. Nine states list silviculture as a leading source of impairment to rivers and streams (USEPA, 2000). On Federal lands, such as national forests, many water quality problems can be attributed to the effects of timber harvesting and related activities (Whitman, 1989). In response to these impacts, many states have developed programs to address NPS pollution from forestry activities.

Sediment

Sediment is often the primary pollutant associated with forestry activities (USEPA, 2005). Sediment is often defined as mineral or organic solid material that is eroded from the land surface by water, ice, wind, or other processes, and is then transported or deposited away from its original location.

Sediment transported from forests to water bodies can be particularly detrimental to benthic organisms and many fish species. When it settles, sediment fills interstitial spaces in lake bottoms or streambeds. This can eliminate essential habitat, covering food sources and spawning sites and smothering bottom-dwelling organisms and periphyton. Sediment deposition also reduces the capacity of stream channels to carry water and of reservoirs to hold water. This decreased flow and storage capacity can lead to increased flooding and decreased water supplies (Golden, et al., 1984).

Suspended sediment often increases turbidity, thereby limiting the depth to which light can penetrate and adversely affect aquatic vegetation and photosynthesis. Suspended sediment can also damage the gills of some fish species, causing them to suffocate, and can limit the ability of sight-feeding fish to find and obtain food. Turbid waters tend to have higher temperatures and lower DO concentrations. A decrease in DO levels can kill aquatic vegetation, fish, and benthic invertebrates.

Nutrients

Nutrients from forest fertilizers, such as nitrogen and phosphorus adsorbed to sediments, in solution, or transported by aerial deposition, can cause harmful effects in receiving waters. Sudden removal of large quantities of vegetation through harvesting can also increase leaching of nutrients from the soil system into surface waters and ground waters by disrupting the nitrogen cycle (Likens et al., 1970). Excessive amounts of nutrients may cause enrichment of water bodies, stimulating algae blooms. Large blooms limit light penetration into the water column, increase turbidity, and increase biological oxygen demand, resulting in reduced DO levels. This process, termed eutrophication, drastically affects aquatic organisms by depleting oxygen these organisms need to survive.

Forest Chemicals

Herbicides, insecticides, and fungicides (collectively termed pesticides) used to control forest pests and undesirable plant species, can be toxic to aquatic organisms. Pesticides that are applied to foliage or soils, or are applied by aerial means, are most readily transported to surface waters and ground waters (Norris and Moore, 1971). Some pesticides with high solubility can be extremely harmful, causing either acute or chronic effects in aquatic organisms, including reduced growth or reproduction, cancer, and organ malfunction or failure (Brown, 1974). Persistent pesticides that tend to sorb onto particulates are also of environmental concern since these relatively nonpolar compounds have the tendency to bioaccumulate. Other "chemicals" that may be released during forestry operations include fuel, oil, and coolants used in equipment for harvesting and road-building operations.

Organic Debris Resulting from Forestry Activities

Organic debris includes residual logs, slash, litter, and soil organic matter generated by forestry activities. Organic debris can adversely affect water quality by causing increased biochemical oxygen demand, resulting in decreased DO levels in watercourses. Logging slash and debris deposited in streams can alter stream flows by forming debris dams or rerouting streams, and can also redirect flow in the channel, increasing bank cutting and resulting sedimentation (Dunford, 1962; Everest and Meehan, 1981). In some ecosystems, small amounts of naturally occurring organic material can be beneficial to fish production. Small streams in the Pacific Northwest may be largely dependent on the external energy source provided by organic materials such as leaves and small twigs. Naturally occurring large woody debris in streams can also create physical habitat diversity for rearing salmonids and can stabilize streambeds and banks (Everest and Meehan, 1981; Murphy et al., 1986).

Temperature

Increased temperatures in streams and water bodies can result from vegetation removal in the riparian zone from either harvesting or herbicide use. These temperature increases can be dramatic in smaller (lower order) streams, adversely affecting aquatic species and habitat (Brown, 1972; Megahan, 1980; Curtis et al., 1990). Increased water temperatures can also decrease the dissolved oxygen holding capacity of a water body, increasing biological oxygen demand levels and accelerating chemical processes (Curtis et al., 1990).

Streamflow

Increased stream flow often results from vegetation removal (Likens et al., 1970; Eschner and Larmoyeux, 1963; Blackburn et al., 1982). Tree removal reduces evapotranspiration, which increases water availability to stream systems. The amount of stream flow increase is related to the total area harvested, topography, soil type, and harvesting practices (Curtis et al., 1990). Increased stream flows can scour channels, erode stream banks, increase sedimentation, and increase peak flows.

Those silviculture activities, which are known to produce pollution, are logging roads and other transport systems, harvesting, crop regeneration, and intermediate practices and activities. The amount of pollution generated by these activities is a function of soil type, climatic conditions, and characteristics of the individual operation. The major type of pollution associated with silviculture activities is increased sediment yield associated with the erosion of harvest sites, log landings, logging, and skid trails. The types of forestry activities affecting NPS pollution include road construction and use, timber harvesting, mechanical equipment operation, burning, and fertilizer and pesticide application (Neary et al., 1989).

Road Construction and Use

Roads are considered to be the major source of erosion from forested lands, contributing up to 90 percent of the total sediment production from forestry operations (Rothwell, 1983; Megahan, 1980; Patric, 1976). Erosion potential from roads is accelerated by increasing slope gradients on cut-and-fill slopes, intercepting subsurface water flow, and concentrating overland flow on the road surface and in channels (Megahan, 1980). Roads with steep gradients, deep cut-and-fill sections, poor drainage, erodible soils, and road-stream crossings contribute to most of this sediment load, with road-stream crossings being the most frequent sources of erosion and sediment (Rothwell, 1983). Soil loss tends to be greatest during and immediately after road construction because of the unstabilized road prism and disturbance by passage of heavy trucks and equipment (Swift, 1984).

Brown and Krygier (1971) found that sediment production doubled after road construction on three small watersheds in the Oregon Coast Range. Dyrness (1967) observed the loss of 680 cubic yards of soil per acre from the H.J. Andrews Experimental Forest in Oregon due to soil erosion from roads on steep topography. Careful planning and proper road layout and design, however, can minimize erosion and prevent stream sedimentation (Larse, 1971). The state's Forestry BMP Manual includes practices for road construction in forested lands.

Timber Harvesting

Most detrimental effects of harvesting are related to access and movement of vehicles and machinery, and skidding and loading of trees or logs. These effects include soil disturbance, soil compaction, and direct disturbance of stream channels. Logging operation planning, soil and cover type, and slope are the most important factors influencing harvesting impacts on water quality (Yoho, 1980). The construction and use of haul roads, skid trails, and landings for access to and movement of logs are the harvesting activities that have the greatest erosion potential.

Surveys of soil disturbance from logging were performed by Hornbeck and others (1986) in Maine, New Hampshire, and Connecticut. They found 18 percent of the mineral soil exposed by logging practices in Maine, 11 percent in New Hampshire, and 8 percent in Connecticut. Megahan (1986) reviewed several studies on forestland erosion and concluded that surface erosion rates on roads often equaled or exceeded erosion reported for severely eroding agricultural lands. Megahan (1986) found that in some cases, erosion rates from harvest operations may approach erosion rates from roads and that prescribed burning can accelerate erosion beyond that from logging alone.

Another adverse impact of harvesting is the increase in stream water temperatures resulting from removal of streamside vegetation, with the greatest potential impacts occurring in small streams. However, streamside buffer strips have been shown to minimize the increase in stream temperatures (Brazier and Brown, 1973; Brown and Krygier, 1970). The state's Forestry BMP Manual includes practices for timber harvesting.

Regeneration Methods

Regeneration methods for inland forests can be divided into two general types: (1) regeneration from seedlings, either planted seedlings or existing seedlings released by harvesting, and (2) regeneration from seed, which can be seed from existing trees on or near the site or the broadcast application of seeds of the desired species. In some areas, regeneration with seedlings by mechanical tree planting is often conducted because it is faster and more consistent. Planting approaches relying on seeding generally require a certain amount of mineral soil to be exposed for seed establishment. For this reason, a site preparation technique is usually needed for regeneration by seeding.

Site Preparation

Mechanical site preparation by large tractors, that shear, disk, drum-chop, or root-rake a site, may result in considerable soil disturbance over large areas and has a high potential to deteriorate water quality (Beasley, 1979). Site preparation techniques that result in the removal of vegetation and litter cover, soil compaction, exposure or disturbance of the mineral soil, and increased storm flows due to decreased infiltration and percolation, all can contribute to increases in stream sediment loads (Golden et al., 1984). However, erosion rates decrease over time as vegetative cover grows back. The state's Forestry BMP Manual includes a set of practices for site preparation.

Prescribed burning and herbicides are other methods used to prepare sites that may also have potential negative effects on water quality. These activities are discussed below.

Prescribed Burning

Prescribed burning of slash can increase erosion by eliminating protective cover and altering soil properties (Megahan, 1980). The degree of erosion following a prescribed burn depends on soil erodibility, slope, precipitation timing, volume and intensity, fire severity, cover remaining on the soil, and speed of revegetation. Burning may also increase stream flow in areas where all vegetation is killed. Such increases are partially attributable to decreased evapotranspiration rates and reduced canopy interception of precipitation. Erosion resulting from prescribed burning is generally less than that resulting from roads and skid trails and from site preparation that causes intense soil disturbance (Golden et al., 1984). However, significant erosion can occur during prescribed burning if the slash being burned is collected or piled, causing soil to be moved and incorporated into the slash. The state's Forestry BMP manual includes a set of practices for prescribed burning for forestry operations.

Application of Forest Chemicals

Adverse effects on water quality due to forest chemical application typically result from improper chemical application, such as failure to establish buffers around watercourses (Norris and Moore, 1971). Aerial application of forest chemicals has a greater potential to adversely affect water quality, especially if chemicals are applied under improper conditions, such as high winds (Riekerk et al., 1989), or are applied directly to watercourses. The State's Forestry BMP Manual includes a set of practices for application of forest chemicals to forested lands.

Coastal Wetland Forests

Louisiana has more than 2 million acres of forested wetlands, with approximately half of these acres existing in coastal parishes. Cypress-Tupelo stands have occupied coastal wetlands in Louisiana since before the first explorers were able to record their existence. In 1774, one of the early settlers wrote, "there is a greatest plenty immediately westward of the mouth of the Mississippi". There appeared to be a limitless supply of bald cypress to the early settlers, with nearly 15 billion board feet of bald cypress estimated in the delta swamps at the time of settlement (Kerr, 1981). The cypress tree was utilized for building houses, caskets, creameries, bakeries, and shingles. Between 1869 and 1932, more than 3 billion board feet of cypress timber had been logged. Depletion of the vast virgin stands of cypress timber and the Great Depression caused most of the bald cypress mills to close. The Louisiana Department of Conservation estimated that in 1934 there were 22,356 acres of bald cypress remaining along with 1.6 million acres of denuded bald cypress lands.

Based on records from the U.S. Forest Service, it was estimated that there were 7.4 million acres of cypress-tupelo forests in 1934, of which 50 percent were cleared by the mid-1980s. The majority of this was harvested as bottomland hardwood forests in the alluvial valley of the Mississippi River, north of the coastal parishes. Wicker (1981) estimated there were 345,911 acres of cypress-tupelo swamps within the state of Louisiana. However, that survey was only for the coastal zone which did not include all of the Barataria or the Atchafalaya Basins, but these records do indicate that the acres of cypress-tupelo forests are declining.

In addition to the harvesting pressures on the cypress-tupelo forests, the altered hydrology of Louisiana's coastal wetlands has affected the potential of these forests to regenerate naturally or perhaps at all, depending on their location. The Governor of Louisiana appointed a Science Working Group (SWG) to examine this question, of whether the harvesting of cypress-tupelo forests in coastal wetlands will result in alteration of the landscape to marsh and eventually open water. The result of this work group was a final report which included this set of recommendations to the Governor:

1. Adopt the following statement of mission and intent regarding coastal wetland forest ecosystem policy: *The State of Louisiana will place priority on conserving, restoring, and managing coastal wetland forests to ensure that their functions and ecosystem services will be conserved for present and future citizens of Louisiana and the United States.*
2. Recognize the regeneration condition classes developed by the SWG and use them to classify existing coastal forest

site conditions for management, restoration, protection and use purposes.

3. Place priority on maintaining appropriate hydrologic conditions of SWG Regeneration Condition Class 1 lands.
4. An interim moratorium should be placed on harvesting activities in Condition Class III lands, because these lands will not regenerate to forest. The goal of the moratorium is to provide time for hydrologic restoration and improvement of stand conditions that will allow artificial or natural regeneration.
5. For coastal bald cypress-tupelo forest stands, a forest management plan with specific plans for regeneration should be required before harvesting for SWG Condition Class I and II sties. The plan should require approval by the Louisiana Office of Forestry (LOF) before harvest can occur and approval should be preceded by an on-site visit. The on-site visit should be the site into one of the three SWG Condition Classes set forward in this document, so that proper regeneration can be assured. If the site falls in SWG Condition Class II, artificial regeneration (panted seedlings at least 3 feet in height with tree protectors [shelters to protect against herbivores] to regenerate the site should be required. If the site falls in SWG Condition Class III, restoration or mitigation should be required once the interim moratorium is lifted.
6. Develop spatially explicit data regarding SWG Condition Classes, existing hydrologic and geomorphic conditions, and current and future threats to coastal wetland forests. These data should be collected, evaluated and updated by a consortium of state, local and federal agencies, universities and non-governmental organizations and made available to all stakeholders. Adding remotely-sensed data to this data set should be aggressively pursued. Until these data are available, it will be difficult to wisely manage and care for the coastal forest of Louisiana.
7. Coastal forests extend beyond the current coastal zone boundary. Therefore, the coastal zone boundary and target area for large scale restoration should be expanded to include coastal wetland forests as defined by the SWG, especially those in major river bottoms draining to the coastal (e.g. Atchafalaya and Pearl River Basins) and those with extensive areas of coastal wetland forests (e.g., Lake Maurepas).
8. Direct all state and local agencies to review, evaluate and coordinate their activities in coastal wetland forests and develop guidelines and practices to prevent the loss and degradation of habitat, functions, and ecosystem services through official actions. The Governor should also officially request that federal agencies do the same.
9. Establish and maintain a system of long-term monitoring coastal wetland forest conditions, supplemental to Forest Information System (FIS) and Coastal Reference Monitoring System (CRMS) datasets, expanded to include the entire SWG coastal wetland forest zone. Additionally, monitoring of restoration should occur, and include measures to evaluate success. This may entail some long-term efforts because forests may take 25 years to establish functioning stands.
10. Review and modify current accepted practices for mitigation of impacts on coastal wetland forests. Given the uniqueness of Louisiana's coastal

wetland forests, all mitigation must be of the same forest type and occur in the same watershed where the impacts are located.

11. Encourage conservation and protection of coastal wetland forest areas by developing a Coastal Wetland Forest Reserve System. Offer several different forms of compensation to landowners that forego income by forgoing harvest of bald cypress-tupelo forests until areas can be restored to productive systems.
12. Actively pursue restoration of degraded wetland forests as defined by the SWG condition classes.
13. Enhance wetland forest ecosystem functions and values as part of all hydrological management decisions, including management of point and nonpoint-source inputs, floodways, diversions, levee construction, and coastal management.
14. Develop policies to ensure implementation of the above recommendations. Various incentive mechanisms should be explored as part of policy implementation.

In addition to the SWG, a technical advisory committee participated in all of the meetings, discussions and the review of the final report that was generated through this effort. Some members of the committee did not concur with all of the recommendations made by the SWG, therefore a series of meetings were held with the technical advisory committee to generate a set of recommendations to the Office of the Governor on the scientific and policy needs related to this issue. Governor Blanco accepted these recommendations and submitted them to the Coastal Protection and Restoration Authority (CPRA) on April 5, 2007.

RECOMMENDATIONS TO GOVERNOR's OFFICE

Coastal Wetland Forests (CWFs) are Cypress-Tupelo and Chenier forests that are influenced by coastal processes such as: subsidence, salinity, erosion, tides, sea level rise, storm surge, etc. The following parameters, though not exhaustive, could be considered in developing a definition for CWFs:

- Proximity of areas near and adjacent to the Gulf of Mexico
- Area surface hydrology
- Whether or not the area is influenced by tide, salinity, wind and wave action
- Whether or not the area is influenced by subsidence
- Soil classification
- Elevation
- Species composition of woody and herbaceous vegetation
- Whether or not the soils and site physiography were formed by alluvial processes
- Whether or not the areas have significant impact on coastal areas through deposition, seed dispersal, or other means

The Advisory Panel would like to recommend to Governor Kathleen Babineaux Blanco and to the State of Louisiana the following items for implementation in order to restore, conserve, protect and manage the functions and values of Louisiana CWFs into the future.

OPTIONS FOR IMMEDIATE IMPLEMENTATION

Restoration and Conservation Programs

Manage all CWFs in a sustainable manner. Specific recommendations include:

- Develop appropriate incentives and technical assistance for landowners in the active management of their coastal wetland forests, and if delay of harvest is recommended or encouraged, provide appropriate incentives to the landowner to achieve that objective.
- Promote the development of Forestry BMPs that support sustainability of Louisiana's CWFs.
- Develop a methodology or criteria for delineation of SWG Cypress-Tupelo CWF Regeneration Condition Classes.
- Identify CWF areas where Cypress-Tupelo forest restoration is feasible.
- Develop criteria for prioritizing restoration and conservation projects.

Funding and Incentives

- Support creation of a dedicated state revenue stream for CWF conservation purposes, including the development of incentive programs for conservation measures and funding of agencies delegated to administer such programs.
- Require government stakeholders to use a portion of coastal restoration funds for CWF conservation, restoration, and acquisition.
- Provide funding for management of conservation easements and fee title lands.
- Increase capacity and support for LDAF nurseries to produce plant material for coastal restoration/reforestation.

Governmental Issues

- Direct the CPRA to engage other stakeholders as appropriate, in their coordination of activities that ensure conservation and management of CWFs.
- Consider the formation of a CPRA standing committee or task force to continue to monitor Louisiana's CWF situation and address related issues as they arise.

Science

- Develop the criteria for defining geographically where the CWFs are located.
- Fund the development of diagnostic tools to identify, distinguish, and map each SWG Cypress-Tupelo CWF Regeneration Condition Class.
- Identify and map SWG Cypress-Tupelo CWF Regeneration Condition Classes.
- Develop research programs to identify how to restore Condition Class III CWFs to Condition Class II or I.
- Develop research programs to identify CWFs which are at risk of becoming unsustainable.
- Determine the impact of hydrologic alteration on forest sustainability.

Federal and State Regulation and Private Property Rights

- Promote the development and use of Forestry BMPs that support sustainability of Louisiana's CWFs.
- Recognize that the majority of the CWFs are privately owned and develop incentives to encourage landowners to manage and maintain CWFs.

Education and Outreach

- Disseminate research-based information to stakeholder groups and policy makers as it exists or becomes available.
- Develop a forum in coastal areas for interested and concerned stakeholders where they can meet to discuss issues as they arise and evolve, and help formulate strategies to address these issues and help implement solutions.

Long-Term Planning for Sustainability

Restoration and Conservation Programs

- Develop a long-term comprehensive plan for Louisiana's CWFs, both public and private.
- Create programs to facilitate economically and environmentally sustainable development and use of CWF resources in order to protect, conserve, and restore these resources.
- Encourage communities, federal, state, and local governments, and Non-Government Organizations to recognize that CWFs are important components of the coastal ecosystem and implement appropriate programs to achieve restoration.
- Direct the CPRA to address the avoidance, minimization, and mitigation of secondary impacts from roads, levees, spoil banks, navigation channels, and other development that has the potential to negatively impact CWFs.

Funding and Incentives

Clearly identify, establish and maintain sufficient funding and technical assistance from a variety of sources to achieve the long-term goal of protecting and restoring the CWFs.

- Expand state and federal incentive programs for creating new CWF stands on agricultural or other suitable open lands.
- Develop an ecosystem services incentives package for landowners that includes compensation for hurricane protection, carbon and nutrient uptake, wildlife habitat, timber value, and water storage.

Science

- Increase funding for CWF research.
- Develop methods and procedures for long term monitoring of CWF health.
- Develop and implement a strategy in coordination with landowners to utilize river diversions, pipeline delivery of sediments, and/or nutrient rich effluent waters into degrading swamp and/or marsh systems.
- Develop research programs that determine the impact of climate change to CWFs.

Governmental Issues

- If state climate change policies are developed, conservation of CWFs should be factored into those policies.
- Ensure long-term, continuous coordination of state agencies with respect to the protection of CWFs.
- Authorize and fund the LDNR and the LDAF to gather and synthesize data for a CWF database of lands, current conditions, landowners, and areas for potential projects in cooperation with universities and other appropriate agencies. Authorization and funding should include follow-up collection of data and monitoring of restoration areas.
- Periodically review the effectiveness of regulation, acquisition, and coastal restoration and management efforts in achieving sustainable CWFs.
- Continue to develop and refine interim guidelines for CWF management as new research becomes available.
- Continue to develop and refine Forestry BMPs that support sustainability of Louisiana's CWFs as new research becomes available.

The next steps will be the actual mapping of the extent and location of the three condition classes of cypress-tupelo forests in coastal Louisiana. Through this process, agencies and the public will be able to clearly see how much of the coastal forests are at risk of being lost because of subsidence, sea level rise and salt water intrusion. Agencies are also working to acquire funds through the Coastal Impact Assessment Program (CIAP) to compensate landowners who decide to delay harvest of their forests in an attempt to restore hydrology and manage them for long-term sustainability.

Define Water Quality/Program Goals

The water quality goals for a statewide forestry program are more generalized than a watershed-specific program, but are still an important aspect of the program. Through LDEQ's historical and current 4-year basin cyclic statewide water quality-monitoring programs, areas of the state have been identified where forestry activities contribute to water quality impairment. These data are combined with satellite imagery to determine where forestry NPS educational outreach programs should be targeted. The pollutants of concern in these water bodies are primarily sediment, total organic carbon and nutrients. The concern with sediment is primarily with turbidity in the stream and its potential impact on fish and macro-invertebrate habitat. If the stream becomes too turbid from forested sites after a storm event, habitats of aquatic organisms can be affected. These effects can be short-term or long-term, depending on the degree of impact to the stream.

The concern with nutrients and total organic carbon is with their effect on DO concentration in the stream. If high loading of either of these types of materials enter the water body from the forested site, there is the potential for them to result in eutrophication and/or algae blooms. When this happens, it can result in declines in DO concentration and fish kills. Declines in DO can also be affected by high stream temperature. During summer months in Louisiana, high temperatures are quite common and typically do have an affect on DO concentration in the stream. If SMZs are removed from the stream bank, the temperature of the water can increase as much as 10 degrees Fahrenheit. This increase in stream temperature combined with increased pollutant loading can result in more extreme fluctuations in the concentration of DO.

Although many water bodies in Louisiana may naturally have low DO concentrations, there are also water bodies that exhibit low oxygen conditions because of increased pollutant loads. Since the 303(d) list is the principle source of information on the extent to which water bodies across the state are impaired, it has been the basis for prioritizing areas where statewide and watershed implementation activities need to be implemented. The long-term goal is to remove these water bodies from the 303(d) list and to restore their designated uses for fishing and swimming. The short-term goal is to reduce the concentration of sediment, nutrients, and total organic carbon in areas of the state where forestry activities have been indicated as one contributing source of NPS pollution.

As LDEQ continues to monitor the water bodies across the state on the 4-year basin cyclic program, annual progress made in BMP implementation will be documented and reported to USEPA. Information will also be available to agencies partnering with LDEQ on program implementation and the public through LDEQ's website. LDEQ anticipates that statewide educational programs could result in in-stream water quality improvement over a 10-12 year period of time. The 4-year cycle for water quality monitoring provides a timeline from which to evaluate progress in meeting water quality goals of the NPS Program. The first phase (4-year cycle) of water quality data was utilized to develop the TMDL and possibly develop the WIP. The second phase of water quality data provided a baseline for implementation of the NPS Management Plan and third phase determines whether the plan has been effective in reducing NPS pollutants and improving water quality. If this third phase of water quality data does not indicate a significant improvement in implementation of forestry BMPs in watersheds on the 1999 court ordered 303(d) list, then LDEQ and cooperating federal and state agencies will determine whether back-up authorities are necessary to achieve the level of BMP implementation required to reduce NPS pollution and improve water quality.

An example of these authorities is included within LDEQ's Regulations: Title 33 Environmental Quality Part IX, Water Quality Regulations Chapter 11. Surface Water Standards:

> §1101(D) The water quality standards described in this Chapter are applicable to surface waters of the state, and are utilized through the waste load allocation and permit processes to develop effluent limitations for point source discharges to surface waters of the state. These can also form the basis for implementing BMPs for control of NPS of water pollution.
>
> §1109(A) (2) Antidegradation Policy
> The administrative authority will not approve any wastewater discharge or certify any activity for federal permit that would impair water quality or use of state waters. Waste discharges must comply with applicable state and federal laws for the attainment of water quality goals. Any new, existing, or expanded point source or NPS discharging into state waters, including land clearing which is the subject of a federal permit application will be required to provide the necessary level of waste treatment to protect state waters as determined by the administrative authority. Further, the highest statutory and regulatory requirements shall be achieved for all existing point sources and BMPs for NPS. Additionally, no degradation shall be allowed in high-quality waters that constitute outstanding natural resources, such as waters of ecological significance as designated by the office. Those water bodies presently designated as outstanding resources are listed in LAC 33:IX.1123.

Explain Programmatic Activities to reach those Goals

LDEQ has partnered with LFA, LOF, USDA-NRCS, U.S. Forest Service and LSU School of Forestry, Wildlife and Fisheries on statewide forestry educational outreach programs. Through these programs, loggers, foresters and both private and industrial landowners have been provided information on forestry BMPs. LFA has hosted intensive all-day forestry BMP training workshops throughout the state. The Sustainable Forestry Initiative (SFI) has hosted training workshops for more than 3,100 loggers and landowners have been trained on forestry road construction, SMZs, timber harvesting practices and site preparation.

Forestry BMPs for Water Quality Goals

In order to reach in-stream water quality goals of reduced loading of sediment, nutrients, and total organic carbon to the stream from the forested site, BMPs have been developed.
Explanation and illustration of these forestry practices have been included in Louisiana's Forestry BMP Manual. This manual was developed by LFA's BMP Committee and was approved by USEPA Region 6 and LDEQ in 1999. USEPA and NOAA have concurred that the revised Forestry BMP Manual is consistent with the management measures described in the CZARA Management Measures for Forestry.

Educational Programs

In order to provide information on which type of BMPs could to be implemented for forestry operations, LDEQ prepared an educational brochure, which included graphics and text on forestry BMPs. Over 10,000 of these brochures have been printed and distributed throughout the state at forestry water quality workshops, through schools, water quality seminars, and at public events like Baton Rouge's Earth Day Celebration. Copies of the Forestry BMP Manual have also been widely distributed and disseminated throughout the state. LSU School of Forestry, Wildlife and Fisheries developed an educational brochure for the series of water quality workshops that LDEQ sponsored and supported with Section 319 funds. These brochures include information on water quality, forestry management and fisheries. A copy was also made available on LSU's website.

During the past years, LFA and NRCS have hosted a series of workshops for loggers, foresters and landowners. These workshops have provided information on erosion control methods and forestry BMPs. Through these workshops, approximately 5400 people have been trained on forestry BMPs and how they should be implemented for timber management and harvesting activities. The six-hour combination classroom and field exercise focuses on planning, design and construction of forest water control measures. The field exercise included learning how to measure slope using a rod and a level. The group is then divided into 5-6 teams and each team is assigned a section of road, fire lane, or SMZ to determine what type and layout of water control devices are required. Using a can of spray paint the team draws the structures on the ground indicating direction of water flow and slope. This type of intensive training has resulted in loggers and foresters improving their knowledge and hopefully their utilization of BMPs.

Sustainable Forestry Initiative

Members of the American Forest and Paper Association embarked on an ambitious program for renewal and improved management of our nation's forests. The Sustainable Forestry Initiative (SFI^{SM}) has forged unprecedented new alliances with environmental and conservation organizations, with universities, with state and federal government agencies and with the business community. An expert review panel with members from each of these groups assists in reporting annual progress of the SFI^{SM}.

In Louisiana, the SFI^{SM} is the responsibility of a State Implementation Committee (SIC) in the LFA. The accomplishments of SFI^{SM} in Louisiana have been achieved through effective partnerships with state and federal agencies, universities, logging contractors, private small landowners, and the forest industry. In four years, SFI^{SM} has established the following training courses:

- BMPs for Forestry
- Wetlands and Endangered Species
- Forest Harvest Planning
- Erosion Control
- Forest Transportation and Harvest Safety
- Business Management for Loggers
- Occupational Safety and Health Administration (OSHA) for Loggers

The Louisiana Master Logger program recognizes loggers who complete thirty-six hours of required training and meet the annual six-hour continuing education requirement. Today, 462 loggers and 208 non-loggers such as foresters and landowners have completed all of their training. An additional two thousand are in the process of completing their training.

Another effort by Louisiana's SFI^{SM} has been to assist in training 148,000 non-industrial private landowners. They own almost two-thirds of the state's forestlands. Generally, this experienced group of landowners is committed to becoming better managers of their forests and forestry activities. The SIC found that they were eager to learn ways to maximize current values of their forests, while ensuring future generations would also have the same opportunities. The SIC has been instrumental in developing several successful approaches for of SFI to share their message with this influential group of landowners.

Educational information is provided by the SIC to small private landowners by the following methods:

- Folders of information were developed and nearly five thousand were distributed by American Forest & Paper Association (AF&PA) members to provide SFI, regeneration and management assistance to small, private forest landowners;
- SIC members helped establish twenty-two parish landowner groups and regularly speak at their meetings;
- The SIC worked with LDEQ and LSU to develop a helpful and award-winning booklet entitled, "Forest Management for Water Quality". SIC also helped present twelve indoor / outdoor companion training sessions;
- Classes for BMPs, wetlands, endangered species, and harvest planning have been successfully combined to include small private landowners, loggers and foresters. The result has been better understanding of the three groups and a dynamic new spark of energy when the group works together to develop a harvesting plan;
- The SICs of Louisiana, Texas and Arkansas cooperated in funding and broadcasting a television commercial explaining the importance of SFI to the public; and
- The SIC is supporting conversion of the *Florida Forests Forever* Compact Disk into a presentation appropriate for Louisiana Schools.

Effective partnerships, quality education programs, and an aggressive schedule for training has been a key factor in the success of SFI^{SM} in Louisiana. Louisiana's SIC has assisted stakeholders to realize how important each partner's role is in working to protect our environment and supply forest products that we all use and need without jeopardizing the ability of future generations to do the same.

BMP Implementation Surveys

In order to determine the extent of forestry BMP implementation across the state, the LOF has conducted a statewide survey. This survey was designed to assess to what extent forestry BMPs have been implemented and what type of variation existed in different parts of the state on BMP implementation. The survey was designed by estimating the board feet of timber harvested for each parish. The parishes were ranked according to these estimates to determine the number of sites that would be surveyed for use of forestry BMPs during forestry operations.

Based on results of this forestry BMP survey, in 1991 only 51 percent of forestry sites where timber was harvested actually utilized BMPs. In 1994, this percentage increased to 80 percent and in 1997, this percentage increased to 83 percent. The goal was to reach a BMP compliance rate of 90 percent by the year 2000, and this goal was achieved and surpassed in 2005 with a 96 percent compliance rate with forestry BMPs. These results indicated the statewide educational programs have been effective in increasing the level of implementation of forestry BMPs across the state. The 2005 survey provided additional information on which parishes had highest and lowest rates of BMP implementation. Another survey was completed in 2009 and results were provided to LDEQ and utilized for tracking where water quality has improved as a result of forestry BMP implementation. All of this information has assisted LDEQ to focus future educational workshops, field days, and programs in basins/watersheds of the state.

BMP Effectiveness Monitoring

In order to determine whether this increased level of BMP implementation has resulted in reduction of NPS pollutants and in-stream water quality improvement, LDEQ partnered with LSU, ULM and local forestry industries on BMP effectiveness monitoring. This type of monitoring involved selecting forested sites that did utilize forestry BMPs and those sites that did not.

Once these sites were selected, in-stream chemical and biological data were collected at each type of site. Chemical data collection included: sediment (TSS, TDS, turbidity), nutrients (TKN, NO2, NO3, TP,) and total organic carbon (TOC). Biological data collection included macro-invertebrate and fish.

This type of sampling was performed in the Ouachita River Basin and results are available to on LDEQ's website for the NPS Program. This water quality data provided a comparison for effectiveness of forestry BMPs in different types of soils, streams and ecological areas of the state. It also enabled the state to more accurately determine whether recommended BMPs have been effective in reducing NPS pollution in forested watersheds. If the data do indicate that problems still exist even when BMPs have been implemented, more work will be necessary to improve their effectiveness. This type of monitoring is basically BMP effectiveness monitoring and should determine whether in-stream goals are met and water quality has improved.

Future Objectives and Milestones

Future objectives of the program include BMP effectiveness monitoring in a variety of forested watersheds that will validate whether forestry BMPs are or are not effective pollution control methods to reduce sediment, nutrients, and organic material from entering the water body. These objectives will be met through the following tasks:

- Utilize the statewide forestry BMP survey as a tool to track effectiveness of statewide forestry programs to improve the level of BMP compliance in forested watersheds (2011-2016);
- Describe the types of BMPs that have been utilized at these sites that have resulted in water quality improvements (2011-2016);
- Examine water quality data to determine improvements that have resulted from statewide Forestry BMP Programs and report these improvements in the NPS Annual Reports (2011-2016);
- Determine, based on the Integrated Report, whether sites with the highest rate of BMP compliance have met short-term or long-term water quality goals(2011-2016);
- Report on the results of these data to the Forestry BMP and the NPS Interagency Committee (2011-2016);
- If data supports the premise that the Forestry BMPs do improve the water quality sufficiently to meet in-stream standards, then accept that the BMPs are effective and continue statewide educational

programs to encourage increased implementation (2011-2016);

- If the data do not support the premise that the existing forestry BMPs improve the water quality, then work with the Forestry BMP Committee and other forestry experts on improving the BMPs to address NPS pollutants (2011-2016);
- Continue to utilize the 4-year basin cyclic program to track whether water quality is improving as a result of implementation of forestry BMPs (2011-2016);
- If water quality is improving as a result of increased implementation of forestry BMPs, remove the water bodies from the 303(d)list (2011-2016);
- If additional steps are necessary to achieve BMP compliance, partner with federal, state and private agencies/organizations to determine the type of actions necessary to improve water quality and restore designated uses for the water bodies (2011-2016);
- Implement those additional steps, including back-up authorities and continue to evaluate water quality improvement as a result of these actions (2011-2016); and
- Through its 6217 program, the LDNR/OCM will track and report on programs and BMP implementation within the Louisiana coastal zone and will be working to ensure that the two programs are consistent in the type of controls that are being recommended for forestry NPS pollution (2011-2016).

The primary goal of the Forestry Statewide Educational Program is to achieve sufficient compliance of forestry BMPs in each of the watersheds where forestry has been identified as an existing source of NPS pollution. The short and long term goals listed above are expected to result in water quality improvements within the next 7-10 years.

Timeline for Milestones: October 2011-September 2016

Stakeholders

The statewide forestry program relies on members of the state's NPS Interagency Committee with expertise in forest management. Each of these cooperating stakeholders plays an important role in implementing the state's forestry NPS management program. Some of these roles are explained here in this section of the document.

Louisiana Forestry Association

LFA is an organization of forestry industry representatives, private non-industrial landowners, foresters, and loggers. LFA has worked closely with LOF, as well as with LDEQ, in development of forestry BMPs and training sessions to educate the forestry community about their utilization. When CZARA of 1990 was enacted, LFA was a leader in reviewing CZARA Management Measures to determine their consistency with the state's existing BMPs. They formed a working BMP Review Committee to revise the state's BMP manual and to address some of the issues in CZARA. Representatives of LFA met with USEPA and NOAA to discuss issues such as enforceable authorities, the coastal zone management boundary and forestry programs. Their inclusion in the dialogue on these issues has helped to shape the direction and process that will be utilized when implementing NPS programs in both inland and coastal watersheds.

USDA Natural Resource Conservation Service (NRCS)

NRCS has been involved in the statewide forestry NPS program's training sessions, workshops and water quality conferences. Their technical expertise in erosion control methods on forest roads has been an important aspect of these educational activities. More than 2700 people have been trained in these workshops that were held across the state with loggers and landowners to provide technical information on how water bars should be constructed to divert water from forest roads, thereby reducing erosion. Their knowledge of soils and erosion control practices continues to be an important aspect of the statewide educational programs on forest BMPs.

Louisiana Office of Forestry - Department of Agriculture and Forestry (LDAF-LOF)

LOF has the responsibility of forest management across the state and has been an important partner for LDEQ in implementation of forestry BMPs across the state. They were involved in development of the initial forestry BMP manual in 1987, and also in one of the first series of educational workshops on NPS issues that were sponsored by LDEQ. They have been involved in dialogue on how LDEQ monitors and assesses its waters and determines the number of stream miles impacted by forestry activities. They have been involved and been the key player in development of the statewide BMP survey that was initiated in 1991. They worked on development of the script and actual filming of the forestry BMP training video, educational materials and workshops throughout the state.

When CZARA was enacted, LDEQ met with LOF and discussed the forestry management measures to determine areas of the BMP manual that could be strengthened to be more consistent with these measures. LOF has been involved in all of the discussions on CZARA and how it would be implemented in Louisiana. LOF has continued to conduct statewide BMP surveys and work on educational programs to achieve goals that were established in 1991 (90 percent BMP compliance by 2000). They have been instrumental in development of the revised Forestry BMP Manual and have been responsible for many improvements made in forestry management across Louisiana. The revised Forestry BMP Manual was approved by USEPA and NOAA as being consistent with the CZARA Forestry Management Measures.

In 1998, LOF successfully introduced a bill into the state legislature to dedicate a portion of state severance taxes, from timber harvesting across the state, for a reforestation program. These funds have been utilized for a cost-share program for private landowners to replant trees on their lands that had been recently harvested. It works similar to the forestry incentive program, but is funded at the state level.

U.S. Forest Service (USFS)

The U.S. Forest Service has been a member of the state NPS Interagency Committee for over twenty years. They are responsible for management of Kisatchie National Forest in Louisiana and many of the highest quality streams and bayous in the state are on these forest lands. Saline Bayou, the state's only national scenic stream flows through Kisatchie National Forest. LDEQ has partnered with staff at Kisatchie National Forest to implement forestry BMP demonstration projects on SMZs, and a project to evaluate innovative methods for stream bank restoration along Saline Bayou. Kisatchie has hosted educational workshops on their lands for foresters, loggers and landowners that involved stream-sampling techniques for macro-invertebrates and fish. These educational workshops have proven to be successful and popular for participants, and always result in positive feedback and increased understanding of the relationship between forestry management and stream ecology.

LSU School of Forestry Wildlife and Fisheries
LSU School of Forestry, Wildlife and Fisheries have continued to be an important partner in the statewide forestry nonpoint source program. Their team of aquatic biologists has worked with LDEQ on the forestry program since its initial stage of development in 1988-89. They provided all of the water quality, macro-invertebrate, and fish data for the demonstration projects on the effectiveness of a 100-foot SMZ at Kisatchie National Forest in 1990-1994. The combination of presentations, technical assistance programs, and forestry field tours has proven to be an excellent program on forestry water quality issues.

Educational materials that they have written and designed have been disseminated at these workshops to over 2000 members of the forestry community. They constructed a web-site, which provides an overview of the workshops and the information contained in the educational brochure on forestry BMPS, water quality and habitat issues. They have provided technical review of the revised forestry BMP Manual, and have also compiled and analyzed the data and information from the statewide forestry survey. They have also been willing to participate in NPS coalitions on hydromodification, offering technical expertise on the importance of riparian buffers along streams and bayous within Louisiana. As Louisiana develops numerical criteria for nutrients and examines how biological criteria can be factored into water quality assessment, these important partners will continue to play a role in understanding the complex dynamics of the aquatic ecosystem.

Louisiana Department of Environmental Quality (LDEQ)
LDEQ has maintained coordination and leadership roles in all of these activities with partners in education, technical dialogue, and policy decisions involving forestry management as it relates to water quality improvement. These partnerships described have shaped Louisiana's NPS Management Program for forestry. Through many meetings and discussions, every aspect of forestry and water quality management has been evaluated and analyzed in an attempt to determine the direction that this program should take to protect and improve the state's waters. As the state continues to develop and implement TMDLs and focus on watershed implementation, these same partners will assist LDEQ in shaping the program to meet in-stream water quality goals.

Louisiana Department of Natural Resources/Office of Coastal Management (LDNR-OCM)
LDNR/OCM will develop and maintain a database for assimilation and reporting of results of the forestry BMP educational efforts and of water quality monitoring data. The four-year cycle of data will be analyzed with assistance of LDEQ and other responsible agencies. LDNR/OCM will prepare a five-year report for NOAA. LDNR/OCM will identify appropriate coastal use permitting and federal consistency back-up authorities that can be implemented when activities cause nonpoint source pollution impacts to Louisiana coastal waters.

Federal Consistency
The federal consistency portion of the statewide forestry educational program will primarily focus on consistency in the types of BMPs recommended to reduce NPS pollution on forested lands This consistency includes U.S. Forest Service and USDA NRCS with the state's NPS Program. Through this federal/state partnership, Louisiana expects to reach full compliance with BMP implementation of federal lands within the next 10 years.

Program Evaluation

Program evaluation will continue through statewide forestry BMP surveys, BMP effectiveness monitoring and the state's cyclic basin water quality monitoring program. Evaluation always involves several layers of activities, including:

a. The extent that forestry BMPs are implemented across the state (2011-2016;
b. The effectiveness of the BMPs in reducing sediment, nutrients, and organic carbon entering the water body (2011-2016);
c. The degree of water quality improvement that can be measured as a result of increased BMP implementation (2011-2016);
d. The resulting habitat improvement for macro-invertebrate and fish in the water body in response to increased BMP implementation (2011-2016);
e. Increased or sustained species abundance and diversity in the water body, as a result of BMP implementation(2011-2016);
f. Removal of water bodies from the 303(d) list as a result of the statewide forestry NPS program (2011-2016); and
g. Determination of future steps and program changes if these improvements can not be determined or measured (2011-2016).

Forestry Best Management Practices

Section 319(b)(2)(A) of the CWA required the State to identify BMPs and measures which will be undertaken to reduce pollutant loading resulting from each category, subcategory, or particular NPS pollutant designated under paragraph (1)(B) which stated, "where appropriate, particular nonpoint sources, which add significant pollution to each portion of the navigable waters identified, which contribute to such portion not meeting water quality standards or goals and requirements".

The types of pollutants that cause the most significant impacts from silvicultural activities include sediment, organic matter and nutrients. The LFA, LOF and NRCS developed a set of BMPs to address these NPS pollutants from forested lands and BMPs are included in this section of the Forestry NPS Management Program.

Streamside Management Zone (SMZ)

SMZs are sensitive areas adjacent to lakes, continuously flowing streams, and intermittent watercourses where extra precautions are necessary to protect water quality. Zone width is a site specific determination based on soil type, slope, vegetative cover, stream character, and worst case storm flows. SMZs protect streams by maintaining water temperatures and reducing sediment deposition through filtration. The following guidelines are recommended when implementing a SMZ along a stream bank.

1. Establish a zone adequate to protect streambed and stream bank integrity;
2. Generally, the larger the stream, the wider the SMZ; special regulations may apply to legally designated Natural and Scenic Rivers;
3. Do not leave tops of trees in streams or watercourses;
4. Avoid frequent stream crossings and cross only at right angles;
5. When crossing, use culverts, bridges, or fords. Do not leave temporary crossing material in streams; and
6. Locate roads and log decks outside SMZs, where possible.

Permanent Access Roads and their Construction

Access roads create more potential for soil movement than any other forest management activity. Road construction planning is necessary to minimize road grade or slope, number of spur roads and to determine their proper location.

The following guidelines are recommended when installing access roads in forested lands.

1. Construct a road sufficient to carry the anticipated traffic load with reasonable safety and with minimum environmental impact;
2. In addition to a thorough knowledge of the area, utilize soil surveys, topographic maps, and aerial photographs to achieve the most practical road location;
3. If possible, avoid building roads in narrow canyons, marshes, wet meadows, natural drainage channels, and in streamside management zones;
4. Minimize the number of stream crossings;
5. Cross streams at right angles to the main channel, where practical;
6. Where topography permits, locate roads along the crest of long ridges;
7. Where feasible, locate roads on the contour and at a distance sufficient to minimize the impact to streams;
8. Timber on road rights-of-way should be removed or decked outside the borrow ditches;
9. Roads should be designed no wider than necessary to accommodate the anticipated use;
10. When practical, balance cuts and fills and utilize this excavated material in the roadway to avoid creating unnecessary borrow pits;
11. To minimize erosion, cut-and-fill slopes should conform to a conservative design appropriate for the particular soil type and topography;
12. Sidecast or fill material should not be placed at or below the ordinary high water mark of any stream except where necessary at stabilized stream crossings;
13. Seeding or mulching should be performed wherever necessary to prevent excessive erosion;
14. Erosion can best be controlled during construction. To the extent practical, plan and conduct work to minimize the impact from heavy rains;
15. Ditches, culverts, and cross drains should be installed at low points in the road gradient. Wing ditches or laterals should be installed at such frequency, considering road grade and relative soil erodibility, to reduce or prevent erosion in the primary road ditches;
16. When maintaining ditches, consideration should be given to herbicides and/or mowing to treat vegetation rather than exposing the soil with motor-grader or dozer;
17. Cross drains, relief culverts, and wing ditches should not discharge onto erosion prone soils or over erodible fill slopes unless outfall protection is provided;
18. Roads should be designed to drain naturally at all times, by crowning, ditching, installing culverts, and/or outsloping;
19. Diversion or wing ditches should discharge in a manner to minimize erosion;
20. Install culverts at the proper level and use a size adequate to carry anticipated water flow. Keep culverts open and clean to permit unrestricted water flow;
21. When fords or crossings are inadequate for the situation, use bridges, culverts or concrete slabs;
22. Stream crossings should cause minimum disturbance to banks and channels;
23. Temporary crossing structures should be promptly removed;
24. Machine activity in the streambed should be minimized;
25. Low water bridges, fills, and earth embankments constructed for use as bridge approaches should be protected from high water erosion;

26. Waste material and woody debris generated during road construction should be cleared from streams and drainage ways and deposited above the ordinary high watermark;
27. Bridges should not constrict clearly defined stream channels and the bridge approach should be constructed to minimize erosion;
28. When possible, cross streams during periods of dry weather when stream flow is low and the threat of erosion is minimized;
29. Endeavor to keep ditches free of blockages in a timely manner;
30. Where natural vegetation is not sufficient to control erosion, revegetate or stabilize exposed soil;
31. Inspect infrequently used roads to monitor their integrity;
32. Crown or out-slope road surfaces and install waterbars, dips or other diversions to dissipate surface runoff and minimize road-bed erosion; and
33. Restrict traffic during periods of excessive ground moisture if such restriction is practical.

Timber Harvesting

Harvesting is an integral part of forest management. Executed properly, it is only a temporary disturbance to the forest environment. Harvesting operations should be planned and conducted to minimize soil compaction, erosion, and sedimentation. The guidelines that should be utilized when implementing this management practice include:

1. Directionally fell trees away from water bodies and remove any debris that gets into water, streams, or drainage courses. Leave SMZs adequate to protect stream shading and stream bank integrity;
2. Skid trails and landings should take advantage of topography to minimize disturbance to natural drainage patterns;
3. Upon completion of the operation, temporary roads, skid trails, and landings should be conditioned to minimize erosion;
4. Skid away from permanent and intermittent streams;
5. Watercourses and streambeds should not be used for skidding or forwarding even when they are temporarily dry;
6. Skidding across streams should be minimized. When unavoidable, crossings should be at right angles and should take advantage of natural fords with firm bottoms, stable banks, and gentle slopes along approaches;
7. Minimize the number of skid trails and traffic on steep slopes;
8. Service equipment away from streams. Oil drained while servicing equipment should be caught in a container and properly disposed; and
9. All trash generated during the operation, including maintenance or equipment servicing, should be disposed in an acceptable manner.

Reforestation

Reforestation refers to those operations undertaken to establish a new forest. Site preparation, for the purpose of forest regeneration, is a basic silvicultural tool where control of competing vegetation and reduction of logging debris are necessary. Common site preparation techniques include manual, mechanical, fire, and herbicides.

Regeneration includes hand and machine planting and direct seeding. Since hand planting and direct seeding pose no water quality problems, BMPs are not necessary. Some mineral soil exposure does occur with machine planting and BMPs are offered.

1. Sites should receive the minimum preparation necessary to successfully control competing vegetation and establish a desirable timber stand. In general, the more intensive the treatment, the more concern there is for water quality;
2. When working on slopes, mechanical operations such as bedding, ripping, shearing, etc. should follow contours. Drum chopping is an exception;
3. Provide water outlets on bedded areas at locations that will minimize soil movement;
4. Soil topography**,** competing vegetation, precipitation, and drainage considerations should govern methods and equipment;
5. Analyze and plan the site preparation method with full consideration for SMZ protection;
6. All bulldozing, shearing, K-G blading, and windrowing should be accomplished in a manner that will minimize soil disturbance;
7. Use operations that minimize soil disturbance on highly erodible soils;
8. Windrows should follow contours and windrowing operations should be accomplished to minimize soil displacement;
9. Streams should be crossed by equipment only on bridges or fording sites that minimize stream channel disturbance;
10. Landowners should take maximum advantage of prompt reforestation to reduce erosion and sedimentation;
11. As a rule, machine planting should follow contours; and
12. Hand planting, direct seeding or natural regeneration should be used on protected areas adjacent to streams or on slopes too steep to machine plant.

Fire Line Construction

Safe use of prescribed fire is encouraged to reduce fire hazard, control undesirable plant growth, promote reforestation, improve wildlife habitat, and achieve other desirable objectives. The following guidelines should be utilized when implementing fire line construction.

1. Pre-suppression firebreaks should be located on the contour as often as possible; and
2. Firebreaks on erodible steeper grades should contain waterbars or diversions at frequent intervals. Discharge water into undisturbed vegetation outside the burn, when possible.

Forest Chemicals

Chemicals may be used for a number of important functions in forest management, including control of insects, undesirable vegetation, and as repellents for seed. Landowners must observe all state and federal laws and regulations that cover the purchase, transport, storage, use and disposal of chemicals. These rules change constantly and can be very complex. The LCES agent should be contacted for the most recent information and details concerning proper, safe, and legal use of chemicals. Be certain that silvicultural chemicals are applied by trained and certified licensees and that the label instructions are followed.

Individual Home Sewerage Systems Statewide Program

A vast majority of Louisiana's NPS pollution can be attributed to sewage runoff from homes, camps, and businesses that are not connected to municipal sewerage treatment facilities. It is estimated that 440,000 people in Louisiana treat and dispose of their sewage with individual waste disposal systems. Approximately 50 percent of these systems are malfunctioning because of incompatible soil types or lack of maintenance. These failing systems are a major cause for water quality degradation in Louisiana's scenic streams and fresh water aquifers. USEPA estimated 25 percent of the nation's population relies on individual home sewerage systems to treat their waste waters. Decentralized (i.e. individual on-site) wastewater treatment systems are used in approximately one-third of all new housing and commercial developments and are typically found in rural areas. More than half of the nation's 25 million home sewerage systems are found in suburban areas (U.S. Department of Commerce, 1997).

Ground and surface water pollution are major concerns when on-site systems are used. Nationally, states and tribes have reported that the designated uses are not being met for 5,281 water bodies because of pathogens and that 4,773 water bodies are impaired by nutrients (1998 303(d)). Sewage treatment and disposal systems should be designed and operated in a manner which prevents the degradation of ground and surface water quality. Septic tank systems used in undersized lots, or where soils are unsuitable for proper treatment of wastewater, are subject to undesirable conditions such as widespread saturation of the soil and malfunction of the treatment system. Malfunctioning systems result in sewage leaching into ground water and roadside ditches, thereby contaminating surface water.

In Louisiana, a person shall not install, cause to be installed, alter subsequent to installation, or operate an individual sewerage system of any kind without a permit from the State Health Officer at LDHH (Chapter 7 of the State Sanitary Code, 2008). Septic tank systems must be designed so that they are compatible with site geology. If the ground water level is high (less than 2 feet below the surface of the absorption trench) or if the soil below the absorption trench does not consist of 4 feet of clay or other impervious strata, the soil will not be effective in removing pollutants and the ground water could be threatened, resulting in a public health hazard. Many diseases, including infectious hepatitis, typhoid fever and dysentery, are caused by water and food contaminated with sewage.

The septic tank and soil absorption system is the most common individual waste disposal system used in Louisiana. A septic tank discharge should not flow directly into a road, street, gutter, ditch, water body or on the surface of the ground (Louisiana Sanitary Code, 2008). Septic tank systems normally consist of two components: a treatment unit and a disposal unit. The purpose of the septic tank is to condition household wastes so that the discharge will readily percolate into the soil. This conditioning is done in a septic tank by the removal of solids by settling and through decomposition of the soluble organics. The soil then provides additional treatment through the removal of bacteria, organics, and nutrients. A properly designed septic tank consists of a buried, watertight, multiple compartment tank (usually of concrete material) that is equipped with inlet and outlet devices and scum control baffles. The absorption system consists of a trench or bed that measures 1 to 5 feet deep containing 6 inches or more of crushed rock or gravel overlaid by a system of perforated distribution piping. This is covered with an additional layer of rock, which is then covered by a suitable, semi-permeable barrier to prevent backfill from penetrating the rock. Proper construction of these systems is an important component in keeping the system functioning properly. Various other types of on-site treatment facilities available include sand filters, aerobic package treatment plants, disinfection units, nutrient removal systems, and wastewater segregation and recycle systems. Other disposal systems available include evaporation systems, aerobic package treatment plants, irrigation systems, and systems that discharge directly into surface waters.

One of the main problems with using conventional septic tank soil absorption systems in Louisiana is that 87 percent of the soil associations in Louisiana are considered inadequate for conventional septic tank systems as determined from the Soil Limitation Ratings for Sanitary Facilities (LDOTD, 1981). Another problem is inadequate maintenance of these systems. Maintenance of individual sewerage systems is the responsibility of the owner and should be in compliance with the state code to avoid creating or contributing to a nuisance or public health hazard. Septic tanks should be inspected every six years and pumped every eight years by a licensed sewage hauler.

The State Sanitary Code outlines and describes regulations that govern installation, maintenance and permitting of individual sewerage systems. A permit from the state health officer is required for installation or operation of an individual sewerage system. The permit is issued through a 2-stage process, with a temporary permit that authorizes the installation of the individual system. A final permit is issued upon verification that the system has been installed in accordance with the sanitary code. Absorption trenches, oxidation ponds and sand filters are examples of the types of additional treatments that should be utilized with a septic tank. A mechanical waste water treatment plant is also approved for use in Louisiana, but also requires a permit for its installation and discharge. Parish Health Units are good sources of information on these requirements. Title 51: Chapter 7 of the Louisiana Sanitary Code can be accessed at the LDHH's website.

In October 2000, LDHH began to require that all individual systems with a capacity of 1500 gallons per day (GPD) that produce treated effluent be followed by an effluent reduction system constructed as described in Chapter 7, Subpart B of the state's sanitary code.

Define Water Quality/Program Goals

Many of Louisiana's water bodies that are included on the state's 303(d) list of impaired waters are listed because of problems with fecal coliform bacteria. Louisiana has numerical criteria for fecal coliform for waters that are designated for both primary and secondary contact recreation (swimming and boating) and drinking water supply. These criteria are defined as follows:

Primary Contact Recreation	Fecal Coliform Bacteria – 400 cells per 100 mL sample
Secondary Contact Recreation	Fecal Coliform Bacteria – 2000 cells per 100 mL sample
Public Water Supply	Fecal Coliform Bacteria – 2,000 cells per 100 mL sample
Oyster Propagation	Fecal Coliform Bacteria – 14 cells per 100 mL sample

If a water body exceeds these criteria more than 25 percent of the time for contact recreation, or 30 percent of the time for public water supplies, then it is considered impaired and is included on the state's 303(d) list. The 2006 IR has included 108 water bodies that do not fully meet PCR because of failure to meet the water quality standard for fecal coliform bacteria during the swimming season (May 1-October 31). During the non-recreational period of November 1 through April 30, the criteria for SCR apply. The state's 2010 IR has indicated that more than 90 percent of the state's water bodies are now in compliance with PCR and SCR water quality standards. This means that substantial progress has been made in reducing the level of fecal coliform bacteria entering the state's water bodies.

To remove these water bodies from the 303(d) list requires in-stream concentrations of fecal coliform bacteria be reduced to meet water quality standards. One source of fecal coliform bacteria is individual home sewerage systems. Approximately 0.5 million people across the state of Louisiana rely on home sewerage systems for treatment of wastewaters. The problem with these types of systems is often related to the types of soils that they are located in. It has been estimated that over 80 percent of the soils in Louisiana are not really suitable for full treatment of home sewage. Consequently, home sewerage systems are one important source of fecal coliform bacteria in the state's water bodies.

Explain Programmatic Activities to Reach those Goals

Educational Programs

Since maintenance is one of the major issues that needs to be addressed to reduce water quality problems associated with home sewerage systems, one of the most important steps is continued education of the homeowner about how his/her home individual system operates. Many homeowners may not be familiar with how to maintain their home sewerage system for maximum efficiency.

LDEQ and LDHH have partnered in several parishes to utilize Section 319 funds to hire additional inspectors to inspect onsite systems. These partnerships have been effective in reducing NPS problems from home sewerage systems.

LDEQ has partnered with LDHH on statewide educational programs aimed at reducing fecal coliform bacteria from home sewerage systems. An educational brochure and video were produced that focused on the types of home sewerage systems that were approved for use in Louisiana. In that material, each type of system was explained, along with maintenance requirements recommended to keep the system functioning properly. A maintenance checklist was also included so that the homeowner could keep a record of the steps that had been taken to repair or clean the system. The educational video has been reproduced and distributed across the state in parish offices of the LDHH and the LCES. These materials are important components for the statewide educational program on home sewerage systems.

In addition to statewide programs, several parishes have implemented their own education and inspection programs to improve the water quality of their local streams, bayous, lakes, estuaries, etc. St. Tammany Parish partnered with LDEQ through a Section 319 grant to implement the "St. Tammany Parish Home Sewerage Reduction Education Program". Through this program, the public, realtors and electrical service providers all worked together to implement a program where home sewerage inspections would be conducted prior to their electrical service being connected. This would be done for new residences and for all customers requesting a change of service. Educational campaigns were implemented during the project through public service announcements, workshops and printed materials. In 2002, a new ordinance was passed that required sewage inspection prior to electrical service connection. Other parishes have implemented similar types of ordinances that link sewage inspection to electrical services.

Innovative Technologies

An area where the NPS Program can be effective at the statewide level is to continue to investigate and evaluate innovative technologies for home sewerage systems that could effectively be implemented in Louisiana. Many other states also have problems with individual sewerage treatment and may have found better methods to treat this type of wastewater. LDEQ can continue to investigate these options and sponsor demonstration projects to evaluate their effectiveness in reducing nutrients and fecal coliform to waters of the state. One project that LDEQ has partnered on with Gulf of Mexico Program (GOMP), BTNEP and LSU is the marsh up-welling camp system. This technology works by injecting waste from a holding tank at the camp, vertically into the marsh soils. Treatment occurs through natural chemical and biological processes as the waste water moves upward through the porous soil environment. Results indicate the system is over 90 percent effective in removing organic material and fecal coliform bacteria from the waste stream.

In addition to innovative designs for treatment of sanitary waste at camp systems, some states utilize low maintenance UV systems as a means to disinfect individual home sewerage systems. USEPA Region 6 has initiated a regional workshop and monthly conference calls with the five states to share information on innovative technologies and other issues related to home sewerage systems. LDEQ will continue to pursue some of these ideas and partner with LDHH to see what is feasible in Louisiana, as other innovative methods that can be implemented in areas where fecal coliform bacteria cause water quality problems.

Future Objectives and Milestones

Louisiana's NPS Management Program will continue to partner with and support efforts by LDHH on statewide educational programs about home sewerage systems. There is still a lot to be done in this area to raise awareness of the general public about the relationship between home sewerage systems and water quality. Public service announcements, printed materials and videos or CDs are all components of a comprehensive educational program about home sewerage systems.

For the next 4-5 years, LDEQ will be focusing substantial efforts to partner with LDHH and local communities on improving the operation of home sewerage systems. The SWPP has cooperated with the City of Natchitoches on a home sewerage program for Sibley Lake Watershed. A more detailed description of this program is included in the SWPP portion of this document. The NPS Program has provided Section 319 funds to the City of Shreveport for a sewerage inspection and replacement program for Cross Lake. Sibley Lake and Cross Lake are both drinking water sources, which made them priorities for watershed programs. LDEQ will focus on watersheds which have been included on the state's 303(d) list of impaired waters and where designated uses are not being met.

In addition to impaired water bodies, another area of focus will be coastal parishes where a joint venture between LDEQ and LDNR-OCM, using 319 funds, will pursue a cooperative agreement with LPBF. The funds will be utilized for a project along the north shore of Lake Pontchartrain and as an example to other coastal parishes. This Lake Pontchartrain Basin project will assess existing home sewerage systems for functionality, and offer assistance in ways to improve their operation.

Camp and houseboat owners in coastal parishes and across the state are benefiting from the publication entitled, "Camp and Houseboat Sanitation in Louisiana." This useful book is accessible through Louisiana Sea Grant and can be found at parish offices around the state as well as on their web page at http://www.laseagrant.org. This guide for camps is unique to the Louisiana environment and offers guidance on site and design for treatment of low flow sewerage systems, found in most camps and houseboats.

There will also continue to be investigation and evaluation of new methods of home sewerage systems that are more conducive to state soils and climatic conditions. BTNEP has evaluated innovative systems for coastal parishes. Data from innovative technologies will be shared with LDHH for consideration of incorporation in the state's sanitary code.

Section 319 of the CWA required states to include a set of milestones to implement their NPS Management Plans. These milestones relate to tasks and timelines to implement those tasks.

- Continue to partner with LDHH on educational materials that can improve statewide educational programs for home sewerage systems (2011-2016);
- Continue to partner with parishes and LDHH on improving their inspection programs for onsite home sewerage systems (2011-2016);
- Continue to determine if new technologies are more effective in reducing NPS pollutants from home sewerage systems (2011-2016);
- Continue to partner with LDEQ's Clean Water State Revolving Loan Fund (SRF) to determine if these funds can be utilized to support cost-share programs for onsite home sewerage systems (2011-2016);
- Continue to evaluate progress and report on results of statewide educational programs in reducing fecal coliform bacteria in water bodies impaired by NPS pollution from home sewerage systems (2011-2016);
- Partner with LDHH to determine what additional steps may be necessary to make progress in restoring designated uses to water bodies where home sewerage systems contribute to NPS pollutant loads (2011-2016);
- Partner with LDNR/OCM to determine appropriate CUP that should be implemented when home sewerage systems cause NPS impacts to coastal waters (2011-2016); and

- Continue to evaluate progress and report whether these additional steps resulted in restoring water bodies to meet designated uses for PCR and SCR (2011-2016).

The primary goals of the Home Sewerage Statewide Educational Program are to continue to partner with LDHH and parish governments on monitoring inspection programs to ensure proper functionality of home sewerage systems. Implementation of short-term and long-term objectives described above should result in increased levels of compliance across the state. This is expected to result in a 50 percent reduction of fecal coliform problems from home sewerage systems during the next 10-15 years.

Timeline for Milestones: October 2011 – September 2016

Stakeholders

Louisiana Department of Health and Hospitals (LDHH)
LDHH has primary authority for home sewerage systems in Louisiana. LDEQ partners with LDHH to explore additional measures that effectively deal with improperly functioning systems. At the statewide level, educational outreach programs focused on these issues should help people understand how to solve them. LDEQ and LDHH have cooperated on an educational video, brochures and a maintenance checklist to assist homeowners maintain their systems.

The LSU AgCenter
The LSU AgCenter has partnered with LDHH and LDEQ on educational aspects of statewide home sewerage programs. Water quality specialists with LSUAgCenter reviewed the educational brochure and draft video to determine whether material was appropriate for the target audience. They also participated in home sewerage educational committees, held at the parish level, addressing pollution associated with improperly functioning systems.

The Louisiana Department of Environmental Quality (LDEQ)
LDEQ has coordinated and offered financial support (Section 319 funds) for many statewide educational activities directed at reducing water quality problems associated with home sewerage systems. LDEQ has also participated in local parish NPS coalitions and committees, focused on home sewerage issues and water quality. Through these local stakeholders, more targeted areas and specific problems can be identified and addressed through demonstration projects, educational programs and local ordinances.

Louisiana Department of Natural Resources/Office of Coastal Management (LDNR-OCM)
LDNR-OCM will work closely with coastal parish CZM administrators to explore the possibility of implementing aggressive monitoring and education programs, especially for camp owners along bayous, rivers, and lakes.

Federal Consistency
Home sewerage systems are operated in accordance with state laws and parish ordinances, therefore no federal consistency provisions or reviews are planned for this portion of the state's NPS Management Plan.

Program Evaluation
Monitoring installation and maintenance of home sewerage systems is a labor intensive job. The NPS Program has provided resources to Parish Sanitarian Offices and partnered with municipalities in watersheds where home sewerage systems have been identified as contributing to water quality impairment. LDEQ has provided federal funds to expand LDHH's parish staff capabilities for home sewerage

system inspection for two to three years in priority watersheds. These staff have inspected existing home sewerage systems and worked with homeowners to correct problems that were identified. The staff has also assisted in establishing a parish-wide database to record inspections and evaluate progress in correcting problems that were identified. LDEQ will report on the results of these projects through semi-annual and annual reports that are submitted to USEPA.

Section 319 of the CWA required states to provide timelines for evaluating progress in implementing their NPS programs. LDEQ provides USEPA with an annual report summarizing progress made during each federal fiscal year for the program.

- Continue to partner with cities and parishes to implement home sewer inspection programs (short-term);
- Partner with LDHH Parish Health Sanitarians to determine effectiveness of inspections and educational programs to reduce water quality problems from onsite home sewerage systems (short-term);
- Utilize federal funds, when available to assist LDHH parish inspectors in areas of the state where onsite sewerage systems contribute to water quality problems (short term);
- Correlate results of parish-wide sewer inspection programs with in-stream water quality improvement (short and long-term);
- Report results from inspection programs to USEPA on an annual basis (short-term);
- Determine if these projects have been successful and share results with other priority watersheds as an effective mechanism to reduce fecal coliform associated with home sewerage systems (long-term); and
- Partner with LDHH to determine if this program can become established as a statewide program supported through a combination of federal and state funds (long-term).

Timeline for Milestones: October 2011 – September 2016

Types of Home Sewerage Systems Approved for Use in Louisiana

Septic Systems

A septic tank is basically a watertight tank constructed of steel, concrete or other approved materials in which the suspended solids of sewage settle out and are largely changed into liquids or gases by microbial degradation. The remaining residue in the tank is a black semi-liquid sludge that must be removed periodically from the tank. Although relatively few disease organisms are present in the sludge material, precautions should be taken in cleaning and disposal of the tank and sludge material. Cleaning and disposal of sludge material from septic tanks can be provided by commercial services. These services are regulated by a permit system, required by local parish health units in accordance with Title 51 of the State Sanitary Code.

A series of single compartment septic tank systems or a multiple compartment septic tank system has proven to be more effective than the individual septic tank system; however the individual septic tank system is still acceptable. Information on the velocities of flow through the system and the types of tees and baffles required for the inlet and outlet valves are included within the description of septic tank systems. Estimates of capacities and size for a system are also included, with recommendations for the types of materials that should be utilized in their construction. Recommendations are also made for inspection and cleaning of the systems with the optimum time period being every two to five years, although the average period between cleaning was estimated to be between eight and ten years.

Septic Tank Effluent

The effluent of the liquid discharged from a septic tank system is classified as primary treatment, usually being foul and potentially dangerous, often containing disease-causing bacteria. Therefore, discharge of septic tank effluent is not allowed in street gutters, surface ditches, or streams, according to regulations in the Louisiana State Sanitary Code. The method recommended for treatment of septic tank effluent is a soil absorption trench system. If the absorption trench is not possible due to poor soil or drainage conditions, a small oxidation pond or a sand filter bed can also be utilized for secondary treatment of septic tank effluent.

Absorption Trench Fields

The recommended method of treatment for septic tank effluent is an absorption trench or "subsurface irrigation" field, when suitable soil conditions exist. The absorption trench consists of a system of covered, gravel-filled trenches into which the septic tank effluent is applied, allowing for seepage of the liquid into the soil. Within the soil, the microbial populations degrade the organic matter in suspension or in solution to the mineral compounds, similar to the process involved in decomposition of animal waste manure in a plowed field. Three conditions must be met in order for absorption trenches to be a suitable method of secondary treatment:

1. The soil percolation rate should be within the acceptable range, dependant on soil porosity or permeability;
2. The maximum elevation of the ground-water table should be at least two feet below the bottom of the proposed trench; and
3. Clay formations or other impervious strata should be at a depth greater than four feet below the bottom of the trenches.

If these three conditions are not met, then an alternative method of treatment should be utilized (Chapter 7; Section 719). In order for a determination to be made on the suitability of the soil for an absorption trench field, a percolation test should be done. The procedure For conducting this test is given within the sanitary code. The code also describes specifications required for adsorption trenches associated with individual residences. Absorption trenches shall not be located:

1. Beneath driveways, parking or other paved areas;
2. In areas that may be subjected to passage or parking of heavy equipment or vehicles, or storage of materials; and
3. Beneath buildings or other structures.

Oxidation Ponds

An oxidation pond may be utilized in conjunction with the septic tank to treat sewage effluent. The oxidation pond is a shallow pond designed specifically to treat sewage by natural purification processes under the influence of air and sunlight. The stabilization process consists primarily of interactions of bacteria and algae. The bacteria digest and oxidize the constituents of sewage and render it harmless and odor free. Algae utilize carbon dioxide, and other substances resulting from bacterial action, and through photosynthesis produce the oxygen needed to sustain bacteria in the treatment process. During the detention period, the objectionable characteristics of the sewage largely disappear. Specifications for construction of oxidation ponds are given in Chapter 7: Section721 of the State Sanitary Code.

Sand Filter Beds

In a sand filter bed, treatment is accomplished by microbial action, where suspended solids of the septic tank effluent are trapped by filtration. It is important for the sand bed to remain aerobic if degradative processes are to occur, therefore the sand surface needs to remain in contact with the air for as long as possible. This can best be accomplished by no cover being allowed on the sand bed system. However, this is not usually acceptable to the landowner therefore a course gravel cover of not more than six inches in depth is permitted. No other cover is acceptable. Recommendations on the size and construction specifications for the sand filter bed are included in Chapter 7: Section723 of the State Sanitary Code.

Mechanical Waster Water Treatment Plants

In cases where septic tank systems cannot be expected to function properly due to unsuitability of soils (based on results of the percolation tests), a mechanical waste water treatment plant is allowed. Mechanical waste water treatment plants are small plants capable of providing primary and secondary sewage treatment. They are considered aerobic treatment systems that do not require previous treatment in septic tanks. Mechanical treatment plants must strictly comply with National Sanitation Foundation International Standard, NSF 40-1996 for Residential Wastewater Treatment Systems (Class I Systems) as revised, May 1996, and published by NSF International, P.O. Box 130140, Ann Arbor, Michigan 48113-0140 USA; and as approved by the American National Standards Institute, 11 West 42nd Street, New York, New York 10036, as standard ANSI/NSF 40-1996, revised May 28, 1996. Determination of compliance with NSF Standard Number 40 requirements shall be the responsibility and sole authority of the State Health Officer acting through the Office of Public Health (Chapter 7:Section 725).

Pumping Stations

A pumping station is often required when a sand filter bed and/or an oxidation pond is utilized as a means of secondary treatment for a septic tank system, especially in areas with flat terrain. Due to the corrosive nature of septic tank effluent, pumps or pumping stations built especially for these effluents are required. Construction specifications for pumping stations are included in Chapter 7: Section 729 of the State Sanitary Code. These specifications include the dimensions and type of materials that should be used for the culvert pipe, the type of pump, the pump housing and the type of cover that should be used for the pump station, allowing for maintenance of the pump.

Sanitary Pit Privy

When a dwelling is not served by water under pressure, water carriage waste systems, as have been previously covered, cannot be used. In these cases, a pit privy is required for waste disposal. The pit privy system must be located so that it will not pollute domestic, private, or public water supplies. Therefore, such a system must be located down gradient and at least fifty feet away from water wells and water supply lines. Pit privies must also be located at least four feet from any fence, ditch, or building to allow enough room for a proper earth mound. They must be housed as separate units and located at least ten feet from the property line. Specifications for construction and maintenance of an approved privy system are included within a pamphlet entitled, "Louisiana Type Sanitary Pit Privy. This can be obtained through the Division of Environmental Services within the Office of Health Services and Environmental Quality (Chapter 7: Section 727).

Microbial Rock Plant Filter

The microbial rock plant filter is an alternative type of individual waste water treatment system that LDHH has investigated and that Region 6 USEPA supports. Originally designed by Dr. W. C.

Wolverton, a research scientist at the Stennis Space Center, the system was to be used for recycling wastes in a space station on the moon. The technology has been evaluated and implemented during the past 10 years for use in individual and community waste water treatment systems within the United States. Thirty-seven of these systems are presently functioning or are being planned for construction in Louisiana. The design utilizes the concept of synergistic effects of naturally occurring plant and rock microbial populations to reduce biochemical oxygen demand (BOD) in septic tanks and oxidation lagoon effluent. The systems have been shown to reduce BOD from 110-50 mg/L to 10-2 mg/L within 24 to 48 hours. Toxic organic and metals have also been reduced through the use of these systems, with measurable reductions in fecal coliform levels.

The scientific basis for the microbial rock plant system for waste water treatment is the growth of plants and microbial populations living on and around plant root systems and the rock filter. Once the microbial populations are established on the aquatic plant roots and the rocks in the filter, a symbiotic relationship is formed with the higher plants, resulting in increased degradation rates. In addition, the system exacerbates the removal of organic chemicals from the waste water effluent surrounding the plant roots and the rock system. The degraded products of the organic chemicals are absorbed by the plants and utilized along with nitrogen, phosphorus, and other minerals as a food source. Microorganisms also use some or all of the metabolites released through the plant roots as a food. Each ecological system, using the other's waste products, provides for a biogenerative habitat to be sustained for accelerated removal of organic material from waste water. Charges associated with the plant root hairs attract the colloidal particles (such as suspended solids) as opposite charges cause them to adhere to the plants where the solids are removed by the rocks and digested and assimilated by microorganisms. This system increases the density of the microorganisms and accelerates the biological activity. The species of plants recommended for these microbial rock plant systems include:

- Aquatic Plants
    1. Southern bulrush (Scirpus californicus)
    2. Reed (Phragmited communis)
    3. Pickerel weed (Pontederia cordata)
    4. Cattail (Typhas spp.)
    5. Arrowhead (Sagitaris spp.)
    6. Soft Rush (Juncus effusus)
    7. Torpedo grass (Panicum Repens)
    8. Water Iris (Iris pseudacorus)
- Semi-Aquatic Plants
    1. CallaLily(Zantedeschia aethiopical)
    2. Ginger Lily (Hedychium spp.)
    3. Canna Lily (Canna Flaccida)

Resource Extraction Statewide Program

Resource extraction is one of the NPS categories identified by USEPA and states as contributing to degradation of the nation's waters. Resource extraction includes a wide range of land disturbing activities. USEPA's definition includes seven resource extraction activities: surface mining, subsurface mining, placer mining, dredge mining, petroleum activities, mill tailings, and mine tailings. Each of these activities has specific pollutants associated with them, affecting the type of water quality impairment which may occur in the watershed where the mining operation exists. The 1992 Report to Congress on Section 319 identified mining as a high priority land-use category, second only to agriculture in contributing to NPS water quality impairment. The majority of mining activities referenced in this report occurred in a five-state area: Ohio, Pennsylvania, Idaho, Kentucky, and Colorado. Although mining disturbs a small percentage of the land surface in any state, the impacts on waterways can be significant. According to USEPA, more than 13,000 miles of streams and 181,000 acres of lakes and reservoirs in the United States have been affected by pollution related to strip, open pit, and underground mines. Ground and surface waters are polluted by sediment, acid and chemicals leached from surface and underground mines. Louisiana's mining industry ranked 34nd nationally in total non-fuel mineral production, with a value of $618 million (USGS, 2008). Non-fuel mineral production in Louisiana increased by $56 million or 10 percent since 2007 and by $94 million or 29 percent since 2006. Increased values of crushed stone, industrial sand and gravel and salt were responsible for these increased values of non-fuel minerals. Louisiana's combined economic gain (both direct and indirect) from the mining industry was $1.5 billion in 2005.

Construction sand and gravel was Louisiana's second leading non-fuel mineral, surpassed only by salt, which is currently Louisiana's leading non-fuel mineral (USGS, 2008). Mining is unique in many respects, compared to the other NPS categories of land-use activities, because it cannot be classified as a homogeneous source of pollution (Report to Congress, 1984). In forestry, agriculture, and construction NPS pollutants consist primarily of sediment, nutrients, and pesticides; in resource extraction, many minerals are mined, each with their own specific set of chemical and physical properties. Some of the activities associated with mining include discharges from inactive operations, surface runoff from inactive road networks, old tailings and spoil piles. Although active mine sites also pose water quality problems, they are typically considered to be point source discharges, which are regulated under state and federal NPDES permits. In addition, Surface Mining Control and Reclamation Act (SMCRA) of 1977 included requirements for collection of runoff from active mines and treatment of such runoff to meet point source discharge requirements. NPS pollutants associated with mining activities include (Report to Congress, 1984):

1. Runoff of sediment from haul roads at both active and inactive mine sites;
2. Drainage of pollutants including acid, sediment, salts, and metals from inactive mines; and
3. Drainage and leachate containing acid, metals, and sediment from spoil and tailing piles generated by both active and inactive mines.

Louisiana has a limited amount of surface mining of coal. It occurs in northwestern portions of the state and is defined as a point source discharge, which requires a permit. However, Louisiana does have extensive sand and gravel mining and oil and gas operations (petroleum activities), which require a permit for discharge of their wastewaters. Sand and gravel operations have been identified as a source of increased sediment loads in rivers and streams. Lack of restoration at abandoned sand and gravel mining sites causes increased erosion and sediment entering adjacent water bodies.

Although mining in Louisiana does not account for as much land area disturbance as agriculture and forestry, water quality impacts resulting from mining can potentially be more harmful. Sedimentation rates from mining can be extraordinarily high, if BMPs are not utilized in all phases of the mining operation. Erosion and delivery of sediment to surface water is a recurring problem in mining, as is often the case with agriculture and forestry. This is due to the fact that mining operations expose large areas of soil and rock, resulting in increased erosion potential. Erosion and sedimentation is associated with almost every abandoned surface mine, haul roads, and with spoil and tailing piles. Most mineral extraction involves grinding the ore down to 200 to 300 mesh size; thus, mill tailings usually consist of fine dust in the 50 to 75 micron range that can easily be eroded by water and wind processes and transported directly or indirectly into water bodies (USEPA, 1984).

Turbidity and siltation continue to be NPS priorities of concern in rivers, lakes, and estuaries in Louisiana (Report to Congress, 2004). Mining related activities have been estimated to cause seven percent of the nation's NPS impacts to lakes and 17 percent of the impacts to the nation's coastal waters. Sediment from surface mining operations consists primarily of biologically inert materials, which adversely affect the water body's designated uses. Inert suspended sediments have the following detrimental impacts to the aquatic habitat:

1. Sediment smothers lower forms of aquatic life in the bottom of a stream. This can destroy a stream for healthy fish habitat, because it kills the food supply. If sedimentation continues with a high concentration of suspended solids, the stream will fail to recover. Sediment deposition may also cover fish eggs and break the life cycle; thereby destroying fishery uses of a stream;
2. A continued cloudy condition of a stream will deter use of a stream for almost all recreational purposes;
3. Directly or indirectly it can change the characteristics of a stream channel and in many instances can limit boat usage and cause additional flood hazards;
4. In rivers that are used for drinking waters, silt creates an additional expense for water treatment and purification processes for domestic and industrial users; and
5. It decreases photosynthetic action and reduces the capacity of a stream to assimilate organic matter.

LDNR manages the state's Abandoned Mine Land (AML) Program. The purpose of the AML program is to abate hazardous conditions related to past mining. It also works to protect and enhance public health, safety and general welfare from these adverse effects. This is achieved by promoting reclamation of mined areas left in an unreclaimed state prior to enactment of PL 95-87 (the Surface Mining Control and Reclamation Act) on August 3, 1977. The primary emphasis of the AML program is identification and reclamation of abandoned surface coal mines. An inventory conducted in northwest Louisiana identified approximately 49 abandoned lignite sites comprising approximately 646 acres. Of these 49 sites, 40 had been reclaimed naturally, seven had been inundated by Toledo Bend Reservoir, one had been reclaimed through site development, and one was scheduled to be mined through by an active mining operation.

The major problems associated with abandoned mines in Louisiana include hazardous high walls (some of which are very unstable), dangerous bodies of water, used as "swimming holes," and abandoned equipment. The Office of Conservation has proposed future legislation to expand and enhance the abandoned non-coal mine reclamation program

Sand and Gravel Mining

Sand and gravel mining has been identified in the IR as contributing to water quality impairment in several water bodies in the state. Whereas, storm water and waste water permits are required for these types of operations, LDEQ partnered with the Concrete and Aggregate Association on a BMP manual for sand and gravel mining operations. The set of BMPs included in that manual has been provided in this document. LDEQ also partnered with the industry on workshops for sand and gravel miners, assisting them to become more familiar with the BMPs.

Annual production value of sand and gravel in Louisiana for commercial and industrial uses is $92 million. An average 6-room house requires approximately 82 metric tons of aggregate and an average size school requires about 14,000 metric tons of aggregate. One kilometer of 4-lane highway requires nearly 50,000 metric tons of aggregate (Langer and Glanzman, 1993). Almost half of the total aggregate produced in the United States is utilized for government-funded projects. A statewide inventory for sand and gravel mine sites indicated that more than 1,200 abandoned non-coal mines have been identified, ranging in size from a few acres to more than 1,000 acres.

Most of the active sand and gravel mines utilize a wet process and reuse their water. Contamination of streams can occur at times of heavy and/or sustained rain. Occasional violations of turbidity standards may be attributed to these facilities. LDEQ established effluent limitations on discharges from sand and gravel operations, which defined them as point source discharges. Sand and gravel operations should operate as a fairly closed system with no discharge. However, these operations are potential sources of NPS pollution and BMPs should be followed in order to keep NPS runoff to a minimum.

Sand and gravel mining in or adjacent to river and stream channels can initiate channel degradation and erosion. In-stream mining (dredging) alters channel geometry and creates local inflection in the stream gradient. In-stream mining is not allowed in Louisiana, unless a permit is obtained. Point bar mining (removal) increases gradient by effectively straightening the stream. Inappropriately sited flood plain mines may capture the river during flood events, causing relocation and inflection of the thalweg.

Such changes are accompanied by increased water velocity above the mined areas precipitating local channel scouring and erosion. Where mining activities are numerous and concentrated, an upstream progression of channel degradation and erosion occurs that is consistent with the process of head cutting. Mining has been identified as a causative factor in active head cuts on the Amite, Bogue Chitto, and Tangipahoa Rivers in Louisiana. Mining induced channel erosion destroys upstream private and public property, reduces recreational and fish and wildlife values, and has contributed to the extirpation and extinction of stream fauna. Geomorphic theory, as well as published field observations and evidence of the damaging effects of channel and riparian mining in alluvial systems is currently more than adequate to prohibit or severely regulate such practices (Hartfield, P., 1993.).

In-channel or near-channel mining of sand or gravel inevitably alters the sediment budget of an alluvial system, and may substantially alter channel hydraulics. These alterations can have variable effects on aquatic habitat depending on magnitude and frequency of mining disturbance, mining methods, particle-size characteristics of the sediment load, characteristics of riparian vegetation, and magnitude and frequency of hydrologic events following mining disturbance. In addition, temporal and spatial responses of alluvial systems can vary because of thresholds, feedbacks, lags, upstream or downstream transmission disturbances, and physiographic controls. Minimization of the detrimental effects of aggregate mining requires detailed predictive understanding of the complex response and recovery of a channel to mining disturbance. Decisions about how much, how frequently, and where to mine also require definition of a reference state -- a minimally acceptable physical and biological condition of the channel. However, understanding of alluvial systems is rarely sufficient to predict responses quantitatively and confidently, and reference states are difficult to define. Still, a general understanding of fluvial processes can provide some guidelines to minimize detrimental effects of mining. Improved understanding sufficient to evaluate physical, biological, and economic tradeoffs, however, will require well-documented case studies and field experiments (Jacobson, R.B., 1995).

Major off-site impacts from extracting sand and gravel from floodplains or low terraces might occur, if during flooding the stream leaves its channel and creates a new channel through the pit. This may result in downstream erosion and associated impacts. The impacts from pit capture can be avoided by constructing a controlled spillway in a levee along the stream. Fine sediment is one of the major environmental factors in degradation of stream fisheries (Waters, T.F., 1995). Gravel mining on floodplains in Alaska produced severe channel alterations, which were thought to have resulted in elimination or reduction of fish populations (Woodward-Clyde Consultants, 1980).

In general, sand and gravel extraction will have less impact to the river or stream hydrologic processes the higher up in the landscape the extraction site is located. Extracting sand and gravel from floodplains is preferable to extraction from stream channels and extraction from terraces is preferable to extraction from floodplains. Extracting gravel from a water filled excavation located away from an active stream channel should cause little or no change to the natural hydrologic processes of the stream, unless the stream captures the pit during periods of flooding (Langer, W.H. and Glanzman, 1993).

LDEQ establishes effluent limitations on discharges from sand and gravel operations as point source discharges, but BMPs need to be utilized in excavation and restoration of these mining sites. The 2004 IR indicated that water quality management sub-segment 040301, which describes a portion of the Amite River, was not meeting PCR or SCR or Outstanding Natural Resource (ONR) uses. Some of the suspected causes were NPS pollutants, partially caused by mine tailings. These types of activities have altered flow of the stream and contributed sediments and turbidity in the water column.

The Amite River sand and gravel mining areas include parts of East Baton Rouge, St. Helena, Livingston, and East Feliciana parishes. With the exception of East Baton Rouge Parish, the major industries in this region are agriculture, timber, and sand and gravel production. An inventory of sand and gravel mine sites indicated that Amite River Watershed had 66 mine sites, which comprise 13,675 acres. In the past, reclamation has not been a priority of sand and gravel producers of Louisiana. However, through the Concrete and Aggregate Association of Louisiana, the industry has partnered with LDNR's Office of Conservation to implement regulations that include environmental protection and economic feasibility (Final Report of Sand and Gravel Committee, 1992).

NRCS has Standards and Specifications for Land Reconstruction of Mined Land. These specifications include erosion control measures and consideration of toxic materials that should be adhered to during removal, stockpiling, and reconstruction of mined soils to protect the quality of adjacent water bodies.

Define Water Quality/Program Goals

The water quality goal for the statewide educational program on resource extraction is to reduce water quality problems that have been identified in the state's IR. Sand and gravel operations have continued to be reported as a problem in water bodies across the state. The types of pollutants associated with sand and gravel mining are primarily turbidity and TSS. The state's water quality standards indicate that turbidity other than of natural origin shall not cause substantial visual contrast with the natural appearance of waters of the State or impair any designated water uses. Turbidity shall not significantly exceed background levels as defined by the natural condition of the water. Determination of background conditions will be established on a case-by-case basis. As a guideline, maximum turbidity levels, expressed as nephelometric turbidity units (NTU), are established and shall apply for the following named water bodies and major aquatic habitat types of the state:

1. Red, Mermentau, Atchafalaya, Mississippi and Vermilion Rivers and Bayou Teche – 150 NTU;
2. Estuarine lakes, bays, bayous and canals –50 NTU;
3. Amite, Pearl, Ouachita, Sabine, Calcasieu, Tangipahoa, Tickfaw and Tchefuncte rivers –50 NTU;
4. Freshwater lakes, reservoirs, and oxbows – 25 NTU; and
5. Designated scenic streams and outstanding natural resource waters – 25 NTU; unless background levels exceed the levels designated within these clauses.

Explain Programmatic Activities to Reach those Goals

The primary goal of the Resource Extraction Section of Louisiana's NPS Management Program is to coordinate with other state and federal agencies which have authorities, land-use policies or BMPs that relate to resource extraction activities in Louisiana. LDEQ will partner with these agencies to improve the level of BMP implementation in areas of the state where resource extraction caused water quality impairment. The state's NPS Interagency Committee will function as an advisory team, which recommends the types of management measures or corrective actions that need to be implemented to reduce NPS pollutant loading from resource extraction activities. LDNR-OCM's coastal permitting and federal consistency authorities augment LDEQ's water quality permitting authority for resource extraction in Louisiana's coastal zone.

Sand and Gravel Operations

In 1974, a bill was introduced in the Louisiana Legislature to regulate the sand and gravel industry, but it failed. In 1990, a task force was formed to address flooding in the Amite River basin. The Final Report of the Governor's Interagency Task Force on Flood Prevention and Mitigation (1990) recommended that a committee be formed to determine if sand and gravel mining caused flooding in the Amite River

Basin. It was suggested that the committee work with the sand and gravel mining industry to:

1. Maintain an economically healthy and viable sand and gravel industry;
2. Identify ways to conduct mining in a manner that reduces impacts on river systems, the natural and human environment; and
3. Alter preplanning phases of mining operations to provide economic enhancement for mining companies to create recreation opportunities and provide for environmental mitigation.

In March 1991, the Sand and Gravel Committee was formed. It consisted of a cross section of expertise, representing various governmental and regulatory agencies, sand and gravel industries, and interested citizens. The Sand and Gravel Committee met five times during 1991 and 1992. A tour of mined lands was conducted in June 1991, and a final report was submitted to committee members in April 1992. The final report included the following recommendations:

1. Louisiana does not have a regulatory program directed towards reclamation of sand and gravel mines. The State should adopt legislation to establish a non-coal surface mine reclamation law administered by LDNR's Office of Conservation. Regulations should be implemented that are compatible with BMPs for reclamation of current and previously mined sand and gravel or construction fill as defined for Amite River basin. These regulations should be consistent with goals and objectives of the State's NPS Management Program. Federal, state and local agencies should coordinate efforts to assist landowners and operators of sand, gravel, and construction fill pits on development of reclamation plans.
2. The process of obtaining sand and gravel mining permits should be coordinated by the use of a pre-application conference between applicants and representatives of relevant federal, state, and local agencies.
3. A regional land-use plan has not yet been developed for Amite River basin. A basin-wide master land use plan is needed for Amite River basin that includes development and design standards for BMPs for reclamation and/or impact mitigation of currently and previously mined lands.
4. The LDNR's Office of Conservation should coordinate with LDAF, the Governor's Office, USDA-NRCS, and Louisiana congressional delegation to develop a plan of action to implement and fund an active Rural Abandoned Mine Program to reclaim sand and gravel mines in Louisiana.

LDEQ regulates process wastewater, process area storm water, storm water runoff from auxiliary process areas, construction storm water, and treated sanitary wastewater discharges related to extraction, mining or dredging of dirt, sand, gravel, shell and similar materials. A self-implementing general permit (LAG490000) is available for Louisiana Pollutant Discharge Elimination System (LPDES) permit coverage for discharges of process wastewater, process area storm water, storm water runoff from auxiliary process areas, and treated sanitary wastewater from sand and gravel mining sites.

General Permit LAG490000 does not cover commercial dredging of shell or other natural resources in natural water bodies, which are regulated under Section 404 of the CWA. Operators who wish to apply for a permit to commercially dredge shell or other natural resources that are regulated under CWA Section 404 permit processes must submit an individual permit application.

Site activities that include clearing, grubbing, grading, constructing roads, and/or excavation being conducted as part of the exploration and construction phase of a mining operation are activities that require coverage under a separate LPDES permit for storm water discharges from construction activities. Exploration and construction activities that disturb equal to or greater than one acre but less than five acres of land are regulated under LAC 33:IX.2511.B.15 and are covered under LPDES Storm Water General Permit for Small Construction Activities (LAR200000). Exploration and construction activities that disturb five acres of land or more are regulated under LAC 33:IX.2511.B.14.j and are required to obtain permit coverage under LPDES Storm Water General Permit for Construction Activities (LAR100000).

Although the Notice of Intent (NOI) requirements for the two permits are different, they both require that a notice be posted at the construction site, and a storm water pollution prevention plan (SWPPP) be developed and implemented for exploration and construction-related phases, and that LDEQ be notified when construction activities cease and the site has been stabilized as defined in construction permits.

Certain land clearing and/or excavation activities require approval from the State Historic Preservation Officer prior to applying for general permit coverage. Under certain circumstances, authorization under the general permit requires coordination with USFWS prior to applying for permit coverage.

These regulations combined with the BMP Manual for Sand and Gravel mining operations provide protection of in-stream water quality from direct discharge of waste waters and NPS runoff from active sites. The next step for additional water quality protection is state regulations that require restoration of abandoned sites. LDEQ has partnered with LDNR's Office of Conservation on this issue and is currently working with them and Louisiana Nature Conservancy on potential pilot project areas where restoration projects could be implemented. These types of projects could provide a cost-benefit analysis for legislation requiring reclamation for sand and gravel mines in the state.

401 - Water Quality Certification

A Water Quality Certification, issued by LDEQ, is a statement that a proposed activity will not have an unacceptable impact on water quality, and is issued in accordance with Section 401 of the CWA. A Water Quality Certification is not a permit to perform the proposed activity, but is often required in order to obtain a permit from another agency. Most Water Quality Certifications are required to obtain permits from the U.S. Army Corps of Engineers for a permit to discharge dredged or fill material under Section 404 of the CWA, and from LDNR for a Coastal Use Permit under Louisiana's State and Local Coastal Resources Management Act.

Applications for Water Quality Certifications generally do not need to be sent directly to LDEQ. If a Water Quality Certification is required, the permitting agency will send a copy of the permit application to LDEQ. Regulations for issuing Water Quality Certifications can be found at LAC 33:IX.Chapter 15. Public supply wells should be researched through LDNR's Water Well Database located at their website. The website provides specific information such as location coordinates depth, date drilled and other pertinent data.

404 - Permits for Wetlands and Waters of the U.S.

The U.S. Army Corps of Engineers (Corps) regulates sand and gravel operations when they occur in navigable waters and/or other waters of the U.S., including wetlands. The Corps regulates all work and structures in or affecting the course, condition, location, or capacity of navigable waters of the U.S. under Section 10 of the Rivers and Harbors Act of 1899 and by the issuance of activity-specific permits for discharge of dredged or fill material into waters of the U.S. under Section 404 of the CWA. Navigable waters are defined as areas subject to the ebb and flow of the tide, and all waters that are presently used, have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. The lateral limit of jurisdiction under the Rivers and Harbors Act in non-tidal waters is the ordinary high water mark. This is defined as a clear natural line along the shore caused by the death of terrestrial vegetation, erosion, shelving, changes in soil character, presence of litter or debris, or other appropriate means considering the characteristics of the surrounding area. In tidal waters, the lateral limit of jurisdiction under the Rivers and Harbors Act extends from the mean high water line to a point 3 nautical miles seaward of the baseline (which is usually considered the ordinary low tide line).

In addition, the discharge of dredged or fill material into waters of the U.S., including wetlands as delineated using the Corps' 1987 Wetlands Delineation Manual, are regulated under Section 404 of the CWA. Such discharges may vary from the obvious site development fills to discharges associated with mechanized land clearing.

The direct relationship between the sand and gravel industry and its potential impact to various waters of the U.S. necessitates close coordination between operators and the appropriate District Office of the Corps prior to performing any activity that will fill-in waters of the U.S. at a potential site. The Corps' decision on an application will be based upon the least damaging practicable alternative available to the applicant. Operators should be aware that the Corps' evaluation and decision-making process typically takes between 90 and 120 days. The decision will often result in a modified project, from that proposed, in order to lessen environmental impacts associated with the mining operation. In some situations this process could lead to denial of the permit request. Therefore, when evaluating a potential mining site, an operator should consider ways to avoid impacts to jurisdictional waters, including wetlands that have been determined to exist on-site, prior to submitting a Department of the Army permit request.

Future Objectives and Milestones

The future objectives of the NPS Management Program are to address water quality problems associated with resource extraction activities, and focuses primarily on sand and gravel operations. LDEQ partnered with a contractor to complete a statewide assessment on the impact that sand and gravel mining has on state waters. Each of the sites was identified on a set of maps and classified by watersheds for inclusion in WIPs for impaired waters. The statewide assessment relied on aerial photographs and field work to identify where each of the 1200 sand and gravel mines were located and whether there were potential water quality problems associated with them. A ranking index was devised which provided information on whether the mine site was active, abandoned, reclaimed or in need of reclamation.

In order to determine the types of BMPs that could effectively be utilized to restore abandoned sites, LDEQ implemented a demonstration project in the Amite River basin. The site was graded and seeded with grasses after soil amendments were added to restore a portion of the organic material that was lost in the mining process. One form of organic material that was evaluated at the sand and gravel mine project site was pelletized poultry litter. This material was effective, resulting in a healthy stand of grasses grown at the site. These BMPs are recommended as the types of methods that should be taken by the sand and gravel operators to reduce pollution associated with their mining activities.

Section 319 of the CWA requires states to identify a set of activities and milestones that will be implemented to restore waters impaired by NPS pollution. The milestones included here were developed to meet CWA Section 319 requirements:

- Partner with Office of Conservation on utilization of BMPs for all sand and gravel mining sites in Louisiana (2011-2016);
- Continue to identify additional sand and gravel mine sites in the state that affect water quality (2011-2016);
- Continue to restore these sand and gravel mine sites and cooperate with local parishes to implement ordinances to require utilization of sand and gravel BMPs (2011-2016);
- Evaluate effectiveness of restoration projects to determine if turbidity and sediment has been reduced from sand and gravel mining sites (2011-2016);
- Report results of these activities to other agencies, USEPA and the public through LDEQ's website (2011-2016); and
- Transfer results of successful projects to other locations in the state so parishes and the State can take action to require that BMPs be implemented at sand and gravel mining sites (2011-2016).

The primary goal of the Statewide Resource Extraction Program is to improve BMP implementation at sand and gravel mining operations in Louisiana. LDEQ anticipates that the short and long-term goals described in this document may require 5-10 years, respectively. These requirements should result in reductions in sediment loading and turbidity in the state's water bodies and stabilize stream banks and sites at abandoned sand and gravel mines.

Timeline of Milestones: October 2011 – September 2016

Stakeholders

United States Department of Interior - Bureau of Mines

The primary responsibility of Bureau of Mines is to ensure the most efficient use and an adequate supply of all minerals, whether obtained from domestic or foreign sources. The Bureau of Mines performs services such as data gathering and reporting, laboratory services, and assistance in resource conservation and management to LDNR-Office of Conservation, other state and local agencies, and private industries.

Natural Resource Conservation Service (NRCS)

NRCS provides technical assistance to individuals, groups, organizations, cities, towns, parishes and state governments to reduce soil erosion and to protect water resources. NRCS technical staff analyzes problems and recommends solutions to landowners. The technical staff includes soil conservationists, soil scientists, economists, engineers, agronomists, biologists, foresters, plant material specialists, range conservationists, geologists, landscape architects, and resource planning specialists.

Although NRCS primarily partners with farmers, foresters, and landowners; they also provide technical assistance and multi-parish resource conservation and development projects to conserve soil and water resources. NRCS has partnered with Amite Sand and Gravel Task Force in Louisiana to recommend management practices that reduce erosion from abandoned gravel pits and mining operations. They also provide technical assistance on mine reclamation for lignite and open pit mining.

Louisiana Department of Natural Resources-Office of Conservation

The Commissioner of Conservation directs the Office of Conservation. All surface mined minerals are the responsibility of the Office of Conservation. The Office of Conservation has not yet exerted management or regulatory control over all forms of surface mining activities in Louisiana. The Office of Conservation does have one staff member dedicated to identifying where in the state that these abandoned sand and gravel mines are located and is creating a database of those sites. LDEQ has met with Office of Conservation to select sites for potential restoration in watersheds where sand and gravel mining has been identified as contributing to water quality impairment.

Louisiana Department of Natural Resources - Division of Natural Resources and Energy

The primary goal of the Division of Natural Resources and Energy is to assist the Office of Conservation in managing, allocating, and pricing of oil and natural gas. At the present time, the Division of Natural Resources and Energy is concentrating on development of computer programs designed to form a foundation for the State Energy Management Program. There are no provisions at this time to initiate programs designed to manage surface mining activities.

State Mineral Board

The State Mineral Board acts to protect state mineral rights, and to ensure maximum income from minerals on state-owned land and water bottoms including those managed by other state agencies. The State Mineral Board may take legal or administrative action to protect the State's interest in these resources. Presently, the State Mineral Board is active in managing only state owned oil and gas resources.

State Land Office

The State Land Office was created in 1844 in recognition of the need for an official at the state level to be responsible for administration and management of state owned land and water bottoms. The primary responsibility of the State Land Office today is to keep records on all state owned property and resources. The State Land Office is also granting right-of-ways to corporations and individuals, to access public lands. At the present time the Office is not leasing land for surface mining activities.

Louisiana Department of Wildlife and Fisheries (LDWF)

LDWF enforces laws and implements policies enacted for protection, conservation, and replenishment of wildlife and aquatic species in the state. This Department is charged with the responsibility of managing all renewable resources on wildlife management areas, refuges and preserves that it may own or lease. This includes regulatory powers over water quality for those water bodies in its jurisdiction. The LDWF is involved with surface mining for state-owned water bottoms. Materials, which are removed and taxed according to their commercial values include shell, sand, and gravel or fill material.

Louisiana Department of Natural Resources - Office of Coastal Management (LDNR-OCM)

The LDNR-OCM is charged with implementing Louisiana’s Coastal Resources Program under the authority of Louisiana State and Local Coastal Resources Management Act of 1978 (Act 361,La.R.S. 49:213.1). This law seeks to provide, develop, and where feasible, restore or enhance resources of the state's coastal zone. Their intent is to balance protection and utilization of the state’s natural resources. Besides striving to balance conservation and resource uses, the policies of OCM also resolve user conflicts, encourage coastal zone recreation, and determine options for coastal development and conservation. LDNR/OCM incorporates BMPs identified for resource extraction into CUPs and consistency determination review processes.

Louisiana Department of Environmental Quality (LDEQ)

LDEQ has responsibility for permitting point source waste water discharges from mining operations and oil and gas production facilities. LDEQ is also the lead agency for the state's NPS Program, working cooperatively with state and federal agencies through the NPS Interagency Committee. This group of agencies implements educational programs and BMPs in areas targeted as impaired by NPS pollution. LDEQ has a 4-year basin cyclic water quality monitoring network that provides monthly data on chemical and physical parameters of state's water bodies.

Concrete and Aggregate Association

The purpose of the Concrete and Aggregate Association is to provide a forum for sand and gravel pit operators, who work together for the mutual good of the industry. The Concrete and Aggregate Association is usually only active when it is necessary to solve mutual problems. In the past, the Concrete and Aggregate Association has dealt with concerns of the highway department, legislators, and police departments.

Federal Consistency

Although the sand and gravel industry is primarily managed at the state level, the federal consistency clause is applicable to activities involving 404 permitting and wetland protection. LDEQ has partnered with the Corps and will continue to through 404/401 certifications. This partnership allows the State to meet goals and objectives of the NPS Management Program.

Program Evaluation

In order to ensure that short and long-term goals described in this section of the NPS Program are implemented, LDEQ's NPS staff will evaluate progress quarterly and report to USEPA through LDEQ's NPS Annual Report.

Best Management Practices - Sand and Gravel Mining

Soil conservation should be addressed during initial phases of any surface disturbing activity, typically with BMPs. These are physical, structural, or managerial practices designed to prevent or reduce pollutants in discharge waters. Typically BMPs include redirecting storm water to prevent mixing with process water, contamination with chemicals, and containment of spills. These are particularly important in areas of concentrated flow. If BMPs are implemented appropriately, they should minimize or eliminate sediment loads discharged to streams.

Selection of appropriate vegetative and structural controls, housekeeping practices, and post construction/storm water management measures and controls prior to, during and after land disturbing activities, are the types of BMPs that should be implemented at mine sites. It can also be effective to include language in deeds, covenants, leases etc., to require sediment and erosion controls be installed or left in-place after mining is complete. There are basically two types of controls: vegetative and structural.

For more information and a complete list of BMPs, please refer to the Sand and Gravel Mining BMP manual on LDEQ's NPS website:
http://nonpoint.deq.louisiana.gov/wqa/sandandgravel.htm

Construction Statewide Program

Most construction activities in Louisiana include residential and commercial development, as well as, road and highway projects. Since all of these types of activities involve clearing land and moving soils prior to and during construction, the major pollutant that is generated is sediment. Other pollutants that are often associated with construction sites are fuel, oil, paints, glues, pesticides, fertilizers, metals, and sanitary and solid wastes. The presence of these pollutants is dependent on site-specific activities and management practices utilized during and after the construction project. Various factors related to the type of impacts that construction has on the receiving stream include size, type and duration of the project, rainfall intensity and frequency, soil characteristics, topography, distance to the receiving stream and the type of management practices utilized. Proximity to the receiving stream or its tributaries greatly influences the sediment and pollutant load and the type of control measures that are necessary to reduce them.

Typically construction practices involve clearing, grubbing, pest control, rough grading, facility construction, site cleanup, final grading, and establishing permanent ground cover (i.e. trees, shrubs, plants, and grasses). Land development activities are expected to produce the greatest construction related water quality impact, followed by highway and dam/floodway construction. Research over the past three decades has found that erosion rates from construction sites are an order of magnitude higher than those measured on row crop lands and several orders of magnitude higher than erosion rates on well-vegetated lands. Soil loss from new development can range from 20 to 150 tons per year, whereas the national average for cropland is 8 tons per year (NPS News Notes, 2000). Research in Louisiana has indicated that approximately 80-90percent of sediment can be retained on site with simple erosion control devices such as hay bales or silt fences. Therefore, sediment and erosion control ordinances are needed at the local level to ensure that all construction projects have BMPs required for them.

In Louisiana, the Environmental Regulatory Code (ERC) IX Water Quality Regulations: Chapter 33.IX.2341 defines requirements for storm water discharge permits from construction sites of 5 acres or more. On December 1999, USEPA published rules for Phase 2 of Storm Water Regulations in the Federal Register. These new regulations required a storm water permit for all construction of 1 acre or more by March 2003. LDEQ is responsible for implementing the Storm Water Program and for revising state regulations to be consistent with federal regulations. The existing regulations state that all construction activities such as clearing, grading and excavation require this type of storm water permit.

Phase 1 and Phase 2 permits are population-based for urban storm water and size-based for construction sites. Phase I Storm Water Regulations required Shreveport, Baton Rouge, Jefferson and Orleans parishes to address construction in their storm water permits. Phase I also required NPDES permits for all construction sites of 5 acres or more. One of the permit requirements was a SWPPP, which described steps that should be taken by developers or builders to prevent storm water runoff entering the water body. Phase II of storm water regulations included additional cities and parishes in Louisiana and extended NPDES permit requirements for construction to all sites less than 5 acres. These two permit requirements should address sediment and erosion control issues for construction activities during the actual construction phase of the project.

Louisiana does not currently have a statewide Sediment and Erosion Control Law, but Chapter 23 (33:IX.2341) of the ERC does list requirements for construction activities of 5 acres or more. Several parishes in the state either have sediment and erosion control ordinances or are in the process of developing them. St. Tammany Parish and Jefferson Parish have implemented sediment and erosion control programs to require utilization of BMPs for construction activities.

Therefore, all construction activities in Louisiana should comply with Phase 1 and Phase 2 of Storm Water Regulations, administered by USEPA and LDEQ. All cities with a population of 50,000 or greater are required through their storm water permit to revise local ordinances in order to comply with federal and state regulations for construction of one acre or more. NPS pollutants associated with construction activities should be controlled through these permitting processes.

For all construction activities of five acres or more, a Notice of Intent (NOI) is required and should be submitted to LDEQ. Through submittal of this notice, the construction activity will be covered by the general permit and will be required to comply with the following limitations:

- a maximum oil and grease concentration of 15 mg/L; and
- until the disturbed areas have been revegetated, a settable solids concentration of 1.0 mg/L.

Waste or used oil shall not be applied as a dust control measure regardless of the size of the site.

For all construction sites of one acre or more, a general permit is also required but the NOI is not required by LDEQ. For all construction activities in cities that must comply with Phase 1 and 2 of the Storm Water Regulations, a storm water management program is required that includes, at a minimum:

1. an ordinance or other regulatory mechanism to require erosion and sediment controls, as well as standards to ensure compliance to the extent allowable under state or local law;
2. requirements for construction site operators to implement and maintain appropriate erosion and sediment control BMPs to reduce pollutant discharges during the time that the construction is underway;
3. appropriate education and training measures for construction site operators;
4. requirements for construction site operators to control waste such as discarded building materials, concrete truck washout, chemicals, litter, and sanitary waste at the construction site that may cause adverse impacts to water quality;
5. procedures for notification of appropriate building permit applicants of their potential responsibilities for construction site runoff under the permitting program; and
6. procedures for site inspections and enforcement of control measures.

Phase 1 cities regulate construction activities under their jurisdiction, and LDEQ should receive the NOI when appropriate for construction activities, however the municipality has primary authority to inspect and enforce permit requirements as outlined in their storm water program. LDEQ retains oversight of how MS4s regulate construction activities within their boundaries. If they do not fulfill their permit requirements, LDEQ can take enforcement action against both the city and the permittee who violate the permit. Phase II cities had five years from general permit issuance to develop and implement a construction storm water program in their regulated area. The five year grace period ended on December 5, 2007.

Therefore all construction activities in municipalities of Louisiana are regulated through LPDES permits for storm water discharges. Since the municipality is the permittee, they are responsible for implementing storm water programs for construction activities in their jurisdictional boundaries. All construction activities outside the boundaries of municipalities are still required to comply with construction storm water requirements by working directly with LDEQ on permit requirements.

Construction for Roads, Highways and Bridges

A 1997 study conducted by Virginia Water Resources Research Center revealed that sedimentation in streams and rivers from road construction in Northern Virginia reduced aquatic insect and fish communities by up to 85percent and 4 percent, respectively. Other research in the Patuxent River basin found that 3 to 3.5 miles of stream reaches below construction sites were adversely affected by construction-related sediment loading. Phase 2 Storm Water Regulations require operators of construction sites where more than one acre is disturbed to obtain a Storm Water Permit and to implement management practices to minimize pollutant runoff, including erosion. LDOTD made it a policy to apply for this type of permit for all of their road and highway construction projects, regardless of size. LDOTD has a book, Standard Specifications for Roads and Bridges (LADOTD, 2006), which contains provisions for erosion control.

With issuance of Phase II storm water permits in March 2003 and renewal of Phase I permits in October 2004 for LPDES Storm Water General Permits for Construction Activities, LDOTD is striving to control storm water runoff from their construction sites. To facilitate this effort, LDOTD has in part, developed polices for designers such that controlling erosion and sediment on the job site becomes part of the overall design process. The development of guidelines, or plan review procedures, to address storm water runoff and consequential erosion problems is required as part of the state's overall Storm Water Management Program. Consultants and in-house designers alike must now prepare project specific plans for controlling erosion and sediment loss on state projects for which these permits pertain.

Municipalities review construction plans to ensure BMPs have been included. They also have inspectors to conduct site evaluations in early stages of the project. During these site evaluations, they can observe location and nature of existing or potential erosion problems, placement of temporary or permanent controls, and where post-construction controls could be placed. If problems exist, follow-up inspections may be necessary to ensure compliance with permit requirements. LDOTD developed a document, entitled, "Plan Checking and Design Procedures for Erosion and Sediment Control" on LDOTD LPDES permitted projects.

These requirements apply to all federal and state highway projects constructed in the state of Louisiana. LDEQ's NPS Program provided Section 319 funds and partnered with LDOTD and LSU on a highway project to evaluate different types of erosion control materials. This project should result in utilization of more effective BMPs on highway projects. These BMPs should reduce erosion and improve water quality in Louisiana.

Construction from Development and Re-Development

Pollutants associated with construction for residential or commercial developments are localized in nature when compared to large sections of the state that are utilized for agricultural or forestry production. This often makes it difficult to correlate impacts from construction sites to a particular in-stream water quality response. However at the local level, the amount of sediment delivered to the stream or bayou from a large construction site can be significant. Defining short-term and long-term water quality goals for the construction section of the program is primarily tied to reducing the amount of sediment leaving the construction site and potentially entering the water body. Whereas there are other concerns besides sediment at the construction site, sediment is typically the most visible and often the most damaging to macro-invertebrate and fish habitats in a water body. If oil and grease from construction equipment are not managed and contained on-site, it can also be a problem. Solid waste (i.e. Styrofoam cups, trash, etc.) at construction sites can be an indicator of whether housekeeping BMPs have been utilized effectively.

All of these sources of pollution should be included in the storm water management plan required as a condition of the permit for all construction activities of one acre or more. In order to assist cities in meeting these requirements, LDEQ's Business Community Outreach and Incentives Division (BCOID) implemented a training program for cities to utilize with their inspectors to ensure storm water permits were implemented and storm water management plans were followed. LDEQ drafted a handbook on erosion and sediment control techniques similar to those developed for Alabama, Florida and Mississippi. The training allowed each participant to receive a certification for completing the class. Seminars were held in 2007 in Shreveport and Lafayette to provide information and training on storm water permit inspections. These workshops were co-sponsored by the cities, USEPA Region 6, the Homebuilders Association and the International Erosion Control Association. Workshops were held in Monroe and Lake Charles in 2008, followed by a two-day workshop in Baton Rouge in 2009.

There are other water quality issues associated with construction that go beyond soil disturbance during the actual construction phase of building or development projects. The actual location of construction or development activity in the watershed is an important factor in protection of floodplains and watersheds. If construction occurs in wetlands, head-waters or floodplains, it alters hydrology at the sub-watershed scale and potentially for the entire watershed. Examples of this type of hydrologic alteration exist in East Baton Rouge Parish, north shore of Lake Pontchartrain and in northern portions of Bossier Parish. As a larger percentage of land in the floodplain or wetland change from pervious to impervious surfaces (i.e. soil to concrete), water quality declines and flooding increases. Therefore, in addition to site-specific erosion control measures that should be implemented to reduce sediment in runoff waters, consideration should also be given to how new development or re-development affects hydrology at the watershed scale.

As LDEQ continues to assist local communities on watershed planning and management, comprehensive planning should reduce local impacts of construction and development on water quality. More effective tools are being developed and utilized to understand and quantify cumulative effects of construction and development on watershed processes. These planning tools are available online to assist local communities, state and federal agencies with their construction and development projects. When developing areas are outside of municipal boundaries, it becomes parish and state responsibilities to include BMPs in new construction projects. Rural areas often have less restrictions and ordinances to guide developers to include BMPs that address increases in storm water discharges. If developments involve wetlands or are in floodplains, adequate drainage may not have been factored into the project. Therefore additional emphasis has to be placed on planning new development and re-development projects in these watersheds.

Define Water Quality/Program Goals

Short and long-term water quality impacts can result from discharge of construction pollutant loads to adjacent water bodies. Aesthetic and recreational values of the stream may be impaired in the short-term, but more serious long-term effects may also result from sediment or toxic loadings. Sedimentation can reduce light penetration and interfere with photosynthesis, damage and smother aquatic life and reduce the velocity and carrying capacity of streams. Short-term water quality goals are to partner with municipalities and parishes to assist them come into compliance with storm water permit requirements. Long-term water quality goals are to implement watershed planning and management programs in a comprehensive manner throughout the state. Long-term water quality goals are also to reduce impacts that development and construction have on state water bodies and remove as many of these water bodies from the 303(d) list as possible.

Explain Programmatic Activities to Reach those Goals

LDEQ developed an educational brochure, explaining the types of NPS pollutants associated with construction and the respective BMPs to reduce these pollutants from entering receiving streams. These BMPs included both non-structural and structural methods to reduce erosion from the construction site. Research has shown that with proper installation and maintenance, hay bales and silt fences can be effective in reducing sediment concentration by 80-90percent from the construction site. Other BMPs for construction sites include:

a. Establish temporary vegetation with seed;
b. Establish permanent vegetation with seed;
c. Mulching for temporary and permanent seeding;
d. Establishing permanent vegetation with sod;
e. Grassed waterway;
f. Hay bales and/or Silt Fences; and
g. Sediment basin or trap.

These educational brochures have been distributed extensively throughout the state at educational workshops, local NPS stakeholder meetings, conferences and public events such as Earth Day, Hunting and Fishing Day and are also available on LDEQ’s NPS website.

Future Objectives and Milestones

The future objectives that will enable the state to meet its water quality goals of reducing pollutants associated with construction activities are primarily based on three implementation strategies:

a. Phase I and II of the Storm Water Regulations;
b. LDEQ’s ERC;
c. CNPCP;
d. WIPs for water bodies where TMDLs have been developed; and
e. Local city and parish ordinances.

The NPS Program will continue to work throughout the state with municipalities and parishes on educational programs, technical assistance, workshops and other implementation activities to achieve water quality goals. The implementation strategies described here will be utilized by the state to reach water quality goals. Municipalities and parishes required to comply with Phase I and II of storm water regulations are required to develop sediment and erosion control programs. Municipalities and parishes in Louisiana's Coastal Zone Management Area should implement management measures consistent with those in USEPA's Coastal Management Measures Guidance Document. As LDEQ continues to develop or implement WIPs for each water body that has had a TMDL developed for it, concerns with water quality issues caused by construction activities will be addressed whenever they are identified as contributing to water quality problems.

- Continue to partner with, evaluate and report annually on progress made with municipalities, communities and agencies participating in educational programs relating to sediment and erosion control practices and ordinances (2011-2016);
- Continue to partner with LDNR-OCM on implementation of CZARA Management Measures for construction activities in municipalities and parishes in or adjacent to the coastal zone management area (2011-2016);
- Partner with LDOTD on educational programs and demonstration projects that reduce sediment and other NPS pollutants from road and highway projects (i.e. Transportation and Enhancement (TE) projects) (2011-2016);
- Cooperate with other state or federal agencies in erosion and control programs for construction activities (i.e. SWCDs and NRCS) (2011-2016);
- Evaluate progress in these programmatic areas and report annually to USEPA through LDEQ's NPS Annual Report (2011-2016);
- Report water quality improvements or pollutant load reductions to USEPA on an annual basis (2011-2016);
- Evaluate effectiveness of these program strategies in reducing the frequency of sedimentation loads in water bodies (2011-2016);
- Continue to monitor water bodies through the 4-year cyclic basin monitoring program to determine whether these tasks have reduced the level of NPS pollution from urban areas throughout the state (2011-2016); and
- Continue to partner with cities and parishes to implement programs that are effective in reducing and controlling these pollutants (2011-2016).

The primary goals and objectives of the Statewide Program for Construction are to partner with state agencies, local governments and parishes on incorporating sediment and erosion control BMPs into construction activities. LDEQ estimates that within the next 5-7 years, that sediment pollution from construction sites would be reduced by 50-60percent through implementation of Phase 1 and Phase 2 of Storm Water Regulations and the State's NPS Management Program (these estimates are based on results from demonstration projects where silt fences and hay bales were utilized at construction sites in Louisiana).

Timeline for Milestones: October 2011 – September 2016

Stakeholders

Louisiana Department of Environmental Quality (LDEQ)

LDEQ is the agency responsible for administration of Phase I and II storm water regulations. LDEQ is also lead agency for the state's NPS Program and co-lead for CNPCP. The success of these programs requires significant internal coordination on program requirements, and recommendations to municipalities, parishes, and cooperating agencies. LDEQ will continue to partner with the NPS Interagency Committee so that stakeholders will understand how these programs can meet water quality goals of the CWA.

Louisiana Department of Natural Resources/Office of Coastal Management (LDNR-OCM)

LDNR-OCM is co-lead on CNPCP and has partnered with LDEQ on the construction portion of the NPS Management Plan. As the state continues this plan, OCM and LDEQ will coordinate their activities to ensure progress is being made in the construction portion of the NPS program. Communication with local programs on erosion and sediment control programs will be important so they understand what is required of them.

OCM will continue to partner with coastal parish Coastal Zone Management (CZM) administrators to ensure that runoff related issues are addressed at the parish level. OCM plans to hold workshops with parish administrators to encourage utilization of erosion/sediment control ordinances and construction site and pesticide application checklists as components of BMPs.

OCM also plans to partner with parishes and other agencies. LDEQ and LDNR-OCM have utilized Section 319 funds for a cooperative agreement with a contractor to produce two coastal zone specific BMP manuals for Urban Storm Water Runoff and Storm Water Runoff from Roads, Highways and Bridges. Hydromodification is also being addressed as it relates to roads, highways and bridges. These guides are intended for use by permit analysts, residential developers, and government staff who specify BMPs for control of storm water. Training and outreach workshops on the BMP manuals have also been planned through similar cooperative agreements. These training workshops will begin in the western part of Louisiana's coastal zone and serve as a template for workshops in the remainder of the coastal zone.

OCM will partner with coastal parishes and LDOTD to seek funding through Intermodal Surface Transportation Efficiency Act (ISTEA) and/or Transportation Equity Act for the 21st Century (TEA-21) Transportation Enhancement for projects in Louisiana's coastal zone. ISTEA allows the states to use a portion of federal funds for NPS pollution and control devices or other BMPs to prevent storm water runoff from reaching lakes, rivers, and bays.

OCM's CUP Program issues permits for activities that affect coastal waters. OCM will review permitting requirements and incorporate NPS controls into the CUP Program. OCM will evaluate NPS controls and urban runoff computer models that predict the type of storm water controls that should be used in particular areas to determine their suitability for coastal areas.

The Barataria-Terrebonne National Estuary Program (BTNEP)

BTNEP has partnered closely with LDEQ's NPS Program on many of the NPS issues that affect water quality in the BTNEP area. Their staff has participated with LDEQ and South Central Planning Commission in local NPS stakeholder meetings focused on construction, urban storm water, home sewerage, and hydromodification. Their staff has partnered with other programs responsible for managing these types of pollution programs. The LPBF and NE Delta R.C.&D have held watershed exchange programs that allowed staff in these different programs to share ideas and experiences on how to effectively solve these NPS issues.

Louisiana Department of Transportation and Development (LDOTD)
LDOTD has major responsibilities with extensive construction projects throughout the state. LDOTD has standards and specifications for erosion and sediment control. LDOTD has participated in the state's NPS Interagency Committee since its inception in 1989 and also worked with LDEQ and OCM on the construction portion of CNPCP. In 1998, the FHA enacted TEA, which allocated a portion of their federal funds for projects that benefit the environment. LDEQ will continue to partner with LDOTD to leverage a portion of these funds to watersheds where NPS pollutants from roads and highway construction have been identified as contributing to water quality problems. LDOTD has committed to partner with LDEQ on storm water permits for their construction sites, regardless of size; these are major steps toward reducing and controlling sediment pollution from road and highway construction.

Jefferson Parish
Jefferson Parish has been a leader in developing and implementing educational programs and inspection programs to address water quality problems associated with construction activities. Jefferson Parish became subject to requirements for Phase I of NPDES storm water regulations, requiring the parish to implement an inspection program for construction sites of 5 acres or more. The parish, according to parish officials, has developed and implemented a program that has proven to be successful in improving the level of BMP implementation at construction sites.

The Lake Pontchartrain Basin Foundation (LPBF)
LPBF is a non-profit organization that strives to improve water quality in Lake Pontchartrain and its surrounding watershed. Although their program is not a statewide initiative, they sponsor and participate in NPS stakeholder meetings that focus on construction and urban storm water runoff. Their educational programs and demonstration projects have been an important aspect of the state's NPS pollution control efforts. They have focused many of their educational programs on impacts that construction and urban storm water runoff have on the state's water bodies.

St. Tammany Parish
St. Tammany Parish focused on several NPS related initiatives, including construction, urban storm water runoff and home sewerage systems. These NPS problems are contributing to water quality impairment for many bayous and streams on the north shore of Lake Pontchartrain. Their efforts on construction and urban storm water runoff could be useful to several municipalities in that parish adopting sediment and erosion control ordinances. St. Tammany Parish is subject to Phase II NPDES storm water regulations. Portions of the parish are in the area defined as CNPCP Management Area. As a result, the parish is required to implement NPS pollution control measures consistent with federal requirements for that program. Therefore, St. Tammany parish is an area for LDEQ to implement programs to address existing and future water quality impacts from construction activities.

South Central Planning and Development (SCPD)
SCPD is a local entity that assists municipalities and parishes in the south central part of the state. LDEQ has partnered with this organization on implementation of a NPS coalition to address pollution issues that exist in Barataria and Terrebonne basins. This local input allows LDEQ and other participating federal and state agencies to understand the types of educational programs and demonstration projects necessary to facilitate implementation of BMPs in this part of the state. SCPC was one of the first local governments to incorporate porous pavement

in the parking lot for their new building, as a demonstration project. This project was implemented with a NPS grant and SCPD continues to address NPS issues throughout their management area.

Federal Consistency

The only regulatory mechanism available at the state level to ensure federal consistency for all construction activities is the NPDES storm water permit. All federal highway projects have already complied with this requirement and LDEQ partners with municipalities and parishes to assist them comply with these federal regulations. LDEQ has oversight responsibility and full enforcement authority for the NPDES program; therefore, authorities exist to ensure construction BMPs are implemented for sites of one acre or more.

Program Evaluation

Since the NPS Program continues to train and partner with local municipalities and parishes through watershed planning and implementation, their role will primarily be to inform local communities about storm water requirements and offer assistance in meeting these requirements. When this assistance is provided to municipalities or parishes, progress will be reported to USEPA through semi-annual and annual reports. It will also be reported to the NPS Interagency Committee through meetings and to the public through LDEQ's web-site.

Construction Best Management Practices

CWA Section 319 required states to include BMPs for each category of land-use identified as contributing to NPS pollution. These BMPs should reduce sediment and other pollutants at construction sites, if they are installed and maintained.

Nonstructural BMPs

A. Establish Temporary Vegetation With Seed

The purpose of this practice is to establish short-lived vegetation (generally annuals) on areas subject to erosion in order to stabilize the soil and reduce erosion of sediment to adjacent water bodies. This management practice is applicable on graded or cleared areas, which are subject to erosion for a relatively short period of time (one year or less). The species of plants suitable for temporary vegetation include:

- Ryegrass
- Wheat
- Oats
- Rye
- Browntop millet
- Sudangrass

B. Establish Permanent Vegetation With Seed

The purpose of this practice is to establish long-lived grasses and/or legumes (perennial or combination of perennial and reseeding annual species) on areas subject to erosion, in order to stabilize the soil and reduce erosion of sediment to adjacent water bodies. This management practice is applicable on graded or cleared areas, which are subject to erosion and where a permanent, long-lived vegetative cover is needed. The species of plants suitable for permanent vegetation include:

- Common Bermuda grass
- Pensacola Bahia grass
- St. Augustine
- Centipede grass
- Carpet grass
- Tall fescue

C. Mulching For Temporary and Permanent Seeding

The purpose of this practice is to apply mulch, plant residues or other suitable materials not produced on the site to the soil surface, in order to conserve moisture, prevent surface compaction or crusting, reduce runoff and erosion, and to establish desired plant cover. This practice is applicable on soils with slopes of 3 percent or greater and/or slow infiltration rates. The types of materials that are suitable for mulching include:

- Wood Waste and Shredded Residues
- Upholster's Burlap
- Wood Cellulose Fiber (Hydromulching)
  Straw or Hay
- Commercial Mulch

D. Establishing Permanent Vegetation With Sod

The purpose of this practice is to establish long-term stands of vegetation using grass sod to stabilize the soil and reduce damage from sediment loss and erosion.

Structural BMPs

A. Armor Plating

The purpose of this practice is to utilize rock riprap or cellular concrete blocks to protect the soil surface from erosive forces. The practice is applicable to soil-water interfaces where soil conditions, water turbulence and velocity, expected vegetative cover and ground water conditions are conducive to erosion due to flow conditions. Examples include storm drain outlets, channel banks and /or bottoms, roadside ditches, drop structures and shorelines.

B. Concrete Block Retaining Wall
The purpose of this practice is to provide lateral support of an embankment with a temporary vertical wall built of concrete blocks in order to prevent earth slides. This practice is applicable to sites where vertical earth banks or unstable slopes are left after excavation occurs.

C. Dikes
The purpose of a dike is to provide a temporary earthen ridge for interception and/or diversion of storm water runoff from upland areas and direct it from an exposed slope to an acceptable outlet. There are several types of dikes designed for specific purposes. They include diversion dikes, interceptor dikes, and perimeter dikes. They are applicable to disturbed areas where prevention of erosion or transport of sediment-laden water to a sediment trap is desired.

D. Earthen Diversions
The purpose of an earthen diversion is to provide a drainageway for diversion of water from low lying areas, steep slopes, construction sites, buildings and residences, or active gullies. They reduce the slope lengths and reduce the velocity of water to non-erosive rates of flow.

E. Grade Stabilization Structure (Chute)
The purpose of this practice is to provide a temporary channel, lined with bituminous concrete, portland cement concrete, cellular block mattresses, and riprap comparable non-erodible material for conveyance of surface runoff down steep slopes. This practice is applicable to an area where concentrated flow of surface runoff needs to be conveyed down a slope to prevent erosion.

F. Grassed Waterway
The purpose of this practice is to provide a natural or constructed waterway or outlet with suitable vegetation established to convey surface runoff from the development area without damage from erosion or flooding. This practice is applicable to sites where added capacity or vegetative protection or a combination of both are required to control erosion resulting from concentrated runoff.

G. Hay Bale Dike
The purpose of this practice is to provide a temporary barrier, constructed with hay bales that will intercept and detain small amounts of sediment from unprotected areas of limited extent. The bales are installed across the toe of the slope and provide protection for a period of approximately 3 months or less.

H. Surface Roughening
The purpose of this practice is to scarify slopes to provide less erosive surfaces that reduce water velocity and increase infiltration rates. Rough slope sites hold water, seed, and mulch better than smooth slopes. Grooves created by construction equipment should run horizontally across the slope.

I. Level Spreader
The purpose of this practice is to convert a concentrated flow of sediment-free runoff, through diversion outlets constructed at zero percent, into sheet flow and to outlet it onto areas stabilized by existing vegetation without causing erosion.

J. <u>Pipe Slope Drain</u>
The purpose of the pipe slope drain is to convey surface runoff safely down slopes, through a flexible tube or rigid pipe, without causing erosion. This is applicable to areas where the conveyance of a concentrated flow of surface runoff needs to be conveyed down a slope to prevent erosion.

K. <u>Sediment Basin</u>
A sediment basin is a temporary dam constructed across a drainageway to intercept and retain sediment and other waterborne debris. It provides a temporary means of detaining sediment-laden runoff long enough for the majority of sediment to settle out. Special consideration needs to be given on depth of water table when this practice is used in order to ensure that infiltration of pollutants does not contaminate ground water aquifers.

L. <u>Sediment Trap</u>
A sediment trap is a small temporary ponding area formed by constructing an earthen embankment to intercept sediment-laden runoff from a small disturbed area long enough to trap and retain it to settle out. This practice should be installed at points of discharge from disturbed areas for a maximum period of 18 months. Special consideration needs to be given on depth of the water table with this practice to ensure that infiltration of pollutants does not contaminate ground water aquifers.

M. <u>Silt Fence</u>
A silt fence is a temporary barrier made of burlap or polypropylene material which is water permeable but will trap waterborne sediment from unprotected areas of limited extent. The silt fence is used during the construction period near the perimeter of a disturbed area to intercept sediment while allowing water to percolate. It should remain in place until the disturbed area is permanently stabilized. It should not be used where there is a concentration of water in a channel or other drainageway.

N. <u>Stabilized Construction Entrance</u>
The purpose of the stabilized construction entrance is to reduce or eliminate the flow of sediment onto public rights-of-way. It is constructed of crushed stone and is located at the entrance or the exit of a construction site, public right-of-way, street, alley, sidewalk, or parking area.

O. <u>Swales</u>
A swale is an excavated drainageway that is constructed adjacent to or across a construction site to intercept or divert storm runoff within the site or to prevent offsite runoff from entering the construction site. The purpose of the swale is to prevent erosion or to transport sediment-laden water to a sediment trapping device. The swale is a temporary structure that should remain in place until the disturbed area is permanently stabilized.

P. <u>Topsoiling</u>
The purpose of topsoiling is to spread fertile topsoil over a disturbed area in order to provide a suitable soil medium that is favorable for vegetative growth. This practice increases the success of establishing adequate vegetation for reduction of erosion. The practice is applicable in areas where texture and quality of the exposed soil material are not adequate for plant establishment, or where the soil is extremely acidic or contains materials toxic to plant growth.

In most situations, a combination of structural and nonstructural BMPs should be utilized in highway and land development projects for reductions of NPS pollutant loading. In highway projects, diversion and filter structures, mulches and temporary seeding will be an additional cost with estimates of a $1000 an acre. These costs may seem high, but are far less than expenditures for restoration on the site when damage is done to the water body by increased sediment loads. In the case of private land development, the cost of BMP installation is normally borne by the developer and transferred to the landowner. However, the benefits of management practice installation to the landowner may prove to balance or offset the costs by adding amenities to their property, which may increase its value.

Urban Runoff Statewide Program

Past concerns with urban storm water runoff in Louisiana have primarily dealt with prevention of localized flooding. Since average annual rainfall in much of the state exceeds 50 inches per year, it makes sense for people to be concerned about increasing quantities of storm water runoff discharged from our cities. As development occurs and impervious surface area increases, flooding will increase if storm water BMPs are not incorporated into new and re-developed areas.

During the past 30 years, urban storm water runoff has been identified as a significant contributor to degradation of water quality. Since water quality problems are not always immediately obvious and are less dramatic than floods, they are often not as high of a priority for urban communities. There has been extensive research on the extent of degradation of receiving streams from urban storm water runoff. In some cases, storm water runoff can produce greater pollutant loads than traditional point source discharges.

Water quality monitoring studies in urban areas have shown that highest pollutant loads usually occur during initial runoff of rain, commonly referred to as the "first flush." In urbanized areas, impervious surfaces such as streets, parking lots, and rooftops are a dominant part of the landscape. These surfaces allow little or no detention or infiltration of storm water. Pollutants accumulate on impervious surfaces during dry periods and are generally transported to the water body during the first inch of rainfall of a moderate to heavy storm. Urban NPS pollution is the result of precipitation moving across the surfaces of urbanized areas. As precipitation falls in urban areas, it picks up contaminants from streets and sidewalks, petroleum residues from automobiles, exhaust products, heavy metals and tar residuals from the roads; fertilization, weed and insect control and sediment from construction sites. Disposal of chemicals such as used motor oil and antifreeze into storm sewers is another source of urban NPS pollution. Illegal connections of storm drains to sanitary sewers can result in increased volumes of flow to waste water treatment plants causing more frequent overflows of sewage to receiving waters.

In land development, pervious surfaces such as vegetated areas and open forests are typically converted to impervious surfaces, resulting in increased runoff volumes and pollutant loads. While urbanization may enhance the use of property under a wide range of environmental conditions (USEPA, 1977), urbanization typically results in changes to physical, chemical, and biological characteristics of the watershed. Vegetative cover is stripped from the land and cut-and-fill activities that enhance development potential of the land often occur. For example, natural depressions that temporarily pond water are graded to a uniform slope, which result in increasing the volume of runoff during a storm event (Schueler, 1987). As population density increases, there is a corresponding increase in pollutant loading generated from human activities. These pollutants typically enter surface waters via runoff without undergoing treatment. USEPA has published a guidance document on urban and sub-urban management measures which stress the importance of green infrastructure and low impact development as methods to reduce NPS pollutants and changes to hydrology in urban streams.

Changes in Hydrology

Urbanization has a profound impact on water quality and hydrologic characteristics of watersheds. In undeveloped natural drainage areas, volume and rate of storm water runoff from a particular rainfall event is primarily determined by natural detention and infiltration characteristics of the land. It is also related to topography, soil type and vegetative cover. In urbanizing areas, increases in impervious surfaces become the dominant factor. With less detention and infiltration, runoff rates and volumes increase. Flooding and stream channel degradation in urbanizing watersheds has adverse impacts upon the public, safety and aesthetics. However, there are also significant adverse impacts on water quality. When streams overflow their banks, there is more opportunity for pollutants, including trash and debris, to enter the water. Erosion of the stream channel can result in a significant source of sediment pollution. Additionally, and loss of vegetation along the stream bank reduces pollutant assimilative capacity of the stream.

As urbanization occurs, changes to natural hydrology of an area are inevitable. Hydrologic and hydraulic changes occur in response to site clearing, grading, and the addition of impervious surfaces and maintained landscapes (Schueler, 1987). Most problematic are greatly increased runoff volumes and ensuing erosion and sediment loads to surface waters that accompany these altered landscapes. Uncontrolled construction site sediment loads have been reported to be on the order of 35 to 45 tons per acre per year (Novotny and Chesters, 1981; Wolman and Schick, 1967; Yorke and Herb, 1976, 1978). Loading from undisturbed woodlands are typically less than 1 ton per year (Leopold, 1968).

Hydrological changes to the watershed are magnified after construction has been completed. Impervious surfaces, such as rooftops, roads, parking lots, and sidewalks decrease infiltrative capacity of the ground and result in increased volumes of runoff. Elevated flows also necessitate construction of runoff conveyances or modification of existing drainage systems to avoid erosion of stream banks and steep slopes. Changes in stream hydrology resulting from urbanization include the following (Schueler, 1987):

- Increased peak discharges compared to predevelopment levels (Leopold, 1968; Anderson, 1970);
- Increased volume of urban runoff produced by each storm in comparison to predevelopment conditions;
- Decreased time needed for runoff to reach the stream (Leopold, 1968), particularly if extensive drainage improvements are made;
- Increased frequency and severity of flooding;
- Reduced stream flow during prolonged periods of dry weather due to reduced level of infiltration in the watershed; and
- Greater runoff velocity during storms due to combined effects of higher peak discharges, rapid time of concentration, and smoother hydraulic surfaces that occur as a result of development.

The effects of urban runoff on water quality of the receiving stream are extremely complex. There are many highly variable factors involved, including: the type, size, and hydrological characteristics of receiving waters; urban runoff quality and quantity; designated beneficial uses of receiving waters; behavioral characteristics and concentration levels of specific pollutants that affect those uses. The concept today is to reduce storm water impacts in urban areas by maintaining pre-development hydrology for all new development and re-development projects. This is currently a requirement for all federal projects of 5000 sq. ft or greater. Whereas storm water detention ponds were once considered as the solution to the problem, recommendations now include infiltration, evaporation or harvest of water for reuse on site. By using low impact development practices to mimic natural hydrology, a larger percentage of pollutants are retained onsite rather than moving down the watershed where they can impact the stream, lake or estuary.

Water Quality Changes

Urban development also causes an increase in pollutants. Pollutants that occur in urban areas vary widely, from common organic material to highly toxic metals. Some pollutants, such as insecticides, road salts, and fertilizers are applied in the urban environment. Other pollutants, including contaminants from automobile exhaust and oil drippings from trucks and cars are the indirect result of urban activities (USEPA, 1977).

Many researchers have linked urbanization to degradation of urban waterways (e.g., Klein, 1985, Livingston and McCarron, 1992, Schueler, 1987). The major pollutants found in runoff from urban areas include sediment, nutrients, oxygen-demanding substances, road salts, heavy metals, petroleum hydrocarbons, pathogenic bacteria, and viruses. Livingston and McCarron (1992) concluded that urban runoff was the major source of pollutant loading to Florida's lakes and streams. In Louisiana, storm water runoff from cities contributes to degradation of water bodies, typically through increased loads of bacteria, nutrients, sediment, metals and BOD. The increased flows during high rainfall events also erode downstream channels which affect habitat and diversity of aquatic organisms. Stream banks become unstable and riparian vegetation begins to slough off into the stream. These impacts can be attenuated through use of green infrastructure techniques such as green streets, green roofs, bioretention, porous parking lots, rain gardens and rain barrels, which can be incorporated into the development.

Sediment

Suspended sediment constitutes the largest mass of pollutant loads to surface waters. Sediment has both short and long-term impacts on surface waters. Among the immediate adverse impacts of high concentrations of sediment are increased turbidity, reduced light penetration and decreased submerged aquatic vegetation (SAV) (Chesapeake Implementation Committee, 1988), reduced prey capture for sight-feeding predators, impaired respiration of fish and aquatic invertebrates, reduced fecundity, and impairment of commercial and recreational fishing resources. Heavy sediment deposition in low-velocity surface waters may result in smothered benthic communities/reef systems (CRS, 1991), increased sedimentation of waterways, changes in composition of bottom substrate and degradation of aesthetic value. Additional chronic effects may occur where sediments rich in organic matter or clay are present. These enriched depositional sediments may present continued risk to aquatic and benthic life, especially where sediments are disturbed and resuspended. In Louisiana, rivers and bayous are typically low-flow sluggish systems. Therefore, when additional sediment is added, they add to sediment oxygen demand (SOD) stored on the bottom of the stream channel. As temperatures increase during summer months, the water body is not able to maintain a sufficient amount of DO to meet water quality criteria. These same sediments clog urban drainage systems, creating more problems with flooding and increased costs for maintenance of urban drainages. Therefore storm water BMPs should always be designed to retain as much sediment as possible onsite.

Nutrients

Problems resulting from elevated levels of phosphorus and nitrogen are well documented and were discussed in detail in the chapter on agriculture. Excessive nutrient loading to aquatic ecosystems can result in eutrophication and depressed DO levels due to elevated algae populations. Eutrophication-induced hypoxia and anoxia have resulted in fish kills and widespread destruction of benthic habitats (Harper and

Gullient, 1989). Surface algae scum, water discoloration, and release of toxins from sediment may also occur. Species composition and size structure for primary producers may be altered by increased nutrient levels (Hecky and Kilham, 1988; GESAMP, 1989; Thingstad and Sakshaug, 1990).

Occurrences of eutrophication have been frequent in several coastal embayments along the northeast coast (Narragansett and Barnegat Bays), the Gulf Coast (Louisiana and Texas), and the West Coast (California and Washington) (NOAA, 1991). High nitrate concentrations have also been implicated in blooms of nuisance algae in Newport Bay, California (NRC, 1990b). Nutrient loading in Louisiana coastal waters have decreased productivity, increased hypoxic events, and decreased fisheries yields (NOAA, 1991). Both inland and coastal waters in Louisiana suffer from low oxygen concentration during summer months. Most of Louisiana's water bodies are naturally high in nutrients and organic material so any additions to the water body most often result in water quality impairments.

Oxygen-Demanding Substances

Appropriate levels of DO are critical to maintaining water quality and aquatic life. Decomposition of organic matter by microorganisms may deplete DO levels and result in impairment of the water body. Data have shown that urban runoff with high concentrations of decaying organic matter can severely depress DO levels after storm events (USEPA, 1983). The NURP study found that oxygen-demanding substances could be present in urban runoff at concentrations similar to secondary treatment discharges. Many of Louisiana's water bodies are high in organic material from natural sources. Therefore, the addition of organic material from urban areas compounds the problems that exist with trying to meet numerical criteria for DO.

Pathogens

Urban runoff typically contains elevated levels of pathogenic organisms. The presence of pathogens in runoff may result in water body impairments such as closed beaches, contaminated drinking water sources, and shellfish bed closings. Pathogens from onsite disposal systems (OSDS) have been implicated in a number of shellfish bed closings. Pathogens from pets, sewer overflows, natural sources and community treatment systems all contribute to total bacteria loads entering water bodies in Louisiana. Many water bodies that drain urban areas are impaired and do not meet contact recreational uses for swimming.

Hydrocarbons

Petroleum hydrocarbons are derived from oil products, and are primarily found in urban runoff as a result of automobile and truck engines that drip oil. Many do-it-yourself auto mechanics dump used oil directly into storm drains (Klein, 1985). Concentrations of petroleum-based hydrocarbons are often high enough to cause mortalities in aquatic organisms.

Oil and grease contain a wide variety of hydrocarbon compounds. Some polynuclear aromatic hydrocarbons (PAHs) are known to be toxic to aquatic life at low concentrations. Hydrocarbons have a high affinity for sediment. They collect in bottom sediments where they may persist for long periods of time and result in adverse impacts on benthic communities. Lakes and estuaries are especially prone to this phenomenon. Since rivers and bayous in Louisiana are typically low-flow systems, sediment tends to drop out and settle on the bottom of streambeds where attached hydrocarbons degrade through natural oxygen-demanding processes, thereby contributing to DO impairments.

Heavy Metals

Heavy metals are typically found in urban runoff. For example, Klein (1985) reported on a study in Chesapeake Bay that designated urban runoff as the source for 6 percent of cadmium, 1 percent of chromium, 1 percent copper, 19 percent of lead, and 2 percent of zinc.

Heavy metals are of concern because of toxic effects on aquatic life and potential for ground-water contamination. Copper, lead, and zinc are most prevalent NPS pollutants found in urban runoff. High metal concentrations may bioaccumulate in fish and shellfish and impact beneficial uses of affected water bodies.

Toxics

Many different toxic compounds (priority pollutants) have been associated urban runoff. NURP studies (USEPA, 1983) indicated that at least 10 percent of urban runoff samples contained toxic pollutants.

Urban NPS pollution has severely impacted many water bodies receiving runoff from major cities of Louisiana. Urban NPS pollution is not limited only to large communities. Rural areas with small communities also contribute urban NPS pollution to water bodies. In water bodies identified in the state's IR as not fully supporting their designated uses, urban NPS pollution contributed to 9.2 percent of major impacted rivers, 7.2 percent of moderately impacted rivers, 7.5 percent of moderately impacted lakes, and 10.3 percent of moderately impacted estuaries.

Define Water Quality/Program Goals

Water quality goals for urban areas of the state are virtually the same as for other types of land-uses, but are often more difficult to reach. Long-range water quality goals for urban streams are to restore designated uses for fishing and swimming. In many urban areas across Louisiana, there are urban streams of sufficient quality to support aquatic organisms; however, fewer would meet criteria for swimming. In some urban streams, it may be a more difficult to restore designated uses for swimming than for fishing. Often urban lakes do not meet these criteria because fecal coliform standards for primary or SCR are not met. University and City Park Lakes in Baton Rouge and Lake Pontchartrain in New Orleans are two examples of this problem. LPBF has made significant progress toward restoring the swimming use on the south shore of the lake. LSU is working through a multi-agency group to restore water quality of City Park and University Lakes.

In review of water quality data and information in the state's 2008 IR, urban water bodies were typically included on the 303(d) list because of low DO or high levels of fecal coliform bacteria. The types of pollutants associated with low DO concentrations were sediment, nutrients, and organic enrichment. These pollutants come from construction sites, lawns and golf courses, and industrial parks. Fecal coliform bacteria are typically associated with birds, pets, and home or municipal sewerage systems. Oil, grease and metals also continue to be included in the array of pollutants associated with urban communities. Oil and grease comes from streets and parking lots, and also from people who change oil in the family automobile and dispose of used oil down the storm drain. Metals come from many sources in urban environments, including industrial processes, tires and metal flashing on roofs and chimneys.

Many cities across the Unites States and around the globe are choosing green infrastructure as one solution to their urban storm water problems. Green infrastructure combines the concepts of filtration and infiltration with high density developments so people can utilize more open space for parks, walkways and greener streets. There is a wealth of information on-line about green infrastructure and smart growth with ideas such as green roofs, rain gardens, bioswales, constructed wetlands and green parking lots. LDEQ has been supportive of these designs and partnered with local landscape architects to produce several reports and products for local parishes and cities to utilize for revising codes and ordinances. The Center for Planning Excellence (CPEX) and Louisiana Recovery Authority (LRA) have partnered to bring smart growth planning principles to small communities, cities and parishes in Louisiana. As city planners and urban developers become more comfortable with these types of designs, people will enjoy benefits of using their urban streams for recreation and wildlife rather than only for flood control.

Urban Nonpoint Source Program Objectives

Attaining long-term water quality goals of restoring designated uses for urban streams and lakes requires identification and control of NPS pollutants. These pollutants include nutrients and pesticides from residential areas and golf courses, sediment from construction sites, fecal coliform bacteria from pets and onsite sewerage systems, and oil and grease from parking lots and streets. Nutrient and pesticide BMPs can be implemented in residential areas and at golf courses, sediment control measures can be installed at construction sites and oil and grease from parking lots and streets can be controlled with infiltration trenches, grassed swales or wetlands and biofilters. Storm drain stenciling or marking programs are another way to educate the public about protecting urban streams from storm water runoff. Implementation of urban BMPs and education programs on proper disposal of oil and antifreeze should reduce NPS pollutants in urban streams.

LDEQ's Storm Water and NPS Programs coordinate activities for on-the-ground BMPs and educational activities in urban areas. Program coordination includes:

1. For cities required to comply with Phase 1 and Phase 2 storm water regulations, NPS staff provide information on the types of BMPs that can be implemented to reduce and control urban pollutants from entering receiving streams. Information on protection of riparian habitats along urban drainages is also provided to urban communities. Drainage is a major concern in most cities in Louisiana, but if on-site BMPs are utilized effectively to reduce sediment and other pollutants in storm water runoff, urban streams can convey storm waters more efficiently. LDEQ has partnered with hydrologists and landscape architects on urban BMPs and ordinances that can be implemented in urban areas.
2. For cities not required to comply with storm water regulations, LDEQ provides educational materials on urban NPS pollutants and BMPs that can be implemented to reduce these pollutants. LDEQ's Urban Landscape Code handbook can be provided to cities and parishes as a guide to alter existing codes for inclusion of urban storm water BMPs.

Examples of ordinances from cities required to comply with storm water regulations can be provided to smaller urban communities and parishes to assist them in reducing urban NPS pollution.

Storm Water Regulations

Louisiana's water quality regulations require post-construction storm water to be managed for new development and re-development. The regulations include the following language:

You must develop, implement and enforce a program to address storm water runoff from new development and redevelopment projects that disturb greater than or equal to one acre, including projects less than one acre that are part of a larger common plan of development or sale, that discharge to a small MS4, as defined in Louisiana's ERC Title 33, Part IX. Subpart2,§2511.B.16. Your program must ensure that controls are in place that would prevent or minimize water quality impacts.

You must:

1. Develop and implement strategies that include a combination of structural and/or non-structural BMPs appropriate for your community;
2. Use an ordinance or other regulatory mechanism to address post-construction runoff for new development and redevelopment projects to the extent allowable under state, tribal, or local law; and
3. Ensure adequate long-term operation and maintenance of BMPs.

To comply with these regulations, cities need to incorporate language into their unified development codes to require BMPs be incorporated in site plans for parking lots, residential and commercial developments. LDEQ partnered with a contractor on developing a guide to assist city planners and developers on incorporation of NPS BMPs into existing landscape codes. BMPs need to be factored into early planning stages of projects to ensure steps are taken to reduce urban NPS loads entering receiving streams. LDEQ partnered with East Baton Rouge Parish Planning Commission on revising their Unified Development Codes (UDC) to include BMPs for new and existing developments. These revisions relate to construction and design stages of commercial and residential development projects. These changes to the UDC can be a model for other urban communities in Louisiana to effectively manage and control storm water pollutants from urban areas.

Education Programs and Urban BMPs

Educational materials and final reports from urban BMP Demonstration Projects could be beneficial to cities as they implement storm water and NPS programs. LDEQ has implemented projects to reduce nutrients, pesticides and sediment from golf courses, residential areas and urban stream networks. All of this information could be compiled in an Urban BMP manual for stakeholders in urban communities. Garden clubs, homeowners' associations, developers, lawn maintenance services and homeowners all need to be aware of their role in reducing and controlling the amount of sediment, pesticides and nutrients delivered to urban streams. The storm drain marking program is an effective project for scouts, students, volunteers and environmental organizations to promote in urban areas. These types of projects combined with urban educational materials can be provided to local schools in watersheds to involve them in implementing urban NPS projects in their communities. In addition to educating the general public, drainage boards, police juries, Departments of Public Works and Planning Commissions need to be included in training workshops on general and specific information on urban NPS pollution and BMPs. OCM-LDNR also developed a set of manuals and training for coastal parishes to address these concerns in coastal areas. These products can be provided to parishes and cities where these issues need to be addressed. Louisiana's Municipal Association, Urban Forestry Programs and landscape architects are important audiences for these materials. This provides for communication with cities and the development community on how urban BMPs can be incorporated urban projects.

Explain Programmatic Activities to reach those Goals

Addressing urban NPS on a statewide level can be challenging since there is not one federal or state agency that has authority over all urban areas. However there are many activities that can be implemented to address urban NPS pollution on a statewide scale. These activities include:

a. storm drain marking programs can be disseminated to local communities;
b. urban NPS educational materials can be distributed through parish and city offices across the state;
c. an urban educational video that highlights pollution problems and controls can be implemented to reduce these pollutants;
d. an urban educational program developed and implemented through statewide organizations such as LSU AgCenter, OSWC, LDNR/OCM, NRCS, RC&D, Urban Forestry Council, Municipal Associations, etc.
e. state rules and regulations that require compliance with Phase 1 and Phase 2 of NPDES Storm Water Regulations; and
f. local ordinances that require implementation of urban BMPs.

Within the next 5 years, LDEQ will continue to disseminate educational materials and videos to cities in Louisiana and partner with them to implement goals and objectives of the NPS Management Plan within 5-7 years.

Future Objectives and Milestones

Future objectives and milestones for the statewide urban NPS program are to continue partnerships with city officials, engineers, planners, developers, and the general public on NPS educational programs. These educational programs rely on existing materials but will also include new information, successfully utilized in other states and cities. The GOMP has developed educational websites on environmental friendly lawns and USEPA's website includes information on green infrastructure. In addition to providing educational materials, LDEQ will continue to partner with state and local governments to implement ordinances and policies to reduce NPS pollution entering water bodies.

LDEQ is hosting a series of workshops across the state to assist cities comply with Phase II storm water regulations. Model ordinances and handbooks on green infrastructure and landscape codes can also be provided to them. In coastal communities, LDEQ and LDNR-OCM will partner to ensure recommendations for control of urban NPS pollution are consistent with CZARA management measures. Existing federal, state, and local authorities will be utilized to achieve implementation of urban management measures and BMPs in the state's NPS Management Plan. Milestones to achieve goals and objectives for the statewide urban NPS Program include:

- Continue to distribute educational materials in urban areas of the state identified as contributing to NPS water quality problems (2011-2016);
- Continue to develop and utilize new educational materials, tools and videos proven to be effective in other cities (2011-2016);
- Continue existing partners and expand the program to include new partners to be involved in statewide urban educational activities (2011-2016);
- Continue to partner with city planners, engineers, developers and builders on innovative designs that incorporate urban forests, wetland detention, grassed swales and other environmentally sensitive practices

to reduce urban pollutants from entering water bodies (2011-2016);

- Continue to partner with parish drainage boards, NRCS and Corps of Engineers on stream bank protection or restoration(2011-2016);
- Continue to build a network of federal, state, and local partner to more effectively address urban NPS issues (2011-2016);
- Continue to evaluate effectiveness of these efforts through in-stream monitoring of urban streams and lakes (2011-2016);
- Continue to partner with local governments ordinances to achieve full compliance with Phase I and II storm water regulations and goals and objectives of the state's NPS Management Program (2011-2016);
- Report on results of these efforts to USEPA, agencies and stakeholders through reports, newsletters, and Internet (2011-2016);
- Continue to monitor water bodies through the 4-year basin cyclic monitoring program to determine if urban BMPs have been effective in improving water quality (2011-2016);
- Partner with local governments to fine-tune their programs to meet existing and new water quality requirements (2011-2016); and
- Restore water quality in watersheds impaired because of urban NPS pollutants (2011-2016).

Milestones of Activities: October 2011 - September 2016

Primary goals and objectives of the Urban Statewide Educational Program are to incorporate urban educational programs into on-going activities of local governments across Louisiana. These educational programs should encourage development of local ordinances to include urban BMPs necessary to reduce NPS pollutants and water quality impairment in the State. Through short and long-term goals described in this document, LDEQ anticipates water quality improvements within the next 5-7 years.

Stakeholders

Louisiana Department of Natural Resources/Office of Coastal Management (LDNR-OCM)

The LDNR-OCM has partnered with LDEQ on NPS programs for coastal communities across Louisiana. LDNR-OCM has developed educational brochures, displays and slide presentations on urban NPS management measures. They have utilized these materials in workshops, meetings, conferences, and NPS coalitions in many coastal areas in south Louisiana. As the CNPCP was developed, they partnered closely with local communities, LDEQ, USEPA and NOAA on how coastal programs are structured and their CUP utilized to implement urban BMPs.

LDNR-OCM developed a storm water BMP manual for permit analysts, residential developers and parish governments. Training and outreach workshops have also been planned to assist them comply with CNPCP requirements. This training and outreach will begin in western parishes of Louisiana's coastal zone and serve as a template to move across the coastal zone to the east.

The OCM's CUP Program issues permits for activities that directly and significantly affect coastal waters. OCM will review the permitting process for inclusion of NPS controls in the CUP Program, and will assist parish Local Coastal

Programs in developing and incorporating NPS controls into coastal management programs.

Louisiana Department of Environmental Quality (LDEQ)

LDEQ will continue to partner with interested stakeholders that can assist them in meeting programmatic and water quality goals. This coordination includes accepting proposals from federal, state, local, private stakeholders or individuals to design and/or implement an urban educational activity, such as a watershed project, an educational tool or outreach program. LDEQ will also exercise oversight and management responsibilities for projects funded with Section 319 funds. LDEQ will also evaluate progress and report to USEPA and other participants on the state's NPS Management Program. LDEQ will evaluate each project to ensure programmatic and water quality goals have been met.

LSU AgCenter

The LSU AgCenter has continued to partner with LDEQ on NPS educational programs in urban areas, including lawn care education programs and teacher training programs on water quality issues. They have participated in urban NPS coalition meetings in several areas in the state and were also involved in discussion and dialogue of how educational components of CNPCP could be implemented. Their involvement in pollution prevention and other programs has assisted the state in obtaining conditional approval on the state's CNPCP. As the state obtains full approval of that program and moves formally into the implementation phase, LSU AgCenter will be involved in many of its educational components.

Resource Conservation and Development Councils (R.C.&D)

The RC&D Councils have partnered with LDEQ on watershed implementation in many parts of the state. The state's first Basin Coordinator was hired there to provide local coordination of watershed education and implementation activities in Tensas River watershed. This partnership with RC&D has been invaluable to successful implementation of watershed restoration projects. The Acadian RC &D is a partner with LDEQ, and has been the local entity for implementing watershed protection programs in Vermilion-Teche River basin. Many activities implemented in watershed protection programs prioritize urban NPS pollutants. The management strategies implemented in these project areas form the basis for how LDEQ will implement coastal NPS management measures for urban communities. This partnership with RC&D has been an essential component to locally-led program implementation.

Federal Consistency

Federal consistency related to the urban portion of the NPS program is primarily linked to either the NPDES permit for storm water or the 404 permit for dredge and fill activities in wetlands. Two regulatory mechanisms to ensure consistency in these two areas are:

- Oversight of compliance with requirements of NPDES permits for storm water from construction sites and communities and parishes included under authority of Phase 1 and Phase II permits; and
- Use of 401 certification as a tool to ensure consistency with the state's NPS Management Program.

In addition to these regulatory tools, the Corps of Engineers is represented on the state's NPS Interagency Committee and has signed a MOU to partner with the state on coordination of programs and projects at the watershed level. Through continued dialogue and cooperation on projects and programs, environmentally sensitive methods of protecting and restoring stream banks and channelized streams can be developed and implemented.

Program Evaluation

To evaluate progress, it is important to track implementation of goals and objectives outlined in this document. LDEQ reports on progress made in all areas of the NPS Management Program. This is accomplished through meetings, conferences, reports and also on LDEQ's web-site. Progress is reported on goals and milestones outlined in the NPS Management Plan to USEPA Region 6 on an annual basis. Semi-annual reports highlight project activities and progress made in specific areas of the program.

As the watershed program continues to evolve, program evaluation may be focused more at the watershed level. LDEQ has always reported on progress made at the watershed level, but expanded this process in the NPS Annual Report to USEPA. These reports are made available on LDEQ's web-site and continue to improve the project tracking capabilities. As more agencies at the federal, state and local level utilized the internet to track their programs, the information becomes more readily available and accessible to other agencies and the public. LDEQ will continue to work with the Corps, NRCS and SWCDs to evaluate progress made in implementation of BMPs and management measures for urban projects. LDEQ will continue to report on this progress to USEPA, the NPS Interagency Committee and the public through annual reports and the internet.

Section 319 of the CWA requires states to identify BMPs that reduce and control NPS pollutants from each category and sub-category of land-use identified as contributing to NPS water quality impairment in the state. The types of BMPs included here are widely utilized throughout the country and are considered standard NPS pollution reduction measures to control urban NPS pollution.

Urban Best Management Practices

BMPs for Storm water Treatment

1. Wet ponds
   Storm water runoff is directed into an artificially constructed or enhanced natural pond, where a permanent pool of water is maintained. During a storm event, the pool volume is increased until the capacity is exceeded. When this occurs, excess runoff is discharged through an outlet or emergency spillway. Wet ponds can remove suspended solids, total phosphorus, total nitrogen, and trace metals.
2. Infiltration practices
   Examples of infiltration BMPs include infiltration basins, trenches, leaching facilities, dry wells and leaching catch basins. These practices should be used in conjunction with a system of BMPs for their effectiveness. Infiltration BMPs can remove suspended solids, trace metals, total nitrogen, total phosphorus, BOD, and bacteria.
3. Vegetated practices (filter strips, grassed swales, basin landscaping)
   Vegetative practices are used primarily to reduce the velocity of storm water runoff in an attempt to promote infiltration and settling of suspended solids and to prevent erosion. Used alone, these BMPs usually cannot treat storm water sufficiently; therefore, they are generally part of a system containing other BMPs, where they act to remove suspended solids from runoff before more intensive treatment. Vegetative BMPs remove suspended solids, organic material, nutrients and trace metals.
4. Constructed Wetlands
   These systems can treat storm water runoff effectively because they combine pollutant removal capabilities of

structural storm water controls with flood attenuation provided by natural wetlands. These systems can remove suspended solids, nutrients, oil and grease, bacteria and trace metals.

5. Riparian Reforestation
   Reforestation/revegetation along urban stream corridors can be included as a practice in conjunction with BMP installations. These practices need to be incorporated in many urban areas as natural filters for urban NPS pollutants. They also provide recreation space in urban settings and contribute to stream restoration. The concept of incorporating vegetative areas into project designs and utilizing existing areas to establish small riparian forests or buffer strips is one of the most effective and inexpensive source controls that add aesthetic qualities and wildlife habitat in addition to its usefulness as a pollution control measure.

Runoff Collection - Distribution

1. Sheet Flow
   Usually requires only grading and seeding during construction.
2. Grass Swales
   Grassed low areas graded at a minimum of 4:1 side slopes. These are shallow grass covered channels, rather than a buried storm drain that is used to convey storm water. Grass channels are mostly applicable in residential areas. They require shallow slopes and soils that drain well. Often grass swales are used to provide "pretreatment" of runoff to other controls, particularly infiltration devices.
3. Filter Strips
   Similar in concept to grass swales, but are designed to distribute runoff across the entire width and result in overland sheet flow. These strips should have relatively small slopes, adequate length, and should be planted with erosion resistant plant species. They are often used as pretreatment for other BMPs, for example, by being placed in the flow path between a parking lot and an infiltration trench.
4. Oil and Grease Filtering Catch Basins and Oil and Grease Separators
   Structures designed to collect and distribute runoff from parking areas and other areas with high vehicular use. They rely on the principle that oil floats on water, and most of them remove petroleum products through a specially designed "T" outlet. Separators are maintenance-intense devices: oil and grease must be removed periodically or these substances will become resuspended or re-emulsified and side charged through the "T" outlet during subsequent storms. Traps can also be flooded during particularly intense storms, allowing separated oil to flow freely. Coalescing plate oil separators work well under certain conditions, but they are expensive to install and maintain. Still they represent a promising technology for specific areas where petroleum products are routinely released to ground surface.
5. Raised Catch Basins
   Catch basins constructed so that the top lip of the catch basin is raised 1 to 2 inches above the surrounding swale or surface elevation.
6. Dual Compartment Catch Basins
   Similar to other catch basin designs except that these contain multi-compartments.
7. Dry Wells-Seepage Pits
   Cavities dug into the ground and filled with gravel or rocks. These work on the principle of returning storm water

directly to groundwater. One nationwide study found these infiltration devices to be effective when accompanied by sound design and maintenance, although they have the potential for contaminating groundwater if storm water they collect and conduct is contaminated. Since clogging is a problem, infiltration devices can only be used in areas where soil is very permeable. (This BMP would be considered a Class B injection well if the well diameter is less than the depth, and may be subject to conditions of Class 5 regulations, currently in draft form).

8. Detention Ponds
("dry ponds") a water impoundment made by constructing a dam or embankment or by excavating a pit to detain storm water and discharge it at controlled volumes. Detention basins hold back a portion of runoff, delaying release to receiving waters and preventing flooding. The settling out of contaminants from runoff that occurs during detention improves water quality. Extended detention ponds use modified outlet structures to release water at a slower rate, greatly enhancing their ability to control sediment. The effectiveness of either type of detention pond is reduced, if maintenance is neglected. Common problems include blocked outlets, accelerated sedimentation, and standing water in "dry" areas. The Metropolitan Washington D.C. Council of Governments has estimated the cost of detention basin maintenance at approximately $300-500 per maintained acre per year.
   a. Extended Detention Ponds
   These basins employ an outlet structure that will cause most storm water to pond in the basin. Following a storm, these basins drain in about 24 to 40 hours and will be dry at all other times. The outlet structures may be either perforated risers or subsurface drains. They provide a practical technique for retrofitting dry ponds to obtain water quality benefits, and can provide particulate removal efficiency equivalent to that of wet ponds.

9. Retention Pond
("wet ponds") a water impoundment made by constructing a dam or embankment or by excavating a pit to retain storm water and discharge a controlled volume. These are similar to detention basins but are designed to retain a portion of the runoff, "saving" this water for later recharge of streams or allowing it to evaporate during dry seasons. As ponded runoff infiltrates into the ground, pollutants may be filtered out or adsorbed onto soil particles. Routine maintenance costs are also similar to those of detention basins, although USEPA has found that the cost of constructing these controls may be as much as 40 percent higher than the cost of detention basins. Removal efficiency depends on size of the basin and area draining into it. Efficiency may be enhanced by use of a device upstream of the basin that intercepts first flush of sediment and other pollutants during a storm.

10. Basin landscaping
Basin landscaping can be addressed during early development of a watershed and can have a significant effect on the control of NPS pollutants. The objectives of basin landscaping include but are not limited to minimization of impervious surface areas; protection and utilization of existing wetlands; provision for green-

belt buffers along stream banks; routing of runoff flow through vegetated areas and away from erosion-prone steep slopes. Careful selection of vegetation most suitable for site conditions has an important bearing on physical appearance and long-term performance of basin landscaping.

11. Parking Lot Storage
    Use impervious parking areas as temporary impoundments during rainstorms. Parking lot drainage systems can be designed to temporarily detain storm water in special designated areas and release it at a controlled rate. The objective is to protect downstream areas from increased flooding, stream channel degradation and/or combined sewer overflows caused by urban development. It is important to minimize potential safety hazards and inconvenience to motorists and pedestrians.
12. Parking Lot Planting Areas
    Areas within a parking lot which are set-aside for plants and shrubbery.
13. Building Setback
    Building other structures associated with development projects should be set back from marshes or other waterfront locations.
14. Conventional Flow Regulators
    Mechanical devices in storm water conveyance and storage facilities which provide control of volumes, velocities, direction of fluid flows in order to maximize operating efficiencies of these systems (static regulators, semi-automatic dynamic regulators, and automatic dynamic regulators).
15. Rain Barrels
    Storage barrels or cisterns designed to harvest and store rainwater as it runs off of the roof. The water can be utilized for irrigation and watering plants during dry periods and attached to the gutter to capture a large portion of water from the roof.
16. Green Roofs
    Vegetated roofs capture and store water before it runs off the roof; this practice combined with rain barrels can be an effective method for reducing the amount of storm water runoff from buildings when it rains.
17. Rain Gardens
    Slight depressions planted with wetland or water loving plants that can absorb storm water and nutrients onsite and prevent pollutants from entering storm drains and urban streams.
18. Green Streets
    Streets with filtration/infiltration areas where soil and vegetation provide space and time for assimilation of storm water from yards, sidewalks and streets prior to entering storm drains.
19. Paving Material
    Minimize impervious surfaces - many surfaces can be made pervious or modified to reduce impacts of flooding during rainy weather. Reducing impervious surfaces lowers surface water runoff, thereby reducing pollution.
20. Pervious Asphalt Paving
    Pervious asphalt allows water to infiltrate into sub-surface soils. This may be expensive and require maintenance to prevent clogging and loss of effectiveness.
21. Paving Blocks
    Supports automobile traffic but leaves unpaved areas to allow for water infiltration.

22. Other Pavement Surfaces
    (coquina, gravel oyster shell) surfaces suitable for use in lightly traveled areas.
23. Structural BMPs
    (i.e. retention basins) usually attempt to deal with storm water problems at their source through artificially constructed systems. They are often used when vegetation alone will not provide necessary degree of protection, or when flows concentrate in a specific area. Examples also include green streets, rain gardens, rain barrels, porous pavements, biofiltration trenches and wetland systems.
24. Nonstructural BMPs
    (i.e. grass swales) take into consideration site factors and use features of natural drainage systems, vegetative controls, and modifications of everyday land-use practices to achieve similar ends. They may prove ineffective as remedial measures, but are best incorporated into designs of future storm water management systems.

Hydromodification Statewide Education Program

Hydrologic modifications are defined as activities, designed to affect natural stream flow. These types of modifications include bank stabilization, channel alignments, high-flow cutoff devices, in-stream construction, dredging, locks and dams, levees, spillways, and impoundments. Dredging, channel modification and impoundments alter physical characteristics of water bodies, often causing NPS problems. Currently, all of these types of activities are routinely conducted in Louisiana, primarily for navigation and flood protection in coastal areas. In 2002, the National Water Quality Inventory Report ranked hydromodification second, only to agriculture, as a cause of water quality impairment in streams, rivers and lakes.

By definition, stream alteration changes the physical shape and characteristics of the water body. This in and of itself affects chemical, physical and biological properties of the water body. By widening, narrowing, deepening, straightening or filling a water body, natural geometry and transport mechanisms for sediment and water are altered. These changes affect the streambed, stream bank and natural flow regimes of the water body. The streambed may become more erosive or more depositional, depending on slope of the new channel. Both of these changes alter energy dynamics of the water, often resulting in stream bed and bank erosion. These types of stream alterations are made on small channels in urban and rural areas to increase drainage efficiency. Similar types of alterations are made on large water bodies, especially in coastal areas, to accommodate transportation of goods and services to inland communities and industries.

In addition to stream alterations made by dredging, water bodies are also altered by levees, pumps and weirs. Levees and pumps have been a part of Louisiana's history since the 1700's when New Orleans was first established. The Mississippi River was leveed to protect the city of New Orleans from spring floods. Canals were dug and pumps were installed to drain the city when it flooded. Most of south Louisiana has been hydrologically altered to allow habitation in areas other than natural ridges of bayous and rivers that flow to the Gulf of Mexico. These types of hydromodification were made to protect life and property during high flow events. Conversely, weirs and impoundments were often placed in water bodies to retain water for irrigation during low flow seasons of the year. It is not unusual for water bodies in Louisiana to have low to no flow during summer and fall months and to experience reverse flow in tidally influenced coastal areas. The most extreme example of hydromodification in Louisiana has been the system of levees that constrain almost the entire length of the Mississippi River. These levees were built following the 1927 flood to protect life and property. Restricting the river within levees has resulted in extensive loss of Louisiana's coastal wetlands, averaging more than 24 square miles each year.

Hydromodification not only affects streams and bayous but also wetlands, when canals were dug for oil and gas exploration, navigation and flood control. These canals have greatly contributed to the rate and extent of coastal wetland loss in Louisiana, through erosion and salt water intrusion. From 1932-2005, Louisiana lost more than 2200 square miles of coastal wetlands and an additional 217 square miles were lost during Hurricanes Rita and Katrina. Wetland alterations can be small, affecting only an acre or two for

residential development or a road, or they can be large, affecting the state's coastal resources.
Louisiana has a no net loss wetland policy implemented through collaboration of federal, state and local agencies.

Section 404 of Federal Water Pollution Control Act (FWPCA) established a permit program, administered by Secretary of the Army, acting through Chief of Engineers, to regulate discharge of dredged materials and those pollutants that comprise fill material into waters of the United States. Section 404(c) gives Administrator of USEPA further authority, subject to certain procedures, to restrict or prohibit discharge of any dredged or fill material that may cause an unacceptable adverse effect on municipal water supplies, shellfish beds, and fisheries (including spawning and breeding areas), wildlife, or recreational areas.

At present, routine dredging by U.S. Army Corps of Engineers is performed at a number of sites along Louisiana's Gulf Coast. This dredging is often conducted during periods of relatively low river flow, usually during summer months. A number of factors, most notably number and duration of periods of high flow and intended use of dredged waterways determines dredging frequency. As an example, dredging in lower Atchafalaya is generally performed once every ten years. The Lake Charles Harbor and Terminal District performs maintenance dredging in lower Calcasieu Basin about once every five years. However, some dredging is performed on a relatively continuous basis.

Dredging typically increases turbidity in the water body by disturbing bottom sediments, which accumulated over an extended period of time. Dredging causes resuspension, redissolution, or leaching of these materials. The concern is that toxic substances or heavy metals may be reintroduced through the water column where they can adversely affect plant and animal life and other beneficial uses of the water body. In Louisiana, re-suspension of benthic sediments often results in organic material attached or stored with the sediments being suspended in the water column, adding to oxygen depletion of the bayou or stream.

A number of methods are used to perform channel modifications, including clearing and snagging, modifying existing channels and excavating new channels. Clearing and snagging are routinely performed to remove obstructions and restore hydraulic capacity of the stream. Channel excavation is conducted to increase hydraulic conveyance, typically by widening and deepening the channel or by eliminating meanders. Water quality problems associated with these types of activities include vegetative and soil cover disturbance during construction, increased scour due to increased water velocities, and increased water temperature if overhanging vegetation is removed.

Impoundments generally fall into two categories and can be created by in-stream locks and dams or reservoirs created by impounding and flooding the stream's floodplain. The latter can range from small tributary weirs and dams constructed for soil and water conservation purposes to large reservoirs with volumes of water that are several hundred thousand-acre feet. Impoundments can cause pollution problems during and following the construction phase. Construction phase problems include high sediment loss from exposed subsoil, from preparation of the dam structure, and clearing operations for the area planned for inundation.

Long-term problems caused by the reservoir itself can include those caused in the impoundment and those in the stream channel downstream of the release from the impoundment. For instance, with increased holding capacity, reservoir waters tend to accumulate materials, contributed from the watershed. With reduced velocities, a large amount of settable materials may settle out and exert a continuous oxygen demand on the lake bottom and/or through resuspension of sediment up into the water column. If water quality in the reservoir degrades, then downstream water quality will also be affected if and when water is released, particularly if no effort is made to reaerate the water. Other downstream water quality problems may result from reduction in stream flow caused by water being impounded.

However, there are also examples of reservoirs having provided drinking water supplies and recreational benefits for local users. Toledo Bend Reservoir provides both drinking water and recreation for the public. The Sabine River, below Toledo Bend, is meeting all of its uses for contact recreation and fish and wildlife propagation. Another example of water quality improvement as a result of man-made alteration is the Red River, where construction of the J. Bennett Johnston Waterway has provided for national exposure due to professional bass fishery.

A brief summary of the types of pollutants often associated with hydrologic modifications and the types of resulting water quality problems are discussed here.

Sediment

The predominant pollutant generated by impoundment construction and dredging is sediment. This material can settle over large areas, blanketing bottom life or becoming resuspended in the water column, increasing turbidity and affecting water organisms. Also, since many chemicals attach to sediment particles, pesticides, organic compounds and metals can be redistributed as sediment is transported downstream. As sediment resuspends, these materials can reenter the water column, resulting in water quality problems. The tendency of impoundments to trap sediment is one benefit to downstream water quality and one of the purposes of small soil conservation structures. However, accumulation in the reservoir of chemicals adsorbed to sediment particles can cause bioaccumulation of these chemicals as they pass through the food chain to fish, shellfish, birds, and eventually to humans.

Nutrients

As mentioned above, increased sediment loads due to hydrologic modifications also cause an increase in nutrient loads. Further, because of greater flood protection in the area where an impoundment has been constructed, agricultural activities may increase, thus promoting use of fertilizers and pesticides in the watershed. This may contribute to accumulation of additional pollutants in the impoundment and downstream if waters are released.

Pesticides and Heavy Metals

These substances are also sediment related and can accumulate in an impounded water body. In the same manner as nutrients and sediment, they can be resuspended through dredging activities or high flow scour. Fish and shellfish industries can be adversely affected by dredging activities if sediment has these types of substances attached to it.

Organic Pollutants

Simple organic compounds are generally biochemically oxidizable and cause loss of DO in the water body. Concentrations of organic pollutants may not be affected by hydrologic modifications, however the ability of the water body to withstand the oxygen demand may be. Physical modification to water bodies alters reaeration rates, water temperature, velocities, dilution, or addition of inhibitory substances. Decreased DO concentrations may occur in a river with a series of weirs or dams because stagnation of water and release of poor quality water from one impoundment to the next.

Thermal Problems

Restructuring a channel's configuration may affect ambient water temperature by altering average depth, hydraulic energy, or by removing protective tree canopy. This, in turn, may affect DO saturation, kinetic coefficients, or solubility of certain substances. Further releases of cold water from deep reservoirs into shallower, warmer streams may affect fish and other organisms for which a proper temperature range is critical.

Other Impacts

Hydrologic modifications can generate other impacts, which can be temporary or exist for the life of the structure. These can include the following:

- Intrusion of salt water into freshwater areas;
- Land inundated to form an impoundment is removed from use; Sudden suspension and resettling of sediments can affect fish spawning areas and other forms of aquatic life;
- Air, water and noise pollution could occur during construction;
- Ecological systems are disrupted during construction, in the case of impoundments, terrestrial habitats are destroyed;
- Development of drainage channels may encourage conversion of wild areas to human-dominated land-use;
- Changing temperature and flow regimes of a river by impoundment or by channel alignment may alter populations of flora and fauna;
- Channelization can be accompanied by accelerated bank erosion;
- Dredging activities can disrupt bottom dwellers; if dredging is periodic, populations may not be able to reestablish themselves; and
- Maintenance of navigation channels may adversely impact wetlands.

USEPA published a guidance manual in July 2007, "National Management Measures to Control NPS Pollution from Hydromodification". In that document, hydromodification is defined as "alteration of hydrologic characteristics of coastal and non-coastal waters, which in turn cause degradation of water quality". USEPA then grouped hydromodification into three basic categories, including:

1. Channelization and Channel Modification – straightening, widening deepening and clearing channels of debris and sediment. Categories of these types of projects are for flood control and drainage, navigation, sediment control, infrastructure protection, mining, channel and bank instability, habitat improvement, recreation and flow control for water supply (Watson et al., 1999).
2. Dams – artificial barriers on water bodies that impound or divert water and are built for a variety of purposes, including flood control, power generation, irrigation, navigation, water supply, etc.
3. Stream bank and Shoreline Erosion – wearing away of material in areas landward of the bank along non-tidal streams and rivers. Stream bank erosion occurs when the force of flowing water in a river or stream exceeds the ability of soil and vegetation to hold the banks in place. Shoreline erosion occurs in large open water bodies, such as Great Lakes or coastal bays and estuaries, when waves and currents sort coarser sands and gravels from eroded bank materials and move them in both directions along the shore away from the area undergoing erosion.

The guidance document contains management measures recommended for each of category of hydromodification. This document is a reference manual for states, cities and parishes that have to balance demands of local and statewide land use activities with protection of water quality. The current website link to the guidance manual is:
http://www.epa.gov/owow/NPS/hydromod/index.htm

One of the management measures not included in the national guidance document which has been utilized for many years in Louisiana is inland and coastal fresh water diversions. Fresh water diversions *"freshen"* waters or wetlands impacted by saltwater intrusion. Examples include diversion of Atchafalaya River into Bayou Teche through Bayou Courtableau or diversion of fresh water from Mississippi River at Carnarvon. A major management strategy for coastal restoration is use of fresh water from the Mississippi River to coastal wetlands. Diversions play an important role in management of water quality and wetlands in Louisiana.

Define Water Quality/Program Goals

Water quality goals for the hydromodification section of the state's NPS Management Plan are more complicated than other land-use categories. Typically hydromodification means physical characteristics of the stream, bayou or river have been altered to accommodate increased drainage or navigation. In a state that averages more than 50 inches of rainfall per year, flooding and drainage are major issues. Whereas these issues are not really water quality issues, solutions typically include straightening the water body, making it deeper, or removing riparian vegetation from the stream bank. Each of these activities affects water quality and habitat for fish and wildlife.

When stream bank vegetation, such as trees, is removed from the edge of the stream, it can have several affects on water quality. If trees provide shade to the stream, their removal can result in increased stream temperature and decreased DO concentrations. If the trees were providing organic input to the stream by leaf material and woody debris, removing trees can result in decreased food sources for macro-invertebrates and woody debris for fish habitat. Woody debris is an important component of fish habitat in bayous and streams of Louisiana, since bayous often do not have pools and riffles in them. Pools and riffles develop around woody debris that falls into the stream or bayou, and provides good habitat for fish and macro-invertebrates. Removing trees from the stream bank can also result in increased soil erosion from steep banks, if proper stabilization methods are not utilized. Increased erosion can result in higher concentrations of suspended solids in the stream as sediment is washed from the bank during storm water events. Increased sediment in the stream can lead to turbidity or murky water that has potential to affect the designated use for FWP.

When a water body is straightened, hydrologic characteristics are altered which can affect its ability to re-aerate itself. In the Mermentau River basin, hydromodification has created areas called "stretch lakes" in many of its bayous. These long, wide segments of the bayou begin to function more like a lake than a flowing stream. Bayous are naturally slow-moving water bodies that transport large amounts of sediment and organic material. As the bayou is channelized and a stretch lake is formed, pollutants settle out and are deposited on the bottom similar to a detention basin. Once these stretch lakes are formed, it is very difficult to flush pollutants out of the system because flow has been reduced to such an extent that pollutants are no longer transported but are deposited in this wide, deep portion of the bayou. These segments of the bayou typically exhibit almost no flow and have very low DO concentrations.

Therefore, through hydromodification, often stream banks and stream channels are altered. These alterations affect dynamics of the stream or bayou in many ways, primarily changing energy of the stream, which affects its flow and ability to transport pollutants and re-oxygenate itself. Urban streams are often channelized so that they can transport the water more quickly, thereby reducing flooding. Through this process energy of the stream typically increases and transports water and associated pollutant load downstream where it is deposited in a lake, estuary or wetland. If the stream is converted to a channel that has a homogenous substrate, this can also affect fishery populations by decreasing habitat diversity. The combined effect of stream channel alteration and removal of riparian vegetation along stream banks often lead to lower DO concentrations and reduced species diversity of fish and macro-invertebrates.

Water quality goals related to hydromodification are to reduce the impact that physical alteration of water bodies have on temperature and DO. These two water quality parameters are utilized to determine if FWP is being met or protected. The programmatic goal is to either reduce the frequency and extensiveness of hydromodification in Louisiana's water bodies or implement the types of BMPs included in this document, to reduce impacts that hydromodification has on fish and wildlife habitat. If steps are taken to implement BMPs on agricultural and forested lands and at construction sites, less sediment should enter the water. If urban planning for new development includes detention basins and vegetated wetlands to trap sediment and organic material, fewer pollutants will be delivered to the water body. If the water body has lower concentrations of sediment, nutrients, and organic matter to transport, it should be able to retain its carrying capacity for water more efficiently. This should result in more effective drainage and less frequent dredging. Less frequent dredging should result in improved aquatic habitat for fish and macro-invertebrate populations and improve the designated use for FWP.

Explain Programmatic Activities to reach those Goals

Programmatic activities that will be implemented to reach water quality goals include increased implementation of BMPs for agriculture, forestry and urban storm water runoff. Through reduction of sediment and other pollutants associated with these three land-use categories, the necessity to channelize streams, bayous and rivers should be reduced. Partnering with police juries, city engineers and parish drainage boards on innovative ways to manage streams and drainage systems at the local level is the primary activity that should assist LDEQ to reach its goals. Most of them spend a great deal of their time planning projects and hearing complaints to alleviate drainage problems. The most effective way to address these problems is through a watershed approach instead of addressing these problems in a piece meal fashion that never examines the total system.

In addition to educational activities, watershed projects implemented throughout the state will include the hydromodification component of the NPS program. LDEQ will continue to monitor water bodies to determine if all of these activities are sufficient to protect coastal and inland waters. As LDEQ continues to monitor water bodies across the state on the 4-year basin cyclic program, annual progress in BMP implementation will be reported to USEPA, NPS Interagency Committee and the general public through LDEQ's website.

The Corps of Engineers has authority to issue permits for alteration of urban and rural water bodies. For each of these 404 permits, 401 Water Quality Certifications are regulatory tools that determine whether water quality will be maintained and protected. BMPs are routinely required through 401 WQ Certification processes and LDEQ's NPS staff continues to partner with 401 staff to improve coordination of BMPs for all hydromodification projects.

In coastal waters, LDEQ and LDNR-OCM partner on implementation of CZARA management measures in coastal areas. Through these combined efforts of education and regulatory programs, water bodies should improve and water quality standards should be met.

Section 319 of the CWA requires that states include tasks and milestones to evaluate their progress in meeting goals and objectives of their NPS Management Plan.

Future Objectives and Milestones

- Develop partnerships with local drainage boards, police juries and conservation districts to implement WIPs in watersheds impaired by stream bank and channel alterations (2011-2016);
- Implement a project where watershed restoration strategies are utilized as a method to improve aquatic habitat (2011-2016);
- Host field tours to illustrate principles utilized on the restoration project and educate parish and city officials on benefits of the techniques (2011-2016);
- Develop an educational video or PowerPoint presentation and brochure to accompany the project so other districts, parishes and city officials can learn to utilize these restoration strategies (2011-2016);
- Evaluate rate of acceptance of these methods through SWCDs, NRCS and other local stakeholders (2011-2016);
- Measure water quality improvement through improved habitat, biological communities, and chemistry of the water in areas where restoration techniques have been implemented (2011-2016);
- Report on progress made in this programmatic area to USEPA on an annual basis (2011-2016);
- Determine if additional steps are necessary to reduce water quality impacts that hydromodification has on water bodies in Louisiana and work with Corps of Engineers, local drainage boards and police juries to implement these steps in each drainage improvement projects (2012-2016);
- Evaluate whether these steps have been successful in improving water quality and reducing NPS pollution that results from hydromodification projects (2011-2016);
- Utilize federal, state and local regulations, laws and ordinances applicable to requiring BMPs be incorporated into 404 and 401 projects, in order to reduce the impact that hydromodification has on state water bodies (2011-2016);
- LDNR-OCM will coordinate its program with LDEQ's program, and track progress and report to NOAA (2011-2016); and
- LDEQ and LDNR-OCM will coordinate education and instructional efforts through local Coastal Programs, when this approach is most functional (2011-2016).

The goals of the Statewide Hydromodification Program are to incorporate NPS water quality goals and objectives into state, federal and local programs that have responsibilities for drainage and navigation projects. LDEQ is committed to these goals and objectives to improve water quality and aquatic habitats along stream banks. Since many water bodies on the state's 303(d) list have TMDLs developed for them or will in the next 5 years, hydromodification issues can be incorporated in WIPs. These steps are consistent with goals and objectives of this section of the NPS Program and are expected to result in water quality improvement in the next 5-7 years.

Timeline for Milestones: October 2011 – September 2016

Stakeholders

Natural Resource Conservation Service (NRCS)
NRCS often provides technical assistance and support for local drainage projects. These requests typically come from local drainage districts or police juries responsible for maintaining drainage at the parish level. Historically in rural and urban watersheds, bayous and streams have primarily been viewed as conduits for draining farmlands and subdivisions. LDEQ partners with NRCS and other stakeholders to find practical solutions to drainage problems and yet protect water quality and habitat. NRCS has technical expertise in land management and hydraulics that are essential components of maintaining natural hydrology. NRCS will continue to be an important partner in any changes to local drainage modification projects.

Soil and Water Conservation Districts (SWCDs)
Local SWCDs are often included with NRCS in planning local drainage projects at parish or district levels. Members of SWCDs are often farmers and landowners that are in support of drainage projects. If stream bank restoration/protection projects are successfully implemented, local districts need to be included in both planning and implementation stage of the project. Their local knowledge of historical drainage patterns and land-use practices in the watershed are essential for understanding current hydrology of bayous and streams in their areas. They are key players in gaining support from local landowners for implementing new, possibly more innovative methods to provide adequate drainage and protect the stream.

Louisiana Department of Environmental Quality (LDEQ)
LDEQ also has an important role in this section of the NPS Program. The NPS staff partner with local drainage boards, police juries and conservation districts on demonstration projects and educational programs that illustrate new methods of stream bank restoration and protection. They sponsor workshops for federal, state and local stakeholders on bioengineering and stream morphology. In addition to facilitating change in methods for hydromodification, LDEQ can utilize 401 Water Quality Certifications as a tool to encourage utilization of BMPs at the local level.

Louisiana Department of Natural Resources/Office of Coastal Management (LDNR-OCM)
LDNR-OCM utilized Section 319 funds to develop a BMP manual for hydromodification. LDNR-OCM also plans to host an outreach and training program for the manual. This training will coincide with storm water runoff BMP manuals, training and outreach projects that begin in the western portion of the coastal zone and move to the east. LDNR-CDM continues to make available the use of the subdivision evaluation guide for OCM permit analysts and residential developers needing BMPs to specify

control of storm water runoff during and after development. The guide is distributed to coastal parish governments and other appropriate users.

Local Drainage Boards

Local police juries or drainage boards for the parish are often the entities that submit a hydromodification project to LDEQ for certification. The parish is typically responding to a request by the local community for improved drainage for their farms or their subdivision, for alleviating flooding problems. The drainage board may also be responsible for maintaining a project that was implemented by Corps of Engineers in the past 10 to 50 years. If the Corps conducted a hydromodification project in 1945 to widen or deepen a water body for flood control and drainage, maintenance responsibilities of the project lies at the local level.

Police Juries

The police jury is a local government entity of elected officials that has many responsibilities at the parish level, one of which is drainage. To alleviate flooding problems in the parish, they work closely with the local drainage board. The police jury may also be a project sponsor for a hydromodification project.

U.S Army Corps of Engineers

The Corps of Engineers has historically been responsible for maintaining the nation's water bodies for navigation and drainage. Therefore, they are an important partner in hydromodification activities conducted at the watershed level. LDEQ has partnered with Corps of Engineers on these issues for years, but continues to dialogue on how as partners to protect the state's water bodies and prevent flooding. Through some of the new initiatives, there are opportunities to coordinate more closely at the watershed level on hydromodification management measures that protect aquatic and riparian habitats.

Federal Consistency

Since NRCS and Corps of Engineers are two principal federal agencies involved in hydromodification, LDEQ will continue to partner with them to incorporate stream bank restoration BMPs into their drainage projects. The U.S. Forest Service has already taken steps to utilize these concepts in their hydromodification projects. USEPA could partner more closely with the state to incorporate these types of BMPs and management measures into hydromodification projects through 404 permits. LDEQ has opened dialogue and made progress with Corps of Engineers on cooperation with projects that involve NPS pollutants, wetlands and stream bank riparian areas. One of the goals for the program is to continue this dialogue and improve the understanding of how agencies can reach common ground on providing adequate drainage system for flood protection, while protecting and improving water quality and habitat for fishing and swimming.

Program Evaluation

Evaluating changes made in methods used to manage streams has to be accomplished at local and state levels. Parish drainage boards and police juries often have authorities for these types of projects. NRCS and local SWCDs are also important stakeholders that can assist with evaluating changes that result from these restoration techniques. LDEQ will partner with these local stakeholders to determine a method that can effectively track improvements made, as a result of activities outlined in this section of the NPS Management Plan.

Evaluating water quality improvements that result from increased implementation of hydromodification management practices is the responsibility of LDEQ. Through LDEQ's 4-year basin cyclic water quality monitoring program, watersheds will be sampled at a minimum of once every four years for stream chemistry. This program can report on long-term changes that result in the stream from improved methods of stream bank protection and watershed management. To determine the level of habitat improvement that results from these restoration techniques, LDEQ will conduct a baseline habitat assessment, which includes macro-invertebrates and fish. Follow-up assessments will determine whether these stream bank and stream channel protection methods have resulted in measurable water quality and habitat improvements. LDNR-OCM will assist in evaluating program effectiveness by providing data from their permit/mitigation database on hydromodification/restoration activities that require CUPs in the coastal zone.

Source Water Protection Program

Introduction

The Source Water Protection Program (SWPP) is an environmental pollution prevention program designed to protect the quality of aquifers and water bodies that are sources of drinking water. In accordance with Federal Register Volume 68 205, LDEQ has included Louisiana's source water protection strategy as part of its NPS management program. The federal government mandated that each state implement a Wellhead Protection Program (Section 1428, Safe Drinking Water Act amendments of 1986) to protect public water wells and a Source Water Assessment Program (SWAP) (Safe Drinking Water Act amendments of 1996) to assess potential susceptibility to contamination of all water sources. Louisiana's source water protection strategy is to satisfy these mandates. In Louisiana this program is called the Drinking Water Protection Program whereas USEPA refers to this program as the SWPP.

Coordination of NPS Program and SWPP

Many NPS pollution and source water protection issues are the same. The SWPP has established a schedule to perform activities in communities consistent with USEPA's guidance. NPS staff and SWPP staff work together on educational outreach and provide technical expertise on NPS pollution and source water protection.

Source Water Assessments

In the assessment phase to determine the susceptibility of public water supplies to contamination, completed in 2003, LDEQ identified nearby types, numbers and locations of potential sources of contamination and hydrogeologic sensitivity factors. LDEQ's SWAP document can be found at LDEQ website: http://www.deq.louisiana.gov/portal/PROGRAMS/SourceWaterAssessmentProgram.aspx

As part of this assessment, LDEQ mapped locations of all public supply wells, surface water intakes and potential sources of contamination in delineated source water protection areas. The factors affecting susceptibility of contamination included:

1. The types and number of potential sources of contamination in the source water protection area and their distance from the well or intake;
2. For ground water systems, the age and depth of the well, the aquifer permeability, and the recharge potential of the aquifer; and
3. For surface water systems, the age of the intake structure, average annual rainfall, vegetative cover, slope of the land and number of feeder streams to the water source.

The source water assessment data is utilized by LDEQ, outside agencies and the public. The SWPP uses this information to prioritize communities to initiate activities, as stipulated by USEPA guidance.

Source Water Protection Strategy

The SWPP has implemented strategies to protect the state's drinking water supplies since the completion of the source water assessment phase. LDEQ developed its SWPP in accordance with USEPA's guidelines to protect sources of water for public water systems (aquifers and surface water sources) from contamination. The SWPP targets communities on a parish or regional (combination of parishes) basis, depending on the local situation. Once work in a community is initiated, source water assessment data and feedback from stakeholders and governmental agencies are used to identify the proper protective measures. Additionally, LDEQ reviews water quality monitoring data to further refine protection activities in each community.

Key elements of the SWPP consist of the following strategies:

1. Maintenance and updating source water assessment data, which includes information on sources of drinking water (wells or intakes) and a list of potential sources of contamination located near those drinking water sources;
2. *Development of contingency plans for all water systems in each targeted community in the event of an emergency or the loss of the water supply;
3. Implementation of public education/awareness campaigns to make the public aware of their drinking water sources and how to protect them;
4. Formation of source water protection committees comprised of local stakeholders from targeted parishes to set goals and carry out source water protection. Each committee is familiarized with drinking water source protection within its community and BMPs that may be used to control pollution in the vicinity of their drinking water supplies;
5. *Dissemination of BMPs through visits to businesses that are considered potential sources of contamination as identified in the source water assessment data;
6. Development and dissemination of educational/outreach material for community awareness for protection of drinking water;
7. Addressing the most threatening potential sources of contamination in each community identified in the source water assessment data;
8. Addressing specific issues affecting water sources identified by local stakeholders;
9. Addressing specific NPS contamination identified as affecting water supplies; and
10. *Partnering with each committee to introduce the drinking water protection model ordinance for adoption by local governments. The model ordinance may be modified by the local governing body to address specific issues and concerns.

* Mandatory key elements

Implementation Schedule

The USEPA Source Water Protection Strategic Plan stated that by 2011, the SWPP will achieve a minimized risk to public health through source water protection for 50 percent of community water systems and for the associated 62 percent of the population served by community water systems (i.e., “minimized risk” is achieved by substantial implementation of Louisiana’s USEPA approved SWPP). To achieve this objective in Louisiana this translates to implementation of protection strategies for 537 community water systems and a population of approximately three (3) million (based on USEPA’s Safe Drinking Water Information System (SDWIS) data at the time the Strategic Plan was developed). Based on LDEQ’s projection the SWPP staff will exceed these targets.

The following table shows LDEQ’s SWPP implementation schedule for FY 2012 through FY 2016. The number of community water systems in each parish and the population served by those systems are from 2010 data contained in SIDWIS. In addition to the Implementation Schedule table below, a map on the following page depicts by fiscal year, the parishes where substantial implementation has been completed or is scheduled to be completed.

LDEQ SWPP IMPLEMENTATION SCHEDULE
FY 2012 – FY 2016

FISCAL YEAR	PARISH	NUMBER OF CWS*	POPULATION
2012	Morehouse	15	34,422
	Tangipahoa	38	99,676
	Webster	33	48,941
2013	Franklin	8	19,512
	Livingston	46	115,914
	Richland	11	20,463
2014	Ascension	30	35,451
	Caldwell	11	15,282
	Madison	4	13,410
2015	Allen	11	29,346
	Evangeline	14	41,299
	St. Mary	11	61,910
2016	Catahoula	9	11,648
	St. Martin	18	65,998
	Union	22	31,099
TARGET TOTALS		281 *COMMUNITY WATER SYSEMS WITH SUBSTANTIAL IMPLEMENTATION	644,371 POPULATION SERVED (FROM SIDWIS)

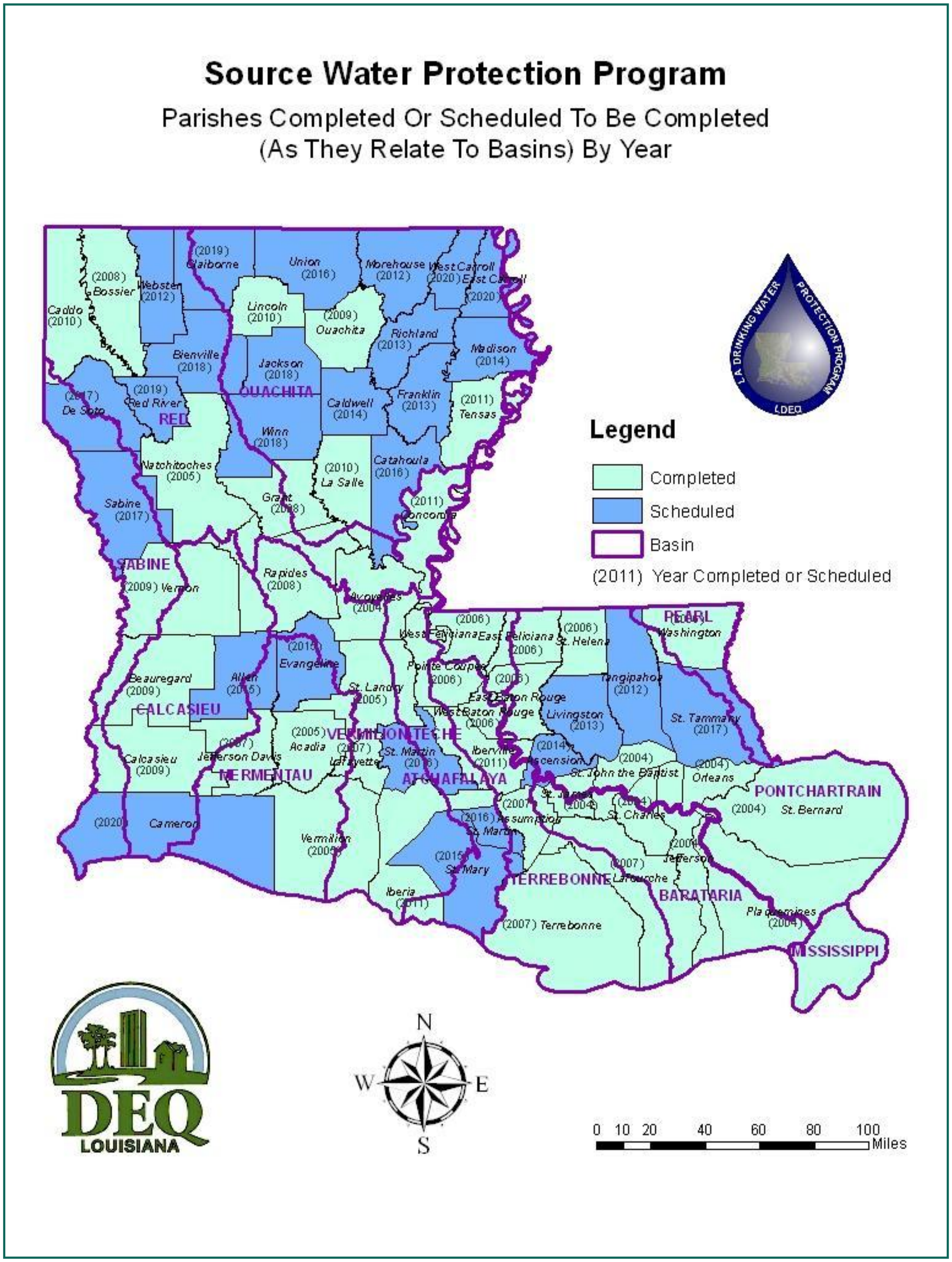

Figure 7: Target parishes for SWP implementation by state fiscal year and corresponding basins for coordination with other NPS Program activities.

Protection Strategies Implemented

The following source water protection strategies are designed for implemented statewide and in each target community.

Updating SWAP Data

This is an ongoing activity for LDEQ. It is important that SWAP data is updated and maintained for use by LDEQ and other agencies seeking information on protecting water supplies. The data is also used in implementation of the SWPP for prioritizing protection activities.

Contingency Plans

Contingency plans are developed for all water systems in each community targeted by the SWPP. This ensures that water systems have a plan in place in the event of an emergency or the loss of the water supply.

Public Education/Awareness

Extensive public education/awareness campaigns utilizing presentations and local media are conducted in each targeted community. These campaigns are used to educate local citizens and to solicit volunteers for source water protection committees. LDEQ also conducts presentations to organizations, at local and statewide events and conferences. As of 2010, LDEQ presented information on drinking water source protection to over 18,000 people including government officials, water system operators, the general public, professional organizations, and schools. LDEQ also utilizes an educational video on drinking water source protection which is aired on television and distributed extensively for public use. LDEQ also distributes "Drinking Water Protection Area" signs to communities to raise the general awareness level regarding drinking water source protection. Specific issues affecting local drinking water sources are also addressed through public education at the local level.

LDEQ uses a visual ground water model to show the public the hydrologic cycle and how aquifers are recharged, how ground water moves through aquifers, and how wells draw water from aquifers. It also shows how an aquifer can become contaminated by both contaminated ground seepage and by interaction with contaminated surface water.

A surface water model is also utilized to show how surface contaminants can be carried into water bodies.

Source Water Protection Committees

In order to gain better stakeholder input, committees are formed in communities targeted by SWPP to assist in indentifying source water protection issues, setting goals, and implementing source water protection activities. As of 2010, seventeen committees were formed on a parish-wide basis and one committee was formed on a tri-parish basis. Each committee is familiarized with how to protect drinking water sources in its community and with the application of proper BMPs to control NPS pollution near drinking water supplies. The committee also sets and implements source water protection goals. LDEQ partners with these committees to perform various activities to protect their drinking water sources. These activities address the most threatening potential sources of contamination in each community and the specific NPS issues affecting water sources.

Visits to Potential Sources of Contamination

LDEQ partners with local committees to share information on the application of appropriate BMPs with businesses identified in the source water assessment phase as potential sources of contamination (PSOCs). The visits educate the local owners and operators about how to protect their local drinking water sources. They are educated on the proper disposal of waste and how to keep surfaces free of chemicals and petroleum products that could threaten the drinking water sources. As seen in the photo below, the blue water droplet on the door denotes that Ryland Motors has become a Drinking Water Protection Partner.

Educational Material

Educational material on drinking water source protection has been developed with assistance from local committees, agencies, and organizations. The topics covered in the material include those issues raised either directly from committees, from SWAP data, or by other means. The following is a list of educational materials that LDEQ has developed:

- Drinking Water Program Brochure
- Top Ten Tips to Protect Drinking Water
- How to Protect Drinking Water in the Home
- How to Conserve Drinking Water in the Home
- How to Protect Drinking Water in the Business
- How to Conserve Drinking Water in the Business
- Well Plugging and Abandonment
- Water Facts and Figures
- BMPs for Irrigation Wells
- Spill Prevention and Control for Above Ground Storage Tanks
- BMPs for Underground Storage Tanks
- Lawn and Garden Fact Sheet
- BMPs for Businesses Using Small Quantities of Chemicals
- Committee Training Manual
- Pharmaceutical Disposal Practices
- How to Protect Drinking Water – Contractor Education

Additional educational material has been developed for water system operators and for students of various levels. Also, relevant educational material from other agencies/organizations or from LDEQ has been utilized to address specific issues. LDEQ maintains a website containing educational material developed for the SWPP. The website can be accessed at: http://www.deq.louisiana.gov/portal/PROGRAMS/DrinkingWaterProtectionProgram.aspx.

The website also explains the program and gives specific updates of current activities with the committees. LDEQ also developed a ten minute video entitled "Drinking Water and You" that describes the sources of drinking water, why it's important to protect them, and how they can be protected. Copies of the video have been distributed to a number of schools, governmental officials, organizations, media outlets, general public, etc. The video is also shown on television stations and is part of LDEQ's presentation material. Additionally, an annual Drinking Water Protection Program newsletter is published every fall. This newsletter reports current events and accomplishments and contains educational items on various drinking water source protection issues. The newsletter is distributed to water systems, local governments, and federal and state agencies.

Most Threatening PSOCs

LDEQ strives to address the most threatening PSOCs found in SWAP in each community. LDEQ defines these as the most numerous high risks PSOC found within one thousand feet of water wells and/or five miles upstream of surface water intakes in each community. Above ground storage tanks have been identified as a common most threatening PSOC in many parishes. The project in Avoyelles Parish is an example of how a most threatening PSOC was addressed by partnering with stakeholders. In an effort to address concerns over spills from above ground storage tanks in the parish, representatives from the State Fire Marshall's Office and LDEQ assisted in training stakeholders on applicable regulations and BMPs. This effort resulted in development of a model spill prevention and control plan distributed in Avoyelles Parish and in other communities targeted by LDEQ's protection strategy.

Local Issues

The committees also target specific issues affecting local water sources. These specific issues include maintenance of individual sewerage treatment systems (septic tanks, etc.), used oil recycling, and proper plugging of abandoned water wells, all examples of NPS pollution. A number of techniques are employed to implement public outreach. For example local papers printed articles informing the public where used oil can be recycled. Also oil recycling flyers were given to oil retailers for distribution to their customers. Improper disposal of used oil can be a NPS of contamination to drinking water.

Specific NPS Issues

LDEQ strives to address specific NPS contamination that has been identified within the framework of its SWPP as affecting water supplies. Specific projects are utilized to address NPS contamination, some of which have been mentioned previously, such as used oil recycling education and visits to potential sources of contamination. LDEQ has also worked in communities to familiarize the public with individual sewerage treatment system maintenance.

<u>Sand and Gravel BMP Manual</u>

The SWPP staff assisted with development of the "Sand and Gravel BMP Manual," dealing with ground water and public supply wells. Due to this input the manual addresses concerns with mining in the aquifers and potential adverse impact on the wells. In this manual, a 1,000 foot setback distance from such wells to mining activities is required.

<u>Sibley Lake</u>

Sibley Lake Watershed Individual Sewerage Treatment System Improvement Project is an example of one way LDEQ addresses specific NPS of contamination around a water source. Located in the Red River basin in Natchitoches Parish, Sibley Lake is the drinking water supply for the City of Natchitoches, the Village of Clarence, and the community of Hagewood. The total population served is almost 25,000 which include incorporated and unincorporated areas. The total watershed and the critical drainage area (a maximum of 5 miles upstream from the intake) are delineated in Figure 8. The watershed surrounding the lake consists of urban and rural land. The area immediately surrounding the lake has a significant amount of residential development and most of this development is located outside corporate limits for the City of Natchitoches. Because most of this development is located outside the city limit of Natchitoches with no access to a centralized sewerage system, it is served by individual sewerage treatment systems. These sewerage treatment systems were in varying degrees of operational condition. Many of these systems were located within only a few hundred feet of the lake or its tributaries. Development of property directly adjacent to and around the lake is expected to continue, which will increase potential for sewage discharging into the lake. LDEQ partnered with the City of Natchitoches to address protection of the water source. As part of this effort, the City of Natchitoches, with LDEQ's assistance, received funding through Section 319 for the Sibley Lake Watershed Individual Sewerage Treatment System Improvement Project. This project enabled the City of Natchitoches to inventory and inspect all individual sewerage treatment systems within a half-mile of Sibley Lake, and areas beyond a half-mile which were immediately adjacent to tributaries. These systems were located by GPS and all pertinent information on each system was entered into the City's GIS System. Owners of malfunctioning individual sewerage treatment units were served notice that their systems must be repaired or replaced. Funding was provided for the repair/replacement of these systems on a cost-share basis. These owners were then required to sign a document stating that they would abide by maintenance requirements specified by City ordinance for as long as they own the system. By implementing this project the City of Natchitoches was able to mitigate future threats of sewerage discharge into Sibley Lake and protect their source of drinking water. A similar project for Cross Lake, the drinking water source for the City of Shreveport, was also undertaken by LDEQ and the City of Shreveport.

<u>Bayou Lafourche</u>

LDEQ has implemented an initiative to address fecal coliform loading in Bayou Lafourche. As part of the SWPP, LDEQ routinely reviews historical sampling data and Louisiana's list of impaired water bodies. During the review process for Assumption, Lafourche and Terrebonne Parishes, it was noted that sub-segment 020401, Bayou Lafourche from Donaldsonville to Intracoastal Waterway at Larose, does not consistently meet its designated uses for fecal coliform levels for PCR, SCR and drinking water. Bayou Lafourche is the main source of drinking water for approximately 189,000 people and there is a TMDL for fecal coliform for the bayou. LDEQ has partnered with local governments, Nicholls State University (NSU) and citizens to address these high fecal coliform levels.

LDEQ initiated inspection of all facilities requiring discharge permits. Fecal coliform samples were collected at every bridge crossing the bayou in an effort to identify sources of fecal coliform. Additional investigation into determining the sources of fecal coliform along Bayou Lafourche was performed through a contract with NSU. Data collected identified the locations of fecal coliform attributed to untreated human waste. Using this data LDEQ advised local officials of this concern. Options that are being discussed to alleviate this concern include adoption of an ordinance to address malfunctioning systems and consolidation of individual sewage treatment systems into more regional, community based systems. Public education, promotion of BMPs, and coordination with LDHH to address individual home treatment systems will also be necessary. Additionally, NSU initiated a similar project upstream from the initial project to prioritize areas where human sewage is entering Bayou Lafourche. As work progresses, LDEQ is continuing to inspect permitted facilities in the area to insure compliance.

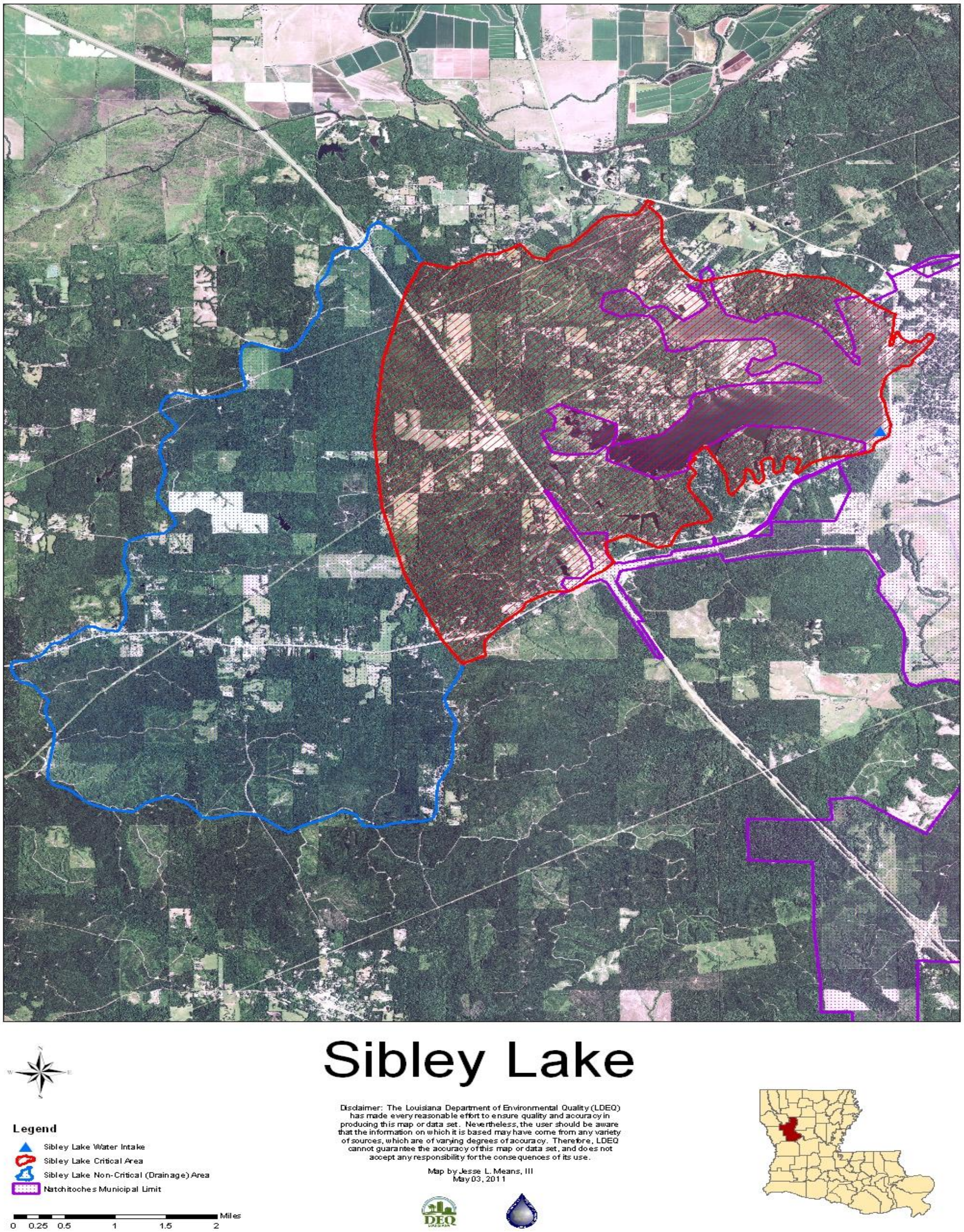

Figure 8: Sibley Lake Watershed

Big Creek

Big Creek, a drinking water source for southern Grant Parish and northern Rapides Parish, is not meeting the fecal coliform standard for PCR. In order to meet this standard LDEQ contracted with University of Louisiana at Monroe (ULM) to determine whether on site sewerage systems and/or agriculture and pasture lands were significant sources of high fecal coliform in Big Creek. Elevated fecal coliform levels were identified in drainage ditches originating behind residential trailer homes during some of the non-rain sample events. It was determined that these bacteria levels were due to faulty sewage systems. During rain events, several areas adjacent to pasture lands and a construction site were identified as potential contributors to elevated fecal coliform levels in Big Creek.

At LDEQ's request LDHH inspected the trailer homes to ensure proper functioning of wastewater treatment systems. BMP implementation could address fecal coliform originating from pasture land and proper maintenance or replacement of individual onsite sewerage systems could alleviate bacterial problems at the trailer parks.

Ordinances

A model ordinance to protect public water wells is introduced in each target community to local governments with public water wells located in their jurisdiction. Through 2010, ordinances were adopted by 63 local governments in 21 parishes prohibiting PSOCs from being placed within 1,000 feet of water wells serving public water systems. These ordinances were based on a model ordinance that LDEQ has developed. The following is a list of parishes with the number of ordinances adopted in each parish:

- Acadia Parish - 5
- Avoyelles Parish - 5
- Beauregard Parish - 2
- Bossier Parish - 3
- Calcasieu Parish - 3
- Caddo Parish - 3
- East Feliciana Parish - 2
- Grant Parish – 1
- Jefferson Davis Parish – 4
- Lafayette Parish – 3
- LaSalle Parish – 2
- Lincoln Parish – 2
- Natchitoches Parish – 1
- Ouachita Parish – 1
- Rapides Parish – 5
- St. Landry Parish – 5
- Vermilion Parish – 7
- Vernon Parish – 6
- Washington Parish – 1
- West Baton Rouge Parish – 1
- West Feliciana Parish - 1

SWPP Summary

The SWPP protects drinking water sources (aquifers and surface water bodies) from contamination. It combines all available resources, including coordination with the NPS Program, and local involvement. SWPP activities result in protection of Louisiana's water sources through environmental education and various pollution prevention activities. In addition to protecting water sources, the pollution prevention work conducted by the SWPP assists the NPS Program with reduction of NPS pollution.

Ground Water Monitoring Overview

The ground water monitoring network, Louisiana's Aquifer Sampling and Assessment Program, or the ASSET Program, is an activity that was developed to determine the quality of naturally occurring ground water in the major drinking water aquifers in the state. The program also monitors and examines regional changes in ground water quality on a statewide basis. This program can provide an early warning to NPS contamination of ground water in the state.

The ASSET Program monitors approximately 180 water wells in fourteen major aquifers and aquifer systems every three years. The actual number of wells sampled in every three year period depends on several factors including owner participation, which is voluntary, and operational status of each well. Over 150 targeted analytes and field parameters are analyzed/measured for each well. Analyte categories include conventional water quality and nutrient parameters, inorganics, volatile and semi-volatile organic compounds, pesticides and PCBs.

The ASSET Program strives to maintain a consistent well density and distribution for each aquifer. Different well use-types are selected so that data collected is representative of the aquifer. Additionally, this distribution and mixed use-type is necessary to detect NPS type pollutants, whereas focusing on a particular area or activity within an aquifer, or a single well use-type would not provide the necessary coverage.

To view the hydrogeologic column of aquifers and aquifer systems in Louisiana please visit the website: http://www.deq.louisiana.gov/portal/DIVISIONS/WaterQualityAssessment/AquiferEvaluationandProtection/ProtectingLouisianasGroundWater.aspx.

Monitoring Strategy

The Aquifer Evaluation and Protection (AEP) Unit operates the ASSET Program as an ambient ground water monitoring activity to assess and monitor the quality of ground water in Louisiana's principal aquifers. Approximately 180 water wells are sampled over a three year period (at least sixty wells being sampled each year). The ASSET Program Ground Water Sampling Schedule Table found below lists the areal extent of each aquifer or aquifer system monitored along with the number of wells scheduled to be sampled for each aquifer or aquifer system through FY 2016.

Water Well Selection

The number of wells selected to monitor an aquifer is based on the aquifer's areal extent. The ASSET Program has established a minimum well density of one well for every 400 square miles of areal extent. For example an aquifer with an areal extent of 6,000 square miles would require a minimum of fifteen wells to be selected to represent the aquifer. In addition to well density within an aquifer, the well's use-type is considered. Different well use-types are selected, when available, to help ensure that all activities within an aquifer's extent are represented. The well use-types selected are: Domestic, Industrial, Irrigation, Monitoring, Observation, Power Generation and Public Supply (use-type is determined by LDNR at the time the well is registered).

The success of the ASSET Program is dependent on well owner participation, and is an important consideration when wells are selected. The owner is made aware that their participation is strictly voluntary and may decide not to participate in the program at any time. Owners are also made aware of the three-year sampling cycle and are encouraged to maintain their well in good working order.

Sampling Schedule

The sampling process is designed so that each well is monitored at least once every three years so that all fourteen aquifers or aquifer systems are monitored within a three-year period. The process is then repeated once a three-year cycle has been completed. Typically, five or more wells, each producing from the same aquifer, are sampled each month when sampling is performed. An effort is made to sample all assigned wells of one aquifer before moving to the next one. Aquifers of small areal extent may be completed in a single month, whereas larger aquifers may require up to four months to be completed.

In a typical year, approximately 60 water wells are sampled. The actual week of each month that samples are collected is coordinated with the analyzing laboratory so that holding times for samples can be met. This must be done so resulting analyses will not be rejected, requiring additional sampling.

Sample Analysis

A common set of field parameters and samples are measured and collected for analyses from each well. Samples are analyzed for the following parameter groups: conventional water quality and nutrients, inorganics, volatile organic compounds, semi-volatile organic compounds, pesticides and PCBs. For the full list of field parameters recorded at each well and the individual analytes contained in each parameter group please refer to the website: http://www.deq.louisiana.gov/portal/LinkClick.aspx?fileticket=ZUdHfHnCRlcpercent3d&tabid=1717.

A more detailed discussion of sample analysis methods, reporting limits, container selection and holding times is found in USEPA's approved QAPP for the ASSET Program. The QAPP is reviewed and updated annually for accuracy, and submitted to USEPA Region 6 for comment and approval. This ensures that monitoring requirements are met, and the data generated is valid and appropriate.

Assessment and Reporting

The sampling strategy of ASSET allows for sampling of an entire aquifer or aquifer system before sampling begins on the next scheduled aquifer. In this manner, sample data received from the lab can be better managed and assessed. All valid sample data collected from each well is reported to the well owner with a discussion of findings.

Once all data for a particular aquifer or aquifer system has been received from the lab, it is reviewed for completeness and validated. An aquifer summary is prepared that assesses and summarizes the findings of sampling activities. This individual summary is posted to LDEQ's website and provided to any interested party requesting it.

At the end of every three year sampling cycle, a Triennial Summary Report is prepared. The Triennial Summary includes a discussion of findings for the period, a comparison of quality of ground water found in each of the aquifers monitored, and a comparison of analytical findings to the Federal Primary Drinking Water Standards, or Maximum Contaminant Levels (MCLs). This report is also published to LDEQ's website, and a hardcopy is available upon request.

In addition to comparing ground water quality across aquifers, each aquifer's analytical results are compared to historical data generated from previous ASSET Program monitoring activities. This can provide trends in water quality changes, improvements or degradation.

LDEQ is the lead implementing agency for this activity with other appropriate agencies responding as necessary according to findings. Following established operating procedures, other agencies notified of findings include: LDHH whenever a public supply well exceeds an MCL; LDNR when petroleum exploration or production contamination is suspected; and LDAF when agriculture related contaminants are discovered. Notification will also be given to appropriate Divisions within LDEQ. In certain situations, multi-agency notification may be required.

Data generated from ASSET is also used to complete the ground water portion, Part 4, of the IR. Every two years, data generated from sampling of an aquifer or grouping of aquifers are selected, summarized and presented in the IR according to USEPA requirements. ASSET Program data is the sole data source that contributes to the ground water portion of the state's IR.

Summary

NPS pollutants could be a major threat to Louisiana's surface waters, ground waters and ground water recharge areas. ASSET is the only statewide continuously operating ambient ground water monitoring activity in Louisiana. It is designed to determine and monitor the quality of ground water in Louisiana. Trends in water quality can be tracked and NPS and other pollutants can be detected early so that action can be taken in an effort to protect the health and safety of Louisiana's citizens. Louisiana's NPS Management Plan contains explicit strategies to protect surface and ground water. ASSET is one of the strategies Louisiana is using to protect ground water.

ASSET PROGRAM GROUND WATER SAMPLING SCHEDULE FY 2012 – FY 2016		
AQUIFER/SYSTEM	AREAL EXTENT (sq. mi.)	NUMBER OF WELLS TO BE SAMPLED
State Fiscal Year 2012 (July, 2011 – June, 2012)	**[Represented by Figure 10-3]**	
Williamson Creek	3,243	7
Chicot Equivalent System	6,800	24
Evangeline Equivalent System	6,252	15
Jasper Equivalent System	6,051	15
BEGIN NEW 3-YEAR SAMPLE ROTATION		
State Fiscal Year 2013 (July 2012 – June 2013)	**[Represented by Figure 10-1]**	
Sparta	6,923	13
Carrizo-Wilcox	4,795	12
Red River Alluvial	1,387	4
Evangeline	4,547	8
Catahoula	2,590	6
North Louisiana Terrace	2,152	11
Carnahan Bayou	3,640	7
State Fiscal Year 2014 (July, 2013 – June, 2014)	**[Represented by Figure 10-2]**	
Mississippi River Alluvial	9,947	24
Cockfield	5,161	12
Chicot	9,949	26
State Fiscal Year 2015 (July, 2014 – June, 2015)	**[Represented by Figure 10-3]**	
Williamson Creek	3,243	7
Chicot Equivalent System	6,800	24
Evangeline Equivalent System	6,252	15
Jasper Equivalent System	6,051	15
BEGIN NEW 3-YEAR SAMPLE ROTATION		
State Fiscal Year 2016 (July 2015 – June 2016)	**[Represented by Figure 10-1]**	
Sparta	6,923	13
Carrizo-Wilcox	4,795	12
Red River Alluvial	1,387	4
Evangeline	4,547	8
Catahoula	2,590	6
North Louisiana Terrace	2,152	11
Carnahan Bayou	3,640	7

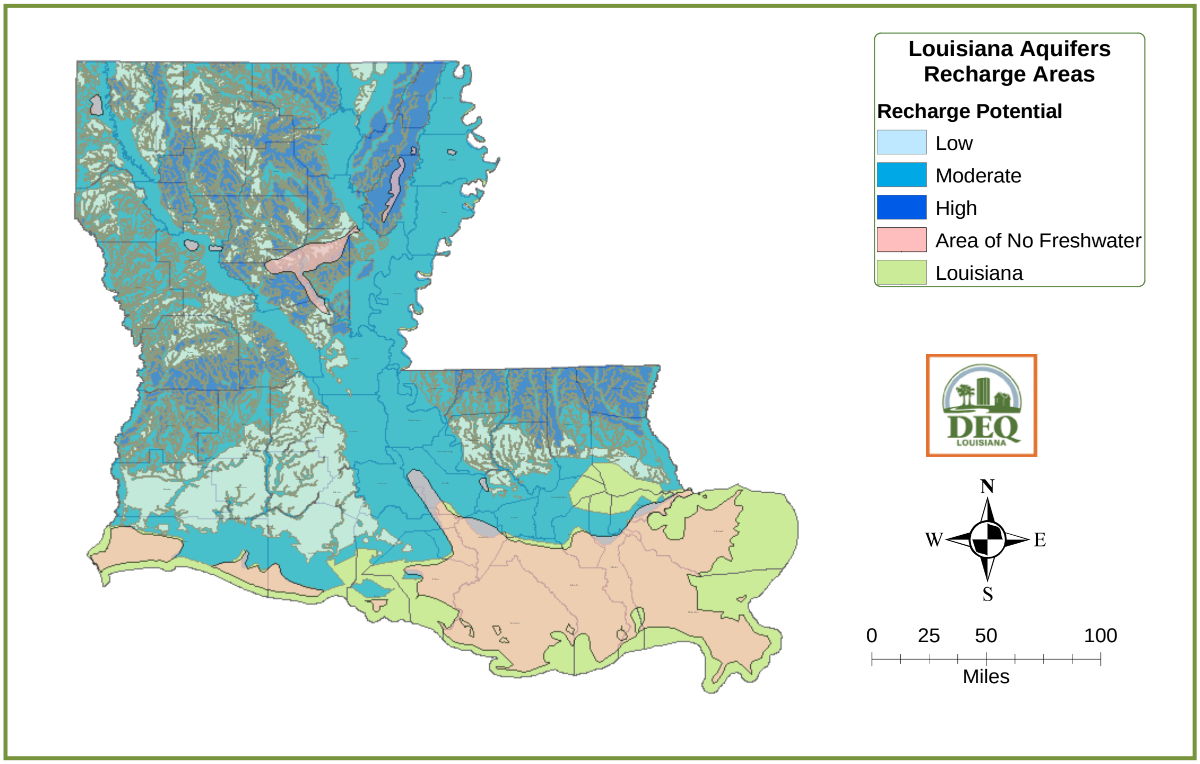

Figure 9: Louisiana Aquifer Recharge Areas

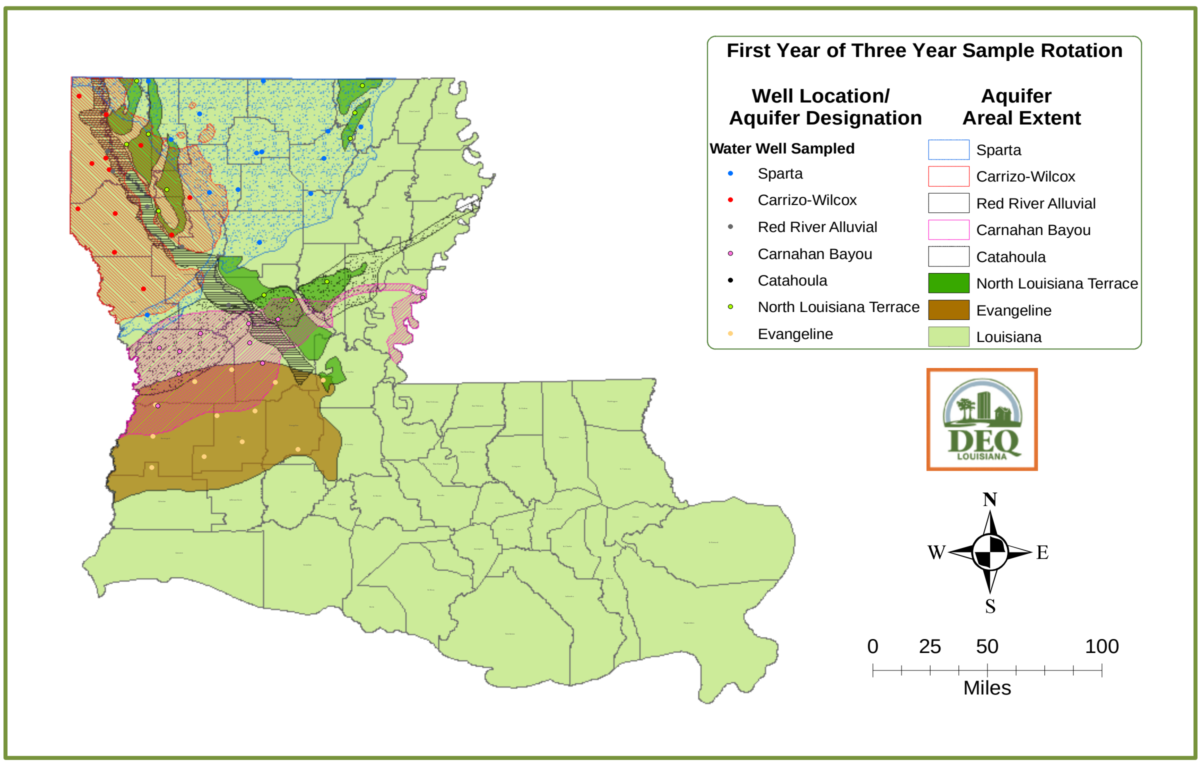

Figure 10-1: Wells/Aquifers Monitored First Year of Three Year Sample Rotation

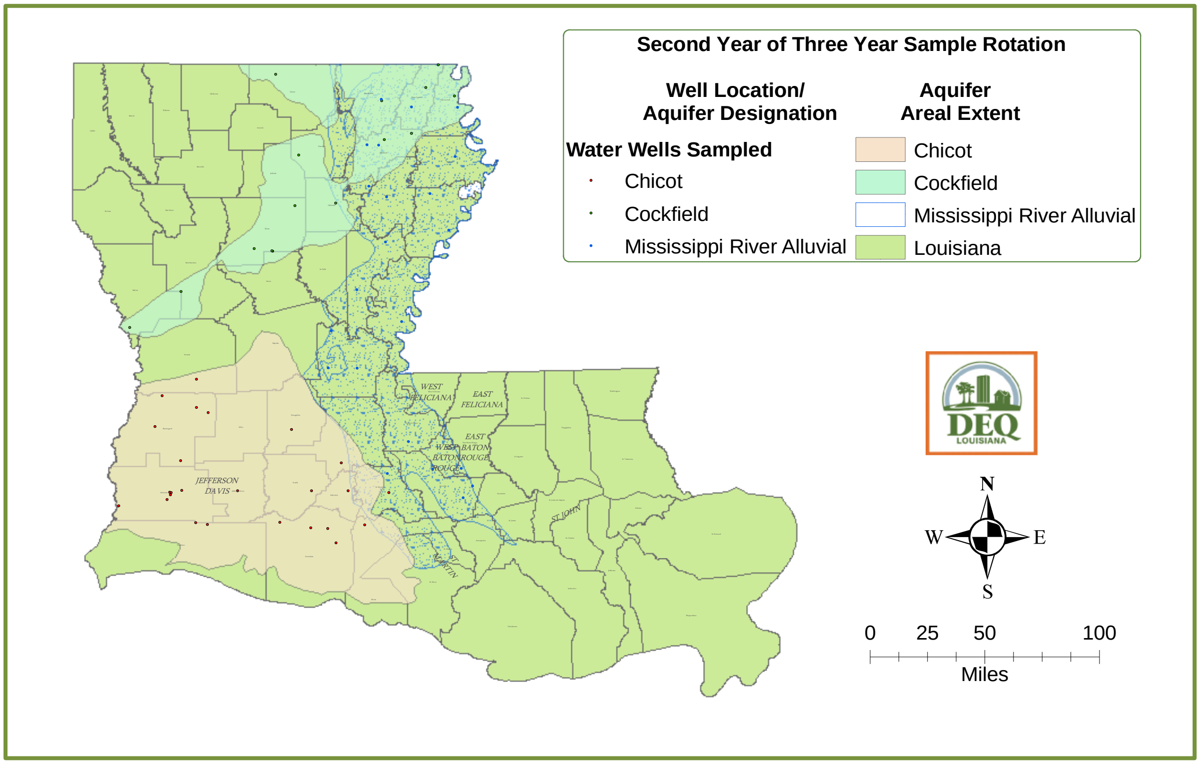

Figure 10-2: Wells/Aquifers Monitored Second Year of Three Year Sample Rotation

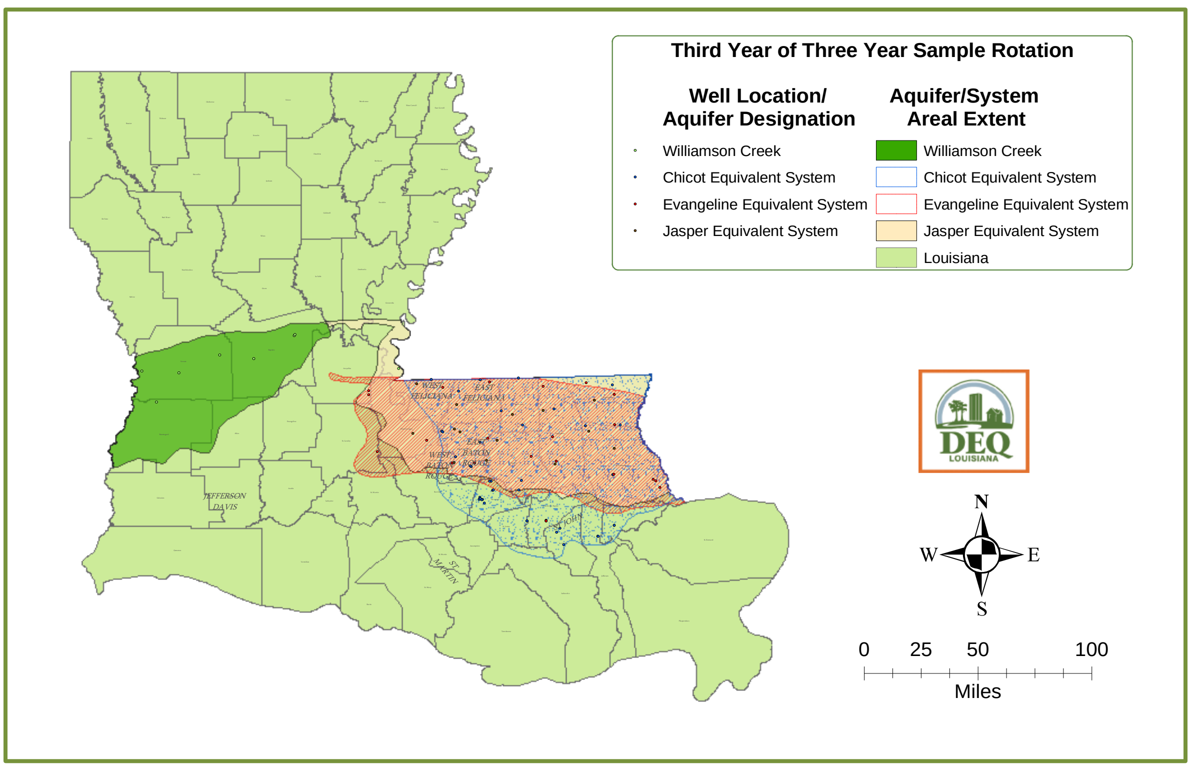

Figure 10-3: Wells/Aquifers Monitored Third Year of Three Year Sample Rotation

Coastal Nonpoint Pollution Control Program

The CNPCP boundary has been delineated by water quality sub-segments (i.e. watersheds) that:

a. occur in Louisiana's Coastal Zone boundary;
b. are adjacent to Louisiana's Coastal Zone boundary; and/or
c. occur in Louisiana's Coastal Wetlands Conservation Plan boundary (i.e. Louisiana Coastal Wetlands Conservation Plan, May 1997).

Louisiana's coastal zone is a geo-political boundary that varies from 16 to 32 miles inland, encompassing 19 parishes across the gulf coast. Generally the coastal zone follows the Intracoastal Waterway from the Texas-Louisiana state line, through Vermilion, Iberia, and St. Mary parishes, dipping southward following natural ridges below Houma, turning northward to take in Lake Pontchartrain and ending at the Mississippi-Louisiana border. LDNR-OCM is currently reviewing information to redefine the coastal zone boundary to include more of CNPCP's management area. This will expand their permitting authority to include the entire CNPCP management area. A scientific analysis was funded with Section 319 funds for revision of Louisiana's coastal zone boundary. The final report, "Defining Louisiana's Coastal Zone: A Science Based Evaluation of the Louisiana Coastal Zone Inland Boundary" was completed in August 2010. This report was reviewed and approved by USEPA Region 6. The report and recommendations by LDNR-OCM was reviewed and the revised boundary was adopted by the state legislature in 2012. The revised boundary includes the entire BTNEP management area and also expands coastal permitting authorities inland, providing more protection for coastal and inland waters. The revised coastal zone boundary provides additional opportunities for LDNR-OCM and LDEQ to partner with agencies and parishes on watershed planning, implementation and coastal restoration.

Louisiana's coastal wetlands conservation inland boundary generally begins at the state line of Texas and Louisiana and proceeds east through parishes of Calcasieu and Cameron then south through Vermilion, Iberia, St. Mary, St. Martin, Assumption, Terrebonne and Lafourche. The boundary then turns to north to include parishes of St. Charles, St. John the Baptist, St. James and then east through Livingston, Tangipahoa and St. Tammany parishes to the Mississippi state line.

LDNR-OCM is charged with implementing Louisiana's Coastal Resource Program (LCRP) under authority of State and Local Coastal Resources Management Act (SLCRMA) of 1978, as amended (LA.R.S. 49:214.21-214.41). The SLCRMA provides for parishes to have local coastal management programs and assume authority over certain types of coastal uses. However, in order to obtain this authority, parishes need to develop a local coastal management plan which must be approved by state and federal coastal management agencies. There are currently 10 Local Coastal Programs (LCP) in Louisiana.

The State of Louisiana has an effective coastal management program which requires permits for activities that have potential impacts to coastal resources within the Louisiana coastal zone boundary (legislated by state statute, R.S. 49:214 et seq.) of the coastal parishes. LDNR's Coastal Restoration Program works with CPRA on all coastal restoration projects and plans for restoring wetlands of coastal Louisiana. LDNR-OCM and parish LCP have authority to include BMPs and NPS conditions in permits. These conditions prevent and reduce NPS pollution in the state's coastal waters.

Since Louisiana loses approximately 25 square miles of coastal lands each year because of subsidence and alteration to hydrology, restoring coastal wetlands will continue to be the primary focus of coastal programs. The two hurricanes of 2005, Katrina and Rita, brought problems associated with coastal wetland loss to the forefront of the state and the nation. An additional 250 square miles of land were lost through impacts of these two storms. Reports from the scientific community suggest that Louisiana needs to make major progress in restoring its coastal wetlands over the next ten years or the problems may be impossible to solve.

The state's comprehensive restoration plan should be effective in restoring a portion of these wetlands, but many complex issues remain in balancing water quality and ecological habitat with survival of coastal communities and industries. If Louisiana and the nation are not successful in this endeavor, significant coastal resources will be lost. Coastal NPS pollution factors into this myriad of issues, as an additional way to protect water quality, improve coastal forests and protect marshes. However, since subsidence and saltwater intrusion are two critical factors affecting coastal land loss, the only way to offset these impacts is by re-introduction of sediment, nutrients and organic material back into coastal wetland systems. Louisiana's CNPCP will be unique from other states; however, it can still focus on CZARA categories: agriculture, forestry, urban, hydromodification, marinas and wetlands, riparian areas, and vegetated treatment systems.

Since hurricanes caused so much damage to infrastructure (i.e. roads and highways, homes, wastewater treatment systems, etc.,), it is an opportune time to incorporate coastal NPS management measures into projects built in coastal parishes of Louisiana. These coastal NPS management strategies are consistent with those of the rest of the state except that emphasis will be placed on diverting treated waste water and storm water back to coastal wetlands, in order to introduce fresh water, nutrients and solids to subsiding wetlands. NPS pollutants from agricultural fields and pastures, forested wetlands and home sewerage systems still need to be managed so that designated uses of receiving waters are protected and restored. Therefore each category of land-use still utilizes a set of management practices aimed at keeping pollutants on-site, but some of these pollutants may also be diverted through storm water control pumps or wastewater treatment systems to natural wetlands instead of receiving streams.

LDEQ has an active NPS program, as described in this document that relates to the entire state. The same set of BMPs included in each of the statewide programs can also be implemented in coastal parishes and watersheds. Through a combination of regulatory and voluntary programs, coastal waters can be managed to restore and maintain designated uses. For CNPCP, LDNR-OCM and LDEQ will ensure coastal management measures are implemented in coastal NPS management areas. CNPCP is a technology based program rather than a water quality based program, meaning management measures are implemented throughout the entire coastal management area whether there is a water quality problem or not. Implementation of CZARA management measures should result in water quality protection and restoration throughout Louisiana's coastal zone.

Louisiana Environmental Regulatory Code (ERC) Title 33, Part IX, Subpart 1 includes language requiring NPS BMPs to protect healthy waters as part of the antidegradation policy:

§1109 *All waters of the state, including interstate, intrastate, and coastal waters, and any portions thereof, whose existing quality exceeds specifications of approved water quality standards or otherwise supports an unusual abundance and diversity of fish and wildlife resources, such as waters of national and state parks and refuges, will be maintained at the existing high quality. The state may choose to allow lower water quality in waters that exceed the standards to accommodate justifiable economic and/or social development in the areas in which the waters are located, but not to the extent of violating the established water quality standards. Appropriate use attainability analyses will be required before any lowering of water quality will be allowed. No such changes, however, will be allowed if they interfere with or become injurious to the existing water uses. No lowering of water quality will be allowed in waters where standards for the designated water uses are not currently being attained.*

The administrative authority will not approve any wastewater discharge or certify any activity for federal permit that would impair water quality or use of state waters. Waste discharges must comply with applicable state and federal laws for the attainment of water quality goals. Any new, existing, or expanded point source or nonpoint source discharging into state waters, including any land clearing which is the subject of a federal permit application, will be required to provide the necessary level of waste treatment to protect state waters as determined by the administrative authority. Further, the highest statutory and regulatory requirements shall be achieved for all existing point sources and best management practices (BMPs) for nonpoint sources. Additionally, no degradation shall be allowed in high-quality waters that constitute outstanding natural resource waters, such as waters in the Louisiana Natural and Scenic Rivers System or waters of ecological significance as designated by the department. Those water bodies presently designated as outstanding natural resources are listed in LRC.

LDEQ in coordination with LDNR provided a letter to NOAA and USEPA in 2003, documenting regulatory authorities that exist to ensure CZARA management measures are implemented. NOAA indicated these authorities were sufficient for program approval. Louisiana’s Coastal NPS Program has been conditionally approved. In 2006, NOAA and USEPA provided LDEQ and LDNR with a table, which outlined remaining steps for federal agencies and the state to reach full approval on Louisiana’s CNPCP. Louisiana is committed to meeting that goal of full approval. Other major partners involved in Louisiana’s CNPCP include LPBF, BTNEP and Atchafalaya Basin Program. To fulfill steps of gaining full approval on CNPCP, LDEQ and LDNR entered into three cooperative agreements for Section 319 funds. These agreements included development of three BMP manuals specific to Louisiana’s coastal zone. The three manuals included were for urban storm water runoff, storm water runoff from roads, highways, and bridges and hydromodification. The agreements also included a series of training sessions with LCP for these BMP manuals. The third agreement related to addressing water quality problems from onsite disposal systems on north shore of Lake Pontchartrain. Wastewater treatment plant assistance in north shore watersheds assists individual owners on operation and maintenance of their OSDS.

Agriculture

Although most agricultural production in Louisiana exists north of the coastal zone boundary and coastal management area, there is some agricultural production in lower Mermentau, Vermilion-Teche, Terrebonne, Barataria basins and north of Lake Pontchartrain. The types of crops that exist in these areas include rice, crawfish, sugarcane, pastures and dairy operations. LDEQ and LDNR partnered with USDA, LDAF, LSU AgCenter and Louisiana's Farm Bureau on implementation of agricultural components of CNPCP.

Collaboration with these agencies partially relies on LDEQ's 303(d) list of impaired waters as basis for targeting where agricultural BMP implementation should be prioritized. The 303(d) listed waters that have had TMDLs developed for them are first priority for inclusion in USDA Farm Bill Programs and Section 319 cost-share projects currently administered through OSWC at LDAF. These areas also form the basis for prioritizing where Master Farmer Program will be implemented. During the past 5 years, extensive agricultural BMP implementation occurred for all agricultural commodities that exist in coastal management areas. LDEQ reports progress made in BMP implementation each year through USEPA grants reporting system (GRTs) for Section 319 funds and through USDA's annual reporting tool, by parish. All of this information is summarized in LDEQ's NPS Annual Report, submitted to USEPA Region 6 in January of each year.

In addition to evaluating progress made each year in implementing agricultural BMPs, LDEQ samples water quality on a 4-year cycle for each watershed in the state. These data are summarized through the state's IR every two years so LDEQ and the public can see whether water quality is improving as a result of BMP implementation. Any progress made in improving water quality is also reported through LDEQ's NPS Annual Report, submitted to USEPA in January of each year. This information is available on-line at LDEQ's website: http://www.deq.la.gov. The 2008 IR indicated that designated uses for contact recreation (i.e. swimming and boating) are met in majority of coastal waters. There are only a few watersheds in Calcasieu, Vermilion-Teche and Terrebonne basins impaired because of fecal coliform bacteria. There are areas at the mouth of the Mississippi River and in Lake Pontchartrain basin impaired for fecal coliform bacteria; therefore, TMDLs were developed for these waters by USEPA Region 6 in December 2011. The location of these waters indicates fecal coliform is primarily from urban areas except for the mouth of Mississippi River, where sources of bacteria include marina/boating discharges, on-site treatment systems and petroleum/natural gas activities. Therefore agricultural runoff does not appear to be affecting contact recreation for coastal waters. However, impacts to coastal waters do prevent FWP uses from being met in watersheds that have agricultural activities associated with them. This information forms the basis of working with agricultural agencies on implementation of management measures for cropland and pastures. Programs such as Master Farmer are important in reaching out to local farmers and helping them implement management measures necessary to improve water quality. The Master Farmer Program currently has approximately 287,850 acres of farmland participating in CNPCP management area. According to information on LSU AgCenter's webpage http://www.lsuagcenter.com/en/environment/conservation/master_farmer/ for Master Farmer Program, participant levels in CNPCP management area are currently at 8 for Phase III and 273 for Phase II of the program. Master Farmer BMP manuals include the types of practices included in NOAA and USEPA guidance documents for agricultural sources. “Guidance for Specifying Management Measures for Coastal NPS Pollution in Coastal Waters” included these agricultural management measures:

Agricultural Management Measures

A. Erosion and Sediment Control Management Measure
B. Management Measure for Facility Wastewater and Runoff from Confined Animal Facility Management (Large and Small Units)
C. Nutrient Management Plans
D. Pesticide Management Plans
E. Grazing Management Measure
F. Irrigation Water Management

There is a micro-watershed implementation project described in the Mermentau River Basin section of the NPS Management Plan which includes types of agricultural practices and programs that reduce NPS pollutants. LDEQ and LDNR will also be partnering with USDA and LDAF on a Conservation Reserve Enhancement Project (CREP) to restore native prairie grasses in portions of lower Mermentau River Basin. This is the same area where water bodies are impaired by agricultural NPS of pollution. More detailed descriptions of watershed specific programs are included in chapters of the NPS Plan on watershed implementation. All of these activities combined with efforts through Master Farmer Program and Farm Bill programs will assist the State to meet water quality goals of restoring and maintaining Louisiana’s coastal waters.

Forestry

The majority of forests in Louisiana are north of the coastal zone or coastal management areas, but forests do exist in Atchafalaya, Terrebonne, Barataria and Lake Pontchartrain Basins. Louisiana has a forestry BMP manual utilized extensively in private and commercial forestry operations with recent estimates of 96percent compliance rate for forestry BMPs. Therefore most inland forestry operations are in compliance with the Forestry BMP Manual that NOAA and EPA determined was consistent with CZARA’s management measures. A website which contains forestry BMP information was developed by LSU AgCenter. The most recent BMP survey evaluated 145 sites across the state, including data and information on compliance with BMPs. Louisiana has a process to detect inconsistent forestry practices and requires landowners or loggers to correct problems caused by poor forestry practices. If these problems are not corrected, the logger can lose Master Logger certification and not be allowed to sell timber in Louisiana. “Guidance for Specifying Management Measures for Coastal NPS Pollution in Coastal Waters” included these forestry management measures:

Management Measures for Forestry

1. Preharvest Planning
2. Streamside Management Areas
3. Road Construction/Reconstruction
4. Road Management
5. Timber Harvesting
6. Site Preparation and Forest Regeneration
7. Fire Management
8. Revegetation of Disturbed Areas
9. Forest Chemical Management

In coastal Louisiana, loss of wetland forests (primarily cypress-tupelo forests) has become an issue in coastal management areas since relatively young cypress forests are considered mature enough to harvest for cypress logs and mulch. Pages 76-81 of the NPS management plan includes detailed information on this topic, which was included in reports from SWG and the Advisory Panel to the Governor’s Office. Since Louisiana’s coastal wetlands have subsided and flood frequency has increased, many cypress-tupelo forests are now constantly inundated and may not be able to regenerate either naturally or artificially. Therefore, if these forests are harvested, the land could convert to marsh and eventually to open water.

In 2004, the Governor's Office of Coastal Activities formed a SWG and an Advisory Panel, to determine whether state policies should be developed to protect these cypress-tupelo forests. The two groups met and produced a report and a set of recommendations on both science and policy of this issue. The SWG Report included a set of findings and recommendations which have been included here that describe initial steps toward protecting and sustaining these forests in coastal Louisiana.

Science Working Group (SWG) Findings

1. *Louisiana's CWF are of tremendous economic, ecological, cultural and recreational value to residents of Louisiana and people of the United States and the world; and include:*
2. *Wildlife habitat (including migratory songbirds/waterfowl, threatened and endangered species);*
3. *Flood protection, water quality improvement (including nitrate removal), and storm protection;*
4. *Carbon storage and soil stabilization;*
5. *Economic benefits of fishing, crawfishing, hunting, timber production, and ecotourism;*
6. *The functions and ecosystem services of Louisiana's CWFs are threatened by large-scale and small-scale hydrologic and geomorphic alterations and by conversion of these forests to other uses;*
7. *Subsidence, sea-level rise, and levee construction are large-scale hydrologic and geomorphic alterations responsible for loss of Louisiana's coastal wetland ecosystems, which include CWFs. Since Louisiana's CWFs are nutrient deprived as a result of the Mississippi River levee system, additional nutrients and sediment are the only way for these ecosystems to maintain their surface elevation relative to sea-level rise.*
8. *The cumulative effects of small-scale or local factors can be of equal or greater importance in CWF loss and degradation than large-scale alternation. These factors include increased depth and duration of flooding, saltwater intrusion, nutrient and sediment deprivation, herbivory, invasive species, and direct loss due to conversion. Causal agents include highways, railroads, channelization, navigation canals, oil and gas exploration canals, flood control structures, conversion of forests to urban and agricultural land, and non-sustainable forest practices.*
9. *Under less severe impacts, many of the important functions and ecosystem services are lost or degraded even though the trees may be intact and the forest may appear unaffected.*

Without appropriate human intervention to alleviate factors causing degradation, most of coastal Louisiana will inevitably experience loss of CWF functions and ecosystem services through conversion to open water, marsh, or other land uses.

Regeneration is a critical process of specific concern in maintaining CWF resources. Successful natural regeneration of this resource in the 1920s was due to fortuitous conditions existing at that time. Currently, there is a lack of regeneration in coastal cypress-tupelo forests that is a direct result of factors identified in SWG Findings and their interaction with regeneration processes.

In those areas where flooding prevents or limits natural regeneration of bald cypress-tupelo forests, artificial regeneration through tree planting is the only current viable mechanism to regenerate the forest. Some swamps are altered to such a significant extent that even artificial regeneration is not possible. Coppice or stump sprouting does not provide sufficient numbers of viable trees to reliably regenerate the forest, even under optimum conditions.

Conditions affecting potential for forest regeneration and establishment are recognizable, based upon existing biological and physical factors. The SWG has developed a set of condition classes for dominant wetland forest types in Louisiana's coastal bald cypress-tupelo forests. All references to flooding depths or duration assume average rainfall conditions, not extreme or unusual events. Sediment input is generally beneficial, but in localized situations, excessive levels can prevent or prohibit natural or artificial regeneration under SWG Condition Classes I and II. The SWG cypress-tupelo coastal wetland forest regeneration condition classes are:

SWG Condition Class I: Sites with Potential for Natural Regeneration

These sites are generally connected to a source of fresh surface or ground water and are flooded or ponded periodically on an annual basis (pulsing). They must have seasonal flooding and dry cycles (regular flushing with fresh water). Also they usually have both sediment and nutrient inputs, and sites in the best condition are not subsiding. These sites have some level of positive tree growth, thereby providing increasing or stable biomass production, organic input, and recharge of water table after drought periods. Sites in this category that are subject to increasing flood frequency, increased flood duration, or increasing flood water depths may eventually move to the next lower category unless action is taken to remedy these detrimental conditions.

SWG Condition Class II: Sites with Potential for Artificial Regeneration Only

These sites may have over story trees with full crowns and few signs of canopy deterioration, but are either permanently flooded (which prevents seed germination and seedling establishment in the case of bald cypress and tupelo) or are flooded deeply enough that when natural regeneration does occur during low water, seedlings cannot grow tall enough between flood events for at least 50percent of their crown to remain above high water level during the growing season. These conditions require artificial regeneration, (i.e. planting of tree seedlings). Water depth for sites in this category is restricted to a maximum of two feet for practical reasons related to planting of tree seedlings. Planted seedlings should have at least 12 inches of crown (length of mainstem with branches and foliage present) and must be tall enough for at least 50 percent of the crown to remain above high water level during the growing season. Sites with a negative trajectory (increasing average annual water depth) may eventually move into SWG Condition Class III unless action is taken to remedy this detrimental condition.

SWG Condition Class III: Sites with No Potential for either Natural or Artificial Regeneration

These sites are either flooded for periods long enough to prevent natural regeneration and practical artificial regeneration, or are subject to saltwater intrusion with salinity levels that are toxic to cypress-tupelo forests. Two trajectories are possible for these two conditions:

1) freshwater forests transitioning to either floating marsh or open fresh water, or
2) forested areas with saltwater intrusion that are transitioning to open brackish

or saltwater (marsh may be an intermediate condition). SWG Category III sites are placed in specific sub-categories relative to stress conditions as listed below. They may differ in the types of recommendations made or actions that should be taken relative to the particular stressing agent.

A. Forests with saltwater intrusion or high soil salinity:
   1. Chronic (semi-permanent) saltwater intrusion (i.e., coastal areas with high rates of subsidence). These are sites where saltwater intrusion is of a long-term nature and requires correction.
      a. For bald cypress, chronic levels of soil salinity of four parts per thousand (ppt) or greater increases mortality of seedlings and makes the likelihood of regeneration unreliable.
      b. For tupelo, chronic levels of salinity greater than two ppt increase mortality.
   2. Acute (temporary) flooding with saline waters such as from storm surges. These conditions are temporary and tolerance can be much higher.

B. Forests with water levels exceeding two feet at time of planting makes artificial regeneration impractical.

SWG Recommendations

1. Adopt the following statement of mission and intent regarding coastal wetland forest ecosystem policy: The State of Louisiana will place priority on conserving, restoring and managing CWFs, including collaborative efforts among public and private stakeholders, to ensure that their functions and ecosystem services will be available to present and future citizens of Louisiana and the United States.
2. Recognize the regeneration condition classes (Finding 5) for cypress-tupelo forests developed by SWG and use them to classify existing CWF site conditions for management, restoration, protection, and use purposes.
3. Place priority on maintaining hydrologic conditions on SWG Regeneration Condition Class I lands.
4. Delay timber harvesting on Condition Class III lands because these lands will not regenerate to forests. The goal is to allow time for hydrologic restoration and improvement of stand conditions to Class I and Class II lands. Place an interim moratorium on harvesting on state-owned Condition Class III lands. Develop mechanisms to delay timber harvesting on privately owned Condition Class III lands.
5. Before harvesting SWG Condition Class I and II sites, a written forest management plan with specific plans for regeneration must be reviewed by a state-approved entity so appropriate practices can be suggested based on local site conditions. The intent is to ensure that cypress-tupelo

regeneration and long-term establishment take place and that species or wetland type conversion does not occur.

6. Develop spatially explicit data regarding SWG Condition Classes, existing hydrologic and geomorphic conditions, and current and future threats to CWFs. This data should be collected, evaluated, and updated by a consortium of state, local and federal agencies, universities and non-governmental organizations and made available to all stakeholders. Adding remotely sensed data to this data set should be aggressively pursued. Such data are critical to wisely manage and care for the CWF wetland ecosystem of Louisiana.
7. Establish and maintain a system of long-term monitoring of CWF conditions, supplemental to Forestry Inventory and Analysis (FIA) and Coastal Reference Monitoring System (CRMS) datasets, expanded to include the entire SWG coastal wetland forest area. Additionally, monitoring of restoration should occur, and include measures to evaluate success. This may entail some long-term efforts because forests may take 25 years to establish functioning stands.
8. CWFs extend beyond the Coastal Zone Boundary. Therefore, target areas for large scale restoration should be expanded to include CWFs as defined by the SWG, especially those in major river bottoms draining to the coast (e.g. Atchafalaya and Pearl River Basins) and those with extensive areas of CWFs (e.g. Lake Maurepas).
9. Direct all state and local agencies to review, evaluate and coordinate their activities in CWFs and develop guidelines and practices to prevent loss and degradation of habitat, functions, and ecosystem services through official actions. The Governor should also officially request that federal agencies do the same.
10. Review and modify current accepted practices for mitigation of impacts on CWFs. Given the uniqueness of Louisiana's CWFs, all mitigation must be of the same forest type and occur in the same watershed where impacts are located.
11. Encourage conservation and protection of CWF areas by developing a CWF Reserve System.
12. Actively pursue restoration of degraded wetland forests, regardless of SWG condition class. Encourage collaborative efforts between public and private stakeholders including development or modification federal legislation to include degraded CWFs in landowner incentives programs.
13. Enhance wetland forest ecosystem functions and values as part of all hydrological management decisions, including management of point and NPS inputs, floodways, creation of diversion, levee and highway construction, and coastal management.
14. Develop policies to ensure implementation of the above recommendations. Various incentive mechanisms should be explored as part of policy implementation.

Federal and State Authorities

The SWG Report to the Governor also included a section on policies and regulations applicable to harvest of CWFs. These regulations include CWA Section 404 and Silvicultural Exemptions, Rivers and Harbors Act of 1899 and existing state regulations.

CWA Section 404 governs timber harvests in coastal and freshwater wetlands and is primarily regulated by USEPA. Section 404 established a program to regulate discharge of dredged or fill material to waters of the U.S., including wetlands. A permit is required before any dredged or fill material may be discharged into waters of the U.S., unless the activity is exempt from Section 404(i.e. certain farming and forestry activities). However if an activity involving a discharge of dredged or fill material represents a new use of the wetland (i.e. conversion to upland), and the activity would reduce reach or impair flow or circulation of regulated waters, including wetlands, then this activity is not exempt. Determination of whether logging activities in cypress/tupelo forests in coastal Louisiana are exempt under CWA Section 404(f) is currently determined on a case-by-case basis, after taking into consideration information specific to each proposed logging operation (SWG Report).

Section 10 of Rivers and Harbors Act of 1899 prohibits unauthorized obstruction or alteration of any navigable water of the U.S., unless a Department of the Army permit has been issued by Corps of Engineers. Section 10 jurisdictions include those waters that are subject to ebb and flow of the tide and/or are presently used, or have been used in the past, or are susceptible for use to transport interstate or foreign commerce. In tidal waters, the shoreward limit of navigable waters extends to the line on the shore reached by the plane of the high water mark. In bays and estuaries, it extends to the entire surface and bed of all bodies of water subject to tidal action. In rivers and lakes, jurisdiction extends laterally over the entire water surface and bed of a navigable water body, including all land and waters below the ordinary high water mark. Therefore, Section 10 jurisdiction extends to marshes and forested wetlands that lie between the channel and mean high water mark. Unlike the CWA, there are no exemptions under Section 10 for regulated work associated with silvicultural activities. Section 10 permits would be required for deposition or redistribution of fill material associated with logging roads, stream crossings, and staging areas, construction or placement of structures such as timber mats and loading/offloading ramps, stockpiling of timber, and excavating or dredging for any reason.

State regulations require landowners that conduct timber harvesting on lands located within Louisiana's Coastal Zone to obtain a coastal use permit prior to commencing work if the U.S. Army Corps of Engineers has determined that their operation is not exempt from CWA 404 or Section 10 of the Rivers and Harbor Act.

In Louisiana's Forestry BMP Manual, forested wetlands are given special attention, with approximately one third of the total BMP guidelines devoted to forested wetlands. These BMPs consist of 15 mandatory practices for roads in jurisdictional wetlands, including water regime flow and vegetative disturbance resulting from road construction and maintenance, borrow and fill material, and culverts. These mandatory BMPs provide protection of habitat for threatened and endangered species, breeding and nesting areas for waterfowl and spawning beds, and prohibitions for discharge in proximity of public water supplies, into concentrated shellfish populations, national wild and scenic river systems.

The Advisory Panel consisted of a wide range of stakeholders, including federal and state agencies, environmental organizations and representatives of the forestry industry. They met with the SWG and then alone to make recommendations to the Governor's Office on policy issues related to Louisiana's CWFs. These recommendations were finalized in March 2007 and submitted to the Governor's Office.

LDEQ would need to partner with LDNR's OCM, OCPR and LOF on a survey or monitoring system to determine whether forestry management measures are implemented for forestry operations in coastal management areas. LDEQ will continue to monitor waters to determine whether water quality is improving as a result of program implementation. LDEQ also utilizes satellite imagery to evaluate the extent of cypress-tupelo harvesting and would need to partner with other agencies on a comprehensive database to monitor logging activities for three condition classes of cypress-tupelo forests.

Urban Areas

CNPCP includes urban runoff from new development, watershed protection, construction, existing development, onsite disposal systems, pollution prevention and runoff from roads, highways and bridges. Hurricanes Rita and Katrina caused such extensive damage in coastal Louisiana; there may not be extensive new residential and commercial development in some areas of the coast. Where new development does require that new onsite disposal systems be installed, there are new opportunities for pollution prevention and watershed protection. In addition to redevelopment, LDEQ is involved in watershed planning in watersheds that have impaired waters. Examples of watershed plans can be found on LDEQ's website: http://www.deq.la.gov.

The complexities of Louisiana's coastal hydrology and wetland subsidence require close coordination of Coastal Restoration and Water Quality Programs. Coastal restoration projects are designed to add sediment and nutrients to subsiding wetlands in the same part of the state where coastal NPS programs are designed to prevent sediment and nutrients from entering water bodies that are not meeting their designated uses because of low DO. Therefore, watershed planning and management will be the only way to understand how and where to route storm water and wastewater to wetlands and coastal forests to offset effects of saltwater intrusion and subsidence. "Guidance for Specifying Management Measures for Coastal NPS Pollution in Coastal Waters" included these urban management measures:

<u>Urban Management Measures</u>

Urban Runoff

A. New Development Management Measure
B. Watershed Protection and Management
C. Site Development Management Measure

Construction Activities

A. Construction Site Erosion and Sediment Control Management Measure
B. Construction Site Chemical Control Management Measure

Existing Development

A. Existing Development Management Measure

On-Site Disposal Systems Management Measures

A. New Onsite Disposal Systems Management Measure
B. Operating On-site Disposal Systems

Roads, Highways and Bridges

A. Management Measure for Planning, Siting and Developing
B. Management Measure for Bridges
C. Management Measure for Construction Projects
D. Management Measure for Construction Site Chemical Control

E. Management Measure for Operation and Maintenance
F. Management Measure for Road, Highway and Bridge Runoff Systems

Most coastal parishes have ordinances that require urban detention of storm waters for new developments to offset increased discharge of storm water as a result of increased impervious surfaces. Whereas the primary focus of these ordinances has been for water quantity, BMPs can be factored into storm water controls to filter sediment and utilize nutrients through native vegetation along swales and detention areas. LDEQ requires post-construction storm water BMPs for all cities and/or parishes included under authorities of storm water regulations, and has completed reports useful to cities on how to incorporate these types of practices into landscape codes and development ordinances.

During construction activities, all developments of 1 acre or more are required to follow LDEQ's storm water permit, which includes sediment and erosion control measures to reduce the amount of sediment from development sites during construction phase of the project. Pollution prevention plans are also required for each new development site in order to reduce pollutant loads associated with earth moving and construction. LDEQ and LDNR have permit authorities to oversee new development and are requiring BMPs in pollution prevention plans and as permit requirements.

Louisiana has an active watershed protection and management program for all water bodies impaired and have TMDLs developed for them. Approximately 670 TMDLs have been completed for watersheds in Calcasieu, Mermentau, Vermilion-Teche, Terrebonne and the Barataria basins. For each TMDL that is developed for DO, a detailed watershed plan is developed which describes the types of land-uses that exist and types of BMPs that need to be implemented to reduce and control these types of pollutants. TMDLs were scheduled for the Terrebonne, Sabine and Lake Pontchartrain Basins for 2007-2011, therefore watershed plans will be developed for each of these watersheds as well. Through this watershed planning process, a synthesis of water quality data is combined with detailed information on land-use provided through satellite imagery classification. A watershed model such as AnnAGNPS or SWAT is utilized, when possible, to determine areas in the watershed for targeting where BMPs need to be implemented. This watershed plan can then guide local stakeholders in how watershed implementation should occur to restore designated uses to the impaired water body.

LDNR-OCM partners with coastal parishes and coastal restoration programs on watershed protection and management. The State of Louisiana has completed the Master Plan for Restoring a Sustainable Coast and this document outlined a state strategy for integrated ecosystem restoration and hurricane protection. As Louisiana continues watershed implementation, coastal NPS issues continue to be coordinated with coastal restoration efforts.

Site Development

All site development in coastal management areas is governed by either LDEQ's Storm Water Permit Program or LDNR Coastal Management Permitting Program. For all roads, highways and bridges, all site designs follow LDOTD standards and specifications http://www.dotd.state.la.us/. Site design plans factor in impacts to wetlands, waterways and natural drainages and require 404 permits and a 401 water quality certification if alteration to any of these sensitive areas is planned. Pursuant to LAC Title 43, Part I, Chapter 7, 701.F. and G., OCM can request, for any proposed coastal use, additional information that addresses polluted runoff. Among other aspects of OCM's review of applications for new subdivisions, applicants for such projects must return a "Subdivision Information Packet." The packet requests information concerning environmental impacts and specifically asks how storm water runoff will be addressed and handled during "site preparation and construction phases and also after the project has been completed". BMPs for assistance in developing site plans to ameliorate water quality issues associated with runoff are included in the Subdivision Information Packet. The additional information for new subdivisions is contained at http://dnr.louisiana.gov/index.cfm?md=pagebuilder&tmp=home&pid=93. Another tool for addressing runoff is the "Drainage Impact Study" which may be required if review of a CUP application suggests there may be issues with polluted runoff. The "Drainage Impact Study" requires the applicant to obtain a CUP to address the following:

a) Techniques and materials used in construction, operation, and maintenance of use;
b) Existing drainage patterns and water regimes of surrounding area including flow, circulation, quality, quantity, and salinity; and impacts of the proposed activity on them, both during construction and at the site thereafter;
c) Minimization of point and NPS pollution, both during construction and at the site thereafter;
d) Minimization of detrimental changes in littoral and sediment transport, both during construction and at the site thereafter;
e) Minimization of detrimental discharges of suspended solids to coastal waters, including turbidity resulting from dredging/excavation, both during construction and at the site thereafter; and
f) Documentation that runoff from developed areas shall, to the maximum extent practicable, be managed to simulate natural water patterns, quantity, and rate of flow, both during construction and at the site thereafter.

There is more oversight in coastal Louisiana than any other part of the state because of efforts of LDNR-OCM, OCPR and LDEQ. LDEQ recently completed a project with a landscape architect in which landscape codes can be revised to include additional storm water BMPs http://www.abbey-associates.com. LDEQ and LDNR are partnering to introduce these concepts to coastal parishes and communities and will continue to evaluate progress on an annual basis toward this end. Through *Louisiana Speaks,* a set of recommendations to coastal parishes and communities on how innovative site designs can be utilized for development and redevelopment to reduce urban sprawl and include green space and storm water controls in site designs in coastal communities http://www.cpex.org.

Existing Development

One of the largest challenges for NPS pollution controls are existing developments designed before storm water detention was required. LDEQ partnered with landscape architects on a handbook and websites for cities and small communities to redesign landscaped areas to include storm water controls. The city of Baton Rouge provided an opportunity to retrofit several areas with storm water BMPs such as rain gardens, grassed swales, and buffers as examples of how to reduce urban storm water entering the Amite River. However in a state with as much damaged infrastructure as Louisiana had in 2005, parishes may be more focused on new developments rather than retrofitting existing developments. Louisiana experienced post-hurricane construction and development that allowed coastal parishes and cities to incorporate landscape codes and ordinances for development in their on-going operations. OCPR has partnered with Center for Planning Excellence (CPEX) on a coastal communities tool-kit that provides information on sustainable development techniques.

On-Site Disposal Systems

The State of Louisiana operates on-site disposal systems according to state polices outlined in the State's sanitary code. This code functions in the same manner throughout the state of Louisiana, whether it is inside or outside of the coastal zone or the management area. A map provided by LDHH illustrated that in coastal Louisiana, one challenge of individual sewage systems is camps. The Home Sewerage Section of the NPS Plan outlined steps LDEQ and LDNR continue to partner on to improve oversight and management of onsite disposal systems. LPBF and BTNEP have partnered with LDEQ on these efforts to reduce the amount of pollution entering coastal waters from on-site systems. For camps in coastal areas, an innovative system was evaluated with support from LDEQ, LDHH, BTNEP and GOMP to determine its effectiveness in reducing nutrients and coliform bacteria from entering the state's water bodies.

Marinas

LDNR-OCM has an approved Clean Marina Program for marinas in coastal Louisiana. Whereas the hurricanes damaged many of these marinas, the program is still in place and has been an effective mechanism for marina operators to learn what is expected of them from the state and federal government. "Guidance for Specifying Management Measures for Coastal NPS Pollution in Coastal Waters" included these marina management measures:

A. Marina Flushing Management Measure
B. Water Quality Assessment Management Measure
C. Habitat Assessment Management Measure
D. Shoreline Stabilization Management Measure
E. Storm Water Runoff Management Measure
F. Fueling Station Design Management Measure
G. Sewage Facility Management Measure
H. Fish Waste Management Measure
I. Liquid Material Management Measure
J. Petroleum Control Management Measure
K. Boat Cleaning Management Measure
L. Maintenance of Sewage Facilities Management Measure
M. Public Education Management Measure

The Louisiana Clean Marina Program promotes and celebrates voluntary adoption of measures to assist marinas and recreational boaters in protecting Louisiana's waters. Designated clean marinas are recognized as environmentally responsible businesses and enjoy positive goodwill and economic feedback of being able to promote their business as: A Clean Marina. Marina operators adopt BMPs in operation and maintenance of their marinas. These BMPs are provided to operators in a guidebook and in other educational materials. In addition, technical help and advice is provided by members of various Louisiana Clean Marina member committees. Clean Marina Certification is achieved after a marina has met a minimum score on the checklist criteria based on BMP options. Operators will conduct self assessments which will be verified by representatives of the Certification Committee. Certification is maintained through an annual re-evaluation of marina BMPs.

Hydromodification

Alteration of streams, bayous and drainage ways to maintain and improve navigation or improve drainage to reduce localized flooding has been an on-going process in many of Louisiana's coastal water bodies. Since coastal communities have developed in floodplains, on natural ridges and in areas just above and even below sea level, flooding and flood control projects are a reality of living in south Louisiana. Levee control boards, drainage boards and police juries often share this responsibility and every coastal parish has a plan with a board on how to manage drainage and reduce the potential for flooding of their communities. Louisiana's coast is an infrastructure that evolved to support commercial and recreational fishing, shrimp, oyster, oil and gas production and shipping. Whereas it is highly utilized for recreational boating and fishing and has an extensive network of camps, there are not really many areas that are classified as recreational beaches or tourist areas. Routine dredging in coastal areas provides flood protection and navigation routes for shipping.

However, federal and state permits are required for any alteration of natural or man-made water bodies. Section 10 of the Rivers and Harbors Act and 404 of the CWA are administered by the Corps of Engineers and require 401 Water Quality Certifications and CUPs from LDEQ and LDNR, respectively. Through these two permitting processes, coastal management measure BMPs can be required for hydromodification activities. "Guidance for Specifying Management Measures for Coastal NPS Pollution in Coastal Waters" included these hydromodification management measures:

Hydromodification Management Measures

Channelization and Channel Modification

A. Management Measure for Physical and Chemical Characteristics of Surface Waters
B. Instream and Riparian Habitat Restoration Management Measure

Stream bank and Shoreline Erosion

A. Management Measure for Eroding Stream banks and Shorelines

Louisiana protects physical and chemical characteristics of its surface waters through all of its permitting programs and through implementation of BMPs for its NPS Program. Stream banks that are forested in Louisiana provide the necessary shade during summer and fall months when temperatures are high and flows in the main channel are sluggish to non-existent. One component of the watershed planning process is to examine physical attributes of the stream bank and the type of vegetation that exists along the bank. Many urban areas have servitudes that protect these riparian areas from clearing or building and USDA has many cost-share programs to encourage protection of the stream bank. Whereas most of these areas are on private land and therefore remain in the hands of the landowner, any alteration of the stream bank in coastal areas does require a CUP and/or a Section 10 or 404 permits from Corps of Engineers. Therefore management practices can be conditions of those permits or water quality certifications.

Louisiana utilizes several practices to protect shorelines from erosion through vegetative plantings and Christmas tree projects that stake trees in place as a mechanism to build up soil. Erosion control projects break wave energy and reduce impacts to fragile coastal soils. Any alteration to shorelines also requires federal and/or state permits that allow management measures be included as conditions of the permit. Louisiana's Coastal Restoration Program has an extensive list of projects where efforts have been made to stabilize coastal shorelines.

Wetlands, Riparian Areas, and Vegetated Treatment Systems

Louisiana has many existing programs, projects and regulations that protect wetland and riparian areas in CZARA management areas. In addition to CNPCP and the NPS Program, activities outlined in this chapter under Urban Runoff Management Measures for New Development, Site Development, Erosion and Sediment Control, Watershed Protection, and Existing Development also relate to this Management Measure.

Wetland, Riparian Areas and Vegetated Treatment Systems Management Measures

A. Management Measure for Protection of Wetlands and Riparian Areas
B. Management Measure for Restoration of Wetland and Riparian Areas
C. Vegetated Treatment Systems

Louisiana not only meets restoration management measures by implementing restoration for wetland and riparian areas through various programs and plans mentioned above, but has restoration programs, projects and regulations for wetland and riparian areas including but not limited to the coastal zone. Restoration projects in the coastal zone can be found at LDNR's OCRM website: http://coastal.louisiana.gov/index.cfm?md=pagebuilder&tmp=home&nid=78&pnid=0&pid=97&catid=0&elid=0 and projects located outside the coastal zone can be found at LDEQ's NPS Program website (319 Projects, http://nonpoint.deq.louisiana.gov/wqa/default.htm)

In addition, since Coastal Impact Assistance Program (CIAP) was authorized by Section 384 of Energy Policy Act of 2005, vegetated treatment systems and wetland assimilation projects are being planned and implemented. CIAP has been tasked with selection of the most beneficial projects and oversight during the construction phase of the funded projects. Information pertaining to these projects can be found on the CIAP website: http://www.coastal.la.gov/index.cfm?md=pagebuilder&tmp=home&nid=84&pnid=76&pid=20&catid=0&elid=0. These projects encompass coastal areas impacted by both hurricanes Katrina and Rita. Projects of various sizes will be selected with emphasis placed on restoration potential and economic capabilities of the municipality. Where feasible, these projects stand to improve quality and quantity of wetlands in proximity to populated coastal areas. In Louisiana, coastal wetlands provide protection from storm surge to many coastal communities. The Wetland Assimilation Strike Team (WAST) is currently working diligently to raise awareness through workshops and hurricane recovery stakeholder meetings. This concept had been presented to the Louisiana Recovery Authority, Environmental Task Force and was well received as a tool to assist in the recovery of coastal communities and their associated wetlands. The positive economic and environmental aspects to this approach demonstrate that, where feasible, wetlands assimilation of treated effluent can provide long-term solutions to municipal infrastructure stability as well as protect and enhance wetlands where many community members live and work. These projects will meet the vegetated treatment systems management measure and serve as examples to others.

Tasks and Milestones

1. LDEQ and LDNR will continue coordinate their programs to ensure that CPNCP management measures are implemented for each category that was identified as contributing to coastal NPS pollution (2011-2016);
2. LDEQ and LDNR will continue to partner with LPBF, BTNEP and Atchafalaya Basin Program to coordinate coastal NPS program activities and reduce duplication of efforts (2011-2016);
3. LDEQ and LDNR will continue to partner with coastal parishes and cities on full implementation of management measures for urban, home sewage and hydromodification issues (2011-2016);
4. LDEQ and LDNR will continue to partner with LDAF, USDA and LSU AgCenter on implementation of management measures for agricultural and forestry issues (2011-2016);
5. LDEQ will continue to collect water quality data to evaluate whether management measure implementation has resulted in improved water quality (2011-2016); and
6. LDEQ will continue to report progress made in implementation of management practices and water quality improvement through LDEQ's NPS Annual Report (2011-2016).

Timeline for Milestones: October 2011 to September 2016

The goals and objectives of this chapter of the NPS Management Plan are to continue to work toward approval of the state's CNPCP and to implement management measures applicable to Louisiana's coastal management area.

Watershed Planning and Implementation

In order to prioritize specific water bodies not meeting designated uses, the watershed implementation process was developed. This process begins with analysis of water quality data to determine if the water body is in compliance with water quality standards. If the water body is not meeting water quality standards, it is included on the 303(d) list of impaired waters. As a result, it will be scheduled for a TMDL, and a WIP which identifies the type of implementation necessary to reduce and control NPS loads. Figure 11 illustrates watersheds that have had TMDLs completed either by LDEQ or by USEPA. The figure also identifies which watersheds have had WIPs completed or are being revised.

Watershed Implementation Plans

A WIP is typically written for a water body that has had a TMDL or set of TMDLs developed for it. The purpose of the plan is to accurately describe which river kilometer or stream reach has the highest NPS loading rates, expressed as BOD or SOD. Once specific sections of the river, bayou or lake are identified as an area of high NPS loading, the drainage area to that section of the water body can also be identified. These are considered critical drainage areas that need additional analysis to determine which part of the drainage area contributes the largest sediment, nutrient and BOD load to the water body. This analysis includes detailed crop-level and soil classification combined with an inventory of the types of BMPS currently being implemented.

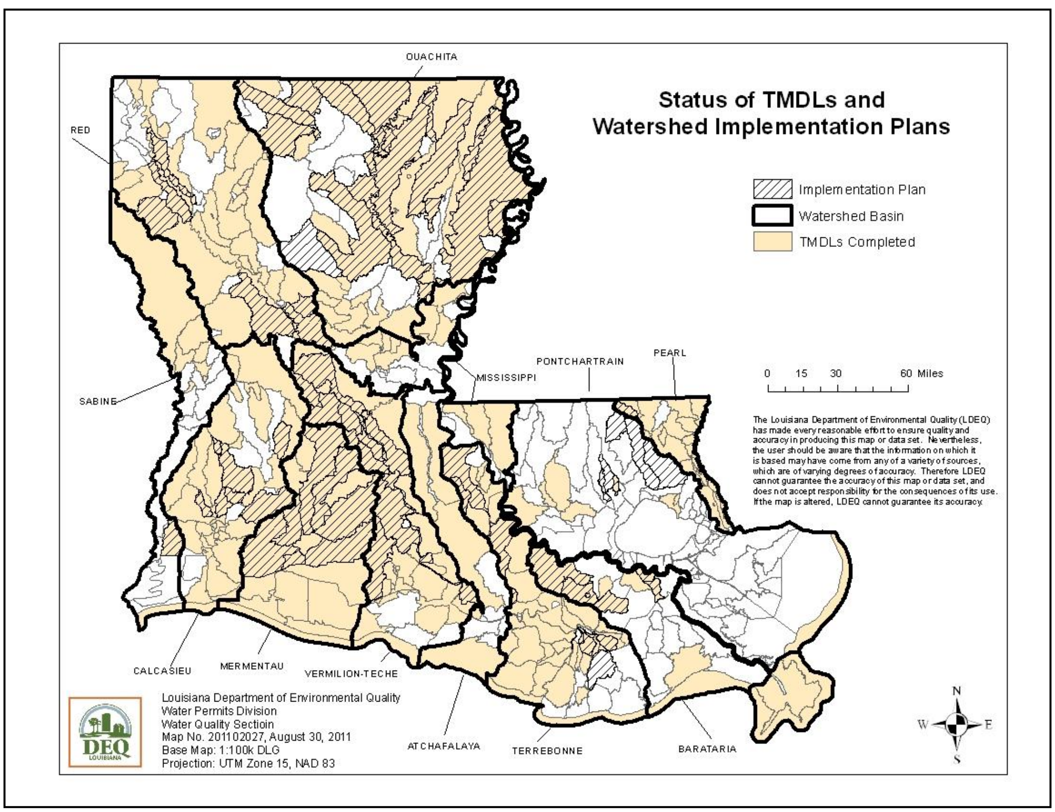

Figure 11: 2010 Status of TMDLs and WIPs Completed

Once all of this information is reviewed, it should be possible to determine what level of BMP implementation is necessary to achieve NPS load reductions and meet water quality standards.

TMDLs completed for Mermentau and Vermilion-Teche River Basins prioritized agricultural production as the principle land-use type where additional BMPs should be implemented to meet water quality standards. Water quality standards are related to restoring designated uses for FWP and contact recreation (both primary and secondary). TMDLs completed for Ouachita, Calcasieu and Barataria Basins also indicated agricultural production and forestry activities as the largest contributing sources to NPS loads. Therefore, LDAF continues to be a major partner in WIP implementation where TMDLs have been completed for these river basins.

Nonpoint Source Management at the Watershed Level

Watershed implementation in Mermentau, Vermilion-Teche, Calcasieu, Ouachita and Barataria Basins will require interagency coordination. The primary mechanisms to achieve this coordination are WIPs and stakeholder groups. The state's NPS Management Plan outlines this approach in a step-by-step process. However, in order to more effectively utilize Section 319 funds, LDEQ and LDAF currently will partner on watershed planning and implementation. This management approach is outlined here:

- LDEQ and LDAF meet to discuss results of the TMDL and collectively decide on WIPs where agriculture or forestry are primary land-uses in the watershed;
- Collaborative efforts between LDEQ, LDAF and USDA are necessary for soils, specific crops, and baseline level of BMP implementation, and will function as the basis for analyzing critical drainage areas in the watersheds;
- Once all of this information is compiled in the WIP, it will be shared with watershed coordinators, local SWCDs, Extension Service Agents, drainage boards and police juries;
- The WIP then serves as the primary basis for guiding where Section 319 and USDA funds are prioritized for water quality improvements;
- For Section 319 funds, LDEQ and LDAF meet to discuss where next fiscal year of federal funds will be prioritized to address NPS loads identified in the TMDL and WIP;
- LDAF is currently responsible for implementation of agricultural BMPs in watersheds where TMDLs and WIPs have been completed;
- LDEQ is currently responsible for addressing statewide and watershed NPS specific issues. LDEQ is also responsible for water quality monitoring, TMDL development, WIP development and NPS program coordination;
- LDEQ and LDAF will continue to partner with USDA toward prioritizing Farm Bill funds in watersheds identified through the 3030(d) list as impaired because of NPS loads to the water body; and
- LDEQ will continue to monitor watersheds on a 4-year cyclic schedule to determine if the watershed approach is effective in improving water quality.

Mermentau River Basin

The Mermentau River Basin is located in southwestern Louisiana and encompasses the coastal prairie region of the state. The southern part of the basin is included in the state's coastal zone boundary. The Mermentau River Basin is bounded on the north and east by Vermilion-Teche River Basin, on the west by Calcasieu River Basin and on the south by the Gulf of Mexico. The Mermentau River Basin is comprised of twenty-one water quality sub-segments. These sub-segments are the hydrologic scale LDEQ utilizes for regulatory permitting, ambient water quality sampling, assessment and water quality standards.

Assessment

The 2008 IR indicated only one of these twenty-one sub-segments was meeting FWP uses. The 2010 IR indicates water quality has improved in Mermentau River Basin for Bayou Mallet and Lower Mermentau River at Lake Arthur. The Mermentau River from Catfish Point Control Structure to Gulf of Mexico fully meets all of its uses for contact recreation and FWP. The 2008 IR also indicated only one water body, Castor Creek did not meet PCR, but did meet SCR. This was an improvement from the 2006 IR which had five water bodies not meeting PCR. Hackberry and Rutherford Beaches did not meet PCR, based on testing through the Beach Monitoring Program. Sixteen water bodies fully met contact recreation uses but were not meeting FWP, including:

- Bayou Mallet – headwaters to Des Cannes
- Bayou des Cannes
- Bayou Plaquemine Brule
- Bayou Nezpique
- Mermentau River – Origin to Lake Arthur
- Lake Arthur and Lower Mermentau River to Grand Lake
- Bayou Queue de Tortue – Headwaters to the Mermentau
- Lacassine Bayou – Headwaters to Grand Lake
- Intracoastal waterway – From the Calcasieu River Basin Boundary to the Mermentau River
- Bayou Chene – includes Bayou Grand Marais
- Grand Lake
- Intracoastal Waterway – Mermentau River to Vermilion Locks
- White Lake
- Bayou Blue – Headwaters to Confluence with Bayou Nezpique
- Big Constance Lake and Associated Water Bodies
- Mermentau River Basin Coastal Bays and Gulf Waters to State three-mile limit

Castor Creek did not meet FWP or PCR. The Seventh Ward Canal was not assessed for contact recreation and was not meeting FWP because of mercury contamination. The Mermentau River – Catfish Point Control Structure to Gulf of Mexico (Estuarine) was fully meeting all of its uses.

As a result, one water body, Castor Creek had problems with fecal coliform bacteria. Additionally, all of the water bodies had problems meeting the DO water quality standard except the lower portion of Mermentau River from Catfish Point Control Structure to Gulf of Mexico. The state's 2010 IR indicated suspected sources of fecal coliform bacteria included wildlife other than waterfowl and unknown sources. The suspected sources of sediment and nutrients that contribute to low DO problems were irrigated and non-irrigated crop production, unknown and natural sources. To restore these designated uses, there will need to be reductions in the amount of fecal coliform bacteria, sediment and nutrients entering the water bodies. Other water quality problems that contribute to FWP impairment included: mercury, turbidity, total suspended solids, nutrients and sedimentation. Implementation of agricultural BMPs that have been recommended for crops and aquaculture operations would decrease the amount of sediment and nutrients entering these water bodies, thereby improving the concentration of DO.

Watershed Implementation

The Mermentau River Basin has been and continues to be a priority area for the state's NPS Management Plan. Section 319 funds have been utilized to fund projects on how to reduce NPS pollutants from rice, soybeans, sugarcane and crawfish operations. Watershed projects have been implemented in Bayou Queue de Tortue, Bayou Plaquemine Brule, Bayou Des Cannes, Bayou Nezpique and Bayou Lacassine watersheds. TMDLs have been developed, by USEPA Region 6 and LDEQ, for each of the water bodies not meeting designated uses and included on the state's 303(d) list. These TMDLs were completed and approved by USEPA in 2002 and can be viewed at http://www.deq.louisiana.gov/portal/DIVISIONS/WaterPermits/TotalMaximumDailyLoadTMDLProgram.aspx. A table on pages 197-202 includes information on which water bodies have had TMDLs developed for them and for which parameters. It also includes information on WIPs that have been completed or are currently being developed and where implementation activities are being conducted. If the water body had water quality parameters delisted, that information was also included.

In order to implement TMDLs, WIPs were developed for Bayou Plaquemine Brule, Bayou Queue de Tortue, Bayou Lacassine, Bayou Des Cannes and Bayou Nezpique. Copies of these WIPs are available on LDEQ's NPS Website at http://nonpoint.deq.louisiana.gov/wqa/default.htm. Actions described in each of the WIPs either have been or are in the process of being implemented. Bayou Plaquemine Brule continues to be a watershed where LDEQ is working with other agencies, universities, local farmers and landowners on BMP implementation and water quality monitoring to determine if NPS pollutants can be reduced; water quality improved; and water quality standards met to remove the water body from the 303(d) list.

LDEQ works in partnership with USDA and LDAF's OSWC on watershed implementation. Funds from Farm Bill programs are prioritized in these watersheds where NPS pollutants contribute to total pollutant loads that need to be reduced to meet water quality standards. In addition to EQIP, lands are treated with BMPs through the CRP, WRP, and WHIP. Section 319 funds have also been prioritized in these impaired watersheds by LDAF and LDEQ. LDAF has utilized Section 319 funds to implement BMPs on more than 50,000 acres of agricultural lands in Mermentau River Basin. During 2005-2006, USDA prioritized a portion of Mermentau River Basin for CREP, with a goal to restore 15,050 acres to native coastal prairie. These types of long-term changes in land-use, combined with increased levels of participation by farmers in other Farm Bill Programs, should result in improved water quality in Mermentau Basin. During 2009-2010, USDA prioritized Lower Mermentau River Basin for USDA's Mississippi River Basin Initiative (MRBI). This prioritization could result in $771,209 of additional funds available for cost-share in Bayou Chene 12 digit HUC and also funds to monitoring water quality and determine whether the project resulted in improved water quality.

LDEQ continued to prioritize Section 319 funds in Mermentau River Basin, to reduce NPS pollutant loads and quantify water quality benefits of BMPs implemented for rice, sugarcane, pastures and soybeans. During 2006-2009, additional funds were prioritized for Bayou Plaquemine Brule (050501) and Coulee Baton sub-watersheds of the Intracoastal Waterway sub-segment (050702) to improve water quality improvement in that part of the state. During 2010, water bodies were also prioritized through LDEQ's CWP for watershed implementation. The CWP combines knowledge and experience of staff in LDEQ's regional offices with those staff in LDEQ's Headquarters in Baton Rouge to implement a watershed approach to restore impaired water bodies and remove them from the 303(d) list of impaired waters.

Water Quality Improvements

LDEQ collects monthly water quality data each year for the Mermentau River, and samples the other water bodies on a 4-year cycle. TMDLs for these water bodies indicated there would need to be a 30-100 percent reduction of NPS pollutant loads for many of the bayous to meet water quality standards for DO during critical conditions. The NPS Management Plan has outlined a 5-year schedule to improve water quality, and monitors these water bodies on a 4-year cycle to determine if watershed implementation has been effective in improving water quality.

The most recent water quality data indicates water quality has improved for some of the water bodies in Mermentau River Basin. Improvements were primarily with fecal coliform bacteria, but sediment and nutrients continue to be a problem in many of these water bodies. Water quality data from 2007 indicated that water bodies were recovering from impacts of hurricanes of 2005, but LDEQ will continue to collect water quality data to determine whether watershed implementation results in water quality improvement. Data continues to indicate sediment and turbidity levels are higher in these bayous during April and May, when rice field discharges are released. As these sediments settle to the bottom of the bayou, they become a part of the sediment oxygen demand (SOD), which draws oxygen out of the water column. The DO concentrations decline in response to these spring pollutant loads, reaching their lowest levels during summer and early fall.

Water quality data from 2005 indicated fecal coliform concentrations had declined in many of these water bodies since 2003, and had even fallen below levels that existed in 1998. Louisiana experienced drought during 1998-2000 and again in 2005. This may partially explain lower concentrations of fecal coliform, since there were fewer rainfall events to deliver fecal coliform bacteria to the bayous. Following hurricanes in September 2005, intensive water quality monitoring was conducted to determine related impacts. High storm surges sent saltwater into Mermentau Basin, causing major impacts to water bodies and to agricultural areas in the basin. Water quality data from 2007 indicated good water quality for Mermentau River and Bayou Nezpique, but an increase in coliform bacteria in Bayou Lacassine. The population of shore birds increased in Mermentau River Basin after the hurricanes, as they migrated to rice and crawfish ponds after coastal areas were so impacted. Crawfish producers indicated populations of birds had significantly affected productivity of their crawfish ponds, which may be one reason for increased levels of coliform bacteria in Bayou Lacassine.

Define Water Quality/Program Goals

Water quality goals for Mermentau River Basin are to reduce NPS loads to a level where water bodies meet water quality standards, designated uses are restored and they are removed from 303(d) list of impaired waters. In order to reduce NPS pollutant loads, the level of suspended and dissolved solids and total organic carbon must be reduced since they contribute to low DO concentrations. Historical NPS efforts in this basin indicated one of the major contributing sources of solids and organic carbon were rice fields. Watershed projects implemented in Bayou Plaquemine Brule have indicated NPS loads can be reduced with the application of BMPs on rice and soybean fields. Outputs from AnnAGNPS watershed model also indicated in-stream water quality standards could be met through application of rice and soybean BMPs.

Explain Programmatic Activities to Reach those Goals

To reduce pollutant loads from agricultural fields and increase concentrations of DO in bayous of Mermentau River Basin, Louisiana's NPS Management Program has made significant efforts to partner with farmers. Through these efforts, BMPs have been implemented in watersheds targeted for watershed activities. USDA has utilized Farm Bill funds to partner with farmers. Additionally OSWC in LDAF has utilized Section 319 funds to assist farmers, and LDEQ has utilized Section 319 funds to quantify effectiveness of agricultural BMPs, provide cost-share and technical assistance to farmers, and evaluate whether water quality has improved as a result of these efforts. This list of projects have been implemented in Mermentau River Basin during the past few years to illustrate what needs to be done to reduce NPS pollutant loads and improve water quality:

- Bayou Plaquemine Brule Watershed Water Quality Monitoring Project, Phase 2;
- Reducing NPS Discharge from Agriculture Fields in the Bayou Wikoff Sub-watershed;
- Reducing NPS Pollution from Agriculture Fields in the Cole Gully Sub-Watershed;
- Soybean BMP Demonstration and Education Program, Phase 3; and
- Modeling NPS Pollution and Land-Use Types in Bayou Plaquemine Brule Watershed.

The results of these projects have been included in LDEQ's NPS Annual Reports and are available on LDEQ's website.

All of these projects provided LDEQ with information that assisted them to understand the types of BMPs implemented to achieve NPS reductions calculated through TMDLs for Mermentau River Basin. To reach these goals, LDEQ will continue to rely upon partnerships with USDA through Farm Bill Programs. The key to success in this basin is for BMPs to be implemented in critical areas of watersheds with water quality problems. The purpose of WIPs is to assist SWCDs, NRCS and watershed coordinators understand where BMPs should be implemented.

LDEQ has been revising WIPs in Mermentau River Basin to be consistent with USEPA's national guidelines for watershed plans. Although TMDLs and ambient water quality data have been based on LDEQ's sub-segment delineations, watershed planning often requires a smaller scale. Therefore LDEQ partners with NRCS and LDAF at the 12 digit HUC scale to determine if water quality problems can be solved and transferred to the other 12 digit HUCs in the sub-segment.

USDA records BMP implementation at the parish level, but these data can also be provided at the 12 digit HUC scale. LDEQ requests this information to evaluate effectiveness of agricultural programs in reducing NPS pollutant loads and water quality improvements. LDEQ's GIS Center produced detailed land use by crop type that can also be provided for 12 digit HUCs. Soils and LIDAR data can also be applied to 12 digit HUCs to identify where hot spots are in the watersheds. All of this information becomes the basis for watershed planning and monitoring designs that support BMP implementation. Once WIPs are completed, all stakeholders should be able to clearly see if their BMP efforts have been successful. This allows local landowners to see, through the annual reporting, whether their water bodies are improving as a result of the watershed implementation on their farms. Demonstration projects and edge of field sampling have proven that BMPs are effective in reaching NPS load reductions estimated through TMDLs. Watershed models and targeted monitoring at the 12 digit HUC scale can identify "hot spots" that exist for highest loads of nutrients, sediment and organic material. Farmers or landowners in those areas can then partner with NRCS and SWCDs to implement BMPs in those "hot spots". Improvements can be evaluated through targeted watershed monitoring at 12 digit HUC scales. These data can then be shared with local stakeholders and the public through LDEQ's website.

LDEQ is currently partnering with LDAF on Bayou Lacassine, Bayou Nezpique, Bayou Plaquemine Brule, Bayou des Cannes and Bayou Queue de Tortue to revise WIPs to include this type of information. Bayou Joe Marcel, Beaver Creek and Bayou Mallet have improved and are close to meeting their designated uses. Water quality improvements have been made for fecal coliform bacteria in many of these watersheds. Bayou Plaquemine Brule was selected for a Success Story in 2009/2010.

LDEQ partners with a watershed coordinator to assist local landowners and citizens in the watershed understand how they can reduce NPS pollutants that prevent their water bodies from meeting designated uses. Progress can be made through collaborative efforts of these partners.

Watershed Implementation Plans

LDEQ and USEPA have continued to implement watershed based approaches for reducing NPS pollution over the past twenty years. The watershed strategy describes actions included in the watershed management approach to restore impaired water bodies in Mermentau River Basin.

1. **Identification of measurable environmental and programmatic goals:** Environmental goals for Mermentau River Basin are to reduce organic matter, nutrients and turbidity to meet in-stream standards. FWP use support relies on meeting in-stream standards for DO, which is currently 5 mg/L between December and February and 3 mg/L between March and November. Through TMDL development, point source and NPS load reductions to meet in-stream standards were estimated. The largest component of these loads was from NPS.
   - 1(a)-LDEQ analyzed historical water quality data for DO, nitrogen, phosphorus, organic carbon, and turbidity;
   - 1(b)-LDEQ determined there were seasonal trends in these concentrations linked to seasonal cropping practices of agricultural crops such as rice, soybeans and sugarcane; and
   - 1(c)-LDEQ examined results of TMDLs for point source and NPS in the watershed.

2. **Identify Sources of Water Pollution and Relative Contribution of Sources:** Detailed satellite images allow for analysis of various land-use types that exist in watersheds. LDEQ has been partnering with SWCDs and USDA to assist in classification of satellite

data by crop type, so estimates can be made on types of pollutants to be addressed in each watershed. Detailed watershed land-use analysis combined with edge-of-field pollutant loading rates provide LDEQ with estimates of relative contributions of pollutants from rice fields, urban areas, home sewerage systems, forested areas, etc.

2(a)-LDEQ's GIS Laboratory has produced these detailed land-use maps;
2(b)-LDEQ has partnered with OSWC and the NRCS to identify different types of crops and land-uses in the watershed (i.e. rice, soybeans, pastures, crawfish, etc.);
2(c)-Edge-of-field NPS loading data has been collected for each major crop type that exists in the watershed; and
2(d)-Watershed models have been utilized to approximate NPS load estimates for organic enrichment, nutrients, and sediment from each crop type to predict reduced NPS loads that can be achieved through BMP implementation.

3. **Implementation of pollution control measures (e.g. permit revisions, implementation of BMPs and buffer strips) to achieve clean water:** The NPS Management Program has already demonstrated an ability to implement BMPs that will improve water quality from agriculture, forestry, home sewage and urban NPS. Through interagency, cooperative efforts of federal, state and local agencies who partner with LDEQ on program implementation, progress has been made in reducing sediment, nutrients, and organic enrichment from rice fields in Bayou Queue de Tortue and Bayou Plaquemine Brule Watersheds.

3(a)-Once the acreage for each crop in the watershed was determined, LDEQ partnered with NRCS and SWCDs on implementing the types of BMPs for each of these crops (rice and soybeans). These agencies have already cooperated on rice and soybean BMPs proven effective in reducing pollutants targeted in this watershed;
3(b)-A ranking criteria is utilized to determine number and location of fields included in a cost-share and technical assistance program in several watersheds in the basin;
3(c)-This ranking criteria is basis for cost-share and technical assistance offered to farmers, willing to partner agencies to implement recommended BMPs for rice, soybeans, and crawfish farms;
3(d)-Water quality monitoring has been designed to evaluate results of BMP implementation, NPS pollutant reduction and water quality improvement;
3(e)-Evaluating progress includes reporting number and type of BMPs implemented for each crop or crawfish farm combined with edge-of-field or field drain monitoring to measure pollutant reduction in watersheds; and
3(f)-Educational outreach programs including field days, farm tours, newspaper articles, radio announcements as methods to disseminate information on watershed issues.

4. **Schedules for Implementation of Needed Restoration Measures and Identification of appropriate lead agencies to oversee implementation, maintenance, monitoring, and evaluation:**

When USEPA awarded requested grant funds for watershed programs, interagency agreements were written with cooperators to implement action items identified in watershed plans.

4(a)-USEPA awarded grant funds to LDEQ and LDAF for implementation of watershed projects;

4(b)-LDEQ created Scopes of Services and Interagency Agreements with stakeholders and organizations that partner with them on NPS projects. These interagency partners provided assistance to LDEQ with cost-share, technical assistance, and educational outreach programs on agricultural BMPs for rice, soybeans, and crawfish farms targeted for inclusion in watershed projects;

4(c)-Once interagency agreements were finalized, LDEQ evaluated progress on implementation of BMPs and educational outreach programs through quarterly reports. These reports are prepared for USEPA on a semi-annual and annual basis;

4(d)-Field drain and/or edge-of-field monitoring has continued as one method to quantify NPS load reductions, resulting from BMP implementation in the watershed;

4(e)-In-stream monitoring is one method to determine effectiveness of watershed implementation in reducing sediment, nutrients, organic enrichment and improvements in DO; and

4(f)-LDEQ evaluates all monitoring data and progress in BMP implementation to determine if load reductions have been sufficient to meet TMDLs for bayous and rivers in Mermentau River Basin.

5. **Implementation of TMDLs for pollutants exceeding state water quality standards:**

Mermentau and Vermilion-Teche River Basins were initially prioritized for water quality monitoring, TMDLs and WIPs. TMDLs provided estimated NPS load reductions for the water body to meet in-stream standards. The NPS WIP prioritized sediment, nutrients, and total organic carbon as parameters related to the DO standard and restoring FWP. As WIPs have been implemented, NPS loads should decline and water quality should improve. Therefore through watershed implementation, the goals and objectives of improving water quality should be achieved.

5(a)-Water quality data collected through 4-year cyclic monitoring program;

5(b)-TMDLs and WIPs completed for Mermentau River Basin, identifying where NPS priority areas are;

5(c)-Historical water quality data for watersheds have been analyzed for seasonal and annual trends in sediment (total suspended and dissolved solids, turbidity), nutrients (nitrogen and phosphorus) and total organic carbon;

5(d)-Satellite imagery data has been utilized to determine locations for continuous monitors and sampling locations for watershed monitoring, modeling, and evaluating NPS reductions;

5(e)-Implementation and evaluation of BMPs in the watershed; and

5(f)-Continue monitoring and evaluating pollutant reduction and water quality improvements that result from BMP implementation.

6. **Implementation of Source Water Assessment and Protection Programs:**

As SWPP identifies potential impacts from NPS pollution to surface water intakes for drinking water supplies, NPS staff and watershed coordinators assist them implement educational outreach programs and ordinances to reduce the problems. WIPs provide a framework to continue these partnerships at the watershed level.

6(a)-Meet with SWPP to discuss Mermentau River Basin management strategy;

6(b)-Identify drinking water sources in the watershed and ranking criteria for vulnerability index from point and/or NPS of pollution;

6(c)-Outline steps to protect drinking water sources if they exist in Mermentau Basin;

6(d)-Implement steps necessary to protect these sources if they exist in the watershed; and

6(e)-Evaluate progress and report to partners, USEPA and the general public.

7. **Needed Monitoring and Evaluation to Assess Progress toward Achieving Environmental and Programmatic Goals:**

LDEQ has implemented a cyclic water quality monitoring program. This monitoring program provides water quality data for each of the state's 476 watersheds. All of this data is analyzed and utilized to guide implementation for watershed restoration. LDEQ has partnered with local universities to place continuous monitors at strategic locations for watershed projects. Sampling has been utilized to track pollutant reduction from implementation of BMPs throughout the watershed. Field drains from rice and soybean fields or crawfish ponds have been identified as sampling locations to collect the types of water quality data necessary to track progress in program implementation. NPS staff have utilized watershed models as one method to determine the most efficient placement of BMPs and sampling locations to achieve water quality and pollutant reduction goals.

7(a)-Water quality data from watersheds has been analyzed and TMDLs completed, indicating NPS load reductions are needed to achieve water quality standards for DO;

7(b)-NPS implementation, tracking and sampling strategies have been initiated to address NPS pollutant loads identified in the TMDL;

7(c)-Progress made in BMP implementation, education, tracking and monitoring have been documented and reported to USEPA on a semi-annual and annual basis; and

7(d)-Progress continues to be examined to determine whether pollutant reduction and in-stream goals are met in the watershed.

8. **Funding Plans to Support the Implementation and Maintenance of Needed Restoration Measures:**

The majority of Mermentau River Basin is utilized for agricultural production, primarily rice and soybeans. Therefore, the most efficient and effective way to restore water quality is through implementation of BMPs for these crops. Previous work implemented in the Bayou Queue de Tortue watershed has demonstrated that rice water quality management practices can be effectively implemented to reduce sediment and organic carbon loads to improve water quality. Previous projects resulted in estimate that sediment can be reduced by 50-70 percent and TOC by 70-80 percent. Implementation in Bayou Plaquemine Brule Watershed indicated that if rice BMPs were implemented, water quality standards would be met.

8(a)-LDEQ partnered with USDA and OSWC to determine acres of rice and soybean farms that exist in priority watersheds;

8(b)-LDEQ partnered with NRCS to determine cost-share rates for rice water quality BMPs;

8(c)-LDEQ partnered with NRCS and LDAF to determine funding priorities for

Section 319 funds in the watersheds; and

8(d)-LDEQ, LDAF and NRCS continue to implement cost-share technical assistance programs through SWCDs and NRCS District Offices for rice and soybean farms in the watersheds.

9. **A Process for Cross-Agency (federal, state, interstate, tribal, and local) Coordination to Help Implement Watershed Restoration Actions:**

LDEQ's NPS Management Program has a strong interagency committee, which consists of federal, state and local agencies. Presentations will be made at NPS Interagency Committee Meetings on watershed strategies to inform agencies about projects conducted in the watersheds. As land-use and monitoring strategies have been designed, agencies with relevant programs were invited to participate in the project. All of these interagency efforts work toward the goal of cross-agency coordination for restoration of watersheds in Mermentau River Basin.

9(a)-Present Watershed Strategy to NPS Interagency Committee and describe it on the website;

9(b)-Requested participation by NRCS, SWCD, LSU AgCenter, LDHH and other organizations that could assist LDEQ with implementation of action strategies;

9(c)-Partner through interagency and cooperative agreements with agencies directly involved in educational activities, cost-share and technical assistance, and evaluating progress on watershed strategies;

9(d)-Partner on schedules for these actions and report on them through semi-annual and annual reports to USEPA;

9(e)-Meet with partnering agencies and local stakeholders involved in projects to communicate progress made in watershed implementation; and

9(f)-Summarize progress made each year in strategies and report on them through the annual reports and LDEQ's website for the NPS Program.

10. **A Process for Public Involvement**

Public involvement has always been an important component of Louisiana's NPS Management Program. Public meetings, workshops, educational materials, fact sheets, and local coalitions provide a linkage between federal and state agencies and the public, who need to be aware of issues and how to take actions to address them. Through open dialogue with public and the local decision-makers, water quality problems are described and NPS issues are discussed. Examples of farming practices, construction methods, forestry planning and harvesting operations, and maintenance of home sewerage systems are the types of issues discussed at these meetings. Brochures and videos with examples of BMPs for these various land-use issues are provided at these meetings for use and distribution at in local communities. Schools, civic organizations, city planners, engineers, and local government stakeholders are involved in the educational process. The importance of preserving water quality, wildlife and wetlands are all emphasized as the focus and objective of our efforts. This public involvement process will continue to be an important component for implementation of watershed programs for water bodies in Louisiana.

10(a)-Meet with cooperating agencies and local stakeholders that have been partnering with LDEQ on watershed programs;

10(b)-Discuss watershed actions and stakeholders to be included in educational outreach activities;

10(c)-Plan meetings where watershed implementation goals are described to the community of farmers, landowners, and home owners, etc. who live in the watershed;

10(d)-Describe TMDL process and resulting pollutant load reductions that are necessary to meet in-stream water quality standards. Describe implementation process the interagency team has outlined for addressing pollutant loading problems;

10(e)-Requested participation and comments on implementation process by farmers, landowners, homeowners and general public;

10(f)-Make TMDLs and WIPs available on LDEQ's website for public access. Make educational materials available for each of the issues that need to be addressed through action strategies;

10(g)-Include local schools, civic organizations and environmental groups in the educational process for the community. Place informational signs at fields where farmers are participating in cost-share programs; and

10(h)-Include progress made in watershed implementation of Mermentau River Basin on LDEQ's website for the NPS Program.

Future Objectives and Milestones

Future objectives for Mermentau River Basin include partnering with federal and state agricultural agencies and local SWCDs on implementation of programs that result in increased acreages of BMPs for rice, crawfish, soybeans, sugarcane and pastureland management. Through implementation of these BMPs, total NPS pollutant loads should be reduced to the level that water quality standards can be met and designated uses restored. The following tasks and milestones serve as guidelines, in order to meet these objectives and to improve water quality.

1. Implement WIPs for impaired watersheds and evaluate progress in reducing sediment, nutrients and fecal coliform to the bayous (2011-2016);
2. Revised satellite imagery based land-use classification to include new information on types of crops grown in Mermentau River Basin (2009-2010);
3. Revise WIPs to include new land-use information and water quality data and results of all implementation completed in Mermentau River Basin (2011-2016);
4. Determine whether WIPs have been successful in improving water quality in bayous and restoring designated uses for fishing and swimming (2011-2016);
5. Partner with federal, state and local agencies on additional programs (i.e. CWP) implemented to restore these uses if initial implementation efforts are not successful (2011-2016);
6. Continue implementation process until the bayous meet water quality standards and designated uses, so they can be removed from 303(d) lists of impaired waters (2011-2016);
7. Transfer this process to other watersheds in Mermentau River Basin, and track rate and level of pollutant reduction and water quality improvements (2011-2016);
8. Continue to adjust BMPs and management options (both voluntary and regulatory) until water bodies across Mermentau River Basin are meeting water quality standards and designated uses for fishing and swimming are restored (2011-2016);
9. Report progress made in BMP implementation, NPS pollutant load reduction and water quality improvement to USEPA on an annual basis (2011-2016); and
10. Once a water body has been removed from the 303(d) list, write a success story that describes types of activities that led to water quality improvement (2011-2016).

The goals and objectives for Mermentau River Basin Watershed Program are to restore designated uses of bayous that have been included on the 303(d) list of impaired waters. The timeline for short-term goals is 5 years and for long-term goals is 10 years. The 4-year cyclic monitoring program combined with localized watershed monitoring will be the basis to evaluate progress made in reaching short-term and long-term water quality goals. Through this implementation process, water quality in the Mermentau River Basin is expected to improve.

Stakeholders

These stakeholders have been involved in watershed activities for Mermentau River Basin:

LSU Rice Experiment Station in Crowley
This facility in Crowley lies in Bayou Queue de Tortue watershed and provides rice and soybean farmers with information on methods to improve their production on new varieties, crop diseases and environmental practices/ programs. They have hosted demonstration projects, which evaluated pollutant reduction potential of rice management practices. A project to evaluate management practices for soybeans has been implemented at this facility. Large field days have been held each year for local rice and soybean farmers, typically with more than 200 farmers attending the event.

Natural Resource Conservation Service (NRCS)
This agency continues to be one of the key partners in the initial interagency task force that refined BMPs for rice, soybeans and sugarcane in Mermentau River Basin. They understood the "mudding-in" practice and also know the types of soils that exist in this basin. They recommended what could be done to alter traditional rice practices to reduce sediment problems in the bayou. They assisted rice farmers by providing technical assistance on implementation of the new practices. They also provided cost-share and technical assistance through USDA's EQIP for farmers and landowners in impaired watersheds of Mermentau River Basin. As they partner with other agencies and stakeholders on CREP, lands will be taken out of rice production and restored to native prairie grasses.

Soil and Water Conservation District (SWCD)
SWCDs partner with LDEQ and NRCS on implementation of BMPs for agricultural lands in impaired watersheds of Mermentau River Basin. They also provided technical assistance to LDEQ's GIS Center staff for detailed land-use classification and offered assistance to local districts to achieve water quality goals. They tracked farmer participation and supported the NPS Program through participation in educational programs concerning water quality issues and new practices to improve water quality.

LSU AgCenter
LSU AgCenter cooperated with other agencies on development of rice BMPs and educational outreach programs for farmers in the basin. They developed sediment test kits and trained rice farmers to monitor their own water quality, and when to release their flood waters from rice fields. They also developed pollution prevention plans for rice and soybean farmers. They have hosted educational field days, workshops, water quality meetings and trained children and adults on watershed management. They coordinated interagency efforts of the Master Farmer Program and hosted workshops and model farms involved in that program.

Louisiana Farm Bureau Federation
Louisiana Farm Bureau represents many rice and soybean farmers in Mermentau River Basin. They have been involved in NPS water quality issues and the NPS Management Program since 1989. They participated in initial meetings on Bayou Queue de Tortue watershed project and

became involved in many issues related to water quality and environmental protection in Louisiana. They have also been involved with LDEQ and LDNR-OCM in development of the agricultural section of Louisiana’s CNPCP. They have actively participated in pollution reduction programs implemented in Mermentau River Basin and are sponsors of the Master Farmer Program.

Louisiana Department of Environmental Quality (LDEQ)
LDEQ was designated as lead agency for the state’s NPS Management Program, and has responsibility to coordinate the program and all activities associated with reduction and control of NPS pollution. LDEQ was involved in prioritizing Bayou Queue de Tortue and Bayou Plaquemine Brule as important watersheds to be included in the state’s NPS Management Program. LDEQ partnered with federal and state agencies in this project and assisted in development and evaluation of rice BMPs. Funds to assist in watershed implementation were provided by LDEQ through Section 319 of CWA. These funds supported evaluation of rice management practices for pollutant reduction of sediment, nutrients and pesticides. These funds were utilized to support educational outreach programs in the basin on the results of these practices and how they could be implemented to improve water quality in these bayous. LDEQ provided water quality monitoring and data analysis to determine if the watershed program was effective in reducing pollutants and improving water quality.

Federal Consistency
Federal consistency will be met by review of BMPs recommended through USDA's EQIP.

Program Evaluation
Section 319 of the CWA requires states to evaluate their NPS Management Programs on an annual basis to determine their effectiveness in reducing NPS pollutants and improving water quality. Program evaluation will occur at several levels to determine if this watershed approach has been effective to reduce NPS pollution and improve water quality. Evaluation will include these types of activities:

1. Evaluate progress in meeting tasks and milestones outlined in the NPS Management Plan (2011-2016);
2. Include information on BMPs implemented as a result of Section 319, EQIP, CREP or other sources of cost-share and technical assistance in LDEQ’s NPS Annual Report (2011-2016);
3. Report progress in reducing NPS pollutants, such as solids, nutrients, and organic carbon from various land-uses (rice, soybeans, crawfish farms) in the watershed (2011-2016);
4. Report annually on water quality improvement in these bayous (i.e. lower concentration of total organic carbon, total dissolved and suspended solids, nitrogen, phosphorus, and higher concentration in DO) (2011-2016);
5. Document results of the tracking to the Nonpoint Source Interagency Committee, residents within the watershed, and EPA (2011-2016);
6. Submit semi-annual and annual reports to EPA which summarize results of the watershed management strategy (2011-2016); and
7. Revise LDEQ's web-site to include information on the progress made in watershed restoration actions, nonpoint source pollutant load reductions, and water quality improvement in the bayou (2011-2016).

A table on pages 200-205 summarizes which water bodies in Mermentau River Basin have had TMDLs and WIPs developed for them, where watershed implementation activities have been conducted and delistings have occurred between 2004-2010.

For more information on which water bodies in Mermentau Basin are currently impaired or fully meeting their designated uses, please refer to LDEQ's IR:
http://www.deq.louisiana.gov/portal/DIVISIONS/WaterPermits/WaterQualityStandardsAssessment/WaterQualityInventorySection305b/2010WaterQualityIntegratedReport.aspx

TMDLs Completed in Mermentau River Basin	Watershed Implementation Plans Completed	Watershed Implementation Plan Developed	Implementation Activities Being Conducted	Delistings Between 2004 -2010
Bayou des Cannes (050101, 050103, 050201) • Dissolved Oxygen/Nutrients • Carbofuran • Fecal Coliform • Fipronil • Mercury • Nutrients • Total Suspended Solids/Siltation/ • Turbidity		yes, currently being revised in 2011	This is a priority watershed for LDAF where agricultural BMPs will be implemented.	Fecal Coliform in 2008
Bayou Joe Marcel (050102) • Total Suspended Solids (TSS)/ Siltation Turbidity • Fecal Coliform		yes, included in Bayou des Cannes Revised WIP – Scheduled for Completion in 2011 -2012		
Bayou Mallett (050103) • Total Suspended Solids (TSS)/ Siltation • Turbidity • Ammonia • Dissolved Oxygen/Nutrients • Total Phosphorus		yes, included in Bayou des Cannes Revised WIP Scheduled for Completion in 2011-2012		Ammonia, Dissolved Oxygen, Nitrite/Nitrate, Total Phosphorus in 2010

	Watershed Implementation Plan Completed	Watershed Implementation Plan Developed	Implementation Activities Being Conducted	Delistings Between 2004 -2010
Bayou Plaquemine Brule (050201) • Dissolved Oxygen/Nutrients • Total Nitrogen • Total Phosphorus • Turbidity • Fecal Coliform • Fipronil • Mercury • Ammonia • Siltation • Total Dissolved Solids (TDS) • Total Suspended Solids (TSS)	yes, Revised in 2010		yes, LDAF, LDEQ, USDA priority watershed for agricultural BMP implementation and monitoring	Fecal Coliform, Total Dissolved Solids in 2008 Ammonia in 2010
Bayou Nezpique (050301) • Dissolved Lead • Dissolved Oxygen • Fecal Coliform • Nutrients • Siltation • Total Suspended Solids (TSS) • Turbidity	yes, Revised in 2010		yes, Section 319 and USDA Funds for agricultural BMP implementation	Fecal Coliform in 2008 and Total Dissolved Solids in 2010

	Watershed Implementation Plan Completed	Watershed Implementation Plan Developed	Implementation Activities Being Conducted	Delistings Between 2004 -2010
Beaver Creek – Headwaters to Confluence with Boggy Bayou (050302) • **Siltation** • **Total Suspended Solids (TSS)** • **Turbidity** • **Dissolved Oxygen**	yes, included in Bayou Nezpique Revised WIP in 2010			
Castor Creek (050303) • **Dissolved Lead** • **Dissolved Oxygen** • **Fecal Coliform**	yes, included in revised Bayou Nezpique WIP in 2010			Dissolved Oxygen in 2008
Bayou Blue (050304) • **Dissolved Lead** • **Dissolved Oxygen**	yes, included in revised Bayou Nezpique WIP in 2010			
Mermentau River (050401) • **Dissolved Oxygen** • **Ammonia** • **Fipronil** • **Nutrients**	No			Ammonia in 2010

	Watershed Implementation Plan Completed	Watershed Implementation Plan Developed	Implementation Activities Being Conducted	Delistings Between 2004-2010
Lake Arthur and Lower Mermentau River (050402) • Ammonia • Dissolved Oxygen/Nutrients • Total Phosphorus • Total Suspended Solids (TSS) • Siltation • Turbidity		yes, currently being developed in 2011-2012		Ammonia, Total Suspended Solids, Turbidity and Sedimentation/Siltation in 2010
Bayou Queue de Tortue (050501) • Dissolved Oxygen • Nutrients • Fipronil • Siltation • Total Dissolved Solids (TDS) • Total Suspended Solids (TSS) • Turbidity		yes, scheduled for revision in 2011-2012	LDEQ and USDA Funds implemented agricultural and stream bank protection BMPs, respectively	
Bayou Lacassine (050601) • Dissolved Lead • Dissolved Oxygen • Ammonia • Nitrogen	yes, included in revised Bayou Lacassine WIP in 2010		Yes, LDAF and MRBI priority watersheds	

	Watershed Implementation Plan Completed	Watershed Implementation Plan Developed	Implementation Activities Being Conducted	Delistings Between 2004 -2010
Bayou Chene (050603) • Dissolved Oxygen • Fipronil	yes, included in Bayou Lacassine		yes, USDA and LDAF priority watershed for Section 319 and MRBI Funds	
Grand Lake (050701) • Carbofuran • Ammonia • Nutrients • Dissolved Oxygen • Siltation • Total Suspended Solids • Turbidity	no			Ammonia, Dissolved Oxygen, Nitrite-Nitrate, Total Phosphorus in 2008
Intracoastal Waterway – Mermentau River to Vermilion Locks (050702) • Ammonia • Nutrients • Dissolved Oxygen • Siltation • Total Suspended Solids • Turbidity • Carbofuran • Mercury • Turbidity	no			Ammonia, Dissolved Oxygen, Nitrite-Nitrate, Total Phosphorus in 2008

	Watershed Implementation Plan Completed	Watershed Implementation Plan Developed	Implementation Activities Being Conducted	Delistings Between 2004 -2010
White Lake (050703) • Chlorides • Total Suspended Solids (TSS) • Total Dissolved Solids (TDS) • Siltation • Turbidity	No			
Big Constant Lake (050801) • Nutrients • Dissolved Oxygen				
Mermentau River Basin Coastal Bays (050901) • Carbofuran • Mercury • Nutrients • Dissolved Oxygen • Siltation • Total Suspended Solids • Turbidity				

Vermilion-Teche River Basin

The Vermilion-Teche River Basin includes Vermilion River and Bayou Teche, which flow through south Louisiana. The upper end of the basin lies in the central part of the state near Alexandria, and extends southward to Gulf of Mexico. The basin is bordered on the north and northeast by a low escarpment and the lower end of Red River Basin. Atchafalaya River Basin lies to the east and Mermentau River Basin lies to the west of Vermilion-Teche River Basin. The Vermilion-Teche River Basin is comprised of forty four water quality sub-segments, which is the scale that LDEQ utilizes for permitting, water quality standards, assessment, and the ambient water quality monitoring network.

Water Quality Assessment

The 2008 IR indicated that of these forty-four watersheds, Vermilion River from its headwaters to LA 3073 Bridge was the only water body that was not meeting designated uses for contact recreation and FWP. There were thirty-five watersheds fully meeting primary and secondary contact recreation uses, but were not meeting FWP. West Cote Blanche Bay, East Cote Blanche Bay, Vermilion Bay, Marsh Island, Spring Creek and Bayou Teche from Charenton Canal to Wax Lake Outlet were meeting all of their designated uses. Seventh Ward Canal, located in Lower Vermilion River watershed, was not assessed for contact recreation but was not meeting FWP because of mercury. The 2010 IR indicates water quality has improved in Vermilion-Tech River Basin. Spring Creek, Cocodrie Lake, Chicot Lake, and portions of Bayou Teche indicated reductions in sedimentation and turbidity. Several of these water bodies also indicated improvements in DO concentrations.

Municipal point sources and municipal separate storm sewers are problems identified as contributing to those water bodies impaired with fecal coliform bacteria. Irrigated and non-irrigated crop production, sand and gravel mining, natural and unknown sources were identified as contributing sediment, nutrients and organic material to water bodies impaired for DO.

Define Water Quality Goals

LDEQ and USEPA Region 6 developed TMDLs for six watersheds in Vermilion-Teche River Basin, including Bayou Teche (060205, 060301, 060401), Bayou Teche (060401 and 060501), Bayou Boeuf (060208), Vermilion River (060801, 060802), Bayou Cocodrie Watershed (060102, 060201, 060203, which includes Cocodrie Lake, Bayou Cocodrie and Chicot Lake), Bayou Courtableau (060204), Lake Fausse Point and Dauterive Lake (060702). Two pollution problems associated with these water bodies included fecal coliform bacteria and/or DO. Bayou Teche, Bayou Boeuf and Vermilion River had TMDLs developed for fecal coliform and DO, whereas Bayou Cocodrie, Courtableau and Lake Fausse Point/Lake Dauterive only had problems with DO. NPS load reductions ranged from 17-68 percent and included agriculture, urban runoff, rural residences, home sewerage systems and hydromodification as contributing sources. A table on pages 214-221 includes information on which water bodies have had TMDLs completed for them, where WIPs have been completed or currently are being developed, where implementation activities are being conducted and delistings have occurred for one or more water quality parameters.

Bayou Boeuf receives runoff from agricultural fields and urban runoff from Alexandria. Vermilion River receives runoff from agricultural fields, urban runoff from Lafayette and runoff from pastures and home sewerage systems. Bayou Cocodrie receives agricultural and forestry runoff and portions of it have been modified for drainage. Bayou Courtableau also receives agricultural runoff and has been extensively modified.

Water Quality Improvements

LDEQ and USEPA have continued to focus resources and time in Vermilion-Teche River Basin and collected water quality data to determine whether water quality was improving as a result of these activities. Water quality data is collected continuously on Vermilion River and Bayou Teche. These data indicate fluctuations in DO concentrations from year to year with lower values in 2007. Water quality improved in Vermilion River and Bayou Teche in 2009/2010 with portions of these water bodies removed from the 303(d) list.

Water quality improved in Vermilion River from 2005 to 2010 with lower concentration of fecal coliform bacteria. Similarly, water quality improved in Bayou Teche, Bayou Cocodrie and Chicot Lake since 2004. LDEQ continues to analyze water quality data from these water bodies to determine if improvements are sufficient to delist them and develop a NPS Success Stories.

Watershed Implementation

There has been extensive implementation in Vermilion River watershed of agricultural BMPs for sugarcane, pastures, rice and crawfish operations. BMPs have been implemented and data has been collected from edge of the fields. Monitoring has indicated these practices are effective in reducing NPS pollutants entering the river. Bayou Vermilion District partnered with LDEQ on a watershed approach to reduce NPS loads entering the river. ULL and local SWCDs have implemented watershed projects to increase acres of BMPs implemented and quantified effectiveness of BMPs in reducing edge-of-field and in-stream NPS loads.

USDA's EQIP has consistently been active in this part of the state, with approximately 20,000 acres of BMPs implemented annually. In addition to EQIP, BMPs were also implemented through CRP, WRP and WHIP. The OSWC implemented Vermilion/Mermentau Section 319 project in which approximately 60,000 acres of BMPs were implemented. LDEQ continues to implement projects through the Section 319 program to reduce NPS pollutants from agricultural lands, home sewerage systems and urban areas.

LDEQ utilized the watershed approach to implement WIPs developed for Vermilion River. Water quality data indicated improvements in 2005-2006, but those improvements were not sustained during 2007 for DO, turbidity and organic carbon. These parameters were actually higher in 2006 than they were in 2005. Water quality data in 2006 IR indicated improved water quality in Vermilion River from New Flanders Bridge to Intracoastal Waterway. This section of the river improved from not meeting SCR to fully supporting that use, which means concentrations of fecal coliform bacteria declined in the river. LDEQ continues to monitor water quality to evaluate improvements resulting from projects that were implemented.

During the past few years, the NPS Program implemented the following projects in Vermilion-Teche River Basin:

- Vermilion-Teche River Basin Water Quality Monitoring Project, Phase 2;
- Evaluating Effects of Reduced Cultivation and Elimination of Burning of Combine-Harvest Residue on Soil and Water Quality and Sugarcane Profitability in Louisiana; and
- Lower Vermilion River Watershed 319 NPS Project.

The results of these projects were included in LDEQ's NPS Annual Reports and final reports located on LDEQ's NPS website. These projects provided information on types of BMPs effective in reducing NPS pollutants from sugarcane fields, pastures and urban residential areas. These results can be utilized in WIPs developed and revised for impaired water bodies in Vermilion-Teche River Basin. The same process described for Mermentau Basin is being utilized in this basin; detailed land-use information was completed in 2010 for the entire basin. This information, combined with water quality data and information on BMP implementation that occurred over the past 5 years can be the basis for prioritizing "high priority areas" for BMP implementation.

Currently, LDEQ has a watershed coordinator in this basin to partner with local stakeholders on restoring designated uses for Bayou Teche. LDEQ's NPS staff is revising WIPs developed several years ago, to comply with USEPA's 9 key elements, include current water quality data and land-use information. Sub-segments will be divided into 12 digit HUCs as a smaller scale to implements BMPs and monitor resulting water quality improvements.

Bayou Vermilion District has partnered with LDEQ to improve water quality in that bayou, through several projects related to agricultural runoff, clearing debris and implementing green infrastructure practices such as rain gardens and porous pavements. These are the type of actions that should be taken to restore the bayou and protect it for recreational purposes.

Goals and Objectives of the NPS Management Program for the Vermilion-Teche River Basin

The Vermilion-Teche River Basin continues to be a high priority for LDEQ. Therefore, it will continue to be a focus area for the NPS Program during the next 5-10 years. Due to a large percentage of the basin being utilized for crop production, there will continue to be an emphasis placed on implementing agricultural BMPs on cropland, pastures, rice and crawfish operations. Cade Farm has hosted several NPS projects and provides a local setting for farmers and landowners to learn more about BMPs and their advantages on production and water quality. The NPS Staff participate with students each year on Envirothon Camp to raise local awareness of environmental problems that exist and how they can become more involved in helping to solve those problems.

The process for implementing future objectives included these steps:

- Continue to implement NPS WIPs for agriculture, home sewerage, urban runoff, forestry, sand and gravel mining, etc. (2011-2016);
- Determine aspects of WIPs that are not sufficiently understood for full implementation of corrective actions (for example: hydromodification, riparian protection) (2011-2016);
- Revise satellite imagery based on detailed land-use data for Vermilion-Teche River Basin (2010-2011);
- Revise WIPs to include new land-use information, water quality data and results of watershed projects implemented in the basin (2011-2016);
- Design projects that clarify remaining NPS problems in the watershed and monitor their effectiveness for NPS pollutant reduction (2011-2016);
- Host educational workshops and field days in watersheds, providing information on implementation

activities, water quality data, progress in restoring water bodies and new technologies for solving NPS problems (2011-2016);

- Seek input and involvement from local communities on effectiveness of watershed implementation, new or existing ordinances that need to be enforced and additional problems that need to be addressed to restore these water bodies (2011-2016);
- Continue to work toward full watershed implementation for each land-use identified as contributing to NPS water quality problems (2011-2016);
- Continue to evaluate progress in implementation of BMPs for the watershed and report on progress made and problems encountered to watershed stakeholders, local communities and USEPA (2011-2016);
- Continue to monitor water quality (chemical, physical and biological components) to determine if watershed implementation has been effective in reducing nutrients, sediment, fecal coliform and organic enrichment in bayous and rivers of the basin (2011-2016);
- Continue to report on progress made or problems encountered with achieving goals of water quality improvement to partners and the local community (2011-2016);
- If water quality improvement is made and designated uses restored, continue maintenance of watershed projects. If water quality improvement is not sufficient to restore designated uses, determine additional actions necessary to reach water quality goals in Vermilion-Teche River Basin (2011-2016);
- Cooperate with local community and stakeholder to implement these additional measures (2011-2016); and
- Continue to evaluate progress in watershed implementation and improvements to water quality and report results to partners and local communities (2011-2016).

Timeline for Milestones: October 2011 - September 2016

The goals and objectives of Vermilion-Teche Watershed Strategy are to implement each of the tasks outlined above and reduce NPS pollutant loads calculated through the TMDL process. As these loads are reduced, water quality should improve and designated uses for fishing and swimming should be restored. The table included on pages 214-221 includes information on current levels of NPS activities in Vermilion-Teche River Basin. LDEQ will continue to partner with stakeholders to improve water quality for water bodies in this basin.

Stakeholders

LSU AgCenter watershed coordinators and LDAF OSWC partner with LDEQ to implement comprehensive WIPs in Vermilion-Teche River Basin, to improve water quality and meet goals and objectives of this plan. Federal agencies often provide funding to implement WIPs. Other state and local agencies could partner to leverage programs and resources for watershed planning and implementation. Benefits of these partnerships include bringing all levels of government together for a shared goal of improving water quality, wildlife habitat, and conservation of soil resources. Whereas this process may have occurred on an informal level, formalizing that process and including measurable goals, objectives and milestones allows LDEQ to evaluate whether water quality problems are being solved.

Louisiana Department of Environmental Quality (LDEQ)
LDEQ is lead agency for the state's NPS Management Program and coordinates many of the agencies and activities involved in watershed planning and management. LDEQ also serves as co-lead for CNPCP with LDNR-OCM. LDEQ currently applies for Section 319 base funds and other federal grant funds that can assist with watershed planning and implementation. LDEQ reports on progress made in NPS program and water quality improvement to the NPS Interagency Committee other partners and USEPA.

Natural Resource Conservation Service (NRCS)
NRCS has made recommendations on BMPs that could be implemented and evaluated at ULL's Cade Farm for sugarcane, pasturelands and crawfish farms. They also provided technical assistance to LDEQ and other cooperating agencies on AnnAGNPS watershed models. As BMPs are implemented throughout Vermilion-Teche River Basin, they will be involved in all levels of technical assistance, watershed planning and management programs.

Farm Services Agency (FSA)
FSA partners with NRCS to provide cost-share funds for farmers and landowners to participate in programs that reduce NPS pollutants from their agricultural operations.

Soil and Water Conservation Districts (SWCDs)
SWCDs can apply through LDAF for incremental Section 319 grant funds. Local SWCDs partner with agencies to implement educational outreach programs, cost-share and technical assistance and also demonstration farms. They provide support directly to farmers on conservation plans that include BMPs recommended to reduce pollutants entering receiving water bodies. SWCD staff evaluates whether implementation programs have been successfully implemented and reports on success of these projects to LDEQ and the NPS Interagency Committee.

Louisiana Department of Agriculture and Forestry (LDAF)
LDAF houses OSWC, LOF, and Office of Pesticides, all of which are important partners in watershed implementation. The OSWC participates with local SWCDs to ensure they are sufficiently funded to implement BMPs and educational outreach programs identified for the watershed or basin. Office of Pesticides monitors water quality to determine if there are pesticide problems in the water body. They cooperate with LDEQ on BMPs and educational programs for pesticides associated with agricultural production. The LOF implements educational programs and statewide BMP surveys to determine if forestry BMPs have been implemented. Each of these stakeholders in LDAF is an important partner in the NPS Management Program and has worked extensively to ensure continued implementation of BMPs in Vermilion-Teche River Basin.

Louisiana Department of Health and Hospitals (LDHH)
LDHH is responsible for home sewerage systems in Vermilion-Teche River Basin and will be included in educational programs and demonstration projects implemented there. The educational video and brochure, which describe the types of home sewerage systems approved in Louisiana, were developed in cooperation with LDHH.

Louisiana Department of Natural Resources - Office of Coastal Management (LDNR-OCM)

LDNR-OCM has continued to partner with LDEQ's NPS Program on development and implementation of CNPCP in coastal watersheds of Louisiana. In Vermilion-Teche River Basin, several watersheds have been identified as having NPS pollution discharging to coastal waters. LDEQ and LDNR partner with local communities on programs to address these pollutants and utilize Coastal NPS management measures as guidance for implementation to reduce NPS pollutants identified in the 303(d) list of impaired waters.

Local Police Jury and Drainage Boards

These local governing boards respond to citizen's concerns on drainage, roads, flooding and a host of other issues. As LDEQ focuses at the local level to implement WIPs, drainage boards and police juries should be involved. If changes are necessary to improve local drainage practices, local decision-makers should be included in the process. Local police juries and drainage boards will be major stakeholders in educational outreach programs in Vermilion-Teche River Basin.

City and Parish Officials

City and parish officials are important partners for LDEQ and other stakeholders involved in watershed protection programs. As USEPA and the State implement storm water regulations, NPS BMPs and CZARA management measures, local communities should participate in the implementation process. Sharing information on project implementation goals, objectives and timelines are key components for a successful project. LDEQ cooperates with local decision-makers on water quality solutions for their community.

LSU AgCenter

LSU AgCenter partners with farmers, landowners and the school system to provide information to the public on NPS pollution, watershed protection and BMPs. Their parish offices provide a location for dissemination of educational materials and also for a local contact with people who live in watersheds prioritized for NPS implementation. Their expertise and experience form a critical link with the local community and utilized in all aspects of watershed education in Vermilion-Teche River Basin.

University of Louisiana at Lafayette (ULL)

ULL provides local expertise on many watershed issues slated for water quality improvement. They have partnered with LDEQ on animal waste issues and been actively involved in watershed protection programs for Vermilion-Teche River Basin. They have hosted a series of demonstration projects on Cade Farm to evaluate effectiveness of BMPs in reducing sediment, nutrients, and pesticides from agricultural activities such as pastureland management, sugarcane and aquaculture. They have implemented educational outreach programs, sharing results of demonstration projects with farmers and landowners who live in Vermilion-Teche River Basin.

Local Community

The local community is an important partner for workshops and public meetings on TMDLs and watershed management projects. The community will benefit from improved water quality and should be kept informed on actions taken and programs being implemented to reach the goal of restoring designated uses to bayous, lakes and estuaries in Vermilion-Teche River Basin. As watershed management strategies are implemented, they need to be involved and partner with LDEQ and other agencies in gaining support for watershed strategies. By involving the local community in water quality and watershed management initiatives, there is a greater likelihood of long-term commitment to goals and objectives of the program.

Environmental Organizations

The environmental community has already expressed interest in seeing water quality improvement in Vermilion-Teche River Basin. They have voiced concern about existing levels of fecal coliform bacteria in their bayous and are interested in participating in watershed management programs. There are many opportunities for their involvement through watershed educational programs, demonstration projects and support of local ordinances that require implementation of BMPs for urban development and construction activities.

Federal Consistency

There are opportunities for LDEQ and LDNR-OCM to partner with Corps of Engineers on federal consistency issues in Vermilion-Teche River Basin. Several water bodies included on the 303(d) list indicated hydromodification and loss of riparian habitat as problems in the watershed. LDEQ will be participating with the Corps, local police juries and drainage boards on incorporation of BMPs and coastal NPS management measures in projects that involve dredging and channel alteration. There needs to be consistency between federal mandates from USEPA and NOAA and Corps federal requirements for flood control and navigation. LDEQ will continue through 401 Water Quality Certification Program to ensure this consistency.

Program Evaluation

Each of the stakeholders, including federal, state, and local partners involved in Vermilion-Teche Watershed Protection Programs assist LDEQ in evaluating progress made in project implementation. Quarterly progress reports are required for stakeholders that receive federal grant funds through Section 319 of CWA. Additionally, LDEQ would like to see other federal and state agencies assist in evaluating progress made in implementation of educational programs, watershed management strategies, BMPs and management measures.

LDEQ will be monitoring water quality in Vermilion-Teche River Basin to determine whether in-stream water quality is improving and NPS pollutants are being reduced. The TMDL process resulted in data collection and analysis for each water body in Vermilion-Teche River Basin included on the 1999 court ordered TMDL schedule. The NPS Program continued to monitor water bodies targeted for watershed management strategies. These data have provided a method to track in-stream water quality improvement during implementation. Other agencies also collect water quality data, which can be examined to determine if NPS pollution was adequately addressed throughout the basin. LDEQ has worked with LDAF, U.S. Geological Survey and other agencies that collect water quality and habitat data to determine if these data can assist in program evaluation. These data are compiled, analyzed and included in annual reports submitted to USEPA, presented to NPS Interagency Committee and included on LDEQ's NPS website.

The steps involved in program evaluation are outlined below:

1. Evaluate progress made on actions outlined in WIPs for Vermilion-Teche River Basin (short and long-term);
2. Continue to report on BMPs implemented as a result of Section 319, EQIP, or other sources of cost-share and technical assistance in the watershed (short and long-term);

3. Evaluate progress in reducing NPS pollutants, such as solids, nutrients, and organic carbon from various land-uses (agricultural, urban storm water runoff and home sewerage systems) in the watershed (short and long-term);
4. Evaluate water quality improvement in bayous (i.e. lower concentration of total organic carbon, total dissolved and suspended solids, nitrogen, phosphorus, and higher concentration in DO) (short and long-term);
5. Document progress as a result of program evaluation to NPS Interagency Committee, local stakeholders and USEPA (short and long-term);
6. Submit semi-annual and annual reports to USEPA which summarize results of watershed implementation (short and long-term); and
7. Revise LDEQ's web-site to include information on progress made in watershed implementation, NPS pollutant load reduction, and water quality improvement in bayous (short and long-term).

For more information on water bodies impaired or fully meeting designated uses in Vermilion Tech River Basin, please refer to LDEQ's IR:
http://www.deq.louisiana.gov/portal/DIVISIONS/WaterPermits/WaterQualityStandardsAssessment/WaterQualityInventorySection305b/2010WaterQualityIntegratedReport.aspx

TMDLs Completed in Vermilion-Teche Basin	Watershed Implementation Plan Completed	Watershed Implementation Plan Developed	Implementation Activities Being Conducted	Delistings Between 2004 -2010
Bayou Cocodrie/Spring Creek/Lake Chicot System (060101, 060102, 060201, 060202, 060203) • Dissolved Oxygen • Total Suspended Solids • Total Dissolved Solids • Salinity • Turbidity • Ammonia • Chlorides • Copper • Nutrients • Siltation • Mercury • Noxious Aquatic Plants • Sulfate	yes	Scheduled for Revision in 2011		DO and Turbidity in Spring Creek in 2008 Chlorides/Sulfates/TDS and Turbidity in Bayou Cocodrie in 2008; DO and Low pH in 2010 Sedimentation/Siltation/TSS/ Turbidity in Chicot Lake in 2008. Low pH in 2010

	Watershed Implementation Plan Completed	Watershed Implementation Plan Developed	Implementation Activities Being Conducted	Delistings Between 2004 -2010
Bayou Teche (060301, 060401, 060501) • Dissolved Oxygen/Nutrients • Nitrogen • Total Suspended Solids • Carbofuran • Chlorides • Fecal Coliform • Sulfate • Total Dissolved Solids • Total Suspended Solids • Siltation • Salinity • Turbidity		yes, currently being revised in 2011	yes, LDEQ and Watershed Coordinator	Chlorides/Sulfates/Total Dissolved Solids and Copper in 2004 Fecal Coliform and Total Suspended Solids in 2006 Sedimentation/Turbidity/Total Suspended Solids/Dissolved Oxygen, Nitrogen, Phosphorus in 2008
Bayou Courtableau (060204) • Dissolved Oxygen • Fecal Coliform • Sulfate • Ammonia • Total Dissolved Solids • Total Suspended Solids • Salinity • Siltation • Turbidity	yes			Sulfates/Total Dissolved Solids in 2004 Ammonia, Fecal Coliform and Dissolved Oxygen in 2008
Indian Creek and Indian Creek Reservoir (060206) • Temperature				

	Watershed Implementation Plan Completed	Watershed Implementation Plan Developed	Implementation Activities Being Conducted	Delistings Between 2004 - 2010
Bayou des Glaises (060207) • Dissolved Oxygen/Nutrients • Siltation • Total Suspended Solids • Turbidity • Carbofuran				
Bayou Boeuf (060208) • Dissolved Oxygen • Fecal Coliform • Nutrients • Total Dissolved Solids • Total Suspended Solids • Siltation • Turbidity	yes			Fecal Coliform in 2008
Bayou Carron (060210) • Dissolved Oxygen/Nutrients • Total Phosphorus • Total Suspended Solids		yes, scheduled for development in 2012		
Lake Fausse Point/Lake Dauterive (060702) • Dissolved Oxygen/Nutrients • Nitrogen • Siltation • Total Suspended Solids • Turbidity	yes			

	Watershed Implementation Plan Completed	Watershed Implementation Plan Developed	Implementation Activities Being Conducted	Delistings Between 2004 -2010
Bayou du Portage (060703) • Dissolved Oxygen • Fecal Coliform • Siltation • Total Suspended Solids • Turbidity				
Vermilion River/Vermilion River Cutoff/Coastal Bays and Gulf Waters to Three Mile Limit (060801, 060802, 060803) • Dissolved Oxygen • Carbofuran • Fecal Coliform • Nitrogen • Sulfates • Total Suspended Solids (TSS) • Nitrogen • Total Phosphorus • Mercury • Siltation • Turbidity	yes		Yes, LDEQ, LDAF, USDA and Vermilion District are implementing agricultural and urban BMPs	Sulfates in 2004 Fecal Coliform, Sedimentation/Siltation/Total Suspended Solids, Turbidity in 2010 for 060801 Sulfates in 2004 Total Suspended Solids in 2006 Fecal Coliform in 2008 for 060802 Dissolved Oxygen, Nitrogen, Phosphorus in Vermilion River Cutoff in 2008 for 060803
Intracoastal Waterway (060804) • Total Suspended Solids • Turbidity • Siltation				

	Watershed Implementation Plan Completed	Watershed Implementation Plan Developed	Implementation Activities Being Conducted	Delistings Between 2004 2010
Bayou Petite Anse (060901) • Fecal Coliform • Total Suspended Solids (TSS) • Dissolved Oxygen • Carbofuran • Nutrients • Turbidity • Siltation • Total Phosphorus				Fecal Coliform and Total Suspended Solids in 2008
Bayou Carlin (060902) • Total Suspended Solids (TSS) • Siltation • Turbidity • Carbofuran				Total Suspended Solids in 2008
Bayou Tigre (060903) • Carbofuran • Dissolved Oxygen/Nutrients • Siltation • Total Suspended Solids Turbidity				Total Suspended Solids and Turbidity in 2008
New Iberia Southern Drainage Canal (060904) • Total Suspended Solids/Turbidity/Siltation • Carbofuran • Total Phosphorus • Dissolved Oxygen/Nutrients				

	Watershed Implementation Plan Developed	Watershed Implementation Plan Completed	Implementation Activities Being Conducted	Delistings Between 2004 - 2010
Intracoastal Waterway (060906, 061102) • Carbofuran • Siltation • Total Suspended Solids • Turbidity				
Franklin Canal (060907) • Carbofuran • Nutrients • Dissolved Oxygen • Siltation • Total Suspended Solids • Turbidity				
Spanish Lake (060908) • Dissolved Oxygen				
Lake Peigneur (060909) • Fecal Coliform • Nutrients • Dissolved Oxygen • Total Phosphorus • Siltation • Total Suspended Solids • Turbidity				Fecal Coliform in 2008

	Watershed Implementation Plan Completed	Watershed Implementation Plan Developed	Implementation Activities Being Conducted	Delistings Between 2004-2010
Boston Canal (060910) • Carbofuran • Siltation • Total Suspended Solids • Turbidity				
Dugas Canal (060911) • Fecal Coliform • Carbofuran • Dissolved Oxygen/Nutrients • Total Phosphorus • Total Suspended Solids • Siltation • Turbidity				Fecal Coliform in 2008
West Cote Blanche Bay (061001) • Nutrients • Dissolved Oxygen				Dissolved Oxygen, Nitrite-Nitrate and Total Phosphorus in 2008
Bayou Petite Anse (061101) • Carbofuran • Siltation • Total Suspended Solids • Turbidity				

	Watershed Implementation Plan Completed	Watershed Implementation Plan Developed	Implementation Activities Being Conducted	Delistings Between 2004-2010
Freshwater Bayou Canal (061103) • Dissolved Oxygen/Nutrients • Siltation • Total Suspended Solids • Turbidity				

Calcasieu River Basin

The Calcasieu River Basin is located in southwestern Louisiana. The drainage area of Calcasieu Basin comprises approximately 3,910 square miles. Headwaters of Calcasieu River are in the hills west of Alexandria. The river flows south for about 160 miles to Gulf of Mexico; the mouth of the river is about 30 miles east of Texas/Louisiana state line. The landscape in this basin varies from pine forested hills in northern reaches to brackish and salt marshes in southern reaches around Calcasieu River. The Calcasieu River Basin includes thirty-six sub-segments, which is the state hydrologic unit utilized for water quality standards, monitoring, permitting and assessment.

Assessment

Of thirty-six sub-segments assessed in 2008, Contraband Bayou, Hickory Branch-Headwaters to West Fork of Calcasieu River, Indian Bayou-Headwaters to West Fork of Calcasieu River and Calcasieu River-Headwaters to LA 8 were not meeting any of their uses. Sixteen watersheds were fully meeting contact recreational uses, but were not meeting FWP. One water body was not meeting PCR, but was fully meeting SCR and FWP. Eleven water bodies were fully meeting all of their uses compared to seven in the 2006 IR. Bayou Olsen has a swimming advisory due to industrial discharges, but was not assessed for any other uses. Holly Beach was not meeting PCR use based on data from Beach Monitoring Program. The 2010 IR indicated there had been water quality improvements in west fork of Calcasieu River from Beckwith Creek to Calcasieu River, and also in Hickory Branch from headwaters to West Fork of Calcasieu River. Bayou Choupique has remained off of the 303(d) list since 2008, and is currently being examined for a possible NPS Success Story. There were also improvements in Lake Prien, March Bayou and Lake Charles with none of these water bodies currently listed for fecal coliform bacteria. Prien Lake also improved in DO.

The 2006 IR indicated water quality had improved in nine water bodies, including: Calcasieu River–from LA Hwy. 8 to Rapides-Allen Parish Line, Rapides-Allen Parish Line to confluence with Marsh Bayou, Bayou Verdine, East and West Forks of Six-Mile Creeks, Six-Mile Creek, Ten-Mile Creek, Bundicks Creek, Bayou Choupique-Headwaters to Intracoastal Waterway, Calcasieu River Basin-coastal bays to three-mile limit. All of these water bodies were fully meeting their uses. Water quality also improved in Calcasieu River at confluence with Marsh Bayou to Saltwater Barrier, West Fork of Calcasieu River and Hickory Branch-Headwaters to West Fork of Calcasieu River. In this set of water bodies, DO levels improved but were not yet fully meeting water quality standards. Water quality also improved in Beckwith Creek and Bayou D'Inde, with fecal coliform levels declining so that PCR was fully met. Water quality declined in Contraband Bayou, Marsh Bayou, Indian Bayou and Intracoastal Waterway either because of increased fecal coliform or lower concentrations of DO. Marsh Bayou has improved and is no longer listed for fecal coliform bacteria.

For water bodies listed as not meeting FWP, suspected causes of impairment included municipal point sources, separate storm sewers, silvicultural activities, irrigated and non-irrigated crop production, managed pastures and natural conditions. The majority of water quality problems associated with FWP includes low DO and mercury contamination, with a few water bodies impaired by turbidity and TSS. For water bodies listed as not meeting contact recreation uses, fecal coliform bacteria were associated with on-site treatment systems, urban storm water runoff, wildlife other than waterfowl and sanitary sewer overflows.

Define Water Quality Goals

Water quality goals for Calcasieu River Basin are to restore impaired waters to meet designated uses for fishing and swimming. LDEQ completed TMDLs for fifteen water bodies and one waste load allocation for Kinder Ditch/Town of Kinder in Calcasieu River Basin listed on the 303(d) list as impaired. LDEQ's NPS staff completed WIPs for 6 of these watersheds, including: Mill Creek, Barnes Creek, Marsh Bayou, Bayou Serpent, Little River and Indian Bayou. The types of land-uses that exist in these watersheds include agricultural cropland in eastern portions of the basin and pastureland and forests in north and central portions of the basin. Construction and rural residential development were also identified as contributing to the sediment and fecal coliform loads, respectively. Copies of WIPs can be found on LDEQ's NPS website. In order to restore these water bodies, additional agricultural and forestry BMPs will need to be implemented, cities will need to continue making progress in meeting requirements of their storm water permits and homeowners will need to manage individual home sewerage systems. A table on pages 228-233 includes current information on which water bodies have had TMDLs and WIPs completed, where implementation activities are occurring and water quality parameters have been delisted.

Watershed Implementation

USDA continues to implement agricultural BMPs through EQIP. Generally, each year they average between 14,000 and 25,000 acres of practices through this program. In addition to EQIP, BMPs have also been implemented through CRP, WRP and WHIP. The OSWC has implemented a Calcasieu River Basin Section 319 project in which more than 25,000 acres of BMPs have been implemented. LDEQ has partnered with Allen Parish SWCD to implement BMPs on farmers' lands in Bayou Serpent watershed to reduce NPS pollutant loads that exist and contribute to water quality impairment.

Marsh Bayou, Indian Bayou and Bayou Serpent continue to have water quality problems and will continue to be NPS priorities for watershed implementation. The CREP described in the Mermentau River Basin section of the NPS Plan will extend to portions of Calcasieu River Basin. This program will result in agricultural land being taken out of production and planted in native prairie grasses.

Calcasieu Parish has implemented an ordinance for all home sewerage systems that requires no discharge to any roadside ditch or drainageway. Increased inspection of these systems should result in maintenance of home sewerage systems and improved water quality in this part of the basin.

During the past years, LDEQ partnered on a project with Allen Parish SWCD to reduce NPS pollutants entering Bayou Serpent, and OSWC a utilized a portion of Section 319 incremental funds to assist farmers and landowners in implementing agricultural BMPs in these eastern watersheds of Calcasieu River Basin. Calcasieu Parish had submitted a project for funding which will result in inspection of individual home sewerage systems in the remaining watersheds impaired for fecal coliform bacteria. This effort could lead to delisting these water bodies in the next 3-5 years.

LDEQ partnered with a watershed coordinator in Calcasieu and Sabine Basins to assist local stakeholders, through Imperial Calcasieu RC&D, to restore water bodies there. The coordinator is drafting a WIP for Vinton Waterway and will assist in source identification, problem solving and determining which BMPs are effective for improving water quality. There have been meetings with McNeese University to arrange a cooperative activity for water quality monitoring in that area.

One of LDEQ's NPS staff has also been assigned to focus on watersheds in this part of the state, and is currently revising Marsh Bayou WIP. Marsh Bayou Watershed, sub-segment 030603 exists in four different parishes: Beauregard, Allen, Calcasieu, and Jefferson Davis. Marsh Bayou is impaired for both fecal coliform and DO. Marsh Bayou has been included on the state's 303(d) list of impaired waters since 2002. Between 2002 and 2004, it was impaired because of low levels of DO, preventing the bayou from meeting FWP. In 2006, Marsh Bayou was also impaired because of high levels of fecal coliform bacteria in the water body, preventing it from meeting PCR. The 2008 IR also included Marsh Bayou for DO and fecal coliform bacteria, indicating these water quality problems persisted. There is a great deal of household debris in Marsh Bayou. FEMA funds are now being requested in to help with the removal of debris in Beauregard parish. The watershed planning process described in Mermentau and Vermilion-Teche River Basins is also being utilized in Calcasieu Basin. LDEQ's detailed land-use classification was completed in 2011 and provided an important data set for revision of existing WIPs and development of new WIPs.

Future Objectives and Milestones

The future objectives and milestones for Calcasieu River Basin include implementation of the NPS component of TMDLs through WIPs that have been completed. Through continued coordination between LDAF and NRCS on agricultural components of NPS problems, water quality should improve. Closer coordination with LDNR and LDHH on home sewerage and urban storm water attributing to NPS problems, should improve water quality. The CWP prioritizes water bodies in Calcasieu River Basin for watershed implementation activities, in order to meet water quality goals of restoring 25 percent of the state's impaired waters by 2016. Section 319 of the CWA requires that states include milestones with tasks and timelines for NPS program implementation. These milestones outline the steps for watershed implementation in Vermilion-Teche River Basin:

- Examine new water quality data collected in 2011-2014 to determine which water bodies need to be prioritized for NPS reduction (2011-2014);
- Utilize data and information from WIPs as the basis for guiding how implementation should occur to reduce NPS pollutants (2011-2016);
- Partner with federal, state and local agencies to implement watershed management strategies to reduce NPS pollutant loads (2011-2016);
- Partner with local community and environmental organizations on educational programs that provide information on what role the local community can play in the watershed implementation (2011-2016);
- Partner with federal and state agencies to prioritize funding and other resources for technical expertise in watershed projects to assist the local community in reaching short and long term goals (2011-2016);
- Revise satellite imagery based detailed land-use information for Calcasieu River Basin (2011);
- Revise WIPs to include new land-use information and water quality data with results of watershed projects implemented in Calcasieu River Basin (2011-2016);

- Continue to report on rate of BMP implementation and educational outreach as one measure of progress in meeting short and long term goals (2011-2016);
- Continue to monitor water quality to determine whether water quality improvements are made and designated uses are being restored or maintained (2011-2016);
- Report results of progress on watershed implementation to USEPA and local communities in the basin (2011-2016);
- Determine where additional steps are needed to reduce NPS pollution from each land-use category identified as contributing to water quality impairment (2011-2016);
- Continue to implement additional management strategies and monitor their effectiveness until water quality standards are met and designated uses are restored (2011-2016); and
- Include highlights and progress made on NPS implementation and water quality improvement in Calcasieu River Basin on LDEQ's NPS web site (2011-2016).

Timeline for Milestones: October 2011 – September 2016

The goals and objectives for the Calcasieu River Basin Watershed Program are to reduce NPS pollutant loads that are calculated through the TMDL process. The table on pages 228-232 provides current information on TMDLs, WIPs, implementation activities and delistings for Calcasieu River Basin. Through tasks outlined in this document, water quality should improve and designated uses should be restored. The 4-year basin cyclic water quality-monitoring program, combined with local watershed monitoring programs, will be the basis for tracking reduced pollutant loading and water quality improvement in Calcasieu River Basin.

Stakeholders

LDEQ will be the coordinating agency that partners with other agencies, local communities and environmental organizations on all aspects of planning, managing and evaluating watershed implementation activities. LDEQ will also be responsible for reporting on progress made in the NPS program to USEPA, cooperating agencies and the general public.

LSU AgCenter

LSU AgCenter continues to provide technical expertise and educational support for BMPs that reduce NPS pollutants from forestry and agricultural activities. In Calcasieu River Basin, they have provided input on effectiveness of forestry BMPs in reducing the amount of sediment, nutrients and organic material after timber harvests. They also provide educational components for Master Farmer Program and manage demonstration farms where BMPs have been implemented and are being evaluated for their effectiveness in reducing NPS loads.

Louisiana Forestry Association (LFA)

LFA continues to provide support to the forestry community and educational programs that provide information to landowners, loggers, and private and industrial foresters on how forestry BMPs should be implemented.

Louisiana Department of Health and Hospitals (LDHH)

LDHH is a member LDEQ's NPS Interagency Committee and has developed educational videos and brochures concerning potential impacts that home sewerage systems have on water quality. As these NPS management strategies are developed and implemented in Calcasieu River Basin, LDHH will be an important partner in designing and evaluating programs that can reduce these types of water quality problems.

Local Environmental Organizations

Local environmental organizations are important partners in watershed planning and implementation. They can provide input on habitat protection and assist with educational outreach programs. As local communities and organizations become more involved in watershed programs, they will take more ownership and responsibility for restoring and protecting water quality.

McNeese University

The local university is an important stakeholder for watershed programs. They can become involved in water quality and habitat data collection. Their educational skills and technical expertise can assist the public to understand water quality problems in their bayous and lakes. The can also assist local communities implement management measures and practices to address these problems.

Natural Resource Conservation Service (NRCS)

NRCS partners with LDEQ in watershed implementation by providing technical assistance and cost-share funds to landowners for agriculture and forestry BMPs. Their local field offices provide information on NPS BMPs that can be implemented to reduce NPS pollution and improve water quality.

Louisiana Department of Agriculture and Forestry (LDAF)

LDAF has staff that provides expertise and experience to assist landowners on agricultural and forestry issues. The local SWCDs have staff to assist with technical and educational aspects of implementing BMPs on lands identified as contributing to NPS. Their staff also assists in tracking the level of participation in cost-share programs and how these programs result in reduction of sediment and other pollutants.

Louisiana Department of Natural Resources – Office of Coastal Management (LDNR-OCM)

LDNR-OCM partners with LDEQ and other cooperating agencies on implementation of the CNPCP. As NPS watershed management strategies are implemented in Calcasieu River Basin, OCM will be involved and participate in areas that affect coastal waters.

Federal Consistency

The Calcasieu River Basin has coastal watersheds with hydromodification and dredging as causes of water quality impairment. LDEQ partnered with LDNR-OCM, Corps of Engineers, police juries and drainage boards to incorporate BMPs and management measures from the CNPCP guidance document into permits for these types of projects. The goal is to work toward federal consistency with USEPA, NOAA and Corps of Engineers on projects/programs related to water quality, habitat protection and watershed restoration.

Program Evaluation

In 1999, LDEQ collected water quality data for each water body in Calcasieu River Basin, and maintains a historical water quality database for those water bodies. During 2000-2001, TMDLs were developed for each of the water bodies included on the 1998 303(d) list of impaired waters. These data served as a baseline for NPS load reductions in Calcasieu Basin.

LDEQ will continue to partner with federal and state agencies and local universities to determine whether sufficient data has been collected to evaluate progress made through watershed implementation. All of this data and information will be analyzed to determine if in-stream water quality goals and objectives have been met. Results will be reported to USEPA, NPS Interagency Committee and the general public. This information will be included in annual and final reports provided to USEPA and will also be included on LDEQ's NPS website.

For more information on water bodies that are impaired or fully meeting their designated uses in the Calcasieu River Basin please see LDEQ's IR:
http://www.deq.louisiana.gov/portal/DIVISIONS/WaterPermits/WaterQualityStandardsAssessment/WaterQualityInventorySection305b/2010WaterQualityIntegratedReport.aspx

TMDLs Completed in Calcasieu River Basin	Watershed Implementation Plan Completed	Watershed Implementation Plan Developed	Implementation Activities Being Conducted	Delistings Between 2004 - 2010
Calcasieu River (030101, 030102, 030103) • Fecal Coliform • Dissolved Oxygen in Upper Calcasieu River • Dissolved Lead				Cadmium, TDS, Sulfates, Copper, TSS, Turbidity in 2004 Dissolved Lead in 2006
Mill Creek (030104) • Dissolved Oxygen	yes			
Calcasieu Estuary and Ship Channel (030301) • Toxics				Copper, Fecal Coliform, Lead, Mercury and Ammonia Nitrogen in 2004
Lake Charles (030302) • Toxics				Fecal Coliform, Non-priority organics, priority organics in 2004 Fecal Coliform in 2010
Prien Lake (030303) • Toxics				Priority Organics in 2004 Dissolved Oxygen and Fecal Coliform in 2010

	Watershed Implementation Plan Completed	Watershed Implementation Plan Developed	Implementation Activities Being Conducted	Delistings Between 2004-2010
Moss Lake (030304) • Toxics				Cadmium, Copper, Lead, Priority Organics in 2004
Contraband Bayou (030305) • Dissolved Oxygen/Nutrients • Fecal Coliform • Toxics				Copper, Priority Organics in 2004
Bayou Verdine (030306) • Toxics				Contaminated Sediments, Mercury, Metals, Nickel, Non-priority Organics, Oil & Grease in 2004
Calcasieu River – Calcasieu Ship Channel below Moss Lake to the Gulf of Mexico (030401) • Contaminated Sediments • Copper • Mercury • Polycyclic Aromatic Hydrocarbons (PAHs) • Toxics				Fecal Coliform, Priority Organics in 2004 Fecal Coliform in 2010
Calcasieu Lake (030402) • Toxics				Fecal Coliform, Priority Organics in 2004

	Watershed Implementation Plan Completed	Watershed Implementation Plan Developed	Implementation Activities Being Conducted	Delistings Between 2004-2010
Whiskey Chitto Creek (030501) • **Fecal Coliform**				
East and West Fork of Six –Mile Creek (030503, 030504) • **Dissolved Lead**				Lead, Cadmium, Copper in 2006
Bundick's Creek and Bundick's Lake (030506, 030507) • **Dissolved Lead**				Lead in 2010
Barnes Creek (030601, 030602) **Dissolved Oxygen**		yes, will be revised in 2012 - 2013		Dissolved Oxygen in 2008
Marsh Bayou (030603) • **Fecal Coliform** • **Dissolved Oxygen**	yes		yes, LDEQ priority watershed	Fecal Coliform in 2010
Bayou Serpent (030701) • **Dissolved Oxygen** • **Dissolved Lead** • **Fipronil**	yes		yes, LDAF priority	Total Dissolved Solids in 2010

	Watershed Implementation Plan Completed	Watershed Implementation Plan Developed	Implementation Activities Being Conducted	Delistings Between 2004-2010
English Bayou (030702) • Dissolved Oxygen • Ammonia Nitrogen • Total Suspended Solids • Turbidity				Lead and Mercury in 2004
West Fork of Calcasieu River (030801) • Dissolved Oxygen				Cadmium, Copper, Lead in 2004 Low pH in 2010
Hickory Branch (030802) • Fecal Coliform				Fecal Coliform in 2010
Beckwith Creek (030803) • Dissolved Lead				Lead and Fecal Coliform in 2006
Little River (030804) • Dissolved Oxygen • Dissolved Lead	yes			Low pH in 2010
Indian Bayou (030805) • Dissolved Oxygen • Fecal Coliform		yes, currently being revised in 2011-2012		

	Watershed Implementation Plan Completed	Watershed Implementation Plan Developed	Implementation Activities Being Conducted	Delistings Between 2004 - 2010
Houston River (030806) • Dissolved Oxygen				Chlorides, Sulfates/Total Dissolved Solids in 2006
Bear Head Creek (030807) • Dissolved Oxygen • Dissolved Lead				
Bayou D'Inde (030901) • Dissolved Oxygen/ Nutrients • Copper • PCBs in Fish • Contaminated Sediments • Hexachlorobutadiene • Hexachlorobenzene • Tetrachloroethane • Priority Organics				Contaminated Sediments, Copper, Fecal Coliform, Mercury, Nickel, Non-priority organics, Oil & Grease, Other Inorganics in 2004
Bayou Choupique (031001) • Dissolved Oxygen • Turbidity				Dissolved Oxygen and Turbidity in 2008
Intracoastal Waterway (031101) • Fecal Coliform				Fecal Coliform in 2010

Lake Pontchartrain Basin

The Lake Pontchartrain Basin is in southeastern Louisiana and is primarily comprised of rivers and bayous that drain to Lake Pontchartrain. The basin is bounded on the north by the Mississippi state line, on the west and south by Mississippi River Levee, on the east by Pearl River Basin and on the southeast by Breton and Chandeleur Sound. The northern portion of the river basin consists of forests, pines and hardwoods, pastures and dairies. The southern portion of the basin consists of cypress-tupelo swamps and lowlands, brackish and saline marshes. Marshes in southeastern portions of the basin constitute the most-rapidly eroding area of Louisiana's coast. Elevations in the basin range from minus five feet below sea level at New Orleans to over two hundred feet above sea level near the Louisiana-Mississippi border.

Water Quality Assessment

The 2004 IR indicated that there were eighty-four sub-segments in Lake Pontchartrain Basin. Of these eighty-four sub-segments, the 2008 IR indicated there were only four water bodies not meeting both contact recreation and FWP (i.e. Yellow Water River, Ponchatoula Creek, W-14 Main Diversion Canal-Headwaters to Salt Bayou and New Orleans East Levied Water bodies). This was an improvement from 2004 and 2006 IRs, when there were six and seven water bodies that were not meeting these uses, respectively. These water bodies had bacterial contamination and either low DO or mercury contamination. There are more problems with mercury and turbidity in Lake Pontchartrain Basin than with DO. However, DO problems do exist in water bodies in western portions of the basin and also for some of those water bodies on north shore of Lake Pontchartrain. These watersheds are all rapidly changing from rural to urban areas and will continue to do so as development spreads along Interstate 12 from Baton Rouge to the Mississippi state line.

The 2008 IR included two water bodies not meeting PCR and two not meeting both primary and SCR, but meeting FWP. This means that these water bodies had problems with bacterial contamination, but were in compliance with water quality standards for DO. These water bodies included Comite River from Wilson-Clinton Highway to White Bayou and from White Bayou to the Amite River, Salt Bayou and Big Creek.

The 2008 IR indicated there were thirty-three water bodies fully meeting all of their designated uses, which is an improvement from both the 2004 and the 2006 IRs, which had twenty-nine and thirty water bodies fully meeting their uses, respectively. Both 2004 and 2006 IRs indicated there were twenty-one water bodies that fully met both the primary and SCR, but did not meet FWP. This number increased in the 2008 IR, with thirty water bodies falling into this category of use support. There were three water bodies that were evaluated because of mercury fishery advisories, but were not assessed for other uses. The Poydras-Verret Marsh in St. Bernard Parish was also included in the list of eighty-four sub-segments, but was not assessed for compliance with designated uses.

Water bodies that did not meet the contact recreational use because of fecal coliform bacteria had several suspected causes identified as contributing to lack of compliance, including on-site treatment systems, sanitary sewage overflows, municipal (urbanized high density areas), package plant or other permitted small flow discharges, dairies and wildlife other than waterfowl. The water bodies that did not meet FWP because of problems with DO had a range of problems, including land development, on-site treatment systems, drainage/filling/loss of wetlands, residential districts, municipal (urbanized high density areas), package plant or other permitted small flow discharges, sanitary sewer overflows, natural conditions and source unknown.

The 2010 IR includes water quality improvements for water bodies in Lake Pontchartrain Basin. The Comite River and Upper Amite River remain off of the list for fecal coliform bacteria and Comite River is no longer listed for turbidity. The Blind River has remained off of the list for nutrients and DO. The Tickfaw, Tangipahoa and Tchefunte River have also remained off of the list for fecal coliform with success stories written for Tangipahoa and Tchefuncte Rivers. Bogue Falaya, Bayou Lacombe, Bayou Cane, Bayou Bonfouca and Lake Pontchartrain have also remained off of the list for bacteria. Several water bodies have also remained off of the list for DO, including Bayou Bienvenue, Bayou Chaperon, Bashman Bayou, Bayou Dupre, Mississippi River Gulf Outlet, Bayou Gentilly, Bayou and Lake Lery have also remained off of the list for fecal coliform. Some of these water bodies will be examined for potential NPS Success Stories during 2011-2016. A table on pages 241-242 includes information on which water bodies have had TMDLs and WIPs developed for them, where implementation activities are currently being conducted and delistings have occurred.

Water Quality Improvement

LDEQ has continued to collect water quality data for many of the water bodies in the Lake Pontchartrain Basin. These data indicate the average concentration of DO for many of the water bodies denote good water quality, with the DO levels exceeding water quality standards for FWP. The fecal coliform water quality data has indicated that almost all of the water bodies have improved and many have been taken off of the 303(d) list of impaired waters.

Water Quality Goals

LDEQ will be finalizing TMDLs for Lake Pontchartrain Basin during 2011. This was the basin scheduled for TMDLs through the 1999 court ordered schedule. Ambient water quality data was scheduled for collection on the 4-year water quality cycle. Watersheds that have TMDLs completed for them will be prioritized for development of WIPs. Two watershed coordinators have been hired to partner with LPBF on stakeholder involvement for watershed plans. LDEQ's NPS staff is also partnering with LPBF to implement these plans, and will be assigned additional watersheds to focus on through the planning and implementation process.

Much of LDEQ's resources for water quality management will be focused on these activities. However, to address some of the known problems that exist in this basin, LDEQ has been implementing programs that address fecal coliform, low DO and mercury contamination. LPBF has implemented many programs to restore water quality and continues to be an important partner for LDEQ as TMDLs are implemented in the basin. Since much of the basin is included in Louisiana's Coastal Zone Boundary, LDNR-OCM will partner with LDEQ and LPBF on implementation of management measures required through CNPCP.

Watershed Implementation

A number of land-use types exist in Lake Pontchartrain Basin. Much of the area north of Lake Pontchartrain has historically been rural with pine forests and pastures dominating the landscape. Small communities lined the north shore of the lake, but during the past 20 years these parishes and communities have experienced the most rapid increases in population as any other part of the state. The two largest urban municipalities in the state exist in Lake Pontchartrain Basin, New Orleans and Baton Rouge. After the two hurricanes of

2005, there was a major population shift from New Orleans to East Baton Rouge Parish, and to the communities on the north shore of Lake Pontchartrain. The city of Baton Rouge is northwest of New Orleans and Lake Pontchartrain and drains to Bayou Manchac.

Areas south of Lake Pontchartrain include the city of New Orleans and wetlands and marshes that are rapidly eroding due to subsidence, sea level rise and saltwater intrusion. Areas just west of Lake Pontchartrain include cypress-tupelo swamps which surround Lake Maurepas. During 2007-2008, LDEQ's GIS Center collaborated with agricultural agencies and local SWCDs on detailed land-use classification of Lake Pontchartrain Basin. These data provide an accurate map and database of existing land-use that can be utilized in watershed modeling and WIPs for impaired water bodies that exist across the basin.

USDA averages between 11,000 to 15,000 acres of BMPs implemented each year through EQIP and partners with LPBF and LDEQ on their watershed priorities. LDEQ has utilized Section 319 funds to implement projects for each major type of land-use problem that exists in LPB.

During the past few years, the NPS Program implemented the following projects in LPB, to address the types of problems that have been identified in the IR as contributing to water quality impairment in LPB:

- Watershed Education Project for Bayou Duplantier in EBR Parish;
- Modeling and Monitoring of NPS Pollutants in Blind and Tickfaw Rivers;
- St. Tammany Parish Watershed Coordinator, Implementation and Educational Outreach;
- NPS Pollution Abatement Program through Inspection of Existing On-Site Sewerage Disposal Systems and Educational Outreach for St. Tammany Parish;
- Mandeville Neighborwoods;
- Mitigating NPS Pollution in Urban Watersheds with Spatial Modeling, BMPs for Wetlands, and Community Outreach;
- Public Outreach Program for NPS Pollution in LPB;
- Storm Water BMPs in Wetland Landscape Design Planning, Construction at Woodlawn High School; and
- Watershed Implementation in St. Tammany Parish: St. Tammany Parish Tchefuncte and Bogue Falaya Watershed Implementation Project.

Results of these projects have included new ordinances to reduce pollution from home sewerage systems and urban development, and examination of BMPs that can restore impaired watersheds or protect watersheds from becoming impaired. Other projects have focused on educating the public on why their water bodies are not meeting designated uses and what steps need to be taken by them or their local governments to restore those waters. The results of all of these projects can be found in LDEQ's NPS Annual Reports or in final reports that posted on LDEQ's NPS website.

Florida Parish Watersheds

The Florida Parishes consist of rural areas that extend to the Mississippi State Line and are primarily comprised of pastures and dairies with small communities such as Amite, Kentwood, Greensburg and Clinton. However since the hurricanes, these areas have experienced rapid growth as people from New Orleans and St. Bernard parishes have chosen to relocate. Water quality problems that exist in these watersheds include fecal coliform bacteria from home sewerage systems, pastureland runoff and dairy operations. USDA has prioritized much of their EQIP funds toward animal operations to ensure landowners have nutrient management plans and animal waste treatment systems in place. LDEQ has utilized a portion of its Section 319 funds for cost-share programs for BMPs on pastureland management. Another portion of the funds have been utilized for inspection programs for home sewerage systems and educational programs on urban storm water runoff.

St. Tammany Parish has implemented projects to reduce NPS problems from home sewerage systems, construction and storm water associated with development. Communities on the north shore of Lake Pontchartrain are experiencing so much growth that watershed protection will continue to be a challenge. However, the watershed work that St. Tammany is doing will help to reduce these impacts on wetlands and water bodies that exist in this part of the state.

Lake Pontchartrain, New Orleans and Jefferson Parish Drainage Canals

Orleans and Jefferson Parishes are included in LDEQ's NPDES storm water program, therefore their storm water is regulated through those permits. LDEQ utilized Section 319 funds for urban storm water and green infrastructure educational programs for these areas. As municipalities in LPB are restored and rebuilt, new opportunities exist to include wetland and water quality protection management measures. LDEQ and LDNR-OCM will continue to partner with coastal parishes on these types of activities.

Future Objectives and Milestones

Implementation of these NPS activities should reduce water quality problems associated with land-use activities in this basin. LDEQ's 4-year cyclic water quality monitoring program continues to be one source of data to evaluate water quality improvement. LDEQ or watershed coordinators may determine additional data at the 12 digit HUC scale may be necessary to evaluate effectiveness of watershed planning and implementation. Water quality data can also be utilized to identify "hot spots" in watersheds where BMPs should be implemented. For example, if a TMDL for Tchefuncte River indicates that 60percent of the pollutant load is NPS, then watershed monitoring and models can determine where BMPs should be implemented to achieve this 60percent reduction.

Since LDEQ partners with federal, state, and local stakeholders to implement NPS strategies, TMDLs and watershed models can accurately quantify and evaluate results of watershed implementation. Section 319 of the CWA required states to include milestones for implementing tasks included in NPS Management Plans. Short-term and long-term milestones for Lake Pontchartrain Basin include:

- Continue to implement existing NPS activities to reduce pollution in Amite River Basin, Florida Parishes and LPB (including Jefferson and Orleans Parish drainage canals) (2011-2016);
- Continue to implement ambient and watershed monitoring programs in LPB (2011-2016);
- Utilize detailed land-use analysis for LPB (2009);
- Analyze water quality data and combine it with historical data to develop TMDLs for each water body on the 303(d) list (2009-2012);
- Estimate NPS pollutant load reductions necessary to meet in-stream water quality standards in impaired water bodies included on

the state's 303(d) list (2009-2012);

- Utilize watershed models to accurately quantify and target specific land-use types that may contribute NPS pollutant loads to receiving streams (2011-2016);
- Finalize TMDLs for LPB (2009-2012);
- Develop WIPs for LPB (2011-2016);
- Host meetings in LPB to discuss results of watershed monitoring, modeling and TMDLs (2011-2016);
- Discuss watershed management options to reduce NPS pollutant loads and improve water quality (2011-2016);
- Offer technical, financial and educational assistance to communities to implement the BMPs to reduce NPS pollutants that contribute to the water quality problems (2011-2016);
- Partner with local communities to plan and implement NPS watershed activities to achieve water quality goals (2011-2016);
- Participate and support educational programs in LPB to reduce NPS pollution and improve water quality (2011-2016);
- Evaluate progress of watershed implementation and report to the NPS Interagency Committee, USEPA and the public (2011-2016);
- Determine whether educational outreach programs and watershed implementation activities have been successful in reducing NPS pollutant loads in water bodies of LPB (2011-2016);
- If NPS loads continue to cause water quality problems, LDEQ will partner with federal, state and local partners on additional steps (both voluntary and regulatory) that should be taken to reduce these pollutants and restore water bodies (2011-2016); and
- Include results on LDEQ's web-site for the public to learn additional steps they can take to improve water quality in their watersheds (2011-2016).

Timeline for Milestones: October 2011 – September 2016

Goals and objectives for the LPB portion of the NPS Management Plan are to implement educational outreach programs and WIPs for water bodies not meeting designated uses. Progress made in meeting these objectives will be monitored through LDEQ's 4-year basin cyclic monitoring program combined with watershed monitoring conducted through the NPS Program.

Stakeholders

Office of Coastal Management of the Louisiana Department of Natural Resources (LDNR-OCM)
LDNR-OCM has partnered with LDEQ on CNPCP in LPB. To fulfill requirements of this program, LDEQ and LDNR-OCM will continue this partnership to incorporate BMPs in their on-going management programs. These efforts will be evaluated through LDEQ's NPS Annual Report to USEPA.

Natural Resource Conservation Service (NRCS)
USDA-NRCS provided technical assistance to dairymen that installed animal waste management systems in Florida parishes. FSA provided cost-share assistance for installation of these systems. NRCS also provided technical assistance to landowners that participated in LDEQ's West Florida Parishes Pastureland BMP Program, funded through Section Section 319 of CWA.

Soil and Water Conservation District (SWCD)
SWCDs have partnered with NRCS on design and installation of animal waste management systems and also on LDEQ's pastureland management program. They also partnered with LDEQ on a cooperative agreement to inspect dairies that installed animal waste management systems to maintain and ensure their functionality.

LSU AgCenter
LSU AgCenter partnered with dairymen in Florida Parishes on educational programs for animal waste management systems and with homeowners on maintenance of home sewage systems. They also participated in NPS Coalition meetings held in St. Tammany Parish.

Louisiana Department of Health and Hospitals (LDHH)
Local parish health units and LDHH Headquarters have partnered on educational outreach programs to reduce NPS pollution problems associated with home sewerage systems. They partnered with LDEQ to develop educational videos and brochures distributed through parish offices in the basin. LDHH also participated in St. Tammany NPS Coalition meetings on water quality problems associated with home sewerage systems.

Lake Pontchartrain Basin Foundation (LPBF)
LPBF provided a focus for continued efforts to improve water quality in Lake Pontchartrain and rivers that drain to it on the north shore. They have been advocates for more environmentally sensitive development on the north shore that retain wetlands rather than clearing them. They have restored sea grass beds in near shore waters and focused on many agricultural and urban problems that exist there. They have implemented extensive educational programs throughout Orleans and Jefferson Parish to inform the general public, children and decision-makers about water quality problems in the lake. They have implemented water quality monitoring programs to identify water quality problems and evaluate where improvements have been made. They have also continued to pressure state, federal and local agencies to focus on solving water quality problems that prevent the public from swimming in the lake. The swimming advisories have been lifted as a result of their efforts.

East Baton Rouge Parish Recreation
East Baton Rouge Parish Recreation has partnered with LDEQ, the Nature Conservancy, and local industries on preservation of Bluebonnet Swamp Nature Center. They implemented extensive educational outreach programs for adults and children about NPS pollution and the importance of watershed management. They have partnered with LDEQ on a golf course NPS demonstration project at City-Park Lakes and continue to implement projects where NPS issues can be incorporated.

U.S. Army Corps of Engineers
The U.S. Army Corps of Engineers has been a member of NPS Interagency Committee since 1990, but is a relatively new partner in watershed planning and management. Through their new federal mandates and programs to work on environmental-based efforts for watershed implementation. Through St. Tammany NPS Coalition and wetland restoration in the Amite/Comite River Basin, there appear be common goals of protecting and restoring wetlands and water quality. These potential project areas could solidify an effective partnership between LDEQ and the Corps on many issues such as 404 permits and 401 Water Quality Certifications.

Louisiana Forestry Association (LFA)
LFA has hosted extensive educational workshops on forestry BMPs in Florida Parishes. These workshops have provided loggers and landowners with an opportunity to gain a better

understanding of erosion control measures, road construction and harvesting BMPs. They have also learned the importance of retaining SMZs for water quality and habitat protection.

Louisiana Farm Bureau

Louisiana Farm Bureau has partnered with farmers, dairymen and landowners to understand what NPS water quality problems are and how they can assist state, federal and local agencies to reduce agricultural problems. They have participated in educational workshops on NPS, coastal NPS program, TMDLs and watershed management. They provide an important linkage between LDEQ and the agricultural community for the NPS Program.

Jefferson Parish

Jefferson Parish has played a major role in storm water management for many years. Their local programs provide data and information to identify specific problems that exist in the parish. Through LDEQ's NPDES Storm Water Program, they were required to implement programs related to reduction and control of pollutants in urban storm water runoff. Their construction inspection program is a model for other parishes across the state. Representatives from the parish have participated in workshops, local coalition meetings and NPS Interagency Committee meetings on NPS issues. LDEQ views Jefferson Parish as an important partner in LPB to reduce NPS pollutants from urban areas in the state.

Federal Consistency

The largest challenge for federal consistency in LPB is 404 permits for clearing and filling wetlands. The I-12 corridor through LPB is an area of high growth and has extensive wetlands. Therefore 404 permits are important tools to protect wetlands and water quality in this part of the state. It seemed apparent in St. Tammany Parish NPS Coalition and Task Force meetings that comprehensive watershed planning and smart growth principles will be important mechanism to restore and protect these ecosystems. St. Tammany Parish has initiated a comprehensive planning strategy and state and federal agencies have provided technical expertise and financial assistance to support those efforts. Frequent meetings facilitate communication between these partners to ensure long-term water quality goals are met.

Program Evaluation

LPB is a large area, encompassing New Orleans and approximately 60 water bodies from Mississippi to the Gulf of Mexico. Semi-annual and annual reports evaluate progress of NPS projects that receive federal grant funds. Progress will also be evaluated through interagency cooperation of federal and state agencies that implement BMPs on agricultural and forested lands. LPBF also evaluates progress of their program and provides highlights of their activities to USEPA and the public.

LDEQ utilizes water quality data from its historical database combined with water quality data from LPBF to determine if water quality improvements are being made as a result of watershed implementation. The NPS Program has prioritized LPB for Section 319 funds to address water quality problems identified there and has partnered with LPBF on two watershed coordinators to assist local stakeholders in addressing their NPS water quality problems.

LDEQ will also partner with other universities and other organizations that may have data and information to assist with watershed implementation in LPB. Results of data analysis will be provided to USEPA, the NPS Interagency Committee and public through LDEQ's website.

For more information on which water bodies in Lake Pontchartrain Basin are impaired or are fully meeting their designated uses, please refer to LDEQ's IR: **http://www.deq.louisiana.gov/portal/DIVISIONS/WaterPermits/WaterQualityStandardsAssessment/WaterQualityInventorySection305b/2010WaterQualityIntegratedReport.aspx**

TMDLs Completed in Lake Pontchartrain Basin	Watershed Implementation Plan Completed	Watershed Implementation Plan Developed	Implementation Activities Being Conducted	Delistings Between 2004-2010
Bayou Manchac (040201) • **Dissolved Oxygen**				Lead, Mercury, Non-priority Organics, Oil & Grease, Siltation/Total Suspended Solids in 2004 Ammonia in 2010
Lower Amite River (040303) • **Dissolved Oxygen**				Fecal Coliform, Oil & Grease, Sedimentation/Siltation, Total Suspended Solids in 2004
Grays Creek (040304) • **Dissolved Oxygen**				Other Organics, Sedimentation/Siltation, Taste & Odor and Total Suspended Solids in 2004
Colyell Creek (040305) • **Dissolved Oxygen**				
Selsers Creek (040603) • **Dissolved Oxygen**		yes, currently being developed by LDEQ's Watershed Coordinator		
Lower Tchefuncte River (040802, 040803) • **Dissolved Oxygen**		yes, currently being developed by LDEQ's Watershed Coordinator		Cadmium, Cooper, Dissolved Oxygen, Fecal Coliform, Lead, Sulfate, Total Dissolved Solids in 2004 Dissolved Oxygen and Fecal Coliform in 2008

	Watershed Implementation Plan Completed	Watershed Implementation Plan Developed	Implementation Activities Being Conducted	Delistings Between 2004 - 2010
Bayou Cane (040903/040904) • **Dissolved Oxygen**				pH, Mercury in 2004 Fecal Coliform in 2008
Bayou Liberty (040905, 040906) • **Dissolved Oxygen**				Fecal Coliform, pH, Turbidity in 2004
Bayou Bonfouca (040907, 040908) • **Dissolved Oxygen**				Fecal Coliform, Mercury, Oil & Grease in 2004 for 040907 Priority Organics in 2008 for 040907 Cooper, Dissolved Oxygen, Fecal Coliform, Mercury, Oil & Grease in 2004 for 040908 Fecal Coliform and Priority & Organics in 2008 for 040908

Barataria Basin

The Barataria Basin is in the eastern coastal region of the state, is bounded north and east by the Lower Mississippi River, west by Bayou Lafourche and south by Gulf of Mexico. Barataria Bay is the major receiving water body in the basin. Barataria Basin consists largely of wooded lowlands and fresh to brackish marsh, with saline marsh on the fringes of Barataria Bay. Elevations in this basin range from four feet above to two feet below sea level.

Water Quality Assessment

The 2004 and 2006 IR included twenty-seven water quality sub-segments for Barataria Basin. Of these twenty-seven sub-segments, only three water bodies were not meeting both PCR and FWP, but were fully meeting SCR. These three water bodies included Lake Cataouatche and its tributaries, Bayou Lafourche from Donaldsonville to Intercoastal Waterway at Larose, Sauls, Avondale and Main Canals. The 2010 IR indicated both Lake Cataouatche and this segment of Bayou Lafourche were in compliance with bacteria standards and met their contact recreational uses.

The 2008 IR indicated ten sub-segments were fully supporting PCR and SCR, but were not meeting FWP, compared to the 2006 and 2004 IRs, when eleven and fifteen water bodies, respectively met this level of use support. The 2006 and 2008 IR indicated thirteen water bodies were fully meeting all of their designated uses, compared to 2004 IR which only had ten water body sub-segments fully meeting all designated uses. The 2006 and 2008 IRs indicated one water body (Intracoastal Waterway–Bayou Villars to Mississippi River) was not meeting PCR, but fully complied with SCR and FWP. The 2010 IR indicated Bayou des Allemands from US 90 to Lake Salvador, Bayou Gauche, Lake Cataouatche and its tributaries, Bayou Lafourche from Donaldsonville to LaRose and Bayou Segnette met the DO standard, therefore those listings were removed from the 303(d) list.

Of water bodies not meeting contact recreational uses, suspected sources of fecal coliform bacteria included unsewered areas, marine/boating sanitary on-vessel discharges, municipal point sources, forced drainage and storm water pumps. For water bodies not meeting FWP, the range of suspected causes included discharges from municipal separate storm sewers, drainage pumping, natural conditions, package plants or other permitted small flows, non-irrigated crop production, and industrial point source discharges.

Water Quality Improvements

TMDLs for Barataria Basin were completed in 2004, and LDEQ's NPS staff completed WIPs in 2006. However these plans are revised if new data indicates water quality restoration or revised to be consistent with USEPA's 9 key elements. WIPs in Barataria Basin follow a similar format previously described for Mermentau and Vermilion-Teche River Basins. WIPs prioritize HUC 12 watersheds for BMP implementation and water quality monitoring and include information on land-use, soils, slope and BMPs implemented over the past 5 years. The most recent water quality data is analyzed to determine types and sources of NPS pollutants that should be addressed to meet water quality standards.

Once these pollutants are identified, discussions can be held with local stakeholders to identify "hot spots" of NPS pollutants. When high priority sites are selected, then appropriate BMPs can be implemented to address those problems. Cost-share and technical assistance is often necessary to achieve implementation goals. Water quality monitoring provides data to evaluate results of BMP implementation.

Water Quality Goals

Water quality goals for Barataria Basin are to restore designated uses for those water bodies impaired by NPS pollution. LDEQ and USEPA completed TMDLs for each of the water bodies included on the 303(d) list. WIPs were drafted in 2006 and finalized in 2007 to describe NPS implementation activities to restore the water quality in these water bodies. Detailed land-use information was collected for the entire basin during 2005, so those data have been utilized for WIPs. Each plan provides information on where NPS activities should be focused to restore bayous in Barataria Basin. BTNEP has an extensive network of stakeholders though its Management Conference that partner with them on educational outreach events, restoration projects and other activities to restore wetlands and protect the public, habitat and natural resources of BTNEP. LDEQ will continue to partner with BTNEP on water quality activities to restore water quality in this basin. People who live in Barataria Basin often have a strong connection to their water bodies and are aware of the importance of wetlands and good water quality. Many residents rely on bayous and coastal waters for their livelihood (i.e. shrimp, fish, crabs and oysters) and on the bayous for their drinking water. A table on pages 249-251 includes information on which water bodies have had TMDLs and WIPs developed for them, where implementation activities are being conducted and delistings have occurred.

BTNEP has raised awareness of current and future threats to wetlands through subsidence, land-loss and saltwater intrusion. Hurricanes in 2005 and 2008 devastated many coastal areas and homes, resulting in a new sense of urgency and determination to protect coastal wetlands and the culture. Documentary films and books have described current conditions of Bayou Lafourche and Barataria Basin. Therefore, focusing on these watersheds over the next 5-10 years should result in major changes and improvements to ecosystem function and sustainability.

Watershed Implementation

Upper portions of Barataria Basin are primarily in agricultural production (i.e. sugarcane), therefore LDEQ continues to partner with LSU AgCenter, OSWC and USDA on projects to reduce NPS pollutants from agricultural lands. NRCS implements approximately 5000 acres of agricultural BMPs through EQIP and WHIP in Barataria basin each year.

The NPS Program has implemented projects in Barataria Basin to address major types of issues in this basin: one was to demonstrate an innovative sewerage treatment system effective for camps along Bayou Segnette. A second project quantified NPS pollutant loads from natural wetland systems compared to sugarcane fields with BMPs. There have also been projects to identify density and location of home sewerage systems in Bayou Lafourche watershed. Information about these projects is summarized in LDEQ's NPS Annual Reports and is accessible through the website.

One challenge in Barataria Basin is to ensure goals of CWA and CZARA interface with OCPR wetland restoration goals. Since upper portions of the basin deliver sediment and nutrients to lower portions of the basin, it will be important to manage these resources to benefit coastal wetlands. Diversion and direct delivery of nutrients and sediment to coastal wetlands and marshes remains critical to restoring and protecting fragile coastal habitats. Therefore, coordination of NPS and CNPCP is an important aspect of restoring and protecting coastal waters. LDEQ partnered with LSU to implement a pilot project modeling sediment, nutrients and waters from sugarcane fields to wetlands to determine if they provided water quality and ecosystem benefits.

Future Goals and Milestones

Section 319 of the CWA requires states to include tasks and milestones in their NPS Management Plans. Portions of Barataria Basin are in Louisiana's coastal zone management area, therefore requirements of CNPCP will apply.

- Continue to implement watershed projects and educational outreach programs to address NPS water quality problems in Barataria Basin (2011-2016);
- Examine new water quality data collected in 2011-2016 to determine if additional water bodies should be targeted for NPS activities (2011-2016);
- Partner with federal, state and local agencies/organizations to implement NPS activities to reduce pollutant loads (2011-2016);
- Partner with BTNEP and LDNR-OCM on educational outreach programs that provide information on the role of local communities in watershed implementation (2011-2016);
- Partner with federal and state agencies to prioritize funding, resources and technical assistance to local watershed projects to assist local communities reach short and long-term water quality goals (2011-2016);
- Continue to evaluate the rate of BMP implementation as one measure of progress to meet short and long- term goals and objectives (2011-2016);
- Continue to monitor water quality to determine whether water quality and designated uses are restored or maintained (2011-2016);
- If educational programs and watershed projects are not effective in reducing NPS pollution and restoring water quality, LDEQ will partner with federal, state and local agencies/organizations to determine additional steps (voluntary and regulatory) necessary to restore designated uses of water bodies (2011-2016);
- Report progress on watershed implementation to USEPA, NPS Interagency Committee and local communities in the basin (2011-2016); and
- Include highlights and progress made on NPS implementation and water quality improvement on LDEQ's website (2011-2016).

Timeline for Milestones: October 2011 – September 2016

Water quality and programmatic goals for the Barataria Basin are to restore water bodies to their designated uses for fishing and swimming. LDEQ's 4-year cyclic water quality data combined with sub-watershed monitoring will be the basis to evaluate NPS pollutant load reductions and water quality improvements.

Stakeholders

Barataria-Terrebonne National Estuary Program (BTNEP)

BTNEP has coordinated with federal, state, and local agencies, citizens and the environmental community to assist in establishing priorities for this part of the state. All of these priorities were combined into a set of action items, which comprise the Comprehensive Conservation and Management Plan. BTNEP has formed Implementation Teams that partner on these action items to ensure they are implemented throughout two management basins that form BTNES. The BTNEP staff has partnered with NPS staff on NPS water quality issues. This partnership continues as LDEQ collects water quality data, develops TMDLs and implements WIPs in Barataria and Terrebonne basins.

Natural Resource Conservation Service (NRCS)
NRCS has been actively involved in development and implementation of action items related to agricultural issues in Barataria and Terrebonne basins. They have prioritized watersheds in these basins for basin studies and partnered with the state's NPS Program on implementation of sugarcane BMPs. This partnership continues as cooperating agencies implement action items identified in BTNEP's Comprehensive Management Plan.

Louisiana Department of Agriculture and Forestry (LDAF)
LDAF assisted BTNEP in development of action items for their Comprehensive Management Plan. The SWCDs provide technical and financial assistance to farmers and landowners to implement BMPs. As action items in BTNEP's CCMP are addressed, the districts continue to play a major role in their implementation.

LSU AgCenter
LSU AgCenter is an important partner for educational outreach components of the NPS Management Program. They provide farmers, the public, science teachers and children with information on water quality, wetlands, habitat protection and a host of other environmental issues. Summer camps offer high school students an opportunity to learn about coastal environments, marshes, and estuaries. Marsh Maneuvers has been a popular learning experience for students to actually spend a week in the marsh, learning about every aspect of its unique ecology. LSU AgCenter hosted and participated in workshops for science teachers on water quality, NPS pollution, watershed management and wetland protection. They are the backbone of the state's educational system for adults and children on agriculture and environmental issues, and they will continue to be a major partner in this area.

LSU has also partnered with the state's NPS Management Program to evaluate the effectiveness of sugarcane BMPs. The sugarcane industry is constantly changing to meet demands of a competitive global market; therefore, environmental practices need to keep pace with these changes. The types of BMPs that were evaluated to reduce NPS pollutants included conservation tillage, pesticide and nutrient management and sugarcane harvesting methods. LSU AgCenter continues to advise and train farmers and cooperating agencies on these new practices and methods.

Louisiana Department of Health and Hospitals (LDHH)
LDHH has offered their support for NPS problems associated with home sewerage systems in Barataria and Terrebonne basins. LDEQ provided Section 319 funds to SCPD to assist LDHH with an inventory of sewerage systems in lower BTNEP. They determined where maintenance of existing systems or installation of new systems is necessary. They also partnered with LDEQ, BTNEP and GOMP on the Shellfish Strategy and provided data and information on shellfish closures and oyster growing waters under stress from pollution. As BTNEP continues to implement action items, LDHH will play a major role in addressing pollution associated with home sewerage systems.

Office of Coastal Management of Louisiana Department of Natural Resources (LDNR-OCM)
LDNR-OCM assisted BTNEP in development of their CCMP. Since portions of Barataria and Terrebonne basins are in Louisiana's coastal

management area, they will continue to utilize CUPs to manage water quality and coastal habitats in Louisiana. They have participated in NPS stakeholder meetings and workshops on CNPCP. Through combined efforts of BTNEP, LDEQ and LDNR-OCM, progress should be made in NPS implementation in Barataria Basin.

South Central Planning and Development (SCPD)

SCPD assists cities and parishes in southeastern Louisiana with environmental and economic development programs. LDEQ has partnered with SCPC on implementation of NPS educational programs in Barataria Basin. They hosted meetings with city and parish officials on NPS issues and assisted LDEQ to gain local support for the program. They have assisted BTNEP staff with educational programs and continue to provide support for NPS educational outreach activities and watershed implementation.

Gulf of Mexico Program (GOMP)

GOMP partnered with LDEQ and BTNEP on a shellfish strategy and provided technical support for that strategy. Additionally, they partnered with BTNEP on workshops in Barataria Basin to gain support for habitat protection. The Nutrient Focus Team of GOMP has partnered with industry, federal, state and local agencies, the public and environmental community to reduce nutrient concentration from point source and NPS in Barataria and Terrebonne basins.

Local Parish and Municipal Governments

Local governments are important partners to participate in educational outreach activities and watershed implementation. They understand local NPS problems and who should be involved to solve them. They assist LDEQ and BTNEP implement their action items and tasks. Without their support, these programs will not be fully implemented. BTNEP, LDNR-OCM and LDEQ have fostered partnerships with local stakeholders and continue to rely on their expertise for program implementation.

Local Environmental Community

The Environmental Community participates in BTNEP's CCMP and implements action items. They have highlighted environmental problems such as saltwater intrusion, wetland loss and agricultural NPS pollutants. They continue to pressure industry and government to reduce point and NPS pollutants in the basin. They also raise awareness about environmental problems to ensure progress continues to be made in reducing them. BTNEP and LDEQ continue to communicate with environmental organizations as TMDLs and WIPs are implemented in the basin.

Local Civic Organizations

The local civic and service organizations include leaders in the community. They care about their community and want to assist in implementation of programs that improve their environment and local economy. These local stakeholders and leaders include farmers, homeowners, and city and parish leaders. They should be included in educational outreach programs and meetings about TMDLs and WIPs that will be implemented in the basin.

Local Universities, Schools

Universities and schools have an opportunity to become involved in water quality, habitat and wetland issues that exist in Barataria basin. Many already conduct their own water quality testing programs and have become involved in environmental education. As BTNEP and LDEQ focus on watershed implementation, there will be additional opportunities for involvement in these programs. Surveys of home sewerage systems, habitat assessment, participation in demonstration projects and educational programs are all examples of activities local students and teachers can become involved in.

Students have restored urban streams and partnered with Corps of Engineers to protect wetlands in other basins of Louisiana. These students have innovative ideas and enjoy focusing on local issues where short-term progress can be seen.

Federal Consistency

There are many opportunities for state, local and federal agencies to partner on federal consistency in coastal areas. Prior to approval of 404 permits for dredge and fill activities, LDEQ and LDNR-OCM review, comment and provide 401 Water Quality Certification as conditions of permit approval. CNPCP includes management measures for hydromodification, riparian areas, and wetlands. As LDNR-OCM and LDEQ partner on WIPs, CZARA management measures can be factored into coastal programs. These two agencies continue to partner with Corps of Engineers on incorporating management measures into federal projects and programs. Federal consistency includes partnering with USDA on federal cost-share assistance programs for farmers and landowners. Communication and coordination with federal and state agencies that partner with local governments remains an important aspect of solving NPS issues.

Program Evaluation

Evaluating progress of NPS water quality goals involves monitoring programmatic activities and in-stream improvements. If Section 319 funds are utilized to support educational outreach programs or watershed projects, progress is evaluated quarterly and reported to USEPA through semi-annual and annual reports. When 401 Water Quality Certification or CUPs are required, BMPs can be incorporated through permit requirements. When USDA funds are provided as cost-share and technical assistance to farmers and landowners, progress in BMP implementation can be evaluated. This information is provided to USEPA and the public through NPS Annual Reports available on LDEQ's website.

In addition to evaluating progress in program implementation, long-term objectives and goals are to improve water quality and reduce NPS pollutants in water bodies. Through LDEQ's 4-year basin cyclic monitoring program, each watershed in Barataria Basin will be monitored for one full year every four years. This should allow LDEQ to evaluate progress in watersheds where NPS activities and WIPs have been implemented. In addition to LDEQ's watershed monitoring program, local schools and universities may become involved in watershed monitoring. Other federal and state agencies also monitor waters for special projects and programs related to a variety of issues. LDEQ cooperates with these agencies to obtain data and information through their monitoring programs. USGS is one example of a federal agency that collects water quality data across the state. LDAF collects pesticide data in many of the state's water bodies where row crop agriculture is one of the major land-uses. All of these data can be utilized to track progress in watershed implementation.

For more information on water bodies that are impaired or water bodies that fully meet their designated uses in the Barataria Basin please refer to LDEQ's IR:
http://www.deq.louisiana.gov/portal/DIVISIONS/WaterPermits/WaterQualityStandardsAssessment/WaterQualityInventorySection305b/2010WaterQualityIntegratedReport.aspx

TMDLs Completed in Barataria Basin	Watershed Implementation Plan Completed	Watershed Implementation Plan Developed	Implementation Activities Being Conducted	Delistings Between 2004-2010
Bayou Verret, Bayou Chevreuil, Bayou Citamon, Grand Bayou (020101) • **Dissolved Oxygen/ Nutrients**	yes		yes, LDEQ Section 319 Project	Fecal Coliform, Mercury, Oil & Grease, TSS, Turbidity in 2004 Chlorides, Total Phosphorus, Sulfates in 2006 Pesticides in 2008
Bayou Boeuf, Halpin Canal, Theriot Canal, and Lake Boeuf (020102) • **Dissolved Oxygen/Nutrients**	yes			Oil & Grease/Priority Organics, Radiation in 2004 Chlorides/TDS in 2006 Pesticides in 2008
Lake Boeuf (020103) • **Dissolved Oxygen/Nutrients**				Chlorides/TDS in 2006 Pesticides in 2008

	Watershed Implementation Plan Completed	Watershed Implementation Plan Developed	Implementation Activities Being Conducted	Delistings Between 2004 - 2010
Bayou des Allemands (020301) • Dissolved Oxygen • Nutrients • Organic Enrichment • Ammonia Nitrogen • Nitrate/Nitrite • Total Phosphorus	yes			Dissolved Oxygen, Mercury, Nutrients, Oil & Grease in 2004 Chlorides/Sulfates/TDS in 2006 Pesticides in 2008 Dissolved Oxygen in 2010
Lake Cataouatche (020303) • Ammonia Nitrogen • Dissolved Oxygen • Nitrite/Nitrate Nitrogen • Total Phosphorus				Dissolved Oxygen, Fecal Coliform, Nutrients, Oil & Grease in 2004 Chlorides/Sulfates/Total Dissolved Solids in 2008 Dissolved Oxygen and Fecal Coliform in 2010
Bayou Lafourche (020401) • Dissolved Oxygen • Nutrients • Fecal Coliform	yes		yes, LDEQ and SWPP priority watersheds	Dissolved Oxygen, Mercury, Oil & Grease, Salinity, Total Dissolved Solids/ Chlorides/Sulfates, Sedimentation/Siltation/Total Suspended Solids/ Turbidity in 2004

	Watershed Implementation Plan Completed	Watershed Implementation Plan Developed	Implementation Activities Being Conducted	Delistings Between 2004 - 2010
St. Charles Canal and Bayous (020501) • **Dissolved Oxygen**	yes			Fecal Coliform, Metals, Oil & Grease in 2004
Bayou Segnette (020701) • **Dissolved Oxygen** • **Fecal Coliform** • **Nutrients**	yes		yes, LDEQ Section 319 and BTNEP, GOMP Project Area	Oil & Grease in 2004 Fecal Coliform in 2006 Dissolved Oxygen, Nutrients and Sulfates in 2010

Terrebonne Basin

The Terrebonne Basin covers an area extending approximately 120 miles from Mississippi River to Gulf of Mexico and varies in width from 18 to 70 miles. Terrebonne basin is west of Mississippi River and Bayou Lafourche and east of Atchafalaya River Basin. The topography of the entire basin is lowland and is subject to flooding except for natural levees along major waterways. The coastal portion of the basin is prone to tidal flooding and consists of marshes ranging from fresh to saline.

Assessment

The Terrebonne Basin has fifty-eight water quality management sub-segments, which is the hydrologic unit LDEQ utilizes for regulatory permitting, ambient monitoring, assessment and standards. Of these 58 sub-segments, the 2004 IR indicated seven were not meeting PCR or FWP (Bayou Portage, Chamberlin Canal, Bayou Maringouin-Headwaters to East Atchafalaya Basin Levee, and Bayou Fordouche-Headwaters near Morganza to Gross Tete, Grand Bayou and Little Grand Bayou-Headwaters to Lake Verret, Bayou Petit Caillou, and Bayou Chauvin). The 2006 IR indicated two water bodies were not meeting all three of these designated uses, including Bayou Portage and Bayou Fordoche from the Headwaters to Morganza. The 2008 IR indicated no water bodies failed to meet all three of these designated uses.

The 2008 IR indicated eight water bodies were not meeting PCR or FWP, but were meeting SCR, compared to seven water bodies in 2004 and six water bodies in 2006, respectively.

The 2008 IR indicated thirty water bodies were meeting PCR and SCR, but were not meeting FWP, compared to twenty-five in 2004 and 28 in 2006 IRs. The 2004 IR indicated one water quality sub-segment, Bayou Petite Caillou to Caillou Bay, was not meeting PCR, but was meeting FWP. The 2006 and the 2008 IR indicated this water body had improved and was fully meeting all of its uses. The 2008 IR indicated fourteen water bodies were fully meeting all of their uses, compared to sixteen in 2004 and twenty-one in 2006.

The 2010 IR indicated water quality improvement in water bodies in the Terrebonne Basin. Bayou Poydras does not indicate a problem with low DO, but still has problems with sedimentation, suspended and dissolved solids and fecal coliform bacteria. Bayou Grosse Tete no longer indicates a problem with fecal coliform bacteria and Bayou Plaquemine from the Lock to Intercoastal Waterway indicated improvement in DO and turbidity. The Intercoastal Waterway, Bayou Cholpi and the Lower Grand River and Belle River, Lake Verret, Grassy Lake, Lake Long, Lake Penchant, Bayou Blue, Timberlier Bay and Lake Pelto also indicated improvements in DO. Bayou Maringouin and Intracoastal Waterway were removed from the 303(d) list for fecal coliform bacteria.

Water bodies not meeting the contact recreation uses because of fecal coliform bacteria, had sources ranging from on-site treatment systems, municipal point source discharges, municipal storm water (urbanized, high-density areas), package plant or other permitted small flows, sanitary sewer overflows, industrial point sources, marina/boating sanitary on-vessel discharges, and total retention domestic sewage lagoons. The majority of these watersheds are either in northwestern or central portions of the basin. Water bodies not meeting FWP as a result of failure to meet DO standards throughout the year, had sediment, nutrient and organic material from crop production, natural conditions, municipal point sources, on-site treatment systems, municipal (urbanized, high density areas), package plants or other permitted small flow discharges, sanitary sewer overflows, or total retention domestic sewage lagoons. In order to address these problems, a systematic watershed approach to management that involves federal, state and local stakeholders that reside in the basin.

Water Quality Goals

Water quality goals for Terrebonne Basin are to restore designated uses by reducing NPS pollutants entering water bodies identified as not meeting water quality standards. There are only a few water bodies impaired because of fecal coliform bacteria. Pasturelands, home sewerage systems and urbanized areas are primary sources of bacteria entering water bodies. As IRs indicated, more water bodies are impaired for failure to meet FWP, therefore reducing sediment and nutrient loads entering water bodies from agricultural lands in upper parts of the basin will remain a high priority. These efforts should be coordinated with Louisiana's Coastal Restoration Program. LDEQ partnered with BTNEP on detailed land-use data and maps for Terrebonne Basin to accurately identify specific types of crops for BMP implementation. Water quality surveys were completed for each watershed in Terrebonne Basin prior to the 2005 hurricanes. These data were utilized to develop TMDLs for 303(d) listed water bodies. TMDLs were completed for Bayou Petite Caillou, Bayou Maringouin, Grand Caillou, the Lower Grand/Belle River and Bayou Pointe au Chein. NPS staff completed WIPs for these water bodies during 2007-2008, describing NPS problems that need to be addressed to restore their designated uses. NPS activities will be coordinated with BTNEP since their CCMP includes NPS water quality as a priority. Agricultural lands occupy a majority of Terrebonne Basin; therefore, LDEQ continues to partner with LDAF, USDA and LSU AgCenter on BMP implementation for sugarcane and pasture lands.

During 2011-2016, LDEQ will partner with local stakeholders and LDEQ's watershed coordinator to develop additional WIPs, revise WIPs from 2007-2008 and implement BMPs to reduce NPS pollutants and restore designated uses. A table on pages 259-269 includes information on which water bodies have had TMDLs and WIPs developed and where implementation activities are currently being conducted. The table also includes delistings of water quality parameters for water bodies in Terrebonne Basin.

Watershed Implementation

During 2007, Atchafalaya Basin Program provided a report on Atchafalaya East Watershed Initiative for Iberville, Pointe Coupee and West Baton Rouge parishes. This includes Bayou Portage, Bayou Grosse Tete, Bayou Sorrel and False River in upper Atchafalaya Basin. Local stakeholders identified poor water quality, loss of fisheries, increased sedimentation and siltation and longer-duration flooding as problems. A WIP is being developed for this area and will be coordinated with BTNEP and other partners in Terrebonne Basin. A series of stakeholder meetings held in fall 2006 to gather input into the watershed planning process. A TMDL completed by LDEQ for Bayou Grosse Tete for low DO included Bayou Blue, Bayou George, Bayou Portage, Bayou Black, Bayou Fordoche, Grand Bayou, Catfish Canal and other unnamed tributaries. The TMDL estimated a 95 percent reduction in oxygen-demanding substances would be needed to meet water quality standards for DO. Watershed implementation will continue in this portion of Terrebonne Basin, with agricultural agencies providing assistance to landowners to implement practices to reduce sediment and nutrient loads entering water bodies in upper portion of Terrebonne Basin.

Bayou Land RC&D has focused watershed planning for upper Bayou Terrebonne (sub-segment 120301). This bayou flows for 54 miles between south Thibodaux and Houma, flowing parallel to Hwy 24 for much of its course before it intersects with Intracoastal Waterway in downtown Houma. The drainage area for this watershed is approximately 35,000 acres, with marshes and wetlands dominating the landscape. Bayou Terrebonne has been completely cut off from its source water, Bayou Lafourche, and as a result, this watershed is primarily storm water driven, receiving storm water and effluent from rural and urban areas via drainage ditches and pipes.

This sub-segment (120301) of Bayou Terrebonne has been channelized; its banks are steep and mostly devoid of riparian vegetation. Most of the lower reaches of this bayou are surrounded by urban debris. Terrebonne Parish Consolidated Government's drainage department has a contract to dredge Bayou Terrebonne through northern portions of Houma. These plans to deepen the channel also include removal of three earthen weirs. Dense urbanization along the southern end of this bayou surrounds it with impervious surfaces and little to no riparian buffer.

Bayou Land RC&D's watershed coordinator has organized a coalition of stakeholders in Lafourche and Terrebonne parishes to serve in an advisory capacity for sustaining future watershed planning efforts. Ideas for improvement include educating the public and incentivizing maintenance and upgrades to individual wastewater treatment systems. Bayou Land RC&D partners with SCPD and local SWCDs to identify locations where smaller sewage districts may be created and regions where water may be naturally treated through wetlands. Challenges they expect to face include: funding, land use rights and access to public right of ways.

LDEQ relies upon collaborative efforts with USDA to implement programs that reduce agricultural NPS pollutants. EQIP implemented an average of 8,000 to 15,000 acres of agricultural BMPs each year in Terrebonne Basin. Section 319 funds have also been prioritized in impaired watersheds to address water quality problems identified through WIPs. In addition to agricultural pollutants, urban storm water BMPs and ordinances to reduce pollution from home sewerage systems are also priorities in Terrebonne Basin. Since a portion of the basin is in Louisiana's coastal zone boundary, LDEQ and LDNR-OCM continue to partner on CNPCP. Through collaborative efforts of LDEQ, BTNEP, LDNR-OCM and agricultural agencies, NPS pollutants should be reduced and water quality improved.

Future Objectives and Milestones

To improve water quality in Terrebonne Basin, LDEQ and cooperating federal, state, and local agencies should continue to implement educational outreach programs and WIPs to reduce NPS pollutants. Most of these implementation activities are based on data and information provided in TMDLs and WIPs. Coordination will also need to continue with BTNEP and LDNR-OCM to achieve the water quality goals for Terrebonne Basin. Section 319 of the CWA required states to include tasks and milestones to implement their NPS Management Plans. Tasks and milestones for Terrebonne basin have been included here:

- Partner with USDA and other cooperating federal, state and local agencies to implement corrective actions for 303(d) listed water bodies in Terrebonne Basin(2011-2016);
- Partner with BTNEP and LDNR-OCM to inform and involve the public in TMDL implementation and WIPs to reduce NPS pollution (2011-2016);

- Implement educational programs and WIPs to target NPS pollutants from agriculture, home sewerage, urban storm water and hydromodification in Terrebonne Basin (2011-2016);
- Evaluate progress in implementing WIPs (2011-2016);
- Continue to coordinate with LDNR-OCM to address CNPCP's goals and objectives (2011-2016);
- Continue to monitor in-stream water quality and NPS reductions for water bodies in Terrebonne Basin (2011-2016);
- If all cooperative, voluntary efforts described in this document are not effective in reducing NPS pollution and improving water quality, LDEQ will partner with federal, state and local governments to determine effective steps to restore water quality(regulatory or voluntary) (2011-2016);
- Report progress on program implementation and water quality improvements to USEPA, the NPS Interagency Committee and the general public (2011-2016); and
- Include this information in NPS Annual Reports on progress made in NPS implementation on LDEQ's website (2011-2016).

Timeline for Milestones: October 2011 – September 2016

Goals and objectives of the NPS Management Program for Terrebonne Basin are to restore designated uses of water bodies not meeting designated uses because of NPS pollution. The 4-year basin cyclic monitoring program combined with NPS sub-watershed monitoring will be the basis to evaluate NPS pollutant loads and in-stream water quality improvements.

Stakeholders

Barataria-Terrebonne National Estuary Program (BTNEP)
BTNEP coordinates federal, state, and local agencies, citizens and the environmental community to establish priorities for this special part of the state. All of these priorities were combined into a set of action items, which comprise the CCMP. BTNEP staff has formed Implementation Teams that implement action items in two basins that form BTNEP. BTNEP staff partnered with NPS staff on water quality issues related to NPS pollution. This partnership continues as LDEQ collects water quality data, develops TMDLs and implements WIPs in Barataria and Terrebonne basins.

Natural Resource Conservation Service (NRCS)
NRCS has been actively involved in development and implementation of action items related to agricultural issues in Barataria and Terrebonne basins. They prioritized watersheds in these basins for watershed projects and partnered with the NPS Program on sugarcane BMPs. This partnership continues as cooperating agencies serve on Implementation Teams to address agricultural actions identified in the CCMP.

Louisiana Department of Agriculture and Forestry (LDAF)
LDAF partnered with BTNEP on development of action items contained in the CCMP. SWCDs assist farmers and landowners to implement BMPs in the basin. As these action items in the CCMP are addressed, SWCDs will continue to play a major role in their implementation.

LSU AgCenter
LSU AgCenter has partnered with LDEQ to evaluate sugarcane BMPs. These practices

included conservation tillage, pesticide and nutrient management and sugarcane harvesting methods. The sugarcane industry is constantly changing to meet demands of a competitive market; therefore, environmental practices need to keep pace with these changes. LSU continues to advise and train farmers and cooperating agencies on these BMPs.

LSU AgCenter plays an important role in educational outreach components of the NPS Management Program. They provide farmers, the public, science teachers and children information on water quality, wetlands, habitat protection and a host of other environmental issues. Summer camps offer high school students the opportunity to learn about coastal environments, marshes, and estuaries. Marsh Maneuvers has been a very popular learning experience for students to actually spend a week in the marsh, learning about every aspect of its unique ecology. The AgCenter hosted and participated in workshops for science teachers on water quality, NPS pollution, watershed management and wetland protection. They are the backbone of the state's educational system for adults and children on agriculture and environmental issues, and it is anticipated that they will continue to be a major partner in this important area.

Louisiana Department of Health and Hospitals (LDHH)

LDHH has implemented NPS programs associated with home sewerage systems across Terrebonne Basin. In many areas, they have inventoried these systems and determined where maintenance problems exist or new systems need to be installed. They partnered with BTNEP and GOMP on data and information on shellfish closures and oyster growing waters that are under stress from pollution. As BTNEP partners with Implementation Teams on action items, LDHH and LDNR-OCM continue to play a major role in addressing pollution associated with home sewerage systems.

Office of Coastal Management of Louisiana Department of Natural Resources (LDNR-OCM)

LDNR-OCM has been a partner in development of the CCMP for BTNEP. Since portions of Terrebonne Basin are in Louisiana's coastal zone management area, LDNR-OCM has assisted coastal parishes include NPS BMPs in CUPs to manage water quality and habitat in Louisiana's coastal areas. They have participated in NPS stakeholder meetings and provided information to the public on CNPCP. As BTNEP continues to implement the CCMP and LDEQ implements TMDLs and WIPs, LDNR-OCM will continue to be an important partner to implement BMPs.

South Central Planning and Development (SCPD)

SCPD is a local entity in south-central Louisiana that assists cities and parishes with environmental and development programs. They have partnered with LDEQ on NPS educational outreach programs in Terrebonne Basin. They hosted meetings with city and parish officials on NPS issues and assisted LDEQ in building local support for the program. They partner with BTNEP staff on educational programs and are expected to remain a major cooperator and supporter for NPS educational outreach and watershed implementation.

Gulf of Mexico Program (GOMP)

GOMP partnered with LDEQ and BTNEP on the Shellfish Strategy. They provided technical support for development of the strategy and hosted workshops in Terrebonne Basin to gain local support for the strategy. The Nutrient Focus Team of GOMP also partnered with industry, federal, state and local agencies, the public and environmental community to reduce nutrients from point and NPS in Terrebonne Basin.

Local Parish and Municipal Governments
Local governments play such an important role in educational outreach activities and watershed implementation of the NPS Program. They understand local problems and who needs to be involved to implement solutions. They advise LDEQ and BTNEP on how action items can be achieved and programmatic goals and objectives attained. Without their support, the program will not be fully implemented. They understand the history of local problems and reasons why solutions may not be feasible. They have responsibilities to the public who live in the basin and should be informed and involved in decisions that may affect their economy and natural resources. BTNEP and LDEQ have fostered partnerships with local stakeholders and continue to rely on local expertise for program implementation.

Local Environmental Community
The Environmental Community has supported BTNEP and participated in planning processes for the CCMP. They highlighted environmental problems of saltwater intrusion, wetland loss, and nutrients and pesticides from agricultural crops. They have continued to pressure industry and government to reduce pollution from point and NPS that exist in the basin. They play an important role in raising awareness about environmental problems and to ensure everyone continues to reduce these problems. BTNEP and LDEQ continue to communicate with them on watershed implementation and TMDLs in the basin.

Local Civic Organizations
Local civic and service organizations include key leaders in the community. These leaders care about their community and want to support programs that improve the environment and their local economy. They include farmers, homeowners, and city and parish leaders that should be involved in programs to assist them with water quality issues. They can be involved in educational outreach programs on TMDLs and WIPs and are viewed as local decision-makers in how these programs should be implemented.

Local Universities, Schools
Universities and schools have an opportunity to be involved in water quality, habitat and wetland protection in Terrebonne Basin. Many students conduct their own water quality testing programs and have become involved in environmental education. As BTNEP and LDEQ partner on watershed implementation, there will continue to be opportunities for their involvement in many aspects of the programs. Surveys of home sewerage systems, habitat assessment along bayous, participation in demonstration projects and educational outreach programs are examples of activities that local schools, university students and teachers can become involved in. Students have restored urban streams and partnered with Corps of Engineers to protect wetlands. They have innovative ideas and enjoy being involved in local issues where short-term progress can be seen.

Federal Consistency
There are many opportunities for state, local and federal agencies to partner on federal consistency in coastal areas. Prior to approval of 404 permits for dredge and fill activities, LDEQ and LDNR-OCM review, comment and provide conditions for 401 Water Quality Certification and CUPs. CNPCP includes management measures for hydromodification, riparian areas, and wetlands. As LDNR-OCM and LDEQ partner on watershed implementation, CZARA management measures will be factored into coastal programs. These two agencies also continue to partner with Corps of Engineers on incorporating management measures into federal projects and programs. Federal consistency includes partnering with USDA on their federal cost-share assistance programs for

farmers and landowners. Communication and coordination with federal and state agencies that partner with local governments on NPS issues will continue to be a priority.

Program Evaluation

To evaluate progress in implementing NPS activities, consistent oversight is necessary. If CWA Section 319 funds are utilized to support educational outreach programs or watershed implementation, quarterly reports are provided to LDEQ, as one method to evaluate progress. When 401 Water Quality Certifications or CUPs are required, progress can be evaluated through inclusion of BMPs and/or permit conditions. When USDA funds are utilized to provide cost-share and technical assistance to farmers and landowners, progress on BMP implementation can be evaluated and reported annually to USEPA and the public through LDEQ's NPS Annual Report.

For more information on water bodies impaired or are fully meeting their designated uses in Terrebonne Basin please refer to LDEQ's IR:
http://www.deq.louisiana.gov/portal/DIVISIONS/WaterPermits/WaterQualityStandardsAssessment/WaterQualityInventorySection305b/2010WaterQualityIntegratedReport.aspx

TMDLs in Terrebonne Basin	Watershed Implementation Plan Completed	Watershed Implementation Plan Developed	Implementation Activities Being Conducted	Delistings Between 2004 -2010
Bayou Portage (120101) • Chlorides • Fecal Coliform • Total Suspended Solids • Total Dissolved Solids • Nutrients • Dissolved Oxygen				Metals and Oil & Grease in 2004 Pesticides in 2008
Bayou Poydras (120102) • Total Nitrogen • Dissolved Oxygen • Total Phosphorus • Fecal Coliform • Sediment • Sulfate • Total Dissolved Solids • Total Suspended Solids				Metals, Dissolved Oxygen, Nutrients, Oil & Grease, Pesticides in 2004 Fecal Coliform in 2006 Dissolved Oxygen in 2010
Bayou Choctaw (120103) • Dissolved Oxygen • Total Nitrogen • Total Phosphorus	yes			Arsenic, Copper, Mercury, Metals, Dissolved Oxygen, Fecal Coliform, Nitrite-Nitrate, Oil & Grease, Total Phosphorus, Salinity/Total Dissolved Solids/Chlorides, Sedimentation/Siltation in 2004 Atrazine in 2008

	Watershed Implementation Plan Completed	Watershed Implementation Plan Developed	Implementation Activities Being Conducted	Delistings Between 2004 -2010
Bayou Grosse Tete (120104) • **Dissolved Oxygen/Nutrients** • **Fecal Coliform** • **Total Dissolved Solids**		Yes, Currently Being Developed in 2012	Yes, LDEQ priority area with Section 319 Watershed Project	Oil & Grease, Sedimentation/ Siltation and Total Suspended Solids in 2004 Atrazine in 2008 Fecal Coliform and Total Dissolved Solids in 2010
Chamberlin Canal (120105) • **Dissolved Oxygen** • **Total Nitrogen** • **Total Phosphorus** • **Fecal Coliform** • **Sediment** • **Total Suspended Solids**				Dissolved Oxygen, Metals, Nutrients in 2004
Bayou Plaquemine (120106) • **Dissolved Oxygen**				Dissolved Oxygen, Fecal Coliform, Metals, Nutrients, Oil & Grease, Pesticides in 2004 Priority Organics and Non Priority Organics in 2008 Dissolved Oxygen in 2010

	Watershed Implementation Plan Completed	Watershed Implementation Plan Developed	Implementation Activities Being Conducted	Delistings Between 2004 -2010
Upper Grand River and Lower Flat River (120107) • Dissolved Oxygen				Dissolved Oxygen, Non-Priority Organics, Oil & Grease, Pesticides, Priority Organics, Salinity/Total Dissolved Solids/Chlorides/Sulfates in 2004
Intracoastal Waterway (120109) • Dissolved Oxygen • Total Nitrogen • Total Phosphorus • Fecal Coliform				Dissolved Oxygen, Non-Priority Organics, Nutrients, Oil & Grease, Priority Organics, Pesticides, Salinity/ Total Dissolved Solids/ Chlorides/ Sulfates, Unknown Toxicity in 2004 Fecal Coliform in 2006 Sulfates in 2008 Dissolved Oxygen in 2010
Bayou Cholpe (120110) • Dissolved Oxygen • Sulfate • Total Dissolved Solids				Dissolved Oxygen, Oil & Grease, Pesticides in 2004 Sulfates in 2008 Dissolved Oxygen in 2010

	Watershed Implementation Plan Completed	Watershed Implementation Plan Developed	Implementation Activities Being Conducted	Delistings Between 2004 -2010
Bayou Maringouin (120111) • **Dissolved Oxygen/Nutrients** • **Fecal Coliform** • **Total Dissolved Solids**	yes			Metals, Oil & Grease, Taste & Odor in 2004 Atrazine in 2008 Fecal Coliform in 2010
Bayou Fordoche (120112) • **Fecal Coliform** • **Total Dissolved Solids** • **Dissolved Oxygen/Nutrients**				Oil & Grease, Pesticides in 2004
Lower Grand/Belle River (120201) • **Dissolved Oxygen/ Nutrients** • **Fecal Coliform** • **Sulfate**	yes			Mercury, Metals, Oil & Grease in 2004 Dissolved Oxygen, Nitrite-Nitrate, Total Phosphorus in 2006 Sulfates in 2008 Dissolved Oxygen in 2010

	Watershed Implementation Plan Completed	Watershed Implementation Plan Developed	Implementation Activities Being Conducted	Delistings Between 2004 -2010
Bayou Black (120202) • Dissolved Oxygen • Total Nitrogen • Total Phosphorus				Mercury, Fecal Coliform, Non-Priority Organics, Metals and Oil & Grease, Salinity/Total Dissolved Solids/ Chlorides/Sulfates in 2004
Lake Verret and Grassy Lake (120204) • Total Phosphorus			yes, priority watershed for USDA through Gulf of Mexico Program	Dissolved Oxygen, Mercury, Nutrients, pH in 2004 Dissolved Oxygen in 2010
Lake Palourde (120205) • Total Nitrogen • Total Phosphorus				Dissolved Oxygen, Nutrients, Oil & Grease, Salinity/Total Dissolved Solids/ Chlorides/Sulfates in 2004
Grand Bayou and Little Grand Bayou (120206) • Dissolved Oxygen/Nutrients • Fecal Coliform • Total Suspended Solids • Mercury				Oil & Grease, Pesticides in 2004 Fecal Coliform in 2006

	Watershed Implementation Plan Completed	Watershed Implementation Plan Developed	Implementation Activities Being Conducted	Delistings Between 2004 -2010
Bayou Terrebonne (120301, 120602) • **Dissolved Oxygen/ Nutrients** • **Fecal Coliform**		yes, currently being developed by LDEQ's Watershed Coordinator		Mercury , Oil & Grease in 2004
Bayou Folse – From Headwaters to Company Canal (120302) • **Dissolved Oxygen/Nutrients**				Fecal Coliform, Mercury, Salinity/TDS/Chlorides/Sulfates/ Total Suspended Solids/Turbidity in 2004
Bayou L'Eau Bleu – From Company Canal to ICWW (120303) • **Dissolved Oxygen/Nutrients**				Dissolved Oxygen, Nitrite-Nitrate, Total Phosphorus in 2010
Intracoastal Waterway (120304, 120403) • **Total Nitrogen** • **Total Phosphorus** • **Dissolved Oxygen**				Dissolved Oxygen, Fecal Coliform, Metals, Nutrients, Oil & Grease, Salinity/Total Dissolved Solids/Chlorides/ Sulfates, Turbidity in 2004 pH in 2006 Priority Organics in 2008 Dissolved Oxygen in 2010

	Watershed Implementation Plan Completed	Watershed Implementation Plan Developed	Implementation Activities Being Conducted	Delistings Between 2004-2010
Bayou Penchant (120401) • **Dissolved Oxygen**				Oil & Grease in 2004
Bayou Chene (120402) • **Total Nitrogen** • **Total Phosphorus**				Dissolved Oxygen, Metals, Nutrients, Oil & Grease in 2004 Priority Organics in 2008
Lake Penchant (120404) • **Dissolved Oxygen**				Oil & Grease in 2004 Dissolved Oxygen in 2010
Lake Hache, Lake Theriot (120405) • **Dissolved Oxygen** • **Total Nitrogen** • **Total Phosphorus**				Nutrients in 2004 Turbidity in 2008
Lake de Cade (120406) • **Dissolved Oxygen** • **Total Nitrogen** • **Total Phosphorus**				Dissolved Oxygen, Fecal Coliform, Metals, Nutrients, Priority Organics, Salinity/ Total Dissolved Solids/ Chlorides/Sulfates in 2004

	Watershed Implementation Plan Completed	Watershed Implementation Plan Developed	Implementation Activities Being Conducted	Delistings Between 2004 - 2010
Bayou Grand Caillou (120501) • **Dissolved Oxygen/Nutrients**	yes			Fecal Coliform, Oil & Grease in 2004
Bayou Grand Caillou (120502, 120701) • **Fecal Coliform** • **Dissolved Oxygen/Nutrients**				Dissolved Oxygen, Mercury, Nutrients, Oil & Grease, Fecal Coliform, Priority Organics in 2004
Bayou Petit Caillou (120503, 120504, 120709) • **Dissolved Oxygen/Nutrients** • **Fecal Coliform** • **Total Phosphorus**	yes			Oil & Grease, Salinity/Total Dissolved Solids/Chlorides/ Sulfates, Total Suspended Solids, Turbidity, Unknown Toxicity in 2004 Taste and Odor in 2006 Dissolved Oxygen, Fecal Coliform, Nutrients, Oil & Grease, Radiation, Siltation/ Sedimentation, Total Suspended Solids in 2004 for 120709

	Watershed Implementation Plan Completed	Watershed Implementation Plan Developed	Implementation Activities Being Conducted	Delistings Between 2004 -2010
Bayou de Large (120505, 120506) • Dissolved Oxygen/Nutrients • Fecal Coliform				Fecal Coliform, Oil & Grease, Total Suspended Solids, Unknown Toxicity in 2004 for 120505 Chlorides/Sulfates/Total Dissolved Solids in 2008 for 120505 Dissolved Oxygen, Nutrients, Oil & Grease in 2004 for 120506
Bayou Chauvin (120507) • Dissolved Oxygen/Nutrients • Fecal Coliform	yes			Arsenic, Mercury, Metals, Oil & Grease, pH, Salinity/Total Dissolved Solids/Chlorides/ Sulfates, Turbidity in 2004 Fecal Coliform in 2006
Houma Navigation Canal (120508) • Fecal Coliform				Dissolved Oxygen, Fecal Coliform, Mercury, Nutrients, Oil & Grease, Priority Organics, Salinity/Total Dissolved Solids/Chlorides/Sulfates, Total Toxics in 2004 Total Dissolved Solids in 2008

	Watershed Implementation Plan Completed	Watershed Implementation Plan Developed	Implementation Activities Being Conducted	Delistings Between 2004 -2010
Bayou Blue (120604, 120606) • Dissolved Oxygen • Total Nitrogen • Total Phosphorus • Fecal Coliform				Oil & Grease, Turbidity in 2004 Chlorides, Sulfates in 2006 Priority Organics, Total Dissolved Solids in 2008 Dissolved Oxygen in 2010
Bayou Pointe au Chein (120605) • Fecal Coliform • Dissolved Oxygen/Nutrients				Oil & Grease, Turbidity in 2004 Fecal Coliform in 2006 Priority Organics in 2008
Bayou De Large (120703) • Fecal Coliform				Copper, Dissolved Oxygen, Nutrients, Oil & Grease in 2004 Fecal Coliform in 2006 Priority Organics in 2008
Lake Boudreaux (120707) • Fecal Coliform				Oil & Grease in 2004 Fecal Coliform and Priority Organics in 2008

	Watershed Implementation Plan Completed	Watershed Implementation Plan Developed	Implementation Activities Being Conducted	Delistings Between 2004 -2010
Lost Lake and Four League Bay (120708) • Dissolved Oxygen • Total Nitrogen • Total Phosphorus • Fecal Coliform				Nutrients and Oil& Grease in 2004

Ouachita River Basin

Ouachita River originates in the Ouachita Mountains of west-central Arkansas near Oklahoma's Border. The river flows south through north central Louisiana, joining the Tensas River to form Black River, which flows to the Red River. The Ouachita River has a drainage area of more than 10,000 square miles. Most of the Ouachita Basin is rich, alluvial plains cultivated in cotton, corn and soybeans. The western portion of the basin is forested with pine trees, which are commercially harvested.

Ouachita River Basin is comprised of sixty-one water quality sub-segments, which are the hydrologic units LDEQ utilizes for regulatory permitting and water quality standards. LDEQ's ambient monitoring network and assessment are also based on these sub-segment boundaries. The 2004-2008 IRs indicated that only two of these sub-segments were not meeting contact recreation and FWP (i.e. Bayou Chauvin headwaters to the Ouachita River and Catahoula Lake). The 2004 and 2006 IRs also indicated ten sub-segments were not meeting PCR or FWP, but were meeting SCR. The 2008 IR indicated nine water bodies were included in this category of use support. These ten water bodies were included in the 2004 IR as not meeting these two designated uses. The water bodies that have an asterisk by them were listed again in the 2006 IR as not meeting PCR or FWP.

- *Bayou D'Arbonne – Headwaters to Lake Claiborne
- Middle Fork of Bayou D'Arbonne – origin to Bayou D'Arbonne Lake
- Big Creek – Headwaters to Boeuf River
- Crew Lake
- *Clear Lake
- Bayou Macon – Arkansas State Line to the Tensas River
- *Little River – Archie Dam to Ouachita River
- *Little River – From Bear Creek to Catahoula Lake
- Fish Creek – Headwaters to Little River
- *Bayou Funny Louis – Headwaters to Little River

The 2008 IR indicated thirty-nine water bodies were fully meeting PCR and SCR, but were not meeting FWP. This number increased from 2006 and 2004, when thirty-two and thirty-three water bodies were included in this category of use support, respectively. The 2008 IR indicated only five water bodies fully met all of their uses, compared to thirteen in 2004 and eleven in 2006. Three water bodies in the same sub-segment (080501) were included as impaired for FWP because of a mercury advisory. These three water bodies (i.e. Hudson Lake, Hatley Lake, and Phillips Lake) were not assessed for contact recreational uses. Black Bayou Lake, Tew Lake and Bushley Creek were also included as impaired for FWP because of mercury advisories. Tisdale Brake and Little Bayou/Wham Brake have industrial point source problems with dioxin. Turkey Creek – from headwaters to Turkey Creek Cutoff was not assessed for PCR but fully met SCR and FWP. Tisdale Brake/Staulkinghead Creek and Deer Creek were only assessed for SCR and fully met that use.

A table on pages 277-285 includes information on which water bodies have had TMDLs and WIPs completed for them. The table also indicates where implementation activities are currently being conducted and delistings of water quality parameters have occurred.

The 2010 IR indicated a number of water bodies had improved and were removed from the list of impaired waters. Black River, Turkey Creek, Dugdemona River, Beaucoup Creek, Little River, Catahoula Lake, Trout Creek, Big Creek and

Hemphill Creek are no longer included in the list of water bodies impaired by fecal coliform bacteria. Bayou Bartholomew, Bayou D'Arbonne from Bayou D'Arbonne Lake to the Ouachita River, Bayou Bonne Idee, Lake Lafourche, Little River, Catahoula Lake and Old River were no longer listed for DO problems.

The range of sources contributing fecal coliform bacteria to water bodies in Ouachita Basin included municipal point source discharges, managed pasture grazing, on-site treatment systems and waterfowl. The range of sources contributing to in-stream DO problems included crop production, flow regulation/modification, natural conditions, sources unknown, municipal separate storm sewers, channelization and on-site treatment systems.

Watershed Implementation

Ouachita River Basin includes many NPS activities that should result in water quality improvement over the next 5-10 years. USDA has successfully implemented CREP for highly erodible lands in eastern Ouachita River Basin. CREP was officially approved on Earth Day, 2005, with a goal of 50,000 acres of land enrolled in Bayou Macon and Boeuf River watersheds. This program provided long-term agreements with landowners to convert highly erodible lands to pastures and forests. Approximately 50,000 acres have been enrolled in CREP, with more than 15,000 acres converted to permanent wildlife habitat and 6000 acres restored to bottomland hardwood forests. In addition to CREP, NRCS implements between 36,000 and 50,000 acres of agricultural BMPs annually through EQIP. More than 500 acres have been included in WHIP and 176,000 acres have been restored through WRP. USDA partnered with LDEQ and other agencies on MRBI, resulting in two project areas approved for funding in Ouachita River Basin. Three sub-watersheds (12 digit HUCs) were selected in Bayou Lafourche watershed. The 12 digit HUC was Upper Joe's Bayou. The three sub-watersheds in Bayou Lafourche watershed include approximately 77,089 acres, and Upper Joe's Bayou includes an additional 20,007 acres of land. In this MRBI project area, there will be approximately $4,786,417 of funds available for cost-share of agricultural BMPs between July 2010 and September 2014. Each project area includes water quality monitoring to evaluate whether water quality is improving as a result of BMP implementation. The primary focus of BMPs implemented will be to reduce nutrients and sediment entering these water bodies. In addition to on-the-farm BMPs, 1400 acres of wetland restoration was also included in the MRBI project.

LDAF utilized Section 319 funds to implement agricultural BMPs in Turkey Creek and Joe's Bayou watersheds. In Turkey Creek watershed, more than 94 applications were received for funding and 22 were approved for contracts, with another 16 scheduled for inclusion in the program. In Joe's Bayou watershed, 58 applications were received and 37 have been funded.

LDEQ and USEPA developed 15 TMDLs for Ouachita River Basin, and there have been 13 WIPs completed by LDEQ or ARS. The watersheds in this watershed planning process included:

- Tensas River
- Bayou de L'Outre
- Bayou Lafourche
- Lake St. Joseph
- Joe's Bayou
- Ouachita River
- Bayou D'Arbonne
- Bayou Desiard
- Bayou Chauvin
- Big Creek
- Castor Creek

The NPS Program has implemented quite a few projects in Ouachita River Basin, including:

- Cost-Share and Technical Assistance for NPS BMPs in Bayou Lafourche/Boeuf River Watersheds;
- Watershed Monitoring and Modeling of Bayou Lafourche and Boeuf River Watersheds, Phase 2;
- Reduction in Nutrient and Pesticide Runoff from the Chennault Park Golf Course in Ouachita Basin, Phase 2;
- Tensas River Watershed Comprehensive NPS Pollution Reduction Program;
- Delta Technical Assistance Program for BMP Implementation and Reduction of NPS Pollution;
- Utilization of Annualized Agricultural Nonpoint Source Pollution Model (AnnAGNPS) in Ouachita River Basin and LDEQ WIPs;
- Monitoring Effectiveness of Forestry BMP Implementation in Flat Creek Watershed, Ouachita River Basin; and
- Reduction in NPS Contaminant Loads to Bayou Chauvin in Ouachita River Basin.

Approximately 8,074 conservation plans were developed and implemented in Ouachita River Basin through the Delta Technical Assistance Project. These plans included basic conservation BMPs and contracts for EQIP, WRP, WHIP, CRP and Continuous Conservation Reserve Programs (CCRP). During this project, agricultural BMPs were implemented on several thousand acres in Ouachita Basin. The practices were implemented according to NRCS standards and specifications to achieve a balance between water quality and production of agriculture and forestry operations. The availability of technical services was provided by staff in SWCD offices to assist landowners and land users. During the project period, these eight conservation technicians were hired to provide technical services in eleven parishes and seven SWCDs. These technicians were trained to install BMPs to prevent or reduce movement of sediment, nutrients, pesticides and other pollutants from entering surface and/or ground water. In Louisiana's Delta, these technicians assisted agricultural, forestry and urban residents. They planned, designed and implemented BMPs for landowners/users to improve impaired water bodies.

In January 2004, NPS staff prioritized Ouachita River Basin to initiate WIPs for impaired water bodies. LDEQ partnered with USDA-ARS to develop six WIPs utilizing the AnnAGNPS watershed model. A WIP describes a plan of action to reduce NPS pollution in a watershed until the water body complies with state water quality standards. The following table includes watersheds where six WIPs in Ouachita River Basin were completed by ARS.

Name of Watershed	Subsegment	TMDL Constituent
Ouachita River	080101	DO
Bayou Chauvin	080102	DO and Nutrients
Ouachita River	080201	DO and Nutrients
Bayou Desiard	080701	DO
Bayou Bonne Idee	080902	DO and Nutrients
Bayou Lafourche	080904	DO and Nutrients

NRCS has extensive knowledge of and experience with impacts of various BMPs on field systems. ARS utilized AnnAGNPS watershed model to evaluate current sediment loads in the watershed. AnnAGNPS is a multi-temporal, continuous-simulation model to simulate several years of local climate data. This model evaluates effectiveness of various

BMPs and compares them to current agricultural practices. The AnnAGNPS model produces estimates of sediment, phosphorus, nitrogen, and organic NPS loads as they move overland through the watershed outlet. It is a robust model with over 900 input parameters that identified pollutants at their source and traced their movement through the watershed.

The AnnAGNPS watershed model estimates load reductions of various agricultural BMPs. Given the relationship of ARS and NRCS and their expertise with watershed modeling, ARS was selected to assist LDEQ with WIPs in Ouachita River Basin. ARS modeled watersheds with current land management practices for runoff, sediment, and nutrient loads in six designated watersheds, and reran the model with BMPs until NPS load reductions met goals of the TMDL and water quality standards.

Currently, LDEQ partners with local stakeholders to revise WIPs for Bayou Lafourche, Tensas River, Lake St. Joseph and Joe's Bayou. A watershed coordinator was hired to assist local landowners on watershed implementation and ULM on water quality monitoring to evaluate whether water quality is improving. The NE Delta RC&D has facilitated watershed coordination in many watersheds, and assisted in planning and implementation of USDA's MRBI in this basin.

Future Objectives and Milestones

Section 319 of CWA requires states to include milestones or timelines to achieve tasks identified in NPS Management Programs. The future objectives and milestones that will be implemented to meet short and long-term NPS water quality goals include:

- Continue to partner on implementation of projects and coordination of programs to reduce NPS pollutant loads in impaired water bodies of Ouachita River Basin (2011-2016);
- Meet with state, federal, local partners, the general public and local communities in Ouachita River Basin to discuss results of TMDLs and watershed modeling efforts completed for 303(d) listed waters (2011-2016);
- Work with local stakeholders to develop WIPs that can be implemented to reduce NPS pollutant loads and improve water quality (2011-2016);
- Explain types of technical, cost-share and educational assistance to assist local communities in reaching water quality goals (2011-2016);
- Partner with local communities who prepare proposals and submit projects that offer financial support for watershed implementation (2011-2016);
- Provide technical, financial and educational assistance that local communities requested for watershed implementation (2011-2016);
- Continue to partner with local communities on implementing watershed solutions that result in reduced NPS pollutant loads and water quality improvement (2011-2016);
- Continue to monitor and evaluate progress in implementing BMPs, NPS pollutant loads and water quality improvement in priority watersheds (2011-2016);
- Determine if NPS watershed implementation has been successful in reducing NPS pollutant loads and improving water quality (2011-2016);
- Report on progress made to state, federal, local partners, the public

and organizations on meeting short and long-term water quality goals (2011-2016);

- If additional management strategies (both voluntary or regulatory) are necessary to restore designated uses, partner with federal, state and local partners to determine what those strategies should be (2011-2016); and
- Include information on progress made in watershed implementation on LDEQ's website (2011-2016).

Timeline for Milestones: October 2011 – September 2016

Water quality goals and objectives of the NPS Management Program for Ouachita River Basin are to restore designated uses for impaired water bodies. The 4-year basin cyclic monitoring program combined with NPS sub-watershed monitoring will be one basis for evaluating NPS reductions and water quality improvements.

Stakeholders

Natural Resource Conservation Service (NRCS)
NRCS has partnered with LDEQ's NPS Management Program on watershed implementation for many water bodies in Ouachita River Basin. Their comprehensive basin planning efforts provided a framework for progress made in Tensas River Watershed. Watershed projects have been submitted to address agricultural NPS problems in Bayou D'Arbonne, Bayou Macon, Bayou Bartholomew, Bayou Lafourche and Boeuf River. EQIP, CRP and WRP funds have been targeted to watersheds to augment and expand implementation of BMPs demonstrated with Section 319 funds. NRCS provides technical assistance and FSA provides cost-share assistance to farmers that choose to participate in watershed management programs.

Soil and Water Conservation Districts (SWCDs)
SWCDs have submitted project proposals to assist farmers with conservation plans that incorporate agricultural BMPs on their farms. The districts have worked with individual farmers and poultry producers to implement BMPs, and to assist LDEQ in evaluating estimated amounts of pollutants reduced as a result of implementation. They have also partnered with LDEQ's GIS Center to assist with classification of crop types that exist in Ouachita River Basin.

Northeast Resource Conservation and Development District (NRCS)
NRCS has partnered with agencies on watershed planning and implementation projects in priority watersheds in Ouachita River Basin. They have prioritized these watersheds for funding with EQIP, as well as their other programs, and have provided technical assistance to implement BMPs.

The Nature Conservancy (TNC)
The Nature Conservancy cooperated with Tensas Technical Steering Committee on Tensas River Watershed Restoration and Mollicy Farm Bottomland Hardwood Restoration Project. They assisted landowners and encouraged their participation in WRP and sustainable agricultural programs. They continued to partner on prioritizing lands for migratory bird habitat by restoring forested corridors. Additionally, they transferred information from Tensas River Watershed to a multi-state effort in Lower Mississippi River Floodplain.

U.S. Geological Survey (USGS)
USGS has implemented a water quality monitoring program, collecting data and information for Lower Mississippi River Floodplain. This program prioritized Tensas River and other rivers that flow through the Mississippi Delta. The water quality monitoring program included water chemistry, macro-

invertebrates, fish and habitat assessment. These data will be utilized in combination with data from LDEQ and LDAF to monitor and evaluate water quality improvements in Ouachita River Basin.

U.S. Fish and Wildlife Service (USFWS)
USFWS provided focus and support for Tensas River Watershed Restoration Project. Tensas River Wildlife Refuge offers a place to experience Tensas River Watershed prior to conversion of bottomland hardwood forests to crop lands. Its bottomland hardwood forests and rich ecological diversity offer an excellent location for Wildwood Wandering Camp and other educational workshops, highlighting efforts of Tensas Technical Steering Committee. Staff at Tensas refuge provides educational training for children and adults on wetlands, sustainable agriculture and habitat protection for wildlife and endangered species. Their leadership was instrumental in acceptance of Tensas River Watershed Restoration Project by the local community.

Local Universities and Schools
Local universities have been involved in NPS projects and educational outreach programs for agricultural and urban sectors of the basin. ULM sponsored a Cotton BMP Demonstration Project, which evaluated effectiveness of conservation tillage, and nutrient and pesticide BMPs in reducing concentrations of sediment, pesticides and nutrients entering Bennett's Bayou. They also implemented a demonstration project that evaluated effectiveness of rock plant filter systems in reducing pollutants from home sewerage systems. ULM implemented a Golf Course BMP Project and educational outreach program. Louisiana Tech University conducted storm water sampling for City of West Monroe Urban Wetland NPS Project and designed the wetland education center for that project site. ULM designed educational outreach programs for the West Monroe Urban Detention project, and disseminated them in many parishes in Ouachita River Basin.

LSU AgCenter
LSU AgCenter has research stations and extension service staff to assist LDEQ in implementing NPS programs in Ouachita River Basin. Northeast Research Station at Winnsboro hosted a NPS BMP Demonstration Project that evaluated effectiveness of BMPs for application of nitrogen to cotton. Nitrates were detected in shallow aquifers on Macon Ridge, and the project was designed to determine whether BMPs could effectively reduce and control nitrogen concentrations. LSU AgCenter implemented agricultural and urban educational outreach programs to reduce NPS pollutants from farms and homes in Ouachita River Basin.

Local Environmental, Service and Civic Organizations
The local environmental community and service or civic organizations are often willing to support local sediment and erosion control ordinances. Therefore, providing educational outreach materials or assisting with workshops will continue to be a priority for the NPS Program. As LDEQ and watershed coordinators prioritize watersheds for WIPs and TMDL implementation, it will be important to involve these local leaders in decisions.

Commodity Groups and Organizations
LDEQ partners with Louisiana Farm Bureau, LFA and commodity groups in Ouachita River Basin. Commodity groups that support cotton and poultry producers need to be included in water quality programs and watershed restoration activities. Support for the NPS Management Program by these organizations has resulted in development and revision of BMPs for each major commodity in Louisiana.

Federal Consistency

Federal consistency in Ouachita River Basin will primarily focus on efforts to partner with Corps of Engineers on utilization of NPS BMPs for hydromodification projects. Many water bodies in eastern portions of Ouachita River Basin have been channelized to improve drainage in urban and agricultural watersheds. A significant portion of land in Ouachita River Basin is currently or has historically been a floodplain for the Ouachita and Mississippi Rivers. As these lands were cleared for agricultural production or urban development, water bodies were altered to convey storm water more efficiently. As LDEQ attempts to restore watersheds in Ouachita River Basin, stream banks and riparian corridors are important components of the restoration process. LDEQ will partner with Corps of Engineers to improve and maintain drainage in a manner that restores water quality and habitat in state waters.

Program Evaluation

To determine whether educational outreach programs and watershed projects have been successful, LDEQ will annually evaluate program activities. Each project funded with CWA Section 319 requires quarterly reporting to monitor success or problems encountered in projects. This information is summarized and provided to USEPA through a semi-annual grants reporting database and is also available to the public through LDEQ's NPS Annual Report, available on LDEQ's website.

Through LDEQ's 4-year cyclic basin program, water quality will be monitored and analyzed to evaluate progress in reducing NPS pollutant concentrations. The results of these data will be published in LDEQ's Annual Report and Success Stories, when water bodies have been restored and removed from the state's 303(d) list.

For more information on water bodies that are impaired or those that are fully meeting their designated uses in Ouachita Basin please refer to LDEQ's IR:
http://www.deq.louisiana.gov/portal/DIVISIONS/WaterPermits/WaterQualityStandardsAssessment/WaterQualityInventorySection305b/2010WaterQualityIntegratedReport.aspx

TMDLs Completed in Ouachita River Basin	Watershed Implementation Plan Completed	Watershed Implementation Plan Developed	Implementation Activities Being Conducted	Delistings Between 2004 -2010
Ouachita River (080101, 080201) • Dissolved Oxygen/Nutrients • Mercury in Fish Tissue • Total Phosphorus	yes		yes, LDEQ and Nature Conservancy Restoration Project Area	Cadmium, Copper, Fecal Coliform, Lead, Pesticides, Priority Organics, Total Suspended Solids/Turbidity, Dissolved Oxygen, Mercury, Nutrients, Sedimentation/Siltation in 2004 Dissolved Oxygen, Nitrite-Nitrate, Total Phosphorus in 2006
Bayou Chauvin (080102) • Fecal Coliform • Noxious Aquatic Plants • Dissolved Oxygen/Nutrients • Siltation • Total Suspended Solids • Turbidity		yes, scheduled for revision in 2012		Ammonia Nitrogen and pH in 2004 Fecal Coliform in 2010
Bayou Louis (080202) • Siltation • Turbidity • Total Suspended Solids				Pesticides in 2004

	Watershed Implementation Plan Completed	Watershed Implementation Plan Developed	Implementation Activities Being Conducted	Delistings Between 2004 -2010
Black River (080301) • **Dissolved Oxygen/Nutrients**				Cadmium, Copper, Lead, Mercury, Pesticides, Unknown Toxicity in 2004 Fecal Coliform in 2010
Bayou Bartholomew (080401) • **Total Suspended Solids** • **Turbidity** • **Mercury** • **Dissolved Oxygen**			USDA Priority Watershed	Fecal Coliform, Lead, Other Organics, Pesticides in 2004 Dissolved Oxygen in 2010
Bayou de L'Outre (080501) • **Dissolved Oxygen**				Dissolved Oxygen, Lead, Salinity/Total Dissolved Solids/Chlorides/Sulfates in 2004
Bayou D'Arbonne, Corney Bayou (080603, 080606, 080607, 080609,) • **Dissolved Oxygen/ Nutrients**	yes		yes, LDAF and LDEQ priority watershed for agricultural BMP implementation	Dissolved Oxygen, Lead, Nutrient, Other Organics, TSS in 2004 Fecal Coliform in 2008 Dissolved Oxygen, lead, Salinity/TDS/Chlorides/Sulfates/TSS in 2004 for Corney Bayou Low pH in 2010

	Watershed Implementation Plan Completed	Watershed Implementation Plan Developed	Implementation Activities Being Conducted	Delistings Between 2004 -2010
Cypress Creek (080606) • **Fecal Coliform**				TDS in 2008
Middle Fork of Bayou D'Arbonne (080610) • **Fecal Coliform** • **Dissolved Oxygen**			yes, LDAF and LDEQ priority watershed for agricultural BMP implementation	Lead/Salinity/TDS/Chlorides/ Sulfates in 2004 Fecal Coliform in 2006
Bayou Desiard (080701) • **Dissolved Oxygen/ Nutrients**	yes		yes, LDEQ Section 319 project area	Dissolved Oxygen, Nitrate-Nitrite, Total Phosphorus in 2006 Copper in 2008
Boeuf River (080901) • **Dissolved Oxygen/Nutrients** • **Siltation** • **Total Suspended Solids** • **Turbidity** • **Nitrogen** • **Toxaphene** • **Carbofuran**				Mercury, Ammonia Nitrogen, Total Phosphorus, Salinity/Total Dissolved Solids/Chlorides/ Sulfates, in 2004 Dissolved Oxygen, Nitrite-Nitrate in 2006

	Watershed Implementation Plan Completed	Watershed Implementation Plan Developed	Implementation Activities Being Conducted	Delistings Between 2004 -2010
Bayou Bonne Idee (080902) • Dissolved Oxygen/ Nutrients • Total Phosphorus	yes			Dissolved Oxygen, Nitrate-Nitrite, Nutrients, Total Phosphorus, TSS in 2004 Dissolved Oxygen in 2010
Big Creek (080903) • Dissolved Oxygen/ Nutrients • Pesticides • Siltation • Total Suspended Solids • Turbidity	yes		yes, LDEQ and LDAF priority watersheds for agricultural BMP implementation	Total Phosphorus, Salinity/Total Dissolved Solids/Chlorides/ Sulfates in 2004 Fecal Coliform in 2006
Bayou Lafourche (080904) • Dissolved Oxygen/ Nutrients • Total Phosphorus • Total Suspended Solids • Turbidity • Dioxin • Siltation	yes	Currently Being Revised	yes, LDEQ and LDAF priority Watershed for agricultural BMP implementation	Dissolved Oxygen, Fecal Coliform, Mercury, Pesticides in 2004 Nitrite-Nitrate, Total Phosphorus in 2006

•	Watershed Implementation Plan Completed	Watershed implementation Plan Developed	Implementation Activities Being Conducted	Delistings Between 2004 -2010
Little Bayou Boeuf/Wham Brake (080904_00559) • Dioxin				
Turkey Creek (080905, 080906) • Fecal Coliform		Yes, scheduled for completion in 2011-2012	Yes, LDEQ and LDAF priority watershed for agricultural and streambank protection BMPs	Nitrogen-Ammonia, Other Inorganics, Pesticides, TSS and Turbidity in 2004 Fecal Coliform in 2006 Fecal Coliform/Total Dissolved Solids in 2010
Crew Lake (080909) • Dissolved Oxygen				Pesticides in 2004 Fecal Coliform in 2006
Clear Lake (080910) • Fecal Coliform • Dissolved Oxygen/Nutrients • Siltation • Total Suspended Solids • Turbidity				Dissolved Oxygen, Fecal Coliform, Pesticides in 2004

	Watershed Implementation Plan Completed	Watershed Implementation Plan Completed	Implementation Activities Being Conducted	Delistings Between 2004 -2010
Tisdale Brake and Staulkinghead Creek – From Headwaters to Little Bayou Boeuf (080912_00) **Dioxin**				
Bayou Macon (081001) • **Total Suspended Solids** • **Turbidity** • **Siltation** • **Fecal Coliform** • **DDT**				Dissolved Oxygen, Nutrients in 2004 Fecal Coliform in 2006
Joe's Bayou (081002) • **Dissolved Oxygen/ Nutrients** • **Total Phosphorus** • **Total Suspended Solids** • **Turbidity** • **Siltation** • **Carbofuran** • **DDT**	yes	Currently Being Revised in 2011/2012	yes, LDEQ, LDAF, MRBII USDA Project for Nutrients and agricultural BMPs	Dissolved Oxygen in 2004

	Watershed Implementation Plan Completed	Watershed Implementation Plan Developed	Implementation Activities Being Conducted	Delistings Between 2004-2010
Tensas River (081201) • **Dissolved Oxygen/Nutrients** • **Pesticides** • **Siltation** • **Total Suspended Solids** • **Turbidity**		yes, revised in 2010/2011	yes, LDEQ Section 319 Priority Watershed	Dissolved Oxygen, Lead, Other inorganics, Salinity/Total Dissolved Solids/Chlorides/Sulfates in 2004 Nitrite-Nitrate and Total Phosphorus in 2006
Lake St. Joseph (081202) • **Dissolved Oxygen/ Nutrients** • **Total Phosphorus** • **Total Suspended Solids** • **Turbidity** • **Siltation**	yes	Currently Being Revised In 2011	Yes, LDEQ, LDAF and USDA priority watershed for agricultural BMP implementation	Dissolved Oxygen and Pesticides in 2004 TDS in 2006
Castor Creek (081501) • **Dissolved Oxygen** • **Chlorides** • **Salinity/Total Dissolved Solids**	yes	Currently Being Revised in 2012		Cadmium, Copper, Lead, Oil & Grease, Fecal Coliform, Mercury, Total Suspended Solids in 2004 Dissolved Oxygen in 2006
Flat Creek (081504) • **Dissolved Oxygen**				Low pH in 2010

	Watershed Implementation Plan Completed	Watershed Implementation Plan Developed	Implementation Activities Being Conducted	Delistings Between 2004-2010
Little River – Confluence with Castor Creek to Catahoula Lake (081601, 081602) • Turbidity • Fecal Coliform • Siltation • Total Suspended Solids • Mercury				Cadmium, Copper, Lead, Non-Priority Organics, Oil & Grease. Salinity/Total Dissolved Solids/ Chlorides/Sulfates in 2004 Fecal Coliform in 2010 for 081602
Catahoula Lake (081603) • Mercury				Salinity/Total Dissolved Solids/ Chlorides/Sulfates in 2004 Dissolved Oxygen in 2006 Oil & Grease in 2008 Dissolved Oxygen, Fecal Coliform in 2010
Little River – Lake to Dam at Archie (081605) • Mercury				
Fish Creek (081606) • Dissolved Lead				Lead in 2006 Turbidity in 2010

	Watershed Implementation Plan Completed	Watershed Implementation Plan Developed	Implementation Activities Being Conducted	Delistings Between 2004 -2010
Trout Creek (081607) • **Fecal Coliform**				Fecal Coliform and Turbidity in 2010
Big Creek (081608) • **Fecal Coliform** • **Turbidity** • **Total Suspended Solids** • **Dissolved Oxygen** • **Nitrogen** • **Methyl Parathion** • **DDT** • **Carbofuran**				Color and Fecal Coliform in 2010

Red River Basin

The Red River originates in eastern New Mexico and flows across portions of Texas, Oklahoma and Arkansas before entering northwestern Louisiana. The river flows south to Shreveport, where it turns and flows southeast for approximately 160 miles to its juncture with Atchafalaya River. From Arkansas state-line to Alexandria, Red River is constrained within high banks and levees, which range from 20 to 35 feet above the low water level. Below Alexandria, the river flows through a flat alluvial plain, which is subject to backwater flooding during periods of high water. The Sabine River Basin is southwest of Red River Basin and Calcasieu, Vermilion-Teche and Atchafalaya River Basins are south of Red River Basin. The Red River drains approximately 7,770 square miles in Louisiana.

Water Quality Assessment

Red River Basin has more than sixty water quality sub-segments, which is the scale LDEQ utilizes for permitting, water quality standards, ambient water quality monitoring and assessment. Of these sixty sub-segments, none met both contact recreation and FWP. The 2008 IR indicated there were five water bodies not meeting either PCR or FWP, but were meeting SCR. There were forty-three water bodies fully meeting PCR and SCR, but were not meeting FWP. Ten sub-segments were fully meeting their designated uses.

The 2006 IR indicated fifteen water bodies were meeting all of their designated uses and thirty-six met all of their contact recreational uses, but did not meet FWP. Five met SCR, but did not meet either primary contact or FWP. Of the six water bodies that were not assessed, three were not assessed for contact recreational uses, but were assessed for FWP. This latter use was not met. Two water bodies were not assessed for PCR or FWP, but did meet SCR. One was not assessed for PCR, met SCR, but did not meet FWP.

The 2010 IR indicated water quality improvements in some of the water bodies in Red River Basin. Black Bayou, Twelve Mile Bayou, Caddo Lake, Boggy Bayou, Wallace Lake, and Sibley Lake were no longer listed for DO. There were also a set of water bodies that came off the list for fecal coliform bacteria. They included Cross Bayou, Bayou Pierre, Cane River and Bayou Kisatchie.

The water bodies not meeting FWP were out of compliance for a wide range of reasons, including: municipal point sources, package plants, small flows, residential areas, irrigated and non-irrigated crop production, natural conditions and mercury.

Seven watersheds that did not fully meet PCR in 2008 included:

- Kelly Bayou – from the Arkansas State Line to Black Bayou;
- Cross Bayou – from Texas State Line to Cross Lake;
- Flat River – Headwaters to Loggy Bayou;
- Bayou Pierre-From Headwaters to Wallace Lake;
- Castor Creek – Headwaters to Black Lake Bayou;
- Cane River-From above Natchitoches to Red River;
- Bayou Kisatchie-Entrance into Kisatchie National Forests to Old River (Scenic);

Four of these seven water bodies have been removed from the list since the 2008 IR was published and are no longer listed as not meeting the contact recreation use in the 2010 IR.

Water bodies not meeting FWP were out of compliance due to low DO or mercury contamination. Low DO waters exist in watersheds on either side of the Red River. Sediment, nutrients and organic material from agricultural fields, pastures and forests drain to water bodies during rainy seasons and reside there during summer and fall months when flows are low and temperatures are high, making it difficult (if not impossible) to meet DO water quality standards. Mercury is a problem in western portions of the basin and is associated with atmospheric deposition, mercury meters from oil and gas fields and natural sources. The State has a program to address mercury contamination; therefore, the NPS Management Plan will focus primarily on agriculture, forestry, urban storm water runoff and home sewerage systems. A Table on pages 292-297 includes information on water bodies where TMDLs and WIPs have been completed, implementation activities are currently being conducted and delistings of water quality parameters have occurred.

Watershed Implementation

TMDLs for Red River Basin were completed in 2008 and LDEQ's NPS staff has developed WIPs for some of these water bodies. A local watershed coordinator has been hired to assist local stakeholders with development and implementation of WIPs to restore impaired waters and protect healthy waters. USDA programs have provided for extensive BMP implementation on agricultural lands in this basin. Approximately 30,000 to 40,000 acres of agricultural BMPs are implemented annually in Red River Basin by USDA through EQIP. CWA Section 319 funds were utilized to implement watershed protection programs for Cross Lake and Wallace Lake. Projects were also implemented to evaluate whether poultry litter could be applied to pastures, cotton and forested areas as an amendment that reduces application rates of inorganic fertilizer. These organic amendments can also reduce soil loss through erosion from fields and forests. Home sewerage inspection programs have been implemented for homes that drain to Cross Lake and Sibley Lake. These inspection programs resulted in replacement and consistent maintenance of home sewerage systems, thereby reducing NPS pollutants entering their drinking water supply. A constructed wetland system was installed at Red River Research Station as a pollutant control device for agricultural pollutants entering Flat River Watershed south of Bossier City. Trailblazer RC&D has partnered with LDEQ and LDWF to reduce problems with giant salvinia on Lake Bistineau. The results of these projects are available on LDEQ's NPS website.

The NPS Program has implemented the following projects in Red River Basin:

- Wallace Lake Watershed Restoration Action Strategy;
- Constructed Wetlands to Improve Water Quality for Whole-Farm Operations;
- Evaluation of Application of Poultry Litter on Water Quality and Wood Production in Forested Lands, Phase 2;
- Water Quality and Crop Production Response to the Use of BMPs and Poultry Litter, Phase II; and
- Cross Lake Watershed Individual Sewerage Treatment System Improvement Project.

Future Goals and Objectives

LDEQ and USEPA finalized TMDLs for Red River Basin in March 2008, and LDEQ's NPS staff developed WIPs for each impaired water body where a TMDL was completed. Field work for detailed land-use classification was completed in 2006 and maps were finalized in 2007. The TMDLs and WIPs guide watershed implementation through 2016 for NPS pollution from agriculture, forestry, urban and home sewerage systems. Section 319 of the CWA requires states to include tasks and milestones in their NPS Management Plans. Specific goals and objectives for NPS Program implementation in Red River Basin are included here:

- Continue to implement WIPs and educational outreach projects to reduce NPS pollutants for priority water bodies in Red River Basin (2011-2016);
- Continue to partner with cooperating federal, state and local agencies on implementation of workshops, field days, projects and WIPs that reduce pollutants identified as contributing to water quality impairment in Red River Basin (2011-2016);
- Continue basin cyclic monitoring program for watersheds in Red River Basin (2011-2016);
- Hold public meetings in Red River Basin to inform the public about TMDLs and WIPs that should be implemented to reduce NPS pollution and restore water quality (2011-2016);
- Implement WIPs, educational outreach programs and implementation activities that reduce NPS pollutants and improve water quality in Red River Basin (2011-2016);
- Partner with cooperating agencies to evaluate results of BMPs on forested land, agricultural fields and urban areas to determine if implementation has been effective (2011-2016);
- Continue to monitor water bodies where WIPs and NPS projects have been implemented to evaluate in-stream water quality improvements (2011-2016);
- Report to USEPA, NPS Interagency Committee and the public on progress made in program implementation and water quality improvement (2011-2016);
- Determine if educational outreach and watershed specific activities have been effective in reducing NPS loads or if additional management strategies (voluntary or regulatory) are necessary to restore impaired waters (2011-2016);
- If additional strategies are necessary to restore impaired water bodies, LDEQ will partner with agencies/organizations to determine timelines for implementation (2011-2016); and
- Include highlights from watershed implementation and water quality improvements in LDEQ's NPS Annual Report (2011-2016).

Timeline for Milestones: October 2011 – September 2016

Water quality goals and objectives for the NPS Management Program for Red River Basin are to restore designated uses for water bodies included on the 303(d) list of impaired waters. The 4-year basin cyclic monitoring program, combined with watershed specific projects will be the basis for evaluating progress in reducing NPS pollutants and improving water quality.

Stakeholders

Natural Resource Conservation Service (NRCS)
NRCS has partnered with LDEQ on projects and educational programs that result in BMPs being implemented on agricultural lands. NRCS provides technical assistance to farmers who participate in water quality projects in Red River

Basin. LDEQ will continue to partner with NRCS to prioritize these watersheds for cost-share and technical assistance through EQIP. NRCS continues to take a leadership role on NPS issues involving agricultural lands.

Soil and Water Conservation Districts (SWCD)
SWCDs have partnered with LDEQ and NRCS on watershed and demonstration projects. These projects have been implemented to reduce pollutants from agriculture and from sand and gravel mining operations. NRCS hosts field days and farm tours and also develops educational outreach materials that highlight BMPs that have been effective in reducing pollutants.

The City of Shreveport
The City of Shreveport has partnered with LDEQ on development and implementation of a WIP for Cross Lake. They have partnered with LDEQ's SWPP to identify potential sources of contamination in Cross Lake Watershed. The city designed a website about Cross Lake that has been utilized by many schools in the city as one method to learn more about NPS.

LSU in Shreveport
LSU in Shreveport participated in the Cross Lake Watershed Protection Program. Students established a water quality monitoring program for the lake that was utilized to evaluate results of watershed implementation projects.

U.S. Geological Survey (USGS)
USGS conducted initial water quality monitoring for City of Shreveport on Cross Lake that described existing water quality problems in the watershed. This data has been and will continue to be utilized as one source of information to plan watershed protection programs for Cross Lake Watershed.

Local Schools
Schools in City of Shreveport have participated in storm drain marking programs and educational outreach programs on NPS pollution.

LSU AgCenter
The Red River Research Station in Bossier City has partnered with LDEQ on demonstration projects to evaluate effectiveness of BMPs for poultry producers on row crops and forested lands. The LSU Hill Farm in Homer hosted a project on application of poultry litter to pasturelands in the watershed.

Local Environmental, Service and Civic Organizations
The local community is the most important partner in the NPS Management Program. They can become involved in educational outreach programs. They can also support local ordinances that require pollution control measures for sediment and erosion control, green infrastructure, smart growth and urban storm water BMPs.

Commodity Groups and Organizations
Agricultural commodity groups and forestry organizations are critical partners in NPS implementation because they decide whether to implement BMPs on their lands. LDEQ has partnered with Louisiana Farm Bureau on Master Farmer Program made presentations to many commodity groups on NPS and watershed implementation priorities.

Federal Consistency

Federal consistency issues for Red River Basin focus on three primary areas: forestry, hydromodification and agriculture. Portions of Kisatchie National Forest are in Red River Basin; therefore, forestry practices implemented should be consistent with state forestry BMPs. Kisatchie National Forest is represented on the state's NPS Committee and has an MOU to partner with LDEQ on implementation of BMPs on their lands. This partnership has been a productive one and has resulted in sharing information on forestry BMPs that should be implemented to protect water quality when timber is harvested or forest roads are built. Hydromodification typically requires a 404 wetland permit from Corps of Engineers and a 401 Water Quality Certification from LDEQ. LDEQ continues to partner with the Corps to incorporate BMPs for hydromodification projects that involve dredging a water body. The local drainage board or police jury typically sponsors these projects; therefore, these stakeholders need to be included in development and implementation of WIPs and educational outreach programs.

Program Evaluation

To determine if NPS Program implementation is effective, program evaluation is essential. Two major components of program evaluation include water quality monitoring and changes in land-use practices. If educational outreach and cost-share assistance programs have resulted in BMP implementation, water quality monitoring should indicate reductions in NPS pollutants and improved water quality. Program evaluation is a large task, requiring federal, state, and local governments to share information. Evaluating water quality improvements is complicated, since there are many sources of pollution in water bodies listed as impaired. Through LDEQ's 4-year basin cyclic monitoring program, water bodies will be sampled and water quality data will be collected. As people become more involved in local water quality issues, NPS sub-watershed monitoring programs may be able to augment the cyclic basin monitoring program. Each WIP has water quality sampling programs associated with them that have been designed to evaluate in-stream water quality improvement.

NPS Program evaluation is included in LDEQ's NPS Annual Report and is available to the public on LDEQ's website. Steps involved in evaluating reductions in NPS pollution and improved water quality have been outlined here:

1. Review quarterly and final reports from each project implemented in Red River Basin and determine whether project goals and objectives have been met (short-term);
2. Prepare information provided in quarterly reports for USEPA semi-annual report and LDEQ's NPS Annual Report (short-term);
3. Analyze data and information to determine if NPS pollutants have been reduced and water quality improvements made (short-term);
4. Evaluate these improvements through LDEQ's 4-year basin cyclic monitoring program to determine water quality improvements as a result of program implementation (short and long term);
5. Provide information to local partners in watersheds and determine if additional steps need to be taken to reduce NPS loads that contribute to water quality impairment (short and long-term);
6. If additional steps are necessary, partner with local, state and federal agencies to restore water quality (short and long-term);
7. Partner with USEPA and other partners to acquire adequate funding for management strategies and proceed with implementation (short and long-term);
8. Continue to evaluate water quality and program implementation until in-stream water bodies have been restored (long-term); and
9. Continue to provide information on progress made in NPS programs through semi-annual and annual reports to USEPA (short and long term).

For more information on water bodies impaired or those fully meeting their designated uses in the Red River Basin, please refer to LDEQ's IR:

http://www.deq.louisiana.gov/portal/DIVISIONS/WaterPermits/WaterQualityStandardsAssessment/WaterQualityInventorySection305b/2010WaterQualityIntegratedReport.aspx

TMDLs Completed in Red River Basin	Watershed Implementation Plan Completed	Watershed Implementation Plan Developed	Implementation Activities Being Conducted	Delistings Between 2004 - 2010
Kelly Bayou (100306) • Fecal Coliform				Oil & Grease, Salinity/Total Dissolved Solids/ Sulfates/Chlorides, Sedimentation/Siltation, Total Suspended Solids in 2004
Cross Bayou (100309) • Chloride • Sedimentation/ Siltation • Sulfates • Total Dissolved Solids • Total Suspended Solids • Turbidity				Nutrients, Oil & Grease in 2004 Color in 2008 Chlorides and Fecal Coliform in 2010
Red Chute Bayou (100402) • Dissolved Oxygen				Cadmium, Copper, Dissolved Oxygen, Fecal Coliform, Lead, Nutrients, Sedimentation/ Siltation, Unknown Toxicity in 2004
Cypress Bayou Reservoir (100404) • Dissolved Oxygen				

	Watershed Implementation Plan Completed	Watershed Implementation Plan Developed	Implementation Activities Being Conducted	Delistings Between 2004 - 2010
Flat River (100406) • Fecal Coliform • Total Dissolved Solids • Dissolved Solids • Nitrogen • Phosphorus	yes			Dissolved Oxygen, Nutrients, Salinity/Total Dissolved Solids/Chlorides/Sulfates, Sedimentation/Siltation, Total Suspended Solids
Bayou Dorcheat (100501) • Dissolved Oxygen • Mercury				Copper, Lead, Mercury, Dissolved Oxygen, Oil & Grease, Other Inorganics, Salinity/Total Dissolved Solids/Chlorides/Sulfates, Sedimentation/Siltation/ Total Suspended Solids in 2004
Bayou Pierre (100601, 100606) • Dissolved Oxygen • Total Nitrogen • Total Phosphorus • Nutrients	yes			Cadmium, Pesticides, Dissolved Oxygen, Fecal Coliform, Nutrients, Salinity/ Total Dissolved Solids/Chlorides/Sulfates, Sedimentation/Siltation in 2004 Fecal Coliform in 2010

	Watershed Implementation Plan Completed	Watershed Implementation Plan Developed	Implementation Activities Being Conducted	Delistings Between 2004-2010
Boggy Bayou (100602) • Dissolved Oxygen • Nutrients (Nitrogen and Phosphorus • Siltation/ Sedimentation/ Turbidity				Dissolved Oxygen, Nutrients, Fecal Coliform, Oil & Grease in 2004 Dissolved Oxygen in 2010
Wallace Lake (100603) • Sedimentation/ Siltation/Turbidity				Fecal Coliform, Lead, Mercury, Non-priority organics, Oil & Grease, Salinity/Total Dissolved Solids/Sulfates, Unknown Toxicity in 2004 Dissolved Oxygen, Nitrate-Nitrate, Total Phosphorus in 2010
Lake Edwards/Smithport Lake (100605) • Dissolved Oxygen/ Nutrients	yes			Cadmium, Copper, Lead, Mercury in 2004 Unknown Toxicity in 2008
Bayou Pierre (100606) • Dissolved Oxygen/Nutrients				Fecal Coliform, Pesticides, Sedimentation/Siltation in 2004

	Watershed Implementation Plan Completed	Watershed Implementation Plan Developed	Implementation Activities Being Conducted	Delistings Between 2004 - 2010
Black Lake Bayou (100701) • Turbidity/TDS/ • Sedimentation • Dissolved Oxygen				Fecal Coliform, Cadmium, Lead, Dissolved Oxygen, Salinity/Total Dissolved Solids/Chlorides/Sulfates, Turbidity in 2004 Low pH in 2008
Black Lake and Clear Lake (100703) • Dissolved Oxygen • Mercury • Turbidity				
Kepler Creek (100704) • Total Dissolved Solids • Mercury				Copper, Fecal Coliform, Lead, pH, Salinity/Total Dissolved Solids/Chlorides/Sulfates, Sedimentation/Siltation and Unknown Toxicity in 2004
Castor Creek (100707) • Fecal Coliform				pH Low, Dissolved Oxygen, Fecal Coliform in 2004
Grand Bayou (100709) • Fecal Coliform				Sedimentation/Siltation in 2004 Fecal Coliform and Mercury in Fish Tissue in 2008

	Watershed Implementation Plan Completed	Watershed Implementation Plan Developed	Implementation Activities Being Conducted	Delistings Between 2004 - 2010
Saline Bayou (100801, 100803) • Fecal Coliform • Dissolved Oxygen • Mercury				Cadmium, Copper, Mercury, Turbidity in 2004 Fecal Coliform in 2006 Lead and Mercury in 2008
Nantaches Creek (100901) • Fecal Coliform				Fecal Coliform in 2008
Cane River (101101) • Fecal Coliform		yes, currently being developed in 2011-2012	yes, a priority watershed for LDEQ's Watershed Coordinators and LDAF	Fecal Coliform in 2010
Rigolette Bayou (101301) • Dissolved Oxygen • Fecal Coliform		yes, currently being developed in 2012		Fecal Coliform and Low pH in 2008
Iatt Lake (101302) • Dissolved Oxygen • Mercury		yes, currently being developed in 2011-2012		
Iatt Creek/Un-named Tributary (101303) • Dissolved Oxygen				

	Watershed Implementation Plan Completed	Watershed Implementation Plan Developed	Implementation Activities Being Conducted	Delistings Between 2004 - 2010
Buhlow Lake (101401) • Turbidity • Lead				Fecal Coliform in 2004 Turbidity and Dissolved Oxygen in 2008
Big Saline Bayou (101501) • Dissolved Oxygen				
Big Creek (101506) • Dissolved Oxygen • Mercury				Low pH in 2008
Lake Concordia (101601, 101605) • Dissolved Oxygen • Turbidity				

Sabine River Basin

The Sabine River Basin is on the Texas-Louisiana border, including more than 2,900 square miles of drainage area in Louisiana. The basin extends from Texas state-line near Shreveport to Gulf of Mexico. Red River and Calcasieu River Basins are east of Sabine Basin. Characteristic vegetation ranges from mixed forests in the upper basin to hardwoods in central portions of the basin and brackish and saline marshes in the southern basin.

Water Quality Assessment

Sabine River Basin is comprised of nineteen water quality sub-segments, which is the scale LDEQ utilizes for regulatory permitting, water quality standards, ambient water quality monitoring and assessment. The 2004 and 2006 IRs indicated none of these water bodies were out of compliance for both contact recreation (i.e. primary and secondary) and FWP. Both 2004 and 2006 IRs indicated one water body, West Anacoco Creek, was not meeting PCR and FWP, but was meeting SCR. The 2008 IR indicated water bodies met contact recreational uses, except Constant Beach Complex which did not meet contact recreation, based on data collected through the Beach Monitoring Program. Both 2004 and 2006 IRs indicated five sub-segments fully met both contact recreation uses, but did not meet FWP. The 2008 IR included eight water bodies in this category of use classification, including: Toledo Bend Reservoir, Bayou Toro from LA 473 to Sabine River, West Anacoco Creek-from headwaters to Vernon Lake, Vernon Lake, Anacoco Lake, Bayou Anacoco-From Anacoco Lake to Cypress Creek, Vinton Waterway-Vinton to Intracoastal Waterway, Sabine River Basin Coastal Bays and Gulf Waters to State three-mile limit. The 2004 and 2006 IRs indicated there were nine sub-segments fully meeting their uses. The 2008 IR indicated eleven water bodies fully met all of their uses; therefore, two water bodies have been added to this category since 2006. These water bodies included: Sabine River-Toledo Bend Dam to Confluence with Old River, Pearl Creek-from Headwaters to Sabine River, Sabine River-Confluence with Old River to Sabine Lake, Black Bayou-to Sabine Lake, Sabine Lake, Sabine Pass, Bayou Toro-From Headwaters to Highway 473, East Anacoco Creek-From Headwaters to Vernon Lake, Bayou Anacoco-From Vernon Lake to Anacoco Lake, Bayou Anacoco-From Cypress Creek to Sabine River, Black Bayou-from Intracoastal Waterway to Pirogue Ditch. The draft 2010 IR is consistent with 2008 IR, with no changes in water quality. The water bodies not meeting FWP had NPS pollution from managed pastures, grazing and natural conditions. A table on pages 300-301 includes information on water bodies with TMDLs and WIPs. The table also indicates whether watershed implementation activities are currently being conducted and delistings of water quality parameters have occurred.

Watershed Implementation

Watersheds scheduled for TMDLs were completed during 2007 and 2008 by LDEQ and USEPA. These watersheds will be scheduled for WIPs during 2012-2013. USDA implements 4700-6300 acres of agricultural BMPs annually in Sabine River Basin. CWA Section 319 funds provided for a dairy pumpout program for Desoto Parish to reduce runoff from dairy facilities. LDEQ hired a watershed coordinator to assist local stakeholders with a streambank stabilization project for Vinton Waterway. This project was implemented to address high turbidity and low DO problems that existed there. The majority of the land in Sabine River Basin is in forests or pastures, both of which are managed through programs administered by USDA.

Future Goals and Milestones

Managed pasture, grazing and hydromodification were land-use categories identified in the state's IR as contributing to water quality problems in Sabine River Basin. Therefore, these types of issues will continue to be prioritized through statewide and watershed specific programs. As WIPs are developed, additional problems may be identified that need to be addressed through more intensive watershed specific efforts. LDEQ's 4-year cyclic water quality monitoring program will be utilized to determine if water quality problems are being sufficiently addressed or whether additional actions will be necessary to improve water quailty and restore designated uses in Sabine River Basin.

For more information on water bodies impaired or those fully meeting their designated uses in the Sabine River Basin, please refer to LDEQ's IR:
http://www.deq.louisiana.gov/portal/DIVISIONS/WaterPermits/WaterQualityStandardsAssessment/WaterQualityInventorySection305b/2010WaterQualityIntegratedReport.aspx

TMDLs Completed in Sabine River Basin	Watershed Implementation Plan Completed	Watershed Implementation Plan Developed	Implementation Activities Being Conducted	Delistings Between 2004 - 2010
Toledo Bend Reservoir (110101) • Mercury				Fecal Coliform in 2004
Pearl Creek (110202) • Fecal Coliform				Fecal Coliform in 2008
Bayou Toro (110401, 110402) • Dissolved Oxygen • Fecal Coliform • Dissolved Lead				Fecal Coliform in 2008
West Anacoco Creek (110501) • Dissolved Oxygen/ Nutrients • Fecal Coliform				Fecal Coliform in 2008
Bayou Anacoco (110504) • Fecal Coliform				Fecal Coliform in 2008

	Watershed Implementation Plan Completed	Watershed Implementation Plan Developed	Implementation Activities Being Conducted	Delistings Between 2004 - 2010
Vinton Waterway (110601) • **Turbidity**		Yes, scheduled for completion in 2011	Yes, LDEQ and Watershed Coordinator Priority Area	Turbidity in 2008

Pearl River Basin

Pearl River Basin borders the Louisiana-Mississippi state-line, with Mississippi to the east and north, and Lake Pontchartrain Basin to the west and south. Elevations in the basin range from 350 feet above mean sea level in the northwest corner to sea level at the southern end of the basin. Correspondingly, the vegetation varies from pine forests to brackish marsh.

Water Quality Assessment

Pearl River Basin has twenty-five water quality sub-segments, which is the scale LDEQ utilizes for regulatory permitting, water quality standards, ambient water quality monitoring and assessment. The 2004, 2006 and 2008 IRs indicated none of these twenty-five sub-segments were out of compliance with both contact recreation and FWP. The 2004 and 2006 IRs included four sub-segments as not meeting PCR or FWP, but met SCR. The 2008 IR included only two water bodies in this category of use support. The 2004 and 2006 IRs included twelve sub-segments as fully meeting PCR and SCR, but not meeting FWP. The 2008 IR included eleven water bodies in this same category of use support. The 2004 and 2006 IRs included only one water body, Big Silver Creek as not meeting PCR, but fully met SCR and FWP. The 2008 IR included four water bodies in this category of use support and three water bodies that fully met all of their uses. Morgan River, Morgan Bayou, Wilson Slough and Bradley Slough were not assessed for either PCR or SCR, but were assessed for FWP and did not meet that use. The 2010 IR indicated water quality remained relatively stable since 2008, with Pearl River delisted for DO between Mississippi state line and Pearl River Navigational Canal.

Water bodies not meeting contact recreation did not comply with fecal coliform standards. There was a wide range of sources contributing to fecal coliform problems, including on-site wastewater treatment systems, sources outside state jurisdictions, wildlife other than waterfowl, upstream sources and municipal point source discharges. Water bodies not meeting FWP were listed primarily because of mercury contamination or high levels of turbidity. There were a number of sources for high turbidity, including silviculture, harvesting, sand and gravel mining and sources outside of the state. Mercury contamination was associated with atmospheric deposition and unknown sources. Thigpen Creek was listed for low DO related to natural conditions. A table on pages 305-307 includes information on which water bodies have had TMDLs and WIPs developed, where watershed implementation is being conducted and delistings have occurred for water quality parameters.

Watershed Implementation

USEPA and LDEQ completed TMDLs for Pearl River Basin. These TMDLs focused primarily on turbidity for four watersheds and a TMDL for mercury in thirteen watersheds. Results of those TMDLs indicated large reductions in fecal coliform bacteria were necessary in all seven water bodies. TMDLs for turbidity indicated there would need to be 66-89 percent reduction of TSS in Bogue Chitto River, West Pearl River, Holmes Bayou and West Pearl River. WIPs will be developed to describe more specifically where in these watersheds NPS problems existed. These TMDLs and WIPs guide the implementation process from 2011 until water quality standards have been met and designated uses restored.

USDA implements approximately 2300-7500 acres of agricultural management practices annually through EQIP. The Nature Conservancy and Mississippi LDEQ formed the Lower Pearl River Partnership to identify and prioritize environmental stressors to water quality, habitat and threatened and/or endangered species in Pearl River System. LDEQ participated in a series of workshops where environmental stressors were discussed and prioritized for their impacts on the system. Sedimentation was identified as one of the major environmental stressors to the aquatic ecosystem. Two key sources of sedimentation were sand and gravel mining operations and changes in geomorphology. A final report was completed for this project and results are posted on LDEQ's NPS website.

LDEQ provided Section 319 funds to Louisiana Nature Conservancy to implement a Conservation Area Plan for Pearl River Watershed, which resulted in identification of where these sand and gravel mined sites were located. A project with Nature Conservancy was initiated to examine geomorphology of Pearl River System. They analyzed the stream channel of Pearl River to see how physical changes to the channel contributed to increased sedimentation in the river. Results of this project are available on LDEQ's NPS website.

Future Goals and Milestones

LDEQ will continue to partner with LFA, LOF and LDHH to identify types of educational outreach programs and watershed projects necessary to reduce these water quality problems. Maintenance and operation programs for home sewerage systems may be necessary to reduce levels of fecal coliform and/or nutrients that may be contributing to water quality problems.

Training programs for loggers, landowners and foresters may be necessary to increase utilization of BMPs for forested lands. These types of programs have been implemented successfully in other parts of the state, and should be effective methods to reduce and control NPS pollutants that exist in Pearl River Basin.

Since the majority of water quality problems are associated with silviculture, surface mining and pastureland management, LDEQ could implement activities through statewide programs that prioritize the type of NPS pollutants associated with these land-use activities. Through statewide forestry educational outreach programs, workshops can be held and educational outreach materials disseminated to landowners in Pearl River Basin. A statewide inventory of sand and gravel mines identified priority sites for restoration in Pearl River Basin. These mined sites can also be prioritized for BMP implementation to reduce sedimentation and turbidity in Pear River.

BMPs have been implemented in Western Florida Parishes for pastureland management through local SWCD and NRCS offices in Pearl River Basin. Water quality problems in Pearl River Basin do not seem extensive except for mercury contamination. DO concentrations have remained relatively stable and are compliant with water quality standards. Fecal coliform bacteria concentrations have fluctuated from low to high values, with the most recent data indicating improved water quality. LDEQ will continue to evaluate water quality in Pearl River Basin to determine if water quality is improving over time as a result of NPS Program activities.

Section 319 of the CWA required states to include tasks and milestones as timelines to complete those tasks in their NPS Management Plans. Tasks and milestones for Pearl River Basin in Louisiana's NPS Plan include:

1. Overlay these data with satellite imagery for Pearl River Basin to target priority watersheds where WIPs need to be implemented to reduce and control NPS pollutants (2011-2016);
2. Review TMDLs that have been completed by USEPA for Pearl River Basin and partner

with federal, state and local stakeholders on WIPs for these water bodies (2011-2016);

3. Prioritize these strategies and outline which ones could be implemented through statewide educational programs and which ones could be implemented through WIPs (2011-2016);
4. Partner with federal, state and local agencies to implement these management strategies to address NPS pollution problems (2011-2016);
5. Continue to utilize LDEQ's 4-year basin cyclic water quality monitoring program combined with on-the-ground BMP evaluation to determine if management strategies have been effective in reducing and controlling NPS pollution (2011-2016); and
6. Report on the results and progress made in statewide and watershed implementation to interagency partners, USEPA and the public (2011-2016).

The goals and objectives of Pearl River Watershed Protection Program are to implement activities and programs that result in reductions in NPS pollutant loads and water quality improvement. LDEQ expects measurable water quality improvements in these water bodies in 5-7 years.

For more information on water bodies impaired or those that fully meet their designated uses in the Pearl River Basin, please refer to LDEQ'S IR:

http://www.deq.louisiana.gov/portal/DIVISIONS/WaterPermits/WaterQualityStandardsAssessment/WaterQualityInventorySection305b/2010WaterQualityIntegratedReport.aspx

TMDLs Completed in Pearl River Basin	Watershed Implementation Plan Completed	Watershed Implementation Plan Developed	Implementation Activities Being Conducted	Delistings Between 2004 - 2010
Pearl River (090101) • **Fecal Coliform**				Cadmium, Copper, Lead, Nutrients in 2004 Fecal Coliform in 2008 Dissolved Oxygen in 2010
Peters Creek (090104) • **Fecal Coliform**				Dissolved Oxygen, Nutrients, Total Suspended Solids in 2004 Low pH in 2008
Holmes Bayou (090106) • **Turbidity**				
Pearl River Navigation Canal (090105, 090204) • **Dissolved Oxygen**				pH in 2010

	Watershed Implementation Plan Completed	Watershed Implementation Plan Developed	Implementation Activities Being Conducted	Delistings Between 2004 2010
West Pearl River (090201, 090202) • Turbidity				Cadmium, Lead, Fecal Coliform in 2004 Turbidity in 2008 Low pH in 2010
Middle Pearl River and West Middle Pearl River (090207) • Dissolved Oxygen • Fecal Coliform				Low pH in 2010
Puspepatapa Creek (090301) • Fecal Coliform				Fecal Coliform in 2008
Bogue Lusa Creek (090401) • Fecal Coliform				Dissolved Oxygen, Nutrients, pH, Turbidity in 2004
Bogue Chitto (090501) • Mercury • Turbidity				Fecal Coliform, Lead, pH in 2004

	Watershed Implementation Plan Completed	Watershed Implementation Plan Developed	Implementation Activities Being Conducted	Delistings Between 2004 - 2010
Big Sliver Creek (090502) • **Fecal Coliform**				
Little Silver Creek (090503) • **Fecal Coliform**		yes, currently being developed in 2011-2012		
Bonner Creek (090505) • **Fecal Coliform**				Low pH in 2008
Thigpen Creek (090506) • **Fecal Coliform**				Cadmium, Sedimentation/ Siltation/Total Suspended Solids in 2004 Dissolved Oxygen and Low pH in 2010

Atchafalaya River Basin

The Atchafalaya River Basin is in south central Louisiana and is a distributary of Red, Black, and Mississippi Rivers. Atchafalaya River currently transports approximately 30percent of the Mississippi River's flow. The basin is well defined by a system of levees, which surround it on the north, east and west. The entire basin serves as the major floodway for Mississippi River flood waters. It encompasses approximately 1,806 square miles and is predominately wooded lowland and cypress-tupelo swamp with fresh water marsh in lower distributary areas. Atchafalaya River Basin constitutes the largest contiguous fresh water swamp in the United States.

Water Quality Assessment

Atchafalaya River Basin has eleven sub-segments. Of these eleven sub-segments, the 2004, 2006 and 2008 IRs indicated no water bodies were out of compliance with contact recreation uses. However, Atchafalaya Bay, Delta and Gulf Waters to Three Mile Limit are not meeting fecal coliform bacteria standards for oyster propagation. It was included on the 303(d) list in 2006 and has remained there through the 2010 IR.

The 2004 IR indicated seven sub-segments were not compliant with FWP. The 2008 IR indicated seven water bodies did not meet FWP, including: West Atchafalaya Basin Floodway-Simmesport to Butte Larose Bay, East Atchafalaya Basin and Morganza Floodway, Crow Bayou which also includes Bayou Blue and Tributaries, Bayou Teche-Berwick to Wax Lake Outlet, Atchafalaya River-from Intercoastal Waterway south of Morgan City to Atchafalaya Bay, Wax Lake Outlet-from U.S. 90 bridge to Atchafalaya Bay, Atchafalaya Bay and Delta and Gulf Waters to State three-mile limit.

The 2006 IR included six water bodies that were not in compliance with FWP. The 2010 IR included Lower Atchafalaya River from Intracoastal Waterway to Atchafalaya Bay, Wax Lake Outlet from U.S. 90 Bridge to Atchafalaya Bay and Intracoastal Waterway from Bayou Boeuf Lock to Bayou Sale as compliant with FWP.

Lack of compliance with FWP was related to low DO or mercury contamination. In some water bodies, sources of these problems were unknown but in others, sources included irrigated crop production, petroleum/natural gas production activities and atmospheric deposition.

The 2004 IR included five water bodies as fully supporting their designated uses including: Atchafalaya River Main stem, Intracoastal Waterway, Lower Atchafalaya River, Wax Lake Outlet, and Intracoastal Waterway-Bayou Boeuf Lock to Bayou Sale. Similarly, the 2006 IR included these same five water bodies, but added Atchafalaya River Headwaters and Floodplain–Old River Control Structure to Simmesport (includes Old River Diversion Channel, Lower Red River, Lower Old River). All water bodies in Atchafalaya Basin fully support PCR and SCR. A table on page 311 includes information on where TMDLs and WIPs have been developed and where watershed implementation activities are currently being conducted. This table also includes delistings of water quality parameters that have occurred.

Watershed Implementation

Since USDA implements agricultural BMPs through EQIP and other cost-share assistance programs, areas where croplands contribute to water quality problems could be addressed through those programs. The Grassland Reserve Program (GRP) prioritizes areas in Atchafalaya basin for BMP implementation. These two programs implement an annual average of 7000-8000 acres of BMPs in Atchafalaya Basin. Water quality improvements in Atchafalaya River Basin may be related to USDA's efforts.

Atchafalaya River is a very large river that transports 30 percent of Mississippi River's flow to Gulf of Mexico. Many pollutants in the river do not originate from Louisiana. However, there is a multi-agency effort to restore water quality, wildlife habitat and improve recreation and tourism in Atchafalaya River Basin.

In 1960, the public became interested in conserving and protecting Atchafalaya River Basin, the largest river-swamp in the nation. In 1971, the Governor of Louisiana agreed to provide state sponsorship for a program to protect Atchafalaya Basin. The initial funding was provided through Water Resources Development Act (WRDA) and subsequent legislation in 1985 and 1986.

Sandra Thompson was Executive Director of Atchafalaya Basin Commission in the 1970s and was asked to appoint a citizen's committee to formulate a state plan for the Basin. The State Plan was developed by a committee of 75 people who represented a collection of federal, state, local and private stakeholders. The committee outlined major goals and objectives to protect and restore Atchafalaya River Basin.

Congress authorized this plan in 1986 with $250 million of federal funds. The state shared responsibility of implementing the plan with Corps of Engineers, who provided cost/share agreements to assist with its implementation. Congress met its obligations to protect Atchafalaya Basin and directed the Corps of Engineers to prepare a comprehensive plan and begin to purchase land. Approximately $250 million was authorized for purchase of land, flood control projects, water management and environmental and recreational programs.

In 1996, the Governor directed LDNR to take the lead in developing the Atchafalaya River Basin Master Plan with the Corp of Engineers to meet the state's responsibility to protect and restore this valuable natural resource. The initial meeting of Atchafalaya Basin Advisory Committee was held on January 23, 1997. A MOU between eight state agencies was signed in March, 1997, and efforts began to develop the Master Plan for Atchafalaya Basin.

Preparation of the Master Plan took one year, more than forty stakeholder meetings and four quarterly meetings of the Advisory Committee. Eight state agencies, six federal agencies, city and parish governments, landowners, fishing clubs, environmental organizations and interested citizens were involved in the planning process for the Master Plan. The Atchafalaya Basin Master Plan became the state's initial step in meeting responsibilities to match federal funds to "conserve, restore and enhance natural habitats and give all people the opportunity to enjoy the "Atchafalaya Experience."

During 1998, the Master Plan was presented to the public through a series of public meetings held throughout the state. These meetings provided the public with an opportunity to support efforts to protect the Atchafalaya River Basin. On April 23, 1998, Secretary of LDNR submitted a copy of state's Master Plan for Atchafalaya Basin to the Governor of Louisiana. LDNR partnered with the Corps of Engineers, other federal agencies and state agencies to implement projects to address goals of the Master Plan.

In 2007, Congress required Louisiana to investigate maximum efficiency for management of water and sediment in Mississippi and Atchafalaya Rivers for coastal restoration, flood control, navigation and operation of Old River Control Structure. In

2008, Louisiana's legislature adopted Act 606, authorizing LDNR to submit an annual plan to the legislature for the Atchafalaya Basin Program, including projects consistent with their Master Plan. Act 606 also created Atchafalaya Basin Conservation Fund. In 2009, Louisiana's legislature approved $3.5 million in state funding for water quality/management and other projects included in FY 2010 Atchafalaya Basin Program Annual Plan, the first adopted since Act 606. The FY 2012 Annual Plan for the Atchafalaya Basin Program is currently available on their website http://www.Basin.la.gov.

LDEQ will continue to partner with LDNR on implementing Atchafalaya Basin Program. Point source and NPS pollution issues could be addressed through this implementation process. The NPS staff can be involved through watershed management activities and basin-wide educational outreach programs, prioritizing NPS pollution problems identified in the basin. Section 319 of the CWA requires states to include milestones and timelines to meet those milestones in the NPS Management Plan. Therefore, milestones for water quality improvement in Atchafalaya River Basin include:

1. Complete TMDLs for water bodies on the state's 303(d) list (2009-2012);
2. Prioritize these water bodies for potential funding through CWA Section 319 funds (2011-2016);
3. Partner with local districts and state and federal agencies for educational outreach programs, WIPs and/or implementation efforts to reduce and control NPS pollutant loads (2011-2016);
4. Partner with LDNR and cooperating agencies on the state's Master Plan for Atchafalaya River Basin (2011-2016); and
5. Report results and progress made on these efforts in semi-annual and annual reports to USEPA and NPS Interagency Committee (2011-2016).

Goals and objectives of the NPS Management Plan for Atchafalaya River Basin are to improve water quality and restore designated uses for water bodies in Atchafalaya Basin.

For more information on water bodies that are impaired or those that fully meet their designated uses in the Atchafalaya River Basin, please refer to LDEQ'S IR: **http://www.deq.louisiana.gov/portal/DIVISIONS/WaterPermits/WaterQualityStandardsAssessment/WaterQualityInventorySection305b/2010WaterQualityIntegratedReport.aspx**

TMDLs Completed in Atchafalaya Basin	Watershed Implementation Plan Completed	Watershed Implementation Plan Developed	Implementation Activities Being Conducted	Delistings Between 2004 - 2010
West Atchafalaya Basin Floodway (010301) • **Mercury** • **Dissolved Oxygen**	no	no		Oil & Grease, Sedimentation/ Siltation, Turbidity in 2004 Dissolved Oxygen in 2006
East Atchafalaya Basin and Morganza Floodway (010401) • **Mercury**	no	no		Mercury in 2008
Lower Atchafalaya Basin Floodway (010501) • **Mercury**	no	no		Mercury and DO in 2004
Crow Bayou, Bayou Blue and Tributaries (010601) • **Chloride** • **Sulfates** • **Total Dissolved Solids**	no	no		Sulfates in 2008

Mississippi River Basin

The Mississippi River creates the boundary between Louisiana and Mississippi, while the lower portion of the river flows southeast through Louisiana. Levees prevent upper portions of the river from receiving tributary flow in Louisiana. However, between Old River Control Structure and Baton Rouge, the river does receive tributary flow from Thompson's Creek, Bayou Sara, Tunica Bayou and Monte Sano Bayou. East and west banks of the Mississippi River are leveed from Baton Rouge below Monte Sano Bayou to Venice. This portion of the river is also heavily industrialized, receiving numerous industrial discharges from Baton Rouge to New Orleans. The birdfoot delta of the Mississippi consists of fresh and intermediate marsh, and it flows to the Gulf of Mexico.

Water Quality Assessment

The Mississippi River Basin has fourteen sub-segments. The 2004 IR included only one water body, Capitol Lake, as not meeting contact recreation or FWP. The 2008 and 2010 IRs indicated improvements in Capitol Lake since it met SCR. The 2010 IR also indicated Devil's Swamp, Lake/Bayou Baton Rouge was not meeting PCR or FWP, but did meet SCR. The 2010 IR indicated Coastal Bays/Gulf waters to the three-mile state limit met PCR and SCR, but did not meet FWP or oyster propagation. The 2010 IR included Raccourci Old River, as fully meeting contact recreation, but not FWP.

The 2004 IR included Bayou Sara as not meeting PCR, but met SCR and FWP. The 2006 and 2008 IRs also included Bayou Sara in this category of use attainment, but added Thompson Creek and Tunica Bayou. The 2010 IR indicates Bayou Sara, Thompson Creek and Mississippi River Passes were fully meeting all of their uses.

The 2008 and draft 2010 IRs included three sub-segments of the Mississippi River as fully meeting all of their designated uses: Mississippi River from Arkansas State Line to Old River Control Structure, Mississippi River from Old River Control Structure to Monte Santo Bayou, and Mississippi River from Monte Santo Bayou to Head of Passes. Page 317 includes information on which water bodies have had TMDLs and WIPs developed for them, were watershed implementation is currently being conducted and delistings of water quality parameters have occurred.

Watershed Implementation in Mississippi River Watershed

The Gulf of Mexico and the Mississippi River are valuable resources for the State of Louisiana. These waters have also been important to the State, because of interstate commerce and their national significance. LDEQ has partnered with a number of agencies and stakeholders to develop appropriate management plans and to address water quality issues. Since the Lower Mississippi River flows to Gulf of Mexico and has built several river deltas over geologic time, the current configuration of Louisiana's coastal zone is largely due to this complex interaction.

The Gulf of Mexico has been of special concern to Louisiana recently because of seasonal occurrences of low oxygen or hypoxia in near shore gulf waters. Addressing gulf hypoxia is of such importance that Louisiana has pursued national solutions that led to creation of the Mississippi River/Gulf of Mexico Watershed Nutrient Task Force in 1997. The task force has conducted evaluations of characteristics and causes of gulf hypoxia and developed an action plan to address it. One of the major causes of gulf hypoxia has been identified as constrained discharge and nutrient loads of the Mississippi River to the Gulf. The Gulf Hypoxia Action Plan was completed in 2001 and revised in 2008. The Action Plan supports Mississippi River states including Louisiana to reduce nutrient loads to the Mississippi River using a NPS watershed approach.

GOMP and Gulf of Mexico Alliance (GOMA) have included gulf hypoxia as a topic area in their programs. LDEQ has been a member of GOMP since it's creation in 1989 and is also a charter member of GOMA. Through GOMP, LDEQ has participated on their nutrient enrichment committee for many years, which included action items for addressing a variety of NPS issues such as agricultural runoff, urban runoff, construction activities, hydrological modifications and individual sewerage treatment systems. The development of actions to address these issues has been an interstate process with Louisiana benefiting from long-term interaction with other gulf states of Florida, Alabama, Mississippi and Texas. Some of Louisiana's NPS water quality issues in coastal waters have been addressed in coordination with GOMP.

This multi-state approach is also utilized by GOMA which was formed as a response to the Administration's 2004 U.S. Ocean Action Plan. In the Action Plan, Gulf of Mexico received more attention and recognition than in any previous government report, resulting in the formation of GOMA, by gulf state Governors to make progress in solving problems of the Gulf. To further that recognition and apply for greater financial resources for the Gulf, five gulf state governors completed and released "Governor's Action Plan for Healthy and Resilient Coasts" in 2006. Major topics addressed by GOMA included water quality for healthy beaches and shellfish beds, harmful algal blooms, wetland and coastal conservation and restoration, identification and characterization of gulf habitats, reduction of nutrient inputs, and environmental education. Louisiana's NPS Program has an important role in implementing some of GOMA's action items in Louisiana's coastal waters. Additional information on GOMP and GOMA is provided on these websites: www.epa.gov/gmpo/. www.dep.state.fl.us/gulf/default.htm.

The Mississippi River flows for 504 miles through Louisiana, traversing 17 parishes from East Carroll Parish at the Arkansas border to Plaquemines Parish at Gulf of Mexico. Louisiana shares approximately 200 miles of the river with the State of Mississippi. The west bank of the river in Louisiana from the Arkansas border at mile 504 to Venice, near Head of Passes is leveed and has no tributary input. However, 30 percent of the flow from the Mississippi and Red Rivers are diverted to the Atchafalaya River. This diversion provides flood protection and maintains a consistent rate of flow for the Mississippi and Atchafalaya Rivers. The Mississippi River flows through specially built structures near river mile 300. Similarly, approximately 500 cubic feet per second (cfs) of the Mississippi River is diverted to Bayou Lafourche at river mile 175.5 for drinking water purposes. The east bank of the River is leveed from Arkansas' border in Mississippi to Vicksburg and from just north of Baton Rouge to Pointe a La Hache, south of New Orleans near river mile 49. Several tributaries enter the River from Mississippi including Yazoo, Black, Homochitto, Buffalo and Bayou Pierre. Bayou Sara, Thompson Creek, Tunica, and Monte Sano Bayous enter the Mississippi River from Louisiana. River diversions for flood control and coastal restoration also occur south of Baton Rouge on both sides of the River. LDEQ and predecessor agencies have had monitoring stations on Mississippi River continuously since 1966.

The Mississippi River Basin includes all or parts of 31 states and two Canadian provinces; therefore, LDEQ has partnered with multi-state programs to monitor, evaluate and protect water quality in the Mississippi River. The Lower Mississippi River Conservation

Committee (LMRCC) is one multi-state partnership that Louisiana has participated in. LMRCC was formed in 1994 with the mission of promoting protection, restoration, enhancement, understanding, awareness and wise use of natural resources of the Lower Mississippi River. LMRCC accomplishes this mission through coordinated and cooperative efforts on research, planning, management, information sharing, public education and advocacy. Members of LMRCC include representatives of fish and game and water quality agencies from six lower river states of Missouri, Kentucky, Tennessee, Arkansas, Mississippi and Louisiana. LDEQ is a charter member of LMRCC and has actively participated in the Water Quality Technical Committee. Through LMRCC, LDEQ has partnered with other river state water quality agencies to further define water quality issues in the River. A special water quality edition of LMRCC newsletter in 1996 became the most requested newsletter at that time, indicating the importance of Mississippi River water quality. LMRCC has also promoted interagency coordination on the gulf hypoxia issue and in development of an Aquatic Resource Management Plan, as well as continuing to support state NPS Management Programs.

Another major interstate program that LDEQ participates in is Lower Mississippi River Sub-Basin Committee on Hypoxia. This committee was developed under the National Hypoxia Task Force, and functions to coordinate implementation of the Hypoxia Action Plan by major sub-basins including coordination among smaller watersheds, tribes and states in each of those sub-basins. Recently, the Lower Sub-Basin Committee coordinated with LMRCC for greater unity since state members serving on the Sub-Basin Committee also served on LMRCC. The Sub-Basin Committee also includes federal members of the Hypoxia Task Force, such as USDA-NRCS, USGS, CORPs, and NOAA. One of the main actions of the Sub-Basin Committee is identification of pilot watershed projects in each state for demonstrating nutrient reduction practices. Louisiana selected Cabin-Teele sub-watershed in Tensas River Basin and Upper Mississippi River Alluvial Plains Ecoregion of northeast Louisiana as a demonstration project. Through support of the Sub-Basin Committee, funding was provided to evaluate effectiveness of nutrient BMPs in Cabin-Teele with support from USDA's ARS.

More information on Lower Mississippi River Conservation Committee can be found on their website at: www.lmrcc.org.

Hypoxia in the Gulf of Mexico

The State of Louisiana has been concerned for many years with occurrence of areas of low DO or hypoxia in near shore waters of Gulf of Mexico. Given Louisiana's resource-rich coastal zone and the fact that gulf hypoxia occurs primarily in waters off Louisiana's coastline, it is only natural that Louisiana has taken an active role in addressing hypoxia in Gulf of Mexico. Historically, Louisiana universities, particularly the Louisiana Universities Marine Consortium (LUMCON), and state and federal agencies have monitored the area of hypoxia in the gulf and noticed a steady increasing trend. Concerns became even greater when the size of hypoxic zone increased from below 10,000 square kilometers to over 15,000 following the large Mississippi River flood of 1992. The gulf hypoxic area has remained fairly consistent at 15,000 square kilometers since 1992.

Early scientific evidence on the cause of gulf hypoxia, which is still relevant today, indicates there is a link between this hypoxic zone and flows of Mississippi River and its major distributary, Atchafalaya River. More specifically, studies have shown that the combination of constricted outflows of Mississippi and Atchafalaya Rivers to the gulf and their associated nutrient loads are related to size and growth of the hypoxic zone. Because of this Mississippi River relationship to gulf hypoxia, the State of Louisiana and LDEQ continue to address these issues through a watershed approach, developed through Louisiana's NPS Program and CWA Section 319.

Using the watershed approach, LDEQ in coordination with GOMP, sponsored by USEPA, began hosting meetings on hypoxia as early as 1995 with national environmental organizations such as the Environmental Council of the States (ECOS), ASIWPCA, LMRCC and Mississippi River Basin Alliance as well as federal and state agencies and universities. These educational outreach efforts were expanded to include meetings with upriver states in the Mississippi watershed. All these efforts led to creation of the Mississippi River/Gulf of Mexico Watershed Nutrient Task Force in 1997. The task force, also known as the "National Hypoxia Task Force", was charged with conducting an up-to-date scientific assessment of hypoxia on its characteristics and causes, and developing a plan for reducing, mitigating and controlling hypoxia in the Gulf of Mexico. This charge was also written into law under the Harmful Algal Blooms and Hypoxia Research and Control Act, P.L. 105-383, 1998.

The National Hypoxia Task Force subsequently met seven times since its creation in 1997 in cities throughout the Mississippi River watershed and successfully produced an, "Action Plan for Reducing, Mitigating, and Controlling Hypoxia in the Northern Gulf of Mexico" at a task force meeting in Baton Rouge in 2001. Through efforts of the National Hypoxia Task Force, numerous documents have been produced and symposiums sponsored to expand knowledge of the gulf hypoxic zone and refine the management strategy to address it. The Task Force revised the Action Plan in 2008 which included a goal to reduce the size of gulf hypoxia to less than 5000 square kilometers by 2013. This Action Plan included 11 key actions to reduce nitrogen and phosphorus loads entering Gulf of Mexico. The Action Plan is available at: http://water.epa.gov/type/watersheds/named/msbasin/actionplan.cfm#documents.

A central focus of the Hypoxia Action Plan is to utilize a watershed approach and leverage resources and experiences from Louisiana and other states to address water quality issues throughout the watershed. Through the Sub-Basin Committee created by the Hypoxia Task Force, states throughout the watershed identified pilot projects for nutrient reduction. For Louisiana, Cabin-Teele watershed in Tensas River Basin was identified as a pilot project through this program. Although not many of Louisiana's water bodies drain directly to the Mississippi River because of levees, they do drain through the Red, Atchafalaya and other rivers to the gulf where they may contribute to hypoxia.

USDA Farm Bill programs are important for addressing hypoxia. In a task force report entitled "Management Action Review Team Report" which was part of the hypoxia plan reassessment process, key provisions of CWA Section 319 NPS Management Programs and USDA Farm Bill Programs were highlighted as programs to reduce nutrient runoff in the Mississippi River watershed. One Farm Bill program, CREP, is utilized by the State of Iowa's Department of Agriculture and Land Stewardship under their, "Iowa Hypoxia Reduction Initiative" to provide wetland filters at the headwaters of subsurface drained lands. Iowa is applying their CREP wetland program using a watershed approach to address higher nutrient loads that drain to the Mississippi River watershed. Using CREP and other Farm Bill programs through a watershed approach, is a cost effective way to address nutrient reduction in the Mississippi River watershed. These nutrient reductions should also reduce the size of gulf hypoxia. Language in the 2008 Farm Bill included programs to support reducing gulf hypoxia for the first time, and was a positive indication for program coordination in the future.

Other nutrient reduction actions identified in the Gulf Hypoxia Action Plan included river diversions for Louisiana coastal restoration and point source nutrient reductions. These are valuable programs in their own right and necessary if we are to achieve the hypoxia reduction goal. Watershed based NPS programs, however, remain a vital part of the overall hypoxia reduction plan. For more information on the Gulf hypoxia issue and actions and activities of the Mississippi River/Gulf of Mexico Task Force, see the website: www.epa.gov/msbasin/index.htm.

For more information on water bodies impaired or those that fully meet their designated uses in the Mississippi River Basin please refer to LDEQ's IR:
http://www.deq.louisiana.gov/portal/DIVISIONS/WaterPermits/WaterQualityStandardsAssessment/WaterQualityInventorySection305b/2010WaterQualityIntegratedReport.aspx

TMDLs Completed in Mississippi River Basin	Watershed Implementation Plan Completed	Watershed Implementation Plan Developed	Implementation Activities Being Conducted	Delistings Between 2004 - 2010
Mississippi River Passes (070401) • **Fecal Coliform**	no	no		none
Thompson Creek (070502) • **Fecal Coliform**	no	no		none
Capitol Lake (070503) • **Fecal Coliform**	no	no		Dissolved Oxygen, Metals, Nutrients, Oil & Grease, Taste & Odor

References

Anderson, D.G. 1970. Effects of Urban Development on Floods in Northern Virginia. pp. 1-22, *USGS*. Washington D.C.

Association of Fish and Wildlife Agencies, Victoria, British Columbia, July 16-19, 1984, pp.251-262.

Beasley, R.S. 1979. Intensive Site Preparation and Sediment Loss on Steep Watersheds in the Gulf Coast Plain. *Soil Science Society of America Journal,* 43(3):412-417.

Blackburn, W.H., M.G. DeHaven, and R.W. Knight. 1982. Forest Site Preparation and Water Quality in Texas. In *Proceedings of the Specialty Conference on Environmentally Sound Water and Soil Management*, ASCE, Orlando, Florida, July 20-23, 1982, ed. E.G. Kruse, C.R. Burdick, and Y.A. Yousef, pp.57-66.

Brazier, J.R. and G.W. Brown. 1973. Buffer Strips for Stream Temperature Control. *Oregon State University School of Forestry, Forest Research Laboratory, Corvallis, OR, Research Paper 15.*

Brown, G.W., and J.T. Krygier. 1970. Effects of Clearcutting on Stream Temperature. *Water Resources Research*, 6(4):1133-1140.

Brown, G.W. and J.T. Krygier. 1971. Clear-Cut Logging and Sediment Production in the Oregon Coastal Range. *Water Resources Research*, 7(5):pp 1189-1198.

Brown, G.W. 1972. Logging and Water Quality in the Pacific Northwest. In Watersheds in Transition Symposium Proceedings, Urbana, IL, pp.330-334. *American Water Resources Association.*

Brown, G.W. 1974 Fish Habitat. USDA Forest Service. *General Technical Report PNW-24*, pp. E1-E15.

Brown,G.W.1985. Controlling Nonpoint Source Pollution form Silvicultural Operations: What We Know and Don't Know. In *Perspectives on Nonpoint Source Pollution*, pp. 332-333. USEPA.

Chesapeake Bay Local Government Advisory Committee. 1988. *Recommendations of the Nonpoint Source Control Subcommittee to the Local Committee Concerning Nonpoint Source Control Needs.* A draft white paper for discussion at the Local Government Advisory Committee's First Annual Conference.

Coats, R.N. and T.O.Miller. 1981. Cumulative Silvicultural Impacts on Watersheds: A Hydrologic and Regulatory Dilemma. *Environmental Management*, 5(2): 147-160.

Curtis, J.G., D.W. Pelren, D.B. George, V.D. Adams, and J.B. Layzer. 1990. Effectiveness of Best Management Practices in Preventing Degradation of Streams Caused by Silvicultural Activities in Pickett State Forest, Tennessee. Tennessee Technological University, Center for the Management, Utilization and Protection of Water Resources.

Dunford, E.G. 1962. Logging Methods in Relation to Stream Flow and Erosion. In Fifth World Forestry Congress 1960 Proceedings, 3:1703-1708.

Dyrness, C.T. 1967. Mass Soil Movements in the H.J. Andrews Experimental Forest. USDA Forest Service, Pacific Northwest Forest and Range Experiment Station. Research Paper PNW-42.

Eschner, A.R., and J. Larmoyeaux. 1963. Logging and Trout: Four Experimental Forest Practices and their Effect on Water Quality. *Progress in Fish Culture.* 25:59-67.

Everest, F.H. and W.R. Meehan. 1981. Forest Management and Anadromous Fish Habitat Productivity. In *Transactions of the 46th North American Wildlife and Natural Resources Conference*, pp. 521-530. Wildlife Management Institute, Washington, DC.

GESAMP. 1990. *The State of Marine Environment,* United Nations Environmental Program (UNEP) Regional Seas Reports and Studies no 115. IMO/FAO/UNESCO/WMO/WHO/IAEA/UN/UNEP Joint Group of Experts on the Scientific Aspects of Marine Pollution, New York.

Golden, M.S., C.L. Tuttle, J.S. Kush, and J.M. Bradley. 1984. Forestry Activities and Water Quality in Alabama: Effects, Recommended Practices, and an Erosion-Classified System. Auburn University Agricultural Experiment Station, Bulletin 555.

Hartfield, P. 1993. Headcuts and Their Effect on Freshwater Mussels. pp 131-141. K.S. Cummings, A.C. Buchanan, and L.M. Kock, eds. Conservation and Management of Fresh Water Mussels. Proceedings of an Upper Mississippi River Conservation Committee (UMRCC) Symposium, 12-14 October 1992, St. Louis, Missouri (UMRCC), Rock Island, IL.

Hecky R.E., Kilham P. 1988. Nutrient Limitations of Phytoplankton in Freshwater and Marine Environments. A Review of Recent Evidence in the Effects of Enrichment. *Limnology and Oceanography*, 33:796-822.

Hornbeck, J.W., C.W. Martin, and C.T. Smith. 1986. Protecting Forest Streams During Whole-Tree Harvesting. *Northern Journal of Applied Forestry*, 3:97-100.

Jacobson, R.B. 1995. Spatial Controls on Patterns of Land-Use Induced Stream Disturbance at the Drainage Basin Scale-An Example for Gravel Bed Streams of the Ozarks Plateau, Missouri, pp 219-239. J.E. Costa, A.J. Miller, K.W. Potter, and P.R. Wilcock, eds. *American Geophysical Union Monograph 89*, the Wolman Volume.

Klein, R.D. 1985. *Effects of Urbanization on Aquatic Resources,* draft, Maryland Department of Natural Resources, Tidewater Administration, Annapolis, MD.

Langer, W.H. and Glanzman, V.W. 1993. Natural Aggregate: Building America's Future.

Larse, R.W. 1971. Prevention and Control of Erosion and Stream Sedimentation from Forest Roads. In *Proceedings of the Symposium of Forest Land Uses and the Stream Environment*, pp.76-83.Oregon State University.

Leopold, L.B. 1968. *Hydrology for Urban Land Planning, Circular 559.* U.S. Geological Survey, Washington, D.C.

Likens, G.E., F.H. Bormann, N.M. Johnson, D.W. Fisher, and R.S. Pierce. 1970. Effects of Forest Cutting and Herbicide Treatment on Nutrient Budgets in the Hubbard Brook Watershed-Ecosystem. *Ecological Monographs*, 40(1):23-47.

Livingston, E.H. and E. McCarron. 1992. *Storm Water Management: A Guide for Floridians.* Florida Department of Environmental Regulation, Tallahassee.

Maas, R. 1984. Best Management Practices for Agricultural Nonpoint Sources: IV. Pesticides. Biological and Agricultural Engineering Department. North Carolina State University, Raleigh, NC. 83 p. NTIS PB85-11424/WEP.

Megahan,W.F. 1980. Nonpoint Source Pollution from Forestry Activities in the Western United States: Results of Recent Research Needs. In U.S. Forestry and Water Quality: What Course in the 1980's? *Proceedings of the Water Pollution Control Federation Seminar*, Richmond, VA, June 19,1980, pp.92-151.

Megahan, W.F. 1986. Recent Studies on Erosion and Its Control on Forest Lands in the United States. In: Richard, F., ed. *Range Basin Sediment Delivery: Proceedings;* 1986 August; Albuquerque, NM. IAHS Pub. 159, Wallington, Oxon, United Kingdom. pp.178-189.

Murphy, M.L., K.V. Koski, J. Heifetz, S.W. Johnson, D. Kirchhofer, and J.F. Thedinga. 1984. Role of Large Organic Debris as Winter Habitat for Juvenile Salmonids in Alaska Streams. In Western Proceedings of the 64th Annual Conference of the Western.

Murphy, M.L., J.Heifetz, S.W. Johnson, K.V. Koski and J.F. Thedinga. 1986. Effects of Clear-Cut Logging with and without Buffer Strips in Juvenile Salmonids in Alaskan Streams. *Canadian Journal of Fisheries and Aquatic Sciences*. 43:1521-1533.

Neary, D.G. W.T. Swank, and H. Riekerk. 1989. An Overview of Nonpoint Source Pollution in the Southern United States. In Proceedings of the Symposium: Forested Wetlands of the Southern United States, July 12-14, 1988, Orlando, FL. USDA Forest Service. General Technical Report SE-50, pp. 1-7.

Nelson, D. 1985. Minimizing Nitrogen Losses in Non-irrigated Eastern Areas. *Proceedings of the Plant Nutrient Use and the Environment Symposium, Plant Nutrient Use and the Environment*, October 21-23, 1985, Kansas City, MOS, pp. 173-209. The Fertilizer Institute.

NOAA. 1991. *Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance.* U.S. Department of Commerce, National Oceanic and Atmospheric Administration, and U.S. Environmental Protection Agency, Office of Water, Washington, DC.

Norris, L.A., and D.G. Moore. 1971. The Entry and Fate of Forest Chemicals in Streams. In *Forest Land Uses and Stream Environment – Symposium Proceedings,* ed. J.T. Krygier and J.D. Hall, Oregon State University, Corvallis, OR, pp.138-158.

North Carolina State University. 1984. Best Management Practices for Agricultural Nonpoint Source Control: IV. Pesticides. North Carolina State University. National Water Quality Evaluation Project, Raleigh, NC.

Novais, R., and E.J. Kamprath. 1978. Phosphorus Supplying Capacities of Previously Heavily Fertilized Soils. *Soil Science Society of America Journal*, 42:931-935.

Novotny, V., and G. Chesters. 1981. *Handbook of Nonpoint Pollution: Sources and Management.* Van Nostrand Reinhold, New York.

Pardo. R. 1980. What is Forestry's Contribution to Nonpoint Source Pollution? In U.S. Forestry and Water Quality: What Course in the 80's? *Proceedings of the Water Pollution Control Federation Seminar*, Richmond, VA, June 19, 1980, pp.31-41.

Patric, J.H. 1976. Soil Erosion in the Eastern Forest. *Journal of Forestry*, 74(1): 671-677.

Swift, L.W., Jr. 1984b. Soil Losses from Roadbeds and Cut and Fill Slopes in the Southern Appalachian Mountains. *Southern Journal of Applied Forestry*, 8(4): 209-215.

Riekerk, H. 1983. Environmental Impacts of Silviculture in Florida, I.U.F.R.O. Symposium on forest Site and Continuous Productivity. USDA Forest Service, Pacific Northwest forest and Range Experiment Station. General Technical Report PNW-163.pp 264-271.

Riekerk, H. 1983. Impacts of Silviculture on Flatwoods Runoff, Water Quality, and Nutrient Budgets. *Water Resources Bulletin*, 19(1) 73-80.

Riekerk, H. 1985. Water Quality Effects of Pine Flatwoods Silviculture. *Journal of Soil and Water Conservation,* 40(3): 306-309.

Riekerk, H. 1989. Forest Fertilizer and Runoff-Water Quality. In Soil and Crop Science Society of Florida Proceedings, September 20-22, 1988, Marco Island, FL, Vol. 48, pp.99-102.

Riekerk, H., D.G. Neary, and W.J. Swank. 1989. The Magnitude of Upland Silviculture Nonpoint Source Pollution in the South. In Proceedings of the Symposium: Forest Wetlands of the Southern United States, July 12-14, Orlando, FL. pp.8-18.

Rothwell, R.L. 1983. Erosion and Sediment Control at Road-Stream Crossings (Forestry). The Forestry Chronicle, 59(2): 62-66.

Schueler, T.R. 1987. *Controlling Urban Runoff: A Practical Manual for Planning and Designing Urban BMPs.* Metropolitan Washington Council of Governments, Washington, D.C.

Sims, J.T. 1992. Environmental Management of Phosphorus in Agricultural and Municipal Wastes. In Future Directions of Agricultural Pollution Research, ed. F.J. Dikora. Tennessee Valley Authority. Muscle. Shoals, AL. Bulletin Y-224.

Swift, D.R. 1984. Periphyton and Water Quality Relationships in Everglades Water Conservation Areas. In: P.J. Gleason, editor, Environments of South Florida: Present and Past. Miami Geologic Society, Coral Gables, FL.

Thingstad et. al., and E. Sakshaug. 1990. Control of Phytoplankton Growth in Nutrient Recycling Ecosystem. Theory and Terminology. *Marine Ecology Progress Series* 63:261-272.

USEPA. 1977. *Nonpoint Source-Stream Nutrient Relationships: A Nationwide Study.* United States Environmental Protection Agency. Washington., DC. NTIS No. PB-276 600.

USEPA.1983. *Final Report of the Nationwide Urban Runoff Program.* U.S. Environmental Protection Agency, Water Planning Division, Washington, DC.

USEPA 1984. Report to Congress: Nonpoint Source Pollution in the U.S. USEPA Office of Water Program Operations, Washington, DC.

USEPA. 1989a. National Primary and Secondary Drinking Water Standards. 40 CFR Parts 141,142 and 143.

USEPA. 1992b: National Water Quality Inventory: 1990 Report to Congress. USEPA Office of Water, Washington, DC.

USEPA. 1992a. Managing Nonpoint Source Pollution, Final Report to Congress on Section 319 of the Clean Water Act (1989) USEPA Office of Water, Washington D.C. EPA-506/9-90.

USEPA. 1993. Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters (EPA-840-B-92-002).

USEPA. 2010. Guidance for Federal Land Management in the Chesapeake Bay Watershed.

USEPA. 2011. FFY 2012 National Water Program Guidance.

Waters, T.F. 1995. Sediment in Streams: Sources, Biological Effect and Control. *American Fisheries Society Monograph*, 7, Bethesda, MD.

Westerman, P.W. L.M. Safley, J.C. Barker, and G.M. Chescheir. 1985. Available Nutrients in Livestock Waste. In *Proceedings of the Fifth International Symposium on Agricultural Wastes, Agricultural Waste Utilization and Management, American Society of Agricultural Engineers*, St. Joseph, MI. pp.295-307.

Whitman, R. 1989. Clean Water or Multiple Uses? Best Management Practices for Water Quality Control in the National Forests. *Ecology Law Quarterly*, 16:909-966.

Wolman, M.G., and Schick, A.P. 1967. Effects of Construction on Fluvial Sediment, Urban and Suburban Areas of Maryland. *Water Resources Research* 3(2): 451-464.

Woodward-Clyde Consultants. 1980. Gravel Removal Studies in Arctic and Subarctic Floodplains in Alaska. USFWS. FWS-OBS-80/08, Washington, D.C.

Yoho, N.S. 1980. Forest Management and Sediment Production in the South – A Review. *Southern Journal of Applied Forestry* 4(1): 27-36.

Yorke, T.H., and W.J. Herbe. 1978. *Effects of Urbanization on Streamflow and Sediment Transport in the Rock Creek and Anacostia Basins, Montgomery County Maryland, 1962-74.* Professional Paper 1003. U.S. Geological Survey, Washington, D.C.

Appendices

Appendix A

Memorandum of Understanding (MOU)

for

Louisiana's NPS Management Plan

MEMORANDUM OF UNDERSTANDING [MOU]

I. PURPOSE

This Memorandum of Understanding (MOU) between state and federal agencies, universities, local governments and non-profit organizations illustrates the level of cooperation and collaboration that will be necessary to implement the State of Louisiana's Nonpoint Source Management Plan. This MOU seeks to identify and encourage the use of existing authorities and programs that can be utilized to achieve the goals and objectives of this plan. As a result of this collaborative approach to water quality management, nonpoint source pollution should be reduced and water quality goals of the Clean Water Act (CWA) should be met.

Through this MOU, Louisiana Department of Environmental Quality seeks to utilize existing programs and encourages new programs to address water quality problems that exist across the state. The entities that have been included in these MOUs are considered real partners and are essential to making the state's NPS Management Plan work. As the NPS Program expands and works in more watersheds and basins during 2011-2016, additional partners will emerge and new MOUs will be added. The coordination and cooperation between agencies, non-profit organizations and local governments will reduce unnecessary duplication of effort and accelerate the rate of implementation of Best Management Practices (BMPs). All BMPs included within the NPS Management Program are the types of practices that should be implemented to reduce the amount of pollutants entering water bodies of the state. Federal, state and local governments have standards and specifications for these types of practices that should be adhered to in order to ensure they function according to design standards. Long-term maintenance of BMPs is an integral part of the nonpoint source pollution reduction strategy in order for water quality to be restored and maintained and the fishable and swimmable goals of the Clean Water Act to be met.

II. AUTHORITIES

Section 319 of the Clean Water Act instructed the Governor of each state to prepare and submit a Nonpoint Source Management Plan, in order to reduce and control nonpoint source pollution and improve water quality. The State Legislature enacted Act 272 in 1987, designating the Department of Environmental Quality as the "Lead Agency" for the State's Nonpoint Source Program, which was to be prepared in cooperation with state and federal agencies who have land management authorities within the state. This MOU does not alter existing statutory or regulatory authority of cooperating agencies. It is intended to facilitate satisfying those statutory requirements through the development of cooperative Federal, State and Local efforts.

III. BACKGROUND

The Water Quality Act of 1987 (WQA) amended the Clean Water Act (CWA) of 1972, with Section 319 directing States to develop and implement programs for the control of NPS pollution. Section 319 authorizes financial assistance to the States for implementing State Management Programs.

States are encouraged to develop NPS programs that build upon related water quality programs such as, Estuaries (Section 320), Surface Water Toxics (Section 304 (1)), Ground Water, Wetlands, and Storm Water Permitting. This allows NPS Programs to be implemented in conjunction with other programs and Section 319 funds to be leveraged with resources from other programs.

The Food Security Act of 1985 and 1990 initiated and subsequent amendments established major new conservation provisions, primarily dealing with highly erodible croplands, which when targeted can assist in protection and enhancement of water quality. In carrying out these requirements and other on-going conservation programs, the USDA NRCS Field Office Technical Guide (FOTG) will serve as the standards and specifications for BMPs dealing with agricultural planning and implementation, for treating NPS.

Agencies involved recognize the need to improve, conserve, and protect the quality of surface and ground water for conducting activities in a manner that promotes maintaining and improving the quantity and quality of water available for public consumption and recreation.

IV. PROVISIONS

Involved agencies will continue to integrate water quality concerns into their ongoing programs and activities. Where requested assistance is beyond that currently provided by any one of the involved agencies (either state or federal), and to the extent authorized by existing legal authorities of the involved agency, such additional assistance will be covered by agreements developed at the State level by appropriate agency leaders. These agreements may provide for:

1. Implementation of statewide water quality educational programs and watershed restoration projects related to the State's NPS Management Program;
2. Assistance in the implementation of BMPs; and
3. Other services that the State identifies as necessary for nonpoint source pollution abatement and other water quality program management.

In accordance with this provision, LDEQ and LDAF will partner on NPS Program implementation to achieve goals of Section 319 of the CWA. This partnership in the State of Louisiana will provide for an effective targeted approach for watershed management to protect and restore waters of the state. LDEQ maintains its role as the "Lead Agency" for the state's NPS Management Program, as authorized by Act 272 by the State Legislature of 1987. However in watersheds where agricultural and/or forestry are the predominant land-uses that need to be addressed to restore water quality, LDAF will apply for and receive federal funds to work with landowners to implement agricultural BMPs that will reduce and control the type of NPS pollutants that have been identified as contributing to water quality impairment.

This state level agreement is developed and will be used to strengthen the assistance and participation with the goal of accelerating implementation of the NPS Management Program. Where USEPA grant funds are used by the States to reimburse USDA or other Federal agencies, these funds will remain subject to the statutory non-federal match requirements established for these grants. Use of these funds to reimburse any federal agency will not diminish the amount of non-federal match required for the grant.

V. Agencies involved and major authorities of each are as follows:

THE DEPARTMENT OF ENVIRONMENTAL QUALITY AGREES TO:

A. Serve as Lead Agency for the state's NPS Management Program and as a partner in implementation of CZARA, Section 6217, and CNPCP.

B. Review all project proposals and commit appropriate resources and personnel, where available, to NPS projects.

C. Review for possible consideration all federal and state funds that are available for NPS projects and determine which projects meet goals and objectives of the state's NPS Program.

D. Maintain a fixed-station, long-term, surface water quality monitoring network and database combined with a 4-year basin cyclic monitoring program to monitor progress made in implementation of NPS projects and programs. Utilize special monitoring programs available through LDEQ and USEPA to address NPS concerns (as time and funds allow).

E. Partner with Federal, State and local stakeholders and host NPS interagency committee meetings to highlight progress of on-going NPS projects and proposals for future projects.

F. Update the NPS Management Plan and MOU for the NPS Management Program, as necessary.

G. Through the state's NPS Management Program, partner with CMD-LDNR on NPS implementation projects and seek to make the CNPCP [Section 6217 of the Coastal Zone Act] and the NPS Program [Section 319 of the CWA] consistent with each other.

LOUISIANA DEPARTMENT OF ENVIRONMENTAL QUALITY

Peggy M. Hatch

Peggy M. Hatch
Secretary, Louisiana Department of Environmental Quality

Date May 24, 2011

DEPARTMENT OF AGRICULTURE AND FORESTRY AGREES TO:

A. Be ultimately responsible through its offices of Soil and Water Conservation, Forestry, and Agricultural and Environmental Sciences for the development, direction, implementation and integrity of natural resource conservation plans that provide for the conservation and protection of soil and water resources within the Soil and Water Conservation District boundaries.

B. Design, construct, improve, operate and maintain structures consistent with the district objectives for soil and water conservation and protection. Districts can enter into cooperating agreements with other agencies and with individual landowners and users.

C. Carry out its legislative authority to oversee Soil and Water Conservation Districts activities, through the State Soil and Water Conservation Committee and the Office of Soil and Water Conservation. The Office of Soil and Water Conservation works closely with each district in developing natural resource conservation plans.

D. Soil and Water Conservation Districts are the local government entities through which the agricultural nonpoint source management programs are implemented. Therefore, the Office of Soil and Water Conservation and the 43 Soil and Water Conservation Districts have an integral and essential role in the development and implementation of the State's Nonpoint Source Management Program.

E. Carry out the governing authority concerning the use of pesticides in the State of Louisiana. The Pesticides Division of the Office of Agricultural and Environmental Sciences within the Department of Agriculture and Forestry exercises authority in state regulation and safe use of pesticides within the state, based on state and federal mandates. The Louisiana Department of Agriculture and Forestry will exchange information that is generated on pesticides with the Louisiana Department of Environmental Quality, in order to prioritize watersheds for nonpoint source implementation projects and educational programs, where pesticides have been detected in surface or ground waters.

F. Through the Office of Soil and Water Conservation working with the Office of Agricultural and Environmental Sciences and the Louisiana Cooperative Extension Service to carry out state and federal laws as they relate to pesticide use. The Office of Agricultural and Environmental Sciences, with assistance from the Louisiana Cooperative Extension Service, will continue to develop and implement educational programs that facilitate the implementation of Best Management Practices for handling, use and application of agricultural chemicals.

G. Be responsible for working with Soil and Water Conservation Districts on continued development and implementation of best management practices that will reduce soil erosion, prevent floodwater and sediment damage, prevent the removal of pesticides and nutrients from the point of application and further soil and water resource protection, conservation, development and utilization.

H. Work closely with state and federal agencies toward implementing nonpoint source program objectives.

I. Advise and guide Soil and Water Conservation Districts in their development of water quality management programs. The Office of Soil and Water Conservation Districts in partnership with USDA Natural Resource Conservation Service will develop nonpoint source pollution control programs by basin, by resource area, by soil type and type of farming operation or designated land use. Best management practices, in addition to those presently contained in the USDA Natural Resource Conservation Service Field Office Technical Guide, will be identified and recommended for abating nonpoint source problems. The Office of Soil and Water Conservation will encourage districts and district cooperators to make water quality a routine component of their soil and water conservation program.

J. Assist Soil and Water Conservation Districts in establishing resource conservation priorities, which govern the activity of cooperating state and federal agencies.

K. Promote the continued cooperation of the Natural Resource Conservation Service, as outlined in the memoranda of understanding with the Secretary of USDA and the Chief of Natural Resource Conservation Service, as the primary source of technical assistance for implementing soil and water conservation programs through Soil and Water Conservation Districts on private lands.

L. Through the Office of Forestry, continue to implement a statewide educational program on silvicultural BMPs and to improve methods for determining BMP effectiveness, including the percentage of silvicutural sites implementing BMPs.

LOUISIANA DEPARTMENT OF AGRICULTURE AND FORESTRY

Mike Strain, M.D.
Commissioner

Date 5/31/2012

THE DEPARTMENT OF HEALTH AND HOSPITALS AGREES TO:

A. Continue to monitor public water supplies pursuant to LSA-R.S. 36:258(B), and LSA-R.S. 40:5.

B. Continue to regulate public water supply treatment and distribution systems pursuant to LSA-R.S. 36:258 (B), and LSA-R.S. 40:5.

C. Work with the Department of Environmental Quality to convince local units of government that stricter ordinances are needed to regulate sewage treatment, sanitary sewage disposal, and other wastewater matters, that are considered nonpoint sources for individual homeowners.

D. Work with the Department of Environmental Quality and the LA Cooperative Extension Service on implementation of educational programs for maintenance of individual septic systems and on investigation and evaluation of alternative individual wastewater treatment systems.

E. Continue to monitor those bodies of water for which the Molluscan Shellfish and Beach Monitoring Programs are responsible for pursuant to LSA-R.S. 36:258(B), and LSA-R.S.40:5. Continue to assist the Department of Environmental Quality through laboratory analysis for bacterial contaminants for both point and nonpoint projects as personnel, programs and funds allow. (There is no provision for a recreational water program in Department of Health and Hospitals).

F. Continue to work with the Department of Environmental Quality, as personnel, programs and funds allow, on watershed projects where home sewage systems have been identified as contributing to nonpoint source pollutant loads and loss of designated uses for the stream, lake or estuary.

G. Work with the Department of Environmental Quality on possible ways to improve inspection programs and enforcement actions for home sewage systems, in order to reduce the level of nonpoint source pollution in state waters.

LOUISIANA DEPARTMENT OF HEALTH AND HOSPITALS
OFFICE OF PUBLIC HEALTH

Date ____________

Bruce D. Greenstein
Secretary

THE LOUISIANA DEPARTMENT OF WILDLIFE AND FISHERIES AGREES TO:

A. Execute laws and implement policies for the protection, conservation, and replenishment of wildlife and aquatic species within the state.

B. To manage all renewable resources on all wildlife management areas, refuges, and preserves that we may own or lease, which would include some regulatory powers over water quality for those water bodies within our jurisdiction.

C. Continue to administer the State Natural and Scenic Rivers System which specifically prohibits channelization, clearing, and snagging, channel realignment and reservoir construction and to regulate other activities affecting system streams through permit restrictions. Incorporate streambank protection best management practices into permits, where feasible, in order to reduce bank erosion and loss of riparian habitat along the water body.

D. Continue to participate in the environmental review process, conduct water analysis in conjunction with studies of productivity of the State's water and regulates the use of toxicant for fishing.

E. Continue to work with Department of Environmental Quality on watershed restoration projects and educational programs to reduce and control nonpoint source pollution.

LOUISIANA DEPARTMENT OF WILDLIFE AND FISHERIES

Robert Barham
Secretary

Date 6-6-2012

BOBBY JINDAL
GOVERNOR

STATE OF LOUISIANA
DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT
P.O. Box 94245
Baton Rouge, Louisiana 70804-9245
www.dotd.la.gov
(225) 379-1025

SHERRI LEBAS
SECRETARY

MEMORANDUM OF UNDERSTANDING (MOU)
Between the
Louisiana Department of Transportation and Development (DOTD)
and the
Louisiana Department of Environmental Quality (DEQ)
Regarding 2011 – 2016 Nonpoint Source Management Plan to
The United States Environmental Protection Agency

The purpose of this Memorandum of Understanding (MOU) is to serve as a letter indicating the importance of a partnership between our Agencies in implanting the States NPS Plan:

THE DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT AGREES TO:

A. Plan, design, construct, maintain, and operate a statewide transportation system consistent with best management practices for the purpose of reducing the level of sediment and other pollutants entering the state's water bodies.

B. Work with the DEQ to incorporate watershed planning and management into development and implementation of the statewide flood control system to reduce the impact of flood control projects on water quality

C. Coordinate and cooperate with DEQ to incorporate best management practices into DOTD's overall water resource planning.

D. Collect, maintain and disseminate water resources information to the general public and to the local, state and federal agencies.

E. Register and maintain a record of all regulated dams and reservoirs in the State.

F. Represent the State on interstate water compacts.

G. Continue to participate in the state's Nonpoint Source Program and work toward inclusion of best management practices into all road and highway projects across the state.

Sherri H. LeBas

Sherri H. LeBas, P.E.
Secretary
Louisiana Department of Transportation and Development

5/31/12

Date

THE DEPARTMENT OF NATURAL RESOURCES AGREES TO:

A. Through this MOU the Louisiana Department of Natural Resources (DNR) seeks to further utilize the personnel, expertise and existing programs of interested state and federal agencies for the development a nd implementation of water quality programs and projects for the Coastal Nonpoint Pollution Control Program (CNPCP) under Coastal Zone Act Reauthorization Amendment of 1990 (CZARA) including Section 6217 (Section 310, Coastal Zone Management Act).

B. Through the Office of Coastal Management (OCM) implement the Louisiana Coastal Resources Program (LCRP), that will seek to protect, develop and, where feasible, restore or enhance the resources of the state's coastal zone.

C. Through the Office of Coastal Management (OCM), work cooperatively with the Department of Environmental Quality on nonpoint source implementation projects and seek to make the Coastal Nonpoint Source Program [Section 6217 of the Coastal Zone Act] consistent with the Nonpoint Source Program [Section 319 of the Clean Water Act].

D. Administer the regulatory responsibilities through the Coastal Use Permit Program, the Consistency Program, and the Enforcement Program.

E. Help landowners to preserve the ecological and environmental integrity of the wetlands.

F. Inform and educate the general public, business, and industry about the programs, policies, and functions of the agency.

LOUISIANA DEPARTMENT OF NATURAL RESOURCES

Scott Angelle
Secretary

Date 6/18/12

THE LSU AGRICULTURAL CENTER AGREES TO:

A. As personnel, programs and funding allow, conduct water quality research and demonstrations on Louisiana Agricultural Experiment Station facilities and private lands, and to make Experiment Station facilities and research programs available for educational efforts emphasizing water quality.

B. Provide leadership in developing and delivering Louisiana Cooperative Extension Service educational programs (including field days and demonstrations) to emphasize the adoption of management practices to protect or enhance water quality.

C. Integrate water quality concepts and management techniques into all appropriate programs that address nonpoint sources of pollution.

D. Provide assistance to involved agencies in support of the development and use of site specific information to address water quality issues.

William B. Richardson

Dr. William B. Richardson
Chancellor and Chalkley Family Endowed Chair
LSU Agricultural Center

Date 6/1/12

John Russin

Dr. John Russin
Vice-Chancellor and Director
Louisiana Agricultural Experiment Station

Date 01 Jun '12

Paul Coreil

Dr. Paul Coreil
Vice-Chancellor and Director
Louisiana Cooperative Extension Service

Date 6/1/12

THE NATURAL RESOURCES CONSERVATION SERVICE AGREES TO:

A. Take leadership in conducting Field Office Technical Guide training for involved agency personnel.

B. Integrate water quality concepts and management techniques into all applicable programs to address nonpoint sources of pollution.

C. Provide technical assistance to all agencies in support of meeting water quality standards of the state and in the development and use of educational materials.

D. Encourage the local Soil and Water Conservation Districts to address the water quality priorities of their district in their business plans.

E. Provide on-site assistance to landowners and land-users in all 64 parishes.

F. Enter into state level agreements to provided technical assistance for implementing Section 319 NPS pollution control projects under provisions of Section IV of this Memorandum of Understanding.

USDA-Natural Resource Conservation Service

Kevin D. Norton

Date 8/4/2008

Kevin Norton
State Conservationist

THE FARM SERVICE AGENCY AGREES TO:

A. Encourage FSA County Committees to support Best Management Practices that conform to NRCS Field Office Technical Guide Practices.

B. Review annual practices. Make necessary revisions to meet minimal requirements of the Louisiana Water Quality Standards.

C. Implement, as applicable provisions of the Food, Conservation and Energy Act of 2008 including Conservation Compliance, Highly Erodible Land and Wetlands.

D. Actively support the Conservation Reserve Program, Conservation Reserve Enhancement Program (CREP), and State Acres for Wildlife Enhancement (SAFE).

E. Provide copies of aerial photography to various agencies for use in planning and implementation of programs.

F. Continue to make information on FSA programs available to other agencies, farmers, and landowners.

USDA – FARM SERVICE AGENCY

Willie Cooper
State Executive Director

Date 7/1/08

THE U.S. FISH AND WILDLIFE SERVICE AGREES TO:

A. Assist in development of cooperative education programs to encourage implementation of land-use practices that provide improved habitat for fish and wildlife and also enhances the quality of groundwater and surface water.

B. Provide technical assistance in development of cooperative demonstration projects, design of water quality monitoring programs, assessment of nonpoint source pollution problems of specific drainage basins, and development of plans to remedy such problems.

C. Continue to review water resource development proposals and recommend measures to mitigate adverse project effects on water quality. Mitigation measures would typically include preservation, restoration, or creation of forested wetlands, marshes and other wetland areas that enhance the quality of ground water and surface water and provide important fish and wildlife habitat.

U.S. FISH AND WILDLIFE SERVICE

Field Supervisor

Date 4/1/08

THE U.S. GEOLOGICAL SURVEY AGREES TO:

A. Provide the hydrologic information and understanding needed for the optimum utilization and management of water resources for the people through cooperation with other Federal, State, and local agencies.

B. Collect data on a systematic basis, needed for the continuing determination and evaluation of the quantity quality, and use of water resources.

C. Conduct analytical and interpretive water-resources appraisals, describing the occurrence, availability, and the physical, chemical, and biological characteristics of the surface and ground water.

D. Conduct supportive basis and problem oriented research in hydraulics, hydrology, and related fields of science to improve the scientific basis for investigations and measurement techniques and to understand hydrologic systems sufficiently to quantitatively predict their response to stress, either natural or man-made.

E. Disseminate the water data and the results of these investigations and research through reports, maps, computerized information services, and other forms of public releases.

G. Provide scientific and technical assistance in hydrologic fields to other Federal, State, and local agencies, to licensees of the Federal Power Commission, and to international agencies on behalf of the Department of State.

U.S. GEOLOGICAL SURVEY
LOUISIANA WATER SCIENCE CENTER

Charles R. Demas
Director

Date 6/20/08

The Barataria-Terrebonne National Estuary Program

A. Coordinate programs and activities related to reducing nonpoint source pollutant loads into water bodies within the Barataria-Terrebonne National Estuary (BTNE);
B. Work with LDEQ on watershed implementation in impaired water bodies that have had total maximum daily loads (TMDLs) and watershed implementation plans developed for them.
C. Share data and information such as GIS land-use maps and water quality data that is related to watershed implementation and reduction of nonpoint source pollutants.
D. LDEQ will participate in the BTNEP Management Conference meetings.
E. BTNEP staff will participate in LDEQ's NPS Interagency Committee meetings and water quality conferences.
F. BTNEP and LDEQ will work together to restore water quality and protect wetlands in the BTNE.

Kerry M. St. Pe'

Kerry St. Pe'
Director

Date 4/22/08

THE LAKE PONTCHARTRAIN BASIN FOUNDATION AGREES TO:

A. Collect water quality samples (including the physiochemical parameters of water temperature, dissolved oxygen, specific conductance, salinity, pH, and turbidity and the enteric pathogen indicators fecal coliform and *Enterococcus*) weekly and release the data to the public under an EPA-approved quality assurance project plan.

B. Collect fecal coliform and *Enterococcus* bacteria samples in St. Tammany Parish bi-weekly under an EPA-approved quality assurance project plan.

C. Collect water samples (including fecal coliform and *E.coli* bacteria and physiochemical parameters) at sites in the Tangipahoa and Natalbany Watersheds under an EPA-approved quality assurance project plan.

D. Use water quality data to track down and correct pollution sources within the watersheds.
   - Assist wastewater treatment plant (WWTP) owners and operators with the maintenance and operation of their plants. Work with LDEQ in the proper permitting of WWTPs (when needed).
   - Work with municipalities in the location and correction of sources of infiltration and inflow into wastewater collection systems.
   - Hold educational events focusing on the proper care and maintenance of WWTPs.
   - Educate dairy owners on the importance of installing and maintaining dairy waste lagoons.

E. Maintain communication with state, parishes, and local agencies involved in the clean-up of the watersheds.

F. Give talks to local civic/environmental groups on issues in the Lake Pontchartrain Basin.

G. Give the local media updates on Foundation programs.

H. Share data with all local, state, and federal agencies and universities/research institutions.

LAKE PONTCHARTRAIN BASIN FOUNDATION

Carlton Dufrechou ________________ Date 2.13.08

Carlton Dufrechou
Executive Director

THE USDA FOREST SERVICE AGREES TO:

This management agency agreement is entered into by and between the State of Louisiana, hereinafter referred to as the State, and the U.S. Department of Agriculture, Forest Service, hereinafter referred to as the Forest Service, for the purpose of identifying the responsibilities and activities to be performed by each agency in carrying out mandates of the Clean Water Act as amended in 1987, Sections 208 and 319, as related to activities on National Forest System (NFS) lands.

WHEREAS

1. The Louisiana Department of Environmental Quality (DEQ) was designated as the "Lead Agency" for the Nonpoint Source Program by the State Legislature of Louisiana in 1987, within Act 272. This legislative act authorized DEQ to develop the Nonpoint Source Program through coordination of efforts of Federal, State, and Local Agencies.

2. The State is responsible for promulgating a Water Quality Management Plan pursuant to the Clean Water Act as amended in 1987, Section 208 and 319.

3. The Forest Service is authorized and directed by Acts of Congress, namely the Act of June 4, 1897, as amended; Act of June 12, 1960 (16 USC 528-31); and Executive Order Number 11514, approved March 5, 1970; and regulations issued by the Secretary of Agriculture to administer, manage, and protect the lands and resources of the National Forest System, and to cooperate with other agencies.

4. The Forest Service, under Section 313 of Public Law 92-500 (U.S.C. 1252), Executive Order 12088 and Executive Order 12372, is directed to meet Federal, State, interstate and local substantive and procedural requirements respecting control abatement of pollution in the same manner, and to the same extent, as a non-governmental entity.

5. The Forest Service and the State agree that presently the most practical and effective means of controlling potential nonpoint sources from forest management practices is through development and implementation of pollution prevention land management practices.

6. The State and the Forest Service mutually desire:

A. To meet the water quality goals defined by Congress in the Clean Water Act, as amended; and to attain these water quality goals and objectives according to an established plan, Vol. 6 of the Water Quality Management Plan (Nonpoint Source Management Program), in order to minimize duplication of effort and facilitate complementary nonpoint source pollution control abatement programs.

B. To ensure control of potential nonpoint source water pollution source water through implementation of pollution preventive measures generally referred to as Best Management Practices (BMPs).

Recommended Forestry Best Management Practices for Louisiana were revised in 1999-2000, by the Louisiana Forestry Association in cooperation with seven groups, including the Office of Forestry, Louisiana Department of Environmental Quality and the USDA Forest Service. Kisatchie National Forest established "Standards and Guidelines" (S and Gs), which function as technical standards or performance guidelines for all forestry and other management activities on NFS lands, some of which relate to the best management practices.

NOW, THEREFORE

1. The Forest Service agrees to:

A. Accept the responsibility for selecting, implementing, and monitoring of the Standards and Guidelines for activities on National Forest System (NFS) lands and to reduce nonpoint source pollution.

(1) Standard and Guideline Selection.

a. Recognize identified beneficial uses and State Water Quality Standards of water and select Standards and Guidelines (S and Gs) that can be expected to provide necessary protection of these beneficial uses.
b. Manage those activities which have the potential to affect water quality within the guidelines of the State (LDEQ) approved BMPs.

(2) Application of Selected Standards and Guidelines.

a. Specify the selected BMPs/S and Gs in Forest Service project and/or operational plans.
b. Include selected BMPs/S and Gs as contractual provisions for FS projects.
c. Incorporate selected BMPs/S and Gs as conditions for special use authorizations.

(3) Monitoring

a. Coordinate monitoring plans with the Louisiana Department of Environmental Quality through the Nonpoint Source Interagency Committee.
b. Monitor implementation and determine effectiveness of BMPs/S and Gs in meeting identified resource, aquatic and State approved water quality standards on selected activities.
c. In cooperation with the State, develop and implement a procedure for the timely modification of ineffective BMPs.
d. Provide annual summaries to the State of monitoring results.

B. Through participation in the Nonpoint Source Interagency Committee, cooperate with the State and other appropriate governmental agencies in evaluating potential sources of nonpoint source pollution on NFS lands.

C. Coordinate education and training sessions with LDEQ to increase employee awareness of and sensitivity to the importance of maintaining water quality and of the requirements of state and federal water quality regulations.

D. Provide the State, on a biannual basis, a general assessment of water quality accomplishments, monitoring results, problems and priorities for inclusion in the Louisiana Water Quality Inventory [305(b)] Reports.

2. The State agrees to:

A. Review and determine if BMPs selected and implemented by the Forest Service according to Louisiana's Nonpoint Source Management Program process herein identified meet the intent of Section 319 of the Clean Water Act.

B. Coordinate State water quality management planning and implementation with the Forest Service when State and Private Forestry (S and PF) activities on NFS lands are involved and include Forest Service representation on technical advisory committees relating to NFS or S and PF activities, through the Nonpoint Source Interagency Committee.

C. Provide drafts of applicable water quality laws, regulations, and appropriate state and local BMP handbooks to the Forest Service for their review and comment.

D. Identify NPS implementation projects and review results of monitoring data and information with Forest Service as appropriate.

E. Review of water quality criteria and beneficial use designations when problems are identified by Forest Service and/or State monitoring information.

3. The **Forest Service** and the **State** mutually agree:

A. To coordinate present and proposed water quality monitoring activities adjacent to and within National Forest boundaries; to share data collection and analysis responsibilities when the results are mutually beneficial to the Forest Service and the State; and to routinely make available any unrestricted water quality data and information; and to identify, test and evaluate the effectiveness of BMPs/S and Gs implemented on NFS lands.

B. To provide, on request, technical expertise and support not otherwise available to the other party, to the extent the supplying party's program priorities, budget and availability of expertise allow. Requests might involve, but not be limited to, training and education sessions, developing, testing and implementing water quality models, and establishing projects.

C. To meet no less than semi-annually to maintain coordination/communication, report on water quality management progress, review proceedings under this agreement and to consider/negotiate revisions and amendments that shall become effective after written approval by both parties.

D. That when the views of the State or the Forest Service are contrary to the accepted policy and plans of the other, the Regional Forester, the Commissioner of Agriculture and Forestry, and the Secretary of the Department of Environmental Quality, or their designated representatives, shall meet and attempt to resolve the differences before any further action is taken by either party.

E. That nothing herein shall be constructed in any way as limiting the authority of the State in carrying out its legal responsibilities for management or regulation of water quality, or as limiting the Forest Service in carrying out it legal responsibilities for management of NFS lands.

F. That nothing in this agreement shall be construed as obligating the Forest Service or the State to expend funds in any contract or other obligation for future payment or services in excess of those available or authorized for expenditure.

G. That no member of or delegate to Congress, or Resident Commissioner of the United States, are admitted to any share or part of this agreement, or benefit that may arise there from.

H. That each and every provision of the Management Agreement is subject to the laws of the State of Louisiana, and the laws of the United States, the regulations of the Secretary of Agriculture, and the regulations of the State of Louisiana.

I. This instrument is executed as of the date of last signature and, unless sooner terminated, is effective through September 30, 2013 at which time it will expire unless renewed.

FOREST SERVICE
U.S. DEPARTMENT OF AGRICULTURE

10/14/08

Margrett "Gretta" Boley
Forest Supervisor
Kisatchie National Forest Service

Forest Service Agreement No.: 09-MU-11080600-003

Anna B. Bennett
F.S. Agreements Specialist

10-16-08
Date

THE UNITED STATES ARMY CORPS OF ENGINEERS AGREES TO:

A. Exercise authority as contained in Section 10 (33 U.S.C. 403) which covers construction, excavation, or deposition of materials in, over, or under navigable waters, or any work which would affect the course, location, condition, or capacity of those waters to minimize any pollution that could impact the physical, chemical and biological functions of those waters.

B. Exercise authority as contained in Section 404 of the Clean Water Act, which addresses authorization of the discharge of dredged of fill materials into waters of the United States to minimize any pollution that could impact the physical, chemical and biological functions of those waters.

C. Continue to cooperate with the State as required in Sections 401 and 319 of the Clean Water Act.

D. Continue to review water resource development proposals and recommend measures to mitigate adverse project effects on water quality. Mitigation measures would typically include preservation, restoration, or creation of forested wetlands, marshes and other wetland areas that enhance the quality of ground water and surface water and provide important fish and wildlife habitat.

E. Work with the State Nonpoint Source Management Program to incorporate best management practices into projects that impact areas that fall under the auspices of the Corps' jurisdiction in order to reduce sediment erosion and loss of riparian habitat along water bodies.

F. Utilize best management practices on all Corps of Engineers construction projects to minimize runoff into receiving waters.

UNITED STATES ARMY CORPS OF ENGINEERS

Alvin B. Lee

Date 8-19-2008

Alvin B. Lee
Colonel, U.S. Army
Commander, New Orleans District

Date 30 SEP 08

Michael C. Wehr
Colonel, U.S. Army
Commander, Vicksburg District

Appendix B

Flow Chart of Louisiana's NPS Management Process For Restoring Impaired Water Bodies

Louisiana's Nonpoint Source (NPS) Management Process for Restoring Impaired Water Bodies

Step 1: Review and Select NPS Impaired Water Bodies for Partial and/or Full Restoration

Action 1-1
Review the State's Integrated Report (IR) for NPS Impaired Water Bodies

Responsible Parties
Louisiana Department of Environmental Quality (LDEQ)'s NPS Staff

→

Action 1-2
Identify and Select a Subset of NPS Impaired Water Bodies for Watershed Implementation and Partial or Full Restoration

Responsible Parties
LDEQ's NPS staff, LDEQ's Watershed Coordinators, Louisiana Department of Agriculture and Forestry (LDAF)'s Office of Soil and Water Conservation (OSWC), and U.S. Department of Agriculture (USDA)'s Natural Resource Conservation Service

Action 1-3
Determine Appropriate Partners (i.e. federal, state and local agencies) and Programs Necessary for Watershed Restoration in Selected Subset of NPS Impaired Water Bodies

Responsible Parties
LDEQ's NPS staff, LDEQ's Watershed Coordinators, LDAF's OSWC, USDA-NRCS, USEPA

Louisiana's Nonpoint Source (NPS) Management Process for Restoring Impaired Water Bodies

Step 2: Execute Watershed Planning Process with Previously Identified Partners

Action 2-1
Host a Meeting to Develop the Watershed Planning Process for the Selected Subset of NPS Impaired Waters. This process includes Actions Steps 2-1 to 2-6.

Responsible Parties
LDEQ's NPS staff, LDEQ's Watershed Coordinators, LDAF's OSWC, USDA-NRCS, and Watershed Stakeholders

Action 2-2
Determine Areas in the Watershed with High NPS Pollutant Loads for BMP Implementation

Responsible Parties
LDEQ's NPS Staff, LDEQ's Watershed Coordinators, LDAF's OSWC, USDA-NRCS, and Watershed Stakeholders

Action 2-3
Select Subset of Appropriate BMPs or other Activities for Implementation in High NPS Loading Areas of the Watershed

Responsible Parties
LDEQ's NPS staff, LDEQ's Watershed Coordinators, LDAF's OSWC, USDA-NRCS, and Watershed Stakeholders

Louisiana's Nonpoint Source (NPS) Management Process for Restoring Impaired Water Bodies

Action 2-4
Identify Cost of BMPs Selected to Reduce High NPS loads in the Watershed and Identify Potential Funding Sources (i.e. Section 319 and USDA Farm Bill) to Reduce High NPS Loads in the Watershed

Responsible Parties
LDEQ's NPS staff, LDEQ's Watershed Coordinators LDAF's OSWC, USDA-NRCS, and Watershed Stakeholders

→

Action 2-5
Determine Appropriate Water Quality Monitoring Strategy to Evaluate Effectiveness of BMPs/Activities for Watershed Implementation

Responsible Parties
LDEQ's NPS staff, LDEQ's Watershed Coordinators, LDAF's OSWC, USDA-NRCS, and Watershed Stakeholders

Louisiana's Nonpoint Source (NPS) Management Process for Restoring Impaired Water Bodies

Action 2-6
Prepare Watershed Implementation Plan (WIP) Consistent with USEPA 9 Key Elements and Submit to USEPA for Review and Acceptance:

a. Identify Sources and Causes of NPS Loads
b. Estimate Load Reductions for NPS BMPs
c. Description of NPS BMPs
d. Estimate of Level of Technical and Financial Assistance to Implement BMPs
e. Information/Education Component of NPS Watershed Implementation
f. Schedule for Implementing NPS BMPs
g. Description of Interim, Measurable Milestones for BMP Implementation
h. Set of Criteria to Determine Whether NPS Load Reductions are being Achieved
i. A Monitoring Component to Evaluate Effectiveness of Watershed Implementation

Responsible Parties
LDEQ NPS Staff and LDEQ's Watershed Coordinators who partner with watershed stakeholders, LDAF and USDA on watershed planning and implementation

Louisiana's Nonpoint Source (NPS) Management Process for Restoring Impaired Water Bodies

Step 3: Apply for Section 319 Grant Funding or Appropriate Funding Sources for Watershed Implementation

Action 3-1
Apply for Section 319 Funds by submitting 319 work plans to USEPA Region 6 for approval or for other Appropriate Funds to Implement BMPs in Areas of the Watershed with High NPS Loads

Responsible Parties
LDEQ's NPS staff and/or LDAF's OSWC

Action 3-2
USEPA approves Section 319 Work Plans

Responsible Parties
USEPA

Louisiana's Nonpoint Source (NPS) Management Process for Restoring Impaired Water Bodies

Step 4: Secure Funding for BMP Implementation

Action 4-1	**Responsible Parties**
Implement BMPs/Activities in Areas of the Watershed with High NPS Pollutant Loads	LDEQ's NPS staff, LDEQ's Watershed Coordinators, LDAF's OSWC, and Watershed Stakeholders

Louisiana's Nonpoint Point Source (NPS) Management Process for Restoring Impaired Water Bodies

Step 5: Monitor Water Quality to Determine Effectiveness of BMPs

Action 5-1	Responsible Parties
Develop Quality Assurance Project Plan (QAPP) to Determine Effectiveness of BMPs and Submit to USEPA for Approval	LDEQ's NPS staff, LDEQ's Watershed Coordinators and Watershed Stakeholders

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Action 5-2	Responsible Parties
Upon USEPA Approval, Monitor Water Quality to Determine Effectiveness of BMPs	LDEQ's NPS Staff, LDEQ's Watershed Coordinators, and Watershed Stakeholders

Louisiana's Nonpoint Point Source (NPS) Management Process for Restoring Impaired Water Bodies

<u>Step 6: Prepare Final Project Report for Each Watershed and Submit to USEPA Region 6</u>

<u>Action 6-1</u>	**<u>Responsible Parties</u>**
Compile and Analyze Water Quality Monitoring Data and Prepare Final Project Report which is Submitted to USEPA for Approval	LDEQ's NPS Staff, LDEQ's Watershed Coordinators, and Watershed Stakeholders

Louisiana’s Nonpoint Point Source (NPS) Management Process for Restoring Impaired Water Bodies

Step 7: Prepare NPS Annual Report, which Serves as Compendium of Multiple Watershed Projects for that Federal Fiscal Year (FFY)

Action 7-1	**Responsible Parties**
Report on Results of NPS Watershed Implementation to USEPA on an Annual Basis	LDEQ’s NPS staff with input from LDEQ’s Watershed Coordinators, LDAF’s OSWC, USDA-NRCS

Louisiana’s Nonpoint Point Source (NPS) Management Process for Restoring Impaired Water Bodies

Step 8: Write Success Stories and Delist Water Bodies, Based on Partial or Full Restoration

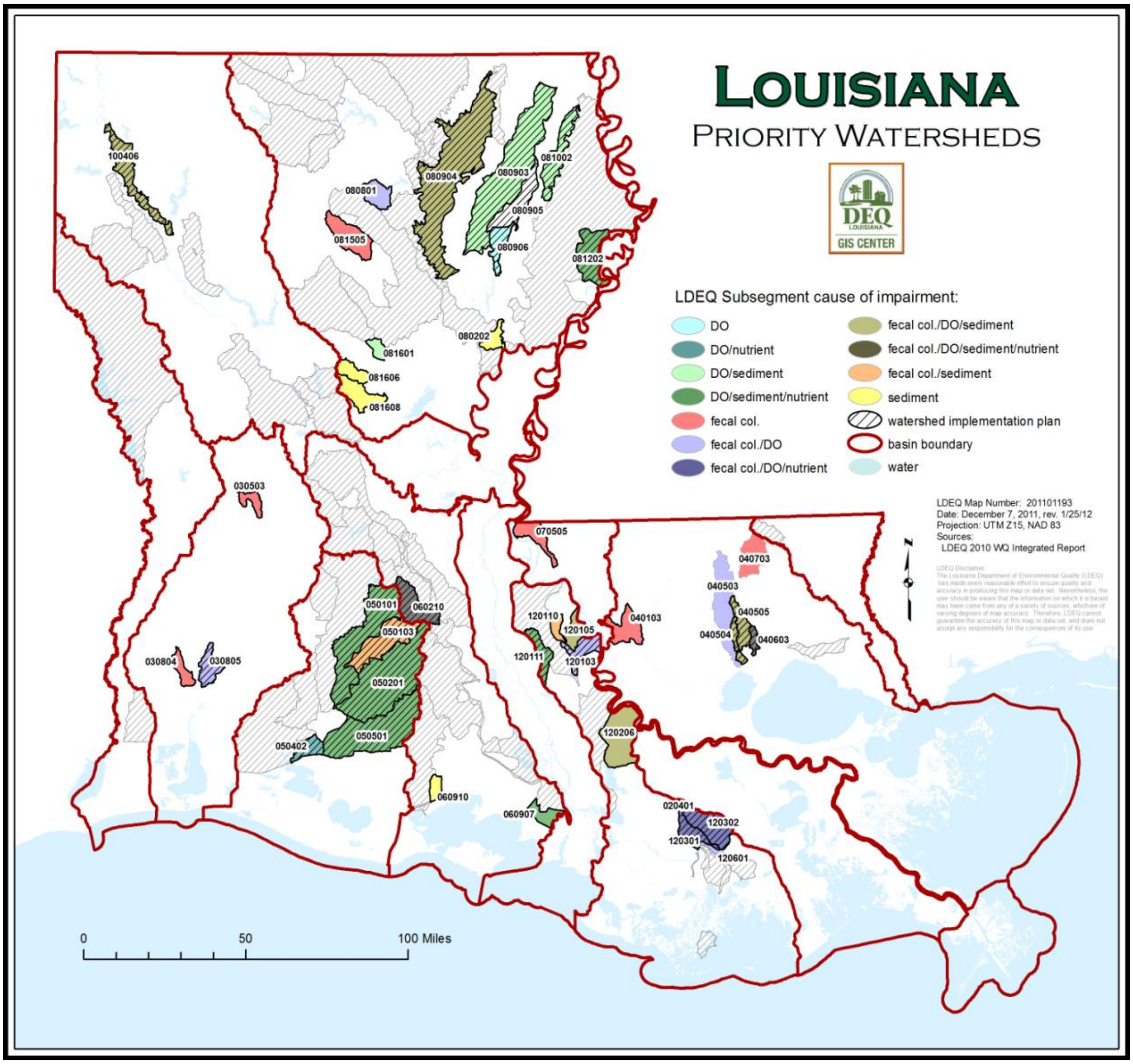
Action 8-1	**Responsible Parties**
Write Success Stories and Delist Water Bodies (for applicable parameters) if Water Quality Data indicates Water Bodies have been Partially or Fully Restored	LDEQ’s NPS staff with input from LDEQ’s Watershed Coordinators, LDAF’s OSWC, USDA-NRCS

Appendix C

Map and Table of Forty (40) NPS Impaired

Water Bodies for Partial and/or Full Restoration

October 1, 2011 – October 1, 2016


LOUISIANA
PRIORITY WATERSHEDS
DEQ
LOUISIANA
GIS CENTER
LDEQ Subsegment cause of impairment:
DO
DO/nutrient
DO/sediment
DO/sediment/nutrient
fecal col.
fecal col./DO
fecal col./DO/nutrient
fecal col./DO/sediment
fecal col./DO/sediment/nutrient
fecal col./sediment
sediment
watershed implementation plan
basin boundary
water
LDEQ Map Number: 201101193
Date: December 7, 2011, rev. 1/25/12
Projection: UTM Z15, NAD 83
Sources:
LDEQ 2010 WQ Integrated Report
LDEQ Disclaimer:
The Louisiana Department of Environmental Quality (LDEQ) has made every reasonable effort to ensure quality and accuracy in producing this map or data set. Nevertheless, the user should be aware that the information on which it is based may have come from any of a variety of sources, whichare of varying degrees of map accuracy. Therefore, LDEQ cannot guarantee the accuracy of this map or data set, and does not accept any responsibility for the consequences of its use.
N
100406
080801
081505
080904
080903
081002
080905
080906
081202
081601
080202
081606
081608
030503
070505
040703
040503
040505
040504
040603
040103
120110
120105
120111
120103
050101
060210
050103
050201
050501
050402
030804
030805
120206
060910
060907
020401
120302
120301
120601
0
50
100 Miles

Louisiana's Nonpoint Source Priority Water Bodies for Partial and/or Full Restoration

Basin/Water Body	2011	2012	2013	2014	2015	2016
Barataria Basin						
1. Bayou Lafourche - From Donaldsonville to ICWW at Larose (020401)						
Calcasieu Basin						
2. Six-Mile Creek-East and West Forks From Headwaters to the Southern Boundary of Fort Polk Military Reservation (030503)						
3. Little River - From Headwaters to West Fork Calcasieu River (030804)						
4. Indian Bayou - From Headwaters to West Fork Calcasieu River (030805)						
Lake Pontchartrain Basin						
5. Comite River (040103)						
6. Natalbany River – From Headwaters to Tickfaw River (040503)						
7. Yellow Water River - From Headwaters to Ponchatoula Creek (040504)						
8. Ponchatoula Creek and Ponchatoula River (040505)						
9. Selsers Creek-From Headwaters to South Slough (040603)						
10. Big Creek - From Headwaters to Tangipahoa River (040703)						
Mermentau River Basin						
11. Bayou des Cannes- From Headwaters to Mermentau River (050101)						
12. Bayou Mallet - From Headwaters to Bayou des Cannes (050103)						
13. Bayou Plaquemine Brule - From Headwaters to Bayou des Cannes (050201)						
14. Lake Arthur and Lower Mermentau River to Grand Lake (050402)						
15. Bayou Queue de Tortue (050501)						
Vermilion-Teche River Basin						
16. Bayou Carron (060210)						
17. Franklin Canal (060907)						
18. Boston Canal (060910)						
Mississippi River Basin						
19. Tunica Bayou - From Headwaters to Mississippi River (070505)						
Pearl River Basin						
20. Little Silver Creek (090503)						
Ouachita River Basin						
21. Bayou Louis - From Headwaters to Ouachita River (080202)						
22. Cheniere Creek - From Headwaters to Cheniere Brake Lake (080801)						
23. Big Creek - From Headwaters to Bouef River; includes Big Colewa Bayou (080903)						
24. Bayou Lafourche - From near Oakridge to Boeuf River near Columbia (080904)						
25. Turkey Creek-From Headwaters to Turkey Creek Cutoff; includes Turkey Creek Cutoff, Big Creek, Glade Slough; Turkey Creek Cutoff to Turkey Creek Lake (080905, 080906)						
26. Joe's Bayou - From Headwaters to Bayou Macon (081002)						
27. Lake St. Joseph (081202)						
28. Caney Lake (081505)						
29. Little River - From Castor Creek-Dugdemona River confluence to Bear Creek (Scenic) (081601)						
30. Fish Creek - From Headwaters to Little River (Scenic) (081606)						
31. Big Creek - From Headwaters to Little River (Scenic) (081608)						
Red River Basin						
32. Flat River - From Headwaters to Loggy Bayou (100406)						
Terrebonne Basin						
33. Bayou Choctaw (120103)						
34. Chamberlin Canal - From Chamberlin to Bayou Choctaw (120105)						
35. Bayou Cholpe - From Headwaters to Bayou Choctaw (120110)						
36. Bayou Maringouin-From Headwaters to East Atchafalaya Basin Levee (120111)						
37. Grand Bayou and Little Grand Bayou-From Headwaters to Lake Verret (120206)						
38. Bayou Terrebonne - From Thibodaux to ICWW in Houma (120301)						
39. Bayou Folse - From Headwaters to Company Canal (120302)						
40. Bayou Terrebonne – From Houma to Company Canal (120601)						
Blue shading with hatched lines indicates WIPs Revised						
Yellow shading with hatched lines indicates WIPs Developed						
Green shading with hatched lines indicates WIPs Implementation and Monitoring						