Louisiana Nutrient Reduction and Management Strategy

Protection, Improvement, and Restoration of Water Quality in Louisiana Water Bodies

2024

Strategy Interagency Team

ABOUT THIS DOCUMENT:

This report aims to provide information on nutrient reduction and management to protect and/or restore water quality in Louisiana across agencies and partners. Digital viewing of the document is preferred for navigation and zooming capabilities.

The audience is geared towards programs/organizations directly concerned with nutrient inputs and their effects. Although subject matter is complicated and specific knowledge and vocabulary are required, effort has been made to keep language and outputs understandable and available to the public.

Each section is meant to stand alone to avoid the need to read the entire document at one sitting, particularly in reference to specific areas of interest for readers. Reported activities have been moved to the end of each Action (Section E.3) for easy reference, and in pertinent areas of Part II.

Five-year Strategy updates allows agency stakeholders to evaluate and provide input on changes, updates, and/or needs for the overall Strategy in the upcoming period. When available, 5-year summaries of activities, and specific timely updates, are provided. Otherwise, reporting is largely for the previous year (2023). All items are specific to projects/programs for nutrient reduction and management related activities. Highlights have been added on page xiii.

Updates were made to this document concerning the renaming the Gulf of Mexico to the Gulf of America, as final release was after Executive Order 14172 (February 9, 2025). Other legislative and/or presidential changes will occur in the appropriate reporting year.

FOREWORD: THE HYPOXIA TASK FORCE AND LOUISIANA

The Mississippi River/Gulf of Mexico Watershed Nutrient Task Force (Hypoxia Task Force, HTF) was established in 1997 to address eutrophication (excess nutrients) and hypoxia (low oxygen) in the Gulf of America (GOA). Members include federal, state (12 key states), and tribal partners along the Ohio and Mississippi Rivers, with continual representation from Louisiana. Currently, the Coastal Protection and Restoration Authority (CPRA) is the Louisiana representative on the HTF. Both the CPRA and the LDEQ have representatives on the HTF Coordinating Committee that provides executive level direction and support to all members.

The HTF reports to Congress every other year as part of the Harmful Algal Blooms and Hypoxia Research and Control Amendments Act of 1998. The HTF has created Action Plans and scientific assessments to address hypoxia and its effects in the northern GOA. Current goals include reduction of the 5-year average areal extent of the summer hypoxic zone to less than 5,000 square kilometers by 2035 (as measured by the annual hypoxia cruise), with an interim goal of a 20% load reduction to the Gulf by 2025. Nutrient reductions are to occur through the combined efforts of states, tribes, federal agencies, and other stakeholders in the Mississippi/Atchafalaya River Basin (MARB); progress within the MARB is to be tracked by multiple metrics.

The development and implementation of state nutrient reduction strategies was identified as a HTF action item and Louisiana fulfilled that directive in 2014. This 2024 *Louisiana Nutrient Reduction and Management Strategy: Protection, Improvement and Restoration of Water Quality in Louisiana's Water Bodies* constitutes the second 5-year update of the original Strategy. Reporting occurs annually.

Louisiana continues support of the HTF and its goals. Collective efforts in the basin will ultimately be responsible for achieving targets, as it has been shown that upriver states contribute considerably to nutrient pollution within the MARB and the Gulf. Within Louisiana, nutrient reduction and management primarily occurs at the local level through a variety of efforts involving nonpoint and point sources. Long-term and large-scale projects, such as river diversions, are also included as viable opportunities for nutrient reduction.

EXECUTIVE SUMMARY

Background

Nitrogen and phosphorus are nutrients necessary for life, and in excess are water pollutants. Nutrients in Louisiana waterbodies originate locally and from upriver, as the state contains the terminus of the largest watershed in the contiguous US. The Mississippi-Atchafalaya River Basin (MARB) drains 41% of the contiguous United States and parts of two Canadian provinces through the state to the Gulf of America (GOA). However, nutrient contribution from sources within the Louisiana have been estimated at only ~2% of the total loads entering the GOA.

Nutrients contribute to the formation of the hypoxic zone, an area of reduced oxygen content located in coastal shelf waters off Louisiana. This area, often called the "dead zone", becomes inhospitable to life and ecosystem functioning primarily during summer months. Dead zones affect many animals' growth and/or survival, including economically important shrimp and fish. Hypoxia extent in bottom waters of the GOA has been measured annually during summer since 1985 (two exceptions), and includes areas within Louisiana state waters. Nutrient solutions must come from all sources to the MARB; the hypoxic zone is a local, state/s, and national issue.

State of Louisiana

The Coastal Protection and Restoration Authority of Louisiana (CPRA) and the Louisiana Departments of Agriculture and Forestry (LDAF), Environmental Quality (LDEQ), and Energy and Natural Resources (LDENR), and partners, developed the 2014 Louisiana Nutrient Management Strategy to lay out the framework of working towards state and The Mississippi River/Gulf of America Watershed Nutrient Task Force (HTF) goals. The HTF provides biennial reports to congress concerning hypoxia, goals, and progress. This *2024 Louisiana Nutrient Reduction and Management Strategy* (Strategy) was developed as the 2nd planned 5-year update. Thus, this Strategy additionally represents the 2023 Annual Report.

Managing nitrogen and phosphorus to protect, improve, and restore water quality in Louisiana's inland and coastal waters is of high priority, and other state and federal agencies as well as stakeholders from the watershed community will continue to play a major role in implementing this Strategy. The state of Louisiana must comprehensively evaluate the nutrient reduction and management activities that are already occurring to leverage the best use of existing resources and future planned activities.

Framework

A ten-component framework for outlining and accomplishing action items was established in the 2014 Strategy for nutrient management. This approach was successful and will continue to be employed in the 2024 update and is outlined below. Multiple components are implemented simultaneously with adaptive management practices inherent in the process. The strategic action items schedule (Appendix A) outlines a timeframe from 2024 to 2029, after which reevaluation and progress to date will again occur.

Strategic Components

1. Stakeholder Engagement
2. Decision Support Tools
3. Regulations, Policies, and Programs
4. Management Practices and Restoration Activities
5. Status and Trends
6. Watershed Characterization, Source Identification, and Prioritization
7. Incentives, Funding, and Economic Impact Analyses
8. Targets and Goals
9. Monitoring
10. Reporting

Implementation

In addition to Strategic Components that compromise functions of the Strategy, implementation will focus on essential areas that are specific to the state of Louisiana for water quality improvements:

Key Implementation Areas

- Nonpoint Source Management
- Point Source Management
- Incentives
- Leveraging Opportunities
- Science Based Technologies/Applications
- River Diversions

Nonpoint Source Management

Nonpoint source management in Louisiana focuses on conservation practices (CPs) such as best management practices (BMPs) to address runoff and water quality in agriculture, forest, and urban settings. LDAF and LDEQ work in collaboration with watershed partners through the Nonpoint Source Pollution Prevention Program (developed through the Clean Water Act (CWA) Section 319 Program), to address nonpoint sources in select watersheds throughout the state. Partners develop implementation plans specifying appropriate CPs/BMPs. Manuals on guidance for BMPs have been developed by LDAF, LDEQ, LDENR, the Louisiana State University Agricultural Center (LSU AgCenter), and others. These guidelines are specific to commodities within the state such as rice, poultry, dairy, sugar

cane, swine, and forestry, as well as nonpoint source pollution from urban stormwater runoff and individual home sewage systems.

Conservation practices recommended by the U.S. Department of Agriculture Natural Resources Conservation Service (USDA NRCS) in Louisiana are the backbone for nonpoint source management efforts in the agricultural arena. These conservation practices are designed to be effective as a systems approach to avoid, control, or trap runoff before it leaves the field. At least 140 conservation practices have been utilized in Louisiana in an effort to improve water quality. Implementation of these conservation practices are largely focused in agricultural and forestry areas in Louisiana.

Reviews of BMP efficiencies indicate their effectiveness in nutrient removal and in limiting water quality degradation. Studies and method reviews for the Lower Mississippi Alluvial Valley and/or Mississippi River Basin agriculture found that many BMPs result in fewer nutrients leaving a field, and that environmental, managerial and site-specific variables should be evaluated when establishing BMPs. A recent review (2023) in Mississippi coastal watersheds indicates total suspended solids and mineral phosphorus are reduced using ponds, wetlands, riparian buffers and combinations thereof. Further, studies on the effectiveness of forestry BMPs indicate they are effective in limiting water quality degradation in Louisiana. Beliefs and perceptions are important for implementing success across sectors (from homeowners to farmers). Continued studies are improving the understanding of BMPs across environmental and sociological sectors, and are ongoing in the state.

The LDEQ Nonpoint Source (NPS) Pollution Program and partners prioritize watersheds that contain water quality impairments that are likely to be improved by efforts in CPs and USEPA/LDEQ Vision activities (e.g., home sewage improvements). Currently, there are 38 LDEQ defined water units on the priority list for planned activities in 2023-2027. During the 2019 Strategy reporting period, at least five water quality impairment removals occurred due to LDEQ and LDAF efforts. Additionally, 86,911 pounds of nitrogen, 19,224 pounds of phosphorus, and 3,012 tons of sediment were kept from entering priority waters.

Point Source Management

Louisiana's Water Quality Regulations (LAC 33: Part IX) require permits for the discharge of pollutants from any point source into waters of the state of Louisiana. The Louisiana Pollutant Discharge Elimination System (LPDES) Permit Program is regulated by LDEQ. There are over 14,800 permitted dischargers within the state. Specific permits relating to nutrients entering surface waters include sanitary wastewater; storm water through industrial, construction, or Municipal Separate Storm Sewer Systems (MS4) permits; Concentrated Animal Feeding Operation (CAFO) permits; various industrial wastewater; and biosolids management. Based on the *Point Source Implementation Strategy for Nutrients*, all point source types will be required to monitor for nutrients through the LPDES permit as applicable. This monitoring will allow LDEQ to gather data

necessary to determine the extent of nutrient contributions from these dischargers to water bodies of Louisiana. Additionally, LDEQ proposed fresh water criteria for ammonia (2023) and promulgation (rulemaking) is expected.

Permitted point source wetland assimilation projects in Louisiana provide an opportunity for wetland restoration and nutrient removal. Through these projects, wetlands receive nutrient rich treated municipal/sanitary wastewater that not only act to bring needed water to a wetland area, but also provide nutrients to the vegetation growing in these wetlands. This in turn decreases the amount of nutrients discharged into receiving waterbodies. There are currently 15 point source wetland assimilation projects permitted in Louisiana and more are proposed. Recent (2018 to 2022) nutrient removal efficiencies calculated by the LDEQ from project reports ranged from 19% to 93% for total nitrogen and no removal to 98% for total phosphorus, with an average of 73% and 27% respectively (averages from positive removal values only).

Incentives

Incentive-based programs within the state of Louisiana offer stakeholders the ability to participate in environmental stewardship activities. Voluntary stewardship programs exist for both nonpoint and point source community groups, thus providing opportunities participate in water quality protection, improvement, and restoration across sources.

Agriculture and forestry voluntary programs are a large part of nutrient-related nonpoint source pollution stewardship in Louisiana. USDA Farm Bill programs such as the Environmental Quality Incentives Program (EQIP), Conservation Reserve Program (CRP), Conservation Reserve Enhancement Program (CREP), Agricultural Conservation Easement Program (ACEP), and Regional Conservation Partnership Program (RCPP), received total funding averaging just over $200 million annually from 2018 through 2023. Water related conservation practices in Louisiana included more than $12 million in funds and affected over 1 million (combined) acres for fiscal year 2023. On November 16, 2023, Farm Bill programs (2018) were extended through September 30, 2024 (H.R. 6363). Farm Bill development for 2024 is ongoing at publication of this *Strategy* document.

The Louisiana Master Farmer Program, led by the LSU AgCenter, promotes stewardship across the state. Over 4,000 participants, primarily farmers, within Louisiana are enrolled in the three phase training program that features classroom, field training, and development and implementation of a farm-specific conservation plan. Louisiana Master Farmer Program participation covers 97% of the parishes in the state with the state's major agricultural and forestry areas demonstrating the most participation. Since 2019, 545 participants attended approximately 120 events where conservation practice implementation and benefits are discussed and demonstrated. Through this voluntary program, 369 producers and landowners have been awarded certification or recertification through the LDAF and represent just over 200,000 acres of documented BMP implementation. This land is in presumed compliance of all state soil and water quality standards. Other tracts of voluntary Master Programs include the Louisiana

Master Logger Program aimed at loggers, the Louisiana Master Gardener, and Louisiana Master Naturalist Program aimed at citizens within Louisiana.

Additional economic incentive programs include: (1) Clean Water State Revolving Fund Program (CWSRF), which supports municipalities in achieving water quality improvements, (2) Water Quality Credit Trading Program, and (3) Louisiana Environmental Leadership Program (ELP). The Trading Program, established in 2019, is a cost-effective approach for reducing nutrients and improving water quality with potential business revenues. The ELP promotes and supports stewardship for many aspects of pollution prevention and reduction from the industry sector and cities/parishes within the state. From 2019-2023 there have been five water quality related ELP awards granted from the LDEQ, with membership reaching 300 in the program.

An important addition to the long-term voluntary incentive opportunities is the passing of the Infrastructure Investment and Jobs Act (IIJA; or Bipartisan Infrastructure Law [BIL]) in 2021 and the Inflation Reduction Act (IRA) in 2022. IIJA funds have made specific provisions for the Mississippi River/Gulf of America Watershed Nutrient Task Force (Hypoxia Task Force, HTF; Gulf Hypoxia Program), the Lake Pontchartrain Basin Restoration Program, and the Gulf of America Alliance (GOAA) Regional Ocean Partnership to address pollution, climate resiliency, and conservation applicable to this Strategy (among other provisions). There are currently two projects from the Gulf Hypoxia Program (GHP), and another through GOAA, which are specific to nutrient reductions and/or related monitoring in state. Total funding is approximately $5,700,000 and will be awarded over the next 3-5 years. The IRA provides ~ 20 billion over 5 years to support USDA conservation programs, including funding for water quality improvements. An additional $1.2 million from the GHP will become available over the next couple of years for lower Mississippi states.

Leveraging Opportunities

Leveraging resources and creating opportunities for collaboration are essential to this Strategy. Stakeholders with vested interest in their watershed community are actively working on projects to protect, improve, &/or restore their water quality. The ability to leverage within and/or among groups, and engage them for creating partnerships &/or projects, will provide water quality improvements. To date, over 30 leveraging opportunities have been identified (Appendix B). For example, partnerships among the GOAA, Morehouse Soil and Water District, and LDAF have leveraged USEPA funds to continue agriculture conservation practices in the Upper Bayou Lafourche watershed at ~ $1.5 million over 3 years (2023-2026).

Science-Based Technologies/Applications

Incorporating the current state of the science and emerging technologies and applications will be needed to uphold Strategy goals. Areas of focus for Louisiana include advancement in agricultural methods/practices, wastewater treatment, nutrient

assimilation and removal, and river diversions. Additionally, nature-based solutions and research models (climate, flow, linked landscape and watershed) are useful to help guide future projects and impacts to local and GOA waters.

The USDA NRCS Conservation Effects Assessment Project (CEAP) aims to quantify the effects of conservation practices and to develop science-based management for agriculture. Two farmer-survey efforts (2003-2006 and 2013-2016) took place to estimate conservation adoption, and reporting was released in 2022. Warming weather and longer growing season was experienced in the interim decade, which in turn influenced crop patterns/shifts. Other noteworthy items include:

- Increase advanced technology use by farmers, typically via enhanced efficiency and variable rate fertilizer applications
- Increased conservation tillage (including no-till)
- Increased cover crop use and rotation, including high biomass crops in rotation
- Decreased erosion
- Slight decrease in surface water nitrogen and phosphorus losses (subsurface losses increased)

New CEAP activities (CEAP III) are planned for 2024-2026 (as of this writing).

Wastewater treatment technologies and advances in this science will aid in nutrient removal from some point source dischargers. These wastewater technologies can aid in reducing the amount of nutrients that enter water bodies in the state. Once nutrients enter a water body, other technologies and applications may aid in assimilation or removal of nutrients from in-stream. Research involving nutrient assimilation and removal through river diversions in coastal Louisiana is ongoing. CPRA is funding relevant research and partnering with academia, industry, and non-profits to address critical diversion-related questions.

River Diversions

River diversions constructed for the purposes of rebuilding and sustaining Louisiana's coastal wetlands have the value-added benefit of assimilating and removing nutrients that have already entered the Mississippi River system either from within Louisiana or from upbasin states. Over the past several decades, extensive research has focused on examining nutrient transformation and assimilation in regions that receive diverted Mississippi River water. Nutrient inputs from river diversions into open water bodies can lead to various ecological changes, such as enhanced primary productivity, shifts in phytoplankton communities, hypoxia, and eutrophication. Increased freshwater flow reduces salinities in the estuaries. Louisiana's shallow coastal estuaries have a greater nutrient removal capacity compared to deeper systems. This is primarily due to enhanced interactions between water, sediments, and vegetation, which promote processes like denitrification and phosphorus adsorption. CPRA uses numerical models to predict potential nitrogen and phosphorus uptake by wetlands receiving river water input. The Environmental Impact Statement for the Mid-Barataria Diversion documents the state of

knowledge of nutrient uptake by wetlands. Modeling for the Mid-Barataria Environmental Impact Statement did not attempt to directly calculate the extent of plant uptake and soil transformation of nutrients in the basin. However, modeling results in the Environmental Impact Statement project that the majority of nutrients transported from the river into the basin by the diversion would be taken up or transformed within the basin.

Existing and operational diversions, such as Davis Pond and Caernarvon, along with siphons like Naomi and West Pointe à la Hache, are already existing and operational. Additionally, the River Reintroduction into Maurepas Swamp is permitted and under construction, while the Mid-Breton Sediment Diversion is in the design phase. The Mid-Barataria Sediment Diversion is on hold in the construction phase. As CPRA's 2023 Coastal Master Plan includes the implementation of additional river diversion projects, and annual removal of total nitrogen and phosphorus from the Mississippi and Atchafalaya Rivers is predicted to be higher once projects are constructed and become operational. Sediment diversions will be operated ruing the spring flood when sediment loads as well as nutrient loads in the river are high. The operational regimes of some planned diversions have been developed, while others are still in the development phase. Additionally, the state is examining additional diversions into the upper coastal basins as well as potential beneficial changes to the operating regime of current diversions. The on-the-ground projects are delivering ancillary nutrient reduction benefits aligning with the Hypoxia Task Force GHAP 2025 goal (see Forward), intercepting nutrients that would otherwise flow into the Mississippi River and offshore. The Maurepas Diversion, along with the Mid-Barataria and Mid-Breton diversions—if permitted and constructed according to schedule—would further provide ancillary nutrient reduction benefits.

Nutrient Solutions

The initial Nutrient Management Strategy (2014) was developed through collaboration with state and federal agencies and through engagement with stakeholders within Louisiana; it is evident that continued input and dialog with multiple entities is required for success. Nutrient solutions will not be found via a single approach, as each of the identified strategic actions and priority areas are relevant. Further, nutrient solutions employed in up-basin states are essential to address nutrients and water quality in the larger MARB, and ultimately the Gulf of America. Managing nutrient at the source, across inputs, watersheds, and state boundaries will be required to affect change.

Information concerning implementation and outcomes is typically not stored or reported in a central area across all federal &/or state programs; in fact, tracking progress is difficult on all levels. Varying metrics, time periods, areas of interest, parameters measured, activity of interest, available reporting, and models used, to name a few, impact how progress is perceived and tracked. Louisiana typically reports out through individual programs. The HTF is working specifically in this realm to identify progress in the MARB as a whole.

LOUISIANA NUTRIENT REDUCTION AND MANAGEMENT STRATEGY INTERAGENCY TEAM

The Louisiana Nutrient Reduction and Management Strategy was developed by an interagency team from the Coastal Protection and Restoration Authority of Louisiana, the Louisiana Department of Agriculture and Forestry, the Louisiana Department of Environmental Quality, the Louisiana Department of Natural Resources. Additional partners in strategy development include the Louisiana State University Agricultural Center and the U.S. Department of Agriculture, Natural Resources Conservation Service.

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HIGHLIGHTS

The fourth Hypoxia Task Force Report to Congress was submitted to describe progress made toward goals of the Gulf Hypoxia Action Plan (HTF 2023).

LDEQ Nitrogen (N) and Phosphorus (P) nutrient trends report indicate Total Kjeldahl Nitrogen levels decreasing across the state; Nitrate-Nitrite and Total Phosphorus show decreasing or no trend for ~90% of locations (LDEQ 2021; select ambient program sites).

LDEQ Nonpoint Source Pollution Program provides assistance in reducing loads to waterbodies for nitrogen, phosphorus, and sediment (reductions per year for year put on ground)[1]

Year	319 Success Story Restored Uses	N reduction (lbs.)	P reduction (lbs.)	Sediment reduction (tons)
2019 - 2023	6	87,000	19,224	3,012

LDAF (2022), LDEQ NPS and TMDL/Vision (2023), and national USEPA 303(d) Vision (2022) and USDA NRCS (2023) programs have developed long-term strategies/plans for next 5 to 10 year periods addressing water quality through programmatic activities; 38 priority watersheds identified for LDEQ/partner programs.

The Bipartisan Infrastructure Law (BIL; 2021) has provided ~$4.2 million over 5 years to Louisiana nutrient reduction efforts via the USEPA Gulf Hypoxia Program, with ~95% of funds going to on-the-ground agricultural conservation practices in St. Joseph; Lower Mississippi Sub-Basin committee (redeveloped 2023) to receive addition funding.

New partnerships (2022-2023) have been formed supporting agricultural practices for nutrient control in Morehouse Parish (~$1.4 million) and expanded Gulf hypoxia monitoring (~$250,000) for 3-5 and 2 years, respectively.

LDEQ proposed standards criteria for ammonia (2023) and promulgation (rulemaking) is expected.

Updated SPAtially Referenced Regression On Watershed attributes (SPARROW) models (2021) have been released providing visual tools concerning nutrient loadings of states within the MARB, including Louisiana; further updates are anticipated.

USDA NRCS acreage receiving agricultural conservation measures ranged from 998,00 to 1.8 million acres, with 50-60% of the state's top 10 conservation practices in support of nutrient/sediment control (2018-2023); new 'Farm Bill' required for continued efforts.

LDEQ TMDL Program (2023-2032) is in the process of incorporating natural channel design (NCD) to improve sedimentation and nutrient loading from erosion; 7 water units have been targeted & are under development New Vision Activities; additional water units are targeted for 2023-2032. NCD may be incorporated on select watersheds.

For the 2019 Strategy reporting years, nearly 17,000 environmental assistance program activities have occurred in assistance of small businesses and communities

[1] Not including reductions incidental to OSDS inspections/repairs, continued practice use through project period, education-outreach activities, or USDA NRCS activities (which LDEQ 319 supports through monitoring)

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LOUISIANA NUTRIENT REDUCTION AND MANAGEMENT STRATEGY

Protection, Improvement, and Restoration of Water Quality in Louisiana's Water Bodies

PART I: BACKGROUND, STRATEGY COMPONENTS, AND ACTIVITY REPORTING

A. PREFACE

A.1 Nutrient Reduction and Management

Nutrient pollution from excess nitrogen and phosphorus is an issue across the United States. The primary origins of these nutrients include nonpoint sources, such as agriculture and urban runoff, and point sources, such as municipal and industrial discharges. Nutrients may be transported far downstream from the original input. While nutrients are essential components of ecological functions, in excess they may upset the balance of natural processes, disrupting nutrient assimilation and degrading water quality. Effects of nutrient pollution include low oxygenated waters, development of harmful algal blooms, and acid rain (which originates with air nutrient pollution that falls into waterways; USEPA 2024). Significant impacts to fish and other aquatic life can result. These impacts have been documented in the Gulf of America (GOA) for decades.

Strategies to manage nutrient pollution in Louisiana waters and in other upstream states are critical (see Box 1). The 2024 Louisiana Nutrient Reduction and Management Strategy will continue to guide the development and implementation of nutrient management activities. The Coastal Protection and Restoration Authority of Louisiana (CPRA), Louisiana Department of Agriculture and Forestry (LDAF), Louisiana Department of Environmental Quality (LDEQ), and the Louisiana Department of Energy and Natural Resources (LDENR) comprise the interagency team that develops and implements this strategy statewide. Through the collaborative and voluntary participation of stakeholders within the Louisiana watershed community, this *Louisiana Nutrient Reduction and Management Strategy* (Strategy) continues to build upon existing programs and initiatives to protect, improve, and restore the water quality within the state.

Many entities, including the Mississippi River Gulf of America Watershed Nutrient Task Force (Hypoxia Task Force), Gulf of America Alliance (GOAA), U.S. Environmental Protection Agency (USEPA), U.S. Department of Agriculture Natural Resources Conservation Service (USDA NRCS), and the U.S. Fish and Wildlife Service (USFWS), recognize the need to address excess nutrients within the nation's water bodies and coastal systems. Additionally, the Harmful Algal Bloom and Hypoxia Research and Control Amendments Act (HABHRCA) created an Inter-Agency Task Force to detect, monitor, assess, and predict harmful algal blooms and hypoxia events in marine and freshwater in the U.S (NOAA NCCOS 2023). As of this writing, amendments to the Act are before the U.S. Congress.

The incidence of hypoxia or low dissolved oxygen in offshore waters such as the GOA has been the focus of nationwide efforts to preserve and restore water quality, habitat, and fisheries.

BOX 1: WHY A NUTRIENT REDUCTION *AND* MANAGEMENT STRATEGY?

Louisiana, situated at the bottom of the Mississippi-Atchafalaya River Basin (MARB) that drains 41% of the contiguous U.S., is impacted by nutrients (nitrogen and phosphorus) introduced by upriver states and locally.

Louisiana's Nutrient Reduction and Management Strategy is not limited just to areas that drain into the MARB. Nonpoint and point source measures are being carried out across the state, primarily at the project level, to address nutrient pollution. Louisiana is committed to protecting, improving, and restoring quality in all state waters.

Coastal restoration is an ongoing effort necessary to reestablish and sustain wetlands that have suffered significant losses in during the last century. Restoration looks to build and maintain coastal wetlands to protect and preserve nationally significant services (e.g., oil and gas production, fisheries, wildlife habitat), provide storm/flood protection for coastal communities, achieve improved water quality, and support the unique history and culture of our state. River diversions along the main stem Mississippi River are a large part of this effort.

As river diversion projects are implemented to build and maintain coastal wetlands, the "trapping" of nutrients in wetlands (via plant production) has the potential to pull nutrients out of the water while improving native habitat. Therefore, Louisiana is uniquely positioned to potentially capture nutrients that have entered the system upstream. This "intercepting" of nutrients is a component of **Louisiana's Nutrient Reduction and Management Strategy** (Figure 1).

The completion of the original 2014 Strategy is the result of coordinated efforts between the HTF and Louisiana agencies in support of the first action item in the *2008 Hypoxia Task Force Action Plan* (Mississippi River/Gulf of America Watershed Nutrient Task Force Hypoxia Task Force [HTF] Plan 2008).

A.2 Gulf of America Hypoxia and Impacts

The HTF was instituted to address hypoxia in the northern Gulf of America (see Foreword). Hypoxia is a condition where sustained dissolved oxygen concentrations in the water decrease to a level that can no longer support aquatic organisms (Rabalais et al. 2001; Breitburg 2002, 2009; Diaz et al. 2008; Vaquer-Sunyer 2008). Hypoxic areas, or "dead zones", are found in many locations around the world and have increased in duration and frequency (Rabalais, et al. 2010; Fennel and Testa 2019; Dai 2023). In the northern GOA, hypoxia was first documented in the early 1970's and its severity and extent have been surveyed annually, with two exceptions, since 1985 (Rabalais et al. 2001a, 2010; Turner et al. 2005; NOAA NCCOS 2024). The annual extent (area) of bottom water hypoxia helped develop HTF goals and continues to be referenced to track progress.

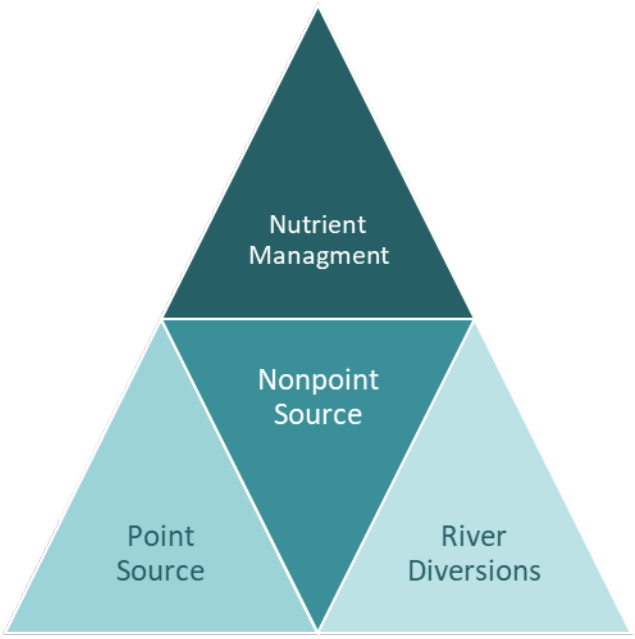


Figure 1. Louisiana's Nutrient Reduction and Management Strategy focuses statewide on improving the management of nonpoint and point sources of nutrients and also leverages the capacity of river diversions to intercept nutrients that have already entered the river upstream.

Hypoxia is a recurring condition in bottom waters off the Louisiana and Texas coasts during summer months, though onset, extent, and duration within the water column and along the coast varies (through space and time). It occurs primarily because of excess nutrients (carried by the Mississippi and Atchafalaya Rivers) and freshwater stratification of coastal shelf waters (Figure 2; Goolsby 2000; Bianchi et al. 2010; Rabalais et al. 2010; USEPA 2024a). The GOA dead zone is a well-established and well-studied phenomenon, with periodic reviews and reevaluations supporting existing paradigms (e.g., USEPA Science Advisory Board 2007; Scavia, et al. 2017; Matli and Obenour 2024; Figure 2). Louisiana coastal waters have been affected every year since measurement began, and changes in weather patterns are expected to intensify the scope of hypoxia in the future for Louisiana and global ocean waters (e.g., Lehrter, et al. 2017; Schmidtko, et al. 2017; Laurent, et al. 2018).

Nutrient pollution and hypoxia can impact fish, fisheries and fishing related ventures, ecosystem services, seafood pricing, and system resilience. Details on hypoxia and commercially and recreationally important species may be found in Section A.2 of the 2019 Strategy (Louisiana Nutrient Management Strategy Interagency Team 2019).

A.3 Significance to the State of Louisiana

The Mississippi-Atchafalaya River Basin (MARB) drains approximately 41% of the contiguous United States and includes several major river systems (Figure 3). According to modeling studies based on recently updated data by the U.S. Geological Survey (USGS), the majority of nutrient loading to the MARB originates in the 'corn belt' of the Midwest (Roberston and Saad, 2021). The primary source of total nitrogen and phosphorus is still generally attributed to crop fertilizers,

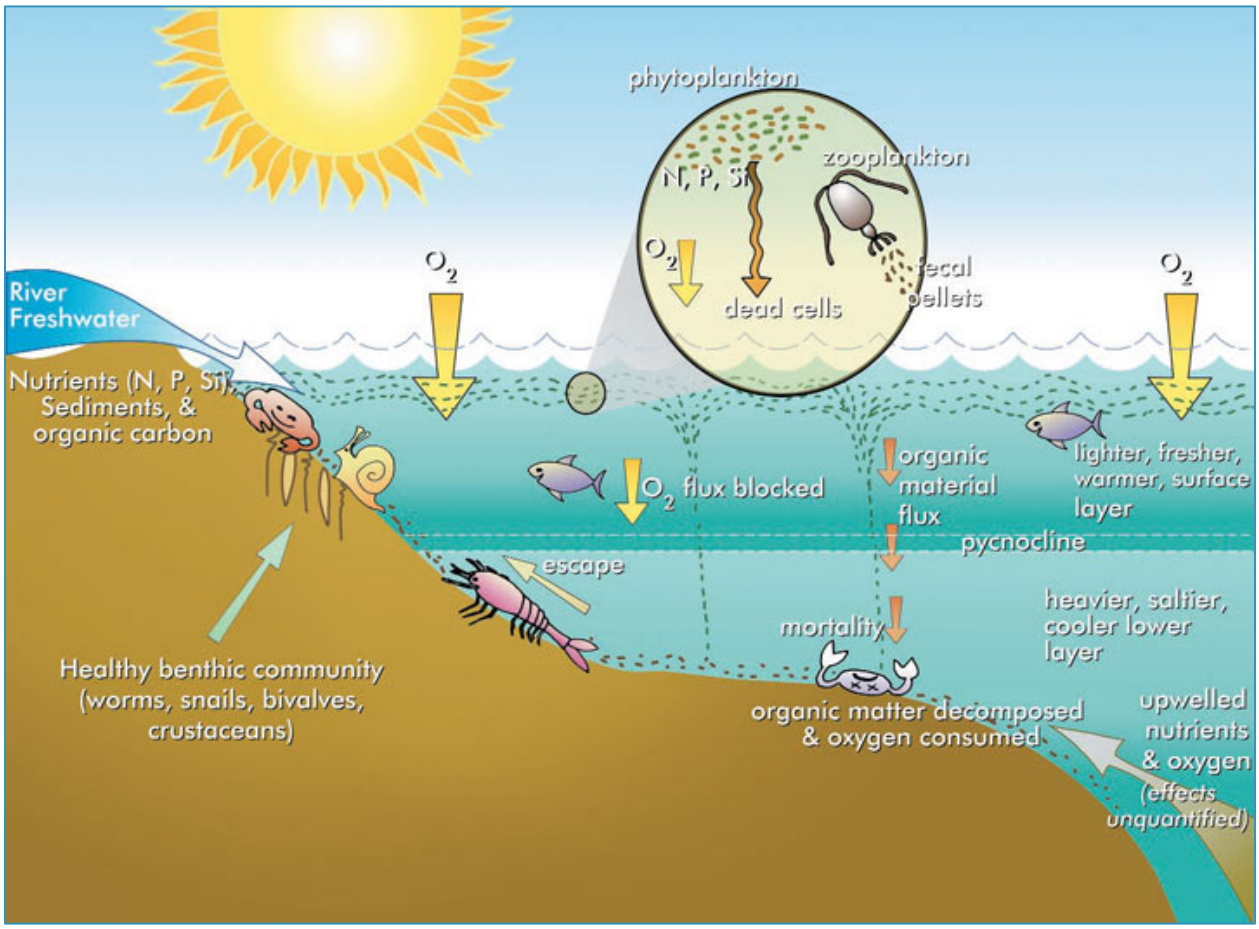


Image source: USEPA (https://19january2017snapshot.epa.gov/ms-htf/hypoxia-101_.html).

Figure 2. Simplified hypoxia development in northern GOA. Freshwater from rivers carry nutrients (e.g., nitrogen and phosphorus) to surface waters. Stratification of the water column results, where saltier and cooler waters are trapped at the bottom (below pycnocline) and oxygen (O2) is not replenished from the surface. Additionally, increased surface water nutrients promote algal (phytoplankton) growth, which in turn feeds small predators (zooplankton). Uneaten algae and excrement from these predators sink to the bottom, consuming O2 during their decomposition. As a result, animals that cannot move to waters with higher O2 levels may die.

Figure 3. The Mississippi-Atchafalaya River Basin (MARB) drains approximately 41% of the contiguous United States that includes all or part of 31 states and 2 Canadian provinces.

though point sources and urban nonpoint sources contribute to phosphorus loading in some areas (Alexander et al. 2008; Robertson and Saad 2013, 2021; White et al. 2014).

Louisiana ranks 18th of 31 states at ~1.3% of the overall nitrogen load contributions to the MARB (Robertson and Saad 2021; calculated from Table 2, all data caveats apply). For phosphorus, these values increase to 14th of 31 states at ~2.5%. However, of the 31 states used for loading calculations, roughly one-half have overall contributions less than 1% for either nutrient. More information on these and other metrics can be interactively viewed on the USGS SPARROW Mappers website (USGS 2021).

Within Louisiana, approximately 43% of the land area drains directly into the MARB, with the remaining 57% of the state land area draining primarily to the GOA through coastal bays and lakes, such as Lake Pontchartrain (Figure 4). In essence, for Louisiana, all waters lead to the Gulf. Therefore, it is important to address water quality and nutrient reduction and management throughout the entire state.

Although Louisiana's contribution to the overall nutrients entering the GOA is small, Louisiana is at the terminus of all nutrient impacts resulting from upstream loads. For this reason, Louisiana is committed to protecting and improving water quality within its inland and coastal waters, and cooperating with upstream states to reduce nutrient loads in the MARB. Specifically, river diversions built as a part of the 2023 Coastal Master Plan (CPRA 2023) will provide an opportunity to intercept nutrients from the main stem of the Mississippi River and reduce the amount of nutrients reaching the Gulf of America.

In addition to the regulatory requirements under the Clean Water Act (CWA), this comprehensive strategy includes an incentives-based approach for participation of all stakeholders within the watershed community involved in agricultural management practices, wastewater treatment technologies, and coastal programs and restoration activities. A commitment to the development of a Nutrient Reduction and Management Strategy for Louisiana is a strong indication of the state's continued dedication to protect, improve, and restore water quality of the state's water bodies. Managing nutrient at the source, across inputs, watersheds, and state boundaries will be required to affect change.

B. VISION

The overarching vision of the Louisiana Nutrient Reduction and Management Strategy is that through its implementation:

- Nutrient levels in Louisiana's surface waters, both inland and coastal, will be managed to ensure support of healthy aquatic communities, clean water for public, agricultural and industrial use, recreation in and on the water, drinking water supplies, and/or irrigation and livestock watering.
- Stakeholders will be involved in nutrient reduction and management at the local level to actively support water quality protection, improvement, and restoration of Louisiana's

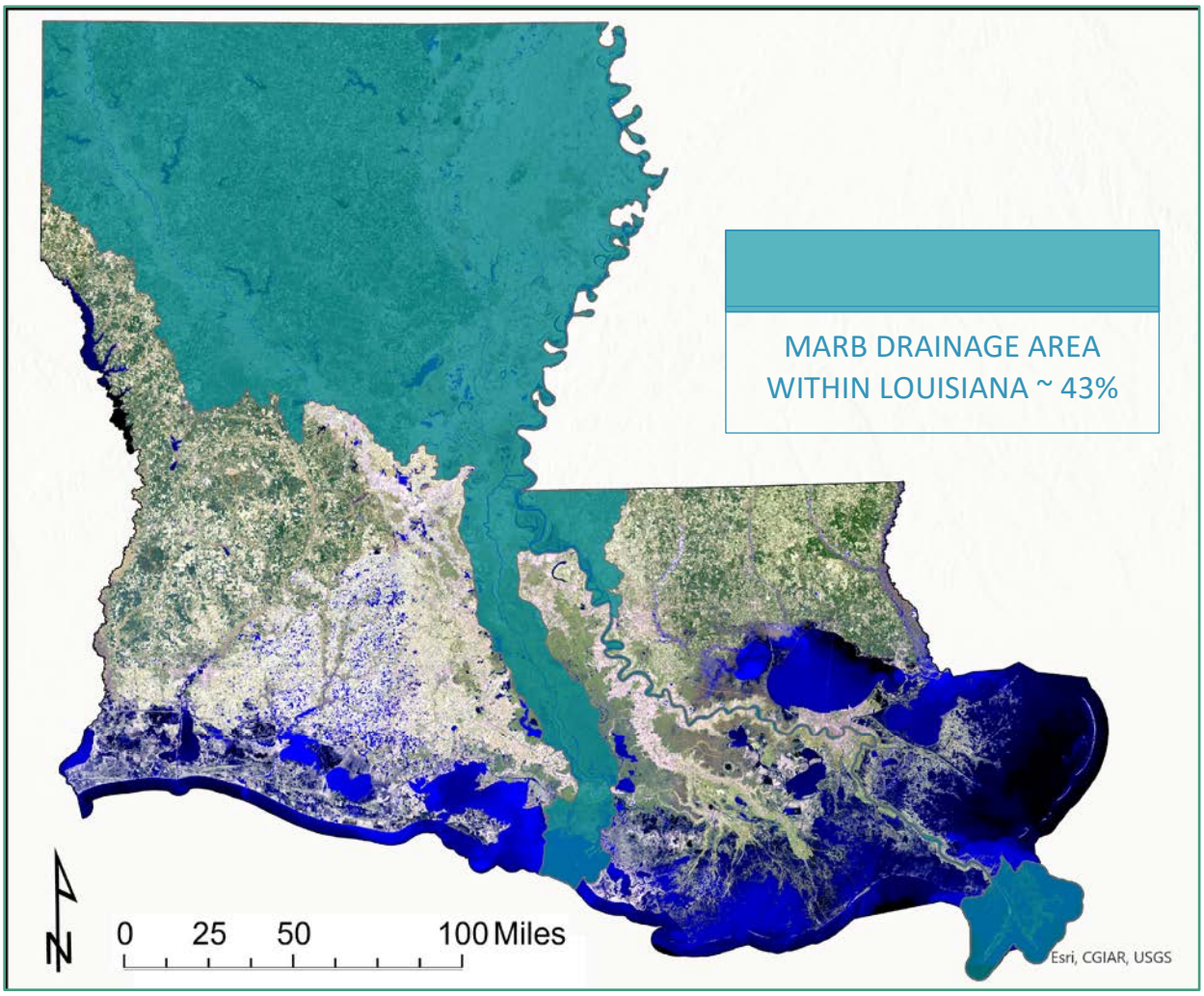


Figure 4. Approximately 43% of Louisiana's land area drains into the Mississippi-Atchafalaya River Basin (MARB) and eventually into the Gulf of America (GOA). The remaining 57% of the land area in the state drains into the GOA either directly or through coastal bays or lakes (USGS NHD 2023).

water bodies and will be encouraged through participation in voluntary, innovative, and incentive-based approaches.

- Nutrient reduction and management for water quality protection, improvement, and restoration at the local level may have a cumulative and positive impact on the health of the receiving water bodies within both the state and the GOA.

C. GOAL

The goal of the Louisiana Nutrient Reduction and Management Strategy is to manage nitrogen and phosphorus to protect, improve, and restore the nutrient-related water quality in Louisiana's inland and coastal waters.

D. STAKEHOLDERS AND PARTNERS

All stakeholders within a watershed community will play a role in nutrient reduction and management. Stakeholders include state and federal agencies, academic institutions, nonprofit, non-governmental organizations (NGOs), private industry, private landowners and members of the watershed community, and parishes and municipalities among others. Participation by and partnerships among these stakeholder entities is crucial for the success of the Louisiana Nutrient Reduction and Management Strategy for protection, improvement, and restoration of water quality within state.

E. FRAMEWORK FOR LOUISIANA'S NUTRIENT REDUCTION AND MANAGEMENT STRATEGY

Strategy features, components, and actions are outlined below. Strategy Features include essential elements and Strategic Components that are the framework for organizing and accomplishing goals. Strategic actions are those action items to be accomplished through employing the nutrient reduction and management methods described therein. Each support the purpose of the Louisiana Nutrient Reduction and Management Strategy.

E.1 Strategy Features

The Nutrient Reduction and Management Strategy (Strategy) for the state of Louisiana will continue to address sources of nutrients including point and nonpoint sources within the water bodies of the state. This implies that all nutrient sources will be considered for management, assimilation, and reduction. Thus, the Strategy will be **goal oriented** where specific actions are identified along with **measurable environmental outcomes.** A **watershed approach** will be employed, where all activities including natural environmental and human activities, are assessed and taken into account. Therefore, it is imperative that **watershed leaders** who are the most familiar with the local conditions and needs be the vanguard for these efforts.

Accordingly, efforts will be **broadly collaborative** with watershed partnerships formed among state and federal agencies, academic institutions, private landowners and industry, and other groups to leverage strategies. Watersheds throughout Louisiana will be included in nutrient reduction and management activities through the connectivity of water bodies statewide culminating in **comprehensive statewide water quality improvements**.

The Strategy relies on **strategic planning** primarily at the project level with stakeholders. Programs and/or projects implemented for water quality improvements through this Strategy will be routinely evaluated and **improvements tracked** in order to measure the environmental outcome. Continued and routine **progress monitoring and reporting** will aid in identifying successes as well as identifying programs that may require adjustments or re-evaluation. Performance measures and tracking will be a key part to strategy implementation.

All available tools will be identified and used in this effort. Decision support tools may include existing data sources, modeling efforts, guidelines, pertinent literature, and mapping applications originating from a wide array of watershed community stakeholders. While current knowledge of the watersheds will be incorporated into this Strategy, it may also be important to **leverage new technologies** to manage and reduce nutrients.

E.2 Strategic Components

The Strategy is composed of a framework of ten strategic components to support its vision and purpose. These ten components (Table 1) represent common themes for nutrient reduction and management and illustrate the processes taken to develop and implement this Strategy to protect, improve, and restore the nutrient water quality within the state.

Further, the ten strategic components for the Strategy align with common components or elements of a nutrient strategy envisioned by such entities as GOAA (2010, 2021), the HTF, and the USEPA strategies for controlling nutrient pollution (2022).

Table 1. Framework of ten strategic components of the Louisiana Nutrient Reduction and Management Strategy.

Component	Description
1. Stakeholder Engagement	Identify, engage, and involve stakeholders within the watershed community
2. Decision Support Tools	Identify and evaluate tools that may be utilized in evaluating and assessing nutrients in watersheds
3. Regulations, Policies, & Programs	Examine current regulations, policies, and programs that may guide nutrient reduction and management activities
4. Management Practices & Restoration Activities	Identify and document appropriate management practices and restoration activities
5. Status & Trends	Examine status and trends of information related to nutrient reduction and management
6. Watershed Characterization, Source Identification & Prioritization	Characterize watersheds and subsegments*, identify nutrient sources, and prioritize watersheds for nutrient reduction and management efforts

Component	Description
7. Incentives, Funding, & Economic Impact Analyses	Utilize voluntary incentives or funding to promote participation in stewardship activities and evaluate economic impact of nutrient management activities
8. Targets & Goals	Document agency commitments, timelines, and milestones for nutrient reduction and management activities
9. Monitoring	Utilize effective monitoring programs to document nutrient levels or other associated data
10. Reporting	Develop reporting mechanisms for communicating with stakeholders and tracking strategy progress

*subsegments are water body units defined by LDEQ

E.3 Strategic Actions

A series of strategic actions guides the implementation of the 2024 Louisiana Nutrient Reduction and Management Strategy. These strategic actions fall under the framework of the ten strategic components described above. Completing these strategic actions, as well as adapting, modifying, or identifying additional strategic actions, will be part of the strategy implementation process.

E.3.1 Stakeholder Engagement

Stakeholder participation is essential to accomplishing the vision of this Strategy. Stakeholders have a vested interest in the protection, improvement, and restoration of water quality within their watershed community and are the stewards of their local landscapes; communicating and partnering with stakeholders are keys to success.

One of the many benefits of a robust engagement process is increased awareness and participation from all sectors within a watershed in activities that are more nutrient-responsible. Working with local watershed and industry leaders, future stakeholder engagement efforts will focus on performing ongoing and additional outreach and education, and identifying and promoting partnerships and leveraging opportunities. Leveraging existing programs will be critical to engage stakeholder communities further as the Strategy is implemented.

The strategic actions for Stakeholder Engagement under the Louisiana Nutrient Reduction and Management Strategy are to:

a) Identify and engage stakeholders for continued strategy development and actions
b) Perform outreach/education on strategy activities
c) Identify and promote partnerships/leveraging opportunities

Major Stakeholders

The Southern Extension and Research Activities Committee No. 46 (SERA-46) is one of the USDA National Institute of Food and Agriculture and Land-Grant University funded committees that promote research and extension activities across states. SERA-46 was established to institute

the non-funded Cooperative Agreement between the HTF and land-grant university Extension and Experiment stations in the north central and southern regions of the US. This agreement is to promote interests and expertise in nutrient related issues from agriculture concerning state-level nutrient impairments and hypoxia in the GOA. As part of this effort, the LSU AgCenter, through the Master Farmer Program and other cooperative efforts, is an integral component in engaging the farming community across the state (see Section F.3.2.3; LSU 2024).

The non-profit community has been very successful leveraging programs and restoration needs with their individual goals and/or funds to promote nutrient improvements across the state. America's Wetland Foundation, The Conservation Fund, Ducks Unlimited, Restore the Earth, and The Nature Conservancy, among others, have all been active in this realm. The Pontchartrain Conservancy has collaborated with USEPA, LDEQ, Louisiana Department of Health, cities and municipalities in their efforts to restore water quality health within the basin. This has been accomplished through monitoring, pollution tracking, and stormwater home and commercial wastewater projects. Barataria-Terrebonne National Estuary Program (BTNEP) utilizes its Comprehensive Conservation & Management Plan for developing projects to address nutrient-related issues with stakeholders within the Barataria watershed (BTNEP 2019).

The LDAF, USDA, LSU AgCenter, and/or local Soil and Water Conservation Districts are stakeholders that often collaborate towards nutrient reduction activities on the ground through USDA practices; resulting projects are a primary component of this Strategy.

Strategic Actions are found in Appendix A. Strategy Annual Reports, where detailed projects and progress are summarized each year, are found on the Nutrient Strategy webpage (LDEQ 2024).

E.3.1 Activities

Over 1300 events have occurred relating to nutrient management/reduction over the last 5 years via outreach activities among Strategy partners (Table 2). Outreach consists of school visits, community functions (e.g., Earth Day, Ocean Commotion), field days for farmers/foresters, facility tours, meetings, trainings, and symposiums across Strategy agencies/partners and the public. A detailed example of these activities may be found in the 2022 Strategy Annual Report on the Nutrient Strategy webpage (Appendix B; LDEQ 2024).
Online outreach by various programs include:

- North Central Region Water Network's *The Current Webinar Series* has a You Tube Channel that offers webinars on water issues related to nutrients and nutrient management, conservation tools, edge-of-field practices and more (NCRWN 2024)
- LDEQ On Air Podcasts on nutrient related topics were recorded in 2023 and are available on demand (LDEQ 2024a)

- LDEQ You Tube channel offers information &/or training on nutrient related topics and are available on demand (LDEQ 2024b)
- USDA NRCS 'Events' webpage for upcoming events (USDA NRCS 2024)
- LDEQ TMDL program participation in *Our Waterways of Louisiana* citizen-groups for Yellow Water, Natalbany, New and Blind Rivers concerning priority watersheds continues (see their Facebook pages).

Priority Waterbody	Link to Facebook Page
Our Waterways of Louisiana – Yellow Water River	Our Waterways of Louisiana-Yellow Water River
Our Waterways of Louisiana – Natalbany River	Our Waterways of Louisiana-Natalbany River
Our Waterways of Louisiana – New River and Blind River	Our Waterways of Louisiana - OWL - New River and Blind River

Activity[1]	2023	2019-2023
Meeting/Symposium	52	360
Presentations	6	29
Public Event	39	70
Workshop/Training	125	139
School Visit	240	378
Tour	253	346
Press	6	4
Field Day	9	60

Table 2. Outreach Activities performed by Strategy Team members (CPRA, LDAF, LDEQ, LDNR, LSU AgCenter, and USDA) concerning nutrient related topics during Strategy reporting period.[1]

[1]Reporting and details fluctuate among programs and years based on staff availability.

E.3.2 Decision Support Tools

Decision support tools are essential to evaluating and assessing various aspects of nutrient reduction and management activities. Web-based data access tools are directly applicable to nutrient reduction and management by providing data from various agencies, while water quality models and Geographic Information Systems (GIS) based tools allow and/or estimate nutrient loadings and visualization of watershed features.

In the development of the 2014 strategy, the Strategy Interagency Team conducted a broad review of available decision support tools, and at that time over 200 were identified, evaluated, and their applicability/utility to nutrient reduction and management determined. These tools

included best management practices, data access portals, mapping applications, modeling tools, guidance, relevant literature, and reports. This list is updated yearly on the Strategy Decision Support Tools webpage (LDEQ 2024c). Currently there are about 190 active tools.

The strategic action for Decision Support Tools under the Louisiana Nutrient Reduction and Management Strategy is to:

a) Identify, evaluate, and document selected tools

Strategic Actions are found in Appendix A. Strategy Annual Reports, where detailed projects and progress are summarized each year, are found on the Nutrient Strategy webpage (LDEQ 2024).

E.3.2 Activities

Various Support Tools in the nutrient realm that have been developed or received recent updates include:

- USEPA
  - How's my Waterway Tool (USEPA 2024b); nationwide water quality impairment mapping
  - Nutrient Pollution Website (USEPA 2024); information and activities
  - Nitrogen and Phosphorus Data Access Tool (USEPA 2024c); nationwide public data source for dischargers
  - Bioretention Design Handbook: Designing Holistic Bioretention for Performance and Longevity (USEPA 2024d)
- USGS
  - Water Quality Portal (USGS et al. 2024); nationwide public data source for monitoring
  - USGS Spatially Referenced Regressions On Watershed attributes or SPARROW model (USGS 2021); MARB nutrient model mapping
- LDEQ
  - Integrated Report Web Map Application; state level water quality impairment mapping (update pending)
  - Louisiana Environmental Assessment Utility (LEAU) Data Web Portal (LDEQ 2024d); state level public data source for monitoring
- CPRA
  - Coastal Information Management System database; state level public data source for monitoring (CPRA 2023a)
- National Oceanic and Atmospheric Administration (NOAA)
  - National Centers for Coastal Ocean Science (NCCOS 2024a); local level daily satellite imagery for SE Louisiana
  - U.S. Drought Monitor has new state pages (NOAA and NIDIS 2024)
  - Data Access Viewer web tool (NOAA OCM 2024)

- The Nature Conservancy and Conservation Technology Information Center launched Operational Tillage Information System (OpTIS) 4.0 for mapping conservation practices on croplands across all 48 states (CTIC 2023)
- The Nature Conservancy Resilient River Explorer (TNC 2023) provides access to the freshwater resilience results for every small watershed the continuous US
- *waterFALL®* Watershed Simulation Tool provides robust scenario and impacts analysis in high resolution (RTI 2024)
- Mississippi State University and the National Center for Alluvial Aquifer Research provides access to research conducted in the Lower Mississippi River Basin (MSU 2023)
- *One Good Idea* is a multimedia clearinghouse where farmers can learn from other farmers about how to be successful and profitable with soil health and other stewardship practices (One Good Idea 2024)
- American Farmland Trust
    - *Farmers' Guides to Soil Health Economics,* series of two-page guides highlighting the economic costs and benefits of farmers adopting soil health practices for crop and grazing land (AFT 2023)
    - *Outcomes Estimation Tools Training Webinar Series* provides farm conservation project managers with information about the different tools that are available (AFT 2023a)
- LSU AgCenter (Wang in 2021 and Parvei in 2023) contributed to the Fertilizer Recommendation Support Tool (FRST) to provide an unbiased interpretation of soil test phosphorus (P) and potassium (K) values for crop fertilization and offers a significant advancement in soil testing for P and K while reducing excess nutrient losses to the environment (LSU AgCenter 2024f)
- A paper by Liu and Brouwer (2023) analyzed water quality trading (WQT) and developed a world-wide WQT database from existing review papers and other publications
- USDA Partnerships for Climate-Smart Commodities Project Dashboard (by state; 2024a)
- USDA Inflation Reduction Act Data Visualization Tool (2024b)

A full list of identified Tools is linked on the Nutrient Strategy webpage and is a stand-alone webpage (LDEQ 2024c).

E.3.3 Regulations, Policies, & Programs

Numerous efforts are underway within the state of Louisiana as well as nationally that address nutrient reduction and management activities such as those aimed toward outreach, monitoring, &/or agricultural incentives. These programs may assist with activities within the state of Louisiana. Agricultural production continues to benefit from Farm Bill programs that offer financial incentives and technical assistance with implementation of conservation practices. A recent review in Mississippi coastal watersheds indicates total suspended solids and mineral

phosphorus are reduced using ponds, wetlands, riparian buffers and combinations thereof (Bhattarai and Parajuli 2023). A list of regulations, policies and programs may be found on the Louisiana Nutrient Reduction and Management Strategy website (LDEQ 2024).

The strategic actions for Regulations, Policies, & Programs under the Louisiana Nutrient Reduction and Management Strategy are to:

a) Propose or establish new regulations, policies and/or programs pertinent to Strategy objectives
   - Leverage multiple regulations, policies, and/or programs to most efficiently utilize varying practices in managing nutrients

Strategic Actions are found in Appendix A. Strategy Annual Reports, where detailed projects and progress are summarized each year, are found on the Nutrient Strategy webpage (LDEQ 2024).

E.3.3 Activities

Regulations, Policies and Programs updates of note include:

- CPRA represents Louisiana as the Hypoxia Task Force Member
- USDA
  - H.R. 6363 extended the 2018 Farm Bill (2023)
    - Farm Bill Activities outlined and reported in Section F.3.2.2
  - H.R. 2617, the Consolidated Appropriations Act, was passed providing authority and funding to make payments to rice producers based on data already on file in 2023
  - Conservation Practice Standard 590, implementing a nutrient management plan, estimates fertilizer average cost savings with plan at $30/acre (USDA 2022; using 2022 data)
  - NRCS allocated $75 million in funds for farmer transition to organic (2023)
  - Conservation Effects Assessment Project (CEAP) National Farmer Survey (CEAP III) is anticipated to begin in 2024 and continue through 2026; the project will aim for ~23,000 modeled cropland points (USDA CEAP 2024)
    - Survey data to be collected includes (producers data is kept confidential):
      - All field management for 3 years
      - Tillage
      - Fertilizer and manure applications
      - Pesticides and pest management
      - Irrigation
      - Crop rotations
      - Conservation practices adopted (not just NRCS)
      - Conservation program participation

        - Operator background, farm income, demographics
        - 1 field per operator only
    - Conservation Investments from Inflation Reduction Act (USDA 2024b)
        - $8.45 billion for the Environmental Quality Incentives Program
        - $4.95 billion for the Regional Conservation Partnership Program
        - $3.25 billion for the Conservation Stewardship Program
        - $1.4 billion for the Agricultural Conservation Easement Program
        - $1 billion for Conservation Technical Assistance
        - $300 million to measure, evaluate, quantify carbon sequestration and greenhouse gas emission reductions from conservation investments
        - $138 million in 138 new climate-smart conservation easements; expansion of climate-smart mitigation
    - Minimal annual payment to producers in Conservation Stewardship Program increased to $4,000 (USDA NRCS 2024a)
- LDEQ
    - Nonpoint Source Management Plan for FY2023-2027 released (LDEQ 2023a)
    - Nonpoint Source Watershed Implementation Plans for 12 subsegments approved by USEPA (Section F.1)
    - Nature based solutions and natural channel design have been incorporated as important considerations towards water quality improvements, including sediment loading and associated nutrient inputs
    - Seven LDEQ TMDL New Vision water units targeted; activities are in various levels of completion (Section E.3.6 and F.1)
    - WQ 114 Notice of Intent published to add fresh water ammonia aquatic life criteria to revise LAC 33:IX Chapter 11 of Surface Water Quality Standards regulations (2023); modifications/promulagtion are underway
- LDNER was restructured from the Louisiana Department of Natural Resources in 2024
- Louisiana House Bill 474 was passed that requires signage for wetland assimilation projects effective August 1, 2024
- The Louisiana Watershed initiative has installed 118 rain, gage/water level, and/or discharge sites across the state since inception in 2019; USGS (2024a) hosts data
- Infrastructure Investment and Jobs Act (IIJA; also known as the Bipartisan Infrastructure Law [BIL]) allocated $50 billion in funds for clean and safe water (IIJA 2021)

- USEPA
  - Gulf Hypoxia Program established to distribute $60 million in funds for 12 states for HTF goals (USEPA 2024e); funding for LA ~ $ 4.2 million over 5 years (Section F.4)
    - Nutrient reductions via agricultural practices in St. Joseph were approved by USEPA February 2023
    - Continued monitoring of nutrients from inshore to offshore (Barataria) approved by USEPA March 2023
  - The Hypoxia Task Force released the 2023 Report to Congress
  - The Lake Pontchartrain Basin Restoration Program was reestablished with ~$53 million in funds specifically for this watershed (USEPA 2024f)

- The Lower Mississippi River Sub-Basin Committee was redeveloped, via a Memorandum of Agreement among 5 member states (AR, LA, MS, MI, TN), to formally establish this group in support of Infrastructure Law and Gulf Hypoxia Program requirements (September 2023)
  - A Technical Advisory group (TAG) consisting of at least one member per state will help guide, develop, and implement projects in benefit of the Committee
  - Work in establishing the agreement and projects are under development
- The Gulf of America Alliance, USEPA, LDAF, and the Morehouse Soil and Water Conservation District are working to implement agriculture conservation measures (~$1.4 million) for nutrient reduction and management; approved by USEPA December 2023 (Section F.4)
- LDAF released 2023-2028 Strategic Plan (LDAF 2024)
- National Academies of Science, Engineering, and Medicine, Gulf Research Program, awarded $22 million to LSU and Tulane to lead a 15-member consortium to advance understanding of the Lower Mississippi River Delta (NASEM GRP 2023)
- LSU Ag Center (2024), through the Louisiana Master Farmer Program and National Wildlife Federation, is expanding social-science based outreach training for agricultural professionals through the “Grow More” program (2023-2025). Instead of utilizing traditional methods to reach producers and stakeholders with benefits of nutrient management and other BMPs, the program focuses on changing farmer behavior through specific motivations. Modifying individual behavior is one way to bridge the gap between knowledge and action to successfully address water quality issues (Section F.3.2.3)
- LSU Ag Center expands Patrick K. Taylor Foundation Model Farm activities to reduce nutrient inputs, including farmer field days (2025; Section F.1.2)

- The Community Sewerage System Infrastructure Sustainability Act (Senate Bill 122, 2023) was passed to assist communities in sewage infrastructure and define local government accountability
- Nutrient Reduction Memorandum released (USEPA 2022)
- Association of Clean Water Administrators released *Standing Principles on Nutrient Reduction* for the USEPA and states (ACWA 2023)
- The Louisiana Outdoors Forever Program was established by House Bill 762 for conservation projects, including those affecting water quality (2022; Section F.3.2.4)
- American Nutrient Policy Council released *American Agriculture's State, Regional, and National Initiatives to Reduce Nutrient Losses in the Mississippi River Basin* (ANPC 2021).

E.3.4 Management Practices & Restoration

Developing, documenting, and leveraging appropriate management practices, including nonpoint source, point source, and restoration activities for a given watershed, is essential to Louisiana's nutrient reduction and management efforts. Opportunities to leverage management practices and restoration activities within a locally selected watershed will allow multilayered benefits.

Currently, management practices that control sources, transformation, and delivery of nutrients are widely applied in various state and federal programs in Louisiana. Watershed management programs have been effective tools for addressing water quality; some of the most effective applications include controlling land use, restoring and maintaining the landscape, and utilizing USDA NRCS conservation practices (CPs; Figure 5 shows how to access current practices). A recent review in Mississippi coastal watersheds indicates total suspended solids and mineral phosphorus are reduced using ponds, wetlands, riparian buffers and combinations thereof (Bhattarai and Parajuli 2023).

Point source wetland assimilation projects that introduce nutrient-rich wastewater to natural wetlands can achieve tertiary levels of sewage treatment and stimulate wetland productivity. The state has adopted policy guidelines and regulations for utilizing wetlands to assimilate nutrients in municipal effluent, and as of 2024, posted signage is required for such projects (LDEQ 2017, 2023; HB474).

Many coastal programs within Louisiana are focused on combating land loss and salt-water intrusion. However, the 2023 Coastal Master Plan (CPRA 2023) focuses on projects that not only reduce risk from storms and flooding but also restore ecosystems and ecological functions (Figure 6). CPRA evaluated ecosystem services such as nutrient uptake potential in various habitats; the evaluation indicated that the management of existing and proposed Mississippi and Atchafalaya River diversions within the MARB could allow for substantial nutrient removal (Rivera-Monroy et al. 2017).

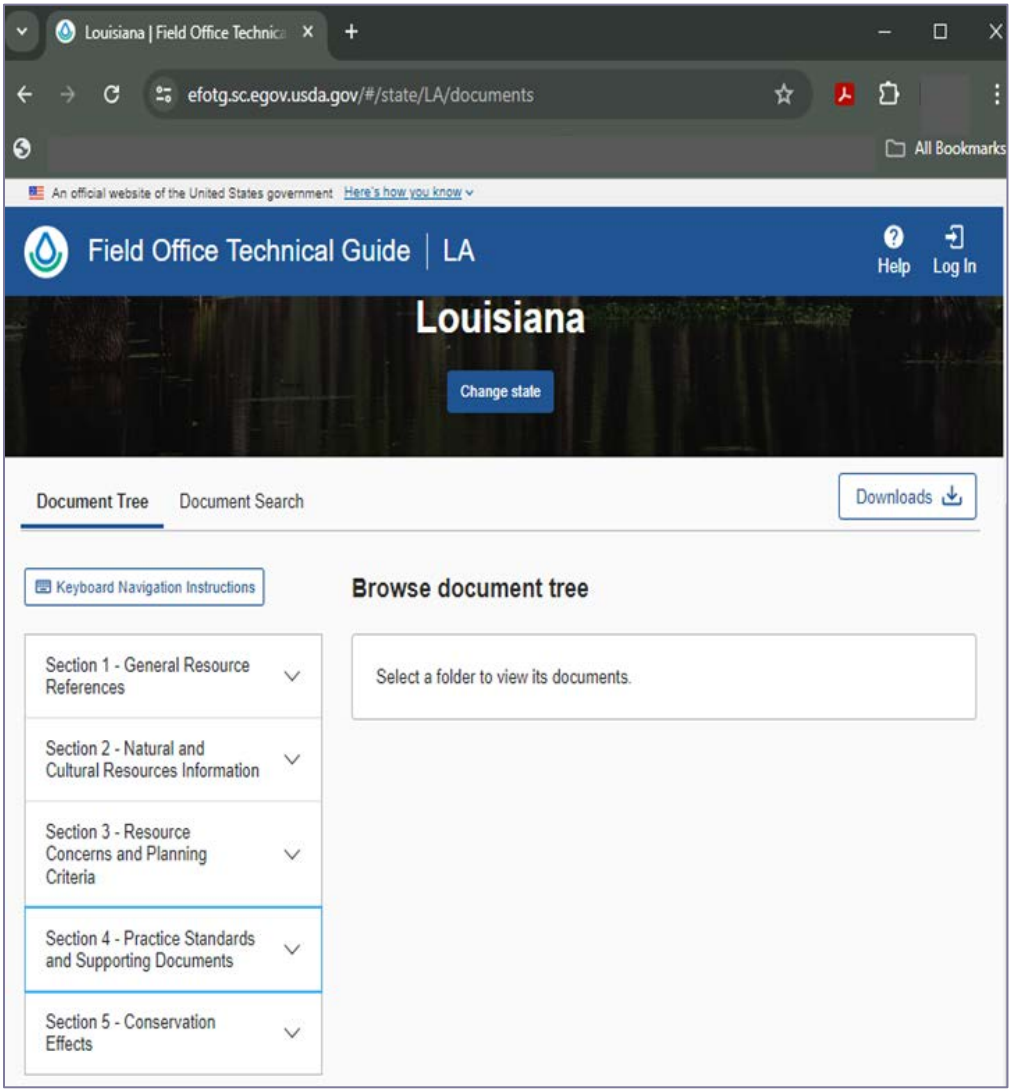


Figure 5. U.S. Department of Agriculture Natural Resources Conservation Service (USDA NRCS) conservation practices applicable to Louisiana (USDA NRCS 2024a).

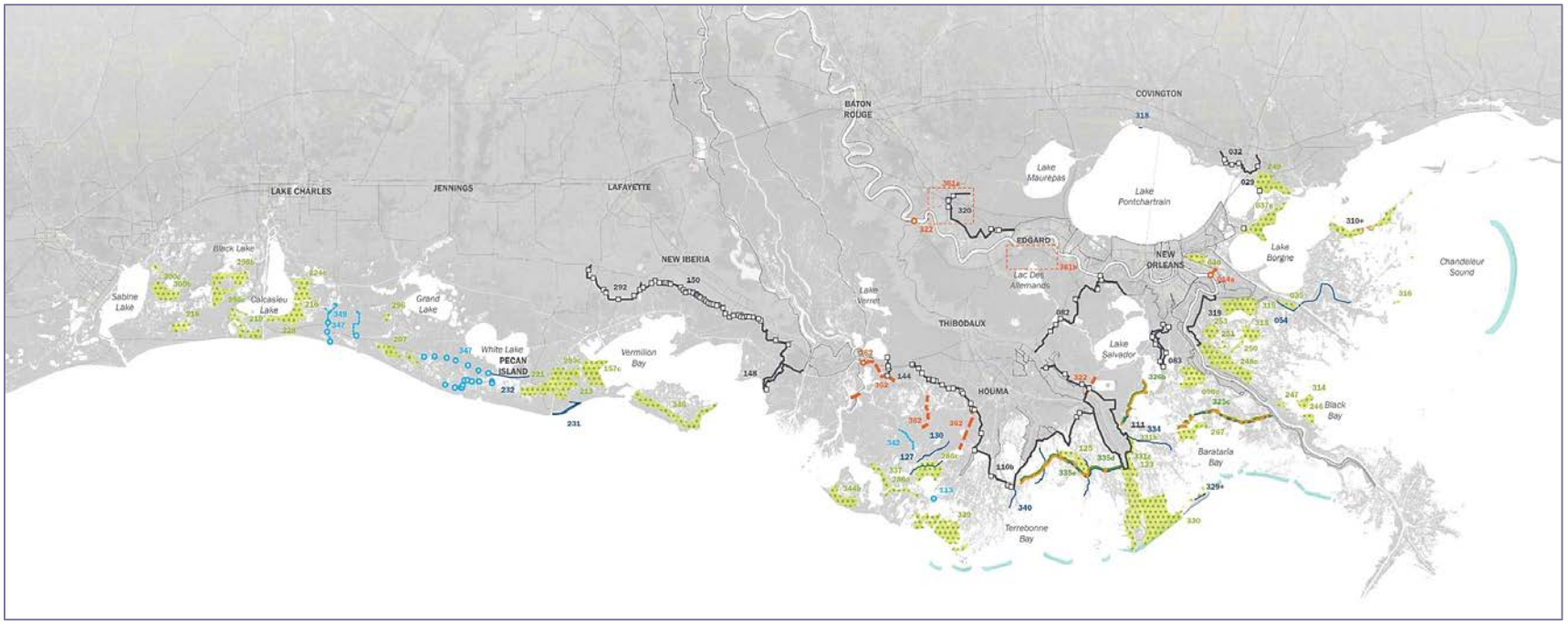


Figure 6. The 2023 Coastal Master Plan by the Coastal Protection Restoration Authority (CPRA; CPRA 2023) includes 77 restoration and protection projects within the state of Louisiana are necessary to build or maintain land and reduce flood risk.

The strategic actions for Management Practices & Restoration Activities under the Nutrient Reduction and Management Strategy are to:

a) Document current practices related to nutrient reduction and management
b) Identify areas where practices are being implemented
c) Identify case studies and model watersheds
d) Integrate science-based nutrient reduction and management approaches
e) Promote BMP/CP implementation by farm in priority watersheds

Strategic Actions are found in Appendix A. Strategy Annual Reports, where detailed projects and progress are summarized each year, are found on the Nutrient Strategy webpage (LDEQ 2024).

E.3.4 Activities

These types of activities are extensive and documented in Part II, Section F: Implementation of Louisiana's Nutrient Reduction and Management Strategy. Details on USDA, LSU Ag Center, practices and reporting are also in this Section.

E.3.5 Status & Trends

Documenting the status of nutrients and determining changes over time is a critical part of evaluating the success of nutrient reduction and management efforts in Louisiana.

The strategic actions for Status & Trends under the Nutrient Reduction and Management Strategy are to:

a) Model nutrient loading estimated within Louisiana watersheds
b) Document and determine trends for in-stream nutrient water quality (long-term)
c) Document and determine trends for social Indicators of nutrient reduction and management behavior
d) Document and determine trends for best management/conservation practice implementation in watersheds
e) Document and determine trends for permitted discharger inventories
f) Document coastal protection and restoration activities

Programs

LDEQ Ambient Water Quality Monitoring Network (AWQMN) provides data on nutrient levels within the state's water bodies (LDEQ 2024f).

LDEQ Permits Program manages point source discharges through the Louisiana Pollutant Discharge Elimination System (LPDES) Permit Program under Louisiana's Water Quality Regulations (LAC 33: Part IX) (LDEQ 2024g). As part of the management practices of LDEQ, permits are tracked yearly.

LDEQ Nonpoint Source Pollution (NPS) Program develops Watershed Implementation Plans (WIPs), which include an evaluation of the status and trends of historical water quality data for each priority water body that is targeted for partial and/or full restoration (LDEQ 2024j). For priority watersheds, the NPS Program collects data where activity is occurring, both as baseline and long-term through one-year post-activity (Section E.3.6, Prioritization).

CPRA Coastwide Reference Monitoring System (CRMS)-*Wetlands*, Barrier Island Comprehensive Monitoring (BICM 2018; CRMS 2024; Dalyander et al. 2021), and the System-Wide Assessment and Monitoring (SWAMP) programs provide data concerning restoration activities throughout the state (The Water Institute 2016).

Strategic Actions are found in Appendix A. Strategy Annual Reports, where detailed projects and progress are summarized each year, are found on the Nutrient Strategy webpage (LDEQ 2024).

E.3.5 Activities

LDEQ

- Long-term and seasonal trends and land-use correlations for concentrations of total kjeldahl nitrogen (TKN), nitrate-nitrite nitrogen (NOx), and total phosphorous (TP) trend analysis for 21 long-term Ambient Water Quality Monitoring Sites was completed in 2021. In general, nutrients are decreasing or remaining steady overall, with exceptions (LDEQ 2021). The report may be found on the Nutrient Strategy webpage (LDEQ 2024).
- The USGS, in cooperation with the HTF specifically, tracks nutrient loading to the GOA and reports yearly on progress. This occurs by examining flow-normalized trends and 5-year running averages. Trends and averages each support reporting goals of the HTF via different approaches (HTF 2024).
- The LDEQ Permits Program tracks number of permits (point source discharges) and those requiring nutrient monitoring by industry each year; these numbers may be used to further quantify inputs to Louisiana waterways in the future (Tables 3 and 4).
- LDEQ Nonpoint Source Pollution Program has WIPs for 12 watersheds accepted by EPA to receive CWA 319(h) funding for BMP implementation. Development of additional WIPs is ongoing. These plans include suggestions for where and what types of BMPs to implement for each watershed in order to reduce suspected causes of impairments, and thus restore use support in the watershed. To that end, in 2023 the NPS Annual Report estimated the reduction of nitrogen entering state waters by over nine tons, and reduction of phosphorus by nearly two tons. LDEQ projects that it will reduce over 50 tons of nitrogen and 12 tons phosphorus by 2027. Links for these activities are found on the LDEQ NPS Pollution

Program website (LDEQ 2024j). There are currently 10 NPS projects with nutrient monitoring

- Nearly 19,000 small business/community assistance requests were completed concerning water permitting in the Strategy reporting period (Section F.2.1, Table 13).

CPRA

- Mid-Barataria Diversion Final Environmental Impact Statement (FEIS) was officially published by the U.S. Army Corps of Engineers on September 23, 2022, representing a major milestone in the project's permitting process
  - The diversion is a first-of-its kind project and represents one of the largest and most innovative coastal restoration efforts ever the Mississippi River to sustainably restore and nourish thousands of acres of marsh
  - Feasibility, engineering, and design analyses projected the Mid-Barataria Sediment Diversion would create and sustain 28 square miles of land
  - The Delft3D water quality model, D-WAQ, was used to simulate dissolved nutrient dynamics in the Barataria and Breton receiving basins.

E.3.6 Watershed Characterization, Source Identification & Prioritization

Watershed characterization, source identification, and prioritization involve identifying the natural characteristics of land and water bodies found within watersheds, and identifying the possible suspected sources of nutrient pollution.

Characterization

Characterization includes land use, elevation, and nutrient sources related to the physical, chemical, and biological properties of the water bodies within a watershed, and involves delineating the watershed to identify the focal management unit addressed by the Strategy. Determining the attributes and characteristics relevant to nutrient water quality allows for prioritization of water bodies for nutrient management activities.

LDEQ's *Water Quality Management Plan, Volume 4 Basins and Subsegment Boundaries* describes the delineations of LDEQ water management units into basins/subsegments and the primary water body types within those units (LDEQ 2023). There are 12 basins within the state that are subdivided into nearly 500 subsegments. These water units are considered for priority watersheds identification and nutrient management activities.

USGS delineates Hydrologic Unit Codes (HUCs) that are also subdivided into successively smaller units (Seaber et al. 1987; USGS 2023). HUCs are another set of water management units that may be utilized in nutrient reduction and management activities; the state of Louisiana contains portions of four HUC2 (regional) watersheds, 12 HUC4 (subregions), 21 HUC6 (basins), 60 HUC8

(subbasins), 278 HUC10 (watersheds), and 1,276 HUC12 (sub-watershed) level watersheds delineated. USDA NRCS programs typically work within HUCs, and not within LDEQ water units.

The National Land Cover Database geographically categorizes the land use/land cover within the state of Louisiana as well as that of the nation (Dewiz 2023). The primary land use/land cover statewide in Louisiana is categorized as 29% wetlands, 21% forests, 17% open water, 14% cultivated crops, 7% developed areas, and 6% pasture/hay (Table 5). The distribution of these land use/land covers differ among basins and regions of Louisiana. Wetlands occur largely within the coastal area and Mississippi and Atchafalaya River delta regions of the state, whereas forests mainly occur in the central to northwestern portions as well as the eastern part of the state.

Table 3. Number and type of LPDES permits during the Strategy reporting period.

	Permit Type		
Year	Total No. Permits	General and Industrial	Stormwater
2019	14,166	11,971	2,200
2020	14,931	12,638	2,283
2021	14,972	12,535	2,441
2022	14,834	12,345	2,489
2023	14,900	12,446	2,453

Table 4. Nutrient monitoring by permit type as of August 2024. Gen=General Permit, Indiv=Individual Permit.[1]

	Nutrient Type	
Permit Type	Nitrogen, Total (As N)	Phosphorus, Total (as P)
Gen-LAG48-Light Commercial	25	24
Gen-LAG53-Sanitary Class I	771	727
Gen-LAG54-Sanitary Class II	227	214
Gen-LAG56-Sanitary Class III	18	18
Gen-LAG57-Sanitary Class IV	106	101
Indiv-Major-Industrial2	24	23
Indiv-Major-MS4	18	18
Indiv-Major-Sanitary	112	112

	Nutrient Type	
Indiv-Minor Industrial[2]	173	180
Indiv-Minor-Sanitary[2]	394	395
Grand Total	**1868**	**1812**

1. Multisector permits not included
2. Totals also include permits requiring nutrient limits (n=12).

Table 5. National Land Cover Database land use/land cover (LULC) classifications within watershed basins and statewide for state of Louisiana (Dewitz 2023). Statewide, wetlands account for nearly 27%, 19% forests, 18% open water, 15% cultivated crops, 6% developed areas, 8% shrub/scrub, and 5% pasture/hay of the LULC within Louisiana.

Watershed Basin	Hectares	Open Water	Barren	Developed, Open Space	Developed, Low Intensity	Developed, Medium intensity	Developed, High Intensity	Pasture/Hay	Cultivated Crops	Shrub/Scrub	Grassland/ Herbaceous	Forest (Deciduous, Evergreen, Mixed)	Woody Wetland	Emergent Herbaceous Wetlands	Unclassified
Atchafalaya River	575,823	23.8	0.0	0.7	0.9	0.2	0.1	2.2	11.0	0.1	0.2	0.5	51.8	8.5	0.1
Barataria	702,135	36.0	0.3	0.8	2.8	1.6	0.8	2.6	5.6	0.0	0.2	0.2	15.7	28.9	4.5
Calcasieu River	1,050,845	7.1	0.3	2.5	3.6	1.2	0.5	8.4	6.4	5.7	4.2	37.8	15.1	7.2	0.0
Lake Pontchartrain	2,052,781	37.7	0.3	3.0	3.1	2.2	0.9	5.6	0.5	1.9	1.1	13.6	15.3	10.2	4.6
Mermentau River	1,009,553	14.0	0.1	1.2	3.4	0.6	0.1	6.9	36.8	0.5	0.6	5.3	8.5	21.9	0.1
Mississippi River	536,026	44.3	0.6	1.6	1.0	0.7	0.5	4.8	2.7	0.7	0.4	13.4	17.2	8.8	3.2
Ouachita River	2,590,106	2.0	0.1	2.9	2.1	0.8	0.2	1.1	30.1	3.8	2.7	30.0	23.0	1.2	0.0
Pearl River	234,858	2.7	0.9	5.3	1.8	0.8	0.2	11.8	0.5	3.5	2.4	32.3	34.1	3.9	0.0
Red River	1,993,430	3.1	0.2	3.1	2.8	1.3	0.5	8.6	9.6	4.7	3.5	39.4	21.9	1.4	0.0
Sabine River	755,385	12.7	0.3	2.6	1.7	0.6	0.3	5.1	0.2	5.3	6.0	40.6	13.3	11.3	0.1
Terrebonne	1,012,555	33.8	0.1	1.1	2.3	1.1	0.5	4.2	9.5	0.1	0.2	0.2	20.0	26.8	0.1
Vermilion-Teche	1,055,275	17.9	0.1	3.0	4.5	1.5	0.5	12.2	23.3	0.6	0.6	7.9	16.6	11.1	0.0
State Total:	13,568,771	17.4	0.2	2.4	2.7	1.2	0.5	5.7	13.9	2.6	2.0	20.9	19.5	9.9	1.1

**Percent's may not add up to 100 due to rounding*

Crops are mainly located within the northeastern and southwestern part of the state (Figure 7). Developed areas are typically associated with larger cities within Louisiana and occur interspersed throughout the state. Other data sets including Geographic Information Systems (GIS) based data such as hydrology and elevation, and water quality monitoring data will be useful in characterizing watersheds for nutrient reduction and management activities.

Source Identification

Suspected sources of pollution within a given water body or watershed are investigated. Identification may be accomplished through desktop analyses or rapid assessment utilizing a multitude of GIS-based tools and water quality data to look at the land surrounding the water body. Windshield surveys, performed by driving around and inspecting the watershed of interest may also help acquire information on potential sources of nutrients; site visits also occur. Drone use is also being considered in this arena.

The LDEQ Compliance Monitoring Strategy (LDEQ 2024k) outlines approaches for monitoring permit compliance to aid in addressing potential point source issues. The LDEQ Surveillance Division performs Watershed Sweeps under the Compliance Monitoring Strategy to identify nonpoint sources and unpermitted point source dischargers within targeted subsegments. These sweeps are established through multiple collaborations within LDEQ and generally occur every year; 2024 Strategy period compliance monitoring reporting is found in Table 6.

Prioritization

Utilizing watershed characterization and source identification information allows for informed prioritization of water bodies for protection, improvement, and restoration of nutrient water quality.

Prioritization under LDEQ's Total Maximum Daily Load (TMDL) Program occurs through the USEPA's Long-Term Vision for Assessment, Restoration, and Protection under the Clean Water Act Section 303(d) Program. In 2022, USEPA released the 10-year Vision planning document and LDEQ has incorporated the guidance for prioritization and associated timelines (LDEQ 2014, 2024l; USEPA 2013, 2022a).

LDEQ's TMDL and NPS programs have developed identified additional measures, in conjunction with the Vison process, to help identify areas within Louisiana that are likely to show the greatest water quality improvement with effort. These measures include: (1) the presence/absence of a completed TMDL, (2) restoration potential of the water body, (3) water quality parameter trends, (4) parameter criteria of water body (5) impairment history, (6) the presence of potential watershed partners.

The prioritization approach includes collaborative efforts with LDAF/USDA NRCS concerning agricultural sources. In an effort to best utilize available resources, leveraging programs and initiatives are essential under this strategy. The LDEQ NPS Pollution Program and partners have determined 38 water bodies have water quality impairments associated with nutrient and/or

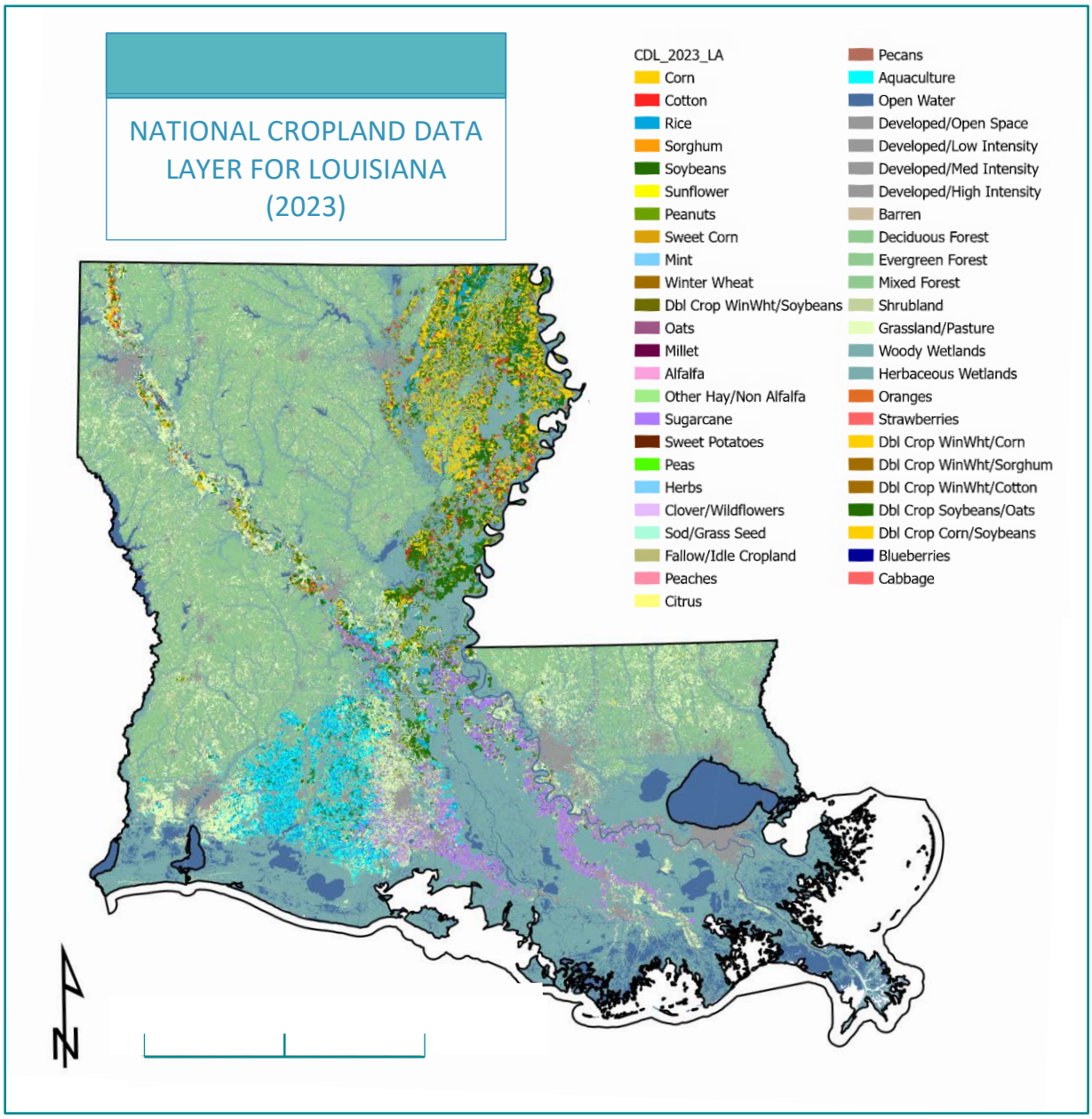


Figure 7. Land use/land cover (LULC) plays a major role in watershed characterization in Louisiana. Here, crop types within the state are highlighted (USDA NASS 2023). Wetlands occur largely within the coastal area and Mississippi and Atchafalaya River delta regions of the state, whereas forests mainly occur in the central to northwestern portions as well as the eastern part of the state. Crops are mainly located within the northeastern and southwestern part of the state.

Table 6. Watershed Inspections for 2024 Strategy reporting period.

LDEQ Water Unit	Waterbody Segment Description	Year (Fiscal Year)[1]	Inventory/ Inspections	Notice of Deficiency (NOD)
LA040809_00	Black River	2022	12	5
LA040402_00	Amite River Diversion Canal	2022	17	6
LA080908_00	Lake Lafourche	2022	2	2
LA060801_00	Upper Vermilion River	2022	23	6
LA080802_00	Cheniere Brake Lake	2021	36	31
LA040809_00	Black River	2021	12	5
LA120605_00	Pointe Au Chien	2020	12	4
LA081203_00	Lake Bruin	2020	4	4
LA080904_00	Bayou Pointe Au Chien – from headwaters to St. Louis Canal	2020	7	2
LA050103_00	Bayou Mallet - From headwaters to Bayou Des Cannes	2019	15	6
LA060501_00	Bayou Teche – from Charenton Canal to Wax Lake Outlet	2019	22	3
LA120605_00	Bayou Pointe Au Chien – from headwaters to St. Louis Canal	2019	12	
LA030702_00	English Bayou – from headwaters to Calcasieu River*	2019	46	27
LA050601_00	Lacassine Bayou – form headwaters to Grand Lake*	2019		

*combined reporting displayed in LA030702_00

[1]Fiscal years begin July 1 and end June 30th of following year; all of reporting year may not be available.

bacterial sources (LDEQ 2023a; Table 7, Figure 8). Five of the listed waterbodies are expected to be developed under an additional addendum to the Nonpoint Source Pollution Program Management Plan in 2024.

USDA NRCS initiatives within Louisiana have prioritized watersheds for restoration activities associated with conservation practices through the USDA National Water Quality Initiative (NWQI) and Mississippi River Basin Initiative (MRBI; Table 8). These programs target watersheds and bayous across the state, with MRBI focusing on reducing fall tillage and increasing cover cops/residue for soil loss reduction. Additionally, URDA NRCS assists producers and/or landowners in improving nutrient management techniques above their current level to increase nutrient utilization. NRCS Public Outreach, Louisiana Office Soil & Water Conservation Districts (SWCDs) Section 319 and Louisiana Department of Agriculture and Forestry (LDAF) and other partners develop targeted outreach plans to reach every producer within the watershed. Conservation planning and technical assistance are offered at no charge to help producers address the watershed goals and to improve water quality such as installing specific practices to reduce soil erosion.

The strategic actions for Watershed Characterization, Source Identification, & Prioritization under the Nutrient Reduction and Management Strategy are to:

a) Maintain watershed and/or water body characterization through time
b) Identify potential pollution sources through desktop analysis/windshield survey
c) Identify unpermitted point sources
d) Identify priority watersheds from leveraging programs
e) Determine priority watershed & subwatershed basins
f) Develop priority watershed scheme for basin subwatersheds
g) Develop/leverage watershed nutrient reduction and management projects for priorities

Strategic Actions are found in Appendix A. Strategy Annual Reports, where detailed projects and progress are summarized each year, are found on the Nutrient Strategy webpage (LDEQ 2024).

E.3.6 Activities

- Prioritization activities are summarized in Tables (7-8) and Figures (8-9) below, and are described in text of this section.

Table 7. The LDEQ Nonpoint Source Program (LDEQ 2023a) identifies priory watersheds through 2027.

SUBSEGMENT ID	NAME	DESCRIPTION	BASIN	2022 STATUS
LA030801_00	West Fork Calcasieu River	From confluence with Beckwith Creek and Hickory Branch to mainstem of Calcasieu River	Calcasieu	TBD
LA030804_00	Little River	From headwaters to West Fork Calcasieu River	Calcasieu	TBD
LA030805_00	Indian Bayou	From headwaters to West Fork Calcasieu River	Calcasieu	TBD
LA030806_00	Houston River	From Bear Head Creek at La. Highway 12 to West Fork Calcasieu River	Calcasieu	TBD
LA040103_00	Comite River	Comite River-From White Bayou to Amite River	Pontchartrain	OSDS Inspections
LA040302_00	Middle Amite River	Amite River-From La. Highway 37 to LMRAP Ecoregion boundary	Pontchartrain	OSDS Inspections
LA040403_00	Blind River	From headwaters to Amite River Diversion Canal (Scenic)	Pontchartrain	New Vision
LA040404_00	New River	From headwaters to New River Canal	Pontchartrain	New Vision
LA040503_00	Natalbany River	From headwaters to La. Highway 22	Pontchartrain	New Vision
LA040504_00	Yellow Water River	From headwaters to Ponchatoula Creek	Pontchartrain	New Vision
LA050101_00	Bayou des Cannes	From headwaters to Mermentau River	Mermentau	Implementation
LA050103_00	Bayou Mallet	From headwaters to Bayou Des Cannes	Mermentau	Implementation
LA050201_00	Bayou Plaquemine Brule	From headwaters to Bayou Des Cannes	Mermentau	TBD
LA050301_00	Bayou Nezpique	From headwaters to Mermentau River; includes intermittent portion of Beaver Creek	Mermentau	TBD
LA050303_00	Castor Creek	From headwaters to Bayou Nezpique	Mermentau	TBD
LA050304_00	Bayou Blue	From headwaters to Bayou Nezpique	Mermentau	TBD

SUBSEGMENT ID	NAME	DESCRIPTION	BASIN	2022 STATUS
LA050401_00	Mermentau River	From headwaters to Lake Arthur	Mermentau	TBD
LA050501_00	Bayou Queue de Tortue	From headwaters to Mermentau River	Mermentau	Implementation
LA050601_00	Lacassine Bayou	From headwaters to ICWW	Mermentau	Implementation
LA050603_00	Bayou Chene	From headwaters to Lacassine Bayou; includes Bayou Grand Marais	Mermentau	Implementation
LA060201_00	Bayou Cocodrie	From US Highway 167 to Bayou Boeuf-Cocodrie Diversion Canal (Scenic)	Vermilion-Teche	TBD
LA060204_00	Bayou Courtableau	From headwaters to West Atchafalaya Borrow Pit Canal	Vermilion-Teche	Planning
LA060208_00	Bayou Boeuf	From headwaters to Bayou Courtableau	Vermilion-Teche	TBD
LA060301_00	Bayou Teche	From headwaters at Bayou Courtableau to Keystone Locks and Dam	Vermilion-Teche	TBD
LA060401_00	Bayou Teche	Bayou Teche-From Keystone Locks and Dam to Charenton Canal	Vermilion-Teche	TBD
LA060501_00	Bayou Teche	Bayou Teche-From Charenton Canal to Wax Lake Outlet	Vermilion-Teche	TBD
LA060703_00	Bayou Du Portage	From headwaters to Dauterive Lake	Vermilion-Teche	Implementation
LA060801_00	Vermilion River	From headwaters to La. Highway 3073 bridge	Vermilion-Teche	Implementation
LA060802_00	Vermilion River	From La. Highway 3073 bridge to ICWW	Vermilion-Teche	TBD
LA070501_00	Bayou Sara	From Mississippi state line to Mississippi River	Mississippi	New Vision
LA070502_00	Thompson Creek	Thompson Creek-From Mississippi state line to Mississippi River	Mississippi	OSDS Inspections
LA070505_00	Tunica Bayou	From headwaters to Mississippi River	Mississippi	New Vision
LA080401_00	Bayou Bartholomew	From Arkansas state line to Ouachita River; also known as Bayou Desiard and Lake	Ouachita	Planning

SUBSEGMENT ID	NAME	DESCRIPTION	BASIN	2022 STATUS
		Bartholomew (Scenic to Dead Bayou)		
LA080903_00	Big Creek	From headwaters to Boeuf River; includes Big Colewa Bayou	Ouachita	TBD
LA080904_00	Bayou Lafourche	From headwaters to Boeuf River near Columbia	Ouachita	TBD
LA081101_00	Lake Providence	Lake Providence	Ouachita	TBD
LA081202_00	Lake St. Joseph	Lake St. Joseph	Ouachita	Planning
LA081609_00	Hemphill Creek	From headwaters to Catahoula Lake; includes Hair Creek	Ouachita	Implementation
LA101601_00	Bayou Cocodrie	From Little Cross Bayou to Wild Cow Bayou (Scenic)	Red	TBD
LA120103_00	Bayou Choctaw	From Bayou Poydras to ICWW	Terrebonne	TBD
LA120104_00	Bayou Grosse Tete	From headwaters to ICWW	Terrebonne	Planning
LA120111_00	Bayou Maringouin	From headwaters to East Atchafalaya Basin Levee	Terrebonne	Planning
LA120302_00	Bayou Folse	From headwaters to Company Canal	Terrebonne	Implementation

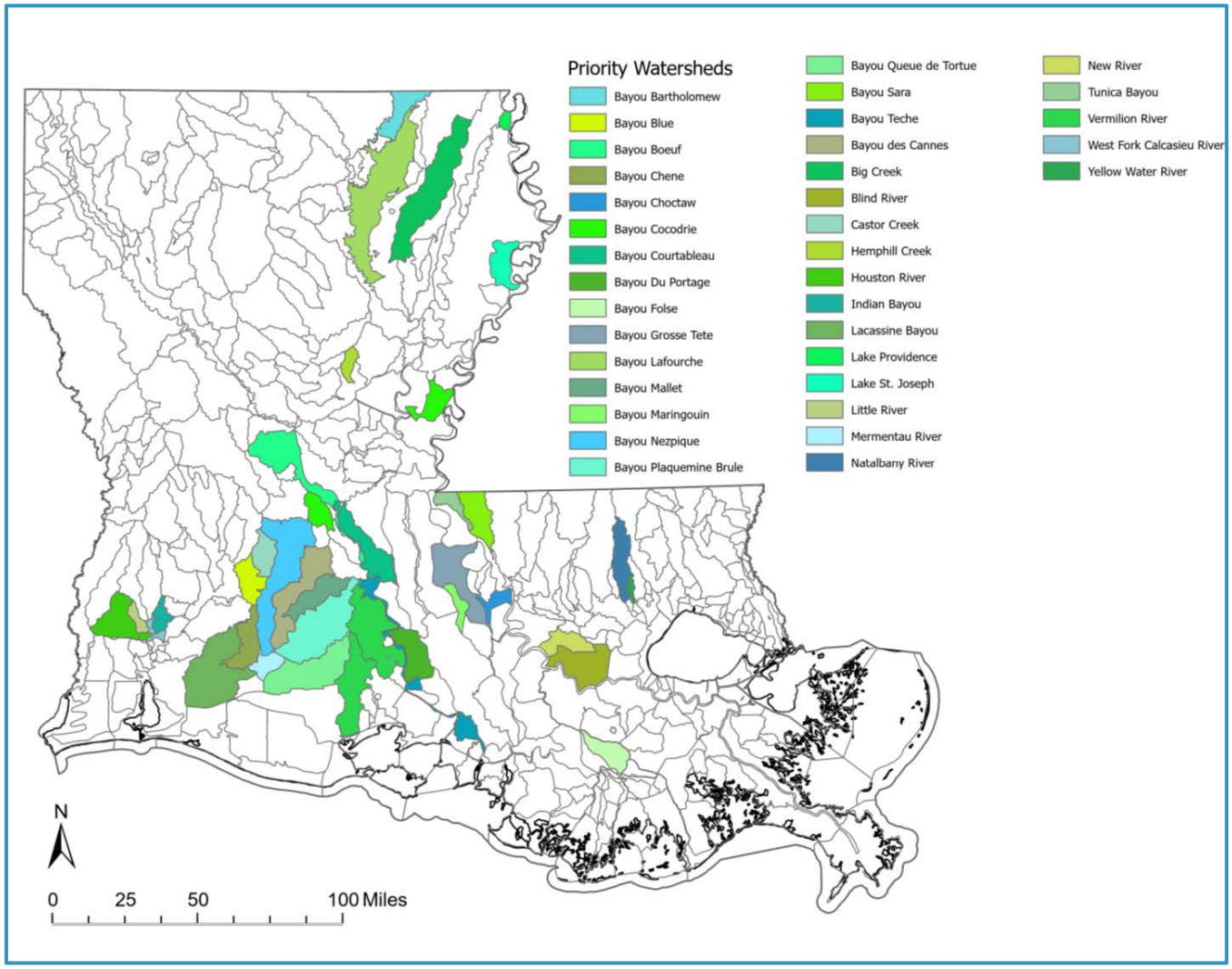


Figure 8. The LDEQ Nonpoint Source Program (LDEQ 2023a) identifies planned activities and priority watersheds for activities through 2027. Five additional water bodies are anticipated, and are identified in Table 7.

Table 8. Priority watersheds for conservation through USDA initiatives in Louisiana: the National Water Quality Initiative, (NWQI) and the Mississippi River Basin Health Watersheds Initiative (MRBI).

NWQI 2020-2024

12-Digit HUC Code	12-Digit HUC Name
080802010206	Bayou Blanc-Bayou Plaquemine Brule
080802010208	Bayou Plaquemine Brule-Estherwood

NWQI Louisiana has received funds for fiscal year (FY) 24 in high-priority (critical acres) to address Water Quality Degradation - Nutrients in Surface or Ground Waters. FY20-23 LA NRCS EQIP NWQI- Blanc-Plaquemine Brule Watershed Complex has seven (7) completed contracts and four (4) contracts that are still active. The contracts covered 2153 acres of watershed area and over $200K has be allocated toward this project.

MRBI 2020-2024

10/12-Digit HUC Code	12-Digit HUC Name
08050030402	Wildhorse Bayou-Tensas River
08050030407	Bieler Bayou-Tensas River
080500020403	Hill Bayou-Bayou Macon
080500020501	Baxter Bayou
080402070301	Tiger Bayou

MRBI Louisiana FY19 funds were $1,183,177 obligated on 7207 acres; FY20 $59,039 obligated on 996 acres, FY21 $77,351 obligated on 5182 acres and FY22 $157,778 obligated on 1051 acres. In FY23, MRBI $312,646 dollars were obligated on 2,021 acres for the Hill Bayou-Bayou Macon and Baxter Bayou. These watersheds have a 5-year project life. In FY23, $233,498 dollars were obligated on 1481 acres for the MRBI Tensas Bayou Watershed Complex. These watersheds contracts have a 5-year project life. Tiger Bayou Watershed Complex in FY20, $119,865 dollars obligated on 360 acres. FY21 $47,394 dollars obligated on 210 acres. These watersheds have a 5-year project life.

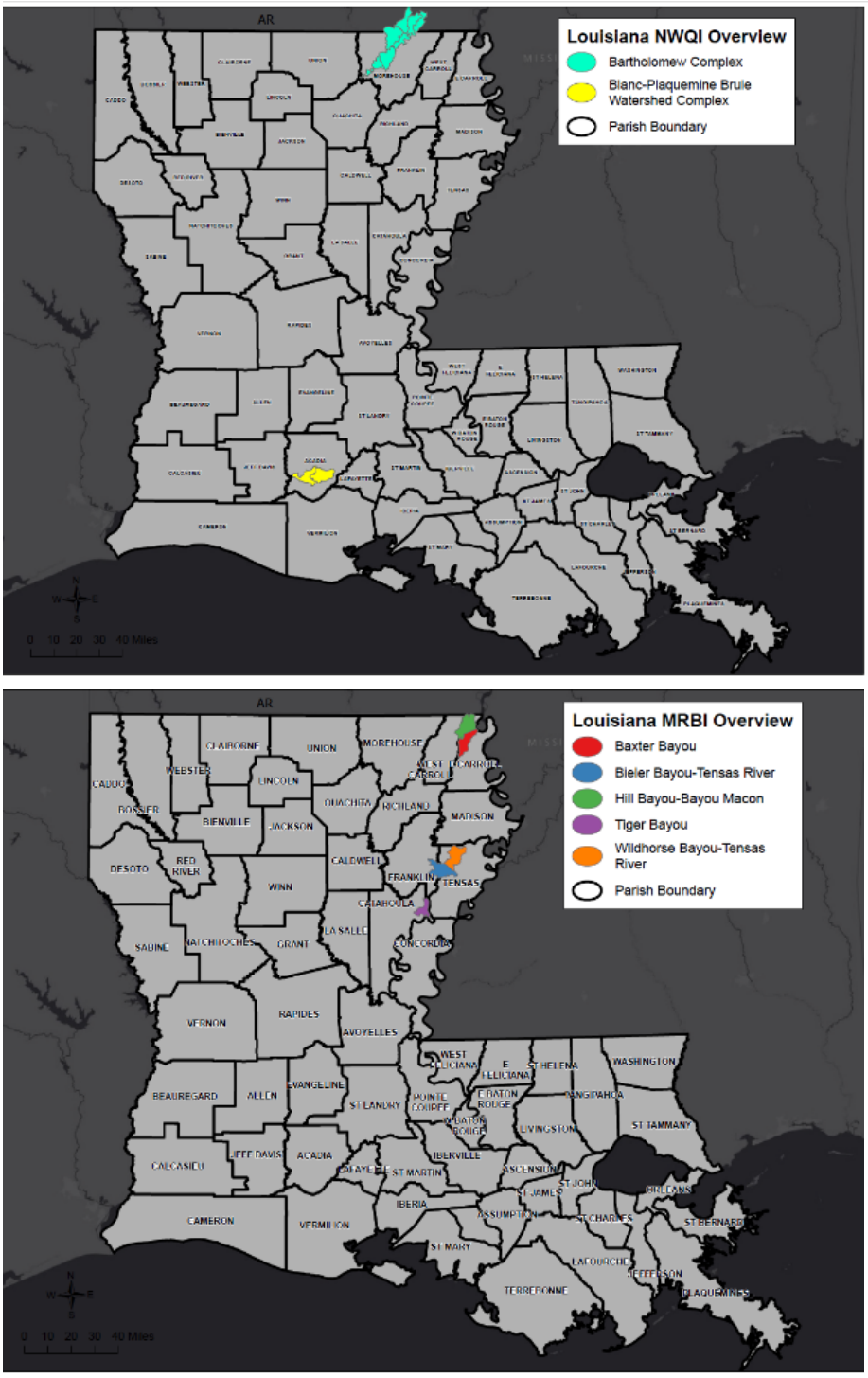


Figure 9. Watershed characterization, source identification, and prioritization are essential to the success of the Louisiana Nutrient Reduction and Management Strategy. USDA NRCS National Water Quality Initiative (NWQI) and Mississippi River Basin Healthy Watersheds Initiative (MRBI) are identified.

E.3.7 Incentives, Funding & Economic Impact Analyses

Ensuring that adequate technical assistance and funding are available for the implementation of voluntary nutrient reduction and management strategies will improve participation and minimize economic losses associated with strategy implementation.

Funds from LDEQ, LDAF, USDA, USEPA, and local parish governments provide economic incentives and technical support for the execution of conservation practices (CPs) in priority watersheds. Government agency agreements and/or partnerships with other agencies and outside programs, including non-profits, often leverage various aspects of programs (e.g., funds, personnel, equipment, data collection and reporting) and offer incentives to improve performance.

Economic impact analyses may be necessary in order to determine the relative costs associated with improving water quality through nutrient management for point and nonpoint source inputs. Determining economic impacts is of interest to the regulatory and non-regulatory stakeholders; specific economic impact analyses may be warranted to determine costs associated with various nutrient reduction and management activities and implementation in relation to economic gains of Louisiana agriculture. These costs are addressed in Section F.3.3. Economic Costs.

Louisiana agriculture was responsible for over $11 billion for the top 10 commodities in 2023, representing increase of $1.2 billion from 2017 values (LSU AgCenter 2024; Figure 10). The increase in agricultural revenue was accounted for primarily by increases in feed grain crops and sugarcane (about $500 million increase each), with subsequent increases in cattle, horse, aquaculture, and rice commodities.

Voluntary programs opportunities for financial and technical assistance, and synergies and partnering opportunities are sought for leveraging nutrient reduction and management projects with other entities.

Programs

LSU Ag Center's Master Farmer program is administered by LDAF to educate and certify agricultural producers (Master Farmer) through classroom education and the development of a nutrient management plan for their specific operations (Sections F.1.2 and F.3.2.3.1).

LDEQ's Environmental Leadership Program (ELP) administered by LDEQ recognizes industries for taking voluntary steps to improve water quality through nutrient management (Section F.3.2.5). The ELP recognizes industry leaders that take the initiative to make voluntary reductions in nutrient discharge above and beyond their permit requirements.

Louisiana developed a Water Quality Trading (WQT) Program in 2019 (WQ009; LDEQ 2024). Implementation of this activity is ongoing (Section F.3.5). An effective WQT program could lead to greater nutrient reductions in the lower Mississippi River Basin and the Gulf of America more quickly and at a lower overall cost than traditional regulatory approaches. In addition, WQT is a

cost-effective approach for reducing nutrients and improving water quality that could provide some point sources and agriculture businesses the opportunity to generate revenues, and offer local regulators more policy options for improving water quality. In 2021, the program was amended to allow projects with public conservation funds eligibility to participate unless otherwise prohibited by the terms and conditions of the public conservation funded project.

Strategy team members, along with federal and/or non-profit partners, coordinate funding and incentive opportunities to support nutrient reduction activities throughout the state.

The strategic actions for Incentives, Funding, & Economic Impact Analyses under the Nutrient Reduction and Management Strategy are to:

a) Promote voluntary participation in incentive-based programs
b) Identify and communicate new funding initiatives/projects
c) Promote assistance (financial or technical) for BMP/CP implementation
d) Promote assistance (financial or technical) for point sources
e) Document economic impacts from available sources
f) Develop and implement a water quality water quality credit trading program

Strategic Actions are found in Appendix A. Strategy Annual Reports, where detailed projects and progress are summarized each year, are found on the Nutrient Strategy webpage (LDEQ 2024).

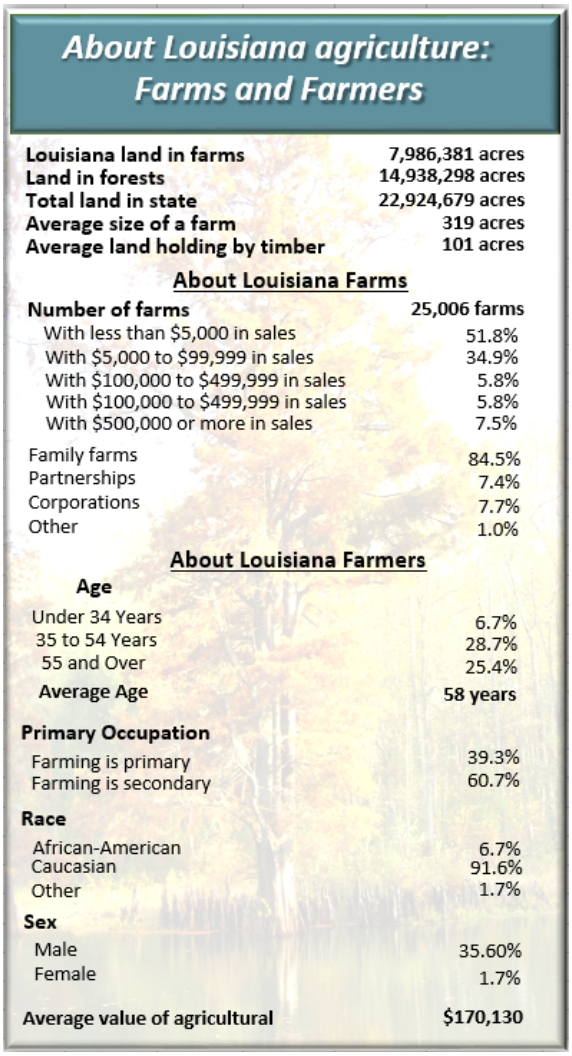
E.3.7 Activities

- ELP now supports 300 members, and distributed five nutrient-related awards during this Strategy reporting period (Section F.3.2.5).
- USDA continues to provide funding for agricultural and forestry efforts, most notably through the US Farm Bill. The 2018 US Farm Bill was extended until September 30, 2024. Funding and incentive details are found in Section F.3 and Figures 16-18.
- Additional investments have become available primarily through the 2021 Infrastructure Investment and Jobs Act (IIJA: Pub. L. No. 117-58 (2021)) and the Inflation Reduction Act (IRA; Public Law No. 117-169 (2022)).
  - IIJA (or BIL):
    - Investments include ~$5.5 billion from IIJA to the USDA Forest Service (~$3 billion to wildfire risk reduction and ecosystem restoration) and a total of $894 million to the USDA NRCS for watershed programs (USDA 2024c, 2024d).
    - ~1.5 billion was allocated by USDA to assist farmers through the Regional Conservation Partnership Program (RCPP) for Conservation and Climate-Smart Agriculture (USDA 2024e).
    - US EPA Hypoxia Task developed the Gulf Hypoxia Program to distribute $60 million to the 12 member states to support nutrient reduction strategies (USEPA 2024e)

- Louisiana to receive ~$4.2 million primarily towards agriculture conservation measures (Sections E.3.3 and F.4 Leveraging Opportunities)
- Lower Mississippi River Sub-basin Committee to receive ~ $1.2 million (to be determined)

❖ IRA:

- Investments include ~ $20 billion in new conservation funding to support climate-smart agriculture and associated conservation programs that are oversubscribed, including (USDA 2024b):
  - $8.45 billion for EQIP
  - $4.95 billion for the Regional Conservation Partnership Program (RCPP)
  - $3.25 billion for the Conservation Stewardship Program (CSP)
  - $1.4 billion for the Agricultural Conservation Easement Program (ACEP).



About Louisiana agriculture: Farms and Farmers

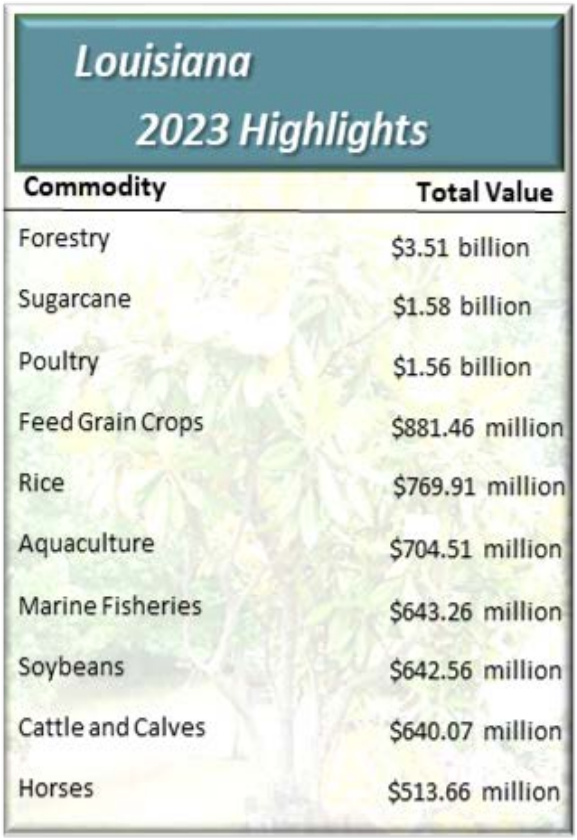
Louisiana land in farms	**7,986,381 acres**
Land in forests	**14,938,298 acres**
Total land in state	**22,924,679 acres**
Average size of a farm	**319 acres**
Average land holding by timber	**101 acres**

About Louisiana Farms

Number of farms	**25,006 farms**
With less than $5,000 in sales	51.8%
With $5,000 to $99,999 in sales	34.9%
With $100,000 to $499,999 in sales	5.8%
With $100,000 to $499,999 in sales	5.8%
With $500,000 or more in sales	7.5%
Family farms	84.5%
Partnerships	7.4%
Corporations	7.7%
Other	1.0%

About Louisiana Farmers

Age	
Under 34 Years	6.7%
35 to 54 Years	28.7%
55 and Over	25.4%
Average Age	**58 years**
Primary Occupation	
Farming is primary	39.3%
Farming is secondary	60.7%
Race	
African-American	6.7%
Caucasian	91.6%
Other	1.7%
Sex	
Male	35.60%
Female	1.7%
Average value of agricultural	**$170,130**



Louisiana 2023 Highlights

Commodity	Total Value
Forestry	$3.51 billion
Sugarcane	$1.58 billion
Poultry	$1.56 billion
Feed Grain Crops	$881.46 million
Rice	$769.91 million
Aquaculture	$704.51 million
Marine Fisheries	$643.26 million
Soybeans	$642.56 million
Cattle and Calves	$640.07 million
Horses	$513.66 million

Figure 10. Economics play an important role in agricultural production. Agricultural production within the state of Louisiana totaled about 11.4 billion in 2023 for the top ten commodities. With the average value produced by a farm in Louisiana valued at $170K among 25,000^{+} farms within the state, Louisiana has a major stake in agriculture production (LSU Ag Center 2024a). The number of farms since 2017 has decreased by about 1,500.

E.3.8 Targets and Goals

Targets and Goals under the Strategy will focus on the strategic actions outlined in the other nine strategic components and the agency commitments, timelines, and milestones. A timeline from 2024 to 2029 is presented for the updated 2024 Strategy, which allows for interim milestones for charting progress. All strategic actions, including agency commitments, timelines, and milestones, are presented in Appendix A. This table provides a very brief outline concerning all Actions in Section E.3 of this document and can be used as a reference.

In 2029, an assessment of the strategy will be conducted to allow for indication of progress to date and updates based on new information that has become available. Amendments or adjustments to strategic actions may occur as necessary. An adaptive management approach among and across partners allows us to capitalize on the successes, incorporate new science as it becomes available, and reconsider management activities that are found to be less effective. Short-term assessments of progress to date allows Louisiana entities to chart progress, make adjustments, and integrate new research, technologies, and opportunities into the Strategy.

Other Louisiana programs such as the LDEQ NPS Pollution Program and CPRA 2023 Coastal Master Plan utilize a 5- or 6-year timeline for program evaluation that incorporates adaptive management. The adaptive approach is crucial to ensuring that the methods for managing nutrients remain effective and that results demonstrate successful nutrient management within Louisiana and the MARB.

Information on reporting may be found in 'About this Document' on page ii of this document and in Appendix E, Section A.1. Strategy Annual Reports, where detailed projects and progress are summarized each year, are found on the Nutrient Strategy webpage (LDEQ 2024).

E.3.9 Monitoring

Monitoring will allow for documentation of nutrient levels and other relevant information regarding nutrient management activities. Monitoring will facilitate the demonstration and verification that nutrient management measures are having the desired effect on water quality, and provide information on pre-implementation conditions.

Programs

LDEQ:

*Ambient Water Quality Monitoring Networ*k (AWQMN; Figure 11)

- Through the LDEQ AWQMN, the agency monitors in-stream water column water quality in water bodies across the state in fulfillment of Clean Water Act responsibilities. Results of the LDEQ ambient water quality monitoring are available through the AWQMN LEAU Web Portal (LDEQ 2024d, 2024f).

Nonpoint Source Pollution Program

- LDEQ Nonpoint Source Pollution Program monitors watersheds where NPS activities are occurring to address water body impairments through implementation of conservation practices (LDEQ 2023a). Results from these activities are reported out in

the LDEQ NPS Annual Report (LDEQ 2024j). There are currently 10 NPS projects with nutrient monitoring:

- Lake St Joseph
- Grosse Tete
- Maringouin
- Folse
- Des Cannes
- Queue de Tortue
- Chene
- Vermilion
- DuPortage
- Hemphill

Louisiana Pollutant Discharge Elimination System (LPDES) Permit Program

- Municipal Separate Storm Sewer (MS4): storm water permittees discharging to waters with dissolved oxygen/nutrient TMDLs are required to develop monitoring programs to evaluate the effectiveness of BMPs to control pollutants in runoff.
- Facility nutrient monitoring: collects nutrient effluent monitoring data from major facilities discharging to the Mississippi River. In May 2016, LDEQ began executing the Point Source Implementation Strategy as a means to track point source nutrient contributions, especially of Publicly Owned Treatment Works (LDEQ 2017). Nutrient data may be found on US EPA's Integrated Compliance Information System (USEPA 2024j).
- General permits: monitoring occurs for nutrient (e.g. nitrogen and phosphorus) and/or nutrient-related parameter (e.g. nitrate/nitrite-nitrogen) for specific sectors and subsectors within each of the following industry categories: chemical and allied products, metal mining, mineral mining and dressing, food and kindred products, and fabricated metal products. A requirement of the monitoring process is the reporting of nutrient (and other pollutants) to the LDEQ and USEPA via Discharge Monitoring Reports (DMRs; LDEQ 2024h, 2024i).
- Point source wetland assimilation: permittees are required to monitor nutrients in their effluent, and the LPDES program collects and analyses the results (Section F.2.2).

CPRA:

- *Coastwide Reference Monitoring System (CRMS)-Wetlands (2024)*
  The Coastwide Reference Monitoring System (CRMS) was designed to monitor the effectiveness of restoration actions at multiple spatial scales from individual projects to the influence of projects on the entire coastal landscape. The CRMS design includes a suite of sites encompassing a range of ecological conditions in swamp habitats and fresh, intermediate, brackish, and salt marshes.
- *System-Wide Assessment and Monitoring Program* (SWAMP).
  SWAMP was initially implemented as a pilot project in Barataria Basin (west of the Mississippi River), and subsequently expanded to hydrologic basins east of the

Mississippi River. SWAMP provides leveraging of resources and monitoring across several data types including water quality within Louisiana's coastal zone (Figure 12). Both programs house data within CPRA's Coastal Information Management System (CIMS) database.

Strategy Partners:

Edge of field monitoring may occur for NPS projects via partners to capture nutrient losses at the field level.

The strategic actions for Monitoring under the Louisiana Nutrient Reduction and Management Strategy are to:

a) Monitor in-stream nutrient water quality
b) Monitor water quality relative to BMP/CP implementation
c) Monitor nutrients associated with riverine diversions
d) Monitor nutrients in point sources
e) Evaluate compliance with point source permits
f) Identify and communicate new monitoring projects/initiatives

Strategic Actions are found in Appendix A. Strategy Annual Reports, where detailed projects and progress are summarized each year, are found on the Nutrient Strategy webpage (LDEQ 2024).

E.3.9 Activities

- Fulfilling requirements in the Point Source Implementation Strategy (2017), nutrient monitoring requirements have been established in 98% of all individual sanitary treatment plants as of December 2023.
- A review of DMRs submitted to LDEQ online through the NetDMR system to USEPA Integrated Compliance Information System (ICIS) was conducted for Total Nitrogen (TN, STORET code 00600) and Total Phosphorus (TP, STORET code 00665) requirements. Over eighty-seven thousand data records were examined from January 1, 2019 to December 31, 2023 for reporting compliance. Overall, about 93% of DMRs were successfully submitted for both nutrients, resulting in approximately 7% data violations that may have been related to overdue reporting or non-receipt. Of the 1,460 records with TN or TP limits, only about 1.3% of the DMR submissions contained effluent violations.
- GOAA
  - A Gulf of Mexico Monitoring Community of Practice (GOM MCoP) was developed through GOAA to provide a forum for the dissemination of information from select monitoring activities throughout the GOA, and will enable interested parties to identify projects that can potentially fulfil nutrient data needs and gaps (GOMA 2016; GoM MCoP 2018). The *Gulf of America Alliance Open Data Platform* (GOAOD) is currently functional, with additions and improvements expected in the next couple of years (GOAA 2024).

- The GOAA Water Resource Team has provided funding (IIJA) for enhanced hypoxia monitoring during the 2024 and 2025 annual NOAA hypoxia cruises:
    - Nutrient data collection and analysis for all sites continued
    - Hypoxia monitoring east of the Mississippi river added to these cruise dates
- GOAA is also supporting nutrient reduction in Morehouse Parish watersheds in NE Louisiana using agricultural conservation practices; pre- and post-monitoring are part of this project

❖ CPRA

- The Mid-Barataria Diversion Monitoring and Adaptive Management Plan is being implemented, including:
    - Chlorophyll-a in Barataria Surface Waters
    - Phytoplankton Species Composition (including Harmful Cyanobacterial/Algal Bloom Species)
    - Harmful Cyanobacterial/Algal Bloom Toxins in Barataria Surface Waters

❖ LDEQ

- AWQMN Program
    - During the 2022/2023 water sampling year (November 2022 through October 2023), LDEQ monitored approximately 151 sites in 149 subsegments for in-stream water column concentrations of nitrogen (nitrate-nitrite and TKN) and phosphorus (TP)
- NPS Pollution Program
    - Project monitoring associated with nutrient related activities with partners is ongoing
- Permit nutrient monitoring has been established in ~all facilities required to do so; data is publicly available through USEPA's ECHO database (2025), LDEQ EDMS (2025), or through a public records request (LDEQ 2025a).

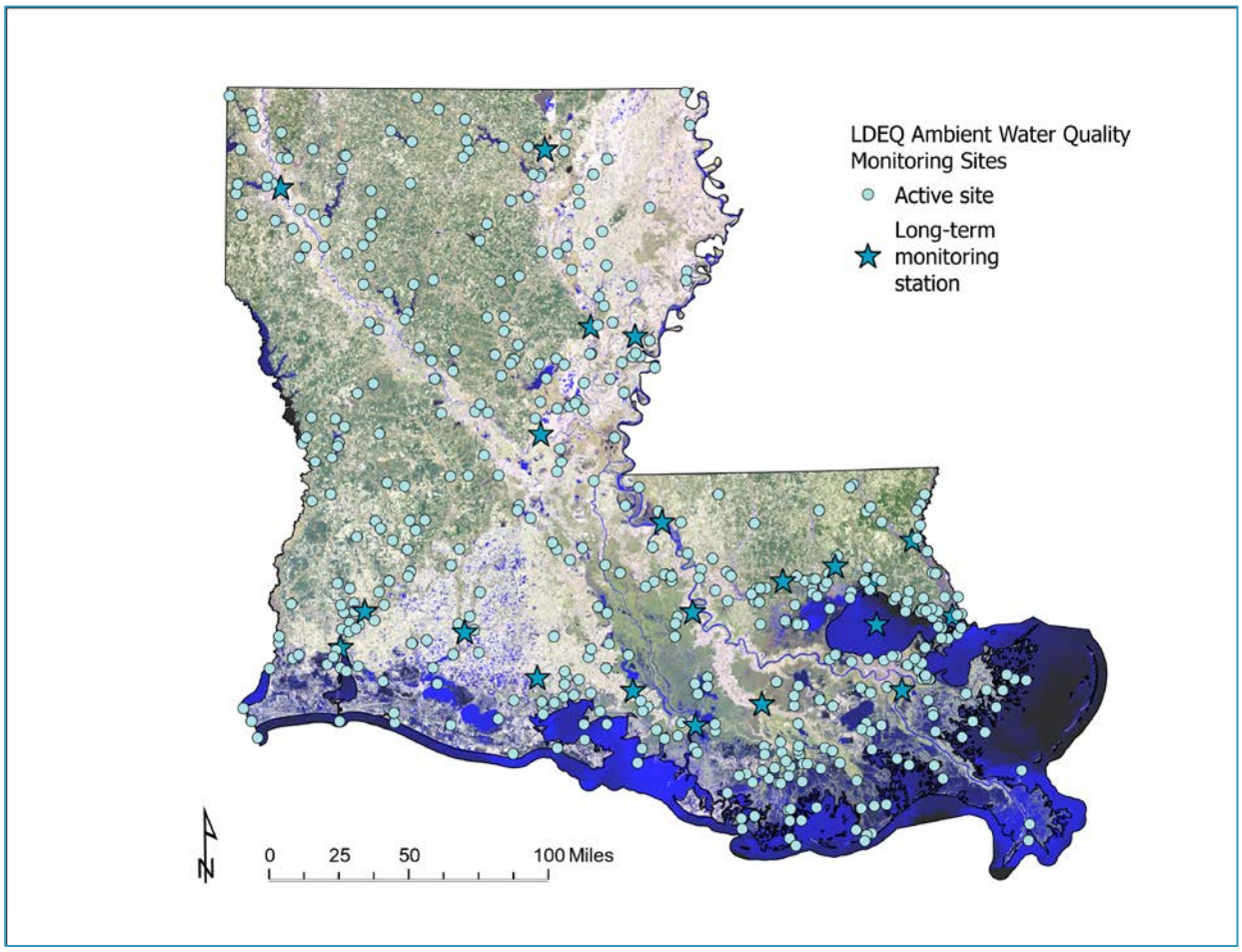


Figure 11. The Louisiana Department of Environmental Quality (LDEQ) performs routine water quality monitoring within the state's water bodies through its Ambient Water Quality Monitoring Network (AWQMN).

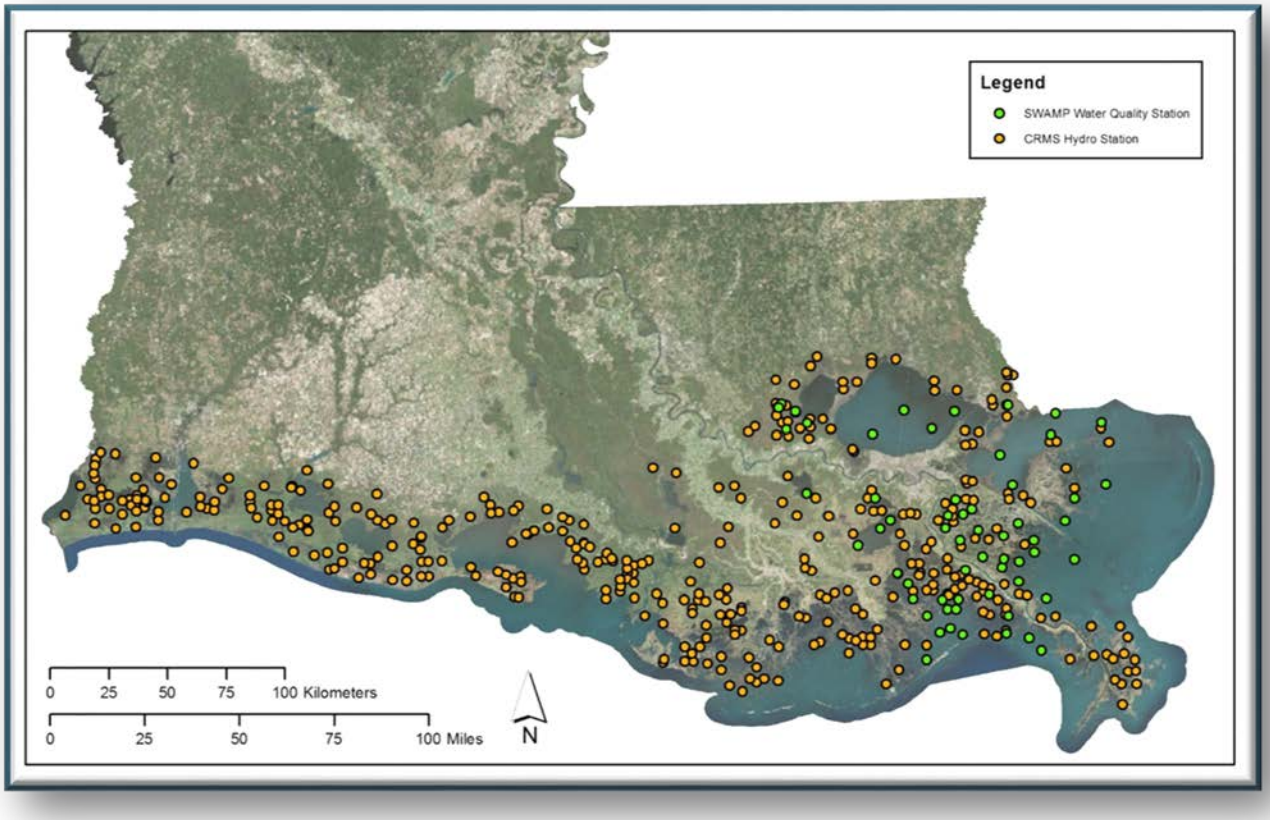


Figure 12. Coastwide Reference Monitoring System Hydro Stations and System Wide Assessment and Monitoring Program (SWAMP) currently implemented water quality stations leveraged by the Coastal Protection and Restoration Authority.

E.3.10 Reporting

Reporting is a critical component of Louisiana's Nutrient Reduction and Management Strategy. Over-reaching targets and goals are addressed through the strategic actions, and are continuing aspects of the Strategy that are provided in Appendix A.

Each 5-year reporting cycle for the Strategy summarizes and accounts for previous year's results and goals for upcoming cycles. Communication to all stakeholders is important to learn from the practices that are implemented. Reporting can take many forms including traditional reports, websites, presentations, and meetings. Information and documents related to Louisiana's nutrient reduction and management approach, including previous Strategy documents and annual reports, may be found on the Nutrient Strategy webpage (Figure 12; LDEQ 2024).

In 2029, an assessment of the Strategy will be conducted to allow for indication of progress to date and updates based on new information that has become available. Amendments or adjustments to strategic actions will occur as necessary. As multiple entities are committed to the protection, improvement, and restoration of Louisiana's water quality, this adaptive management approach is integral to the Louisiana Nutrient Reduction and Management Strategy.

Detailed reporting for programs highlighted in this Strategy that address nutrients within Louisiana and publish on progress may be found on each agency's website, and are the go-to for specific details and goals of each agency and/or program. Suggested websites include LDEQ's NPS and TMDL programs (LDEQ 2024a, 2024b, 2024j, and 2024l), Louisiana Department of Agriculture and Forestry (LDAF 2024), CPRA (CPRA 2024), and the USDA NRCS information and statistics page (USDA NRCS 2024e). This process allows for the minimization of reporting burdens, while providing the public and other interested parties access to important activities and outcomes concerning nutrient and natural resource management.

The strategic actions for Reporting under the Nutrient Reduction and Management Strategy are to:

a) Conduct 5-year strategy review
b) Report annually on strategy activities
c) Disseminate information through strategy website (Figure 13)
d) Document spotlight(s) of nutrient reduction and management successes

Strategic Actions are found in Appendix A. Strategy Annual Reports, where detailed projects and progress are summarized each year, are found on the Nutrient Strategy webpage (LDEQ 2024).

E.3.10 Activities

- The Mississippi River/Gulf of America Hypoxia Task Force has committed to reporting on common measures for nutrient reductions concerning point and non-point sources (HTF 2024).
  - Report on Point Source Progress in Hypoxia Task Force States (2016), Second Report on Point Source Progress in Hypoxia Task Force States (2019); update in progress
  - Progress Report on coordination for Nonpoint Source Measures in Hypoxia Task Force States (2018)
  - Biennial Report to Congress (2021,2023; upcoming in 2025)
  - USGS and HTF annual load trends and 5-year running average reporting (2022)
  - Compendium of Tools to Track Conservation (2022)
- LDEQ and partners 5-year update of *Strategy* (2024)
- Individual agency/program reports can be found on their associated web pages (see above)

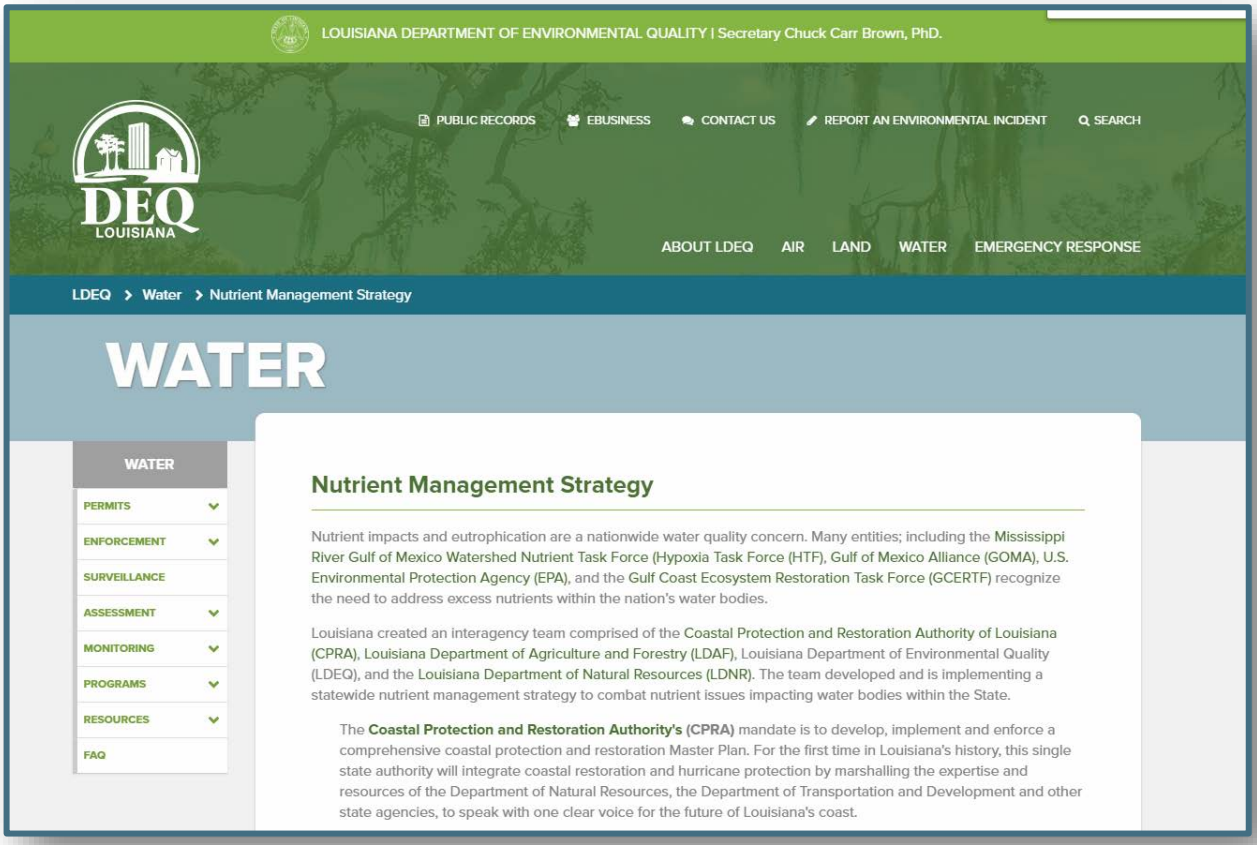


Figure 13. Reporting nutrient reduction and management strategy activities and results is important to the success of the Louisiana Nutrient Reduction and Management Strategy. Through accessing the website https://deq.louisiana.gov/page/nutrient-management-strategy, stakeholders can learn more about current and planned nutrient reduction and management activities within Louisiana.

PART II: DETAILED IMPLEMENTATION MEASURES

This section explains each type of implementation, and each individual component per type, across agencies/programs. Activities have been added to pertinent Sections. Additionally, 2019 Strategy period reporting has been added in Sections F.1, F.2.2, Tables 9-12, and Figures 16-18.

F. IMPLEMENTATION OF LOUISIANA'S NUTRIENT REDUCTION AND MANAGEMENT STRATEGY

OVERVIEW

Nutrient reduction and management within Louisiana's water bodies relies on capture and control (Figure 14). Methods that promote incentives help foster voluntary participation, and opportunities for leveraging among programs, partnerships, and stakeholders will be necessary for ultimate water quality protection, improvement, and restoration within Louisiana's water bodies.

Management methods are determined regionally and temporally based on land use practices for each watershed. A one-size-fits-all approach is not appropriate given the unique geographic features located within the state (uplands, alluvial plains, coastal wetlands and deltas, etc.) and associated variety of land uses (cultivated crops, forests, pasture, wetlands, etc.). Therefore, conservation and management practices may differ among watersheds and application timing.

This Strategy utilizes nonpoint source and point source management, voluntary incentive-based programs, and river diversions to address nutrient issues within the state. Additionally, leveraging opportunities are utilized for multi-entity collaboration on watershed scale projects to engage all stakeholders and promote participation in order to protect, improve, and restore Louisiana's water bodies. Great strides have been made in this regard during the 2019 Strategy period that will continue into 2024 and beyond.

River diversions are a central component of *Louisiana's Comprehensive Master Plan for a Sustainable Coast* (CPRA 2023). Diversion projects reconnect the Mississippi and Atchafalaya Rivers to the adjacent deltaic wetlands and estuaries to re-establish land-building and land-sustaining processes that have been disrupted by river management and flood protection projects over the past century. Sediment diversion projects will result in the Mississippi and Atchafalaya River flow of nutrients, freshwater, and sediments to bays, wetlands, and estuaries. In addition to the restoration benefits of building and sustaining coastal land, diversions have the potential to improve offshore water quality (including mitigation of hypoxia) through enhanced wetland nutrient retention.

Louisiana has an active and effective Nonpoint Source (NPS) Pollution program that operates through a NPS Management Plan approved by USEPA for 2023-2027 (LDEQ 2023a). One of the important aspects of this NPS Management Plan is inclusion of statewide and watershed annual milestones where state agencies and other stakeholders work to select and prioritize water

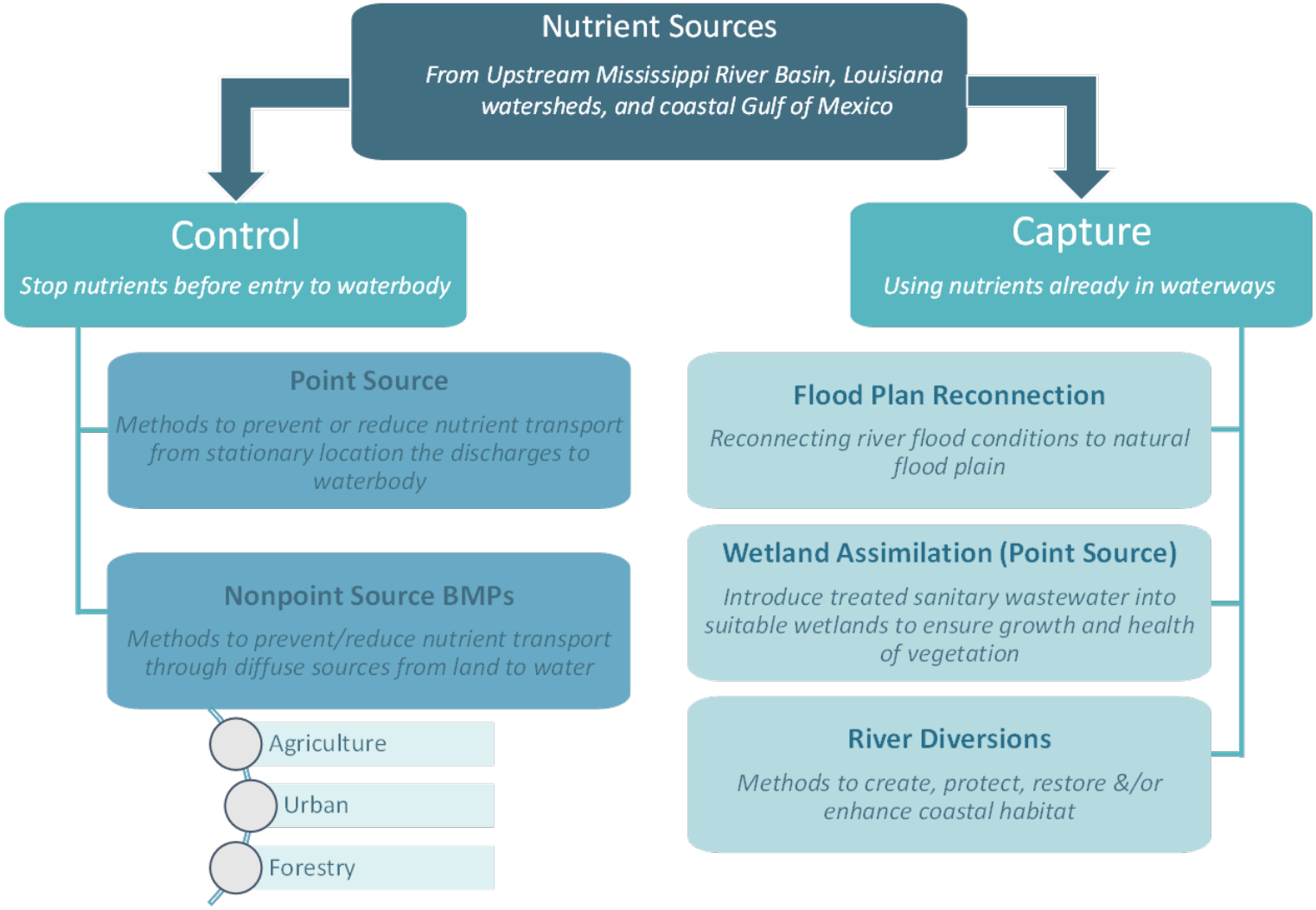


Figure 14. Conceptual model of nutrient sources entering Louisiana water bodies locally, from upbasin, or even from the coastal area. Methods for specific nutrient control or capture will aid in managing nutrients within Louisiana water bodies.

bodies to partially or fully restore by 2027, as funding permits. Additionally, assistance programs through the USDA NRCS and LDAF Office of Soil and Water Conservation (OSWC) aid with the identification and implementation of appropriate nonpoint BMPs/CPs for a given watershed in the state. Managing point source nutrient discharges is also an important component of overall nutrient reduction and management. Since the creation of the Clean Water Act in 1972, the National Pollutant Discharge Elimination Systems (NPDES) program has been a major force in the nation's efforts to protect and restore the quality of our rivers, lakes, and coastal waters. Louisiana's Water Quality Regulations (LAC 33: Part IX) require permits for the discharge of pollutants from point source into waters of the state of Louisiana. This surface water discharge permitting system is administered under the Louisiana Pollutant Discharge Elimination System (LPDES) Permit Program.

F.1 Nonpoint Source Management

Nonpoint source (NPS) pollution is a type of water pollution that is not generated from a discrete conveyance, such as a discharge pipe, but is generated during rainfall events. Nonpoint sources include agricultural and urban runoff. Section 319 of the Clean Water Act (CWA) required that the states develop a NPS Management Plan to reduce and control nonpoint sources of pollution from the various types of land-uses that contribute to water quality problems across the United States.

Watershed Implementation Plans, based on EPA's guidance for 9-minimum element watershed based plans for restoring watershed use support through BMP implementation, have been submitted by the LDEQ NPS program for 12 subsegments in Louisiana; all have been accepted by the USEPA. Two additional plans are currently under development (2024). LDEQ NPS staff work with additional agencies and other entities including the USDA NRCS, to collaborate and implement these WIPs, identify the BMPs/CPs, management programs, and milestones to address NPS issues within a given watershed. There are currently 38 watersheds with planned activities for water quality improvements (Section E.3.6; Table 7 and Figure 8).

During the 2019 Strategy Reporting period, nutrient load reductions were calculated for LDEQ NPS and LDAF 319 projects (USEPA Pollutant Load Estimation Tool/s [2025]). Reductions are watershed-scale estimates based on STEP-L modeling. Minimum inputs include: USDA SSURGO soils data k-factor and hydric soil information, cropland data layer and land use information, and LDAF BMP implementation data. Estimates are for first year on the ground, and therefore underestimate values in additional years of practice. Water Quality (WQ) Impairment removals are determined using Integrated Report assessments for the appropriate year/project period (LDEQ 2024j; Table 9).

An important regulatory effort is the Long-Term Vision for Assessment, Restoration, and Protection under the Clean Water Act Section 303(d) Program ('New Vision' or 'Vision'; USEPA 2013, 2022; LDEQ 2015, 2023). LDEQ is part of this national collaborative effort by states and the USEPA to promote restoration and protection measures through TMDL or alternative strategies/plans (see Section E.3.6). Round one of the New Vision approach was scheduled for 2016-2022; Round two is scheduled for 2022-2032. As part of the prioritization goal during

Table 9. Nutrient reduction estimates and impairments removed as reported by LDEQ NPS Pollution Program during the 2019 Strategy reporting period; see text for details.

Estimated Annual Reductions 2019 Strategy Period				
Year	Nitrogen (lbs)	Phosphorus (lbs)	Sediment (tons)	WQ Impairments Removed
2023	19,282.7	3,623.8	598.2	1
2022	8,869.3	1,874.1	188.1	1
2021	14,865.1	3,153.7	488.4	1
2020	20,084.8	5,926.8	997.0	1
2019	23,809.0	4,646.0	740.2	2

Round one, the LDEQ, through collaboration with various stakeholders including state, federal and watershed-based entities, identified six priority watersheds for remediation effort (LDEQ 2024l, 2023a). Restoration/protection plans (reports) are anticipated for each of these watersheds over the next one to two years, although some of the activities will continue onward. Round two of the Vision will begin as Round one is completed, after using a similar prioritization strategy. Under this Vision approach, LDEQ plans to revise several TMDL reports that address oxygen-demanding loads, including nutrients as identified causes.

During the 2019 Strategy reporting period, seven LDEQ TMDL/Vision priority waters received efforts that are in various stages of completion, reporting will occur in the appropriate year as described in Section E.3.10. Bacterial inputs and nutrient inputs are correlated, and considered appropriate for nutrient inclusion (Table 10).

Table 10. LDEQ TMDL/Vision targeted activities over the 2019 Strategy reporting period.

New Vision Activities 2019 Strategy Period		
Priority Subsegment	Subsegment Name	Parameter Being Addressed
LA070505_00	Tunica Bayou	Fecal Coliform Bacteria
LA040504_00	Yellow Water River	Low Dissolved Oxygen, Nutrients (Total Nitrogen & Total Phosphorus), Fecal Coliform Bacteria
LA040503_00	Natalbany River	Low Dissolved Oxygen, Nutrients (Total Nitrogen & Total Phosphorus)
LA070501_00	Bayou Sara	Fecal Coliform Bacteria
LA040401_00	Blind River	Low Dissolved Oxygen, Nutrients (Total Nitrogen & Total Phosphorus), Fecal Coliform Bacteria

New Vision Activities 2019 Strategy Period		
LA040403_00	Blind River	Low Dissolved Oxygen, Nutrients (Total Nitrogen & Total Phosphorus), Fecal Coliform Bacteria
LA040404_00	New River	Low Dissolved Oxygen, Nutrients (Total Nitrogen & Total Phosphorus), Fecal Coliform Bacteria

The United States Congress passed the Coastal Zone Act Reauthorization Amendments (CZARA) in 1990, which entrusted the States with the task of developing and implementing State Coastal Nonpoint Pollution Control Programs (CNPCPs; USEPA 2023a). States must implement management measures approved by NOAA and the USEPA that will control or prevent nonpoint source pollution from five designated sources: agriculture, forestry, hydromodification, marinas and recreational boating, urban runoff (TSS) and wetlands, riparian areas, and vegetated treatment systems. The Louisiana Coastal Nonpoint Pollution Control Program (CNPCP) was developed in partnership between LDENR, LDEQ, and other governmental and non-governmental agencies to educate Louisiana coastal users about available best management measures, and to reduce pollutants that may impact the coastal waters of Louisiana (LDENR 2024, 2024a). The plan received final approval in 2022 from USEPA and NOAA (CNCP 2024a). In the state of Louisiana, agriculture, forestry, urban storm water runoff, and home sewage systems contribute to nonpoint source pollution issues and may be a source of nutrients into Louisiana's water bodies. Nonpoint source issues can be addressed through BMPs/CPs specific to the suspected source of pollution and made available on the website. Another method for nonpoint source management is floodplain reconnection, which is a management practice where hydrologically modified areas are reconnected to the natural floodplain. BMPs, CPs, and floodplain reconnection may all be used to help address nonpoint source pollution in Louisiana's water bodies.

Details concerning NPS efforts are provided below. ***It is important to note that LDEQ and LDAF efforts concerning Clean Water Act (319) goals and funding are generally separate from national programs supporting USDA directives and programs, although the actual mechanisms for agricultural practices are the same.***

F.1.1 Best Management Practices (BMPs) and Conservation Practices (CPs)

For nonpoint source pollution that originates from diffuse sources through runoff, best management practices (BMPs) and/or conservation practices (CPs) are key to addressing suspected sources of nutrients. These practices are specific to the source of the suspected pollutant and those for agricultural, forestry, urban storm water runoff, and home sewage systems may help to address nutrients within Louisiana's water bodies.

F.1.2 Agricultural

Agricultural practices associated with crops, pastures, dairies, and aquaculture may result in nonpoint sources of nutrients into Louisiana's water bodies. The LSU AgCenter has developed a series of BMP guidance documents for these major agricultural activities within Louisiana (LSU AgCenter 2024b). BMPs specific to a variety of practices in Louisiana

are available through the LSU AgCenter (Table 11), while USDA NRCS BMPs applicable to the state are provided in Table 12.

Table 11. Best Management Practice (BMP) manuals produced specifically for Louisiana (LDAF 2024a; LDNR 2013, 2013a, 2013b; LSU AgCenter 2018; LSU AgCenter 2024b).

1	Louisiana Lawns *NEW*	**9**	Swine
2	Hydromodification	**10**	Beef
3	Rice	**11**	Aquaculture
4	Poultry	**12**	Crawfish
5	Agronomic Crops	**13**	Urban Storm water
6	Dairy	**14**	Urban Storm water: Highways, Roads, Bridges
7	Sweet Potato	**15**	Forestry
8	Sugar Cane	**16**	Soybean
17	Protecting Louisiana's Waters using Best Management Practices		

Objectives of participating in BMP research and demonstration projects include: 1) increase producers/farms participation in the Master Farmer Program; 2) form regional partnerships to support Master Farmer conservation efforts and the implementation of the GOA Regional Ecosystem Restoration Strategy, Gulf Hypoxia Action Plan and the Gulf of Mexico/America Alliance's Governors' Action Plan; 3) increase awareness of benefits of specific CPs and encourage participation in federal and state funding opportunities; and 4) use edge-of- field monitoring to evaluate conservation practices effect on water quality at selected cooperator farms.

In October 2013, an Interagency Agreement through the USEPA Gulf of Mexico Program Office and the USDA NRCS in Louisiana was signed to increase measurement efforts at edge-of-field to show how conservation practices are working on farms. This agreement also helps the Louisiana Master Farmer Program implement CPs as recommended in existing regional strategies that USEPA has supported with partners.

A state-wide BMP research project focusing on nutrient-reducing management practices was implemented through the Patrick F. Taylor Foundation (2014). Two "Model Farms" (sugarcane and feed grain) were originally selected to evaluate impacts of standard farmer practices and BMPs through edge-of-field monitoring and soil sampling. Phase I of the project was successful and completed in 2022. Two additional farms were selected in 2023 to address water quality issues in rice production. Through various outreach activities, the Master Farmer Program has coordinated 8 field days (approximately 350 participants) and utilizes websites, social media, and press releases to disseminate results to producers and industry.

Table 12. USDA NRCS core and supporting conservation practices (CPs) for water quality in Louisiana (reproduced from USDA NRCS and LDAF OSWC 2012).

	CORE PRACTICES		SUPPORTING PRACTICES	
	Code	***Practice Name***	***Code***	***Practice Name***
AVOIDING	328[a]	Conservation Crop Rotation[2]	327	Conservation Cover[4]
	340	Cover Crop[2]	381	Silvopasture [5]
	528	Prescribed Grazing[1]	382[c]	Fence[0]
	590[b]	Nutrient Management[5]	464	Irrigation Land Leveling[2]
	633	Waste Recycling[0]	472	Access Control[2]
			511	Forage Harvest Management[1]
			561	Heavy Use Area Protection[1]
			612	Tree/Shrub Establishment[2]
CONTROLLING	329	Residue & Tillage Management No-Till[4]	324	Deep Tillage[1]
	330	Contour Farming[2]	342[d]	Critical Area Planting[1]
	345	Residue & Tillage Management Reduced Till[2]	362	Diversion[0]
	412	Grassed Waterway[2]	386	Field Border[2]
	512	Pasture & Hayland Planting[1]	410	Grade Stabilization Structure[0]
	554	Drainage Water Management[1]	430[e]	Irrigation Pipeline[1]
	643	Restoration & Management of Declining Habitats[0]	447	Irrigation System, Tailwater Recovery[2]
	645	Upland Wildlife Habitat Management[0]	449	Irrigation Water Management[2]
			468	Lined Waterway or Outlet[0]
	Conservation Practices Physical Effects (CPPE) factors for Water Quality Degradation - Nutrients in Surface Water (superscripts match color formatting): [5]Substantial Improvement; [4]Moderate to Substantial Improvement, [3]Moderate Improvement, [2]Slight to Moderate Improvement; [1]Slight Improvement; [0]No effect; [-1]Slight Worsening; [-2]Slight to Moderate Worsening.		484	Mulching[2]
			533	Pumping Plant[0]
			558	Roof Runoff Structure[2]
			587	Structure for Water Control[0]
			606	Subsurface Drainage[-2]
			607	Surface Drainage[-2]
			620[f]	Underground Outlet[-1]
			638	Water & Sediment Control Basin[0]
TRAPPING	332	Contour Buffer Strips[2]	350	Sediment Basin[5]
	342	Critical Area Planting[1]	356	Dike[0]
	390	Riparian Herbaceous Cover[5]	436[g]	Irrigation Reservoir[0]
	391	Riparian Forest Buffer[5]	490[h]	Tree/Shrub Site Preparation[0]
	393	Filter Strip[4]	533	Pumping Plant[0]
	601	Vegetative Barriers[2]	587	Structure for Water Control[0]
	635	Vegetated Treatment Area[4]	629	Waste Treatment[2]
	656	Constructed Wetland[4]	638	Water & Sediment Control Basin[0]
	657	Wetland Restoration[3]	646	Shallow Water Development & Management[1]
	658	Wetland Creation[3]		
	659	Wetland Enhancement[3]		
Conservation Activity Plans	102	Comprehensive Nutrient Management Plan	a. minimum of 3 different crops must be used and/or at least 2 years in perennial vegetation; b. Fall application will give lowest ranking; c. Only use with 511, 512, and 528; d. As a component of wetlands, construction, or earth-disturbing practices; e. In conjunction with Waste Transfer (634); f. As a supplement to terraces and sediment basins; g. Only to be used with Tailwater Recovery (447); h. For use with 612, 381, and 391	
	118	Irrigation Water Management Plan		
	130	Drainage Water Management Plan		

Through the LDAF there are several agricultural-based programs regarding management practices currently in place. These include the Louisiana Agricultural Nonpoint Source Reduction Program (partner-USEPA, LDEQ, USDA NRCS), Louisiana Agricultural Solid Waste Management Program, Agriculture/Marshland and Forestry Certified Prescribed Burn Manager Program (Louisiana Cooperative Extension Service [LCES]}, LSU Sea Grant), and Coastal Vegetative Planting Program (CPRA). Additionally, school, community, and producer level conservation outreach and training programs such as Project WET for Louisiana (Project WET 2025), Stewardship Week, and LA Master Farmer Certification (LCES, USDA NRCS) are very active outreach and stewardship programs in support of water quality management, including nutrients.

The USDA NRCS released its Strategic Plan for years 2023-2027; the plan consists of five goals with natural resource improvements continuing through conservation practices and activities (USDA NRCS 2023a; Figure 15). Concerning nutrients, in 2022 USDA NRCS offered streamlined opportunities for nutrient management improvements in association with the Inflation Reduction Act. These efforts include the (1) Streamlined Nutrient Management Initiative (via EQIP), (2) Nutrient Management Economic Benefits Outreach Campaign (via outreach campaign on nutrient management plans for farmers), and (3) Expanded Nutrient Management Support through Technical Service Providers Streamlining and Pilots (via new agreements with key partners). Precision Agriculture, conservation programs (e.g., EQIP and the Conservation Stewardship Program), and SMART nutrient management are key components of USDA activities (USDA NRCS 2024f). SMART management includes the 4Rs of nutrient stewardship – the right Source, right Method, right Rate, and right Timing – and emphasizes smart activities to reduce nutrient loss by Assessment of comprehensive, site-specific conditions.

The USDA NRCS National Level Strategic Plan and goals in turn affect how funding, practices, partnerships, and reporting occur across states, including Louisiana.

F.1.3 Forestry

Forestry practices can help ensure water quality during forestry operations from forestry landowners, logging contractors, and forest industry (LDAF 2024a). Forestry BMPs and CPs include those aimed at managing forest roads, timber harvesting, site preparation/reforestation, silvicultural chemicals (e.g, fertilizers, pesticides), fire management, and forest wetlands. The Louisiana Forestry Association (LFA) has helped develop these BMPs and works with various forestry industries across the state to implement training workshops for loggers (LFA 2022, 2024).

F.1.4 Urban Storm Water Runoff

Urban storm water runoff is a source of pollution to water bodies. Some urbanized areas are covered by Municipal Storm Sewer System (MS4) permits (see Section F.3.1); however, many urban areas remain unregulated sources of pollution. Storm sewers

Figure 15. USDA NRCS Strategic Goals provided in the 2023-2027 Strategic Plan (USDA NRCS 2023a).

collect and convey the urban runoff to surface waters. While nutrient concentrations in urban runoff are generally not as high as concentrations in urban point sources, such as municipal wastewater discharges, or nonpoint agricultural sources, urban areas are often not designed with consideration for their effects on nutrient export. Consideration of the complex interactions urban development has on water quality during the design and planning process can reduce negative impacts. An approach that includes strategies to plan construction and conserve natural areas can reduce the impact of urbanization on stormwater transport of nutrients to adjacent water bodies.

Best management practices to address urban storm water runoff include those aimed at site design, biofiltration, permeable pavement and media filtration, rooftop/building, hydrodynamic separation, baffling, and retention and detention. An international BMP database and reporting has been ongoing since 2010, and has expanded to include agricultural and stream restoration. The 2020 stormwater summary statistics report (The Water Research Foundation [WRF] 2020) and 2023 data are available on request (WRF 2024). LDENR and partners have released Louisiana coastal best management practices for urban runoff (LDENR 2024a).

In addition, the Louisiana Yards & Neighborhood Initiative Program through the LSU AgCenter aims to encourage homeowners to create and maintain landscapes in ways that minimize environmental damage (LSU AgCenter 2024c). This is accomplished by focusing

on water quality and conservation, reducing stormwater runoff and decreasing nonpoint source pollution of surface water, enhancing desirable wildlife habitats and creating functional, attractive landscapes.

F.1.5 Individual Home Sewage Systems

Nonpoint source nutrients from home sewage systems may also impact Louisiana's water bodies. LDEQ partners with watershed groups and the Louisiana Department of Health (LDH) on more efficient ways to coordinate inspections and field work on home sewage systems in waters impaired due to fecal coliform bacteria. Individual home sewage system BMPs are available for homeowners to address this type of nonpoint source pollution (Hendrick 2007; USEPA 2024g). Other resources are available through the Louisiana Department of Health (LDH 2024). The LDEQ NPS and TMDL programs work on education on home sewage issues throughout the coastal region.

F.1.6 Hydromodification and Floodplain Reconnection

According to the United States Environmental Protection Agency (USEPA), hydromodification is one of the leading sources of impairment in our nation's waters. Restoring the natural hydrology of a stream can be an important factor in improving water quality. Upriver (non-coastal) diversions where river water is reintroduced to the floodplain and then channeled back into the river may act to reduce sediment and nutrients loads in that diverted water. Floodplain reconnection projects involve reverting human-altered drainage patterns toward more historic and natural floodplain drainage patterns in an attempt to address problems associated with artificially altered hydrology. On a large scale, this technique may involve locks or gates on major navigation channels; on a smaller scale, it may involve blocking dredged canals or cutting gaps in levee banks that were created by canal dredging. Such floodplain reconnection projects located within Louisiana include Mollicy Farms (the largest floodplain reconnection project in Mississippi River Basin; Waterloop 2024), Atchafalaya River Basin (ARB), Cat Island National Wildlife Refuge, and Three Rivers Wildlife Management Area. To assist with selection of areas for potential reconnection, The Nature Conservancy and partners developed the Floodplain Prioritization Tool (TNC 2018).

The LDEQ has partnered with the Louisiana Watershed Initiative to include 'nature based' design components to improve water quality, including sediment loading and associated nutrient inputs, through incorporating elements that retain/restore hydrology to the state's rivers and streams (LDEQ 2024j).

F.2 Point Source Management

Point sources are those that originate from a stationary location or fixed facility from which pollutants are discharged directly into a water body. Point source discharges into Louisiana waters are managed through the Louisiana Pollutant Discharge Elimination System (LPDES) Program through permits regulated by the Louisiana Department of Environmental Quality (LDEQ) under Louisiana's Water Quality Regulations (LAC 33: Part IX) (LDEQ 2024g; 2024h). Permits may contain effluent limitations requiring control and treatment equivalent to secondary

treatment, best practicable control (BPT) technology currently available, best conventional technology (BCT) for conventional pollutants, best available control technology economically achievable (BAT) for nonconventional or toxic pollutants, and/or water quality based effluent limits (WQBELs). Point source management regarding nutrients in Louisiana is primarily addressed through water permits, wetland assimilation projects, and biosolids land application. In the past, nutrient limits in Louisiana focused primarily on ammonia-nitrogen. In 2016, Louisiana began implementing total nitrogen (TN) and total phosphorus (TP) monitoring requirements for selected facilities (LDEQ 2017; 2024h).

The USEPA provides information for local infrastructure decisions (including financing opportunities) through its Water Infrastructure and Resiliency Finance Center (USEPA 2024h; LDEQ 2024o). The center helps local decision makers make informed decisions for drinking water, wastewater, and stormwater infrastructure to protect human health and the environment.

F.2.1 Wastewater Permits

Louisiana's Water Quality Regulations (LAC 33: Part IX) require permits for the discharge of pollutants from any point source into waters of the state of Louisiana. This surface water discharge permitting system is administered under the Louisiana Pollutant Discharge Elimination System (LPDES) program (LDEQ 2024h). LDEQ became the state agency delegated to administer the National Pollutant Discharge Elimination System (NPDES) Program in August of 1996. There are over 14,800 LPDES permitted dischargers within the state of Louisiana. Related to nutrients, input from point sources may include industrial and municipal wastewater, industrial or construction storm water, and Concentrated Animal Feeding Operation (CAFO) permits. In addition, the Louisiana Small Business/Small Community Assistance Program (SB/SCAP) provides free technical assistance to small business related to permits.

Wastewater permits for discharge of industrial and treated sanitary wastewater are designed to support water quality standards. The limitations and narrative conditions included in permits are developed in accordance with LDEQ's Water Quality Management Plan, Volume 3: Permitting Guidance Document for Implementing Louisiana Surface Water Quality Standards (LDEQ 2023). Nitrogen and phosphorus limits may be included in a permit if USEPA has developed a nitrogen and/or phosphorus Effluent Limit Guideline (ELG) for a particular point source category. Facility specific limits may be calculated from the ELG using production values, facility effluent flow, and receiving stream flow data. Without ELG values, monitoring only requirements are included in a permit where appropriate. Storm water permits may be needed for industrial or construction activities. Industrial stormwater permits are sector-specific and are required for industry types that may contribute to nutrient runoff, such as the agricultural chemical industry. These permits require the permit-holder to monitor storm water discharges for nitrogen and/or phosphorus, minimize exposure, and implement BMPs in order to achieve benchmark pollutant levels or effluent limitations. While these nutrient-related BMPs are required for industrial storm water permits, they are not required in construction storm water

permits. For permitted construction storm water discharges, required BMPs are primarily intended to reduce and/or eliminate discharges of sediments, debris, paints, fuel, etc.

Storm water permits may also be required for Municipal Separate Storm Sewer Systems (MS4) (LDEQ 2024n). An MS4 is a conveyance or system of conveyances designed or used for collecting or conveying storm water from urbanized areas. An urbanized area is a densely settled core of census tracts and/or census blocks that have a population of at least 50,000, along with adjacent territory containing non-residential urban land uses as well as territory with low population density included to link outlying densely settled territory with the densely settled core. It is a calculation used by the Bureau of the Census to determine the geographic boundaries of the most heavily developed and dense urban areas. An MS4, which by definition is a government entity, is considered "regulated" and is required to obtain a LPDES permit when 1) the MS4 met the population threshold of the 1990 US Census (Phase I); 2) all or a portion of the jurisdictional area is located within an urbanized area according to the latest US Census (Phase II); or 3) the MS4 is designated by the permitting authority. However, only the governmental entity and the infrastructure owned and/or operated by that entity is considered "regulated." The point source is where the outfall of a regulated MS4 discharges urban storm water into a water of the state. Individual permits and the master general permit for small regulated MS4s require that the Storm Water Management Plan (SWMP) include certain minimum storm water control measures. Flexibility in development and implementation of control measures is included in the permits so that each MS4 may address water quality management issues unique to its area. The required control measures may include targeting residential or non-industrial areas in order to control the discharge of certain pollutants in storm water (such as fertilizers, pesticides, trash, pet waste, etc.), if such pollutants are determined to be a potential source of water quality impairment. Control of pollutants from residential or non-industrial areas normally occur as part of community education programs or local ordinances. However, storm water discharges from a single privately owned building is not defined as a point source and is addressed through LDEQ's nonpoint source pollution program. LDEQ has issued 4 major (Phase I) MS4 permits and 47 authorizations (Phase II) under the small MS4 General Permit (LAR040000).

MS4 General Permits within the LPDES Program follow the USEPA's NPDES Stormwater MS4 General Permit Remand Rule (Environmental Defense Center v. U.S. Environmental Protection Agency, 344 F.3d. 832, 9th Cir. 2003, EDC; USEPA 2017). LDEQ incorporated this Rule into state regulation on July 20, 2017. These activities have been included as part of LDEQ's MS4 responsibilities, and include: promoting green infrastructure practices, training in MS4 and other stormwater related issues as resources allow, and assessment of the program itself through MS4 compliance reviews are ongoing. Tracking and reporting of the program assessment began in 2020. A Master General Permit for Dischargers of Stormwater for 5 acres or more was developed to reflect MS4 changes, The Master General Permit was updated to be consistent with the MS4 Remand rule in

2017. Stormwater management guidance and conference presentations are available on the LDEQ Stormwater Permit Resources page (LDEQ 2024n).

In 2022, Louisiana became the 42nd state to declare stormwater a utility. This legislation can provide a mechanism to permanently fund a stormwater management program in communities to address water quality and water quantity (flooding) issues.

The Louisiana Small Business/Small Community Environmental Assistance Program (SB/SCEAP) provides free technical assistance to small businesses and small communities in understanding and complying with wastewater permits and environmental regulations (LDEQ 2024o). SB/SCEAP operates in accordance with the Confidentiality option provided by the EPA Enforcement Response Policy, effective August 12, 1994, regarding Section 507 of the Clean Air Act; under this policy, violations detected through assistance will be kept confidential. Assistance is provided through various forms that includes consultation, assistance with permit applications and new permits, pollution prevention plans audits and follow-up activities from other LDEQ departments (enforcement, permitting, and/or surveillance). From 2019-2023 nearly 17,000 assistance activities have been provided by the SB/SCAP group (Table 13). In addition, the USEPA provides information for local infrastructure decisions (including financing opportunities) through its Water Infrastructure and Resiliency Finance Center (USEPA 2024h; LDEQ 2024o).

Permits are also required for any Concentrated Animal Feeding Operation (CAFO) that discharges pollutants to waters of the state. Louisiana operations are typically designed to land apply wastes. As long as the operation's Nutrient Management Plan (NMP) complies with technical standards and there is no discharge of pollutants to state waters, a LPDES permit is not required.

F.2.2 Point Source Wetland Assimilation

There are currently 15 point source wetland assimilation projects in south Louisiana and more are proposed. Mean nutrient removal efficiencies for assimilation wetlands in Louisiana have been reported as 96% for TN, 75% for TKN, 97% for nitrate-nitrite nitrogen, 85% for TP, and 74% for phosphate (Day et al. 2004; Hunter et al. 2009a, 2009b). Thus, the nutrient removal observed in assimilation wetlands is considerable. Further, Hunter et al. (2009b) observed that freshwater forested wetlands receiving secondarily treated effluent could reduce nutrient concentrations to background concentrations present in relatively undisturbed wetlands. LDEQ calculated nutrient removal efficiencies (2018 to 2022) measured by permitted wetland assimilation projects ranged from 19% to 93% for total nitrogen, and no removal to 98% for total phosphorus, with an average of 73% and 27% respectively (averages from positive removal values only; LDEQ 2019d). Nutrient removal efficiencies may range up to near 100% for nitrogen and phosphorus compounds in some years, although there is variability among efficiencies; at times, positive fluxes of phosphorus have occurred.

Table 13. Louisiana Small Business/Small Community Environmental Assistance Program Activities during the project reporting period.

Year[1]	Assistance Requests	Compliance Consultations	Newly Permitted Assistance	Permit Applications	Water Assists	LDEQ Referrals[2]
2019	2,492	799	62	183	1,333	115
2020	1,675	577	33	152	846	67
2021	1,727	574	27	174	820	132
2022	1,890	608	43	214	901	124
2023	923	312	51	80	431	49
Total	**8,707**	**2,870**	**216**	**803**	**4,331**	**487**

[1]Fiscal years begin July 1 and end July 30th of following year; all of reporting year may not be available
[2]Referrals from internal LDEQ enforcement, permitting or surveillance

The LDEQ Water Permits Division oversees each wetland assimilation project to ensure each permittee submits quarterly DMRs for nutrient sampling and Annual Wetland Reports. House Concurrent Resolution (HCR) 42 of the 2019 Louisiana Legislative Regular Session requested that LDEQ study the overall impacts of wetland assimilation projects. A review of LDEQ's wetland assimilation projects was performed in 2020. Overall, 12 of the 13 permitted projects were found to be successful; Breaux Bridge was considered failing (LDEQ 2020). Another report recommends no new permits be approved (LWF 2020). LDEQ intends to continue this program, with monitoring, for the upcoming Strategy period.

F.2.3 Biosolids Management

Biosolids, or sewage sludge, are also regulated and permitted through the LDEQ's permit program (LDEQ 2024p). Biosolids are nutrient-rich organic matter obtained from wastewater treatment that can be recycled and used beneficially. One such use is for fertilizer as the biosolids contain nutrients such as nitrogen and phosphorus that can be applied to the land (USEPA 2024i). Biosolids applied to agricultural land, forest, a public contact site, or a reclamation site are done so in accordance with agronomic rates and slope requirements.

F.3 Incentives

Incentive-based programs involving watershed stakeholders are an integral part of Louisiana's water quality protection, improvement, and restoration efforts. Incentive-based programs and activities may aid to foster stewards to the environment to support nutrient reduction and management in Louisiana.

F.3.1 Voluntary Incentive Based Programs

During the development of the 2014 Louisiana Nutrient Management Strategy, regulations, policies, and programs were inventoried and perceived gaps were noted.

Stakeholders at this time expressed interest in voluntary incentive-based programs such as water quality credit trading in Louisiana, which has been promulgated and is discussed in Section F.3.5. Efforts such as the Louisiana Water Synergy Project, through the US Business Council for Sustainable Development (2024), work towards sustainable development goals within the state while addressing water issues via voluntary actions. The Synergy Project has a diverse membership of over 20 participants including partners such as The Water Institute, Restore the Earth, nonprofits, and private industry. Regional collaborations such as the Lower Mississippi River Valley Nutrient Compact and the Mississippi Rivers & Towns Initiative can assist in improving water quality through stakeholder participation and voluntary efforts.

F.3.2 Voluntary Stewardship

Voluntary stewardship activities are foundational to nutrient reduction and management within Louisiana's water bodies. Nonpoint source stewardship initiatives in the state of Louisiana areas are coordinated with federal agencies, such as the USDA, USEPA, and USGS; state agencies, such as CPRA, LDAF, LDEQ, and LDENR; and additional stakeholder groups. These efforts facilitate implementation and coordination of management strategies to manage nonpoint source nutrients to protect, improve, and restore the water quality in Louisiana's water bodies and to subsequently, along with similar efforts in upbasin states, aid in prevention and reduction of nutrient inputs to the GOA. In addition, Louisiana has created a voluntary point source stewardship program, which recognizes industries and other groups for voluntary nutrient reductions.

F.3.2.1 Nonpoint Source Stewardship

Nonpoint source stewardship programs include federal and state level programs designed to promote voluntary participation in conservation practice implementation. Federal level nonpoint source stewardship programs include USDA NRCS Farm Bill programs. State level stewardship programs include Louisiana Master Farmer, Gardener, and Naturalist Programs through the LSU AgCenter, LDAF Forestry's Stewardships, and the Louisiana Master Logger program administered by the Louisiana Forestry Association (LFA).

Agriculture and forestry organizations agree that environmental stewardship programs maintain a strong agriculture and a healthy environment. Core principles of these organizations:

- Focus on private lands and encourage leadership from the agricultural community and commodity and trade organizations
- Support policies and programs necessary to maintain the economic viability of agriculture allowing farmers to utilize the land for production while promoting conservation and being environmental stewards
- Utilize non-regulatory/voluntary approaches
- Develop and implement locally led projects through accelerated technical and financial assistance and share the results across states in the MARB
- Provide technical assistance based on decisions derived from sound science

- Solicit, promote and achieve wide public and governmental support with ongoing coordination
- Enhance the research and extension capacity of the Land Grant University systems
- Forge partnerships with nonagricultural agencies and organizations to promote, develop and implement cost effective, scientifically based conservation programs and site specific practices

F.3.2.2 Farm Bill Programs (Agriculture Improvement Act of 2018; Farm Act)

The current farm law (2018 Farm Act), was signed on December 20, 2018, and remains in effect through 2023 and into 2024. The 2018 Farm Act made few major changes in agricultural and food policy. Nutrition policy, particularly the Supplemental Nutrition Assistance Program (SNAP), continues with minor changes. Crop insurance options and agricultural commodity programs exist much as under the 2014 Farm Act. All major conservation programs were continued, although some were modified significantly. Programs were expanded for trade, research and extension, energy, specialty crops, organic agriculture, local and regional foods, and beginning/socially disadvantaged/veteran farmers and ranchers.

The 2018 Farm Act increased FY2019-FY2023 spending by $1.8 billion (less than 1%) above the level projected for a continuation of the previous farm act. The Congressional Budget Office projected 76% of outlays under the 2018 Farm Act to fund nutrition programs, 9% to fund crop insurance programs, and 7% to fund conservation and commodity programs. The remaining 1% was expected to fund all other programs, including trade, credit, rural development, research and extension, forestry, horticulture, and miscellaneous programs.

Historically, the Conservation Title expands the working farmlands philosophy as participation in conservations programs have increased with program flexibility, working farmlands, public-private partnerships and focuses on short and long-term issues, such as drought, wildlife habitat, watershed management and water quality. The 2018 Farm Bill maintains the conservation programs, and mainly shifted funding among programs. The Conservation Reserve Program (CRP) expanded to a maximum 27 million acres, and the rental rate decreased from 100 percent to 90 percent to reduce competition with working land. The Environmental Quality Incentives Program (EQIP) was maintained with increased funding levels, and the Conservation Stewardship Program (CSP) was maintained with decreased funding. The Grassland Incentive Program payments continue under the CSP program. The Agricultural Conservation Easement Program (ACEP) and the Regional Conservation Partnership Program (RCPP) were retained in the 2018 Farm Bill. New programs included watershed and flood prevention, small watershed rehabilitation and a feral swine eradication and control pilot program. Spending and acreage for conservation programs under the 2018 Farm Act for Louisiana is found in Figures 16 and 17. Long-term program funding is found in Figure 18. The Bipartisan Infrastructure Law and the Inflation Reduction Act provides funds to supplement and/or enhance programs that typically fall under Farm Bill legislation.

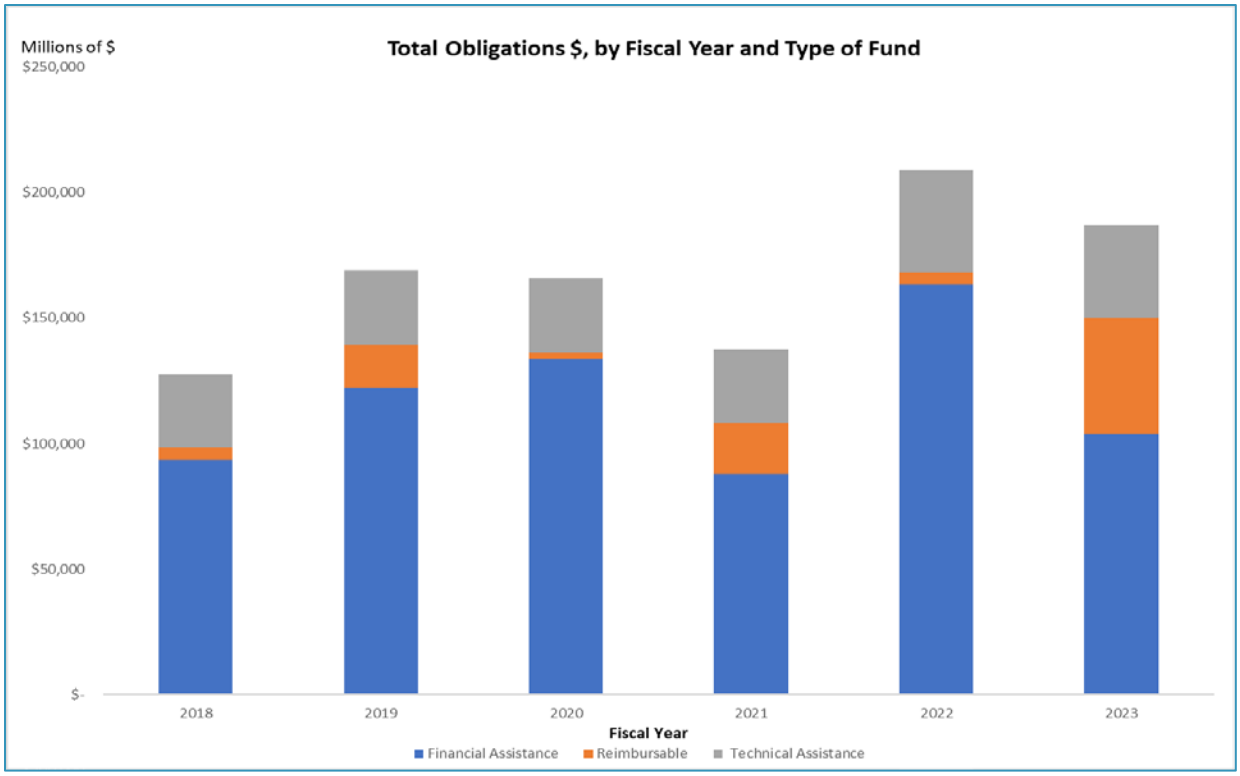


Figure 16. USDA NRCS programs in Louisiana from 2018 through 2023 (USDA NRCS 2024).

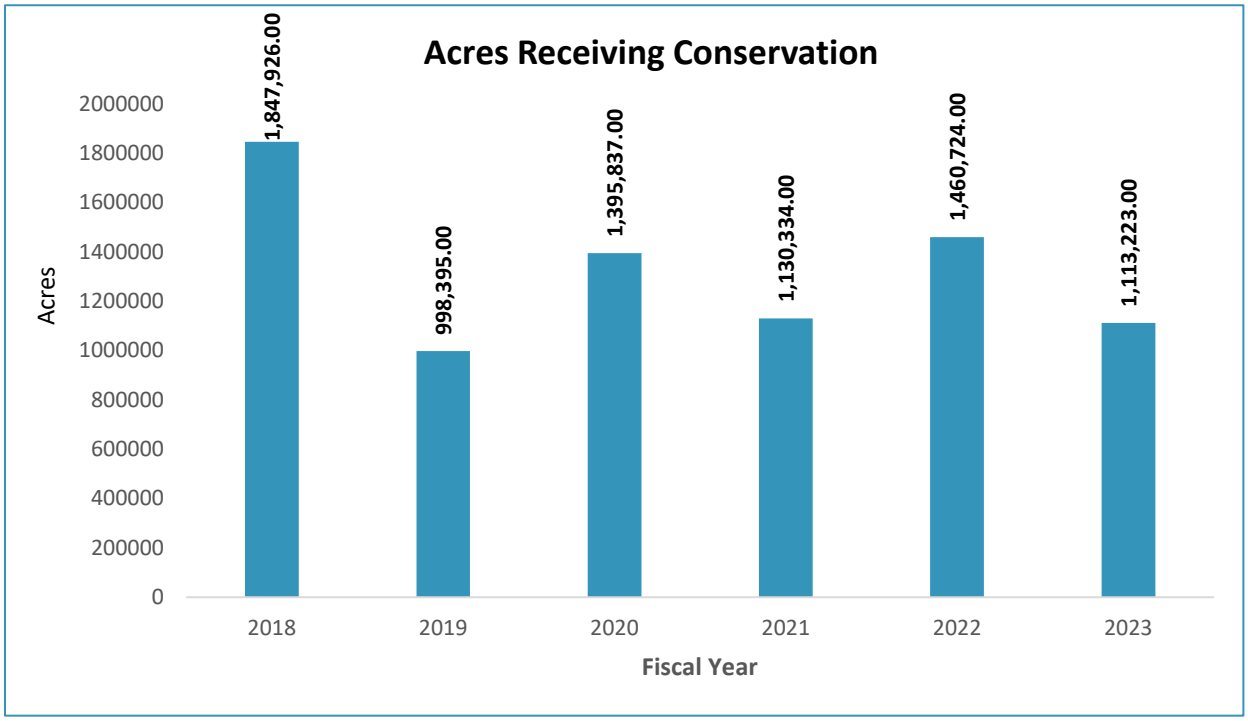


Figure 17. Acres receiving conservation through USDA NRCS in Louisiana from 2018 through 2023 (USDA NRCS 2024h, USDA NASS 2024b).

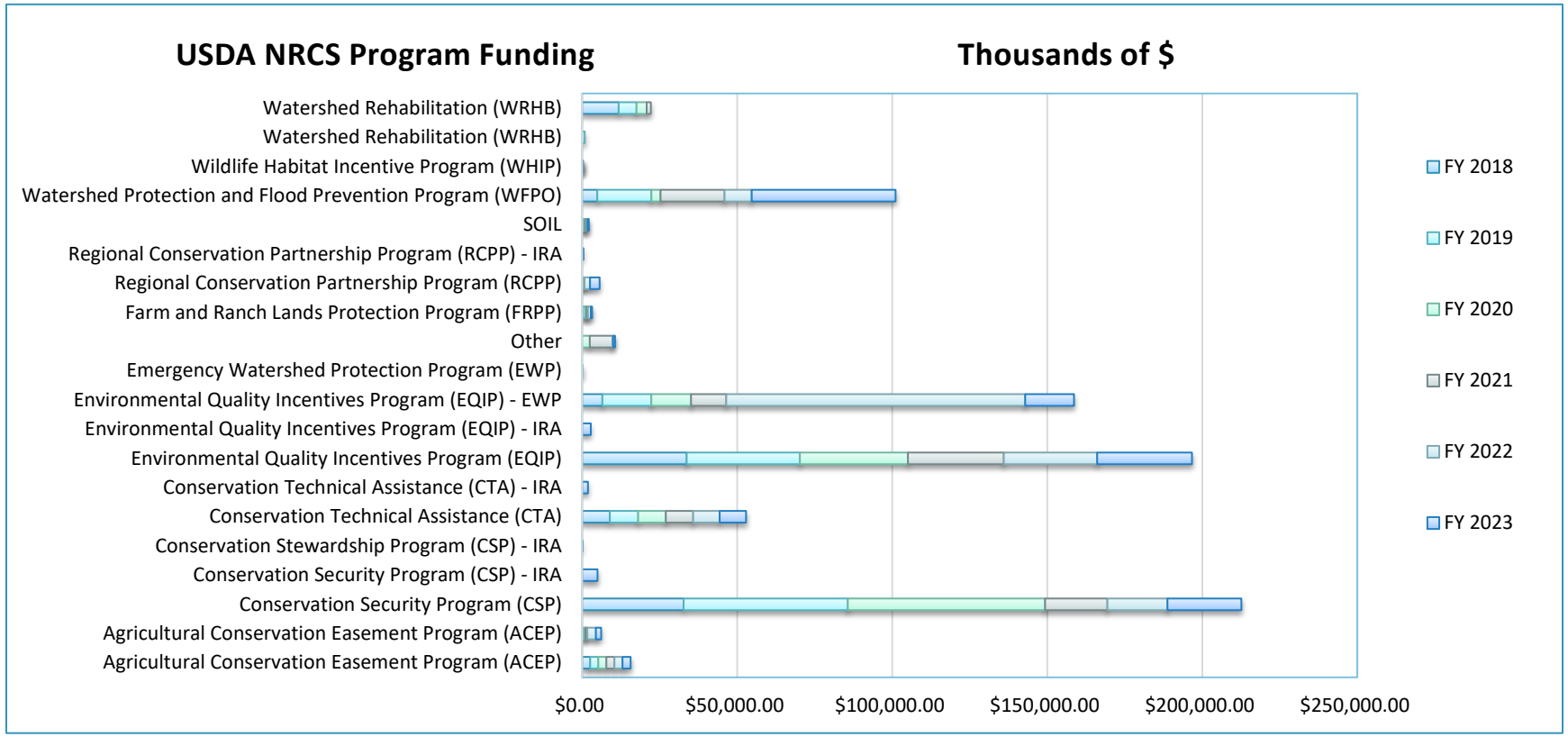


Figure 18. Funding for USDA NRCS Conservation Programs in Louisiana from 2018 to 2023. Total Obligations, by Program Fund and Fiscal Year, includes Technical and Financial Assistance and Reimbursable Fund Types, in thousands of dollars (USDA NRCS 2024h, USDA NASS 2024b).

F.3.2.2.1 Conservation Reserve Program (CRP)

The Conservation Reserve Program (CRP) was signed into law by President Ronald Reagan in 1985 and is the country's largest private-lands environmental improvement program, is run through USDA's Farm Service Agency (FSA), and is a voluntary program for agricultural landowners. In exchange for a yearly rental payment, farmers enrolled in the program agree to remove environmentally sensitive land from agricultural production and plant species that will improve environmental health and quality. Contracts for land enrolled in CRP are 10-15 years in length. The long-term goal of the program is to re-establish valuable land cover to help improve water quality, prevent soil erosion, and reduce loss of wildlife habitat.

F.3.2.2.2 Conservation Reserve Enhancement Program (CREP)

The Conservation Reserve Enhancement Program (CREP) is an offshoot of the Conservation Reserve Program (CRP) and targets high-priority conservation issues identified by local, state, or tribal governments or non-governmental organizations. It is a voluntary land retirement program which helps agricultural producers protect environmentally sensitive land, decrease erosion, restore wildlife habitat, and safeguard ground and surface water. Through this program, eligible landowners may receive financial incentives to remove environmentally sensitive cropland and grazing land from production for up to 15 years; these areas are then converted to native grasses or trees. Like CRP, CREP is administered by the USDAFSA. By combining CRP resources with state, tribal, and private programs, CREP provides farmers and ranchers with a sound financial package for conserving and enhancing the natural resources of farms. CREP addresses high-priority conservation issues of both local and national significance, such as impacts to water supplies, loss of critical habitat for threatened and endangered wildlife species, soil erosion, and reduced habitat for fish populations. CREP is a community-based, results-oriented effort centered on local participation and leadership. In addition to contributing to improvement of the environment in multiple ways, those enrolled in CREP receive an annual rental payment for their enrolled acres. FSA also provides cost-sharing and other incentives to help offset the costs associated with putting these practices in place.

F.3.2.2.3 Conservation Stewardship Program (CSP)

The Conservation Stewardship Program (CSP) is a voluntary conservation program that encourages producers to address resource concerns in a comprehensive manner by undertaking additional conservation activities to enhance and improve existing conservation activities. Documented benefits include:

- Enhanced resiliency to weather and market volatility
- Decreased need for agricultural inputs
- Improved wildlife habitat conditions

F.3.2.2.4 Environmental Quality Incentives (EQIP) and Mississippi River Basin Healthy Watersheds Initiative (MRBI) Programs

The Environmental Quality Incentives Program (EQIP) is a voluntary program that provides financial and technical assistance to agricultural producers through contracts up to a maximum term of ten years in length. These contracts provide financial assistance to help plan and implement conservation practices that address natural resource concerns and for opportunities to improve soil, water, plant, animal, air and related resources on agricultural land and non-industrial private forestland. In addition, a purpose of EQIP is to help producers meet Federal, State, Tribal and local environmental regulations.

Launched in 2009, the 12-state MRBI uses several Farm Bill programs, including the EQIP, to help landowners conserve America's natural resources through voluntary conservation. The overall goals of MRBI are to improve water quality, restore wetlands and enhance wildlife habitat while ensuring economic viability of agricultural lands.

Ongoing activities for these programs are outlined in Section E.3.6, Table 8.

F.3.2.2.5 Regional Conservation Partnership Program (RCPP)

The Regional Conservation Partnership Program (RCPP) promotes coordination between USDA NRCS and its partners to deliver conservation assistance to producers and landowners. USDA NRCS provides assistance to producers through partnership agreements and program contracts or easement agreements. As of 2023-2024, there are currently four projects in Louisiana:

1. 2134: RSP Improving Water Quality Using Practice 590
2. 2274: MidSouth Graduated Water Stewardship (not offered in FY24)
3. 2779: Conjunctive Water Use Protects MidSouth Aquifers
4. 2319: AR-LA CDN Open Pine Landscape Restoration

F.3.2.2.6 Wetlands Reserve Easements (WRE)

The Wetlands Reserve Easement (WRE) program is a voluntary program offering landowners the opportunity to protect, restore, and enhance wetlands on their property that have been previously degraded due to agriculture. The program is undergoing changes through the Agricultural Conservation Easement Program (ACEP) along with the Agricultural Land Easements program (USDA ACEP 2024).

F.3.2.3 Louisiana Master Programs

F.3.2.3.1 Louisiana Master Farmer

To offer Louisiana farmers a voluntary education option to improve environmental stewardship, in 2001 the Louisiana State University Agricultural Center developed an Environmental Stewardship educational module in an agricultural proficiency "Master Farmer" program (Oldham and Castille 2003; LSU AgCenter 2018b; Table 14). Another component of this program is the incentive-based financial assistance portion of the

program. For this environmental stewardship module, state agencies and advocacy groups developed a three-phase program (Figure 19):

Phase 1. Six hour environmental stewardship training
Phase 2. Approved Farm field day/Virtual Model Farm workshops
Phase 3. Development and implementation of a farm-specific conservation plan

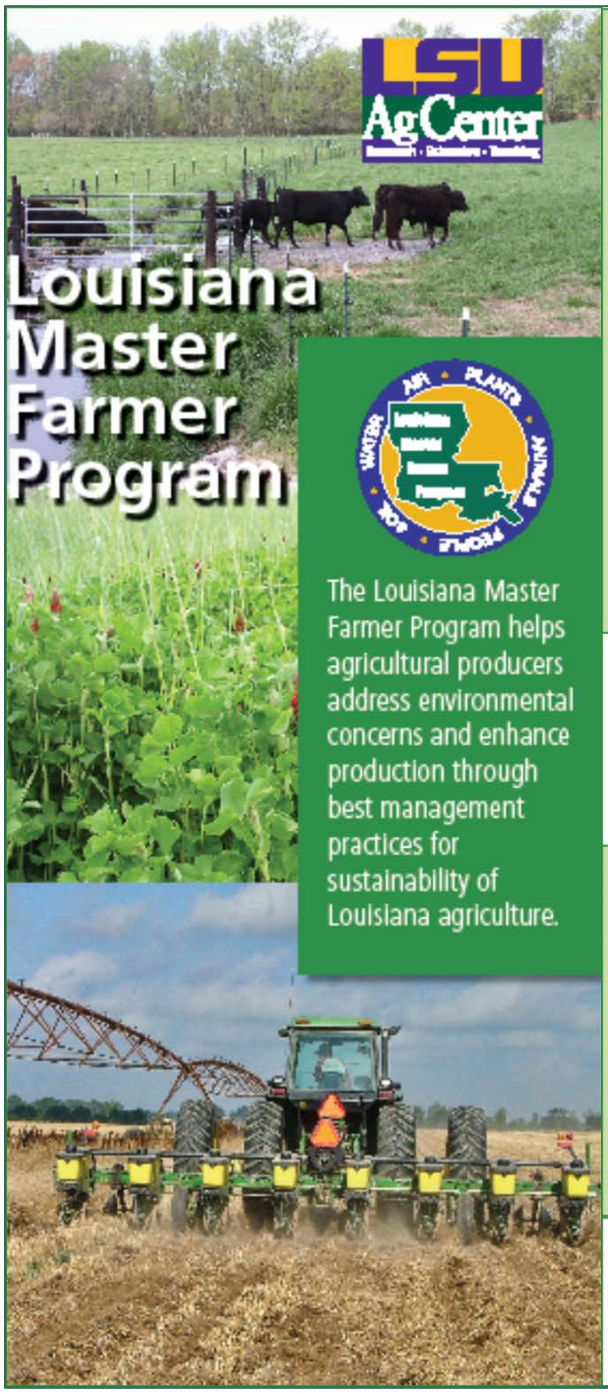
Table 14. Partners of the Louisiana Master Farmer Program.

LSU AgCenter
United States Department of Agriculture
Natural Resources Conservation Service
Louisiana Department of Agriculture and Forestry
National Oceanic and Atmosphere Administration
Louisiana Department of Natural Resources
Louisiana Department of Environmental Quality
Louisiana Soy Association
Louisiana Cattleman's Association
Louisiana Rice Growers Association
Louisiana Farm Bureau
Potash & Phosphate Institute
American Sugar Cane League
National Association of Conservation Districts
Louisiana Forage and Grassland Council
Louisiana Cotton Producers Association
Louisiana Crawfish Association
Louisiana Soybean Association

The classroom instruction in Phase 1 presents material on the Clean Water Act, national and Louisiana water quality standards, TMDLs, impacts of nonpoint source pollution in the coastal zone, BMPs, role of Conservation Districts, the Natural Resources Conservation Service planning process, and current conservation programs. Phase 2 of the Master Farmer certification process consists of a visit to a commodity specific model farm that demonstrates environmental BMPs 'on-the-ground.' Phase 3 is the development of farm-specific conservation plans in cooperation with local Natural Resource Conservation Service and/or Soil and Water Conservation District.

The Louisiana Master Farmer Program also includes three specialized tracks for Master Poultry Producer Program, Master Rice Grower Program, and Master Cattle Producer Program. In July 2002, a significant piece of legislation unanimously passed the Louisiana legislature called Act 145, which certifies that producers successfully completing all

phases of the Louisiana Master Farmer Program will be presumed in compliance with the Louisiana soil and water conservation requirements. This legislation allows for



Louisiana Master Farmer Program

Phase I

Producer attends classroom instruction on environmental stewardship issues related to:

- The Clean Water Act of 1972
- National and Louisiana water quality standards
- Effects of nonpoint source pollution on coastal zone and the Gulf of Mexico
- Best Management Practices (BMPs)
- Role of conservation districts in conservation planning/implementation
- Resources conservation planning processes
- Farm Bill conservation programs
- Spill prevention control and countermeasures
- Other conservation-related topics such as prescribed burning, septic system, or watersheds

Phase II

Producer attends a conservation education field day where specific BMPs are demonstrated and discussed. This also may include pasture walks, soil quality workshops and other commodity-specific demonstrations.

Phase III

A producer must request a farm-specific Resource Management System (RMS) level conservation plan through the USDA's Natural Resources Conservation Service and their local Soil and Water Conservation District. This plan includes a comprehensive summary of all resource concerns on land which the producer has control and goals to address these concerns. Once plan is complete, the producer may then apply for Master Farmer Certification from LDAF.

Upon Completion of all three phases of the Louisiana master Farmer Program, producers are presumed to be in compliance with Louisiana's soil and water conservation requirements

Figure 19. Louisiana Master Farmer Program is a voluntary incentive-based program in Louisiana where participating agricultural producers learn about water quality and conservation practices and develop a management plan specific to their commodity needs.

reasonable assurance that producers are being educated to make better decisions on research-based BMPs, that these BMPs are being implemented, and that producers will verify the implementation of these practices by developing and implementing a comprehensive conservation plan (Oldham and Castille 2003). Administration of the certification is supervised by LDAF.

In October 2013, the LSU AgCenter launched an additional format for Phases 1 and 2 of the training. This Master Farmer University is a 2-day training event that maximizes a farmer's time and effort spent in the training program by offering Phase 1 and Phase 2 training in a back-to-back format. After completion of the Master Farmer University, a farmer must then only complete Phase 3 to receive certification. This streamlined format encourages increased participation in the program and result in more farmers becoming certified.

F.3.2.3.1 Activities

Currently, over 4,000 farmers have participated in the educational phase of the program and are continuing in the subsequent phases. These participants span 97% of the parishes within the state (62/64 parishes), and of these participants, over 254 farmers have completed the three phase training program to become Certified Master Farmers. Since 2019, 545 participants attended approximately 120 events where conservation practice implementation and benefits are discussed and demonstrated. Through this voluntary program, 369 producers and landowners have been awarded certification or recertification through the LDAF and represent just over 200,000 acres of documented BMP implementation.

F.3.2.3.2 Louisiana Master Gardener Program

The Louisiana Master Gardener Program through the LSU AgCenter offers home gardeners opportunities to develop their skills and share their knowledge with others (LSU AgCenter 2024d). Volunteer participants in the Master Gardener program must attend at least 80% of scheduled instruction, pass an open-book examination and volunteer a minimum of 40 hours of service to earn the title of Louisiana Master Gardener. Certification is restricted to one year and new certifications are issued each year only to those individuals who make a commitment to participate for the coming year. Master Gardener's perform outreach in the community to share horticultural knowledge.

F.3.2.3.3 Louisiana Master Naturalist Program

The Louisiana Master Naturalist Program (LMNP) is a voluntary certification program sponsored by the LSU AgCenter where citizens can expand their natural history knowledge base of Louisiana resources (LSU AgCenter 2024e). The primary purpose of the LMNP is to offer a statewide program that educates Louisiana citizens about flora and fauna, as well as other aspects of their environment and ecosystems. To become certified, citizens complete training requirements of 46-58 hours of class and field

training, 20 hours volunteer service, 8 hours advanced training, and successful completion of an exam. Attending annual educational programs (8 hours) and continued volunteer opportunities are needed for annual recertification. Certified Louisiana Master Naturalists are required to use their talents to educate others or assist programs that promote and protect Louisiana's natural heritage.

F.3.2.3.4 Louisiana Master Logger Program

Awareness of forestry issues has been promoted through various programs that concentrate on sustainable forestry, e.g., Louisiana Forestry Association's *Master Logger Program* and *Best Management Practices* (LFA 2024, 2024a). USDA Sustainable Forest Stewardship is focused on three activities: assisting landowners in resource management, keeping land productive and healthy in the near and long-term, and increasing economic benefits while conserving the natural environment (USDA 2024). LDAF aims for improving forestry practices on small timber tracts throughout the state following these principles to promote Forest Stewardship, and assists landowners in these principles (LDAF 2024b, 2024c). Additionally, recent environmental evaluation indicates that sustainable forestry practices are favorable for carbon sequestration, lowered emissions, and increased ecosystem resilience (Fatima et al. 2024).

One of the most recognized expressions of the stewardship ethic is the Sustainable Forestry Initiative (SFI; SFI 2024). The forestry community of Louisiana has developed a comprehensive 30-hour program to provide training to loggers, foresters, and forest landowners in the management and harvesting of trees. The program covers safety requirements, environmental concerns, sustainable forestry practices, and business management. This program aims at enhancing professionalism among foresters, timber harvesters, and others that participate in the forestry industry.

The Louisiana Master Logger designation recognizes logging contractors and others who have completed 30 hours of instruction in five Professional Logger Education and Training Seminars. Master Loggers must also complete six hours of continuing education annually to maintain their certificates. Since the beginning of Best Management Practice (BMP) training in 1999 for water quality protection and forest sustainability, the Louisiana Forestry Association has trained over 10,000 foresters, loggers, and landowners.

F.3.2.4 Louisiana Outdoors Forever (LOF) Program

Act 714 of the 2022 Legislative Session provided $10 million for the Louisiana Outdoors Forever Fund for outdoor conservation projects in the state. The program, run by the Louisiana Department of Wildlife and Fisheries. LOFP is a significant source of match funding for additional conservation grants. Voluntary applicants (meeting specified eligibility criteria) apply for state funding to implement conservation projects that fall within these categories: conservation of important natural areas, including fish and wildlife habitat; water quality projects related to land conservation or land management, including those lands that protect drinking water supplies; conservation projects on working land, farms, and forested land; conservation projects on recreational properties

related to important natural areas and public use; and historic properties adjacent to or integral to habitat restoration or enhancement. Thirteen projects were selected for funding in 2023, the first year of the program (LDWF 2023).

F.3.2.5 Point Source Stewardship

The primary and most comprehensive voluntary point source stewardship program in Louisiana, which recognizes point source contributors for voluntary improvements in water quality, pollution prevention and waste reduction, is the Louisiana Environmental Leadership Program (ELP). This program was established in 1995 as a voluntary incentive program sponsored by Louisiana professional, environmental, industrial, and municipal associations to improve the quality of the state's environment through pollution prevention, community outreach and environmental management (LDEQ 2024q). LDEQ and USEPA Region 6 provide financial and logistical support for the program.

The ELP supports water quality pollution prevention and reduction including nutrient management. Several industrial and municipal facilities and others have been recognized for their pollution prevention and reduction efforts specific to nutrients and water quality during this Strategy period. Participants are recognized by the Secretary of LDEQ, and if selected by the Steering Committee, may be recognized at an annual award ceremony hosted by the Governor of Louisiana.

The ELP also commissioned a review of point source nutrient reductions in the Mississippi River Industrial Corridor (MRIC) from a baseline year of 1987 (when Toxic Release inventory [TRI] reporting initiated) through 1998. The findings were first published in a report entitled *Nutrient Releases to the Mississippi River in the Louisiana Industrial Corridor* (Knecht 2000), and were updated in 2014 (US BCSD 2014). These reports highlight significant voluntary reductions in nitrogenous and phosphatic compounds achieved by Louisiana industries along the MRIC, an area covering 12 parishes (West Feliciana Parish, East and West Baton Rouge, Iberville, Ascension, St. James, St. John, St. Charles, Jefferson, Orleans, St. Bernard and Plaquemines parishes) along the lower Mississippi River.

Some specifics from the US BCSD (2014) update report include: the MRIC corridor continued to receive the greatest load of toxic release sites in the State of Louisiana (accounting for 66% of the loads to surface waters for the 2012 reporting year); there was a considerable increase in industry along the corridor from 2008 to 2013 (though total nitrogen releases continued to decrease); and ammonia and nitrate compounds were found to dominate nutrient releases to the Mississippi River (88% during this time). For phosphorus, an average concentration decrease of 0.01 mg/L was reported for 1999 to 2012. The report goes on to address the nutrient contributions of industry in the MRIC to the GOA.

F.3.2.5 Activities

Currently, there are 300 members of the ELP program (LDEQ 2024r), with 41 new members initiated in the 2019-2023 Strategy reporting period; each member provides valuable actions across various environmental categories (e.g., recycling, energy reduction, and water protections). Due to COVID-19 disruptions, award submissions were reviewed for 2019-2021 for the 2022 ELP award recognition, where one outstanding achievement, three achievements, and five recognition awards were granted by LDEQ to these leaders for environmental responsibility. For the Strategy reporting period, five water quality related awards are outlined in Table 15.

F.3.3 Economic Costs

Costs associated with nutrient pollution have been examined in recent years by various organizations and programs in an effort to quantify, in dollars, the effects of increasing nutrient levels throughout the country and the world.

The USEPA reports economic losses in the United States due to nutrient pollution on tourism (nearly $1 billion) and the fish and shellfish industry ($10's of millions). A recent paper (Xu et al. 2022) estimates the cost of reducing nitrogen runoff from crop production in the Mississippi River Basin by 45% (Gulf Hypoxia Action Plan recommendation) to be $6 billion. Additionally, every $1 spent on protecting sources of drinking water saves in water treatment costs and property values can increase by up to 25% when associated with clean waters (USEPA 2024).

F.3.4 Economic Incentives

Incentives that provide financial support for water quality improvement projects are necessary in accomplishing nutrient reduction and management in the state of Louisiana. Such economic incentives in Louisiana include those targeted toward agricultural producers, coastal groups and communities, both point and nonpoint sources within watersheds. These incentives are necessary to both fulfilling CWA requirements for impaired waters and for offsetting costs of current water quality issues resulting from nutrient pollution.

The American Farmland Trust (2023) has released four documents on soil health economics to assist farmers, as economic costs can occur on-farm when BMP/CPs are used. These documents include:

A Farmer's Guide to Soil Health Economics: Budget Analyses
A Farmer's Guide to Soil Health Economics: National Surveys
A Farmer's Guide to Soil Health Economics: Research Trials
A Farmer's Guide to Grazing

Table 15. Voluntary point source stewardship management programs recognized for water-specific activities through the Louisiana Environmental Leadership Program (ELP) during the 2019 5-year Strategy period.

Entity	Location	Year	Stewardship
Jefferson Parish Environmental Affairs	Harahan, Louisiana	2022	Jefferson Parish Environmental Stewardship Program was created to educate and prevent pollutants from reaching Louisiana waterways. Workshops & walkthroughs were held for Industrial and High Risk Facilities, reducing complaints by 35%. Additionally, stewardship awards were established for parish industry and businesses that demonstrate environmentally friendly stormwater practices.
New Orleans Ernest N. Morial Convention Center	New Orleans, Louisiana	2022	Pollution Prevention: Major Energy and Water Reduction Projects. Upgrades to facility includes low-flow bathroom fixtures and stormwater management improvements including green controls. Other improvements include recycling and a switch LED lighting.
Tangipahoa Parish Government	Amite, Louisiana	2022	Pollution Prevention: Tangipahoa Parish Waterway Enhancement. Through public and private partnerships, the parish collects and recycles water-based trashed utilizing a 'Litter Gitter'®, has staff for education and water testing, and has passed legislation towards improvements in on-site stormwater control requirements.
Port of New Orleans	New Orleans, Louisiana	2019	Received Green Marine Certification; mission to increase storm water management and support aquatic ecosystems
St. Tammany Parish	Bayou Liberty Watershed and St. Tammany Parish, Louisiana	2019	Septic improvements and parish-wide Decentralized Management Program Developed

F.3.4.1 Clean Water Act Section 319, LDEQ

To address agriculture-related runoff issues, LDEQ works with LDAF, the USDA NRCS, and local Soil and Water Conservation Districts (SWCDs) to coordinate the planning and voluntary implementation of Agricultural BMPs and CPs on farms in priority watersheds to reduce the amount of nonpoint source pollutants entering water bodies. These BMPs and CPs comprise various structures and methods of operation whereby sediment, pesticides, nutrients and organic matter are stabilized or beneficially utilized on the landscape with lessened susceptibility of runoff. This program is closely coordinated with LDEQ's water quality protection efforts (LDEQ 2023a).

F.3.4.2 Coastal and Estuarine Land Conservation Program (CELCP), LDENR

The National Oceanographic and Atmospheric Administration (NOAA) established the Coastal and Estuarine Land Conservation Program (CELCP) in 2002 to protect coastal and estuarine lands considered important for their ecological, conservation, recreational, historical or aesthetic values. The LDENR, Interagency Affairs and Field Services Division is the state lead coastal management agency (LDNER 2024a). The program provides state and local governments with matching funds to purchase significant coastal and estuarine lands, or conservation easements on such lands, from willing sellers. Lands or conservation easements acquired with CELCP funds are protected in perpetuity so that they may be enjoyed by future generations. To date the program has funded eight grants within Louisiana.

F.3.4.3 Clean Water State Revolving Fund Program (CWSRF)

The Clean Water State Revolving Fund (CWSRF) Program was established pursuant to Title VI of the Clean Water Act, as amended in 1987 (the Act). The CWSRF program presently operates under R.S. 30:2301-2306 (Act 296 of the 2010 Regular Session of the Louisiana Legislature). This statute established a state revolving loan fund capitalized by federal grants (Capitalization Grants for Clean Water State Revolving Funds, CFDA 66:458), by state funds when required or available, and by any other funds generated by the operation of the clean water revolving loan fund. LDEQ is authorized to engage in activities regarding the sums on deposit in, credited to, or to be received by the state revolving loan fund (LDEQ 2024s).

The Financial Services Division and Water Planning and Assessment Division within LDEQ are responsible for the operations of the CWSRF program in the State of Louisiana. These divisions within LDEQ provide assistance to municipalities in developing, financing, and implementing wastewater treatment and/or storm water management plans. The Water Planning and Assessment Division provide engineering oversight, design review, and inspection services as well as environmental assessments. The Financial Services Division oversee grant management, program administration, and financial services on eligible projects. All efforts are directed toward improving water quality by assisting communities in providing wastewater treatment processes that meet established effluent limits and achieve the goals of the Clean Water Act.

F.3.4.3 Activities

Since July 2022, the CWSRF program has committed to funding nearly 31 projects for over $200 million for renovations and upgrades to wastewater treatment plants, rehabilitation to collection systems and pump stations, and stormwater management projects. Nearly half of those projects are proposing to achieve system compliance and/or discharging into impaired waterbodies. In particular, the following projects are proposing to upgrade or rehabilitate the wastewater treatment plants and/or changing the discharge locations to aid in water quality improvements: Albany ($1.2 million), Amite City ($25 million), Bonita ($671,000), Concordia Parish ($500,000), Elizabeth ($1.34 million), Eunice ($12 million), Grambling ($847,000), Lake Arthur ($1.25 million), Lincoln Parish Police Jury ($950,000), Montgomery ($1.6 million), New Orleans Water & Sewerage Board ($38.9 million), Olla ($2 million), Pointe Coupee Parish Sewer District No. 1 ($1.32 million), Sikes ($750,000), St. Tammany Parish ($7 million), and Sunset ($3 million).

Much of the above funds are part of the Bipartisan Infrastructure Law (BIL) Supplemental funds {a.k.a. Infrastructure Investments and Jobs Act (IIJA); Public Law 117-58}. Some of these above projects are components of either the 2022 or the 2023 BIL supplemental funds. These BIL supplemental funds are expected to be allocated through fiscal year 2026. Additionally, the BIL allows 2% of each federal capitalization grant to be used to develop a Technical Assistance (TA) program. The LDEQ CWSRF program has developed that TA program and has used much of the initial funds to evaluate a few communities less than 10,000 population with historical non-compliance issues. The goal of this TA program is to assist the smaller communities with system assessment needs in order to obtain compliance. Secondarily, this TA program is expected to also aid with building the CWSRF project priority list.

F.3.5 Water Quality Trading

Water Quality Trading (WQT) is a market-based tool where water quality goals are achieved through connecting different sources of pollutants, such as nonpoint and point sources (USEPA 2023). The pollutant control costs of these different sources may differ significantly thus allowing for trading as a cost-effective means to achieve water quality goals by engaging these different sources (CTIC 2006). Through the work of the 2014 Louisiana Nutrient Management Strategy, state agencies in Louisiana began to set a course for developing a WQT program that could involve activities such as river diversions, nonpoint sources, and for municipal and industrial point sources that may provide a cost-effective means for nutrient management. An effective WQT program could lead to greater nutrient reductions in the lower Mississippi River Basin and the Gulf of America more quickly and at a lower overall cost than traditional regulatory approaches; as well as provide some point sources and agriculture businesses the opportunity to generate revenues, and offer local regulators more policy options for improving water quality. Additionally in late 2018, USEPA and USDA encouraged the use

of market-based approaches to address excess nutrients (USEPA 2023). In early 2019, USEPA announced the availability of a new WQT policy memorandum that further supports the use of market-, incentive-, and community-based programs to reduce excess nutrients and improve water quality (USEPA 2023). The memorandum identified six 'Market Based Principles' to encourage innovation in the development and implementation of programs to reduce pollutants in the Nation's waters (USEPA 2023):

- States, tribes and stakeholders should consider implementing water quality trading and other market-based programs on a watershed scale
- EPA encourages the use of adaptive strategies for implementing market-based programs
- Water quality credits and offsets may be banked for future use
- EPA encourages simplicity and flexibility in implementing baseline concepts
- A single project may generate credits for multiple markets
- Financing opportunities exist to assist with deployment of nonpoint land use practices.

In 2017, the Enrolled Act No. 371 (House Bill No. 423) of the 2017 Regular Session of the Louisiana Legislature amended and reenacted R.S. 30:2074(B)(9)(a), (b), and (c) and repealed R.S 30:2074(B)(9)(d) and (e), relative to water quality; to provide for the powers and duties of the secretary of the Department of Environmental Quality; to provide for the establishment and administration of a water quality trading program; to provide for certain criteria for credits; to provide for limitations on use of credits; to provide for records; to provide for a pilot program; to provide for legislative oversight; and to provide for related matters. This revised statute update allowed for consideration of both point and nonpoint sources in a water quality trading program for Louisiana.

Louisiana agencies reviewed the National Network on Water Quality Trading document to evaluate options and considerations for a WQT program in Louisiana (National Network on Water Quality Trading 2015). Findings from this review aided Louisiana in identifying options and considerations that were helpful in designing and implementing a WQT program for Louisiana. In addition, the Association of Clean Water Administrators (ACWA) and the Willamette Partnership made available a WQT toolkit that provides a blueprint for states seeking to create a WQT program (ACWA and Willamette Partnership 2016). The WQT toolkit consists of five templates [1) state guidance, 2) watershed framework, 3) state rule, 4) NPDES permit, and 5) program annual report] that can be used as a starting point for trading and can be customized based on a state's needs. ACWA also formed a workgroup for state and federal representatives to participate in discussions on WQT; LDEQ participated in this workgroup.

In December 2017, LDEQ issued a Potpourri Notice (1712Pot1) to inform the public of a stakeholder meeting in January 2018, the availability of draft guidance document, and that the agency was interested in hearing comments on aspects of a WQT program development and implementation to help advance WQT as a cost-effective means for

nutrient management and general water quality protection and restoration (LDEQ 2024m). In total six stakeholder meetings were held in 2018 with participation of 116 individuals representing 63 entities. In January 2019, LDEQ proposed a rule (WQ099) for the establishment and administration of a WQT program for Louisiana, with a public hearing being held on March 1, 2019 and written comment period ending March 8, 2019. In October 2019, the Final Rule for a WQT program (LAC 33:IX.Chapter 26) was published in the Louisiana Register (LDEQ 2024m). Additional information of Louisiana's WQT program can be found at https://www.deq.louisiana.gov/page/water-quality-trading.

F.4 Leveraging Opportunities

Nutrient reduction and management projects and activities are the focus of many programs within Louisiana as well as up-basin in the larger Mississippi-Atchafalaya River Basin (MARB). In addition to those numerous programs already discussed above, opportunities of leveraging with existing programs will be pursued as a means to collaborate and share information regarding nutrient reduction and management. These leveraging opportunities are a chance to combine or expand benefits from these multi-faceted programs that may be working within the same watershed.

The stakeholder groups and programs currently identified where leveraging may be beneficial to nutrient reduction and management within Louisiana are given in Appendix C (listed alphabetically by group/program).

F.4 Activities

New collaboration and leveraging opportunities in 2022-2023 have provided funding and initiation of two nutrient monitoring projects and two on-the-ground nutrient reduction projects over the next 3-5 years. These projects would not have been possible without a multitude of partners and leveraging among them:

- *Bipartisan Infrastructure Law funding (BIL; also known as Infrastructure Investment and Jobs Act [IIJA]) and Gulf Hypoxia Program (USEPA 2024e)*
    - *Lake St. Joseph, Louisiana, Nutrient Loading Reductions (GHP, LDEQ, LDAF Morehouse Soil and Water Conservation District, and farmer partners)*
    - *Pilot Transition to Autonomous Monitoring from Inshore to Offshore in Coastal Louisiana (GHP, LDEQ, and CPRA)*
- *Gulf of America Alliance [GOAA] project through USEPA Funds*
    - *Nutrient Reduction in Upper Bayou Lafourche, LA (GOAA, USEPA, LDEQ, LDAF, Tensas-Concordia Soil and Water Conservation District, and farmer partners)*
- *GOAA project through BIL funds*
    - *Enhancement of Hypoxia Monitoring in the Northern Gulf of America (2024-2025; GOAA, Louisiana State University, NOAA)*

F.5 Science-based New Technologies/Applications

Science-based methods must be employed in order to realize improvements in nutrient reduction and management. Development and utilization of advancing and new technologies are an integral part of improving nutrient management within Louisiana's water bodies. These science-based new technologies and applications may be implemented close to the source of nutrients such as through agricultural production or wastewater treatment, or may be implemented in-stream or further downstream in order to improve water quality.

F.5.1 Agricultural Production

Science-based technologies and applications for agricultural production will be necessary to meet future demand of production as human population continues to increase exponentially and while efforts are ongoing to protect, improve, and restore water quality. The Conservation Effects Assessment Project (CEAP) of the USDA NRCS provides an assessment of the agricultural production and effectiveness of conservation practices in place. Fertilizer application methods and technologies promote the most effective means to apply fertilizers to maximize uptake by the plants that need them and to minimize loss from runoff.

F.5.1.1 Conservation Effects Assessment Project (CEAP)

The Conservation Effects Assessment Project (CEAP) was created in 2003 to help USDA NRCS better understand and optimize environmental benefits of conservation practices and programs; the program aims to quantify the environmental effects. Additionally, CEAP aims to develop science-based management for agricultural environments to help inform decision and policy-makers and farmers alike. The overall goal is to develop the science base for managing agricultural lands while promoting environmental quality (CEAP 2024).

CEAP has produced regional and watershed based assessment of conservation practices from data gathered in two phases: 2003-2006 (CEAP I) and 2015-2016 (CEAP II). CEAP assessments, including cropland, wetlands, grazing land, and wildlife are available for CEAP I and CEAP II. Additionally, a comparison report between each effort has been released (USDA CEAP 2024a). Take-always from the comparison report include:

- Cropping pattern shifts between surveys
    - Reasons for shift/s include:
        - warming weather, longer growing season, and advances in seed technology and higher yielding crops
        - corn and soybean replaced wheat and other crops
- Adoption of CPs resulted in more cultivated cropland meeting loss thresholds for erosion, sediment, and nutrients (surface nitrogen and sediment-transported phosphorus)

- Advanced nutrient technologies increased; cultivated cropland exceeded loss thresholds for subsurface nitrogen and soluble phosphorus, reflecting the growth in high-nutrient-demand crop varieties
- Moderate and high levels of conservation treatment for most cultivated cropland across the US
- Opportunities exist to improve conservation performance using currently available tools
- The comparison report and public webpage concerning CEAP are cited and publically available for further information on data and results.

CEAP III is projected to begin in 2024 and extend into 2026 and will survey farmers to quantify benefits of voluntary conservation (USDA CEAP 2024). In addition, about 23,000 modeled cropland points are anticipated for improved projections.

F.5.1.2 Fertilizer Application

The fertilizer industry endorses a concept known as 4R nutrient stewardship (The Fertilizer Institute [TFI] 2024, 2024a). The 4R approach is to use the right fertilizer source, at the right rate, at the right time, with the right placement. 4R nutrient stewardship requires the implementation of best management practices (BMPs) that optimize the efficiency of fertilizer use. The goal of fertilizer BMPs is to match nutrient supply with crop requirements and to minimize nutrient losses from fields. Selection of BMPs varies by location, and those chosen for a given farm are dependent on local soil and climatic conditions, crop, management conditions and other site-specific factors. Other agronomic and conservation practices, such as no-till farming and the use of cover crops, play a valuable role in supporting 4R nutrient stewardship. As a result, fertilizer BMPs are most effective when applied with other agronomic and conservation practices.

Management practices that control the fate of fertilizer treatments, whether commercial or residential, or use practices that promote the efficient use of nutrients by plants will minimize the amount of nutrients that could potentially be lost from the application site. In addition, applying controls to prevent runoff and erosion will help maintain fertilizers in the areas where they are applied. The Fertilizer Institute has resources for the public once an account is made (TFI 2024).

Enhanced Efficiency Fertilizers (EEF) are those that can reduce nutrient losses to the environment while increasing nutrient availability for the plant or the crop. These fertilizers can either slow the release of nutrients for uptake or alter the conversion of nutrients to other forms that may be less susceptible to losses. Categories of EEFs include slow and controlled release nitrogen fertilizers, nitrogen stabilizers and phosphate management products (The Fertilizer Institute 2024b). Further, the precision agriculture method of variable rate technology (VRT) provides the means to change the rate of fertilizer application through mapping the soil characteristics of a farm and determining the appropriate rate and amount of application for a given area of land. These and other

means of managing fertilizer application are useful and necessary in managing nutrients applied to a field and in minimizing nutrients lost through runoff.

F.5.2 Wastewater

Treating nutrients in wastewater at the source is an effective method for ensuring excess nutrients do not enter water bodies. Primary treatment involves physical removal of floatable or settable solids. Secondary treatment involves the biological removal of dissolved solids. Advanced treatment methods may allow for tertiary treatment that includes processes to remove nutrients.

Biological nutrient removal (BNR) removes TN and TP from wastewater through the use of microorganisms under different environmental conditions in the treatment process; BNRs for nitrogen and/or phosphorus are outlined in the USEPA document published in 2007. Additionally, the USEPA funded a National Study of Nutrient Removal and Secondary Technologies to determine efficient and cost-effective approaches for nutrient removal at publicly owned treatment works. A website of the same name has been developed to disseminate information on approaches and success stories concerning this effort (USEPA 2024).

F.5.3 River Diversion Research

A large amount of research has been done over recent decades to investigate nutrient transformation and assimilation in areas receiving diverted Mississippi River water (Elsey-Quirk, Graham et al. 2019, White, DeLaune et al. 2019). Estimates of nutrient concentrations and removal from currently operating diversions and siphons would require a large data collection and collation effort. Interested parties and the public are encouraged to read the special virtual issue of Estuarine, Coastal, and Shelf Science titled "Impacts of freshwater inputs to coastal systems with special reference to the Mississippi delta" (2021), as well as information on that topic developed in Chapter 4 of the Mid-Barataria Environmental Impact Statement (ACOE 2022). Research will continue as sampling programs gain ground in data collection and studies are developed; gages will be an important component of research efforts (gage needs are present). Additional previous research is covered in Section F.6.

F.6 River Diversions

Louisiana is situated at the bottom of the Mississippi-Atchafalaya River Basin (MARB) watershed, where watersheds that drain from upriver terminate. In its unique position at the mouth of the Mississippi-Atchafalaya River Basin, Louisiana faces the aggregate effects of nutrients introduced to the system in each upriver state. Once nutrients have entered the Mississippi River system, they are on a highway to the GOA. One of the ways to address this challenge is to trap nutrients in aquatic and coastal systems, for example through nutrient uptake by wetland vegetation.

A quarter of Louisiana's productive coastal landscape has been lost over the past century, with greater losses predicted in the future. Diversions of water from the Mississippi and Atchafalaya Rivers into adjacent bays and wetlands to restore natural land building processes have been a

significant component of coastal restoration strategies since the 1990s (Gagliano and Van Beek 1993; LCWCRTF-WCRA 1998; USACE and LDNR 2004; and CPRA 2007, 2012, 2017, 2023). Louisiana's Coastal Master Plan identifies a number of river projects designed to divert freshwater and sediment from the Mississippi River into adjacent coastal wetlands in an effort to restore deltaic land-building processes disrupted by the construction of levees on the river and to reverse the trend of land loss that has plagued coastal Louisiana since at least the 1930s (CPRA 2023). The river diversion projects could have multiple potential restoration benefits in addition to building and sustaining coastal land, including improvement of offshore water quality (including the mitigation of hypoxia), through enhanced wetland nutrient retention. This trapping of nutrients by wetlands receiving the diverted river water has the potential of lower nutrient loads that reach the Gulf of America. A study on river diversions found that operating river diversions to flow over the surrounding marshes maximizes the potential for removal of riverine nitrate and limits delivery of nitrate to the coastal ocean, thereby mitigating expressions of eutrophication including algal blooms and hypoxia (VanZomeren et al. 2013).

Louisiana's 2023 Coastal Master Plan (CPRA 2023) prescribes a portfolio of projects to reduce land loss and preserve coastal ecosystems and communities (see Figure 6). The 2023 Coastal Master Plan utilized decision criteria to assess risk reduction and restoration potential and identified projects that maximize these benefits (CPRA 2023). CPRA also used metrics as criteria to evaluate the effectiveness of projects and understand how benefits differ between projects. Water quality changes in open water areas are calculated by the Master Plan model, and are used by the Fish and Shellfish Community Model to represent changes in fish biomass and distribution. Reconnecting the river with the coastal wetlands through diversion projects is not a new concept or endeavor; a number of diversion projects and siphons have already been constructed and are operating (e.g., Davis Pond). River diversion projects have been a significant component of every coastal planning effort since the 1990s and are a keystone project of the 2023 Coastal Master Plan. The 2023 Coastal Master Plan predicts 314 square miles of land built or maintained under a lower 50-year future environmental scenario, compared to 1,100 square miles lost without action. River diversion projects are predicted to contribute a large portion of this built or sustained land.

The CPRA has developed a System-Wide Assessment and Monitoring Program (SWAMP) to monitor and assess both natural and human systems in coastal Louisiana. The development and implementation of SWAMP provides the framework to evaluate to evaluate and manage the overall protection and restoration program and serves as the backbone of project-related monitoring needs. Through SWAMP, a regional discrete water quality monitoring was implemented coastwide. The regional SWAMP water quality network in leverages existing long-term water quality programs (Louisiana Department of Environmental Quality, Louisiana Department of Wildlife and Fisheries (LDWF), and U.S. Geological Survey), combined with the implementation of new water quality stations for a total of 120 discrete and 3 continuous water quality stations. Water quality parameters measured include nitrogen [(total Kjeldahl nitrogen (TKN), nitrate+nitrite nitrogen (NO3NO2), and ammonia (NH3)], phosphorus [(total phosphorus (TP), orthophosphate (PO4)], silica (SiO2), chlorophyll a, total suspended solids (TSS), turbidity, dissolved oxygen (DO), dissolved oxygen percent saturation, temperature, salinity, and pH.

A tremendous amount of research has been done over recent decades to investigate nutrient transformation and assimilation in areas receiving diverted Mississippi River water. This research includes empirical studies in a variety of habitats including coastal swamps, wetlands, and estuaries. Furthermore, this research suggests that estuaries have a number of biotic and abiotic pathways to remove nutrients from the water column, including denitrification, burial, plant uptake, and assimilation into the food web. Thus, the overall amount of nitrogen and phosphorus reaching the GOA can be reduced by reconnecting the Mississippi River to coastal estuaries (DeLaune et al. 2005; Lane et al. 2004).

River diversions are included as part of the Strategy as they have been shown through modeling and other lines of evidence to provide ecosystem restoration benefits, including nutrient reduction capabilities. Some diversions such as Davis Pond and Caernarvon are existing and operational. Louisiana's Coastal Master Plan (CPRA 2023) identifies a number of sediment diversions, which models predict will build coastal wetlands that have the ability to assimilate nitrogen and phosphorus. A number of sediment diversions are included in the first Coastal Master Plan implementation period (1-10 years); projections of construction completion and beginning of operations for current "in process" diversions are:

- Mid-Barataria: 2029 (on hold in construction phase)
- Mid-Breton: ~2027 for Record of Decision
- Maurepas: 2025

The State recognizes the lengthy time frame for planning, engineering, and design work that is necessary to construct river diversion projects. Sediment diversions are components of a larger restoration and protection strategy beyond 2029.Section: River Diversion Research (pg. 103).

Constructing projects in Louisiana that divert Mississippi River water into surrounding wetlands is not a new concept. Such projects have been in place since the 1930s. The first river diversion projects were constructed for flood control. Later, various diversions and siphons were constructed to combat salt water intrusion and improve fish and wildlife habitat. The most recently planned diversions are aimed at diverting sediment to build wetlands.

Understanding deltaic geology and the land-building processes, such as those that built the Mississippi River Delta, are critical to the effective engineering, design, and construction of river diversions that are capable of building and sustaining land. Likewise, understanding the effects of river diversions on the receiving basins containing coastal wetlands and estuaries is also important. CPRA has commissioned scientists over the years to study the effects of existing river diversions on coastal wetlands and estuaries to better understand and predict what will happen when the river is reconnected to coastal areas after decades of being isolated from riverine inputs. Even though this body of science has grown exponentially, there are still uncertainties to be resolved.

Researchers such as Mitsch et al. (1999) emphasized the importance of targeting wetland creation and restoration in areas where nitrogen concentrations and loads were highest as a

means of removing nutrients from local rivers and streams as a method of nonpoint source control. Perez et al. (2011) also said that based on their research, diversions from the Mississippi River into shallow estuarine systems can result in significant reductions in nutrients, especially nitrogen, prior to reaching offshore waters. Additional research suggests that estuaries have a number of biotic and abiotic pathways to remove nutrients from the water column, including denitrification, burial, plant uptake, and assimilation into the food web. Thus, reconnecting the Mississippi River to the coastal estuaries in Louisiana can assimilate nutrients through several pathways, thereby reducing the overall amount of nitrogen and phosphorus exported from the system before they reach the GOA (DeLaune et al. 2005; Lane et al. 2004). Studies conducted over the past 1-2 decades have reported that Breton Sound wetlands receiving Mississippi River water through the Caernarvon Diversion act as a sink for nitrogen (Day et al. 2009; Lane et al. 1999).

LIST OF APPENDICES

APPENDIX A: STRATEGIC ACTIONS SCHEDULE 2024 TO 2029

Strategic actions targets and goals (Component 8) from 2024 through 2029 for the Louisiana Nutrient Reduction and Management Strategy ("Strategy"). *Activities may be dependent on resource availability.*

Strategic Action	Agency Commitment(s)	Schedule 2024 to 2029
1. Stakeholder Engagement		
1.a. Identification and engagement of stakeholders	Strategy Interagency Team	Ongoing
1.b. Perform outreach/education on strategy	Strategy Interagency Team	Ongoing
1.c. Identify and promote partnerships/leveraging opportunities	Strategy Interagency Team	Ongoing; 2 new leveraging partners (GOAA and USEPA Gulf of America Division) activities will continue for next 3-5 years.
	Stakeholders	As needed, notify Strategy Interagency Team of opportunities (contact nutrient.management@la.gov).
2. Decision Support Tools		
2.a. Identify, evaluate, and document selected tools	Strategy Interagency Team	Ongoing; new tools reported annually.
	Stakeholders	Ongoing, notify Strategy Interagency Team of potential tools (contact nutrient.management@la.gov).
3. Regulations, Programs, & Policies		
3.a. Propose new regulations, policies and programs	Strategy Interagency Team	As needed.
	Stakeholders	As needed, notify Strategy Interagency Team of new items (contact nutrient.management@la.gov).
4. Management Practices & Restoration Activities		

4.a. Document current practices related to nutrient reduction and management	LDEQ, LDAF, USDA NRCS and LDENR for Coastal NPS Program LDEQ LPDES Program	Annual Annual
	CPRA	See Coastal Master Plan.
4.b. Identify areas where practices being implemented	LDEQ, LDAF, USDA NRCS and LDENR for Coastal NPS Program	Annual, see NPS Pollution Program and Coastal Nonpoint Pollution Control Program.
	LDEQ LPDES Program	Quarterly, see LPDES Program.
	CPRA	Annual, see Coastal Master Plan.
4.c. Identify case studies and model watersheds	LDEQ, LDAF, USDA NRCS and LDENR for Coastal NPS Program	Annual
	LSU AgCenter	Annual
	CPRA	Annual
4.d. Integrate science-based nutrient reduction and management approaches	CPRA	Ongoing, see Coastal Master Plan.
	LSU AgCenter	Ongoing
	LDEQ LPDES	Ongoing
4.e. Promote BMP/CP implementation by farm in priority watersheds	USDA NRCS	Ongoing, see Farm Bill Programs; updates pending as of 2024.
	LDAF OSWC	Ongoing
	LSU AgCenter	Ongoing
5. Status & Trends		
5.a. Model nutrient loading estimated within Louisiana watersheds	USGS, LDEQ, CPRA	SPARROW modeling released 2021; continued work on project continues into 2024 Strategy period. Annual USGS loadings to MARB and associated press ongoing.
	CPRA	Ongoing, see Coastal Master Plan
5.b. Document/trends for in-stream nutrient water quality	LDEQ	Annual documentation, Long-term ambient stations trends update targeted for 2026.

5.c. Document/trends for Social Indicators of nutrient reduction and management behavior	SERA-46 and Land Grant Universities (LGU)	See SERA-46 and LGU.
5.d. Document/trends for BMP/CP implementation in watersheds	USDA NRCS, LDAF OSWC, LSU AgCenter, LDEQ	Annual documentation for state programs; USDA information will be summarized when 2018 Farm Bill complete.
5.e. Document/trends for permitted discharger inventories	LDEQ LPDES Program	Annual documentation.
5.f. Document/trends for river diversion efforts	CPRA	See Coastal Master Plan.
5.g. Document coastal protection and restoration activities	CPRA	See Coastal Master Plan.
6. Watershed Characterization, Source Identification, & Prioritization		
6.a. Maintain watersheds and water body characterization	LDEQ	Ongoing, National Hydrography Dataset (NHD) & Watershed Boundary Dataset (WBD); Water Quality Management Plan (WQMP) Volume 4 Basins & Subsegments.
	LDENR, CPRA	As needed, coastal zone boundary.
	USGS, USDA	Ongoing, national datasets.
6.b. Identify potential pollution sources through Desktop Analysis/Windshield Survey	LDEQ New Vision	Ongoing, project specific.
	LDEQ Surveillance	
	LDEQ NPS	
6.c. Identify unpermitted point sources	LDEQ Surveillance	Ongoing
6.d. Identify priority watersheds from leveraging programs	USDA MRBI	Extended through 2024.
	USDA NWQI	Extended through 2024.

	LDEQ/LDAF/LDENR NPS	See NPS Program; Plan in effect 2023-2027.
	LDEQ Vision 2.0	USEPA Vision Program 2022-2032
	Stakeholders	Ongoing, notify Strategy Interagency Team of priority watersheds (contact nutrient.management@la.gov).
6.e. Determine priority watershed & subwatershed basins	Strategy Interagency Team	Established for LDEQ NPS/TMDL and CPRA programs for 2024 Strategy period; ongoing annual reporting via programs.
	LDEQ WPAD	Evaluate nutrient translator applicability (ongoing through 2024 assessment period); Water Quality Standards Triennial Review process begins 2024, anticipated end 2025.
6.f. Develop/leverage watershed nutrient reduction and management projects for priorities	Strategy Interagency Team	LDEQ NPS/TMDL 5-year priorities identified (through 2027) and work initiated in 2023.
	LSU AgCenter	Ongoing, see LSU AgCenter
	NRDA Louisiana TIG	See BP Deepwater Horizon Restoration Louisiana Trustee Implementation Group.
	Stakeholders	Ongoing, notify Strategy Interagency Team of projects (contact nutrient.management@la.gov).
7. Incentives, Funding, & Economic Impact Analysis		
7.a. Promote voluntary participation in incentive-based programs	Louisiana Master Farmer	Ongoing, see LSU AgCenter.
	Louisiana Master Poultry Producer	
	Louisiana (Kellogg) Master Rice Grower	
	Louisiana Master Cattlemen	

	Louisiana Master Gardener	Ongoing, see LSU AgCenter.
	Louisiana Master Naturalist	
	Louisiana Environmental Leadership Program (ELP)	Ongoing, see ELP Program; Annual Reporting.
7.b. Identify and communicate new funding initiatives/projects	Strategy Interagency Team	Ongoing; projects and initiatives integrated into Strategy Annual Reporting.
	Stakeholders	Ongoing, notify Strategy Interagency Team of projects (contact nutrient.management@la.gov).
7.c. Promote assistance (financial or technical) for BMP/CP implementation	USDA NRCS	Ongoing
	LDAF OSWC	Ongoing
7.d. Promote assistance (financial or technical) for point sources	LDEQ SB/SCAP	Ongoing
	LDEQ Enforcement	Ongoing
7.e. Document economic impacts from available sources	Strategy Interagency Team	As available.
	LSU AgCenter	Monthly, Commodities and Conservation.
	Stakeholders	As available, notify Strategy Interagency Team of sources (contact nutrient.management@la.gov).
7.f. Develop and implement a water quality credit trading program	LDEQ	Final rule in October 2019; Ongoing implementation.
	Stakeholders	Ongoing, notify LDEQ of interest in participating in water quality trading (contact wq.trading@la.gov).
9. Monitoring		
9.a. Monitor in-stream nutrient water quality	LDEQ Surveillance	Ambient stations monthly for a year, every 4 years.
		Long-term ambient stations monthly each year.

	LDEQ WPAD	Monitored select coastal lakes 2021-2023; evaluating data 2024-2026.
9.b. Monitor water quality relative to BMP/CP implementation	LDEQ Coastal NPS Program	Project specific, bi-monthly or monthly.
9.c. Monitor nutrients associated with riverine diversions	CPRA	Project specific, see Coastal Master Plan.
9.d. Monitor nutrients in point sources	LDEQ LPDES Permitted Dischargers	Performed by permittees quarterly or other frequency as specified in permit.
9.e. Evaluate compliance with point source permits	LDEQ	Annual sweeps and reporting.
9.f. Identify and communicate new monitoring projects/initiatives	Strategy Interagency Team	Ongoing
	Stakeholders	GOAA Water Resources and NOAA extending annual hypoxia cruise in 2024 and 2025; LMRSBC examining projects that may including monitoring ~2024-2025; (contact nutrient.management@la.gov).
10. Reporting		
10.a. Conduct 5-year strategy review	Strategy Interagency Team	Initiate in 2028, complete in 2029.
10.b. Report annually on strategy activities	Strategy Interagency Team	Annual
10.c. Disseminate information through strategy website	LDEQ	Ongoing; at least annually during 2024 Strategy period.
10.d. Document spotlight(s) of nutrient reduction and management successes	Strategy Interagency Team	Ongoing; LDEQ success stories published via USEPA upon identification during 2024 Strategy period.
	Stakeholders	Ongoing, notify Strategy Interagency Team of spotlights; (contact nutrient.management@la.gov).

APPENDIX B: LEVERAGING OPPORTUNITIES

Leveraging opportunities for nutrient reduction and management within Louisiana may exist through collaboration with numerous and diverse stakeholder groups such as these described below. This list includes programs/organizations that have and/or can promote direct on-the-ground activities for nutrient management and reduction in Louisiana.

Stakeholder Group	Description	Web Resource
4R Nutrient Stewardship	4R Nutrient Stewardship is a science-based approach that offers environmental management, increased production, increased farmer profitability, and improved sustainability. The 4R concept is the use of the right fertilizer source, at the right rate, at the right time, with the right placement.	https://4rcertified.org/
American Farmland Trust	American Farmland Trust is working with farmers, planners and policy makers to ensure a regionally diverse structure for agriculture and more favorable economic conditions to keep farmers and ranchers on the land.	http://www.farmland.org/
America's Watershed Initiative	This initiative seeks to build and implement a vision based on collaboration and mutually beneficial outcomes in contrast to single purpose advocacy. It builds upon strong leadership present in many tributary watersheds. America's Watershed also seeks to link and augment these efforts, creating a broader partnership that can serve as a unified voice for the whole system, and support the effective resolution of issues that span multiple regions and issues such as energy, transportation, water quality and floodplain management.	http://americaswatershed.org/
Atchafalaya Basin Program (ABP)	The Atchafalaya Basin Program (R.S. 49:214.8.1 et seq.), placed under the Coastal Protection and Restoration Authority (CPRA), focuses on water quality/water management as a key category for managing projects within the basin. The ABF Annual Plan resides within the overall annual planning process of CPRA. This process allows for extensive public review and input as well as oversight from the CPRA Board and the State Legislature.	http://coastal.la.gov/atchafalaya-basin-program/

Stakeholder Group	Description	Web Resource
Barataria-Terrebonne National Estuary Program (BTNEP)	BTNEP is one of 28 National Estuary Programs, spanning 29 states, throughout the United States and its territories. The National Estuary Program was established by Congress through section 320 of the Clean Water Act of 1987 and BTNEP became a National Estuary in 1990. BTNEP is a partnership of government, business, scientists, conservation organizations, agricultural interests, and individuals for the preservation, protection, and restoration of the Barataria-Terrebonne National Estuary in southeast Louisiana. An understanding between BTNEP and Minnesota was in place during the 2019 Strategy period for improved water quality upbasin for benefits downstream.	https://btnep.org/
Bayou Vermillion District	Bayou Vermilion District proposes to improve water quality and aesthetics of Bayou Vermilion within Lafayette Parish to promote the waterbody as a recreational and cultural asset, an economic asset, and for the general enhancement of the condition of the bayou.	https://bayouvermiliondistrict.org/
The Conservation Fund (TCF)	TCF practices conservation to achieve environmental and economic outcomes. Since 1985, more than 211,000 acres have been preserved to benefit wildlife within Louisiana; several projects have water quality benefits. In addition, TCF supports the gulf hypoxia efforts through conservations across programs.	https://www.conservationfund.org/where-we-work/louisiana
Delta REACH (Research and Education to Advance Conservation and Habitat)	The REACH program will be a Mississippi state-wide, producer driven, "hands on" delivery vehicle, that will provide coordination and support for documenting the benefits of conservation efforts to natural resources and agriculture on specific farms. Similar land use and conservation practices within the Mississippi delta region are found in Louisiana, and this REACH effort could inform Louisiana producers.	

Stakeholder Group	Description	Web Resource
Ducks Unlimited (DU)	DU works on conservation programs within Louisiana through restoring grasslands, replanting forests, restoring watersheds, working with landowners and partners, acquiring land, conservation easements, and management agreements. These efforts by DU aimed at restoring habitat for waterfowl also act to improve water quality.	https://www.ducks.org/louisiana
Field To Market	Field To Market is a nonprofit organization of a diverse alliance working to create opportunities across the agricultural supply chain for continuous improvements in productivity, environmental quality, and human well-being. Field to Market provides collaborative leadership that is engaged in industry-wide dialogue, grounded in science, and open to the full range of technology choices. Currently 50 organizations participate in Field to Market and this participation includes growers, conservation, agribusiness, and academic/research groups.	http://www.fieldtomarket.org/
Gulf Hypoxia Program	The Bipartisan Infrastructure Law provides a historic $50 billion in funding for EPA to support states and Tribes investing in clean and safe water, with $60 million to this program. Funding allows USEPA to invest in strategies to improve water quality in the Mississippi River/Atchafalaya River Basin and the Gulf of America and reduce the hypoxia zone in the northern Gulf. Program is scheduled for FY22-FY26, with no-cost extensions possible.	https://www.epa.gov/ms-htf/gulf-hypoxia-program

Stakeholder Group	Description	Web Resource
Gulf of America Alliance (GOAA)	GOAA is composed of state and federal agencies along with partners and covers the five Gulf states of Alabama, Florida, Louisiana, Mississippi, and Texas. The goal of GOAA is to increase regional collaboration to enhance the ecological and economic health of the Gulf of America. Five priority issue areas have been identified: Data & Monitoring, Educations & Engagement, Habitat Resources, Water Resources, and Wildlife and Fisheries. Cross Initiatives include: Comprehensive Conservation, Restoration, and Resilience Planning Ecosystem Services, and Marine Debris. The GOMOD platform includes a comprehensive map of extent for priority habitats across the entire Gulf of America, curated theme maps for key coastal and ocean management topics of interest to Gulf stakeholders, a data explorer where users can choose their own datasets of interest, and access to a suite of regional data tools developed by GOAA. Water Resources has secured funding for nutrient reductions in the Morehouse district via agricultural BMPs via grant funding through the USEPA (2023).	http://www.gulfofmexicoalliance.org/index.php
Gulf of America Hypoxia Watch	The Gulf of America Hypoxia Watch maps near real-time bottom dissolved oxygen data to monitor hypoxic conditions in the Gulf of America. Data is collected during the NOAA Fisheries annual Summer Groundfish Survey, which evaluates the population and health of commercially important shrimp, fish, and other marine organisms relative to environmental conditions in the Gulf as part of the Southeast Area Monitoring and Assessment Program (SEAMAP), a federal, state, and university cooperative. Oxygen data from the survey are used to generate products that provide updates on hypoxic conditions in the Gulf.	https://www.ncei.noaa.gov/products/gulf-mexico-hypoxia-watch

Stakeholder Group	Description	Web Resource
Healthy Watersheds Protection, USEPA	This USEPA encourages local and state agencies to be proactive and place a stronger emphasis on protecting their remaining healthy watersheds as a way to save money and the environment. The program also supports and integrates the work of these efforts to encourage more holistic protection of aquatic ecosystems.	https://www.epa.gov/hwp
Lake Pontchartrain Basin Restoration Program	The purpose of the Clean Water Act Section 121 (33 U.S.C. 1273) Lake Pontchartrain Basin Restoration Program is to restore the ecological health of the Basin by developing and funding restoration projects and related scientific and public education projects to reduce the risk of pollution. The 2021 Infrastructure Investment and Jobs Act, also known as the Bipartisan Infrastructure Law, provided additional annual funds of $10,248,000 for the program for fiscal years 2022-2026.	https://www.epa.gov/la/lake-pontchartrain-basin-restoration-program
Louisiana Outdoors Forever	During the 2022 legislative session, the Louisiana House of Representatives and Louisiana Senate passed House Bill 762, establishing the Louisiana Outdoors Forever Program and Louisiana Outdoors Forever Fund. Working through voluntary conservation measures, the program will help fund projects that protect drinking water supplies, conserve wildlife habitat, provide recreational opportunities in urban and rural areas, sustain working farms and forests, and much more.	https://www.wlf.louisiana.gov/page/louisiana-outdoors-forever

Stakeholder Group	Description	Web Resource
Louisiana Trustee Implementation Group	The Deepwater Horizon Oil Spill Louisiana Trustee Implementation Group (Louisiana TIG) has released the Final Restoration Plan and Environmental Assessment #4: Nutrient Reduction (Nonpoint Source) and Recreational Use. This Final Restoration Plan describes and proposes restoration project alternatives considered by the Louisiana TIG to improve water quality by reducing nutrients from nonpoint sources and to compensate for recreational use services lost as a result of the Deepwater Horizon oil spill. More funds are expected through this aspect of the program.	https://la-dwh.com/final-restoration-plan-and-environmental-assessment-4-nutrient-reduction-nonpoint-source-and-recreational-use/
Louisiana Water Synergy Project, U.S. Business Council of Sustainable Development	The Water Synergy Project creates an industry forum for regional collaboration to address water quality, quantity, and storm water challenges in southern Louisiana, with a focus on the New Orleans to Baton Rouge Mississippi River Corridor. In this structured forum, business leaders from multiple industries will work together to identify water management issues, identify solutions that work, and implement.	http://usbcsd.org/water

Stakeholder Group	Description	Web Resource
Louisiana Watershed Initiative	In May 2018, Louisiana state Gov. Edwards issued an executive order establishing the Council on Watershed Management to develop and implement a statewide floodplain management program based on watersheds as opposed to political and jurisdictional boundaries, which water does not recognize. The Council was charged with empowering local jurisdictions and communities to implement regional, long-term solutions that follow watershed boundaries to better reduce flood risk in Louisiana communities. The Louisiana Watershed Initiative serves as the program through which floodplain management responsibilities are coordinated across federal, state and local agencies, supported by experts who serve as advisors in building a foundation of data, projects, policies, standards and guidance. Aspects of the program continue.	https://watershed.la.gov/
Lower Mississippi River Conservation Committee (LMRCC)	The LMRCC is a coalition of 12 state natural resource conservation and environmental quality agencies in Arkansas, Kentucky, Louisiana, Mississippi, Missouri and Tennessee. It provides the only regional forum dedicated to conserving the natural resources of the Mississippi River's floodplain and focuses on habitat restoration, long-term conservation planning and nature-based economic development.	http://www.lmrcc.org/

Stakeholder Group	Description	Web Resource
LDAF Office of Soil & Water Conservation (OSWC)	The Office of Soil & Water Conservation provides financial assistance, administrative support, centralized direction and coordination to Louisiana's 44 Soil & Water Conservation Districts (SWCDs) which provide conservation planning services to landowners within their individual districts. SWCDs are local units of state government with capabilities unique to any other form of state or local government, due mainly to their capability of entering private property at the request of landowners to plan and/or construct various conservation systems. Each of Louisiana's 44 SWCDs are assisted by the USDA NRCS.	https://www.ldaf.la.gov/about/organization/oswc
Lower Mississippi River Sub-basin Committee (LMRSBC)	The LMRSBC is composed of representatives from five states including Arkansas, Louisiana, Mississippi, Missouri, and Tennessee. Key to the mission of the LMRSBC is to support the Gulf Hypoxia Action Plan.	Under construction; see USEPA's Gulf Hypoxia Program https://www.epa.gov/ms-htf/gulf-hypoxia-program
Mississippi River Basin Healthy Watershed Initiative (MRBI), USDA NRCS	Launched in 2009, the 12-state MRBI uses several Farm Bill programs, including the Environmental Quality Incentives Program (EQIP), to help landowners conserve America's natural resources through voluntary conservation. The overall goals of MRBI are to improve water quality, restore wetlands and enhance wildlife habitat while ensuring economic viability of agricultural lands.	https://www.nrcs.usda.gov/programs-initiatives/mississippi-river-basin-healthy-watersheds-initiative

Stakeholder Group	Description	Web Resource
Mississippi River Cities and Towns Initiative (MRCTI)	The MRCTI was created by the Northeast-Midwest Institute (NEMWI) through a grant from the Walton Foundation. The goal of the MRCTI is to create a new and influential voice for the Mississippi River and to demand effective river protection, restoration, and management in Washington, D.C. MRCTI is a local government-lead effort empowering the ten states and over one hundred cities that border the Mississippi River to act for its continued prosperity, sustainability, and economic growth. There are 124 Mississippi River main stem cities and towns. These riparian population centers are soundly River-centric. MRCTI gives a common voice to those who depend most upon the River, and by virtue of doing so, spans political and economic interests.	https://www.mrcti.org/
Mississippi River/Gulf of America Watershed Nutrient Task Force (Hypoxia Task Force)	The Hypoxia Task Force consists of 5 federal agencies, 12 states and the tribes within the Mississippi-Atchafalaya River Basin (MARB). The Task Force was established in 1997 to reduce and control hypoxia in the Gulf of America.	http://water.epa.gov/type/watersheds/named/msbasin/index.cfm
National Water Quality Initiative (NWQI), USDA NRCS	The NWQI will work in priority watersheds to help farmers, ranchers and forest landowners improve water quality and aquatic habitats in impaired streams. NRCS will help producers implement conservation and management practices through a systems approach to control and trap nutrient and manure runoff. Qualified producers will receive assistance for installing conservation practices such as cover crops, filter strips and terraces.	http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/programs/financial/eqip/?cid=stelprdb1047761

Stakeholder Group	Description	Web Resource
National Oceanographic and Atmospheric Administration (NOAA)	The National Centers for Coastal Ocean Science (NCCOS) supports a Hypoxia National Office at the Northern Gulf Institute, a NOAA Cooperative Institute. This office advances research and management of hypoxia in the Gulf of America and addresses NOAA mandates under the Harmful Algal Bloom and Hypoxia Research and Control Act. The Hypoxia National Office works with NOAA to provide technical assistance, observations and monitoring, coordination, and the science underpinning the management of the annual hypoxic zone in the Gulf of America, including summer measurements via annual cruises. Harmful Algal Bloom satellite imagery is also available ~daily on the specially developed NCCOS supporting webpage.	https://coastalscience.noaa.gov/crp/hypoxia/
Pontchartrain Conservancy (PC)	The PC is dedicated to restoring and preserving the water quality, coast, and habitats of the entire Pontchartrain Basin. The Lake Pontchartrain Basin is a 10,000 square mile watershed encompassing 16 Louisiana parishes. Through coordination of restoration activities, education, advocacy, monitoring of the regulatory process, applied scientific research, and citizen action, LPBF works in partnership with all segments of the community to reclaim the Basin for this and future generations.	https://scienceforourcoast.org/ https://www.nrcs.usda.gov/wps/portal/nrcs/detail/la/people/partners/?cid=nrcs141p2_015725
Restore the Earth	Restore the Earth is a nonprofit organization that supports restoration of the Earth's forested and wetland ecosystems. One of its goals is to restore 1 million acres in the Mississippi River Basin through public and private partnerships. Multiple projects have been completed or are slotted to begin within Louisiana towards restoration goals.	http://restoretheearth.org/projects/

Stakeholder Group	Description	Web Resource
Source Water Protection Program (SWPP), LDEQ	LDEQ manages the 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 that 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.	https://deq.louisiana.gov/page/drinking-water-protection-program
Southeast Aquatic Resources Partnership (SARP)	SARP is a regional collaboration of natural resource and science agencies, conservation organizations and private interests developed to strengthen the management and conservation of aquatic resources in the southeastern U.S.	https://southeastaquatics.net/
The Conservation Fund	This program boasts over 200,000 acres saved in the state of Louisiana. Selected projects in Louisiana include the Upper Ouachita National Wildlife Refuge, Maurepas Swamp Wildlife Management Area, and the Joyce Wildlife Management Area. To date, 211,420 acres of land and water saved, > 83,880 acres have been preserved in partnership with the Fish and Wildlife Service, and > 203,350 acres have been preserved to benefit Wildlife within the state.	http://www.conservationfund.org/
The Nature Conservancy (TNC), Louisiana	Within the state of Louisiana, TNC has protected nearly 300,000 acres of crucial habitats for people and nature. TNC has helped create or significantly expanded 9 State Wildlife Management Areas, 13 National Wildlife Refuges, and 2 State Conservation Areas. In addition, TNC has collaborated to successfully reconnect Mississippi River water at Mollicy Farm. The *Atchafalaya River Basin Initiative,* the *Freshwater Network*, and the Floodplain Prioritization Tool have been or are being developed by TNC for use by all parties involved in restoration efforts in Louisiana and/or the MARB.	http://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/louisiana/index.htm

Stakeholder Group	Description	Web Resource
U.S. Department of Agriculture Natural Resources Conservation Service (USDA NRCS)	Watershed Protection and Flood Prevention Program (PL-566) helps units of federal, state, local and federally recognized tribal governments (project sponsors) protect and restore watersheds.	https://www.nrcs.usda.gov/programs-initiatives/watershed-protection-and-flood-prevention-operations-wfpo-program
U.S. Environmental Protection Agency (USEPA)	The USEPA is the federal agency responsible for protecting and improving water quality. USEPA provides programs related to both nonpoint and point source management activities.	http://water.epa.gov/
U.S. EPA Recovery Potential Screening (RPS) Tool	Restoring the nation's tens of thousands of impaired waters is an immense challenge. No single restoration program, public or private, has the resources to work on all impaired waters at once. The RPS website offers a flexible framework of methods, technical information, instructional examples and tools that can be tailored to any watershed program or purpose in any geographic locality. This website provides a 'one-stop shop' for technical assistance in using RPS. Its major components include a step-by-step methodology, access to downloadable tools, reference materials on watershed indicators and user training and support. The multi-step RPS Methodology is described at a clear and basic level but also supported by hyperlinks to more complex technical tools, documents and training resources throughout the website.	https://www.epa.gov/rps
U.S. Fish and Wildlife Service (USFWS)	The USFWS is active in environmental projects within the state of Louisiana and the Mississippi-Atchafalaya River Basin that can impact water quality of the state's waters. The USFWS recently released a vision document for the GOA (USFWS 2013) which addresses focal areas of the Mississippi River Delta, Coastal Wetlands and Barrier Islands; Mississippi River Alluvial Valley; and Atchafalaya River Basin in Louisiana for gulf restoration priorities.	http://www.fws.gov/

Stakeholder Group	Description	Web Resource
USGS National Water-Quality Assessment (NAWQA) Program, USGS	The USGS NAWQA program provides information that can help managers tailor protection strategies to fit a given need, providing high quality water while minimizing costs. Examples of two significant projects driven by the NAWQA program include the Nutrients National Synthesis and the SPARROW model.	https://www.usgs.gov/mission-areas/water-resources/science/national-water-quality-assessment-nawqa?qt-science_center_objects=0#qt-science_center_objects
Water Environment Research Federation (WERF)	WERF, formed in 1989, is an independent scientific research organization dedicated to wastewater and storm water issues.	http://www.werf.org/
Walton Family Foundation (WFF)	The WFF focuses on protecting oceans and rivers and the livelihoods they support, for the benefit of people and the environment. Focus for the 2020 Environment Strategic Plan includes the Mississippi River and Coastal Gulf of America (with emphasis on supporting oil spill recovery projects). In 2018, a total $90.3 billion in environmental grants were awarded, with over $25 billion focusing on the Mississippi River and coastal areas (worldwide). Nearly $3 million dollars were earmarked specifically for water quality improvements in the Mississippi River Basin for 2018.	http://www.waltonfamilyfoundation.org/

APPENDIX C: REFERENCES

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APPENDIX D: RESPONSE TO COMMENTS

The Strategy Interagency Team (identified on page iv) informed the content of the updated 2024 Strategy based on agency and program specific objectives, and from building on 2014 and 2019 Strategy components through stakeholder interactions over the past five years. On November 6, the 2024 Strategy update was made available on the Louisiana Nutrient Strategy website at https://www.deq.louisiana.gov/page/nutrient-management-strategy and the Louisiana Department of Environmental Quality (LDEQ) public notice website at https://deq.louisiana.gov/public-notices?keyword=Nutrient+reduction&startDate=&endDate= for public comment through December 4, 2024. The public notice was also published in eight major papers across Louisiana, including The Daily Advertiser (Lafayette), The Advocate (Baton Rouge), American Press (Lake Charles), Houma Today, The News Star (Monroe), Shreveport Times, The Times Picayune/New Orleans Advocate, and The Town Talk (Alexandria). LDEQ multi-parish and statewide mailing lists were also included in the public notice.

Thirteen letters of public comment were received by December 4, 2024 and are available in the LDEQ Electronic Document Management System (EDMS; https://www.deq.louisiana.gov/page/edms). One response arrived on December 19, 2024 with a November 19, 2024 postmark, and was included with 12 other responses.

The Nutrient Reduction and Management Strategy (NRMS) is a 'living' document, as activities to address nutrients in Louisiana are continual and adaptive. During the reporting period, significant administrative and staff changes occurred across all agencies/partners, yet efforts have continued and new projects developed through additional funding, partnerships, and collaborative efforts of dedicated team members. The Mississippi River/Gulf of Mexico Hypoxia Task Force (HTF), formed in 1997, initiated nutrient strategy development; both CPRA and LDEQ remain active on the HTF Coordinating Committee (CC). The HTF CC provides executive level direction to support nutrient reduction/management within the Mississippi/Atchafalaya River Basin (MARB) throughout the 12 member states; each state remains able to address how efforts are to occur within their state boundaries. Louisiana continues to respect that directive while remaining open to opportunities to reduce nutrient effects coming into Louisiana and the Gulf of America (GOA) from upstream states. Additionally, Louisiana continues to support the reduction of nutrients (primarily total nitrogen [TN] and phosphorus [TP]) within state waters through voluntary efforts and programmatic activities across state, federal, local agencies and partners.

The Strategy Interagency Team reviewed the public comments, and responses to comments are provided below and grouped in three ways: (1) comments by topic, (2) areas of interest, and (3) specific questions/comments of respondents. The Strategy Interagency Team thanks the participants for their responses and suggestions to improve the Strategy. Some text clarification, document modification, and minor improvements were made that are not addressed below.

A. COMMENTS BY TOPIC

Several respondents shared similar comments by theme. These main topics include Strategy construct, defined goals, quantitative targets, Louisiana's nutrient burden, and public access/input to the Strategy. Responses to these main topics are discussed below.

A.1 Strategy Document: Some respondents did not like the structure of the Strategy and amount of information or results provided/not provided

Response: As nutrient management and reduction includes activities across agencies, partners, funding streams, fiscal years, and individual project deadlines, every effort has been made to breakdown the components (10 Strategic Actions) to assist with both understanding and reporting. This document is a 5-year (re)evaluation/update of the Strategy and components necessary for nutrient control, and constitutes the 2023 annual report to avoid duplication of effort. Reporting has been clearly outlined in the last action item since 2014 (Section E.3.10).

Due to public input, the actual document has been divided into three parts, including an explanatory page (page ii). Additional metrics were added where available to provide clarity and requested items. However, reporting from multiple agencies does not occur on the Strategy 5-year timeline, and reporting typically occurs by watershed and/or individual project level. Additionally, same-year reporting (here, 2024 activities and outcomes) should not be expected to occur, as it is not possible and/or efficient at time of development. Annual reporting is ongoing; reports are available on the Strategy's public webpage https://www.deq.louisiana.gov/page/nutrient-management-strategy. Scrolling the webpage is required to locate all active links.

Specific call-outs:

- Strategy 5-year update
    - Agency stakeholders evaluate the document and provide input on changes, updates, and/or needs for the overall Strategy for the upcoming 5-year period
        - Additional information pertinent to the member's area of expertise and 2023 reporting activities are requested for inclusion to the document
    - When available, 5-year summaries of the previous activities have been provided
- Action table
    - Breaks down ways in which the overall Strategy is accomplished across programs at each Action Level (described in Section E.3), with details on what the Action entails (each Action part is identified as a, b, c and so on):
        - After 10 years, Strategic Action components have been incorporated into Strategy team member's responsibilities and are marked as 'ongoing' according to the specific agency/partner; table was retained for continuity and clarity on what Actions involve and as a reference.
        - Additional details have been provided where relevant to overall Strategy goals at the project or program level.

A.2 Commenters requested a defined goal or directive within the Strategy

Response: The goal of the Strategy is to manage nitrogen and phosphorus to protect, improve, and restore the nutrient-related water quality in Louisiana's inland and coastal waters (page 8). LDEQ directives primarily follow Nonpoint Source Pollution Program (NPS) and Total Maximum Daily Load (TMDL and US EPA Vision alternatives) activities, in which priority watersheds for nutrient reduction/management efforts in the next 5-years have been identified. Priority waters and activities on them are done in conjunction with LDAF and associated partners. USDA priorities and watersheds have also been included under the current Farm Bill; national legislation and funding are necessary for new goals to be implemented in that arena. See Sections E.3.6: Prioritization, E.3.7, F.1, and F.3.2 for details. All of these programs contribute to nutrient reduction activities within state waters.

Additionally, other organizations such as the LSU Ag Center and the USEPA/Gulf of Mexico Alliance have engaged in projects that address nutrient pollution, and new projects have been initiated through the Gulf Hypoxia Program (via Infrastructure Law), where ~ 95% of funds are being directed to agricultural management practices on the ground. See Sections E.3.3 Activities and F.4 for details. These projects' activities, along with new/other opportunities being pursued, will be documented via the Strategy during the designated reporting/update year (Appendix D, Section A.1).

A.3 Some commenters asked for numeric (quantitative) targets for various programs within the Strategy, or for the Strategy as a whole

Response: The nutrient Strategy team continues to support and report ongoing nutrient reduction efforts across agencies/programs. LDEQ NPS Program and TMDL/TMDL Alternatives have quantitative targets specific to waterbodies and/or LDEQ defined water units. LDEQ NPS Program has developed or will develop Watershed Implementation Plans for priority watersheds on individual timelines. Thirty-eight water bodies were identified by LDEQ for water quality protection and restoration in 2023 for the next five years (Table 7). These priority water bodies are scheduled for nutrient load reductions through implementation of agricultural conservation practices (CPs, see below) and/or New Vision inspections/remediation actions. Existing nutrient load reduction targets are already in place for specific watersheds through TMDLs for dissolved oxygen/biochemical oxygen demand. Historically, TMDLs developed by LDEQ have required anywhere from a 25% to 80% reduction of the oxygen-demanding load to meet to the respective dissolved oxygen criterion of the waterbody for which the TMDL was developed. Additional TMDL activities have been planned, including new TMDLs, TMDL revisions, and advanced restoration plans (also referred to as TMDL alternative plans). It is anticipated that these activities will require or implement similar load reductions.

Agricultural CPs, whether implemented through Farm Bill conservation programs or through CWA Section 319 funds (both co-occur within Louisiana), aid significantly in water quality improvements. Implementation of many Farm Bill conservation practices, and all Clean Water

Act Section 319 practices, are geared towards statewide priority watersheds regarding nutrient and sediment loading, while also addressing multiple natural resource concerns. As such, agricultural CP goals and objectives are watershed specific; incentive program participation varies according to local environmental conditions, commodity markets, incentive value, land rental rates, landowner preference, watershed impairment, and other factors.

The Louisiana Master Farmer Program was developed over 20 years ago to offer a voluntary means of addressing resource concerns and water quality issues related to production agriculture across the state. Because all participation in the program is voluntary, numeric goals are not set for the number of certified Master Farmers nor a time-line to meet any goal. Many variables impact the certifications achieved each year, including the size of the farm, financial issues, producer goals, number of resource concerns that must be addressed, and actual ownership of the land. The program's goal is to continue to promote environmental stewardship and assist producers in reaching certification with a whole farm conservation plan, which ultimately improves surrounding waterbodies.

Concerning nutrient criteria targets, at this time LDEQ remains committed to current nutrient reduction and management activities, while exploring criteria and related requirements within the state of Louisiana. As an interim strategy, LDEQ is currently implementing EPA approved ammonia limitations into LPDES permits based on the EPA-approved ammonia criteria, as adopted at 40 CFR 131.21. The interim strategy has been utilized while developing new freshwater ammonia criteria and implementation procedures. LDEQ is in the final stages of approval for the new freshwater ammonia criteria, which is a positive step towards nutrient reduction in Louisiana waters. Additionally, pilot development of inland rivers and streams narrative nutrient criteria translators has occurred; testing for applicability is ongoing (see Appendix D, Section B.2.4).

Marked progress is reported, after internal testing and clearance, via the Strategy during the designated reporting year (Appendix D, Section A.1).

A.4 Some commenters requested mandatory and/or enforceable actions for nutrient reduction

Response: The Strategy continues to support existing approaches to managing nutrients in Louisiana water bodies. The Strategy Interagency Team and stakeholders will continue to provide opportunities to enhance nutrient reduction and management through the ten strategic components and associated actions outlined in Section E.2 (Strategic Components), and report on those outcomes in annual reports and 5-year updates to the Strategy.

Enforcement activities, via inspection, are ongoing as a means to target the number of unpermitted dischargers or dischargers in violation of permit limits in support of TMDL/New Vision alternatives for impaired water bodies. In some waterways, these enforcement efforts

may provide more impact to nutrient reduction than nonpoint source or discharge efforts in the permitting process.

A.5 Respondents want Louisiana's nutrient burden and hypoxia impacts highlighted more, particularly concerning fisheries/seafood

Response: The Strategy Interagency Team acknowledges upstream nutrient loading and the cascading effects of hypoxia development, such as the disruption of ecosystems (and their services) and economic hardships (Executive Summary, Preface, and Sections A.2, A.3, and F.3.3). Changing weather patterns, harmful algal blooms, and worsening of conditions through time are also called-out. Gulf of Mexico hypoxia is a well-studied and widely reported phenomenon, with yearly press occurring with hypoxia size predictions and measurements from the annual hypoxia cruise. Louisiana assists with the Hypoxia Task Force reports to congress. Additionally, nutrient effects are a part of discussion for public engagements (Section E.3.1). Resolutions and/or support concerning hypoxia impacts and reduction needs from industry are also reported via the Strategy during the designated reporting year (Appendix D, Section A.1).

A.6 Provide more Public Participation and Access

Response: The LEQ maintains a public website for the Strategy, pertinent activities, and Strategy-related documents: https://www.deq.louisiana.gov/page/nutrient-management-strategy. This public webpage has been maintained at its current location for at least six years and remains active. Additionally, decision support tools for use in nutrient reduction and management (models, strategies, BMPs, project plans, guidelines, etc.) are updated yearly on a separate public webpage (see also Section E.3.2): https://www.deq.louisiana.gov/page/nutrient-management-decision-support-tools. Trainings, for both Strategy Team members and for the public (including farmers), are highlighted in Section E.3.1 in both 5-year updates and in annual reports across years. These trainings are opportunities for educating all stakeholders on issues related to nutrient activities and include public outreach events. The LDEQ TMDL program has partnered with citizen-based groups (Our Waterways of Louisiana, Yellow Water, New, and Natalbany Rivers) that maintain Facebook pages on activities, and invites the public to participate in those endeavors.

Some commenters did not like that meetings and efforts towards nutrient stakeholder (and public) outreach/education are tracked and reported, while others wanted to be assured that these efforts concerned nutrient related issues (yes) and requested more information. The Strategy will continue ongoing efforts to balance conflicting views from the public and as staff are able.

Each Strategy update offers a ~30 day public comment period (the 2024 update is outlined at the top of this appendix). Each response to comment is read and considered towards improvement to both the Strategy document itself, and to pressing concerns from the public. For future public notices regarding the Strategy and other pertinent related activities, visit

https://deq.louisiana.gov/public-notices. This website posts current LDEQ Public notices, links for inclusion in the Permits Public notice mailing list, and LDEQ Public Participation Group information. For public notification of Total Maximum Daily Load and 303(d) List of Impaired Waterbodies, visit: https://internet.deq.louisiana.gov/portal/SUBSCRIBES/TMDLs-and-303-d-List-of-Impaired-Waterbodies.

A.7 Some commenters had issues concerning efforts in Louisiana occurring outside the MARB and/or at smaller-scales, while another criticized limiting activities to the MARB

Louisiana's approach to nutrient reduction and management occurs primarily at the state and local level. Combined efforts across governmental agencies and programs, industry, and agricultural communities, among others in the state, will ultimately affect nutrients originating within Louisiana's inland waters and transported downstream to coastal waters and the GOA. As essentially all waters in Louisiana drain to the Gulf; all nutrient reduction activities in the state are relevant (not just areas within the MARB). State participation and support of the Hypoxia Task Force and its actions, as well as strategic actions outlined within the state Strategy, are means by which the Strategy Interagency Team continues to work and address issues related to all nutrient sources and the impacts to Louisiana. This includes projects across scales and locations, as well as being open to opportunities outside of state boundaries.

B. COMMENTS BY AREA'S OF INTEREST

Several respondents had comments related specifically to river diversions and permits related activities. Responses are discussed below.

B.1 River Diversions

B.1.1 Timing and Uncertainty of Diversions

Commenters commended the multi-agency collaboration and the identification of control and capture methods, noting the recognition of river diversions as an important tool in reducing nutrient input into the GOA. However, commenters also raised concerns that the timelines for diversion projects do not align with those of the Gulf Hypoxia Action Plan (GHAP) due to their inherent uncertainty. Projections for the completion of key diversions, as outlined in the 2014 and 2019 strategies, were all incorrect.

Concerns were also raised about the long timeline of the Louisiana Comprehensive Master Plan (CMP), which spans 50–60 years, as this serves no purpose relative to the GHAP. Commenters highlighted that key diversions like the Mid-Barataria Sediment Diversion, which is touted as a major way for Louisiana to reduce nutrients, has been delayed again and under litigation, further limiting its impact.

While river diversions were noted as a tool to reduce nutrient loads, commenters emphasized that they are constructed primarily for rebuilding and sustaining Louisiana's coastal wetlands, with nutrient reduction benefits being a collateral effect. As such, commenters suggested that

the inclusion of diversions as a central element of the Nutrient Management Strategy should be reconsidered, particularly given that they don't contribute to the GHAP or an effective strategy until operational.

Concern was expressed over litigation and opposition, such as the announcement by Governor Landry that the Mid-Barataria Sediment Diversion would "break our culture" and litigation surrounding the Bonnet Carré Floodway. These issues compound the uncertainty surrounding river diversions, which are considered by commenters to be an untenable central strategy for nutrient reduction and management.

Response: River Diversions are one of ten strategic components of the NRMS to reduce and manage nutrients. Sediment diversions are key components of a broader coastal restoration and protection strategy beyond 2025. Existing and operational diversions, such as Davis Pond and Caernarvon, along with siphons like Naomi and West Pointe à la Hache, are already existing and operational. Additionally, the River Reintroduction into Maurepas Swamp is permitted and under construction, while the Mid-Breton Sediment Diversion is in the design phase. The Mid-Barataria Sediment Diversion is on hold in the construction phase. Additionally, the state is examining additional diversions into the upper coastal basins as well as potential beneficial changes to the operating regime of current diversions. The on-the-ground projects are delivering ancillary nutrient reduction benefits aligning with the GHAP 2025 goal, intercepting nutrients that would otherwise flow into the Mississippi River and offshore. The Maurepas Diversion, along with the Mid-Barataria and Mid-Breton diversions—if permitted and constructed according to schedule—would further provide ancillary nutrient reduction benefits by 2035, aligning with the GHAP 2035 goal.

B.1.2 Nutrient Pollution Concerns

A commenter highlighted the need to address several scientific and operational questions before adopting diversions as a nitrogen and phosphorus pollution reduction measure. While diversions may reduce pollution reaching the Gulf, they risk redirecting it elsewhere, potentially causing harmful algae blooms and dead zones in wetlands and bays. Studies indicate that increased nutrient pollution can harm wetlands, emphasizing the importance of ensuring cleaner water flows into diversions. Past events, such as the Bonnet Carré Spillway opening, demonstrate these risks and should be carefully considered.

Response: A large amount of research has been done over recent decades to investigate nutrient transformation and assimilation in areas receiving diverted Mississippi River water (Elsey-Quirk, Graham et al. 2019, White, DeLaune et al. 2019). Nutrient inputs from river diversions into open water bodies can lead to various ecological changes, such as enhanced primary productivity, shifts in phytoplankton communities, hypoxia, and eutrophication. Increased freshwater flow reduces salinities in the estuaries. Louisiana’s shallow coastal estuaries have a greater nutrient removal capacity compared to deeper systems. This is primarily due to enhanced interactions between water, sediments, and vegetation, which promote processes like denitrification and

phosphorus adsorption (White, DeLaune et al. 2019). The Environmental Impact Statement for the Mid-Barataria Diversion documents the state of knowledge of nutrient uptake by wetlands. These documents will be summarized and referenced in the final draft.

B.1.3 Research Gaps

One commenter noted a lack of information on research regarding nutrient uptake in other existing diversion areas, such as Wax Lake, Atchafalaya River Delta, Mardi Gras Pass, Neptune Pass, Bohemia Spillway, and West Bay.

Response: The comment is acknowledged. Although a large amount of research has been done over recent decades to investigate nutrient transformation and assimilation in areas receiving diverted Mississippi River water (Elsey-Quirk, Graham et al. 2019, White, DeLaune et al. 2019), providing estimates of nutrient concentrations and removal from currently operating diversions and siphons would require a large data collection and collation effort. For example, no current gauge data currently exists for Neptune Pass, and the Bohemia Spillway is an extensive area.

B.1.4 Role in Nutrient Reduction

Commentators pointed out a lack of clarity and consistency in the 2024 Strategy regarding diversions as a nutrient reduction measure. While the text refers to diversions as "viable solutions" to intercept and reduce nutrients, it also uses conditional language about their "potential" role, creating ambiguity in what the Strategy is proposing.

Response: Acknowledged. Language that is more concise has been added to the final document.

B.1.5 Addition of Gulf Hypoxia Action Plan Discussion in Mid-Barataria Final Environmental Impact Statement

Commentators noted that the completion of the Final Environmental Impact Statement (FEIS) for the Mid-Barataria Sediment Diversion (2022) is included as a major milestone. The GHAP was initially not mentioned in the Draft EIS, despite sections of the EIS covering trends of nitrogen and phosphorus, and the involvement of various federal and state agencies. The Louisiana Hypoxia Working Group submitted comments on June 3, 2021, pointing out this omission. In response, the US Army Corps of Engineers and the Trustee Implementation Group added GHAP discussion to Section 4 of the FEIS.

Response: The Gulf Hypoxia Action Plan discussion is included in the final Mid-Barataria Sediment Diversion Environmental Impact Statement.

B.1.6 Unaddressed Fisheries Impacts

Comments included concerns that the negative impacts of river diversion projects, particularly the Mid-Barataria Sediment Diversion, on coastal fisheries are not adequately addressed.

Response: It is not the intent of the NRMS to address all of the effects of management decisions across the coast. These effects are addressed in the Mid-Barataria Environmental Impact Statement and Louisiana's Coastal Master Plan. The final Strategy will include references to these efforts (see also Appendix D, Section A.7).

B.1.7 Shifting Policies on Coastal Wetlands' Role in Nutrient Interception

Commenters noted that the NRMS must be a clear part of a strategy that helps ensure waters that are fit for use and that the public trusts. The most obvious and urgent change comes from the changes in policy and perception about the ability and desirability of the Louisiana coastal wetlands and waters to intercept nutrients from the mainstem of the Mississippi River and reducing the amount of nutrients reaching the Gulf of Mexico.

Response: Louisiana is working as part of the Hypoxia Task Force to reduce nitrogen and phosphorus pollution in the Mississippi/Atchafalaya River Basin and the Gulf of Mexico. More than 98% of the Nitrogen load and 97% of the Phosphorus load entering the Gulf of Mexico is introduced up-river from Louisiana. Louisiana's Nutrient Reduction and Management Strategy incorporates strategic components to reduce nutrients in Louisiana, as well as intercept nutrients in the river to coastal wetlands where the nutrients are processed and sequestered versus being transported to the Gulf of Mexico. As part of a comprehensive nutrient reduction and management strategy, both in-state removal and interception of excess nutrients are needed.

B.1.8 Feasibility and Timing Concerns

Comments included that the Strategy claims large reductions in TN and TP from proposed diversions. However, this seems to suggest that all of the diversions will be operating at once. If this is true, this conflicts with the idea of staggered “pulsed” diversions. Given the available information, the commenters question if these reductions would actually be feasible. Further, nitrogen and phosphorus pollution varies in the river depending on rainfall and season. Will the diversions be operated during times of high nitrogen and phosphorus loadings? Is this the best time to operate for land building?

Response: Some past modeling efforts have investigated operation of all diversions simultaneously. Sediment diversions will be operated during the spring flood when sediment loads as well as nutrient loads in the river are high. The operational regimes of some, but not all, of the diversions in the Coastal Master Plan have been developed. The final draft will reflect that operations of a comprehensive inventory of diversions is still to be worked out.

B.1.9 Nutrient Benefit Quantification and Supporting Studies

Commenters emphasized that proposed nutrient benefits from the diversions are not quantified, and the cited studies fail to provide solid evidence for nutrient removal. VanZomeren et al. (2013) measured potential denitrification rates, not actual rates in the field, with the study emphasizing that wetland loss could undermine the expected benefits. Lane et al. (1999) made faulty

comparisons by neglecting key factors like freshwater input and mixing with seawater. Day et al. (2009) relied on Lane et al.'s flawed analysis to support their nutrient removal assumptions, perpetuating inaccurate conclusions.

Response: The authors thank to commenters for their deep dive into the technical details. While the authors acknowledge that all technical publications have some caveats, they also believe that the existing text and cited literature is consistent with the broader body of literature on the biogeochemical response of coastal wetlands to diversion flows, without burdening this report with an unnecessary deep dive on a single technical issue. The commenters and the public are encouraged to read the recent (2021) special virtual issue of Estuarine, Coastal, and Shelf Science titled "*Impacts of freshwater inputs to coastal systems with special reference to the Mississippi delta*", as well as information on that topic developed in Chapter 4 of the Mid-Barataria Environmental Impact Statement.

B.1.10 Delayed Wetland Gains for Mid-Barataria Sediment Diversion

Comments included that using presently-stalled Mid-Barataria Sediment Diversion or others in nutrient management plan is unjustified due to net wetland gain happening 40 years after diversion becomes operational. Nutrients may be trapped or transformed in wetlands, but only one diversion is authorized and this one diversion (if built; MBSD) will cause the demise of wetlands for the first 40 years according to ecosystem model used to evaluate diversions. So the State has calculated that the earliest net gain in wetlands under the conservative sea level rise scenario will not happen until 40 years after the diversion becomes operational. Assuming a 3 year construction period, then net wetland gain would not happen until 2064. Using the presently-stalled MBSD or others in a nutrient management plan is unjustified.

Response: The Mid-Barataria Environmental Impact Statement (EIS, https://www.mvn.usace.army.mil/missions/regulatory/permits/mid-barataria-sediment-diversion-eis/) discloses and analyzes all significant environmental impacts of the diversion. Chapter 4 of the EIS, Environmental Consequences (https://usace.contentdm.oclc.org/digital/collection/p16021coll9/id/2950), analyzes impacts that my result from the construction, operation, and maintenance of the project. From the EIS document, Table 4.2-4 contains the projected cumulative net changes in land area under Action Alternatives relative to No Action Alternative (no project built). For the Applicant's Preferred Alternative, the project area change in land area relative to the No Action Alternative is: 4,980 ac in 2030, 11,900 ac in 2040, 17,300 ac in 2050, 15,800 ac in 2060, and 10,400 in 2070. This increase in acreage is also visualized in Figures 4.2-2 through 4.2-5 in Chapter 4 of the EIS.

B.1.11 Additional Approaches for Siphon Placement and Nutrient Management

A commenter noted there was no doubt that the overall benefits of river diversion projects outweigh the temporary losses, and that some of the losses could be eliminated by more science-based designs so that fresh waters would be distributed as far upstream from the Gulf as possible.

Two additional ideas not included in the existing plan were suggested for improving management. The first involved creating multiple siphon points along the Mississippi River north of Baton Rouge, with a common collection pipeline traveling south along the River Road and extending into the Upper Barataria Watershed. The second idea emphasized gaining a better understanding of how nitrogen and phosphorus molecules are compartmentalized in river water or in the sedimentary zone near the river bank. The location of siphon intakes should be determined based on the compartment with the highest nutrient mass, either near the surface or lower down beside the bank.

Additionally, the commenter noted that in the Calcasieu River studies, encroaching sea water accelerated the precipitation of the suspended clay particles to which toxins were adherent electrostatically. This is likely useful in planning distribution of river sediment. N (nitrogen) and P (phosphorus) adherences should be defined to further guide the positioning of siphons.

Response: The current and planned siphons are intended for water and sediment management, with nutrient management an ancillary benefit. Placing diversions upstream from the Gulf is consistent with the 2023 Coastal Master Plan. The state has an "Upper Basin Diversion Program" that is analyzing potentially new diversions in the Pontchartrain and Barataria Basins. Obtaining a better understanding of possible compartmentalization of nitrogen and phosphorus particles is an interesting point, with current understanding that nitrogen and phosphorus in the river is well mixed. The processes described from the Calcasieu River study are noted, and these processes are at least partly built into CPRA's planning models.

B.2 Permits

Commenters had interests concerning permitted discharges that included: nutrient loadings, WQBELs enforcing narrative criteria, permit reporting, Environmental Leadership Program successes as requirements, wetland assimilation projects, municipal treatment plant monitoring, and others as identified.

B.2.1 Nutrient loading from permitted facilities—monitoring, reporting, limits needed

Response: Current LDEQ permit requirements outlined in LAC 33: IX and the '*Point Source Implementation Strategy for Nutrients in the Louisiana Pollutant Discharge Elimination System (LPDES) Program*' are consistently applied upon issuance of all LPDES permits according to federal and state regulations (LAC 33:IX.2515). Individual industrial permits are open for public review and comment, prior to issuance of a final decision. LDEQ welcomes the public to provide input during the review process.

Per the Point Source Strategy, LDEQ is continuing collection of nutrient concentrations in identified permitted facilities; essentially all permittees now report for total nitrogen and phosphorus where applicable. This action was initially put forth in the 2014 Strategy. All discharge monitoring report (DMR) data is publicly available through EPA's ECHO database

(https://echo.epa.gov), in LDEQ's Electronic Document Management System (EDMS; https://www.deq.louisiana.gov/page/edms), or through a public records request. Additionally, LDEQ has been gathering permit nutrient data which may be used to develop future requirements.

The Hypoxia Task Force (see Forward) has provided two point-source reports on nutrients to the Mississippi-Atchafalaya River Basin (Section E.3.10), with another one anticipated. These reports are available on the HTF website: https://www.epa.gov/ms-htf/reports-point-source-progress-hypoxia-task-force-states. Louisiana Strategy inclusion of HTF point-source reports will occur during the designated reporting year (Appendix D, Section A.1). All Louisiana Strategy documents are publically available on the Strategy webpage: https://www.deq.louisiana.gov/page/nutrient-management-strategy.

B.2.2 Municipal treatment plant monitoring—stated only 13 of 105 facilities have nitrogen and phosphorus monitoring

Response: LDEQ Water Permits Division has followed the 2017 Point Source Implementation Strategy for Nutrients and has included nutrient monitoring (TN and TP) in *all* municipal permits discharging 100,000 gallons per day (GPD) or greater, as well as some general permits as required by Total Maximum Daily Loads (TMDLs). Currently, over 1,800 LPDES permits include TN and TP monitoring requirements, as stated in the 2024 Strategy text, Tables 3 and 4, and in Appendix D, Section B.2.1 above.

B.2.3 Plastic factory nitrogen discharges—no numerical limits in permits

Response: The November 2024 "Plastic's Toxic River" report is currently under review (Environmental Integrity Project; see Strategy Appendix D, Section A.1). Upon completion of review, LDEQ will determine if updates to the 2017 Point Source Implementation Strategy for Nutrients are needed.

B.2.4 WQBELs should include current narrative criteria

Response: LDEQ's narrative nutrient criteria, LAC 33:IX.113.B.8 states "the naturally occurring range of nitrogen phosphorus ratios shall be maintained. To establish the appropriate range of ratios and compensate for natural seasonal fluctuations, the administrative authority will use site-specific studies to establish limits for nutrients...." LDEQ's Water Planning and Assessment Division has drafted an Assessment Protocol for Translation of the Narrative Nutrient Criteria for the Fish and Wildlife Propagation Use in specified Louisiana Inland Rivers and Streams. An assessment protocol, which establishes site-specific baseline ratios, determines whether screening levels are exceeded and the severity of the impairments. These protocols are a first step prior to establishing permit implementation procedures, and are currently under review by the USEPA. LDEQ considers the narrative criteria as one potential avenue for establishing

appropriate permit limits; additional steps and reviews are required. Marked progress will be reported via the Strategy during the designated reporting year (Appendix D, Section A.1).

LDEQ has also supported any EPA proposal to develop technology-based limits for publicly owned treatment works.

B.2.5 Wetland Assimilation Projects—continued use, scale, location/s questioned and alternative processes in lieu of assimilation proposed

Response: Wetland assimilation is allowed in accordance with LDEQ's Water Quality Standards (LAC 33:IX.1109.K), Volume 3 of LDEQ's Water Quality Management Plan (WQMP), and the Permitting Guidance Document for Implementing Louisiana Surface Water Quality Standards. The regulations and the prescribed conditions, data, and process(es) specified in the WQMP limits the types and conditions of wetlands that may be utilized for assimilation. The regulations and supporting permit process in the WQMP have been public noticed, approved by EPA Region 6, and supported overall by scientific studies. Additionally, LDEQ works collaboratively with Louisiana Department of Energy and Natural Resources (LDENR) on all proposed projects, which require a LDENR Coastal Use Permit.

Concerning the use of traditional tertiary wastewater treatment methods and/or constructed wetland systems in lieu of assimilation into natural wetlands, LDEQ does not have authority to specify treatment plant design. Louisiana Department of Health (LDH), Engineering Services reviews treatment plant design and issues the permit, approving the design and all aspects of the collection system.

B.2.6 Implement basic technology limits for sewage treatment plants

Response: No standardized technology limits have been approved or promulgated by EPA. LDEQ, through participation in Association of Clean Water Administrators (ACWA), has recommended the development of standardized technology limits to EPA, along with other state NPDES permitting agencies.

B.2.7 LPDES Draft Permits do not mention the 2019 version of the Strategy

Response: LPDES permits do mention the overall strategy and the Point Source Implementation Strategy.

B.2.8 Environmental Leadership Program—make successful techniques mandatory with facility initiation or changes

Response: The mission of the Louisiana Environmental Leadership Program (ELP) is to promote a cleaner and better environment for Louisiana through voluntary pollution prevention, waste reduction and/or other environmental stewardship efforts. Membership is about 300, including businesses, federal entities, municipalities, non-governmental organizations, schools and universities. LDEQ continues to promote these activities through voluntary participation at this

time and encourages the public to share with others how to enroll in this program by visiting the website: https://deq.louisiana.gov/page/the-louisiana-environmental-leadership-program. ELP details are provided in Section F.3.2.5.

C. Specific Comments

Additional comments, outside the areas of interest above and/or very specific, are discussed below.

C.1 "…Developing a watershed approach similar to the Chesapeake Bay program will produce significantly greater benefits. USEPA's 2003 Water Quality Trading Policy and 2007 Water Quality Trading Toolkit may be used by LDEQ for guidance."

Response: Currently the Chesapeake Bay Program (CBP) is specified under Clean Water Act Section 117 (33 U.S.C. 1267) and executive order 13508 (renewed restoration efforts), and receives on-going financing from congress with ~2/3 of funding (through USEPA) going directly to state and local partnerships for watershed restoration activities. Total funding for the program from 2021-2025 is estimated at $455 million in support of multi-state efforts towards nutrient and toxin reduction in that watershed.

The Louisiana Nutrient Strategy Team supports, within current capabilities, multi-programmatic partnerships to implement watershed activities to improve/restore Louisiana waters and ultimately, the GOA. Additionally, LDEQ has initiated water quality (WQ) trading and welcomes participation in that program (Section F.2.5); this includes exploring opportunities for trading across boundaries. Up-to-date Information on LDEQ's WQ trading program is publically available: https://www.deq.louisiana.gov/page/water-quality-trading. Advances and reporting for the Strategy occur as outlined in Appendix D, Section A.1.

Citations:

- 33 U.S. Code § 1267 – Chesapeake Bay. https://www.law.cornell.edu/uscode/text/33/1267.
- *Chesapeake Bay Program, Our Funding*. https://www.chesapeakebay.net/who/funding-and-financing.
- *Executive Order 13508, Chesapeake Bay Protection and Restoration*. https://obamawhitehouse.archives.gov/realitycheck/the_press_office/Executive-Order-Chesapeake-Bay-Protection-and-Restoration.

C.2 Lower Mississippi River Sub-basin Committee updates not present (paraphrased).

Response: Updated. See Section E.3.3 Activities and Appendix B.

C.3 "…the draft references the Clean Water Revolving Loan Fund and highlights some projects, but it does not provide a sense of the scale or impact of this funding source. Notably, no mention of the State's return of $100 million in these funds."

Response: LDEQ is looking into this comment.

C.4 "… in the Calcasieu River Watershed…I never see ANY attempts by the loggers to stop the mud runoff."

Response: Forestry BMP violations may be reported by contacting LDAF at (225) 922-1234. Written reporting may be sent to:

Louisiana Department of Agriculture and Forestry
P. O. Box 1628
Baton Rouge, LA 70821.

Additionally, the Louisiana Forestry Association may be contacted at (318) 443-2558.

C.5 "…in Beauregard there are there are a lot of new subdivision developments… Non-point source control… consists of flimsy black plastic "barriers" and hay bales that guide the mud into the ditches so that it can send nutrients into the creeks instead of onto the gravel or blacktopped roads."

Response: Large construction (which requires permits) BMP violations may be reported by contacting LDEQ at the Single Point of Contact (SPOC) number at (225) 219-3640 or (225) 342-1234. Reports may also be made by use of the Online Incident Reporting system available on the LDEQ website at https://www.deq.louisiana.gov/page/file-a-complaint-report-an-incident. Simply follow the onscreen instructions and complete the necessary fields.

Written reporting and information needed for all SPOC complaints may be found here: https://www.deq.louisiana.gov/page/single-point-of-contact.

City and/or parish officials may also be contacted for smaller-scaled projects.

C.6 "…English Bayou, is NOT listed…as Priority Watershed even though that large stream had 27 Notices of Deficiency during someone's inspections in 2019…"

Response: LDEQ performs inspections; persons/companies/responsible parties found to be in violation, or do not have necessary permits, are reported or instructed to apply. Concerning LDEQ permitting, the Water Permits Division utilizes the most current Integrated Report for impairments. Staff also review the facility type, wastewater discharge type, facility flow, and analytical data during the development of permit requirements.

Priority watersheds for LDEQ Nonpoint Source Pollution and Total Maximum Daily Load programs are chosen based on six components (Section E.3.6 Prioritization). Watershed sweeps (Table 6) are part of these programs; however, the decision to include a priority waterbody is not based on sweeps alone. The commenter's response has been noted.