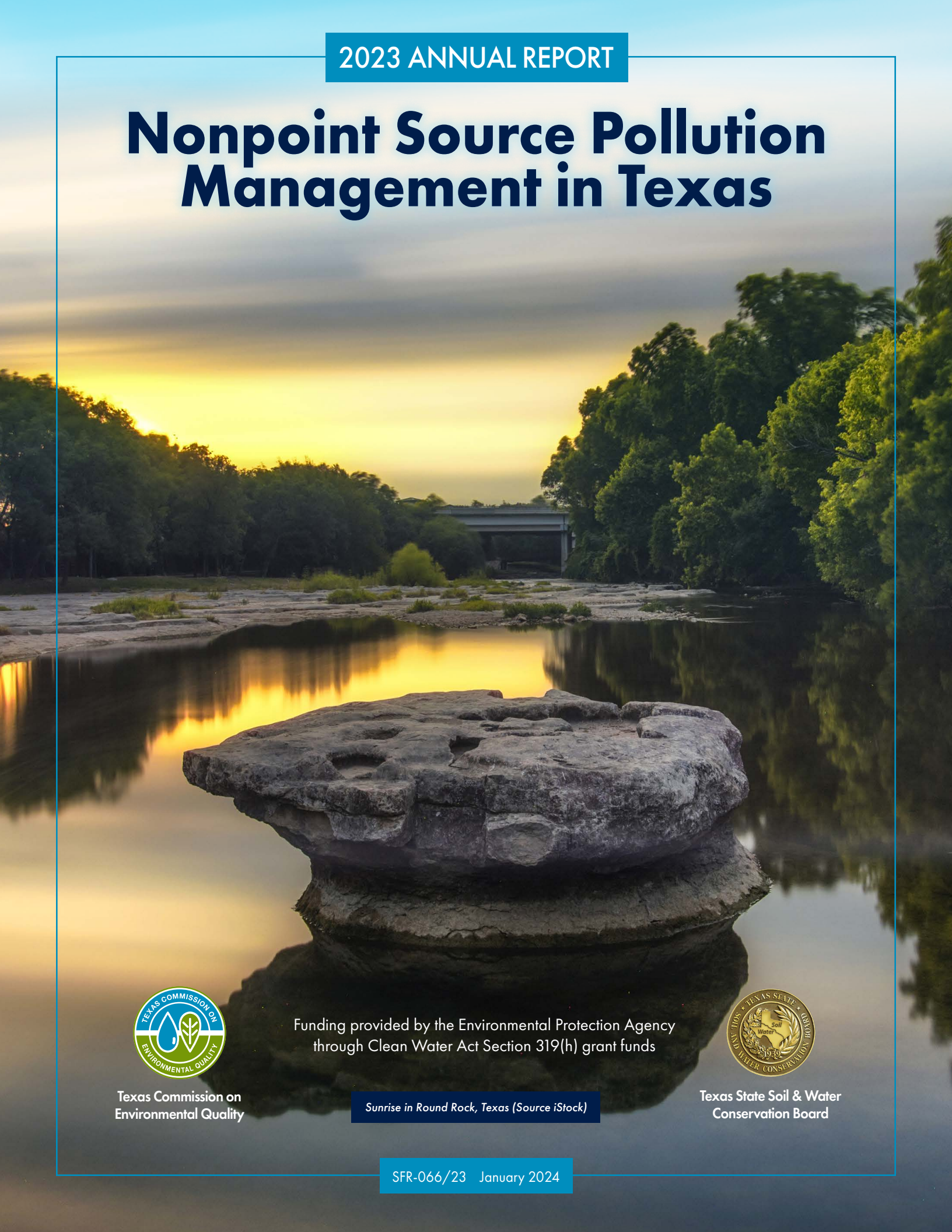
2023 ANNUAL REPORT

Nonpoint Source Pollution Management in Texas



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Texas Commission on Environmental Quality

Sunrise in Round Rock, Texas (Source iStock)

Texas State Soil & Water Conservation Board

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Pennybacker Bridge over Lake Austin (Source iStock)

Letter from the Executive Directors

The Nonpoint Source Management Program outlines Texas' comprehensive strategy to protect and restore waters across the state impacted by nonpoint source pollution. This strategy is implemented by utilizing voluntary, regulatory, financial, and technical assistance approaches, while working with a multitude of partners, to achieve a balanced program. The United States Environmental Protection Agency (EPA) provides grant funding to Texas for the components and goals in the Texas Nonpoint Source Management Program. The responsibility for implementing this program is shared between the Texas Commission on Environmental Quality (TCEQ) and the Texas State Soil and Water Conservation Board (TSSWCB).

Texas has consistently worked with partners across the state to develop and implement watershed-based plans (WBPs) to improve water quality. At the close of fiscal year 2023, more than 40 watershed protection plans that satisfy EPA's nine key elements have been accepted by EPA. Together with partners and stakeholders, TCEQ and the TSSWCB are actively engaged in implementing voluntary management measures identified in the WBPs.

We are pleased to present the 2023 Annual Report of the state's Nonpoint Source Management Program. The report highlights our accomplishments in managing nonpoint source pollution and meeting the goals of the program. In partnership with EPA and other federal, state, regional, and local watershed stakeholders, TCEQ and TSSWCB look forward to the continued implementation of an efficient, accountable, and transparent program.

Sincerely,

Rex Isom
Executive Director
Texas State Soil and Water Conservation Board

Kelly Keel
Executive Director
Texas Commission on Environmental Quality

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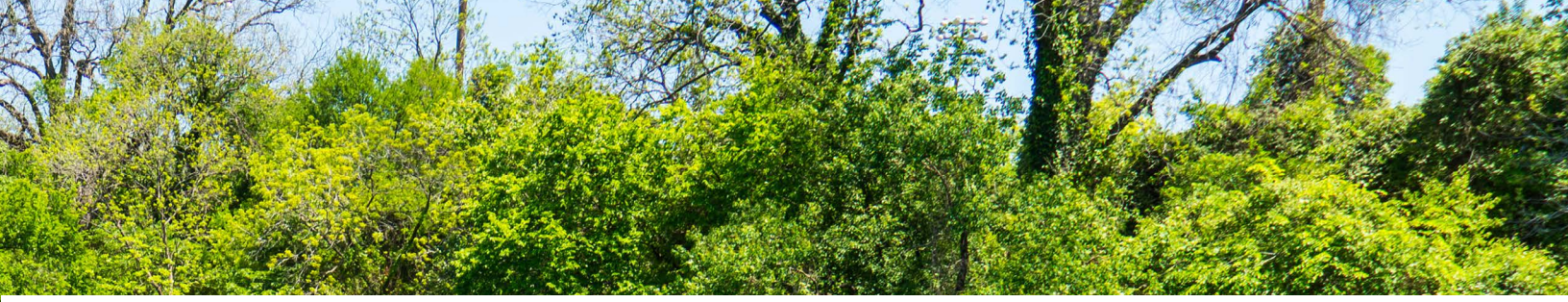
Sunset over bluebonnets and Lake Bardwell in North Texas (Source iStock)

Aerial view of Colorado River in Austin, Texas (Source iStock)

Abbreviations

AU	assessment unit
BMP	best management practice
CBBEP	Coastal Bend Bays and Estuaries Program
cfu	colony forming units
Creekside Program	Lower Colorado River Authority Creekside Conservation Program
CWA	Clean Water Act
CWQMN	Continuous Water Quality Monitoring Network
CZARA	Coastal Zone Act Reauthorization Amendments
E. coli	*Escherichia coli*
EPA	United States Environmental Protection Agency
GBEP	Galveston Bay Estuary Program
GLO	Texas General Land Office
GRTS	Grants Reporting and Tracking System
H-GAC	Houston–Galveston Area Council
IH	interstate highway
I-Plan	Implementation Plan
lb	pounds
LCRA	Lower Colorado River Authority
LID	low-impact development
Meadows Center	The Meadows Center for Water and the Environment
mg/L	milligrams per liter
mL	milliliter
mm	millimeter
NRA	Nueces River Authority
NRI	Texas A&M Natural Resources Institute
OSSF	on-site sewage facility
PPG	Performance Partnership Grant
SH	state highway
SWCD	Soil and Water Conservation District
TCEQ	Texas Commission on Environmental Quality
TDS	total dissolved solids
Texas Integrated Report	Texas Integrated Report of Surface Water Quality Sections 305(b) and 303(d)
TGPC	Texas Groundwater Protection Committee
TMDL	Total Maximum Daily Load
TSSWCB	Texas State Soil and Water Conservation Board
TWRI	Texas Water Resources Institute
USGS	United States Geological Survey
UCRA	Upper Colorado River Authority
WAP	watershed action plan
WBP	watershed-based plan
WPP	watershed protection plan
WQMP	water quality management plan
WWTF	wastewater treatment facility
yr	year

Barton Springs along Lady Bird Lake in Austin, Texas (Source iStock)



CHAPTER 1

Introduction

Defining Nonpoint Source Pollution

Nonpoint source pollution occurs when rainfall or snowmelt flows over land, roads, buildings, and other features of the landscape, and carries pollutants into drainage ditches, lakes, rivers, wetlands, coastal waters, and even underground sources of water. This is unlike point source pollution which results from a discharge at a specific single location. Some nonpoint source pollutants include:

- Fertilizers, herbicides, and insecticides from agricultural lands and residential areas.
- Oil, grease, and toxic chemicals from spills, roads, urban areas, and industrial facilities.
- Sediment from construction sites, crop and forest lands, and eroding stream banks.
- Bacteria and nutrients from livestock, pet waste, wildlife, and leaking septic systems.

Nonpoint source pollution can also originate as air pollution, which is deposited onto the ground and into waterways, through a process called atmospheric deposition.

What Guides Nonpoint Source Pollution Management in Texas?

Under the federal Clean Water Act (CWA) and the Texas Water Code, Texas must adopt surface water quality standards for waters in the state, assess the status of water quality, and take actions necessary to achieve and maintain those standards. The long-term goal of the Texas Nonpoint Source Management Program, developed under CWA Sections 319(a) and 319(b), is to protect and restore the quality of the state's water resources from the adverse effects of nonpoint source pollution. This is accomplished through the cooperative organizational tools and strategies below.

Partnerships

The Texas Commission on Environmental Quality (TCEQ) is the lead state agency responsible for establishing the level of water quality to be maintained in Texas. According to Texas Water Code, Chapter 26, the primary responsibilities of TCEQ include the issuance of permits for point source discharges and abatement of nonpoint source pollution from sources which are not agricultural or silvicultural. The Texas State Soil and Water Conservation Board (TSSWCB) is the lead agency in the state responsible for planning, implementing, and managing programs and practices that prevent and abate agricultural and silvicultural nonpoint source pollution. TCEQ and TSSWCB coordinate closely to jointly administer the Texas Nonpoint Source Management Program.

Managing nonpoint source pollution in Texas involves partnerships with many organizations to coordinate, develop, and implement the program. With the extent and variety of nonpoint source issues across Texas, cooperation across political boundaries is essential. Many local, regional, and state agencies play an integral part in managing nonpoint source pollution. They provide information about local concerns and infrastructure and build support for the management measures that are necessary to prevent and reduce nonpoint source pollution. By coordinating with these partners to share information and resources, the state can more effectively manage its water quality protection and restoration efforts.

The Texas Nonpoint Source Management Program

The Texas Nonpoint Source Management Program outlines Texas' comprehensive strategy to protect and restore waters impacted by nonpoint source pollution. Nonpoint source pollution is managed through assessment, planning, implementation, and education. The state has established long-term and short-term goals and objectives for guiding and tracking the progress of its nonpoint source management program. This report highlights the success in achieving these goals and objectives.

Goals for Nonpoint Source Management

Long-Term Goal

The long-term goal of the Texas Nonpoint Source Management Program is to protect and restore water quality affected by nonpoint source pollution through the following short-term goals: data collection and assessment, implementation, and education.

Short-Term Goals

Goal One—Data Collection and Assessment

Coordinate with appropriate federal, state, regional, and local entities, and stakeholder groups to target water quality assessment activities in high priority, nonpoint source-impacted watersheds, vulnerable and impacted aquifers, or areas where additional information is needed.

Goal Two—Implementation

Implement Total Maximum Daily Load (TMDL) implementation plans (I-Plans) or watershed protection plans (WPPs) and other state, regional, and local plans and programs to reduce nonpoint source pollution by targeting activities to the areas identified as impacted or potentially degraded by nonpoint source pollution with respect to use criteria.

Goal Three—Education

Conduct education and technology transfer activities to increase awareness of nonpoint source pollution and activities which contribute to the degradation of water bodies, including aquifers, by nonpoint source pollution.

The Watershed Approach

Protecting the state's streams, lakes, bays, and aquifers from the impacts of nonpoint source pollution is a complex process. Texas uses the watershed approach to prioritize water quality issues of both surface water and groundwater. It is based on the following principles:

- A geographic focus based on hydrology rather than political boundaries.
- Water quality objectives based on scientific data.
- Coordinated priorities and integrated solutions.
- Diverse, well-integrated partnerships.

For groundwater management, the geographic focus is on aquifers rather than watersheds. Wherever interactions between surface water and groundwater are identified, management activities will support the quality of both resources.

The watershed approach recognizes that to achieve restoration of impaired water bodies, solutions to water quality issues must be socially equitable, economically viable, and environmentally bearable.

FIGURE 1.1 Social, economic, and environmental considerations for water quality restoration

Watershed Action Planning

A major element in the Texas Nonpoint Source Management Program is the inclusion of the Watershed Action Planning (WAP) process and the Nonpoint Source Priority Watersheds Report.

The WAP process provides a framework for tracking priority water quality issues from selection through implementation. Participants in the WAP process first review identified water quality issues, which are typically water bodies listed as impaired on the CWA Section 303(d) list of impaired waters, then determine the best strategy for addressing the issue. Strategies may include:

- Collecting more data.
- Evaluating appropriate water quality standards.
- Developing a watershed-based plan (WBP) with specific restoration activities.

Once a strategy is determined, a lead program for implementation is assigned. Restoration activities identified in WBPs are eligible and prioritized for federal funding.

Management strategies to address nonpoint source water quality issues are determined through a collaborative approach and documented in the Nonpoint Source Priority Watersheds Report. This comprehensive planning process fosters relationships and facilitates greater coordination between state and local water resource agencies.

Funding limitations, new guidelines, increasing populations, and evolving environmental policies create new challenges for the state water quality planning programs. This elevates the importance of incorporating the WAP process in the Nonpoint Source Program. The coordination process allows stakeholders the opportunity to provide a local perspective into water quality management strategies and priorities. Interagency coordination of the state's water quality programs allows for more effectively developing projects, leveraging resources, and implementing water quality management strategies with stakeholder support.

The WAP process integrates information from existing planning tools and from the coordination process to develop and track water quality management strategies and implementation. As part of the WAP process, these strategies are documented and periodically updated with the cooperation of the WAP partners. Partners include TSSWCB, Clean Rivers Program partners (typically river authorities), and the five TCEQ Water Quality Planning Division program areas—Texas Surface Water Quality Standards Group, Surface Water Quality Monitoring Program, Clean Rivers Program, TMDL Program, and the Nonpoint Source Program.

The result of this process is a list of all water quality impairments and special interest water bodies in the state and the actions that are planned to address the impairment or concern, the party responsible for undertaking the action, and a means of tracking progress.

The Rio Grande River in West Texas (Source iStock)

Fall foliage and entangled cypress roots on the Guadalupe River at Guadalupe State Park (Source iStock)

CHAPTER 2

Progress in Improving Water Quality

Section 319(h) of the CWA requires that state nonpoint source annual reports include, "…to the extent that appropriate information is available, reductions in nonpoint source pollutant loading and improvements in water quality… resulting from implementation of the management program." This specifically applies to the water bodies that have previously been identified as requiring nonpoint source pollution control actions to "… attain or maintain applicable water quality standards or the goals and requirements of the Clean Water Act." The three primary ways to measure improvement in water quality are:

- Measuring actual results from implementing management measures.
- Calculating estimated load reductions with the help of models or other calculations.
- Monitoring the water body long-term.

Other indicators of progress toward water quality improvements include land use modifications or behavioral changes that are associated with reductions in loadings or pollutant concentrations in water bodies. Examples include restored riparian habitat and reduced use of fertilizers and pesticides.

FIGURE 2.1 Pooling wastewater above septic tank in the Tres Palacios Creek watershed (Photo by Ryan Gerlich, Texas A&M AgriLife Extension Service)

Reductions in Pollutant Loadings

Tres Palacios Creek WPP Implementation: On-site Sewage Facility Remediation Project

Tres Palacios Creek is the primary source of freshwater for Tres Palacios Bay and drains into the Matagorda Bay system. The watershed is predominately rural and most of the population relies on on-site sewage facilities (OSSFs), also referred to as septic systems, to manage wastewater. During the watershed protection planning process, stakeholders identified failing OSSFs that needed repair or replacement which became a key management measure in the Tres Palacios Creek WPP.

The primary purpose of this project was to replace failing OSSFs in the riparian areas of the Tres Palacios Creek watershed. The Texas Water Resources Institute (TWRI) implemented the project with CWA Section 319(h) funds. OSSF inspections in the Tres Palacios watershed revealed diverse septic system issues including:

- Standing effluent underneath homes.
- Hoses connected to plumbing fixtures draining directly into yards.
- System overflows during normal rain events.

FIGURE 2.2 New septic system installed with proper sloping to prevent standing water from damaging pump (Photo by Eddie Sifuentes, CL Septic)

Fixing failing OSSFs results in immediate pollutant reductions to nearby waterbodies because bacteria and nutrients are reduced through properly treating effluent.

COVID-19 social restrictions hindered the project team's visits to the area for education programs and limited the number of residents reached. Increases in the cost of labor and supplies also delayed repairing and replacing OSSFs. Despite these hindrances, the project was still able to replace eight failing OSSFs in the Tres Palacios Oaks subdivision.

Load reductions achieved from these OSSF replacements in fiscal year 2023 are presented in Table 2.1.

TABLE 2.1 Estimated load reductions from OSSF replacements in the Tres Palacios Creek watershed

Pollutant	Load Reduction
Escherichia coli (*E. coli*)	1.55 x 1016 cfu/year
Nitrogen	133.3 lb/year
Phosphorus	17 lb/year
Suspended Solids	686.9 lb/year

cfu - colony forming units | lb - pounds

Brady Creek Vortex Separator Project

Brady Creek was first listed as impaired for depressed dissolved oxygen in the 2004 Texas Integrated Report of Surface Water Quality Sections 305(b) and 303(d) (Texas Integrated Report) when the water body failed to meet its assigned dissolved oxygen criteria of intermediate aquatic life use. In response, stakeholders developed the Brady Creek WPP which EPA accepted in 2016. Because of significant hindrances and challenges presented by COVID-19 and persistent drought conditions, the initial project, which started in 2017, was not completed until 2023. Under this project, the Brady Creek Watershed Partnership, primarily through the efforts of the Upper Colorado River Authority (UCRA) and the City of Brady, successfully installed and evaluated a structural best management practice (BMP) and a comprehensive education and outreach campaign. The load reductions achieved from these actions in fiscal year 2023 are presented in Table 2.2.

TABLE 2.2 Estimated load reductions from the Brady Creek vortex separator

Pollutant	Load Reduction
Nitrogen	16.50 lb/year
Phosphorus	1.48 lb/year
Suspended Solids	5,073.78 lb/year

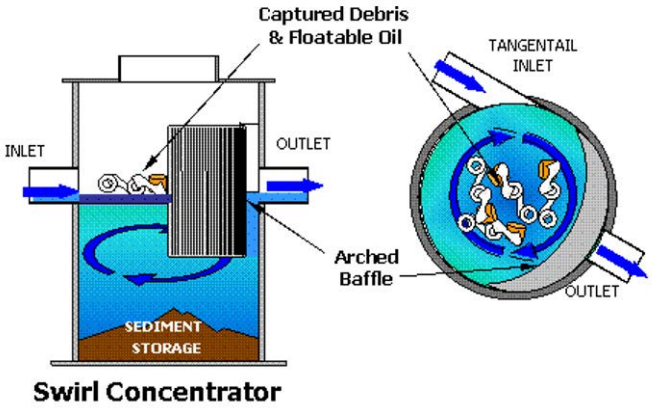


FIGURE 2.3 Diagram of the vortex separator, side and top cross-section (Source AquaShield)

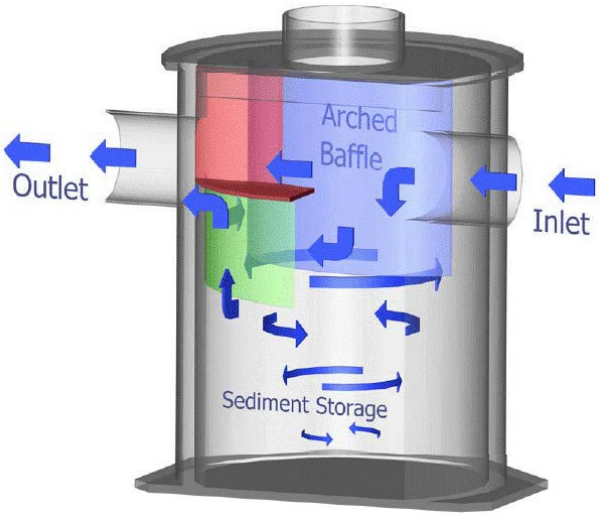


FIGURE 2.4 Diagram of the vortex separator, 3D model (Source AquaShield)

Construction activities for the structural BMP consisted of installing an underground vortex separator (Figures 2.3, 2.4, and 2.5) that captures stormwater flows from an approximately 220-acre sub-basin of Brady Creek, routes it to the hydrodynamic vortex separator, and discharges the treated stormwater into Brady Creek.

FIGURE 2.5 Installing the vortex separator (Photo by UCRA)

Two automatic samplers were installed that collect flow-weighted composite stormwater samples before and after treatment. The analytical data were used to evaluate BMP effectiveness. Drought conditions that began in the fall of 2020 and continued through the project impacted the number of stormwater events available for monitoring BMP effectiveness.

Lower Colorado River Authority: Creekside Conservation Program

For over 30 years, the Lower Colorado River Authority (LCRA) has addressed soil erosion and nonpoint source pollution through the LCRA Creekside Conservation Program (Creekside Program) offered within the Lower Colorado River watershed. This program is a collaborative partnership between private landowners; LCRA; TSSWCB; the United States Department of Agriculture—Natural Resources Conservation Service; and Soil and Water Conservation Districts (SWCDs) to plan and implement BMPs designed to reduce soil erosion and increase water infiltration.

Offering technical assistance and financial incentives, the Creekside Program has assisted well over 300 agricultural producers within the project region.

During fiscal year 2023, an additional 13 participants were enrolled, collectively placing 893 acres of private lands under conservation management plans. BMPs implemented through those conservation plans included:

- 3,981 feet of cross fencing
- 3,058 feet of water pipeline
- 162 acres of brush management
- 43 acres of grass planting
- five livestock watering facilities
- two pumping plants

Figure 2.6 illustrates cross fencing, which divides a grazing area into smaller paddocks for rotational grazing to minimize over-grazing and to allow soil and vegetation recovery.

FIGURE 2.6 Cross fencing on a ranch in San Saba (Photo by Marshall Trigg)

Not only have these landowners benefited, so has the entire Lower Colorado River basin through a reduction in soil erosion and sediment load reaching receiving water bodies and the resulting improvement in water quality. Currently, the Creekside Program is offered within an 11-county project region that consists of Bastrop, Blanco, Burnet, Colorado, Fayette, Lampasas, Llano, Matagorda, San Saba, Travis, and Wharton counties. For more information, visit the **LCRA Creekside Conservation Program website**[1].

Using the Texas Best Management Practice Evaluation Tool, the load reductions in Table 2.3 were achieved in fiscal year 2023.

TABLE 2.3 Estimated load reductions from BMPs implemented through the Creekside Program

Pollutant	Load Reduction
Nitrogen	6,828 lb/year
Phosphorus	861 lb/year
Sediment	708 tons/year

Austin County Soil and Water Conservation District: Mill Creek

The Mill Creek watershed is a 263,450-acre watershed located in parts of Austin and Washington counties. Mill Creek is formed by two forks, East and West Mill Creeks, which unite near Bellville, Texas, in Austin County to form the main stem. Mill Creek then flows 14 miles southeast to its confluence with the Brazos River. The Mill Creek WPP was accepted by EPA in 2016.

TSSWCB and the Austin County SWCD have partnered on a CWA Section 319(h) grant to develop and implement Water Quality Management Plans (WQMPs) to reduce agricultural nonpoint source pollution in the Mill Creek watershed. A WQMP is a site-specific plan developed through and approved by SWCDs for agricultural or silvicultural lands. The plan includes appropriate land treatment practices, production practices, management measures, technologies, or combinations thereof. The purpose of WQMPs is to achieve a level of pollution prevention or abatement determined by TSSWCB, in consultation with local SWCDs, to be consistent with state water quality standards.

In fiscal year 2023, two WQMPs covering 1,920 acres were certified. The following BMPs were implemented:

- 1,573 acres of prescribed grazing
- 1,572 acres of brush management
- 17,400 feet of cross fencing
- 12,010 feet of livestock pipeline
- 15 water facility storage tanks

Using the Texas BMP Effectiveness Tool, the load reductions in Table 2.4 were achieved in fiscal year 2023.

TABLE 2.4 Estimated load reductions from BMPs implemented in the Mill Creek watershed

Pollutant	Load Reduction
Nitrogen	36,326.92 lb/year
Phosphorus	4,056.82 lb/year
Sediment	18.82 tons/year

Water Quality Improvements

TCEQ and TSSWCB work together to identify water quality improvements that occur as a result of utilizing nonpoint source BMPs. Once a water body candidate is identified, a “success story” is written and sent to EPA for review and approval.

Linking instream nonpoint source pollutant reductions to land management practices is challenging. Changes to the land can occur over varying temporal and spatial scales and contributions to the stream are rainfall driven. As a result, changes in water quality often lag behind the implementation of nonpoint source BMPs, and many years of implementation may be needed before significant improvements in a water body are observed. Despite these challenges, Texas continues to see measurable water quality improvements. Following are highlights of some of these success stories.

[1] www.lcra.org/community-services/land-conservation

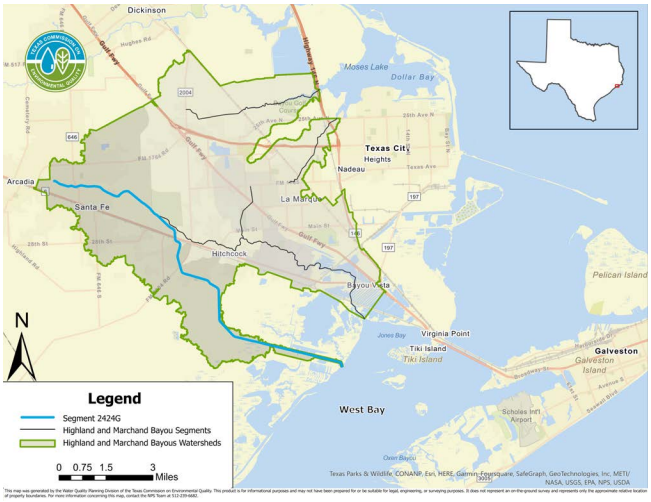


FIGURE 2.7 The Highland Bayou Diversion Canal in Southeast Texas

FIGURE 2.8 A section of Highland Bayou Diversion Canal (Photo by GBEP)

Repairing and Replacing OSSFs for Improved Water Quality in the Highland Bayou Diversion Canal

Water Body Improved

The Highland Bayou Diversion Canal [assessment unit (AU) 2424G_01] was first identified as impaired in the 2014 Texas Integrated Report and placed on the 303(d) list of impaired water bodies due to elevated bacteria. Since then, state and federal agencies, and local communities have focused on improving water quality through education and outreach programs and by providing assistance with OSSF maintenance and repairs. See Table 2.5 for water quality information on this water body.

TABLE 2.5 Highland Bayou Diversion Canal water body information

Water body(s)	Highland Bayou Diversion Canal (AU 2424G_01)
Pollutant(s)	Bacteria
Source(s) of Impairment	Unknown, nonpoint source
Designated Use(s)	Primary Contact Recreation
Year Listed/Year Delisted	2014 / 2022
TMDL(s)	No

Water Quality

Water Quality Challenge

The Highland Bayou Diversion Canal (AU 2424G_01) was constructed by the Army Corps of Engineers in the 1970s to reduce flooding along Highland Bayou. The canal diverts water from Highland Bayou south through Basford Bayou and empties into West Bay (Figures 2.7 and 2.8).

The area around the diversion canal contains a large amount of residential OSSFs. The City of Santa Fe has the largest concentration of OSSFs, and pollutants from any that fail will likely drain into the diversion canal. Additionally, the soils in the area have a high clay content, which is not ideal for the drain fields that are part of traditional OSSFs. Aerobic OSSFs are better suited for these types of soil but are more mechanical in nature, and many OSSF owners are not familiar with how to properly maintain these systems.

The Highland Bayou Diversion Canal was placed on the 2014 303(d) list of impaired water bodies when water quality data indicated that it no longer met its designated primary contact recreation use due to Enterococcus concentrations greater than 35 cfu per 100 milliliters (mL).

Long-billed curlew (Jason Liefester)

Night herons on upper San Marcos River (Source Andrew Shirey, Texas State University)

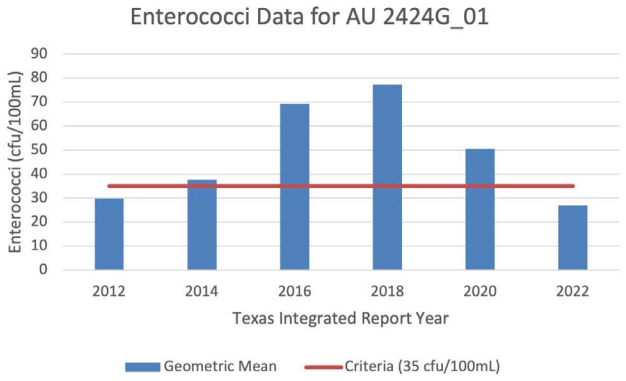


FIGURE 2.9 Highland Bayou Diversion Canal Enterococci geometric means from the 2012-2022 Texas Integrated Reports

Results

From 2010 to 2020, education and outreach activities and OSSF repair and maintenance in the watershed have helped to reduce nonpoint source pollution. The geometric mean of Enterococcus decreased from 77.34 cfu per 100 mL to 26.96 cfu per 100 mL (Figure 2.9). As a result, the Highland Bayou Diversion Canal was identified as fully supporting the primary contact recreation use in the 2022 Texas Integrated Report.

Highlights

In 2010, the Galveston Bay Estuary Program (GBEP) began a watershed characterization project on Highland and Marchand Bayous to collect data and involve stakeholders. GBEP and partners completed the Highland and Marchand Bayous WPP, which was accepted by EPA in May 2021. The WPP cites failing OSSFs as significant potential sources of bacterial pollution in the Highland Bayou Diversion Canal.

Since 2010, TCEQ has continuously funded projects that provide OSSF maintenance trainings for homeowners, as well as initiatives for OSSF pump-outs, repairs, and replacements in the area. There have also been a series of projects carried out through the Coastal Zone Act Reauthorization Amendments (CZARA), which focused on creating an inventory of OSSFs, while offering OSSF inspection and maintenance training to homeowners.

Around the Highland Bayou Diversion Canal area, there were eight OSSF pump-outs and inspections in 2016, which removed over 5,000 gallons of septage from the watershed. Six OSSFs were replaced, which led to an annual load reduction in Enterococcus bacteria of about 1.7 x 1016 cfu per year. Additionally, there were three trainings in the area that covered OSSF maintenance that were attended by a total of 93 people.

TABLE 2.6 BMPs implemented in the Highland Bayou Diversion Canal between 2010 and 2020

BMP	Number of BMPs delivered	Comments
OSSF Pump-outs	8	Eight pump-outs were in proximity to the Highland Bayou Diversion Canal. Over 5,000 gallons of septage were removed from watershed.
OSSF Inspections	8	Failing systems were prioritized for replacement.
OSSF Replacements	6	Six replacements were in proximity to the Highland Bayou Diversion Canal. Annual Enterococcus load reduction in the watershed was approximately 1.7 x 1016 cfu/year.
Homeowner Training	3	Training events attended by 93 homeowners on OSSF maintenance.

TABLE 2.7 Project funding in the Highland Bayou Diversion Canal

Partner Type	Agency/Program	Funding Provided	Notes
Federal	EPA	$1,094,138.00	Through TCEQ
Federal	EPA	$399,181.00	Through GBEP
Federal	EPA	$35,000.00	Through TSSWCB
Non-federal	Texas A&M AgriLife	$460,703.00	Non-federal match through University/College (Texas A&M AgriLife)
State	TCEQ	$34,181.00	TCEQ state funding
State	TCEQ	$50,000.00	Through GBEP's Water and Sediment Quality Committee's project funding process
Other	H-GAC	$132,664.00	Non-federal match

TSSWCB also hosted education and outreach activities on:

- water quality
- feral hog management
- riparian area protection
- OSSF maintenance
- water well protection

About 400 people attended these events. These educational programs have used over $35,000 in EPA CWA Section 319(h) grant funds provided through TSSWCB and more than $21,000 in non-federal funds from Texas A&M AgriLife programs.

Partners and Funding

Between 2010 and 2020 watershed partners have spent approximately $2,205,867 on WPP development, BMPs implementation, and education and outreach. Of these funds, $1,528,319 are federal CWA funds, $84,181 are state funds, and $593,367 are match funds from local entities. Watershed partners include the Houston–Galveston Area Council (H-GAC), TWRI, Texas A&M AgriLife Extension, and Texas A&M AgriLife Research.

Conservation Practices and Replacing, Repairing, and Pumping OSSFs for Improved Water Quality in the Lower Nueces River

Water Body Improved

The Lower Nueces River was first listed as impaired on the 2012 Texas Integrated Report and 303(d) list of impaired water bodies for total dissolved solids (TDS). TSSWCB utilized CWA Section 319(h) funding from EPA and partnered with Nueces River Authority (NRA) and local SWCDs to develop a WPP for the Lower Nueces River. During the WPP development process, stakeholders learned about their local water quality issues and developed management measures to address them. The WPP was accepted by EPA in 2016. Water quality was improved as a result of implementing the management measures identified in the Lower Nueces River WPP. Consequently, two AUs of the Nueces River (2102_01 and 2102_02) were removed from the state's list of impaired waters in 2022 (see Table 2.8).

TABLE 2.8 Lower Nueces River water body information

Water body(s)	Lower Nueces River, AUs 2102_01 and 2102_02
Pollutant(s)	TDS
Source(s) of Impairment	Unknown, nonpoint source
Designated Use(s)	General
Year Listed/Year Delisted	2012 / 2022
TMDL(s)	No

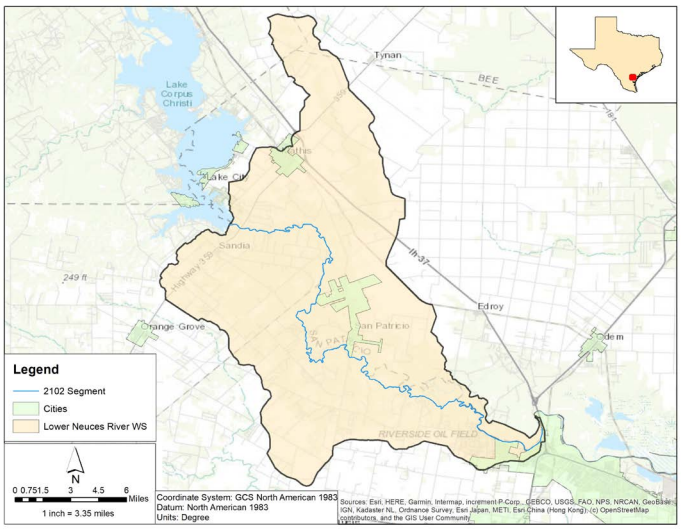


FIGURE 2.10 Lower Nueces River in South Texas

Water Quality

Water Quality Challenge

Lower Nueces River, located in South Texas, begins at Wesley E. Seale Dam at Lake Corpus Christi and flows southeast. It runs through primarily rural lands, consisting of grazing lands and cropland—where cotton, grain sorghum, corn, and wheat are grown—and a few unincorporated population areas, before it reaches the City of Corpus Christi and the saltwater barrier dam in Calallen (Figures 2.10 and 2.11).

Water quality data collected in Lower Nueces River from 2003 to 2010 showed that TDS levels exceeded the water quality standard. As a result, TCEQ added the river to the 303(d) list of impaired water bodies in the 2012 Texas Integrated Report for not supporting general use.

Results

Water quality monitoring data show that the geometric mean of TDS collected from 2013 to 2020 in the Lower Nueces River was 496.35 milligrams per liter (mg/L). This level met the TDS water quality standard for general use (500 mg/L). The Lower Nueces River was removed from the 303(d) list of impaired water bodies in the 2022 Texas Integrated Report.

This success can be attributed to increased stakeholder awareness and knowledge of water quality issues during the watershed planning process, implementation of conservation practices, and replacement or repairs of OSSFs in the watershed. Water quality monitoring results are used to track and measure the interim progress of the WPP implementation and to ensure this restoration effort remains a success.

Highlights

TSSWCB partnered with NRA and the City of Corpus Christi in 2012 to develop a WPP for the Lower Nueces River, Segment 2102. Throughout the planning process, stakeholders worked together to holistically address the sources and causes of impairments, and the threats to surface and drinking water resources within the watershed. The Lower Nueces River WPP was accepted by EPA in 2016.

Between 2013 and 2018, TSSWCB partnered with the Nueces and San Patricio SWCDs to develop and implement six WQMPs covering 1,660 acres of grazing and row crop operations. These plans included:

- alternative water sources
- livestock pipeline
- prescribed grazing
- pasture and range planting
- cross fencing
- nutrient management
- conservation crop rotation
- irrigation land leveling
- brush management

TCEQ partnered with NRA to assess the needs and feasibility of repair, replacement, and conversion of OSSFs along the river which led to a voluntary inspection program for OSSFs, and offered technical and financial assistance to qualifying homeowners to repair or replace failing OSSFs. A total of 51 applications were received, and 44 OSSFs were pumped out and inspected. A total of 25 OSSFs were repaired or replaced.

FIGURE 2.11 A section of the Nueces River, South Texas (Photo by Jana Lloyd, TSSWCB)

TABLE 2.9 BMPs implemented in the Lower Nueces River between 2012 and 2020

BMP	Number of BMPs delivered	Comments
WQMPs	6	Developed and implemented between 2013 and 2018. Addressed grazing and row crop operations, covered 1,660 acres.
WPP	1	Accepted by EPA in 2016.
OSSF Pump-outs	44	51 applications were received.
OSSF Inspections	44	Failing systems were prioritized for replacement or repair.
OSSF Replacements/ Repairs	25	25 OSSFs were repaired or replaced.

Partners and Funding

Over $510,840 in EPA CWA Section 319(h) funds provided by TSSWCB and more than $448,580 in non-federal matching funds from NRA supported the development and implementation of the Lower Nueces River WPP. TSSWCB also provided $21,472 in state funding to the Nueces and San Patricio SWCDs for the development and implementation of WQMPs in the watershed.

Additionally, TCEQ provided $670,560 in EPA CWA Section 319(h) funds, which, combined with $447,291 in non-federal matching funds from NRA supported the assessment, repair, replacement, and proper maintenance of OSSFs.

TABLE 2.10 Project funding in the Lower Nueces River

Partner Type	Agency/Program	Funding Provided	Notes
Federal	EPA	$510,840	Through TSSWCB
Federal	EPA	$670,560	Through TCEQ
State	TSSWCB	$21,472	TSSWCB state funding
Other	NRA	$448,580	Non-federal match
Other	NRA	$447,291	Non-federal match

Sunset at Lake Lavon (Source iStock)

CHAPTER 3

Progress Toward Meeting the Goals and Objectives of the Texas Nonpoint Source Management Program

TCEQ and TSSWCB have established goals and objectives for guiding and tracking the progress of nonpoint source pollution management in Texas. The goals describe high-level guiding principles for all activities under the Texas Nonpoint Source Management Program. The objectives specify the key methods that will be used to accomplish the goals. Although not comprehensive, this chapter reports on a variety of programs and projects that directly support these goals and objectives.

EPA CWA Section 319(h) Grant Program

Section 319(h) of the CWA establishes a grant, appropriated annually by Congress to EPA. EPA allocates these funds to the states for nonpoint source pollution reduction activities supporting the congressional goals of the CWA. TCEQ and TSSWCB target these grant funds toward nonpoint source activities consistent with the long- and short-term goals defined in the Texas Nonpoint Source Management Program.

The grant funds can support a wide variety of activities including the implementation of BMPs, technical assistance, financial assistance, education, training, technology transfer, and monitoring to assess the success of specific nonpoint source implementation projects. In fiscal year 2023, Texas received $6,924,528 in EPA CWA Section 319(h) federal grant funds to utilize and award to sub-grantees across the state. In turn, sub-grantees provided $2,769,811.20 in matching funds to leverage resources used for addressing nonpoint source pollution.

Status of EPA CWA Section 319(h) Grant-Funded Projects in Fiscal Year 2023

TCEQ – 38 projects totaling approximately $11.7 million (Figure 3.1).

- Projects addressed a wide range of nonpoint source issues.
- A primary focus was developing and implementing WPPs to address urban nonpoint source pollution and targeted outreach and education activities.

TSSWCB – 42 projects totaling approximately $10.8 million (Figure 3.2).

- Projects addressed agricultural and silvicultural nonpoint source pollution.
- Specific projects included developing and implementing WPPs, supporting targeted educational programs, and installing BMPs to abate nonpoint source pollution from agricultural and silvicultural operations.

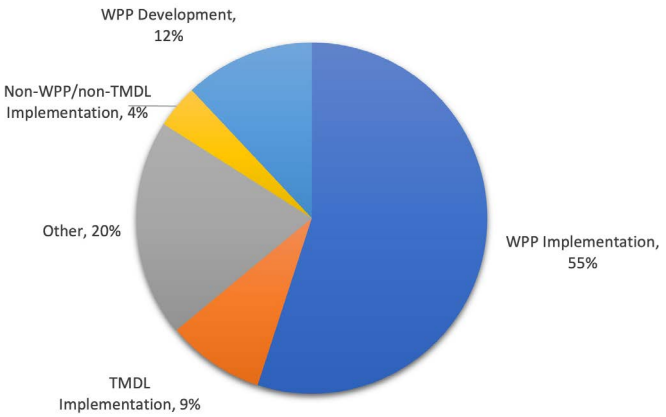


FIGURE 3.1 TCEQ fiscal year 2023 nonpoint source grant funds by project type

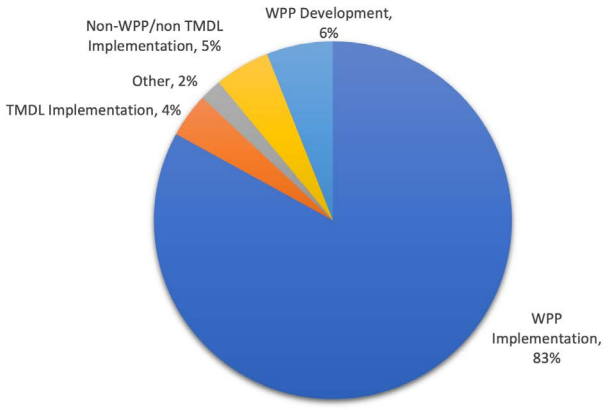


FIGURE 3.2 TSSWCB fiscal year 2023 nonpoint source grant funds by project type

Short-Term Goals and Milestones of the Texas Nonpoint Source Management Program

Goal One—Data Collection and Assessment

One of the goals of the Texas Nonpoint Source Management Program is to collect and assess water quality data. Data collection requires the coordination of appropriate federal, state, regional, and local entities as well as the private sector and citizen groups. TCEQ's Surface Water Quality Monitoring Program, operating from the Austin central office and 16 regional offices, conducts both routine ambient monitoring and special studies. The Clean Rivers Program, a collaboration between TCEQ and 15 regional water authorities, collects surface water quality data throughout the state in response to both state needs and local stakeholder interests. TCEQ also acquires water quality data from other state and federal agencies, river authorities, and municipalities after assuring the quality of the data is comparable to that of data collected by TCEQ's programs.

TCEQ assesses data to determine if a water body meets its designated uses or if water quality improvement activities are achieving their intended goals. For impaired or special interest waters, water quality data can be used in the development of WPPs and TMDLs. Data are also used to determine potential sources of pollution, the adequacy of regulatory measures, watershed improvements, and restoration plans. The data collection guides the distribution of EPA CWA Section 319(h) grant funds toward the development of WPPs and water quality assessment activities in high priority watersheds, nonpoint source-impacted watersheds, vulnerable and impacted aquifers, or areas where additional information is needed.

Texas Integrated Report

The Texas Integrated Report describes the status of all surface water bodies in the state evaluated for the given assessment period. TCEQ uses data collected during the most recent seven-to-ten-year period to assess the quality of surface water bodies in the state. The descriptions of water quality for each assessed water body in the Texas Integrated Report represent a snapshot of conditions during the period considered in the assessment. Water bodies identified as impaired by nonpoint source pollution are given priority for EPA CWA Section 319(h) grant funds. The assessment guidance includes methods to determine use attainment for water quality standards. The guidance document is developed by TCEQ with the input of an external advisory work group. The assessment methods for the 2022 Texas Integrated Report are detailed in the 2022 Guidance for Assessing and Reporting Surface Water Quality in Texas. The 2022 Texas Integrated Report was adopted by TCEQ in June 2022 and approved by EPA in July 2022.

Water Quality Status Categories

The Texas Integrated Report assigns each assessed water body to one of five categories in order to report water quality status and potential management options to the public, EPA, state agencies, federal agencies, municipalities, and environmental groups. These categories indicate the status of a water body and describe how the state will approach identified water quality problems. Table 3.1 defines the five categories and shows the number of water bodies assigned to each assessment category in the 2022 Texas Integrated Report.

The 303(d) list of impaired waters, Category 5 of the Texas Integrated Report, identifies waters that do not meet Texas Surface Water Quality Standards. It is an important management tool produced as part of the Texas Integrated Report and must be approved by EPA. Water bodies on the 303(d) list of impaired waters are those that require action to restore water quality. An impairment occurs when a water body or a portion of that water body called an assessment unit, does not meet the water quality criteria to protect a specific use. The same AU can have multiple impairments. For example, a water body may not meet the criteria for both dissolved oxygen and bacteria; this is considered two impairments. Since a water body has multiple uses, it may fall into different categories for different uses. In that case, the overall category for the water body is the one with the highest category number.

The Texas Integrated Report further divides Category 5 water bodies into subcategories to reflect additional options for addressing impairments:

- Water bodies in Category 5a have a TMDL underway, scheduled, or to be scheduled.
- Water bodies in Category 5b require a review of the water quality standards for the water body to be conducted before a management strategy is selected.
- Water bodies in Category 5c require additional data and information to be collected or evaluated before a management strategy is selected.
- Water bodies in Category 5n do not meet their applicable chlorophyll-a criteria, but additional study is needed to verify whether exceedance is associated with causal nutrient parameters or impacts to response variables.

TABLE 3.1 Number of water bodies assigned to assessment categories in the 2022 Texas Integrated Report

Category	Definition	Number of Water Bodies
1	All designated uses are supported, no use is threatened.	90
2	Available data or information indicate that some, but not all of the designated uses are supported.	310
3	Insufficient or unreliable available data or information to make a use support determination.	103
4	Available data or information indicate that at least one designated use is not being supported or is threatened, but a TMDL is not needed.	131
5	Available data or information indicate that at least one designated use is not being supported or is threatened, and a TMDL is needed. Category 5 is the CWA Section 303(d) list of impaired waters.	457
Total		**1,091**

Continuous Water Quality Monitoring

TCEQ has a network of continuous water quality monitoring sites on priority water bodies. The agency maintains 30 to 45 sites in its Continuous Water Quality Monitoring Network (CWQMN). The number and locations of sites varies from year to year. In fiscal year 2023, TCEQ had 32 active sites (Figure 3.3). At these sites, instruments measure basic water quality conditions every 15 minutes. The continuous water quality monitoring data may be used by TCEQ or other organizations to make water resource management decisions, target field investigations, evaluate the effectiveness of water quality management programs such as TMDL I-Plans and WPPs, characterize existing conditions, and evaluate spatial and temporal trends. You can find site information and data at the **Continuous Water Quality Monitoring webpage**[2].

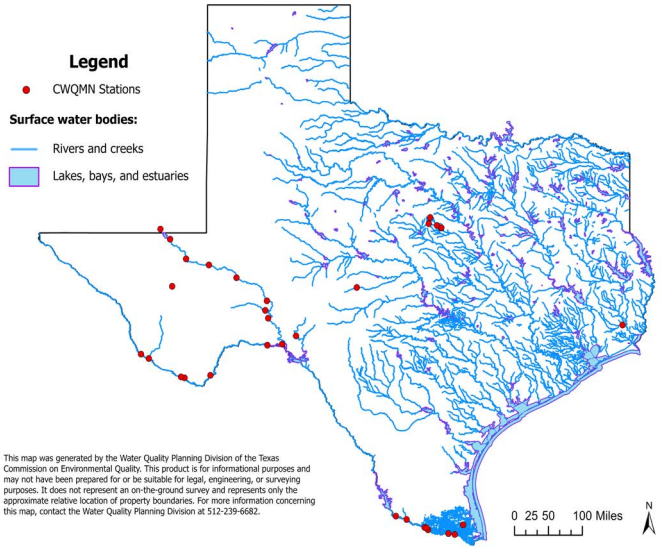


FIGURE 3.3 TCEQ's active CWQMN stations in fiscal year 2023

Texas Stream Team Monitoring

The Texas Stream Team program is administered within the Watershed Services Division at the Meadows Center for Water and the Environment (Meadows Center), a research institute at Texas State University. This statewide network of trained water quality community scientists and supportive partner organizations works to gather information about the natural resources of Texas. The program's volunteer community scientists receive certification after completing training to collect water quality and environmental parameters from monitoring sites along rivers, lakes, streams, and estuaries. All water quality and environmental data collected under the program are available online. The Meadows Center receives EPA CWA Section 319(h) grant funds from TCEQ to administer the statewide program.

In fiscal year 2023, Texas Stream Team and its partners achieved the following:

- Conducted 58 trainings across the state.
- Trained 477 volunteers in surface water quality monitoring.
- Volunteer community scientists held 4,469 monitoring events at 297 active stations (See Figure 3.5) and contributed 6,778 hours of time, and 91,400 miles of travel.

[2] www.tceq.texas.gov/waterquality/monitoring/swqm_realtime.html

The program also expanded its efforts in coastal regions to address the unique water quality challenges faced by these areas. They established a partnership with Clean Coast Texas, a Texas General Land Office (GLO) initiative that implements the federally approved Texas Coastal Nonpoint Source Management Program. Through this partnership, more than 22 residents have been trained to monitor water quality and to actively participate in safeguarding their natural resources.

Texas Stream Team also updated and provided new or expanded resources for community scientists and trainers so they can use the latest tools and knowledge for accurate and effective water quality data collection. Actions included:

- Creating and revising training manuals for the Riparian Evaluation Training, the Advanced Water Quality Citizen Scientist Training, and the *E. coli* Bacteria Water Quality Citizen Scientist Training.
- Launching the electronic Standard Core Environmental Monitoring Form, so volunteers can submit data directly to the Waterways Dataviewer database while including data validations for initial quality control.
- Developing training PowerPoint presentations and modules to provide consistent information.

Together, these resources contribute to the overall effectiveness and efficiency of the program. Texas Stream Team expects these advancements to empower its scientists and trainers in protecting and preserving the water resources of Texas.

Program initiatives were implemented around water bodies with WPPs including: Attoyac Bayou, Bastrop Bayou, Clear Creek, Cypress Creek (Segment 1815), Cypress Creek (Segment 1009), Double Bayou, Dry Comal Creek and Comal River, Hickory Creek, Highland and Marchand Bayous, La Nana Bayou, Lake Lavon, Lavaca River, Mid and Lower Cibolo Creek, Navasota River Below Lake Limestone, Nolan Creek, Plum Creek, Rowlett Creek, San Bernard River, Shoal Creek, Spring Creek, Upper Cibolo Creek, Upper San Antonio River, Upper San Marcos River, and West Fork of the San Jacinto River. The program strives to expand and continue water quality monitoring through improved data collection within and beyond WPP areas.

For more information and for future events and trainings, visit the **Texas Stream Team website**[3].

FIGURE 3.4 Texas 4-H Ambassadors Program Standard Core Training at the Meadows Center (Photo by the Texas 4-H Ambassadors Program)

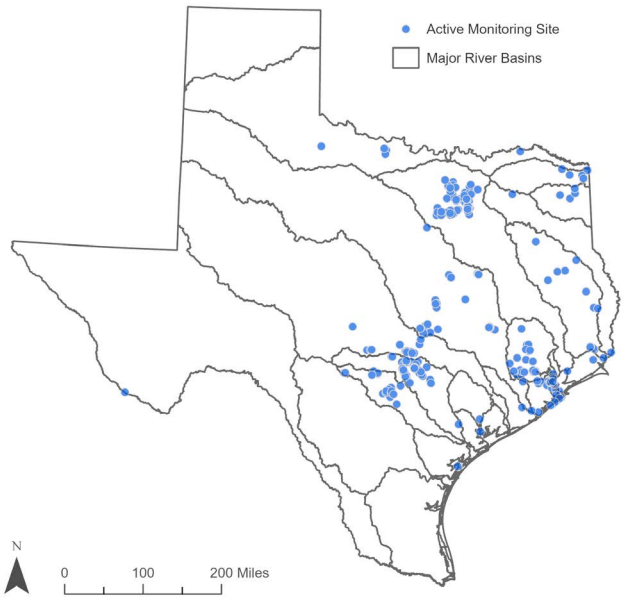


FIGURE 3.5 Active Texas Stream Team monitoring sites in fiscal year 2023

[3] **www.meadowscenter.txst.edu/Leadership/TexasStreamTeam.html**

Goal Two—Implementing Programs to Reduce Nonpoint Source Pollution

The second goal of the Texas Nonpoint Source Management Program is to implement activities that prevent and reduce nonpoint source pollution in surface water, groundwater, wetlands, and coastal areas. The objective of this goal is to implement WPPs, TMDL I-Plans, the Texas Groundwater Protection Strategy, TSSWCB-certified WQMPs, BMPs on agricultural and silvicultural lands, and other identified priorities. Following are highlights of some implementation projects.

Implementing the Shoal Creek Watershed Action Plan

The Shoal Creek watershed is a highly urbanized area within Austin that includes an 11-mile creek and over 30 miles of streams. The watershed (AUs 1429A_01 and 1429J_01) lies partially within the environmentally sensitive Edwards Aquifer recharge zone and drains into the Colorado River. The watershed is comprised of 54 percent impervious cover, 71 percent of which was developed before the adoption of local water quality regulations. Shoal Creek suffers from poor water quality and overall creek health due to elevated bacteria concentrations, flooding and erosion, riparian habitat loss, and high pollutant loads.

FIGURE 3.6 Volunteers removing invasive species at the Seiders Springs Greenbelt riparian restoration site (Photo by Sierra DaSilva)

FIGURE 3.7 Native species plantings and educational signage at the 10th Street riparian restoration site along Shoal Creek (Photo by Sierra DaSilva)

To address these challenges, Shoal Creek Conservancy worked with community stakeholders and environmental professionals to develop the Shoal Creek Watershed Action Plan, accepted by EPA in 2021. The watershed action plan defines a path for restoring a fishable, swimmable Shoal Creek. Priority activities include:

- Installing new rain gardens and pet waste stations in the watershed.
- Expanding and improving Shoal Creek's riparian buffers.
- Organizing trash cleanups.
- Engaging watershed residents to manage their properties sustainably.

In 2023, implementation of the plan focused on expanding and improving riparian buffers. The conservancy collaborated with the City of Austin, local nonprofit organizations, and community stakeholders to begin riparian restoration at five sites along Shoal Creek that suffered compacted soil, erosion, and invasive species. Restoration events engaged over 450 volunteers in improving the water quality and health of Shoal Creek and included:

- Hosting 11 workdays to remove invasive species (including Arundo donax, Colocasia esculenta, and Ligustrum trees) and plant suitable native aquatic and riparian species.
- Hosting 10 workdays to convert a large rain garden initially installed with Bermuda grass turf to native plantings.
- Planting 1,370 native plants.
- Sowing 30 gallons of native seed.
- Making and distributing 1,550 native seedballs.

During fiscal year 2023, the Shoal Creek Conservancy also:

- Installed three new pet waste stations along the Shoal Creek Trail.
- Hosted two workshops on sustainable landscaping.
- Held 20 creek cleanups, during which an estimated 8,600 pounds of trash and recyclables were removed from Shoal Creek.

Implementing the Upper San Marcos WPP: San Marcos Greenbelt Alliance and The Mermaid Society of Texas

In fiscal year 2023, an implementation project from the Upper San Marcos River WPP was completed in collaboration with the Meadows Center, the City of San Marcos, the San Marcos Greenbelt Alliance, and the Mermaid Society of Texas.

Sessom Creek crosses the Sessom Creek Natural Area and empties directly into the headwaters of the San Marcos River where endangered species and their critical habitat are located. The city and the alliance made significant strides in protecting and restoring the natural area through paid and volunteer actions:

- Removing non-native invasive species from the Sessom Creek Natural Area.
- Constructing sediment control berms along the steepest contours of the area to prevent stormwater runoff from reaching Sessom Creek, helping to protect the San Marcos River.

Education and public involvement included:

- Installing seven education signs within the Sessom Creek Natural Area to provide information on restoration and park features.
- Creating three additional signs for other nature-based projects to raise awareness of water quality initiatives.
- Engaging community members, regional volunteers, and non-profits in monthly volunteer workdays restoring Sessom Creek and its watershed.
    - Involved 212 volunteers, who contributed a total of 747 hours.
    - Removed non-native invasive species from approximately 16.5 acres.

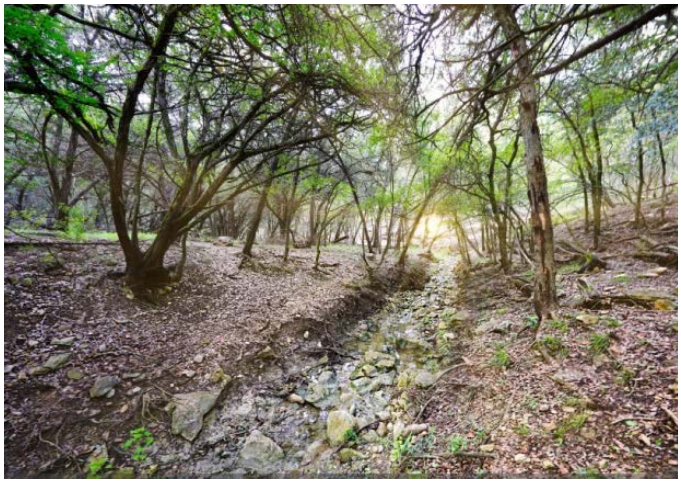


FIGURE 3.8 Non-native plants cleared across 14 acres near Sessom Creek (Photo from the Edwards Aquifer Habitat Conservation Plan)

The Mermaid Society of Texas played a vital role in fostering children's curiosity and enthusiasm for the San Marcos River through 16 education and outreach events. During these events, over 2,700 educational kits and 151 SPLASH patches were disseminated to inspire children to become stewards of the river and the surrounding natural resources (Figure 3.10). The acronym SPLASH stands for the study units required to earn the patch: Stewardship, Preservation, Local, Arts, Sustainability, Heritage. The Mermaid Society has contributed to fostering a culture of preservation and stewardship for the unique natural resources precious to the watershed.

All of these achievements demonstrate the power of community collaboration and volunteer participation. The restoration projects, including non-native invasive species removal and constructing sediment control berms, serve as a model for future endeavors by residents, developers, and stakeholders.

FIGURE 3.9 Sessom Creek Natural Area planting workday (Photo by the San Marcos Greenbelt Alliance)

FIGURE 3.10 An educational event for children under the Mermaid SPLASH Patch Program (Photo by The Mermaid Society of Texas)

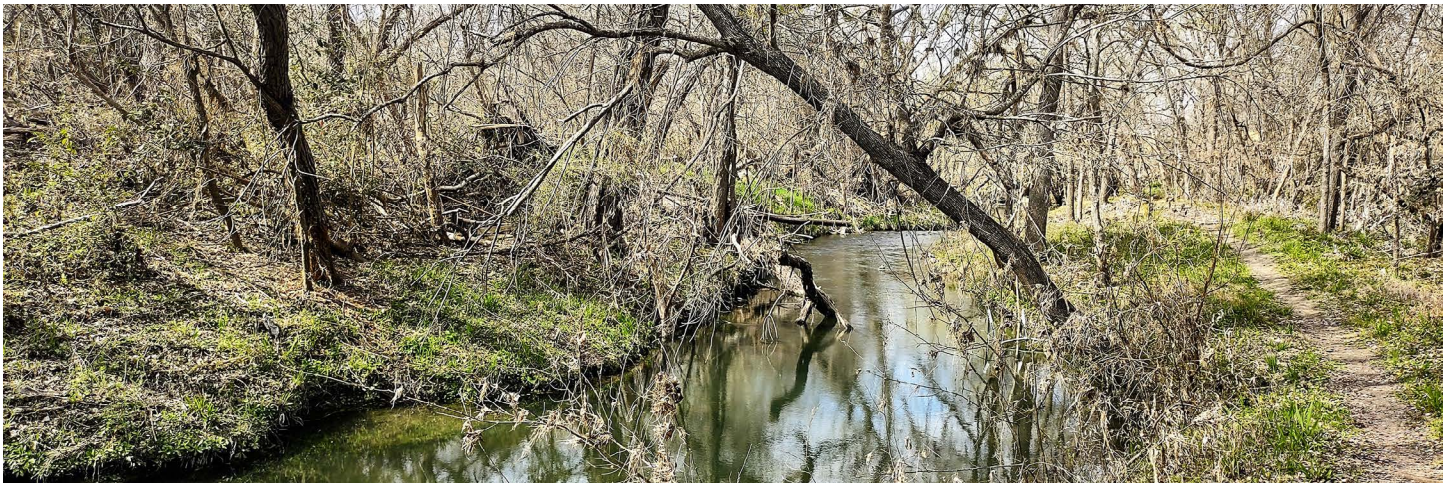


FIGURE 3.11 Geronimo Creek (Photo by AgriLife Extension)

Implementing the Geronimo and Alligator Creeks WPP

The Geronimo and Alligator Creeks WPP was developed to address elevated levels of bacteria and nitrate-nitrogen in the Geronimo and Alligator Creeks watershed (Figure 3.11). The WPP was accepted by EPA in 2012. Since then, diverse water conservation efforts have been implemented in the Geronimo and Alligator Creeks watershed. Through education, public outreach, and technical and financial assistance, this WPP has brought the community together to improve water quality.

The watershed coordinator facilitates educational programs focused on water quality and BMPs for stakeholders. During fiscal year 2023, programs included:

- A low-impact development (LID) course focused on structural BMPs that reduce the effects of new construction, hosted at the Irma Lewis Seguin Outdoor Learning Center. This LID course allowed participants to see demonstrations of a rainwater harvesting system, pervious pavement, and a rain garden.
- A new Turfgrass Management Course where attendees learned about responsible application of pesticides and fertilizers to reduce pollution from runoff.

Fiscal year 2023 marked the 10th year of implementing the Geronimo and Alligator Creeks WPP. Cleanup events have been a key focus for stakeholder involvement since implementation began (Figure 3.12). On April 22, 2023, volunteers collected over 2,000 pounds of trash during the 10th Annual Spring Cleanup Event. Over the course of the implementation period, over 20,000 pounds of trash have been removed from the watershed.

TSSWCB and the Comal-Guadalupe SWCD continue to work together to provide technical and financial assistance to local landowners. There are currently 40 active WQMPs in the Geronimo and Alligator Creeks watershed. During fiscal year 2023, the SWCD:

FIGURE 3.12 Cleanup by volunteers (Photo by Annalee Epps)

- Reviewed the status of existing plans.
- Completed the development of one WQMP.
- Worked on two additional applications for planning assistance that encompass 15,990 feet of terraces, 18 acres of pasture planting, 16 acres of brush management, 2.4 acres of sodded waterway, and one pond.

By offering education, outreach, and assistance, the Geronimo and Alligator creeks partnership has continued to be a valuable resource in the protection of water resources in both Comal and Guadalupe counties. Future projects and programs will provide for a persistent presence in the watershed to restore water quality in the area.

Total Maximum Daily Loads and I-Plans

The TMDL Program develops targets for reducing pollution and helps communities build plans to improve water quality in their waterways. TMDL I-Plans may be developed concurrently with TMDLs to leverage resources and increase the pace at which Texas improves impaired waterways.

In fiscal year 2023, the TMDL Program continued to implement the CWA Section 303(d) Vision which covers all of the following:

- Enhances overall efficiency of the CWA Section 303(d) Program.
- Focuses attention on priority waters.
- Provides flexibility to state programs to use available tools such as TMDLs, TMDL I-Plans, WPPs, or other restoration plans to attain water quality standards.

TCEQ's Nonpoint Source and TMDL programs and TSSWCB coordinated with stakeholders to continue surface water quality monitoring in the Mission and Aransas rivers watershed, and to continue collecting data for the development of the Arenosa and Garcitas Creeks WPP.

Stakeholders provide local expertise to identify site-specific problems, targeting areas for attention, and determining what management measures will be most effective. Ultimately, it is stakeholders who carry out the plans to improve water quality in the rivers, lakes, and bays and achieve long-term success. Several TMDL I-Plans that address nonpoint sources of pollution are supported by EPA CWA Section 319(h) grant funds from TCEQ and EPA.

Texas Coastal Management Program

The Texas Coastal Management Program coordinates between local, state, and federal entities that manage coastal resources to ensure the coast's long-term economic and ecological productivity. GLO administers the program with advice from members of the Coastal Coordination Advisory Committee. Each state with an EPA-approved coastal management program must also develop a federally approvable program to control coastal nonpoint source pollution.

The National Coastal Nonpoint Source Pollution Control Program was established in 1990 by Section 6217 of the Coastal Zone Act Reauthorization Amendments. This program establishes management measures for states to control coastal nonpoint source runoff from five main sources: urban areas, forestry, agriculture, hydromodification, and marinas. EPA and the National Oceanic and Atmospheric Administration reviewed the Texas Coastal Nonpoint Source Pollution Control Program and formally approved the program in 2022. In fiscal year 2023, the following activities related to coastal septic systems and stormwater management were implemented.

Septic Systems

The Texas Coastal Nonpoint Source Pollution Control Program funds several projects to inspect OSSFs in the coastal zone (per Coastal Zone Act Reauthorization Act requirements). In fiscal year 2017, Texas A&M AgriLife Extension Service secured CWA Section 319(h) grant funds from TCEQ and EPA to update the Coastal On-site Sewage Facility Inventory database and conduct OSSF inspections and education events in the designated coastal zone boundary. The database stores septic system information such as location, age, type, permit information, and inspection date and helps the state efficiently direct funding and resources to designated areas.

In fiscal year 2023, Texas continued to implement a five-pronged approach for septic system inspections which consists of:

1. Point-of-sale real estate OSSF inspections
2. WBP implementation inspections
3. Regulated maintenance inspections
4. Complaint-based inspections by authorized agents
5. Section 319-funded OSSF inspections by licensed contractors

Wooden docks at sunrise in Galveston Bay (Source iStock)

Using this strategy, Texas estimates that the required number of inspections will be obtained within 15 years. In fiscal year 2023, Texas A&M AgriLife Extension Service processed an estimated 426 new inspections of existing OSSFs.

Clean Coast Texas and the Coastal Stormwater Management Manual

Clean Coast Texas, a program of the Texas Coastal Nonpoint Source Pollution Control Program, supports a thriving Gulf Coast economy and environment through research, planning, constructed improvements, collaboration, and activities that manage nonpoint source pollution to keep our coastal waters clean. Clean Coast Texas is guided by GLO, in partnership with numerous stakeholders and state and local agencies.

Program resources can help Texas coastal communities reduce the environmental impacts of stormwater runoff from existing and new urbanized areas and enhance wastewater treatment. Resources developed under the program include:

- A **website**[4] providing information on the Texas Coastal Zone, stormwater runoff, and community and technical resources.
- A technical manual, Guidance for Sustainable Stormwater Drainage on the Texas Coast to provide additional guidance and resources to coastal communities.
- A monthly series, "**Lunch and Learn**[5]," to feature timely content about coastal nonpoint source pollution.

Estuary Programs in Texas

Galveston Bay Estuary Program

GBEP is one of two estuary programs in the state of Texas and one of 28 nationwide. It is a non-regulatory program of TCEQ, and together with its partners is tasked with implementing The Galveston Bay Plan, 2nd Edition. This comprehensive conservation and management plan seeks to preserve the bay for future generations. Two of its action plans, which are to improve water quality through both nonpoint and point source pollution abatement, continue to be top priorities of the program. These are two of the three action plans listed in the Galveston Bay Plan's first priority, to ensure safe human and aquatic life use.

Microplastics in Tributaries to Galveston Bay

Microplastics, plastic particles less than five millimeters (mm) in diameter, are of increasing concern due to potential environmental impacts. In the Galveston Bay watershed, these have been identified as a priority research topic by the Water and Sediment Quality subcommittee of the Galveston Bay Council. These small particles, derived from the degradation or mechanical breakdown of larger plastic objects or particles, are introduced to waterways through urban runoff, wastewater effluent, and other man-made sources. Microplastics ingested by birds, oysters, fish, and turtles can have negative effects on their health, including death.

The long-term effects of microplastics in the environment are not well known. However, concerns over potential effects have increased the interest in understanding the extent of their presence and their potential for bioaccumulation and disruption to ecosystem functions.

Until recently, there had been no published studies on the occurrence and abundance of microplastics in the Galveston Bay watershed. In fiscal year 2020, the United States Geological Survey (USGS) obtained EPA CWA Section 320 grant funding through GBEP to complete a baseline study of microplastics in the tributaries to Galveston Bay. The objectives of this study were to investigate the occurrence of and categorize microplastics in selected watersheds draining to Galveston Bay.

USGS collected samples at 10 stations in tributaries to Galveston Bay on two occasions: once during baseflow conditions, and once during a runoff event (Figure 3.13). The size of particles analyzed ranged from 0.30 to 4.76 mm. Using Raman Spectroscopy, a technique that uses a laser to identify a material. Particles were also categorized into one of the following categories:

- fiber
- fragment
- bead/pellet
- film
- foam
- aggregate (a conglomerate of particles of various categories that could not be physically separated)

[4] www.cleancoast.texas.gov

[5] www.eventbrite.com/cc/clean-coast-texas-lunch-learn-series-83869

Morphologically, fragments were the dominant type observed—41 to 100 percent of most samples—followed by beads/pellets. Microplastic particles—from greater than 1.00 to 4.76 mm in diameter—were detected in 18 of the 20 samples collected. The concentration of microplastics detected ranged from 0.02 to 6.74 particles per cubic meter. The highest concentration was in a stormflow sample from Clear Creek near Friendswood, Texas, an area with a relatively high percentage of urban land cover.

Sites along Buffalo Bayou—near downtown Houston—produced consistently higher volumes of microplastics during both stormflow and baseflow conditions. The Buffalo Bayou sample taken upstream of the downtown area showed lower concentrations of microplastics than the sample downstream of that area.

The overall concentration of microplastics was also higher in samples collected during stormflow conditions than during baseflow conditions for most of the monitoring stations. The two samples with no detected microplastics were from the West Fork of Double Bayou near Anahuac, Texas, and Cedar Bayou near Crosby, Texas, both more rural areas.

This study has provided baseline information on the occurrence and abundance of microplastics in tributaries to Galveston Bay, filling gaps in our understanding of the spatial distribution and concentrations. The data can be used in future assessments and evaluations of microplastics in the watershed and as a foundation for future studies. USGS plans to use funding secured in fiscal year 2024 to target areas of high microplastic concentrations or areas skipped in the previous two phases of the study.

Coastal Bend Bays and Estuaries Program

The Coastal Bend Bays and Estuaries Program (CBBEP) is one of the 28 National Estuary Programs that works with local government, stakeholders, conservation groups, industry groups, and resource managers to improve water quality and restore critical habitats. The program targets nonpoint source pollution issues through the following activities:

- Conducting research projects to determine sources of pollution.
- Participating in developing and implementing WPPs and TMDL I-Plans.
- Prioritizing land conservation and management and education through the Delta Discovery Program.

CBBEP continues to partner with stakeholders and scientists to investigate sources of nutrients periodically found in high concentrations in bay systems and to sample soils and runoff to identify areas of concern. The information is being used in outreach efforts to deter practices that may introduce pollutants and nutrients in runoff and improve water quality.

In fiscal year 2023, CBBEP worked in partnership with NRA and Texas A&M University–Corpus Christi to deliver an education and outreach program that connects urban and rural communities of the Oso Bay and Oso Creek watershed. Several human activities have been identified, including littering and illegal dumping, as potential sources of point and nonpoint source pollution. Some of the underlying factors of these sources are a lack of awareness about natural resources and a lack of access to proper waste disposal facilities, which are reflected by refrigerators, tires, animal carcasses, and household garbage dumped at public road crossings.

To address the illegal dump sites CBBEP led an Up2U Plus dumpster program to provide dumpsters to communities at no cost, which removes barriers of cost and physical accessibility that prevent proper disposal of dumped items.

CBBEP partnered with NRA and Texas A&M University–Corpus Christi on an education and outreach project to connect urban and rural communities of the Oso Bay and Oso Creek watershed. This project encourages personal responsibility for water quality and polluting behaviors by providing information to residents about runoff, nonpoint source pollution, and their connection to the watershed.

FIGURE 3.13 Collecting microplastics with a net towed by a boat (Photo by GBEP)

Oso Bay (Segment 2485) and Oso Creek (AU 2485A_01) are listed on the 2022 Texas Integrated Report 303(d) list of impaired waters. Following the initiation of a TMDL project for Oso Bay, stakeholders decided to develop an I-Plan for both the Creek and the Bay that included the following educational projects:

- Fabricated a plastic relief model of the watershed that allows participants to locate landmarks, apply different kinds of mock pollutants on the land, and see how water "flows" into the Bay.
- Shared the model with every fifth-grade classroom in the watershed to reinforce the Texas Essential Knowledge and Skills and cultivate student understanding, reaching approximately 1,000 students.
- Developed bilingual informational materials.
- Took the model to community events for underserved communities (colonias).

CBBEP is also developing a model for use in the Baffin Bay watershed in fiscal year 2024 based on recommendations in the recently approved Petronila and San Fernando Creeks WPP, and the success of the Oso Bay and Oso Creek Watershed Education and Outreach Project. For more information about this project, visit the **Coastal Bend Bays and Estuary Program's website**[6].

Texas Groundwater Protection Committee

Groundwater is a major source of water in Texas. Texans use groundwater for drinking, livestock, irrigating crops, and mining and industrial processes. It also serves as habitat for plants and animals, some of which are endangered species.

The interagency Texas Groundwater Protection Committee (TGPC) protects groundwater resources and includes nine state entities and an association of groundwater districts. TGPC strives to improve interagency coordination and continues to develop and update the comprehensive groundwater protection strategy for Texas. The committee may also identify new programs or enhancements to existing programs to improve groundwater protection.

Two subcommittees accomplish the majority of TGPC's responsibilities:

1. The Groundwater Issues Subcommittee.
2. The longstanding Public Outreach and Education Subcommittee.

The Groundwater Issues Subcommittee and TGPC each have standing agenda items at every meeting to discuss nonpoint source pollution issues.

What the Groundwater Issues Subcommittee does:

- Oversees the cooperative groundwater monitoring program for select pesticides of interest in groundwater.
- Coordinates and assists TGPC member agencies with monitoring programs for emerging contaminants or constituents of concern.
- Develops white papers on groundwater issues, including recommendations or policy options for TGPC.
- Forms task force working groups as needed to address individual issues, such as nonpoint source pollution.

TGPC emphasizes groundwater quality awareness in its outreach and education efforts.

What the Public Outreach and Education Subcommittee does:

- Works with TGPC member agency Texas A&M AgriLife Extension Service to develop fact sheets and "frequently asked questions" documents targeting private drinking water well owners, which often include information on nonpoint source pollution and BMPs.
- Facilitates a TGPC booth at various events, including TCEQ's annual Environmental Trade Fair, answering questions and distributing fact sheets and information on groundwater protection, including nonpoint source pollution.
- Supports Texas A&M AgriLife Extension Service's Texas Well Owner Network program as it conducts educational events for private drinking water well owners.

TGPC prepares a biennial report to the Texas Legislature describing its activities for the two preceding years and recommendations for groundwater protection to be considered by the Legislature. The Legislative Report Subcommittee was activated in fiscal year 2022 and developed a draft report for consideration by TGPC prior to the 88th legislative session. TGPC filed the report with legislative leadership in December 2022, state fiscal year 2023.

Additional information on TGPC, including activities related to nonpoint source pollution, is available on **TGPC's website**[7].

[6] www.cbbep.org [7] tgpc.texas.gov

Clean Water State Revolving Fund Loans for Nonpoint Source Projects

Another tool available in Texas for addressing nonpoint source pollution is the Clean Water State Revolving Fund, which is administered by the Texas Water Development Board. This financing program, authorized under the federal CWA, is partially capitalized by an annual grant from EPA. The program provides funding assistance in the form of up to 30-year loans at interest rates lower than the market offers, as well as a limited amount of funds which do not have to be repaid. The funds that do not have to be repaid are available to disadvantaged communities and green projects.

Although most of the funds finance publicly owned wastewater treatment and collection systems, the Texas Water Development Board can also use the fund for nonpoint source pollution abatement and stormwater projects. Funds are available to cities, counties, groundwater conservation districts, SWCDs, and other public agencies, as well as to nonprofit organizations and mainly water supply or sewer service corporations.

A water quality-based priority system is used to rank potential applicants and fund projects, including nonpoint source projects. To be eligible, a nonpoint source project must be one of the following:

- An identified practice within a WQMP, TMDL I-Plan, or WPP.
- A nonpoint source management activity that has been identified in the Texas Groundwater Protection Strategy.
- A BMP identified in the Texas Nonpoint Source Management Program or the National Estuary Program.

All applications are initiated with the Texas Water Development Board, and then TCEQ reviews them in cooperation with Councils of Government participating in the CWA Section 604(b) Grant Program to ensure conformance with the Texas Water Quality Management Plan. Loans can be used for planning, designing, acquiring, and constructing WWTFs, wastewater recycling and reuse facilities, and collection systems. Other activities eligible for funding assistance include:

- agricultural, rural, and urban runoff control
- estuary improvement
- nonpoint source education
- wet weather flow control, including stormwater management activities

Staff members from the Texas Water Development Board, TCEQ, and TSSWCB meet as needed to coordinate efforts to identify water bodies impacted by nonpoint source pollutants and to identify potential applicants for assistance under this funding program.

Goal Three—Education

The third goal of the Texas Nonpoint Source Management Program is to conduct education and technology transfer activities to raise awareness of nonpoint source pollution and activities that contribute to the degradation of water bodies by nonpoint source pollution. Education is a critical aspect of managing nonpoint source pollution. Public outreach and technology transfer are integral components of every WPP, TMDL, and TMDL I-Plan. This section highlights some of the nonpoint source education and public outreach activities in fiscal year 2023.

Statewide Urban Riparian and Stream Restoration Program

TWRI and the Texas A&M AgriLife Extension Service jointly deliver the Urban Riparian and Stream Restoration Program across the state with funding from the CWA Section 319(h) grant. This educational program promotes healthy watersheds, stream restoration, water quality improvement, and riparian habitat improvement by delivering one-day workshops in priority watersheds.

Priority watersheds are those that have developing or implementing WBPs. The workshops introduce attendees to procedures for natural channel design and natural stream restoration through hands-on field work and lectures. Prior participants of the program can also participate in a three-day Advanced Stream Restoration Design workshop.

In fiscal year 2023, TWRI's efforts in conducting the workshops included:

- Delivering four one-day Urban Riparian and Stream Restoration workshops and one three-day advanced workshop (see above).
- Advertising the workshops to consultants, engineers, biologists, parks and recreation staff, floodplain managers, architects, nutrient management specialists, crop advisors, municipal land managers, and key volunteer groups such as the Texas Master Naturalists.

Nearly 100 participants attended the workshops and heard presentations from the program's lead instructor and extension specialist, Dr. Fouad Jaber, and special guest presentations from professionals including a regional planner, physical scientist, regulatory specialist, retired civil engineer, and watershed managers and coordinators (Figure 3.14 and Table 3.2).

FIGURE 3.14 Stream inspection with Dr. Fouad Jaber, Big Elm Creek watershed (Photo by Alexander Neal, TWRI)

Education and Outreach Events in the Big Elm Creek Watershed

Big Elm Creek, a major tributary of Little River in the Brazos River Basin, was first identified as not meeting the primary contact recreation standard for *E. coli* in the 2010 Texas Integrated Report. Sections of the creek also have concerns for depressed dissolved oxygen. In response, stakeholders developed the Big Elm Creek WPP which was accepted by EPA in February 2021. Since that time, implementation of the plan has been underway.

Stakeholders attended a variety of educational activities such as:

- Homeowner Maintenance of Septic Systems Class
- Urban Riparian Workshop
- Texas Watershed Stewards Program
- Bell County Conservation Expo
- Bell County Water Symposium

TABLE 3.2 Urban Riparian and Stream Restoration workshops offered in fiscal year 2023

Date	Local Contacts	Watersheds	Meeting Location	Attendees
March 2023	H-GAC	West Lake Houston Basin (Cypress Creek, Spring Creek, West Fork San Jacinto River, Lake Creek)	The Woodlands, TX	9
April 2023	Shoal Creek Conservancy	Shoal Creek	Austin, TX	36
April 2023	TWRI, Texas A&M AgriLife Extension Service	Big Elm Creek	Temple, TX	24
3-Day Workshop, June 2023	TWRI, Texas A&M AgriLife Extension Service	Dallas watersheds/Trinity River	Dallas, TX	19
August 2023	TWRI, City of Nacogdoches	La Nana Bayou	Nacogdoches, TX	6

These events were designed for a wide audience to increase awareness and understanding that will cause a change in behavior that protects water quality.

To facilitate stakeholder engagement purchases this year included a new projector, screen, and an EnviroScape tabletop watershed model. These tools will be used to reach a wide range of audiences and provide hands-on experience.

Eight pet waste stations were purchased and installed covering all the parks within the City of Cameron. Pet waste stations serve a functional role, but also raise awareness of the importance of protecting the natural environment and resources in the city.

Lone Star Healthy Streams

The Lone Star Healthy Streams (LSHS) program is a partnership between the Texas A&M AgriLife Extension Service and TSSWCB. The LSHS program educates Texas livestock producers and land managers on how to best protect Texas waterways from bacterial contributions associated with the production of livestock as well as feral hogs.

Groups of extension specialists, research scientists, resource conservation agencies, agricultural groups, and producers collaborated to compile five LSHS manuals, which include BMPs known to reduce *E. coli* contributions to rivers and streams from beef cattle, dairy cattle, horses, poultry, and feral hogs. In addition to reducing bacterial contributions, the BMPs listed in the manuals allow livestock and landowners to further protect Texas waterways from sediment, nutrient, and pesticide runoff while also potentially improving the productivity of the property.

A manual and a factsheet for each BMP are offered at every in-person event and are readily available online.

FIGURE 3.15 Training on feral hog traps at LSHS workshop (Photo by Leanne Wiley)

As a pilot test, the beef cattle manual was formulated into a free online course that is publicly available. This course has received 27 attendees and excellent reviews thus far.

In addition to making all the resources compatible with online viewing, a new website was designed and launched in February 2023. Resources, workshops dates, and program contact information are readily available on the **LSHS website**[8]. To further the program's online presence, Facebook and Instagram accounts were created and will be used to market upcoming events, share facts, and allow open dialogue with users.

The LSHS program has been well received by producers and landowners across the state and endorsed by seven livestock groups and three natural resource agencies. The program continues to expand and has partnered with additional extension specialists for subjects such as sheep and goat management, weed management for pastures, and backyard poultry management.

FIGURE 3.16 A feral hog on land disturbed and vegetation uprooted by feral hogs (Source Shutterstock)

[8] **http://lshs.tamu.edu**

FIGURE 3.17 Aerial photograph of a group (sounder) of feral hogs (Source Shutterstock)

In fiscal year 2023, 10 educational programs were delivered, reaching 328 producers throughout Texas. The LSHS program has reached an additional 962 Texas citizens through promotional endeavors. In Figure 3.15, participants attend a training workshop on feral hog management.

Lone Star Healthy Streams: Feral Hog Component

During fiscal year 2023, the LSHS Feral Hog program promoted healthy watersheds through face-to-face educational programs, distance-based education, resource creation, interagency collaborations, and increased social media outreach. Conventional and innovative new efforts were used to increase overall awareness and understanding of biology, impacts, economics, methods of removal, and laws and regulations related to feral hog management in Texas. Program participants are trained on use of traps to manage feral hogs (Figure 3.18). Program coordinators targeted priority watersheds across Texas to reduce damage in areas where feral hogs had the greatest potential impact on water quality issues. Figure 3.16 demonstrates the damage feral hogs can do to soil and vegetation, and Figure 3.17 shows a group (sounder) of feral hogs. The LSHS Feral Hog program is funded by a CWA Section 319(h) grant provided by EPA administered through TSSWCB, for activities facilitated by the Texas A&M AgriLife Extension Service and the Texas A&M Natural Resources Institute (NRI).

Fiscal year 2023 represented an exciting year for the LSHS Feral Hog program with a resurgence of face-to-face educational programs after COVID-19 restrictions. Sixteen educational wild hog events were conducted statewide with:

- 721 attendees
- 963.5 direct contact hours

Non-conventional methods of outreach continue to be a cornerstone of the LSHS Feral Hog program as NRI utilizes innovative techniques such as distance-based educational options, social media platforms, and traditional news platforms to reach the Texas public. Some results from the 2023 fiscal year include:

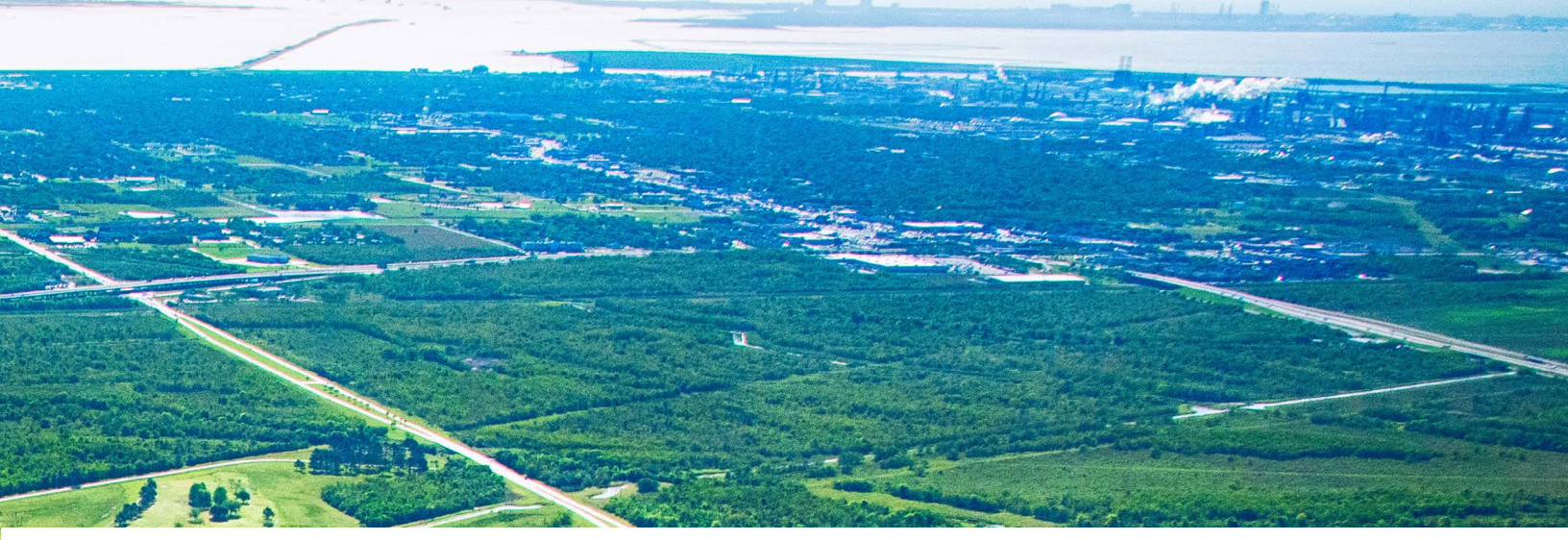
- 13 reports provided through the statewide online feral hog reporting tool noting 106 hogs sighted or removed.
- Four educational videos created as of November 2022 with over 19,000 views and over 1,400 hours of watch time.
- 232,663 users reached through the Feral Hogs Facebook page with 2,852 page-visits and 62 new likes.
- 1,319 views of the Feral Hogs Twitter page with 711 followers.

The LSHS Feral Hog program staff maintain vital working relationships with watershed coordinators, project managers, county extension agents, and other related personnel across the state through face-to-face and online collaborations. For more information and upcoming programs visit **NRI's Wild Pigs website**[9].

FIGURE 3.18 Program coordinator James Long demonstrating a feral hog trap to landowners (Photo by Dr. James Cathey)

[9] **https://wildpigs.nri.tamu.edu**

A river known as The Moses Bayou cutting into the rural farmland of East Texas near the Gulf of Mexico coastline near Texas City just north of Galveston (Source iStock)



CHAPTER 4

Developing and Implementing WPPs

TCEQ and TSSWCB apply the watershed approach to managing nonpoint source pollution by supporting the development and implementation of WPPs. Local stakeholder groups develop these plans and coordinate activities and resources to manage water quality. In Texas, WPPs facilitate restoring impaired water bodies and protecting threatened waters before they become impaired. These stakeholder-driven plans give the decision-making power to the local groups most vested in the goals specified in the plans.

Bringing groups of people together through watershed planning efforts combines scientific and regulatory water quality factors with social and economic considerations. While WPPs can take many forms, plans funded by EPA CWA Section 319(h) grants must follow EPA guidelines. You can find these guidelines in the **Nonpoint Source Program and Grants Guidelines for States and Territories**[10].

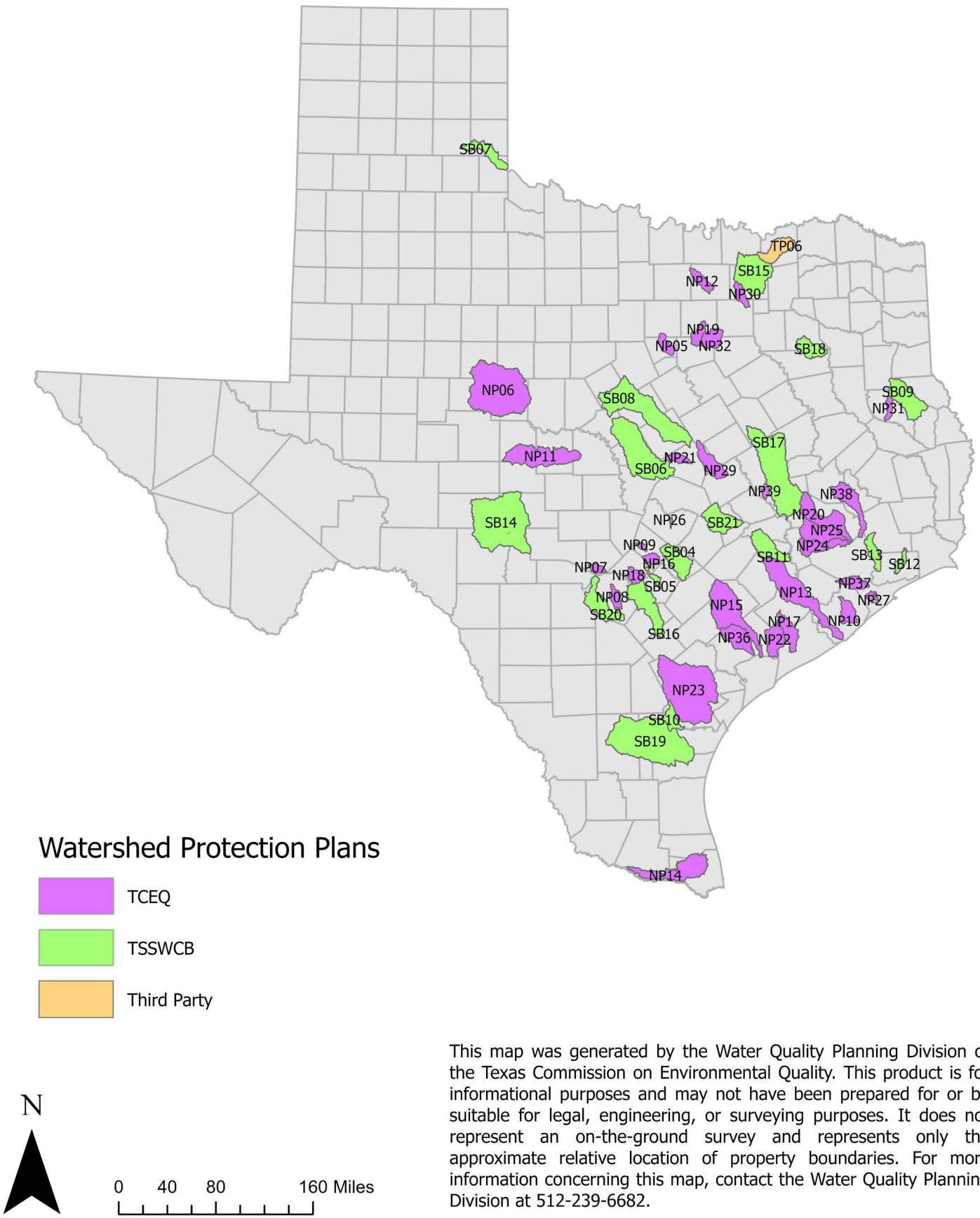
As of 2023, TCEQ and TSSWCB have facilitated the development and implementation of approximately 51 WPPs throughout Texas by providing technical assistance or funding through grants to regional and local planning agencies and, thereby, to local stakeholder groups. A significant portion of the funding to address nonpoint source pollution under the federal CWA is dedicated to WPPs in areas where nonpoint source pollution has contributed to impaired water quality.

In Texas, WPPs are also developed by third parties independent from TCEQ and TSSWCB. WPPs being developed or implemented in Texas at the end of fiscal year 2023 are shown on the map in Figure 4.1 and listed in Table 4.1. Neither the map nor table are intended to be a comprehensive list of all the watershed planning efforts underway in Texas because there may be other local planning efforts not funded by EPA CWA Section 319(h) grant funds.

Turtle in Upper San Marcos River (Source Jennifer Idol)

[10] **www.epa.gov/nps/319-grant-program-states-and-territories**

FIGURE 4.1 Watersheds with developing or implemented WPPs as of fiscal year 2023



This map was generated by the Water Quality Planning Division of the Texas Commission on Environmental Quality. This product is for informational purposes and may not have been prepared for or be suitable for legal, engineering, or surveying purposes. It does not represent an on-the-ground survey and represents only the approximate relative location of property boundaries. For more information concerning this map, contact the Water Quality Planning Division at 512-239-6682.

TABLE 4.1 Developing, accepted, or implemented WPPs as of fiscal year 2023

ID	TCEQ WPPs
NP36*	Arenosa and Garcitas Creeks
NP14	Arroyo Colorado
NP10	Bastrop Bayou
NP29	Big Elm Creek
NP11	Brady Creek
NP22	Carancahua Bay
NP37*	Clear Creek
NP06	Colorado R Below EV Spence
NP24	Cypress Creek (Segment 1009)
NP09	Cypress Creek (Segment 1815)
NP18	Dry Comal/Comal River
NP38*	East Fork San Jacinto River
NP41*	Greens Bayou
NP12	Hickory Creek
NP27	Highland Bayou
NP32	Joe Pool Lake
NP31	La Nana Bayou
NP19	Lake Arlington/Village Creek
NP05	Lake Granbury
NP15	Lavaca River
NP23	Mission and Aransas Rivers
NP21	Nolan Creek
NP30*	Rowlett Creek
NP13	San Bernard
NP26	Shoal Creek
NP25	Spring Creek
NP39*	Thompsons Creek
NP17	Tres Palacios Creek
NP07	Upper Cibolo Creek
NP08	Upper San Antonio River
NP16	Upper San Marcos River
NP20	West Fork of San Jacinto and Lake Creek
ID	**TSSWCB WPPs**
SB09	Attoyac Bayou
SB07	Buck Creek
SB13	Cedar Bayou
SB12	Double Bayou
SB05	Geronimo Creek
SB18*	Kickapoo Creek
SB15	Lake Lavon
SB06	Lampasas River
SB08	Leon River
SB10	Lower Nueces River
SB20*	Medina River
SB16	Mid and Lower Cibolo Creek
SB21*	Middle Yegua Creek
SB11	Mill Creek
SB17	Navasota River
SB19	Petronila & San Fernando
SB04	Plum Creek
SB14	Upper Llano River
ID	**Third Party WPPs**
TP06	Bois d'Arc Lake

*Developing WPPs

WPP Highlights

Spring Creek WPP

Spring Creek runs east from its origin in Waller County to join with the West Fork of the San Jacinto River near Interstate Highway (IH) 69. This waterway contributes an appreciable part of the flow entering Lake Houston, an important drinking water source for the region. Approximately 440 square miles of land covering parts of Grimes, Montgomery, Harris, and Waller counties form the watershed of Spring Creek.

Land cover is characterized by heavy development and scattered wooded areas in the eastern third, transitioning to lighter development, forest, and grasslands in the western reaches. Development has expanded in the last decade as growing populations have pushed northwest from the Houston area and from established urban areas along IH 45, State Highway (SH) 249, and SH 99 transportation corridors. This watershed is essential to supporting local communities and economies, recreation, fisheries, and a diverse ecology, and impacts on its water quality affect the uses of the waterway, including regional water supply.

Water bodies in the Spring Creek watershed face several water quality challenges including impairments caused by elevated levels of *E. coli*. High levels of nutrients, low dissolved oxygen, and impacts on macrobenthic communities are also concerns in some portions of the watershed. These impairments and concerns can impact public health, ecological health, and the area's economy.

Development of the WPP

After receiving funding from EPA—administered by TCEQ—to address these challenges, the Houston–Galveston Area Council worked closely with local stakeholders to develop a WPP. The Spring Creek Watershed Partnership—a group representing residents, government, industry, agricultural producers, community groups, and other local partners—engaged

FIGURE 4.2 Aerial view of Spring Creek (Photo by Jessica Casillas)

A great blue heron standing alone in the salt marsh (Source iStock)

in regular public meetings between summer 2020 and summer 2021 to discuss the development of the WPP.

First, the partnership used data analysis provided by H-GAC to evaluate the causes and sources of water quality issues. Then, they identified voluntary, cost-effective solutions reflecting community priorities to address sources of fecal waste and other concerns. Stakeholders prioritized solutions to manage pet waste, repair and replace OSSFs, and raise awareness about water quality through outreach and education. While specific emphasis was on reducing fecal waste which can directly impact human health, many of the solutions in the WPP are intended to have multiple water quality benefits. EPA accepted the Spring Creek WPP on June 30, 2023.

Education and Outreach

This project was carried out through the peak of COVID-19 social distancing practices that impeded in-person meetings and public events. Despite this, H-GAC was able to conduct and participate in a series of outreach efforts to engage local stakeholders, empower them to make informed decisions about their community's water quality, and facilitate participation in developing a WPP for Spring Creek. Project staff gave presentations at several events:

- Woodlands GrassRoots Environmental Education Network Lecture Series
- H-GAC Clean Waters Initiative Workshop
- Woodlands Township Outdoor Education Event

H-GAC also represented the project at local committee meetings:

- GBEP Water and Sediment Quality Subcommittee
- H-GAC's Natural Resource Advisory
- Regional Flood Management Committees

Plum Creek WPP

The Plum Creek watershed has a drainage area of 397 square miles and lies within the Guadalupe River Basin, which drains South Central Texas from the Hill Country to the Gulf of Mexico. The Plum Creek watershed includes portions of Hays and Travis counties and much of Caldwell County. The area is also undergoing substantial land use changes. In the past 15 years, large swaths of the watershed have been transformed by the construction of SH 130 and rapid residential and commercial growth along the IH 35 corridor. The rural landscape has changed as well with a considerable increase in the number of small farms in both Hays and Caldwell counties and a steep increase of reported feral hog activity throughout the watershed.

Plum Creek was put on the 303(d) list of impaired water bodies in the 2004 Texas Integrated Report for having *E. coli* concentrations above the primary contact recreation use standard. The 2004 Integrated Report also listed Plum Creek with a nutrient concern.

Development of the WPP

TSSWCB and Texas A&M AgriLife Extension Service first introduced the concept for this revolutionary project to the local stakeholders in 2006. Under guidance from TSSWCB, the Plum Creek Watershed Partnership was established to address elevated bacteria levels within the Plum Creek watershed. The Plum Creek WPP was accepted by EPA in 2009, becoming the first WPP in the state of Texas. The Plum Creek Watershed Partnership was also the first to assemble local funding to match federal dollars to hire a local watershed coordinator. The partnership is currently working towards the continued implementation of all management measures outlined in the WPP as well as updating and expanding the plan with the changing landscape of the watershed.

FIGURE 4.3 Plum Creek in Kyle, Texas (Photo by Sean Melvin)

Education and Outreach

The 38th Annual Great Texas River Cleanup was held in Kyle, Texas. On the first weekend in March 2023, 68 volunteers helped clean up litter in Plum Creek and around Waterleaf Park in Kyle (Figure 4.3). Through their efforts, 1,740 pounds of trash and 90 pounds of recyclables were collected. This not only got individuals engaged in cleaning the creek but provided an educational opportunity to learn about the impacts of stormwater on the watershed. This annual event is a partnership with the City of San Marcos and City of Kyle.

In December 2022, the Plum Creek Watershed Partnership and Texas A&M AgriLife Extension presented the On-site Septic Facility Workshop as a virtual event. This workshop taught septic system owners the differences between a conventional septic system and an aerobic septic system and how to maintain them. This also provided an opportunity to teach how a malfunctioning OSSF can impact local water quality.

Wildlife Management

In 2013, the Plum Creek Watershed Partnership applied for grant funds from the Texas Department of Agriculture to implement a feral hog abatement program to mitigate the growing feral hog population in Caldwell County and the watershed. This abatement program includes a feral hog bounty that is offered annually from February to August focusing efforts in Hays and Caldwell counties. Since its implementation, there have been more than 15,500 feral hogs removed from both counties and the Plum Creek watershed thanks to the hard work of local stakeholders. In fiscal year 2023, over 350 feral hogs were removed from the watershed through the bounty program. At bounty collection events, citizens also learn about the water quality benefits of feral hog management.

Technical Assistance

TSSWCB and the Caldwell-Travis SWCD continue to work together to provide technical and financial assistance to local landowners. There are currently 50 active WQMPs in the Plum Creek watershed. During fiscal year 2023, the SWCD reviewed the status of existing plans and completed the development of three WQMPs that encompass:

- 23 acres of pasture planting
- 5,225 feet of cross fencing
- 2,965 feet of livestock pipeline
- 5 livestock troughs
- 27 acres of brush control.

Brazos Bend State Park (Source iStock)

Cypress trees in the swamp of Caddo Lake State Park (Source iStock)

Appendix

TEXAS NONPOINT SOURCE MANAGEMENT PROGRAM MILESTONES

Goals / Objectives	Milestone	Milestone Description	Milestone Measurement	2023[1] Estimate	2023 Actual	Comments
ST1/A	Nonpoint Source Assessment Report	The state will produce the Texas Integrated Report in accordance with applicable EPA guidance	Texas Integrated Report	0	1	N/A
LT/2	Nonpoint Source Management Program Updates	The state will update the Management Program in accordance with applicable EPA guidance	Management Program updates	0	1	N/A
LT/2	Nonpoint Source Performance Partnership Grant (PPG) End of Year Reports	The state will produce an End of Year Report for PPG activities completed by TCEQ	PPG End of Year Reports	1	1	N/A
LT/7	Nonpoint Source Annual Report	The state will produce the Nonpoint Source Annual Report in accordance with applicable EPA guidance	Nonpoint Source Annual Report	1	1	Due to EPA January 2023
LT/5	Implementation of Coastal Nonpoint Source Pollution Control Management Measures	Applicable Management Measure	Nonpoint Source Annual Report and the GLO Reporting Mechanisms	TBD	426	Estimated OSSFs inspected in the Coastal Zone Boundary
LT/2-5	Section 319(h) Grant Program Solicitation	The state will conduct individual TCEQ and TSSWCB solicitations for Section 319(h) grant funding	Grant Solicitation documentation	2	2	One from each agency
LT/2-5	Section 319(h) Grant Program Application	The state will prepare individual TCEQ and TSSWCB grant program applications and submit them to EPA for Section 319(h) grant funding	Grant Application documentation	2	2	One from each agency
LT/2	Section 319(h) Grant Program Reporting	The state will report grant funded activities to the Grants Reporting and Tracking System (GRTS) in accordance with EPA guidance	GRTS updates	4	4	Two semi-annual updates from each agency
ST2/A	Priority Watersheds Report Updates	The state will update the Priority Watersheds Report based upon information and recommendations derived through the WAP process as described in the Management Program	Priority Watersheds Report Updates	1	1	N/A
ST3/C,D	Watershed Training	The state will provide training to watershed professionals to ensure quality and consistency in the development and implementation of watershed protection efforts	Texas Watershed Planning Short Course	1	1	N/A
ST3/A,B,F,G	Watershed Education	The state will provide watershed education to help citizens participate in programs designed to address water quality issues	Texas Watershed Steward Program (number of workshops)	8	9	N/A
ST3/C,D	Watershed Training	The state will provide a forum to facilitate the transfer of information between watershed professionals in the state	Texas Watershed Coordinator Roundtable	2	2	N/A
ST3/B,F,G	Volunteer Monitoring	The state will provide support for local volunteer monitoring groups. These groups provide water quality data to the state water quality planning program and gain insight into resolving water quality issues	Texas Stream Team Participation (numbers of stations monitored)	250	297	N/A

[1] Estimates are from the 2022 Texas Nonpoint Source Management Program report | RQ - Reportable Quantity

Appendix

TEXAS NONPOINT SOURCE MANAGEMENT PROGRAM MILESTONES (CONT.)

Goals / Objectives	Milestone	Milestone Description	Milestone Measurement	2023[1] Estimate	2023 Actual	Comments
ST1/B	Quality Assurance	The state will ensure that monitoring procedures are in compliance with EPA-approved TCEQ and TSSWCB Quality Management Plans	Annual Quality Management Plan updates	2	2	One from each agency
ST1/C	Watershed Characterization	The state will support the implementation of projects designed to evaluate watershed characteristics and produce the information needed for watershed and water quality models	Watershed characterization projects	3	4	N/A
ST2/A,C	Watershed Coordination	The state will support watershed coordination projects which facilitate the implementation of WPPs	Watershed coordination projects	12	14	N/A
ST1/D	Develop WPPs	The state will support projects which provide for the development of WPPs which satisfy applicable EPA guidance	WPP development projects	5	10	N/A
ST2/D	Implement WPPs	The state will support projects which provide for the implementation of management measures specified in WPPs which satisfy applicable EPA guidance	WPP implementation projects	42	48	N/A
ST1/D	Develop TMDLs and I-Plans	The state will support projects which provide for the development of TMDLs and I-Plans which satisfy applicable state, federal, and program regulations and guidance	TMDL and I-Plan development projects	0	0	N/A
ST2/D	Implement TMDLs and I-Plans	The state will support projects which provide for the implementation of management measures specified in TMDLs and I-Plans which satisfy applicable state, federal, and program regulations and guidance	TMDL I-Plan implementation projects	5	6	N/A
ST2/B,C	Load Reductions	The state will support projects which provide for the reduction of loadings of nonpoint source pollutants	Nonpoint source load reduction projects	18	22	N/A
ST2/B,C	Load Reductions (Nitrogen)	The state will ensure project reductions are reported utilizing GRTS	GRTS Report	RQ	1,733.06 lb/yr	Numbers reflect projects with load reductions reported in fiscal year 2023
ST2/B,C	Load Reductions (Phosphorus)	The state will ensure project reductions are reported utilizing GRTS	GRTS Report	RQ	6,509.37 lb/yr	Numbers reflect projects with load reductions reported in fiscal year 2023
ST2/B,C	Load Reductions (Sediment)	The state will ensure project reductions are reported utilizing GRTS	GRTS Report	RQ	13,506.58 tons/yr	Numbers reflect projects with load reductions reported in fiscal year 2023
ST2/E	Effectiveness Monitoring	The state will support projects which provide for the collection and analysis of water quality and other watershed information for evaluating the effectiveness of BMPs	Effectiveness monitoring projects	15	12	N/A

[1] Estimates are from the 2022 Texas Nonpoint Source Management Program report | RQ - Reportable Quantity

Caddo Lake, Texas, late November, early morning (Source iStock)

Printed on recycled paper using vegetable-based ink

Hamilton Pool, Texas Hill Country (Source iStock)

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