

Nonpoint Source Pollution Management in Texas

2021 ANNUAL REPORT



Texas
Commission on
Environmental
Quality



Texas State
Soil & Water
Conservation
Board

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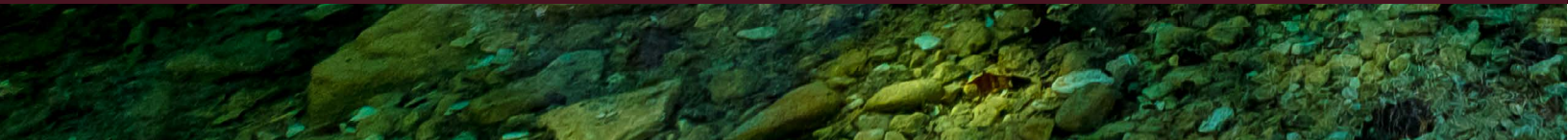
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Cobblestone in Frio River (Source iStock)

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 to implement the components and goals set forth 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 to improve water quality. At the close of fiscal year 2021, more than 30 watershed protection plans that satisfy EPA's nine key elements for watershed-based plans 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 watershed-based plans.

We are pleased to present the *2021 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



Toby Baker
Executive Director
Texas Commission on
Environmental Quality

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Frio River at Garner State Park (Source iStock)



Introduction

Chapter 1

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, industrial facilities, and energy production;
- 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 implement 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 cooperative implementation using the organizational tools and strategies defined 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 the Texas Water Code Chapter 26, 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*.

Management of nonpoint source pollution in Texas involves partnerships with many organizations to coordinate, develop, and implement the Texas Nonpoint Source Management 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 implementing 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 and/or watershed protection plans and other state, regional, and local plans and programs to reduce nonpoint source pollution by targeting implementation 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 focus efforts on the highest priority water quality issues of both surface water and groundwater. The Watershed Approach 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 Solutions 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 further data collection, evaluation of appropriate water quality standards, and/or development of a watershed-based plan with specific restoration activities. Once a strategy is determined, a lead program for implementation is assigned. Restoration activities identified in watershed-based plans are eligible and prioritized for federal funding for implementation.

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 effective development of projects, leveraging of resources, and the implementation of 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, which are 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 recommended strategies are documented in the [WAP Strategy Table¹](#), which summarizes the water quality management information. Data from the table, and special projects associated with impaired water bodies, are available through the [WAP Public Viewer²](#), an interactive, web based application. Water quality management strategies identified through the WAP process are implemented on a continuing basis. This process has helped identify and track restoration efforts, the collection of water quality data, the adoption of TMDLs, and the completion of watershed protection plans.



Frio River (Source iStock)

¹<http://www.tceq.texas.gov/waterquality/planning/wap/>
²<https://www80.tceq.texas.gov/WapWeb/public/map.htm>



Cypress Tree on the bank of the Guadalupe River at Guadalupe State Park (Source iStock)

2

Progress
In Improving Water
Quality

Chapter 2

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 in order to "...attain or maintain applicable water quality standards or the goals and requirements of the Clean Water Act." The three primary ways of measuring improvement in water quality are through:

- 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.



Barton Creek (Source iStock)

Reductions in Pollutant Loadings

Implementing Agricultural Nonpoint Source Components of the Plum Creek Watershed Protection Plan

Plum Creek rises in Hays County north of Kyle and runs south through Caldwell County, passing through Lockhart and Luling, and eventually joining the San Marcos River north of Gonzales County. Plum Creek is 52 miles long and has a drainage area of 389 square miles. The Plum Creek Watershed Protection Plan was developed in 2008 and updated in 2020.

Over the past decade, TSSWCB and the Caldwell-Travis Soil and Water Conservation District have partnered on multiple CWA Section 319(h) grants to develop and implement water quality management plans (WQMPs) to reduce agricultural nonpoint source pollution in the Plum Creek watershed.

In fiscal year 2021, three WQMPs covering 272 acres were certified. The WQMPs included the following best management practices (BMPs): 98.3 acres of forage and biomass planting, 2,600 feet of livestock pipeline, 125.7 acres of brush management, 5,800 feet of cross fencing and two water facility storage tanks.

TABLE 2.1

Plum Creek Estimated Load Reductions According to the Texas BMP Evaluation Tool

Pollutant	Load Reduction
Nitrogen	1,008.55 lb
Phosphorus	134.40 lb
Sediment	1.53 ton

Implementing OSSF Remediation in Attoyac Bayou

Failing on-site sewage facilities (OSSFs) are a leading contributor to the bacteria surface water quality impairments in the Attoyac Bayou. The Attoyac Bayou Watershed Protection Plan OSSF Remediation Program funded the repair or replacement of eight systems in fiscal year 2021. The project provided financial assistance to low-income households with priority for those closest to waterbodies. The average cost for a replacement OSSF is \$6,500. During a previous OSSF remediation project that ended in February 2020, the average cost for a new system represented 27.8% of annual household incomes for program participants which highlights the significant need for continued financial assistance to replace OSSFs for Attoyac Bayou watershed residents.

Replacing failing OSSFs results in the reduction of nonpoint source pollutant loading in the Attoyac Bayou as the amount of bacteria, nutrients, and biological oxygen demand are reduced through the proper treatment of effluent. Using literature values and equations from the Attoyac Bayou Watershed Protection Plan, estimated load reductions can be calculated.

TABLE 2.2

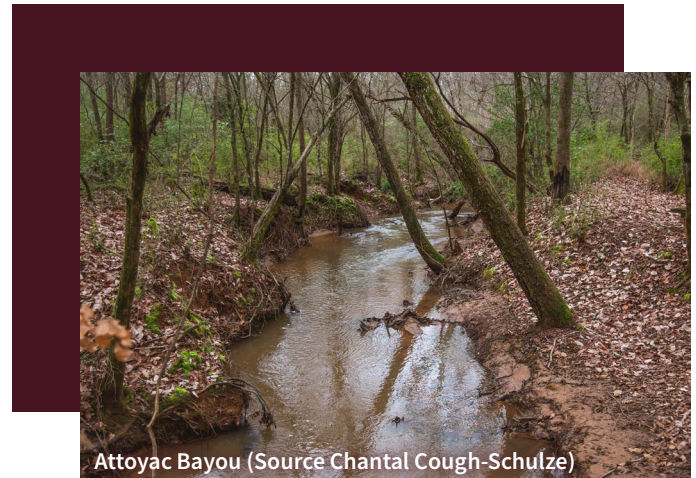
Attoyac Bayou Estimated Load Reductions for Eight Systems Repaired and Replaced in Fiscal Year 2021

Pollutant	Load Reduction
<i>E. coli</i>	1.64*10 ¹⁶ cfu/100 mL ^a
Nitrogen	141.12 lb
Phosphorus	18.00 lb
Sediment	0.331 ton
5-Day Biological Oxygen Demand	668.13 lb

^acfu/100mL – colony forming units per 100 milliliters

The OSSF remediation program has been well received by the community in the Attoyac Bayou Watershed and surrounding areas. In addition to repairing and replacing the systems, the project team provided educational materials and programs to help homeowners properly maintain their septic systems, as well as continuing education credits for OSSF professionals. Over the last year, project partners have seen an increase in requests for inspections, pump-outs, and installation of new systems compared to earlier phases of the program. Project efforts are frequently highlighted in statewide and local news media outlets, but most of the awareness for the program comes through word-of-mouth and referrals from county designated representatives. The Attoyac Bayou OSSF Remediation Program gives homeowners a tangible reminder of the watershed protection planning efforts happening

in their area, creates buy-in for implementing other parts of the watershed protection plan, and reduces the pollutant loads in local waterbodies.



Attoyac Bayou (Source Chantal Cough-Schulze)

Implementing Agricultural Nonpoint Source Components of the Mill Creek Watershed Protection Plan

Mill Creek is formed by two forks in southwest Washington County, East and West Mill creeks, which unite near Bellville 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 watershed encompasses 263,450 acres in parts of Austin and Washington counties. The Mill Creek Watershed Protection Plan was completed in 2016.

TSSWCB and Austin County Soil and Water Conservation District have partnered on a CWA Section 319(h) grant to develop and implement WQMPs to reduce agricultural nonpoint source pollution in the Mill Creek watershed.

In fiscal year 2021, four WQMPs covering 416.9 acres were certified. The WQMPs included the following BMPs: 359.3 acres of prescribed grazing, 77.5 acres of forage and biomass planting, 4.1 acres of brush management, 5,914 feet of cross fencing, 325 feet of livestock pipeline, and a water facility storage tank.

TABLE 2.3

Mill Creek Estimated Load Reductions According to the Texas BMP Evaluation Tool

Pollutant	Load Reduction
Nitrogen	2,187.89 lb
Phosphorus	147.06 lb
Sediment	7.98 ton



Mill Creek (Source Houston-Galveston Area Council)



Town Branch Creek Rain Garden Construction (Source Plum Creek Watershed Partnership)

Implementing BMPs to Improve Town Branch Creek’s Riparian Function

Town Branch, a tributary of Plum Creek, is located in northern Lockhart in Caldwell County. In 2014, Town Branch was identified as having concerns for depressed dissolved oxygen, nitrates, and bacteria. Since that time, there continued to be concerns for these parameters at the routine surface water quality monitoring station located along Town Branch Creek.

In 2018 the City of Lockhart was awarded a CWA Section 319(h) grant to address potential nonpoint pollution sources and to improve water quality along areas of Town Branch Creek controlled by the City of Lockhart. The project partners—the City of Lockhart, Plum Creek Watershed Partnership, and Nueces River Authority—started implementing strategies identified during the creek’s riparian evaluation. The evaluation study area included approximately 177 acres of land along the creek.

The project partners executed over two acres of grow zones, planted native plant species, removed invasive species, educated the public with five instructional signs, engaged the public with online surveys, and installed a rain garden between the city’s pond and Town Branch to reduce pollutant loads.

TABLE 2.4

Town Branch Creek Estimated Load Reductions

Pollutant	Load Reduction
Nitrogen	1.70 lb
Phosphorus	0.30 lb

Water Quality Improvements

TCEQ and TSSWCB work together to identify water quality improvements where the implementation of nonpoint source BMPs are a contributing factor. Once a 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.

Success Story Highlights

Low Impact Development, Outreach, and Sewer System Infrastructure Contribute to Improved Water Quality in the Brownsville Ship Channel

WATER QUALITY IMPROVED

The Brownsville Ship Channel Assessment Unit (AU) 2494_01 was first listed for failing to meet water quality standards for bacteria in the 2010 *Texas Integrated Report of Surface Water Quality and Texas 303(d) List* (Integrated Report). Since that time, efforts to improve water quality by local partners and several state and federal agencies have been focused on outreach and

education, implementation of BMPs, stakeholder participation, and construction of a sewer collection system. These efforts have led to documented water quality improvements in the Brownsville Ship Channel. As a result, TCEQ delisted Brownsville Ship Channel AU 2494_01 from the 2020 Texas 303(d) list for bacteria.

PROBLEM

The Brownsville Ship Channel, Segment 2494, is a 42-foot deep dredged channel in Cameron County at the southernmost tip of Texas. The Brownsville Ship Channel is part of the Lower Laguna Madre/Brownsville Ship Channel Watershed and contributes approximately 25% of the freshwater flow into the Lower Laguna Madre. It is defined as originating from the Port of Brownsville downstream to the confluence with the Laguna Madre. Segment 2494 has a designated noncontact recreation use and an *Enterococci* criterion of 35 colony forming units (cfu) per 100 milliliters (35 per 100 mL). TCEQ originally listed AU 2494_01 on the 2010 Texas 303(d) List due to elevated bacteria levels. In 2010, the *Enterococci* geometric mean was 47.07 per 100 mL, exceeding the criterion of 35 per 100 mL for the Brownsville Ship Channel. In 2018, the Texas Water Resources Institute (TWRI) collaborated with the University of Texas Rio Grande Valley to complete a watershed characterization with CWA Section 319(h) funds to gain additional information prior to developing a watershed protection plan. Elevated levels of bacteria are suspected to have originated from nonpoint source pollution associated with urban stormwater and failing on-site wastewater disposal systems.

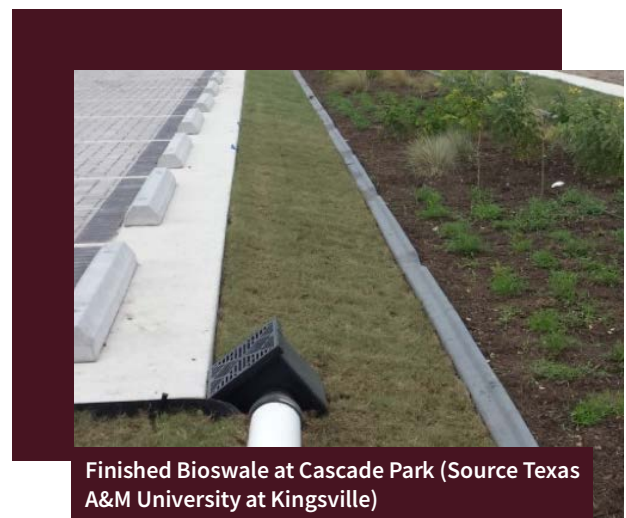
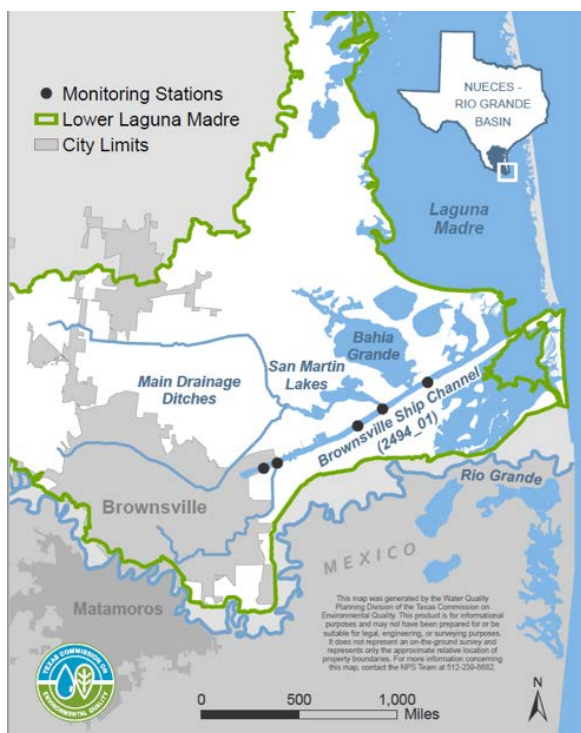
PROJECT HIGHLIGHTS

Between 2011 and 2017 several state and federal parties collaborated to implement BMPs, conduct education and outreach, and participate in water quality improvement projects in the Lower Laguna Madre/Brownsville Ship Channel Watershed. Texas A&M University at Kingsville used CWA Section 319(h) funds to improve Lower Laguna Madre/Brownsville Ship Channel Watershed conditions by implementing Low Impact Development (LID) BMPs at Cascade Park in Brownsville, TX, and conduct several nonpoint source education and outreach events. The main LID elements of Cascade Park were the construction of a retention wetland, a pervious parking lot bordered by bioretention areas and pervious channels, a bioswale, and cisterns for collecting rainwater. Texas A&M University at Kingsville performed several education and outreach campaigns to promote the importance of LID BMPs in the watershed.

Highlights from this campaign included creating factsheets that explained the BMP design process, developing LID public service announcements, delivering an annual LID workshop, and conducting educational activities with local elementary and middle school students. In addition, a media campaign highlighted the importance of managing nonpoint source pollution and LID practices. The campaign successfully promoted public participation in clean-up events, tree plantings near waterways, and a watershed-wide classroom competition for the design of a nonpoint source pollution awareness mascot. Using CWA Section 319(h) funds, TCEQ continues to fund implementation projects and the development of other watershed protection plans in the Lower Laguna Madre/Brownsville Ship Channel Watershed.

FIGURE 2.1

Map of the Brownsville Ship Channel Watershed



Finished Bioswale at Cascade Park (Source Texas A&M University at Kingsville)

In 2013, Brownsville Public Utility Board began construction on the Colonias Improvement Project. The project focused on the lack of a proper sewer collection system for residents of the Colonia areas located southeast of Brownsville. Many of the on-site wastewater disposal systems in use were installed prior to Cameron County’s adoption of septic system design and

installation standards. These systems contributed bacteria and nutrients to the waterways, particularly during wet weather. Brownsville Public Utility Board was awarded grants by the Texas Water Development Board to create sewer system infrastructure and connect homes in the Colonia areas to the city sewer system. By the end of 2016, approximately 2,200 residents were connected for the first time to the public sewer collection system, and 474 septic tanks were decommissioned. These efforts reduced health risks to residents and eliminated a source of bacteria caused by failing septic systems. The project resulted in an estimated 175,720 gallons per day of wastewater collected and properly treated.

RESULTS

In the 2010 through 2016 Integrated Reports, the geometric mean concentration of *Enterococci* samples from the Brownsville Ship Channel was above the criterion of 35 per 100 mL. During the period from 2011 to 2017, targeted implementation activities in the watershed helped to reduce polluted runoff to the Brownsville Ship Channel. Data collected in 2017 and 2018 allowed the AU to be reassessed in the 2020 Integrated Report. New data was collected after implementation actions were in place. In the 2020 Integrated Report, the geometric mean concentration of *Enterococci* samples from the Brownsville Ship Channel was below the criterion of 35 per 100 mL, and as a result was delisted from the Texas 303(d) List. As more BMPs in the watershed protection plan are implemented, a continued improvement of bacteria levels in the waterbody is expected.

PARTNERS AND FUNDING

Watershed partners have spent approximately \$1.6 million on a watershed characterization, education and outreach efforts, and implementing BMPs. This total includes \$938,353 in federal CWA Section 319(h) funds and \$625,567 from local entities. Watershed partners included Texas A&M University at Kingsville, The Lower Rio Grande Valley Stormwater Task Force, Cameron County Drainage District No. 1, The Valley Proud Environmental Council, The Institute for Sustainable Energy and the Environment, and The Arroyo Colorado Watershed Partnership. Brownsville Public Utility Board received approximately \$29.2 million from various grant and loan programs to complete the Colonias Improvement Project.

Implementing Conservation Practices and Conducting Watershed Outreach Improved Water Quality in Sulphur Creek

WATER QUALITY IMPROVED

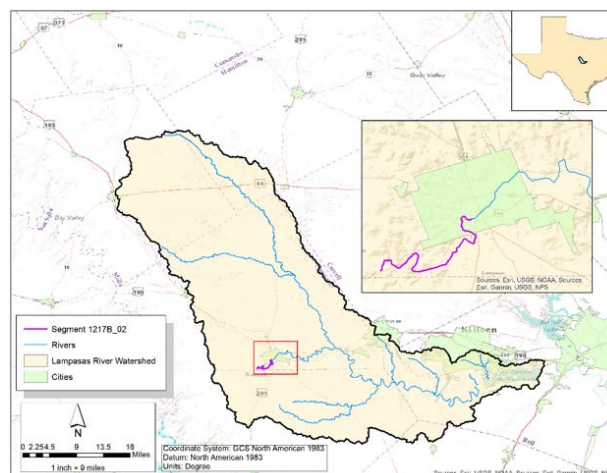
Sulphur Creek, a tributary of the Lampasas River, was listed as impaired on the 2016 Integrated Report due to high levels of *Escherichia coli* (*E. coli*) bacteria. TSSWCB used CWA Section 319(h) funding from EPA and partnered with Texas A&M AgriLife Research and local soil and water conservation districts to

develop a watershed protection plan for the Lampasas River. During the process of developing the watershed protection plan, stakeholders learned about their local water quality issues and developed management measures to address them. Project partners implemented management measures that had been identified in the watershed protection plan and this improved water quality. As a result, one AU of Sulphur Creek, AU 1217B_02, was removed from the state's list of impaired waters in 2020.

PROBLEM

Sulphur Creek, Figure 2.2, is a tributary of the Lampasas River in the Brazos River Basin. The watershed is in Central Texas and lies in the eastern Texas Hill Country, which is dominated by rangeland and dotted with small communities that serve the local agriculture-based economies. Outside of these small towns, the landscape is most suitable for grazing by cattle, goats, and sheep, and for engaging in outdoor recreation, such as hunting and camping.

FIGURE 2.2
Map of Sulphur Creek



Water quality data collected in Sulphur Creek from 2007 through 2014 showed that *E. coli* levels exceeded the bacteria water quality standard for contact recreation. As a result, TCEQ added the creek to the 303(d) list in the 2016 Integrated Report for not supporting its primary contact recreation use.

PROJECT HIGHLIGHTS

TSSWCB partnered with Texas A&M AgriLife Research in 2009 to develop a watershed protection plan for the Lampasas River. Throughout the planning process, stakeholders worked together to holistically address the sources and causes of impairments and threats to surface water resources within the watershed. The Lampasas River Watershed Protection Plan was accepted by EPA in 2013.

The Agriculture Nonpoint Source Work Group focused their efforts on addressing contributions from livestock, whitetail deer and feral hogs. They recommended that individual agriculture



Lampasas City Park (Source iStock)

operations implement voluntary WQMPs, and that the Texas Parks and Wildlife Department adopt habitat management programs, such as wildlife management plans and managed land deer programs to mitigate the bacteria contribution from whitetail deer. The work group believed that feral hogs also needed to be addressed, and they recommended creating a watershed-specific feral hog specialist position to provide technical assistance to landowners.

The Urban Nonpoint Source Work Group addressed concerns about wastewater, stormwater, and domestic dogs. The Wastewater Work Group recommended that a detailed database and inventory of all OSSFs within the watershed be developed

and that aging systems in particular subwatersheds be repaired or replaced.

TSSWCB and the Hill Country Soil and Water Conservation District partnered to develop and implement eight WQMPs in the impaired watershed between 2013 and 2018. Most of the WQMPs were on grazing operations, covering 1,929 acres. These plans included alternative water sources, prescribed grazing, pasture and range planting, cross-fencing, nutrient management, and brush management. In addition, the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS) worked with landowners to implement conservation practices on over 3,000 acres with funding from the Environmental Quality Incentives Program. The conservation practices implemented included prescribed grazing, pasture and range planting, prescribed burning, cover crops, and brush management.

RESULTS

Water quality monitoring data show that the long-term E. coli geometric means in the upper portion of Sulphur Creek, AU 1217B_02, are meeting the state water quality standard of 126 cfu per 100 mL of water for primary contact recreation. Data collected from 2011 to 2018 show a geometric mean of 45.51 cfu per 100 mL for the 2020 reporting period. As a result, TCEQ removed Sulphur Creek, AU 1217B_02, from the 303(d) list in the 2020 Integrated Report.

This effort was successful because developing a watershed protection plan and implementing conservation practices in



Sulphur Creek (Source TSSWCB)

the watershed led to increased stakeholder knowledge of water quality issues. Water quality monitoring continues to track and measure interim progress to implement the watershed protection plan and ensure this restoration effort remains a success.

PARTNERS AND FUNDING

Partners developed and implemented the Lampasas River Watershed Protection Plan with over \$498,422 in CWA Section 319(h) funds provided by TSSWCB and more than \$332,281 in non federal matching funds from Texas A&M AgriLife Research. TSSWCB also

provided \$167,140 in CWA Section 319(h) funding to the Hill Country Soil and Water Conservation District to develop and implement WQMPs in the watershed.

TSSWCB, Hill Country Soil and Water Conservation District, and NRCS worked with landowners to voluntarily implement conservation practices to reduce the impact of agricultural operations in the watershed. The partners provided approximately \$43,300 in state funding and \$234,875 in federal Farm Bill funding to landowners as financial incentives to implement BMPs in the Sulphur Creek watershed.



Santa Elena Canyon, Big Bend National Park (Source iStock)



Bald Cypress Trees along the Frio River at Garner State Park (Source iStock)

3

Progress toward Meeting the Goals and Objectives of the Texas Nonpoint Management Program

Chapter 3

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 the goals and objectives of the Texas Nonpoint Source Management Program.

Clean Water Act Section 319(h) Grant Program

Section 319(h) of the CWA establishes a grant that is appropriated annually by Congress to the EPA. EPA allocates these funds to the states to implement 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 2021, Texas received \$6.7 million in CWA Section 319(h) federal grant funds to utilize and award to sub-grantees across the state. In turn, sub-grantees provided \$4.5 million in matching funds to leverage resources used for addressing nonpoint source pollution.

Status of Clean Water Act Section 319(h) Grant-Funded Projects

In fiscal year 2021, TCEQ had 55 active CWA Section 319(h) grant-funded projects totaling approximately \$12.7 million, which addressed a wide range of nonpoint source issues (Figure 3.1). A primary focus of these projects was the development and implementation of watershed protection plans to address urban nonpoint source pollution and targeted outreach and education activities.

In fiscal year 2021, TSSWCB had 34 active CWA Section 319(h) grant-funded projects totaling approximately \$9.3 million, which addressed both agricultural and silvicultural nonpoint source pollution, Figure 3.2. Specific projects included developing and implementing watershed protection plans, supporting targeted educational programs, and implementing BMPs to abate nonpoint source pollution from agricultural and silvicultural operations.



Cypress Trees on Frio River (Source iStock)

FIGURE 3.1
TCEQ Fiscal Year 2021 Nonpoint Source Grant Funds by Project Type

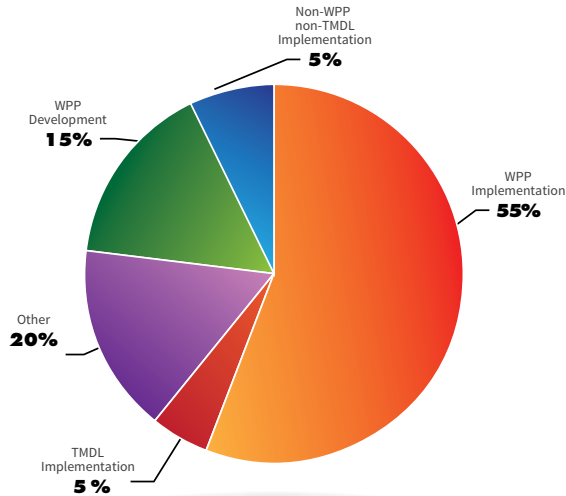
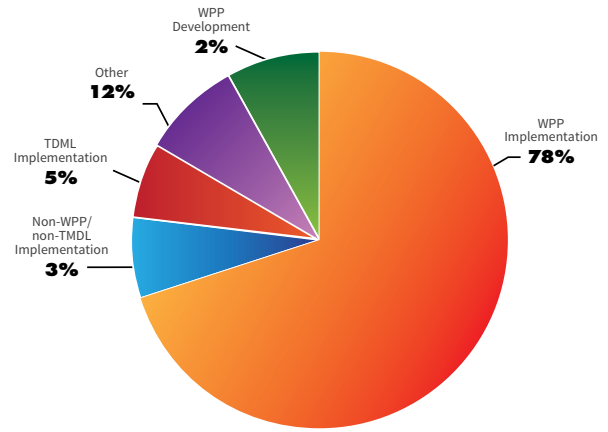


FIGURE 3.2
TSSWCB Fiscal Year 2021 Nonpoint Source Grant Funds by Project Type



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. In addition, the Clean Rivers Program, which is a collaboration between TCEQ and 15 regional water agencies, collects surface water quality data throughout the state in response to both state needs and local stakeholder interests. Furthermore, TCEQ 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.

Data are assessed by TCEQ 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 watershed protection plans and TMDLs. Data are also used to determine potential sources of pollution, the adequacy of regulatory measures, watershed improvements, and restoration

³ https://www.tceq.texas.gov/assets/public/waterquality/swqm/assess/20txir/2020_guidance.pdf

plans. The data collection guides the distribution of CWA Section 319(h) grant funds toward the development of watershed protection plans 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 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 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 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 2020 Integrated Report Texas 303(d) List was approved by TCEQ in March 2020 and by EPA in May 2020. The assessment methods for the 2020 Integrated Report are detailed in the *2020 Guidance for Assessing and Reporting Surface Water Quality in Texas*³.

Water Quality Status Categories

The 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 2020 Integrated Report.

TABLE 3.1
Number of Water Bodies Assigned to Each Assessment Category in the 2020 Integrated Report

Category	Definition	Number of Water Bodies
1	All designated uses are supported, no use is threatened.	90
2	Available data and/or information indicate that some, but not all of the designated uses are supported.	334
3	Insufficient or unreliable available data and/or information to make a use support determination.	110
4	Available data and/or information indicate that at least one designated use is not being supported or is threatened, but a TMDL is not needed.	124
5	Available data and/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.	432
Total		1090

The 303(d) list of impaired waters, Category 5 of the Integrated Report, identifies waters that do not meet Texas Surface Water Quality Standards. It is an important management tool produced as part of the 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 AU, 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

https://www.tceq.texas.gov/waterquality/monitoring/swqm_realtime.html

different uses. In that case, the overall category for the water body is the one with the highest category number.

The 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.

Continuous Water Quality Monitoring

TCEQ has a network of continuous water quality monitoring sites on priority water bodies. The agency maintains 30-45 sites in its Continuous Water Quality Monitoring Network. The number and locations of sites varies from year to year. In fiscal year 2021, TCEQ had 30 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 implementation plans and watershed protection plans, characterize existing conditions, and evaluate spatial and temporal trends. You can find site information and data at the [Continuous Water Quality Monitoring Network website](#)⁴.

FIGURE 3.3
Active Continuous Water Quality Monitoring Stations in Fiscal Year 2021



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 (the Meadows Center), a research institute located at Texas State University. Texas Stream Team is a statewide network of trained water quality citizen scientists and supportive partner organizations that work together to gather information about the natural resources of Texas. Texas Stream Team citizen scientists receive certification after completing training to collect water quality and environmental parameters from monitoring sites along rivers, lakes, and streams. All water quality and environmental data collected under the Texas Stream Team program is available to the public. The Meadows Center receives CWA Section 319(h) funds from TCEQ and EPA to administer the statewide program.

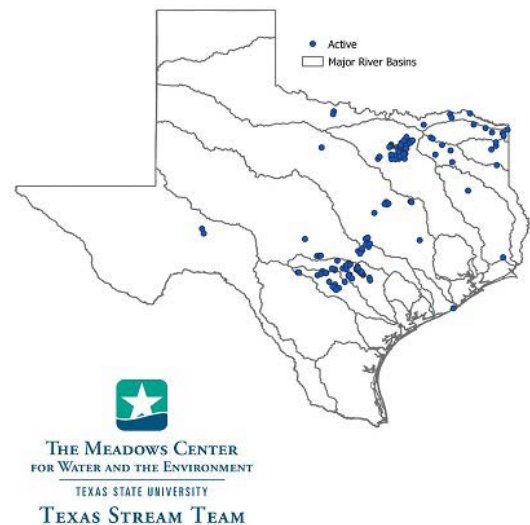
Due to COVID-19, training and monitoring activities in fiscal year 2021 were limited. Fortunately, Texas Stream Team continued to transition its E. coli Water Quality Citizen Scientist Training, Riparian Evaluation Citizen Scientist Training, and Standard Core Water Quality Citizen Scientist Training to online instruction. The remote format brought many advantages to the Texas Stream Team program regarding versatility and enhanced functionality. The program now offers select trainings remotely, for the first time, reaching more communities across the state in one sitting and training materials are now available in a variety of different formats allowing for more participation. Prerequisite training modules will be used in the future to allow citizen scientists to learn background information at their own pace and ensure enough time is allowed to discuss monitoring protocols on the day of the virtual or in-person training.

In fiscal year 2021, Texas Stream Team and its partners conducted 51 trainings across the state, which resulted in over 261 volunteers trained in surface water quality monitoring. Additionally, citizen scientists volunteered 2,571 hours of their time, traveled a cumulative distance of 28,986 miles, and conducted 1,699 monitoring events at 211 active stations on rivers, lakes, streams, bays, and estuaries across Texas. In the summer of 2021, seven trainings are planned to be held across the state. Education and outreach activities also persevered in fiscal year 2021 as the Spring Lake Education program was able to transition watershed education field trips to a virtual platform. So far in fiscal year 2021, Texas Stream Team has connected with 3,065 individuals through virtual or socially distant activities. Many Texas Stream Team activities took place on water bodies that had watershed protection plan implementation activities such as: Upper Cibolo Creek, Mid, and Lower Cibolo Creek, Upper San Antonio River, Upper San Marcos River, Dry Comal Creek, Comal River, Plum Creek, Rowlett Creek, Lake Lavon, Navasota River Below Lake Limestone, and Cypress Creek.

The last year prompted changes that may never have occurred were it not for the circumstances COVID-19 induced. The previously postponed Stream Team Fest will take place fall 2021 in a mostly virtual platform from October 12 through 14. Stream Team Fest will commemorate the 30th anniversary of Texas

Stream Team and will give citizen scientists, partners, trainers, and the public the opportunity to meet and learn the latest about Texas Stream Team. For more information visit the [Texas Stream Team website](http://www.texasstreamteam.org/)⁵.

FIGURE 3.4
Active Texas Stream Team Monitoring Sites in Fiscal Year 2021



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 watershed protection plans, TMDL implementation plans, the Texas Groundwater Protection Strategy, and TSSWCB-certified WQMPs, as well as implement BMPs on agricultural and silvicultural lands, and other identified priorities.

Implementation Project Highlights **IMPLEMENTING THE UPPER SAN ANTONIO RIVER WATERSHED PROTECTION PLAN**

The San Antonio River Authority was awarded a CWA Section 319(h) grant in 2019 to develop a master plan for the use of green stormwater infrastructure in the Upper San Antonio River watershed. This three-year project builds off recommendations made in the Upper San Antonio River Watershed Protection Plan to implement green stormwater infrastructure to reduce stormwater runoff pollution, and addresses measures in the Texas Nonpoint Source Management Program.

Traditional stormwater infrastructure is designed to manage stormwater volume, not stormwater quality. Green stormwater infrastructure BMPs are constructed features that add the stormwater quality component by mimicking the predevelopment hydrology of an area. Examples modeled in this project are

⁵<http://www.texasstreamteam.org/>

bioretention basins, bioswales, and extended detention basins. They are designed to capture and treat stormwater runoff pollution before it enters local creeks and rivers. They also help reduce local flooding. All these measures are above and beyond what is required in Municipal Separate Storm Sewer Systems permits.

Since green stormwater infrastructure is still relatively new to the San Antonio River Basin, the Master Plan aims to guide decision-makers on where and how to apply limited resources in the upcoming years to maximize water quality benefits while addressing local flooding concerns. The San Antonio River Authority incorporated stakeholder input from property owners, operators, and community groups to identify and build on common goals and investment priorities for implementing green stormwater infrastructure. Outreach was conducted virtually during COVID-19, utilizing online platforms, yard signs, and flyers to ensure participation.

The San Antonio River Authority used watershed-scale models to identify sub-basins or small watersheds that have the highest potential for stormwater pollutant load reductions. This project used existing data and modeling tools to identify and prioritize sites within those areas that have the highest potential for effectively implementing green stormwater infrastructure. Properties considered for implementation included public lands, schools, capital improvement projects, city planning areas, and neighborhoods with supportive stakeholders, such as homeowners associations that had partnered with the agency.

For the eight recommended sites, the San Antonio River Authority developed site-scale models, concept-level designs, and green stormwater infrastructure cost estimates. The Green Stormwater Infrastructure Master Plan will include a recommended schedule of implementation, the stakeholder process, costs, funding considerations, and the overall process of evaluating and prioritizing projects—all as examples communities can use for their own decision-making.

Ultimately, the goal is for the Green Stormwater Infrastructure Master Plan to become a template for all sub-basins that are not meeting water quality standards in the San Antonio River Basin. To learn more about this project and others visit the [San Antonio Riverty website](https://www.sariverauthority.org/)⁶.



Gorman Falls, at Colorado Bend State Park (Source iStock)

IMPLEMENTING THE TRES PALACIOS WATERSHED PROTECTION PLAN

The Tres Palacios Creek watershed drains approximately 268 square miles of mainly rural and agricultural land. Tres Palacios Creek starts near the town of El Campo and continues south through Wharton and Matagorda counties before draining into Tres Palacios Bay and Matagorda Bay. Tres Palacios Creek provides an important water resource for agriculture, livestock, wildlife, businesses, and residents. The tidal portion of Tres Palacios Creek was identified as impaired in the 2006 Integrated Report for elevated levels of E. coli and in 1996 for depressed dissolved oxygen. The watershed protection plan development process began in fall 2016 and the final watershed protection plan was accepted by EPA in May 2018. Since 2018, a number of BMPs to restore water quality in the tidal portion of Tres Palacios Creek have been implemented through long-term conservation and stewardship of the watershed's resources.

During fiscal year 2021, TWRI implemented urban stormwater and pet waste management measures, and septic system education and outreach for the Tres Palacios Creek watershed. Working with the City of El Campo, the largest municipality in the watershed, TWRI established five pet waste stations and a stormwater education sign at Legacy Park in El Campo. Legacy Park, one of the few public spaces in the watershed, is a priority location for implementation to reach the public due to its walking trails, public baseball fields, and fishing pond, which promote extensive human-environmental interactions. Along with stormwater and pet waste education, septic system education and outreach continue to be a priority when implementing BMPs in the Tres Palacios Creek watershed. TWRI conducted a septic system education workshop for area homeowners in January 2021, and 28 people attended the online workshop. Additionally, TWRI continues to offer a septic system repair and replacement program in two targeted neighborhoods along Tres Palacios Creek where proximity to the creek can lead to adverse water quality impacts.

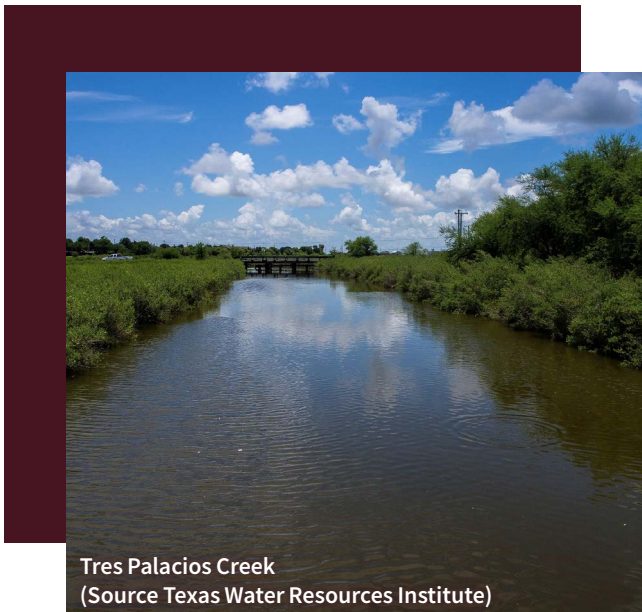


Stormwater Educational Sign at Legacy Park (Source Texas Water Resources Institute)

This program is popular, and qualified applicants in this program are in the process of site visit appointments for soil testing and system design.

⁶<https://www.sariverauthority.org/>

While COVID-19 created some obstacles for implementing a watershed protection plan through traditional means throughout fiscal year 2021, it created the opportunity for watershed coordinators to be creative with outreach and education efforts. Coordinators held online educational events and meetings and groups worked together to secure watershed protection plan implementation funding, which strengthened relationships with local environmental organizations. TWRI continued monitoring water quality in the Tres Palacios Creek watershed and the watershed now has 23 months of surface water quality data. The watershed protection plan includes more stormwater education campaigns for the Tres Palacios Creek area along with an OSSF educational



Tres Palacios Creek
(Source Texas Water Resources Institute)

direct mailer campaign for watershed residents. Further, in-person water education events are anticipated to return to the Tres Palacios Creek watershed area in fiscal year 2022.

IMPLEMENTING THE GERONIMO AND ALLIGATOR CREEKS WATERSHED PROTECTION PLAN

The Guadalupe-Blanco River Authority and Texas A&M AgriLife Extension Service received a CWA Section 319(h) grant from TSSWCB to develop a watershed protection plan for the Geronimo and Alligator Creeks watershed. The Geronimo and Alligator Creeks Watershed Partnership was formed to address the elevated levels of bacteria and nitrate-nitrogen in the creeks. The partnership included a diverse group of local stakeholders who worked together to develop the Geronimo and Alligator Creeks Watershed Protection Plan. Since its acceptance by EPA in 2012, the plan has been guiding implementation efforts to restore and protect water quality in Geronimo and Alligator creeks.

With heavy focus on public outreach and education, the watershed protection plan supports a variety of programs including Homeowner Maintenance of Septic Systems, Healthy Lawns

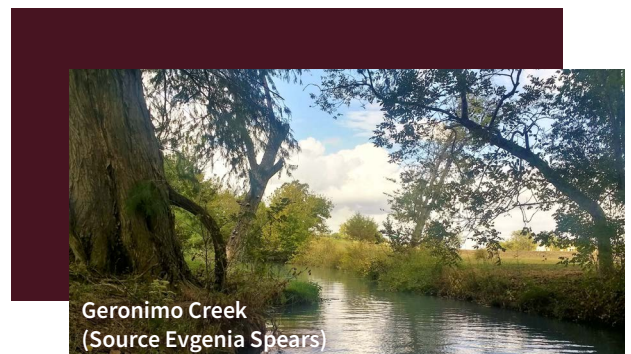
Healthy Waters, Urban Riparian and Stream Restoration, Texas Well Owner Network, and many others. Even though COVID-19 significantly restricted the delivery of these programs, certain activities continued. For example, to facilitate homeowner OSSF certification during COVID-19, the partnership developed the new virtual Homeowner Maintenance of Septic Systems training, which was approved by the Guadalupe County Environmental Health Department. Texas A&M AgriLife made the online course available on the [AgriLife Learn⁷](https://agrilifelearn.tamu.edu/) platform.

Through funding provided by TCEQ, the partnership, led by the City of Seguin, began a grant project in fiscal year 2021 to decommission septic systems in the watershed and tie homeowners into central wastewater lines. Depending on the age and location of the system, the failure rates of septic systems in the area range from 5 to 15%. By offering technical and financial assistance to local homeowners, this funding has been used to reduce the number of malfunctioning septic systems in the Geronimo and Alligator Creeks watershed.

TSSWCB and Comal-Guadalupe Soil and Water Conservation District continued to work with local landowners to develop and implement WQMPs in the watershed. Since October 2020, four WQMPs have been developed and the Soil and Water Conservation District is working with five new applications for planning assistance. Terraces, waterways, brush management, and grass planting were among the practices implemented as of August 2021. In addition, soil tests were taken to develop nutrient management plans for each WQMP.

In April 2021, the partnership hosted the 8th Annual Geronimo and Alligator Creeks Cleanup Event, a watershed-wide effort to promote public awareness of local water quality and environmental stewardship. Since the first event was held in 2013, more than 1,200 volunteers have removed nearly 20,000 pounds of trash and debris from the roadways and creek banks in the area. In 2021, 30 volunteers worked together to collect 1,880 pounds of trash. The registration and event-related information, such as maps of cleanup locations, personal safety and trash pickup rules, and other resources, were available to volunteers on the [watershed protection plan website⁸](http://www.geronimocreek.org/Plan.aspx).

Active stakeholder engagement supported through public outreach and education is critical for the successful implementation of the Geronimo and Alligator Creeks Watershed



Geronimo Creek
(Source Evgenia Spears)

⁷<https://agrilifelearn.tamu.edu/>
⁸<http://www.geronimocreek.org/Plan.aspx>



Geronimo Creek Cleanup Event
(Source Evgenia Spears)

Protection Plan. In late summer 2021, the partnership resumed face-to-face delivery of programs, including a Feral Hog Management workshop, Homeowner Maintenance of Septic Systems workshop, and Texas Well Owner Network workshop.

Total Maximum Daily Loads and Implementation Plans

The TMDL Program develops targets for reducing pollution and helps communities build plans to improve water quality in local waterways. TMDL implementation plans may be developed concurrently with TMDLs to leverage resources and increase the pace at which Texas improves impaired waterways. In fiscal year 2021, the TMDL Program continued to implement the CWA Section 303(d) Vision. The CWA Section 303(d) Vision enhances overall efficiency of the CWA Section 303(d) Program and focuses attention on priority waters. The CWA Section 303(d) Vision provides flexibility to state programs to use available tools such as TMDLs, TMDL implementation plans, watershed protection plans, or other TMDL alternatives to attain water quality restoration and protection. In fiscal year 2021 the TCEQ Nonpoint Source Program, TMDL Program, and TSSWCB coordinated with stakeholders to finalize the Mission and Aransas Rivers Watershed Protection Plan, and continued water quality monitoring for the development of the Arenosa and Garcitas Creeks Watershed Protection Plan. 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 implement the plans to improve water quality in the rivers, lakes, and bays and achieve long-term success.

Several TMDL implementation plans that address nonpoint sources of pollution are supported by CWA Section 319(h) funds from TCEQ and EPA.

Texas Coastal Management Program

The Texas Coastal Management Program coordinates coastal management between local, state, and federal entities that manage coastal resource use. The Texas Coastal Management Program's mission is to ensure the long-term economic and ecological productivity of the coast. The Texas General Land Office administers the Texas Coastal Management Program and is advised by members of the Coastal Coordination Advisory Committee.

The Coastal Nonpoint Pollution Control Program was established in 1990 by Section 6217 of the Coastal Zone Act Reauthorization Amendments (CZARA). This program establishes a set of management measures for states to use to control coastal nonpoint source runoff from five main sources: urban, forestry, agriculture, hydromodification, and marinas. Details of these management measures are included in the Texas Coastal Nonpoint Source Pollution Control Program. The program, which describes how the State will implement the management measures required under CZARA, must receive approval from both EPA and the National Oceanic and Atmospheric Administration.

In fiscal year 2020, Texas obtained approval of the on-site disposal system measure. In fiscal year 2021 Texas received interim decision documents from EPA and NOAA indicating that the Texas program has satisfied all requirements related to the remaining management measures for hydromodification. These management measures are discussed in more detail in the following sections. Texas now awaits formal federal approval of the full Texas Coastal Nonpoint Source Pollution Control Program.

SEPTIC SYSTEMS

The Texas Coastal Nonpoint Source Pollution Control Program is implementing several projects to help satisfy CZARA requirements to inspect septic systems in the coastal zone. In fiscal year 2021, Texas A&M AgriLife Extension Service secured CWA Section 319(h) funds from TCEQ and EPA to update the Coastal On-site Sewage Inventory database and conduct OSSF inspections and education events in neighborhoods with malfunctioning systems. The Coastal On-site Sewage Inventory database stores septic system information such as location, age, type, permit information, and inspections. This database helps the state efficiently direct funding and resources to designated areas.

In fiscal year 2021, Texas implemented the septic system inspection strategy that includes a five-pronged approach:

1. Authorized Agents and Maintenance On-Site Disposal System Inspections;
2. WBP On-Site Disposal System Inspections;
3. Point-of-Sale Real Estate On-Site Disposal System Inspections;

4. Direct Contracting for On-Site Disposal System Inspections;
5. On-Site Disposal System Education and Outreach.

Using this strategy, Texas estimates that the required amount of inspections will be obtained within a 15-year timeframe.

CLEAN COAST TEXAS AND THE COASTAL STORMWATER MANAGEMENT MANUAL

Clean Coast Texas was launched by the Texas General Land Office in fiscal year 2021 to provide an online resource for coastal communities. Resources provided by Clean Coast Texas can help Texas' coastal communities reduce environmental impacts of stormwater runoff from existing and new urbanized areas and enhance wastewater treatment to support a thriving Gulf Coast economy and environment. Clean Coast Texas is guided by the Texas General Land Office in partnership with numerous stakeholders and state and local agencies. The state has developed a [Clean Coast Texas website](https://cleancoast.texas.gov/)⁹ that includes information on the Texas Coastal Zone, stormwater runoff, and community and technical resources. Additionally, the program developed a technical manual [Guidance for Sustainable Stormwater Drainage on the Texas Coast](#)¹⁰, to provide additional guidance and resources to coastal communities.

HYDROMODIFICATION

The Hydromodification Best Management Practices Manual, developed in 2008, describes several recommended practices that are consistent with the Hydromodification management measures. The Texas program to address these management measures encourages voluntary adoption of the State's hydromodification manual. To encourage the voluntary adoption of these practices and recommendations, Texas has included relevant hydromodification practices and guidance in the [Guidance for Sustainable Stormwater Drainage on the Texas Coast](#). This guidebook is available to communities, county authorities and other relevant planning authorities in the coastal nonpoint management area through the Clean Coast Texas website, workshops, and other outreach efforts. Additional voluntary initiatives, as well as regulatory activities, further support the implementation of the Hydromodification management measures.

Estuary Programs in Texas

GALVESTON BAY ESTUARY PROGRAM

The Galveston Bay Estuary Program (GBEP) is one of two estuary programs in the state of Texas and one of 28 nationwide. GBEP 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 Galveston Bay for future generations. The Action Plans, Improving Water Quality through both Nonpoint and Point Source Pollution Abatement, continues to be top priorities of the

program. These are two of the three action plans listed in the Galveston Bay Plan's Plan Priority One, Ensure Safe Human and Aquatic Life Use.

Coordinating Implementation of a Watershed Protection Plan for Double Bayou

The Double Bayou watershed is situated in the eastern portion of the Lower Galveston Bay watershed on the Upper Texas Gulf Coast and is comprised of two main subwatersheds: East Fork Double Bayou and West Fork Double Bayou.

The Double Bayou watershed drains 98 square miles of predominantly rural and agricultural land directly into the Trinity Bay system and, ultimately, into Galveston Bay. Double Bayou West Fork, Segment 2422B, is listed as impaired on the 2020 Integrated Report for depressed dissolved oxygen and for elevated levels of bacteria. In addition, the Double Bayou East Fork, Segment 2422D, is listed as impaired for bacteria.

TSSWCB and GBEP provided funding to the Houston Advanced Research Center to develop a watershed protection plan for the Double Bayou watershed. The watershed protection plan, approved by EPA in 2016, serves as a framework for implementing water quality protection and restoration strategies within the watershed through diverse partnerships of stakeholders to assure long-term health of the watershed. The Double Bayou Watershed Partnership that was formed during the watershed protection plan development process continues to work with citizens, businesses, public officials, and state and federal agencies to improve water quality. This group recognizes that the success of the people who live, work, and recreate in the Double Bayou watershed depends on improving and protecting its water resources.

In fiscal year 2018, the Houston Advanced Research Center received funding through GBEP and TSSWCB to coordinate an implementation project in the Double Bayou watershed. This project brought the partnership together to successfully implement stakeholder-approved management measures that were outlined in the Double Bayou Watershed Protection Plan.

The Houston Advanced Research Center used the Spatially Explicit Load Enrichment Calculation Tool (SELECT) in the watershed protection plan to estimate potential pollutant loadings for bacteria sources across the Double Bayou watershed. Cattle and feral hogs were found to be the two highest potential contributors of bacteria. To gain further insight and validate SELECT results, Double Bayou stakeholders recommended utilizing bacteria source tracking (BST) as a management tool in the implementation phase of the watershed protection plan. The results obtained in September 2020 from the *BST on Tributaries of Trinity and Galveston Bays study*¹¹, which was funded by GBEP, supported stakeholder conclusions from the SELECT modeling process that cattle and non-avian wildlife, including feral hogs, are the leading contributors to instream bacteria concentrations in the watershed. Wildlife accounted for just over half of the *E. coli* sources identified, comprised of approximately 31% non-avian wildlife, which includes feral hogs, and 21% avian

⁹<https://cleancoast.texas.gov/>

¹⁰<https://cleancoast.texas.gov/documents/2021-sustainable-stormwater-drainage-cleancoasttexas.pdf>

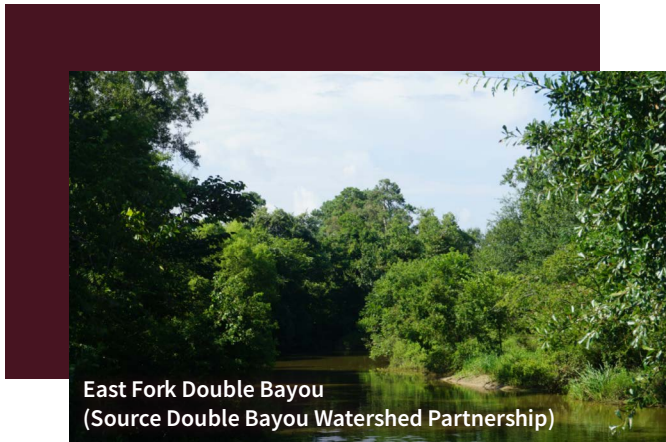
¹¹https://gbep.texas.gov/wp-content/uploads/2020/09/18-80240-TWRI_BST_Final-Report.pdf

wildlife. The non avian wildlife source is the largest category contributing to *E. coli* loads. The human source category was only 4%; however, elimination of human sources will remain a priority for stakeholders.

SELECT results highlighted feral hogs as the second highest potential source of bacteria contributions in the watershed. Stakeholders agreed that feral hog bacteria contributions are a high priority to focus management efforts during implementation. Because feral hogs typically spend time near waterways, direct deposition of fecal waste by feral hogs into streams or bayous is a highly concentrated delivery mechanism of bacteria impacting instream water quality. In addition, feral hogs are responsible for economic and ecological impacts because they cause damage to crops, lawns, and public spaces, as well as riparian habitats that help support a healthy Double Bayou watershed.

During the development of the watershed protection plan, the total feral hog population in the watershed was estimated to be 1,519. This equates to 43% of the bacteria load reduction goal. Local efforts to address feral hogs resulted in substantial progress towards improving water quality within the Double Bayou watershed.

Milestones reached during this project include developing new WQMPs, revising existing WQMPs, addressing feral hogs, engaging stakeholders through meetings and outreach activities, developing electronic educational resources, replacing and maintaining failing OSSFs in the watershed, and continuing to



East Fork Double Bayou
(Source Double Bayou Watershed Partnership)

monitor surface water quality. Additional management measures completed include hiring a WQMP technician, conducting a BST study, and convening a Watershed Texas Stream and Riparian Workshop. These achievements and the continued support of stakeholders, all work together to help improve water quality in the Double Bayou watershed.

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, and resource managers to improve water quality and restore

critical habitats. CBBEP targets nonpoint source pollution issues by conducting research projects to determine sources of pollution. In addition, CBBEP participates in the development and implementation of watershed protection plans and TMDL implementation plans. Other CBBEP priorities include land conservation and management and education through the Delta Discovery program.

CBBEP continues to focus efforts on investigating sources of nutrients that may periodically be found in high concentrations in bay systems by partnering with stakeholders and scientists to sample soils and runoff to identify areas of concern. The information is being used to focus outreach efforts to deter practices that may lead to the introduction of elevated pollutants and nutrients in runoff and improve water quality.

In fiscal year 2021, CBBEP continued a project to sample nutrients every month in Petronila Creek, a tributary to Baffin Bay. The health of Baffin Bay has been concerning to scientists and citizens due to fish kills, water quality problems, and food web changes. The data will assist with developing an accurate picture of all possible nutrient sources and will be utilized by the Baffin Bay Working Group to help guide them in their watershed planning and restoration efforts. The Baffin Bay Working Group consists of researchers, commercial and recreational fisherman, landowners, ranchers, business owners, local governments, and federal and state agencies. This working group has identified various watershed protection needs, which will require developing a watershed protection plan and identifying sources of funding. The plan will identify locally driven solutions to voluntarily address complex water quality and land use issues across multiple jurisdictions and promote unified approaches to seek funding to ensure that this bay system continues to support the local, regional, and state economy. For more information visit the [Coastal Bend Bay's Estuary Program website](http://www.cbbep.org/)¹².

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. Groundwater also serves as habitat for plants and animals, some of which are endangered species. The Texas Groundwater Protection Committee (TGPC) was established by the Texas Legislature in 1989 as an interagency committee to protect this resource. TGPC consists of nine state entities and an association of groundwater districts. TGPC strives to improve interagency coordination and continues developing and updating the comprehensive groundwater protection strategy for the state. TGPC also identifies areas where new programs could be created, or existing programs could be enhanced, to provide added protection.

Two subcommittees, the Groundwater Issues Subcommittee and the longstanding Public Outreach and Education Subcommittee, execute the majority of TGPC's responsibilities. Both the Groundwater Issues Subcommittee and the main TGPC

¹²<http://www.cbbep.org/>

have standing agenda items at every meeting for discussion of nonpoint source pollution issues.

The Groundwater Issues Subcommittee oversees the cooperative groundwater monitoring program for pesticides in groundwater, which monitors aquifer conditions for select pesticides of interest. Primary goals of the subcommittee include coordinating monitoring programs for emerging contaminants or constituents of concern, assisting member agencies with monitoring programs, and developing white papers on groundwater issues with recommendations or policy options to the TGPC. The Groundwater Issues Subcommittee may also form task force working groups as needed to address individual issues, such as nonpoint source pollution.

TGPC emphasizes groundwater awareness in its outreach and education efforts. Targeting private drinking water well owners, the Public Outreach and Education Subcommittee works with Texas A&M AgriLife Extension Service, a member of TGPC, to develop fact sheets and frequently asked questions that include nonpoint source pollution and BMP information. While COVID-19 restrictions limited the number of events TGPC members could attend in 2021, TGPC typically distributes several thousand copies of fact sheets and displays information on groundwater protection at various conferences and events. TGPC participated in virtual events to the extent possible, and supported Texas A&M AgriLife Extension Service's Texas Well Owner Network program in conducting educational events for private drinking water well owners and providing literature on groundwater protection.

More information on TGPC, including activities related to nonpoint source pollution, visit the [TGPC's website](https://tgpc.texas.gov/)¹³.

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. The Clean Water State Revolving Fund is a financing program authorized under the federal CWA and is partially capitalized by an annual grant from EPA. This 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 as well as for green projects. Although most of the funds finance publicly owned wastewater treatment and collection systems, the Texas Water Development Board can also use the Clean Water State Revolving Fund for nonpoint source pollution abatement and stormwater projects. Funds are available to cities, counties, groundwater conservation districts, Soil and Water Conservation Districts, and other public agencies, as well as to nonprofit organizations, mainly water supply and/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 an identified

practice within a water quality management plan (WQMP), TMDL implementation plan, or watershed protection plan; a nonpoint source management activity that has been identified in the Texas Groundwater Protection Strategy; or 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 reviewed by TCEQ in cooperation with Councils of Government participating in the CWA Section 604(b) Grant to ensure conformance with the Texas Water Quality Management Plan. Loans can be used for planning, designing, acquiring, and constructing wastewater treatment facilities, 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; and wet weather flow control, including stormwater management activities.

Staff members from the Texas Water Development Board, TCEQ, and TSSWCB meet regularly to coordinate efforts to identify water bodies that are impacted by nonpoint source pollutants and to identify potential applicants for Clean Water State Revolving Fund assistance. They also identify potential candidates for Green Project Reserve funding, which can provide some loan forgiveness if low impact development practices are constructed.

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 watershed protection plan, TMDL, and TMDL implementation plan. This section highlights some of the nonpoint source education and public outreach activities conducted in fiscal year 2021.

Upper San Marcos River Watershed Protection Plan Implementation—San Marcos Greenbelt Alliance and the Mermaid Society of Texas

This collaborative project brings together the Meadows Center for Water and the Environment, the San Marcos Greenbelt Alliance, the City of San Marcos, and the Mermaid Society of Texas to continue Phase I implementation of the Upper San Marcos River Watershed Protection Plan. This project focuses on a specific area for restoration efforts and includes a large education and outreach program to educate residents, students, and visitors in the watershed on the importance of preventing nonpoint source pollution and how they can personally protect the Upper San Marcos River.

Restoration efforts are focused on the Windmill Tributary, a

¹³<https://tgpc.texas.gov/>

tributary to Sessom Creek, which is a main tributary to the Upper San Marcos River. Steep slopes and unmanaged invasive species in the area have caused significant landscape and streambank erosion, which has led to degraded water quality and wildlife habitat. The BMPs being implemented will reduce erosion through the stabilization of hillsides and the restoration of native vegetation. To further enhance these efforts in the Windmill Tributary and other locations within the watershed, the San Marcos Greenbelt Alliance and the City of San Marcos have been holding regular volunteer workdays, which are open to the public. Volunteers can help build restoration and preventative measures by assisting in the removal of invasive plants and trees, laying mulch down, and more. The volunteer workdays were initially delayed due to COVID-19, but with precautions in place, they have been able to occur as scheduled. As of fiscal year 2021, over 50 volunteers participated in six workdays.

The Mermaid Society of Texas has been developing in-depth educational programs for elementary schools and scout programs in the watershed, the Mermaid Chat and S.P.L.A.S.H. Patch programs, respectively. S.P.L.A.S.H. includes the themes

of Stewardship, Preservation, Local, Arts, Sustainability, and Heritage. The Mermaid Society of Texas is a highly regarded organization in the community. Support from TCEQ and EPA has helped to enhance outreach and educational programs. Children in the watershed are eligible to participate in the free S.P.L.A.S.H. Patch and Mermaid Chat programs, where they will learn how to better understand and value their communities, increase their awareness of the Upper San Marcos River, and actively get involved in protecting their local waterways. The Mermaid Chat and S.P.L.A.S.H. Patch programs will be complimented with educational videos for the classroom, traveling educational programs, and more for both English and Spanish speakers.

The COVID-19 pandemic led to delays in implementation of these programs in the community, but the extra time allowed for greater refinement of the programs and their corresponding materials. Both programs will be integrated into local elementary schools at the beginning of the 2021-2022 school year. Education and outreach efforts will continue throughout the rest of the implementation timeline, allowing opportunities for community members of all ages to learn more and get involved in the protection and restoration of their local waterways.

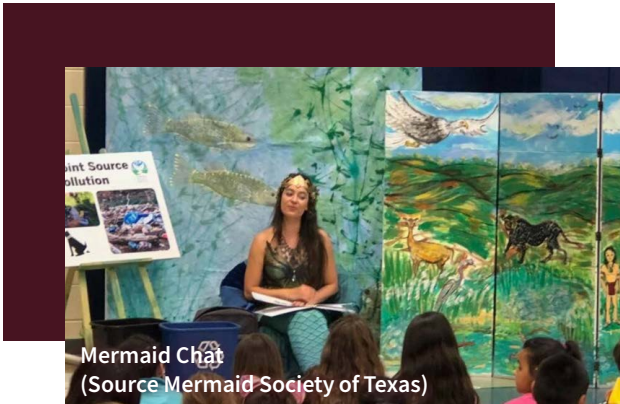
Comal River Education and Outreach in New Braunfels

The Dry Comal Creek and Comal River watersheds encompass approximately 130 square miles in and around New Braunfels. The ephemeral Dry Comal Creek winds 34 miles through the Texas Hill Country northeast of the city and is a tributary to the Comal River. The Comal River is known for being the shortest navigable waterway in Texas, two and one-half miles long, and is located entirely within the New Braunfels city limits.

Urban populations of white-tail deer and non-native avian species were determined to be a large contributor to the bacterial loading in both the Dry Comal Creek and Comal River during development of the watershed protection plan. To reduce the congregation of wildlife in environmentally sensitive areas, such as Landa Park and the neighborhoods surrounding the segment of the Balcones Escarpment where the headwater springs of the Comal River are located, the City of New Braunfels passed an ordinance restricting the feeding of wildlife within the city limits in fall 2018. Along with the ordinance that prohibited feeding wildlife, the city installed educational signs throughout Landa Park to inform visitors of the negative impacts of feeding wildlife and the ordinance. Two-hundred and five signs were placed in Landa Park, and an additional 23 “Do Not Feed the Wildlife” signs were distributed to local river outfitters to be placed where patrons could view them prior to embarking on the river.

The City of New Braunfels has engaged with various resident groups to promote bacteria reduction initiatives outlined in the EPA-accepted watershed protection plan.

Educational presentations were provided to community organizations such as two local Lions Clubs and the Chamber of Commerce’s Natural Resource Committee. Watershed educational



programming was also presented to the youth of New Braunfels, often incorporated into their earth science and biology curriculum at school. Sixteen pet waste bag dispensers were purchased and provided to the city's parks and recreation department for placement in city parks within the watershed. Puppy Playland, a dog park within the city park system, received two of these bag stations along with additional signage explaining how pet waste poses a threat to the health of the watershed and what pet owners can do to help. An additional 24 pet waste bag dispenser stations were provided to local apartment and condominium owners and homeowners associations for placement in the common areas.

In 2020, city staff and stakeholders reevaluated outreach and educational components of the watershed protection plan to accommodate the unforeseen obstacles created by COVID-19.



Pet Waste Education Sign
(Source City of New Braunfels)

The city produced a three-minute educational video covering topics such as proper pet waste management, negative impacts of feeding wildlife, and nonpoint source pollution in stormwater runoff. The video was displayed as a movie preview for 10 weeks in two local movie theatres and published on the city's [watershed protection plan website](http://www.nbtexas.org/1914/Watershed-Protection-Planning)¹⁴. The City of New Braunfels has also enlisted the help of a local advertising firm to develop two internet browser-based games that focus on watershed knowledge and trivia. Students of all ages can use these games to learn the basic principles of the watershed protection plan and to convey the importance of community stewardship in supporting the health of a watershed. Additionally, the firm is developing a hands-on learning module that includes a presentation and a water testing laboratory component for use in classrooms. Lastly, a watershed visualization tool implemented in a geographic information system is currently being developed and is projected to be published in the winter of 2021. The visualization tool will allow users to manipulate data sets and map layers in an interactive setting to illustrate water flow within the watersheds, including information about which areas of the city drain to

¹⁴<http://www.nbtexas.org/1914/Watershed-Protection-Planning>

specific storm sewer systems and where nonpoint source pollution can occur.

Statewide Riparian and Stream Ecosystem Education Program

The Texas Water Resources Institute (TWRI), a part of Texas A&M AgriLife, has partnered with TSSWCB, Texas Riparian Association, Texas A&M Forest Service, Texas Parks and Wildlife Department, Natural Resources Conservation Service, and Nueces River Authority to conduct Riparian and Stream Ecosystem Education programs across the state with funding from a CWA Section 319(h) grant. Riparian degradation is a major threat to water quality, instream habitat, terrestrial wildlife, aquatic species, and overall stream health. Proper management, protection, and restoration of riparian areas decrease bacteria, nutrient, and sediment loading; lower instream temperatures; improve dissolved oxygen levels; and improve aquatic habitat.

To improve the management of these sensitive and vital ecosystems across Texas, riparian education programs provide the opportunity for landowners and land managers to understand the function and benefits of riparian zones, and BMPs to protect and restore them. The program has a website with online tools and education modules, and during fiscal year 2021 had 7,478 blog subscribers, a listserv of 505 members, and a Facebook page with 1,762 followers that serve as outlets for disseminating information. Workshops are conducted in watersheds where watershed protection plans and TMDL efforts are ongoing. Due to COVID-19, in-person programs were not available in fiscal year 2021. Instead, work was spent creating an online program and hosting virtual question and answer sessions to keep participants engaged and connected.

The free online program explains some of the content normally covered during the field portion of the training and includes many of the same continuing education credits as the in-person program. Since the online course launched in October 2021, 290 people have completed it.

Half of the attendees identified themselves as landowners and an additional 20% identified themselves as land managers or operators. Total land acreage impacted from the online training program over fiscal year 2021 was more than 175,183 acres. Eighty-nine percent of participants were mostly or completely



Riparian Education Event (Source Texas Water Resources Institute)



Guadalupe River at Guadalupe State Park (Source iStock)

satisfied with the online program and 98% would recommend the course to others. Eighty-seven percent of attendees anticipate adopting or recommending the use of BMPs discussed and 46% anticipate benefitting economically. All land and water management practices discussed received above 50% rates for “plan to adopt” by respondents. Specifically, reducing bare ground, rangeland planting for vegetative cover, and herbaceous riparian buffers were the most popular BMPs noted by participants and all three received a 60% or higher “plan to adopt” rating.

In addition to the online program, the team hosted three virtual question and answer sessions in targeted watersheds. Participants who took the online course were able to join the online session, hear about local watershed planning efforts, and ask questions. Targeted areas included the Attoyac Bayou watershed, San Antonio-area watersheds, and the Joe Pool Lake watershed.

TWRI chaired the planning committee and coordinated the Urban Riparian Symposium, held February 10 through 12, 2021. The symposium was held virtually, due to COVID-19, with 163 attendees. The conference was spread out over three days with three opening and closing plenary speakers, networking, exhibitor booths, a Texas Riparian Association Annual Business Meeting and Awards Presentation, and 42 concurrent presentations.

Texas Watershed Stewards Program

Texas Watershed Stewards (TWS) is a one-day training program designed to increase citizen understanding of watershed processes and increase local participation in watershed management and watershed protection planning activities across the state. In doing so, nonpoint source pollution may be better addressed. This is an important step in improving surface water quality, given that public participation in local watershed management efforts is critical in addressing nonpoint source pollution.

The TWS Program offers both in-person workshops and online training courses. A team of environmental professionals, using high quality visual aids and hands-on teaching stations, deliver the in-person workshops. Each workshop is either a four-hour or a seven-hour educational event and tailored to the targeted watershed in which it is hosted. Targeted watersheds primarily include those with an existing water quality impairment that are developing or implementing a watershed protection plan, TMDL, implementation plan, or other watershed-based plan. To increase the reach and accessibility of TWS curriculum, the program administers three, self-paced online courses: two video-based courses marketed to adult learners and one interactive course

formatted for middle school-aged youth.

Beginning in spring 2020, COVID-19 resulted in many necessary adaptations to the TWS program. In-person workshops were initially unable to be delivered due to COVID-19. However, the need continued for programming to mitigate nonpoint source pollution. Therefore, the program implemented necessary protocols to help ensure safe, in-person workshops, and perform virtual outreach when and where needed.

As of August 2021, the program has conducted 124 workshops in watersheds across the state, seven in fiscal year 2021. Participants have included landowners, agricultural producers, city personnel and officials, business owners, staff at state and federal environmental agencies, public schools and universities, environmental and engineering professionals, and other watershed residents. There are 5,116 people that have completed the program and become Texas Watershed Stewards, with over 200 participants in fiscal year 2021.

Through the five units of the TWS curriculum, participants learn about the nature and function of watersheds, potential impairments, and BMPs for watershed stewardship. Those five units include: a program introduction, an overview of watershed systems, identification of watershed impairments, watershed management and regulation, and community-driven watershed protection strategies. The curriculum is compiled into a publicly available, comprehensive handbook.

To evaluate the effectiveness of the workshops, the participants take tests before and after they complete the program and submit an evaluation six months after completing the program. Based on the results, the reported knowledge gain by workshop attendees for water quality-related questions is over 30%. Moreover, approximately 80% of respondents have either adopted or maintained one or more water related BMPs within six months of workshop completion.

The TWS program is sponsored by the Texas A&M AgriLife Extension Service and TSSWCB, and is made possible through a Clean Water Act Section 319(h) grant. Additional information about the program is available on the [TWS website](#)¹⁵.



Texas Watershed Steward Workshop
(Source Michael Kuitu)

¹⁵<https://tws.tamu.edu/>



Pedernales State Park in Dripping Springs (Source iStock)

4

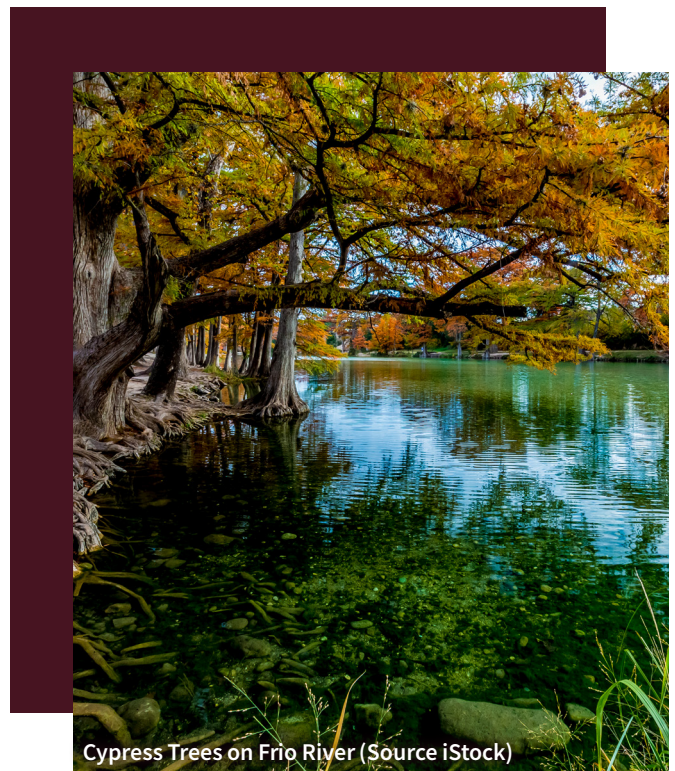
Developing And Implementing Watershed Protection Plans

Chapter 4

TCEQ and TSSWCB apply the Watershed Approach to managing nonpoint source pollution by supporting the development and implementation of watershed protection plans. These plans are developed through local stakeholder groups who coordinate activities and resources to manage water quality. In Texas, watershed protection plans facilitate the restoration of impaired water bodies and the protection of 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 watershed protection plans can take many forms, the development of plans funded by CWA Section 319(h) grants must follow guidelines issued by the EPA. You can find these guidelines in the *Nonpoint Source Program and Grants Guidelines for States and Territories*¹⁶.

TCEQ and TSSWCB have facilitated the development and implementation of approximately 44 watershed protection plans throughout Texas by providing technical assistance and/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 the development and implementation of watershed protection plans in areas where nonpoint source pollution has contributed to the impairment of water quality. In Texas, watershed protection plans are also developed by third parties independent from TCEQ and TSSWCB. Watershed protection plans being developed or implemented in Texas at the end of fiscal year 2021 are shown in Figure 4.1. Watershed protection plans which

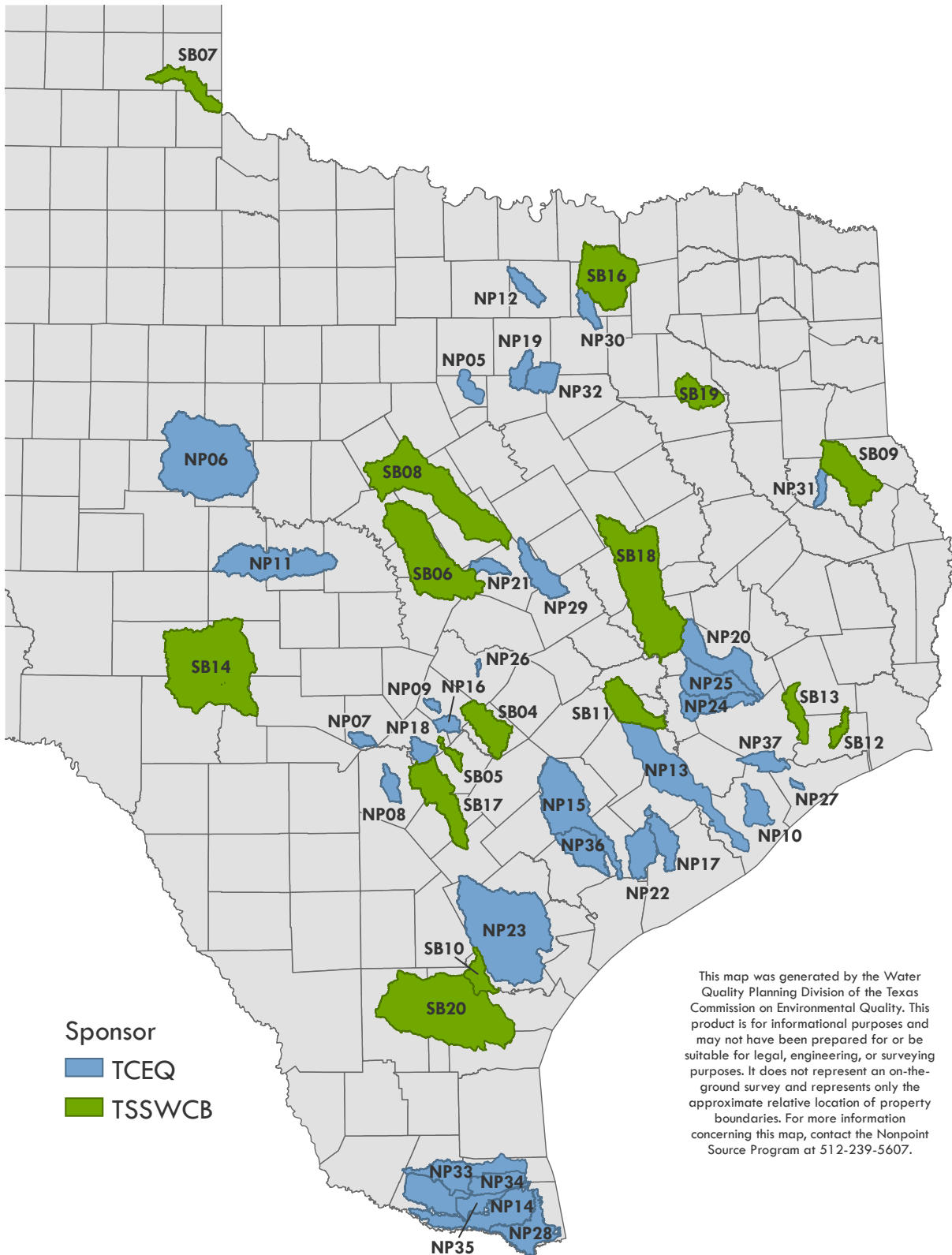
are under development or being implemented are listed in Table 4.1. Neither the map nor table are intended to be a comprehensive list of all the watershed planning efforts currently underway in Texas because there may be other local planning efforts not funded by CWA Section 319(h) funds.



Cypress Trees on Frio River (Source iStock)

¹⁶<https://www.epa.gov/nps/319-grant-program-states-and-territories>

FIGURE 4.1
Map of Watersheds with Watershed Protection Plans Being Developed or Implemented



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 Nonpoint Source Program at 512-239-5607.

TABLE 4.1
Watershed Protection Plans Under Development*, Accepted, or Implemented

ID	TSSWCB WPPs
SB09	Attoyac Bayou
SB07	Buck Creek
SB13	Cedar Bayou
SB12	Double Bayou
SB05	Geronimo Creek
SB19*	Kickapoo Creek
SB16	Lake Lavon
SB06	Lampasas River
SB08	Leon River
SB10	Lower Nueces River
SB17	Mid and Lower Cibolo Creek
SB11	Mill Creek
SB18	Navasota River
SB20*	Petronila and San Fernando Creeks
SB04	Plum Creek
SB14	Upper Llano River
ID	TCEQ WPPs
NP14	Arroyo Colorado
NP10	Bastrop Bayou
NP29	Big Elm Creek
NP11	Brady Creek
NP22	Carancahua Bay
NP36*	Clear Creek
NP06	Colorado River Below EV Spence Reservoir
NP24	Cypress Creek (Segment 1009)
NP09	Cypress Creek (Segment 1815)
NP18	Dry Comal/Comal River
NP12	Hickory Creek
NP27	Highland Bayou
NP32*	Joe Pool Lake
NP31*	La Nana Bayou

table continued on next page

TABLE 4.1
Watershed Protection Plans Under Development*, Accepted, or Implemented

ID	TCEQ WPPs
NP19	Lake Arlington/Village Creek
NP05	Lake Granbury
NP15	Lavaca River
NP28*	Lower Laguna Madre/Brownsville Ship Channel
NP23	Mission and Aransas Rivers
NP21	Nolan Creek
NP13	San Bernard River
NP26	Shoal Creek
NP25*	Spring 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 River/Lake Creek

Watershed Protection Plan Highlights

Shoal Creek Watershed Action Plan

The Shoal Creek Watershed Action Plan (SCWAP) is a community-guided plan to restore Shoal Creek so residents can safely fish, swim, and play in it. It represents the hard work of community stakeholders and environmental professionals who came together to share their knowledge of Shoal Creek and define a path to restore a clean, healthy waterway. Following three years of collaborative development, the SCWAP was accepted by EPA in fiscal year 2021.

Stretching from north to central Austin, the Shoal Creek watershed covers an area of approximately 13 square miles, including an 11-mile creek and more than 30 miles of streams. Shoal Creek flows into the Colorado River, and 25% of the watershed, 3.5 square miles, falls within the Edwards Aquifer recharge zone. A series of hike-and-bike trails follows the creek for almost 10 miles. Since 2002, elevated bacteria concentrations have been observed in the Spicewood Tributary, Segment 1403J. This tributary is currently listed as impaired for bacteria and a concern for nitrate in the 2020 Integrated Report.

Approximately 54% of this highly urbanized watershed is surfaced in impervious cover. Currently, only 19% of the watershed’s impervious cover area is designed to improve water quality. Stakeholder cooperation is necessary to address water quality issues since over 1,300 residences and 94 commercial properties are located directly along Shoal Creek. The watershed currently has a population of approximately 72,000 people and is expected to reach approximately 104,000 people by 2040.

Under Shoal Creek Conservancy’s leadership, environmental professionals and community stakeholders worked together to identify science-based, actionable steps to improve water quality, halt erosion, restore native habitat, and more. This collection of implementation strategies forms the basis of the watershed protection plan. The SCWAP takes EPA’s nine element watershed protection plan as its basic structure. Proposed BMPs include scaling up green stormwater infrastructure on public and private property, as well as education and outreach programming to spur long-term behavior change. The SCWAP has been lauded by the City of Austin Watershed Protection Department as a much-needed, replicable template for innovatively managing other urban watersheds in the region.

Stakeholders involved in developing the plan included a group of 264 attendees, 40 on average per meeting, representing

a range of interests in the watershed including business owners, real estate organizations, residents, researchers and educators, government representatives, and environmental nonprofit organizations. Additionally, a steering committee was formed to provide continued leadership as the watershed protection plan moves into implementation. The steering committee is composed of representatives from public and private sector entities whose participation is critical to implementation. The following highlights illustrate implementation progress in fiscal year 2021.

CREEKSIDE NEIGHBORS PROGRAM

The Creekside Neighbors program, launched in 2020, empowers residents of the Shoal Creek watershed to make land changes that positively impact watershed health. The program's two primary activities are facilitating clean-up events on private property and promoting resources and incentives that are offered by the City of Austin to assist residents in installing green infrastructure such as rain gardens, reducing runoff to reduce nutrients, and minimizing the impact of pet waste. In fiscal year 2021 the Creekside Neighbors program facilitated four creek cleanup events on private property and initiated a standing weekly cleanup led by one household.

The Creekside Neighbors program was created to harness the enthusiasm of watershed stakeholders: Shoal Creek Conservancy hears significant demand from community members for resources on proper stewardship of their creek-side property, as well as a demand for small-scale stewardship projects.

As SCWAP implementation unfolds, it is anticipated that Creekside Neighbors will play three critical roles: 1) effecting behavior change at the individual and household level to reduce pollution and improve water quality, 2) expanding active stewardship of private property, and 3) driving implementation of residential-scale green infrastructure installations on private property through participation in City of Austin incentive programs.

LARGE-SCALE ENVIRONMENTAL CLEANUPS

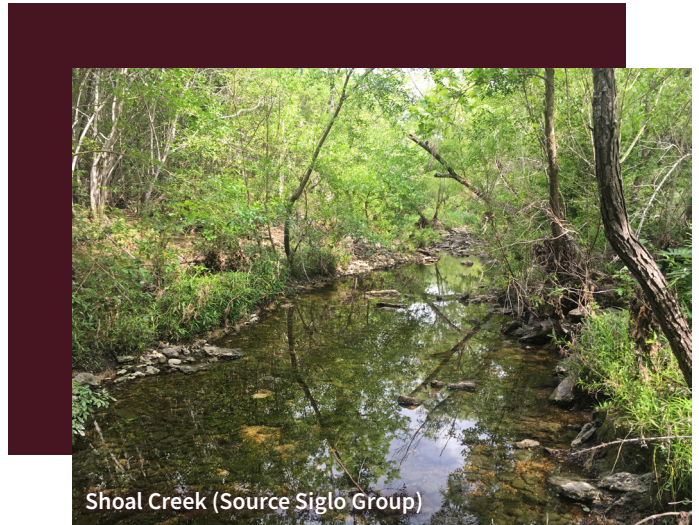
Shoal Creek Conservancy established a new partnership with The Other Ones Foundation to conduct large-scale environmental cleanups related to creek-side encampments along Shoal Creek. The Other Ones Foundation is a nonprofit organization that provides personalized case management and low-barrier employment to people experiencing homelessness in Austin. The Other Ones Foundation has conducted at least 11 cleanups in the Shoal Creek watershed since March 2020.

EDUCATION AND OUTREACH

Outside of Creekside Neighbors, the main avenues for Shoal Creek Watershed Action Plan education and outreach have been public events, including volunteer service days and creek tours, and social media engagement. Service days are a hands-on opportunity to educate community members about the challenges facing the watershed and how they can make a positive impact. Shoal Creek Conservancy's seasonal creek tours helps to educate the public about watershed health and individual impacts on water

quality. Relevant content is integrated into creek tours with diverse themes such as human geography, wildlife, and natural history, so that attendees learn from a variety of angles. Due to COVID-19, some creek tours were hosted virtually.

With the initiation of implementation in fiscal year 2021, Shoal Creek Conservancy and stakeholders have taken the first steps towards restoring water quality.



Shoal Creek (Source Siglo Group)

Lavon Lake Watershed Protection Plan

Impounded by Lavon Dam near Wylie, Texas, Lavon Lake is the uppermost reservoir on the East Fork of the Trinity River. The reservoir is the primary source of municipal water supply for 1.8 million Texans. Its 769-square-mile watershed stretches across parts of Collin, Grayson, Fannin, and Hunt counties in North Texas.

The watershed remains primarily rural. However, growth in the southwestern portion is occurring and the landscape is rapidly urbanizing. Population projections indicate that incorporated areas within the watershed will continue to grow, increasing the potential for changes to stream hydrology and water quality.

DEVELOPMENT OF THE WATERSHED PROTECTION PLAN

In 2014, TCEQ identified elevated levels of bacteria in two major tributaries of Lavon Lake: Wilson Creek and the East Fork of the Trinity River. In 2016, the North Texas Municipal Water District received a CWA Section 319(h) grant to address the impairments through a watershed protection plan. North Texas Municipal Water District formed a partnership of local stakeholders and resource agencies to develop a plan that would help address the bacteria impairments and improve and protect water quality throughout the watershed.

Based on water quality data, modeling, land uses, and stakeholder input, the Lavon Lake Partnership identified potential



Wilson Creek (Source North Texas Municipal Water District)



Lavon Lake Data Collection (Source North Texas Municipal Water District)

sources of pollution and recommended management measures and educational resources to address each. EPA accepted the Lavon Lake Watershed Protection Plan in 2017.

Since acceptance by EPA, implementation of the plan has been supported through grants from TSSWCB and TCEQ and from private donations and in-kind partners. One strategy supported by a CWA Section 319(h) grant from TSSWCB funds a full-time district technician at the Collin County Soil and Water Conservation District. The technician works with agriculture producers to develop and implement WQMPs within the watershed. WQMPs and conservation practices have been established on more than 2,000 acres.

Another CWA Section 319(h) grant from TCEQ supports a series of roundtable meetings with cities in the watershed, development of resource materials, and the installation of LID features to demonstrate innovative urban stormwater treatments. In 2021, designs for the LID installations were completed. The designs include raingardens, bioswales, pervious pavers, and rain catchments systems. Construction at four sites in Wylie and McKinney is expected to be complete in 2022.

EDUCATION AND OUTREACH

Education and outreach events have been challenging due to COVID-19. Continued support from TSSWCB CWA Section 319(h) funding enabled the purchase of a stream trailer to demonstrate

hydrology and erosion in natural stream systems. The trailer, which is loaned to schools and organizations as an educational resource, was increasingly used as communities opened up for educational events in 2021.

Other outreach programs that supported watershed protection goals included a Texas Watershed Steward Workshop and a Healthy Lawns and Healthy Waters Workshop. Free registration for an online Homeowner Septic System Maintenance workshop was also supported to offer an alternative to in-person participation.



Guadalupe River at Guadalupe State Park (Source iStock)

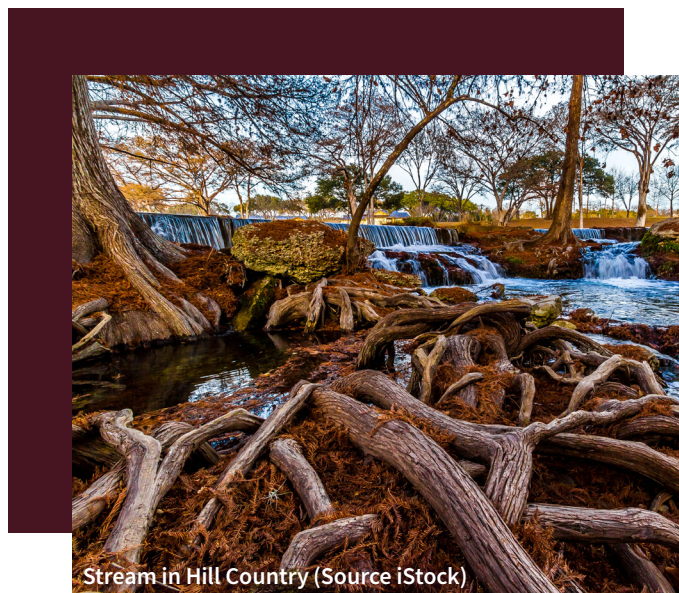


Waterfall in Gorman Falls Colorado Bend State Park (Source iStock)



Abbreviations

AU	Assessment Unit	TGPC	Texas Groundwater Protection Committee
BMP	Best Management Practice	TMDL	Total Maximum Daily Load
BST	Bacterial Source Tracking	TSSWCB	Texas State Soil and Water Conservation Board
CBBEP	Coastal Bend Bays and Estuaries Program	TxDOT	Texas Department of Transportation
CFU	Colony Forming Units	TWRI	Texas Water Resources Institute
CWA	Clean Water Act	TWS	Texas Watershed Stewards
CZARA	Coastal Zone Act Reauthorization Amendments	WAP	Watershed Action Planning
<i>E. coli</i>	Escherichia coli	WQMP	Water Quality Management Plan
EPA	U.S. Environmental Protection Agency		
GBEP	Galveston Bay Estuary Program		
GRTS	Grants Reporting Tracking System		
Integrated Report	Texas Integrated Report of Surface Water Quality and Texas 303(d) List		
lb	Pounds		
LID	Low Impact Development		
Meadows Center	The Meadows Center for Water and the Environment at Texas State University		
mL	Milliliter		
NRCS	Natural Resources Conservation Service		
OSSF	On-Site Sewage Facility		
PPG	Performance Partnership Grant		
SCWAP	Shoal Creek Watershed Action Plan		
SELECT	Spatially Explicit Load Enrichment Calculation Tool		
TCEQ	Texas Commission on Environmental Quality		



Stream in Hill Country (Source iStock)



Hamilton Pool Preserve (Source iStock)



Appendix

Texas Nonpoint Source Management Program Milestones

Goals / Objectives	Milestone	Milestone Description	Milestone Measurement	2021 ^a Estimate	2021 Actual	Comments
ST1/A	Nonpoint Source Assessment Report	The state will produce the Integrated Report in accordance with applicable EPA guidance	Integrated Report	0	0	EPA accepted 2020 Integrated Report in May 2020
LT/2	Nonpoint Source Management Program Updates	The state will update the Management Program in accordance with applicable EPA guidance	Management Program updates	0	0	
LT/2	Nonpoint Source Performance Partnership Grant (PPG) End of Year Reports	The state will produce End of Year Report for PPG activities completed by TCEQ	PPG End of Year Reports	1	1	
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 2022
LT/5	Implementation of Coastal Nonpoint Source Pollution Control Management Measures	Applicable Management Measure	Nonpoint Source Annual Report and the Texas General Land Office Reporting Mechanisms	0	0	

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Texas Nonpoint Source Management Program Milestones

Continued

Goals / Objectives	Milestone	Milestone Description	Milestone Measurement	2021 ^a Estimate	2021 Actual	Comments
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	0	0	

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Texas Nonpoint Source Management Program Milestones

Continued

Goals / Objectives	Milestone	Milestone Description	Milestone Measurement	2021 ^a Estimate	2021 Actual	Comments
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	0	Postponed due to COVID-19. Scheduled for September 2021.
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)	7	7	
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	1	One held virtually due to COVID-19
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	211	2021 Actual was lower due to delays and canceled trainings because of COVID-19

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Texas Nonpoint Source Management Program Milestones

Continued

Goals / Objectives	Milestone	Milestone Description	Milestone Measurement	2021 ^a Estimate	2021 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	TWatershed characterization projects	2	4	
ST2/A,C	Watershed Coordination	The state will support watershed coordination projects which facilitate the implementation of WPPs	Watershed coordination projects	10	11	
ST1/D	Develop WPPs	The state will support projects which provide for the development of WPPs which satisfy applicable EPA guidance	WPP development projects	3	9	
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	53	

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Texas Nonpoint Source Management Program Milestones

Continued

Goals / Objectives	Milestone	Milestone Description	Milestone Measurement	2021 ^a Estimate	2021 Actual	Comments
ST1/D	Develop TMDLs and implementation plans	The state will support projects which provide for the development of TMDLs and implementation plans which satisfy applicable state, federal, and program regulations and guidance	TMDL and implementation plan development projects	0	0	
ST2/D	Implement TMDLs and implementation plans	The state will support projects which provide for the implementation of management measures specified in TMDLs and implementation plans which satisfy applicable state, federal, and program regulations and guidance	TMDL implementation plan implementation projects	3	6	
AT2/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	16	29	
ST2/B,C	Load Reductions (Nitrogen)	The state will ensure project reductions are reported utilizing GRTS	GRTS Report	RQ ^(b)	161,479.18 lb/yr	Numbers reflect projects with load reductions that were reported in fiscal year 2021

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Texas Nonpoint Source Management Program Milestones

Continued

Goals / Objectives	Milestone	Milestone Description	Milestone Measurement	2021 ^a Estimate	2021 Actual	Comments
T2/B,C	Load Reductions (Phosphorus)	The state will ensure project reductions are reported utilizing GRTS	GRTS Report	RQ ^(b)	16,768.92 lb/yr	Numbers reflect projects with load reductions that were reported in fiscal year 2021
ST2/B,C	Load Reductions (Sediment)	The state will ensure project reductions are reported utilizing GRTS	GRTS Report	RQ ^(b)	2,828.95 ton/yr	Numbers reflect projects with load reductions that were reported in fiscal year 2021
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	10	13	Numbers reflect active projects

(a) Estimates are from the 2017 *Texas Nonpoint Source Management Program* report

(b) RQ – Reportable Quantity



Large Granite Boulders at Lost Maples State Park (Source iStock)



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